Determinants of the Block Premium and
of Private Benefits of Control[*]

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Abstract

We study the determinants of private benefits of control in negotiated block transactions. We estimate the block pricing model in Burkart, Gromb, and Panunzi (2000) (BGP) acknowledging the presence of both block premia and block discounts in our sample. We find evidence in favor of the BGP model according to which the occurrence of block premia and block discounts depends on how competitive the block seller can be in opposing a potential tender offer for the target's stock. Private benefits represent 3% of the target firm's stock market value. In addition, our approach allows us to measure the efficiency with which private benefits are extracted: On average, each \$1 of private benefits costs shareholders \$2 of equity value. Private benefits decrease with target's size and short term debt, and increase with target's past performance, intangible assets, and cash. The later effect is stronger if the target's cash is higher than the acquirer's cash. Acquirer's overpay an average of 7% of the target's stock price relative to the BGP benchmark. We use our structural estimation to conduct a counterfactual policy evaluation of the Mandatory Bid Rule. Our results suggest that the Mandatory Bid Rule fails to add value to shareholders because it fails to prevent welfare decreasing transactions and deters welfare increasing transactions by forcing inefficient tender offers.

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1 Introduction

After Jensen and Meckling (1976) and Grossman and Hart (1980), private benefits of control have become a staple in the corporate finance literature. From firm investment and financing policies to corporate governance and forms of control sharing, much of the literature presumes that controlling shareholders and managers have the ability to derive private benefits. In addition, recently, several models have been written which derive implications of private benefits extraction for asset pricing.[1] Yet, model specifications of private benefits are generally ad hoc. For example, many models assume fixed private benefits of control. Such ad hoc assumption of fixed private benefits is justified for its simplicity, but also because of the limited empirical evidence on the determinants of private benefits of control.

This paper studies the size and determinants of private benefits of control. We estimate private benefits of control by estimating the block pricing model in Burkart, Gromb, and Panunzi (2000) (hereafter BGP) using a structural estimation method. In the BGP model, if a private negotiation of a minority block fails, the buyer can still acquire control via a tender offer. The presence of this alternative acquisition method implies that the block price reflects the outcome of the potential tender offer. BGP show that the occurrence of a block premium or a block discount depends on how effective the block owner can be in opposing a tender offer by a potential buyer.

The paper presents four main results. First, we show that the BGP model fits well several features of the data on block trades. Block premia in the data occur mainly when the block owner is predicted to be effective in opposing a tender offer and, vice-versa, block discounts in the data occur mainly when the block owner is predicted to be ineffective in opposing a potential tender offer. In addition, the BGP model can capture variation arising from blocks that trade at a discount relative to the pre-announcement exchange price. As we discuss below, this is a unique feature of the BGP model.

Second, average private benefits represent 3% of the target firm's equity value. However, the distribution of private benefits is highly positively skewed: Approximately 28% (50%) of trades are associated with private benefits of less than 0.1% (1%). We also estimate the efficiency with which private benefits are extracted. On average, each $1 of private benefits costs shareholders $2 of equity value. We show that private benefits of control as a fraction of firm size increase with the firm's cash holdings to total assets. This effect is stronger if the target firm has more cash than the acquirer firm. We find that private benefits decrease with short-term debt. Moreover, the elasticities of private benefits to cash holdings and short term debt are almost equal to each other (in absolute value) across all specifications. This evidence strongly supports Jensen's (1986) free cash flow hypothesis. Whereas the previous liteature has failed to identify an unambiguous effect of leverage on private benefits, we have isolated

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[1] See, for example, Dow, Gorton, and Krishnamurthy (2005) and Albuquerque and Wang (2008).

the free cash flow story by decomposing debt into short and long term. Private benefits also decrease for cases where the potential buyer is already an active shareholder in the target firm, suggesting that incentives play a role in limiting income diversion. Finally, we show that private benefits increase with the target firm's ratio of intangible assets to total assets and its past stock price performance.

Third, we conduct a counterfactual analysis with policy implications for the debate regarding the choice between the Market Rule and the Mandatory Bid Rule (MBR).[2] We find that, in most transactions, the MBR brings losses to dispersed shareholders. On average, total welfare decreases by 3% assuming that all deals that go through under the MR would also go through under the MBR. Total welfare decreases by an additional 10% on average after dropping the deals that would not be undertaken under the MBR. We then test the conjecture in Barclay and Holderness (1992) that the benefits of the MBR should be small given the large observed increase in share value that follows the trade announcement. Consistent with this conjecture, we find that the deals where most of the benefits from the MBR arise are characterized by low price run-ups. We also find that the benefits of the MBR occur in the transactions with the lowest block sizes, but only if the seller can be an effective competitor in the alternative of a tender offer. Because block size by itself is neither necessary nor sufficient for the MBR to be beneficial, the practice in various European countries of conditioning the implementation of the MBR only on block size is questionable (see Berglöf and Burkart (2003) for a summary of regulatory practices). We explore the policy implications of these results for the debate in Europe on Europe-wide takeover regulation.

Fourth, we find evidence that acquirers' overpay by about 7% of the target firm's value relative to the BGP benchmark price. Our finding differs from the previous literature which has argued that no overpayment is made. One possible explanation of the difference in results is that prior tests focus on the subsample of deals where the buyer is a publicly traded corporation. Specifically, Barclay and Holderness (1989) and Dyck and Zingales (2004) reject the overpayment hypothesis by rejecting the hypothesis that the buyer's stock price falls around the block trade event. However, in our data a disproportionately high number of the largest block premia is attributable to buyers who are not publicly traded corporations.

We use data on trades of blocks of stock to estimate private benefits of control. The evidence suggests that block transfers are associated with control transfers (Barclay and Holderness (1991, 1992) and Bethel et al. (1998) for the US, and Franks et al. (1995) for the UK). It also suggests that block transfers are generally associated with an increase in share value and with the transfer of private benefits to the new block owner (e.g., Barclay and Holderness (1989) and Dyck and Zingales (2004)). As Barclay and Holderness (1989) have

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[2]According to the Mandatory Bid Rule, also known as the Equal Opportunity Rule, the terms offered to the block holder have to be offered to all other shareholders. There is no such obligation with the Market Rule, where blocks are traded privately.

noted, acquirers are willing to pay a premium for the block in order to obtain the private benefits of control.

One difficulty that arises is that the block premium is not a measure of private benefits (e.g. Barclay and Holderness (1989)).[3] Instead, the block premium may be better described as a function of private benefits and of the change in share value with the new owner. The problem then arises of how to disentangle the effect that various independent variables might have on private benefits from their effect on the superior share value under the new block owner. Dyck and Zingales (2004) approach this issue by proposing an elegant, model-based adjustment to the block premium that insulates the private benefits from the increased share value. According to their model, the adjusted block premium is the average private benefit between seller and buyer. However, their estimation takes the increase in share value as given and does not internalize the fact that any increase in private benefits occurs simultaneously with a decrease in share value.

One key issue is that blocks often trade at a *discount* with respect to the post-announcement exchange price. In the US, both the size of the discount and the proportion of them in the data are large. Treating block discounts simply as if they were low (i.e., negative) realizations of the block premium leads to a downward-biased, and often negative, estimate of the private benefits of control. Therefore, in order to use the variation in block premia and in block discounts to identify private benefits, we must first determine when each may occur.

The structural estimation we pursue here has several advantages over the previous literature.[4] First, it imposes explicit theoretical constraints on the data as an identification tool to measure private benefits of control. The model we estimate takes as given the private benefits as a function of block size and the change in the intrinsic share value due to the change of ownership and predicts the changes in the rates of extraction of private benefits, the changes in the level of private benefits, the effectiveness of competition posed by the seller in the alternative of a tender offer, the block premia and the run-up in the exchange price. We are therefore able to disentangle the changes in share value from the private benefits associated with a control transfer while taking into account that share values are not independent of private benefits. Second, as a by-product of our analysis, we estimate the inefficiency with which private benefits are extracted. Third, the structural estimation allows us to produce direct estimates of the block owner's surplus. This has not been possible in the previous literature unless one assumes that sellers have all the bargaining power, in which case the models predict no discounts. Fourth, our estimation approach allows us to do a counterfactual analysis with policy implications for the debate regarding the choice between

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[3]There is also a literature that tries to measure private benefits of control using the voting premium, i.e., the difference in price for voting versus non-voting shares (e.g. Zingales (1995) and Nenova (2003)). For a review of the literature see Benos and Weisbach (2004). This literature suffers from the same problem; the voting premium combines information on private benefits and on changes in share values.

[4]Betton and Eckbo (2000) conduct a structural estimation in the context of tender offers.

the Market Rule and the Mandatory Bid Rule (MBR). Fifth, the predicted, model-based average block premium can be compared to the sample average block premium to yield a measure of overpayment.

In addition, our choice of the BGP model is justified by its potential for addressing a rich variety of features in block trades.[5] First, the BGP model nests a model of block premia with a model of block discounts. In contrast, previous empirical approaches have had limited success in modeling block discounts which, as we shall argue, has lead to an underestimation of private benefits of control. Second, we document that in over half of the block discounts in our sample there is a discount in the block price relative to the pre-announcement stock-exchange price. To our knowledge, this feature of the data can only be captured by the BGP model.

Despite its general setup, the BGP model is sufficiently tractable to allow for a structural estimation. Yet, arguably, some assumptions are made for analytical tractability that may hamper the quantitative structural estimation that we pursue (e.g. risk neutrality of controlling shareholders). While the choice of functional form remains a concern in any structural or non-structural estimation, we note that our estimates of the BGP model capture many features of the data and a substantial fraction of the variation in block premia. Moreover, we perform a series of goodness of fit tests and robustness checks that increase our confidence on the results. Another concern is that the BGP model, and our non-linear estimation of it, imposes strong restrictions on the data. This makes our empirical approach significantly more computationally intensive than linear regression approaches. In addition, to guarantee that a global minimum is attained in our non-linear estimation, we exhaustively search the parameter space. This search adds in computation time. On the other hand, the estimation yields parameter estimates that are stable and gives us confidence on the quality of the fit. Moreover, under the null hypothesis that the BGP model is true, imposing restrictions on the data has the effect of increasing the power to reject the null hypothesis.

The paper proceeds by setting up a list of simple stylized facts about block pricing in the US in Section 2. In Section 3, we briefly review the BGP model and derive the block premium under the mutually exclusive assumptions of effective and ineffective competition. We also discuss the BGP model relative to other theories of block pricing. Section 4 describes our empirical approach. Section 5 gives a description of the data and Section 6 reports the results of our estimations. Section 7 discusses the policy implications of moving to a mandatory bid rule system. Section 8 concludes the paper. The Appendix contains details on the data, the estimation method, and proofs that are omitted in the main text.

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[5]See Section 2 for a complete list.

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2 Stylized Facts on Block Pricing

We start by analyzing stylized facts on the pricing of block transactions. Below, we shall contrast different theoretical models on their ability to capture these facts and therefore, to identify private benefits. We shall also evaluate how well our estimates match these facts.

We use a sample of 120 block transactions in the US. This sample includes all the block trades between 1/1/1990 and 31/08/2006 in the Thomson One Banker database (formerly SDC), where the fraction of equity being traded, or the block size, is between 10% and 50%. Previous studies have lumped together minority and majority blocks. However, minority blocks are priced differently than majority blocks. Indeed, with minority blocks, buyers can choose a tender offer as an alternative control-contest strategy (see Section 3). Aside from excluding majority blocks, we follow Dyck and Zingales (2004) in their sample selection procedure, which includes imposing criteria on the transfer of control. Section 5 and Appendix A.1 contain details on the sample selection and the construction of the variables.

Denote by P the per share block price and by P^0 and P^1 the per share stock exchange prices before and after the announcement of the block transaction, respectively. We choose the date for P^0 such that P^0 precedes the pre-announcement build up of expectations by dispersed shareholders associated with any information leakage about the trade. We choose the date for P^1 such that P^1 fully internalizes any gains from the change in control. To be more concrete, we take P^0 to be the stock exchange price 21 trading days before the public announcement of the block trade and take P^1 to be the stock exchange price 2 trading days after the public announcement of the block trade adjusted using a market model of returns (Dyck and Zingales (2004)).

Define the percentage *block premium* as in Barclay and Holderness (1989) by $\frac{P-P^1}{P^1}$. The block premium is expressed relative to P^1 in order to capture the acquirer's payment over and above the increase in share value recognized by dispersed shareholders.

Fact 1. The average block premium is 19.6%.

This feature appears in other datasets as well. In their original study, Barclay and Holderness (1989) document an average block premium of 20.4% on a sample of 63 block trades between 1978 and 1982 which includes all blocks with at least 5% of common stock. Barclay, Holderness and Sheehan (2001) use a dataset of 204 trades of blocks larger than or equal to 5% spanning the period 1978 to 1997 and report an average premium of 11%. Mikkelson and Regassa (1991) use a smaller dataset of only 37 deals, with block size ranging from 1.5% to 44% of outstanding shares, recorded between 1978 and 1987, and find an average block premium of 9.2%.

We denote the change in prices, $\frac{P^1-P^0}{P^0}$, as the *price run-up*.

Fact 2. The price run-up averages 14.1%.

Figure 1 shows the average normalized-price path from -21 trading days to $+21$ trading days around the announcement. The price path is displayed for prices that are market adjusted and market-model adjusted. The market model adjustment shows a less pronounced price increase before the public announcement and a smaller price jump at the announcement. Otherwise the price patterns are quite similar. Barclay and Holderness (1991) use a sample of 106 trades of blocks of 5% or more of common stock between 1978-1982 and document a market-model, price-adjusted average increase of 14% between 40 trading days before the announcement and the announcement date.

<center><INSERT FIGURE 1 ABOUT HERE></center>

Blocks are said to trade at a *discount* when the block premium is negative, i.e. when $\frac{P-P^1}{P^1} < 0$.

Fact 3. Blocks trade at a discount in 50% of the observations. The average discount in our sample is 24% of the post-announcement market-adjusted price.

Discounts are a common feature of block transactions. The fraction of discounts in our sample is larger than the 20% and 15% found in Barclay and Holderness (1989) and (1991), respectively. Both of these papers use samples from 1978 to 1982. With more recent samples, Barclay, Holderness and Sheehan (2001) report 32% of blocks traded at discounts between 1978 and 1997 whereas Dyck and Zingales (2004) report 19 out of 46 observations, or 41%, of blocks trading at a discount between 1990 and 2000.[6]

Fact 4. When a block trades at a discount it normally also shows a positive price run-up.

Figure 2 gives a scatter plot of the observed values of the price run-up and the percentage block premium. In our sample, 78% of the discounts also show a positive price run-up (points to the left of and above the origin) whereas only 58% of the premia showed a price run-up (points to the right of and above the origin).

<center><INSERT FIGURE 2 ABOUT HERE></center>

We can also define the block premium relative to the pre-announcement price as $\frac{P-P^0}{P^0}$.

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[6]Discounts are also preeminent in studies of the voting premium, i.e., the price difference between voting versus non-voting shares (e.g., Lease, McConnell and Mikkelson (1983) and Zingales (1995)). Much like the block premium, the voting premium is thought to be indicative of the existence of private benefits of control.

Fact 5. The percentage block premium relative to the pre-announcement price, $\frac{P-P^0}{P^0}$, is negative in 34.2% of the observations.

The percentage block premium relative to the pre-announcement price averages 30.7% in the whole sample and -25.7% for those observations where it is negative. This is an important property of the data that we shall argue is consistent only with the BGP model of the block premium. The fraction of discounts measured relative to the pre-announcement price that are associated with positive price run-ups equals 59%. This fraction is smaller than the 78% of discounts relative to the post-announcement price that show a positive price run-up.

3 Theory

3.1 The BGP Model Under Effective Competition

The model studies the interaction between a leading minority investor with fractional ownership of $\alpha < \frac{1}{2}$, called the incumbent I (i.e., the seller), and a potential acquirer, called the rival R, or buyer, who owns no shares. Whomever owns a block of size α or higher gains control. The party with control $X \in \{I, R\}$ generates *security benefits* v_X and makes a resource allocation by choosing $\phi \in [0,1]$, which then yields *share value* of $(1-\phi)\, v_X$ and *private benefits* $d_X\,(\phi)\, v_X$. There are no transactions costs, all information is complete, agents are risk neutral and the discount rate is zero.

There is an initial stage of negotiations, stage 1, in which I and R can trade privately by playing a Nash bargaining game with respective bargaining powers ψ and $1-\psi$, where $\psi \in [0,1]$. At this stage, I and R agree to exchange a fraction of α at the price P. I and R can also enter into a standstill agreement where I pledges not to acquire further shares in the future. If bargaining is successful R gains control, allocates resources to realize security benefits and extracts private benefits.

If bargaining is not successful, a second stage starts with a takeover contest. The consideration of this alternative trading mechanism is what makes the BGP model special. Subsection 3.3 considers the model solution in its absence. In the takeover contest, R makes an offer, then I may counterbid. Tendering is assumed to be sequential: I and R first decide on how many shares after which the remaining shareholders make their tendering decision. Each of the later shareholders is atomistic believing that the outcome of the tender offer is not affected by his decision an acts noncooperatively. Again, the party that gains control realizes security benefits and extracts private benefits.

BGP make 4 assumptions regarding d_X, v_I and v_R, which are:

Assumption 1 *The function $d_X\,(\phi)$ is strictly increasing and strictly concave on $[0,1]$, with $d_X\,(0) = 0$, $d'_X\,(0) = 1$ and $d'_X\,(1) = 0$.*

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Assumption 2 *R can generate higher security benefits than I;* $v_R > v_I$.

Assumption 3 *R values the block more than I,* $\alpha\left(1-\phi_R^{\alpha}\right)v_R+d_R\left(\phi_R^{\alpha}\right)v_R > \alpha\left(1-\phi_I^{\alpha}\right)v_I + d_I\left(\phi_I^{\alpha}\right)v_I$.

Assumption 4 *I presents effective competition to R,* $\left(1-\phi_R^{\alpha}\right)v_R < v_I$.

Later we shall replace Assumption 1 by an explicit choice of functional form for d_X. Assumption 2 says that the target firm can generate greater security benefits under R than under I. The source of these security benefits is not relevant for our purposes and could include for example greater production efficiency, greater efficiency at monitoring management or greater ability to procure contracts. Subsection 3.2 analyzes the consequences of dropping Assumption 4.

Under these four assumptions BGP demonstrate that if X owns the fraction α of company shares, optimal stealing $\phi_X^{\alpha} \equiv \phi_X\left(\alpha\right)$ is given by the first order condition:

$$\alpha = d'_X\left(\phi_X^{\alpha}\right). \tag{1}$$

Denote by $d_X^{\alpha} \equiv d_X\left(\phi_X^{\alpha}\right)$.

BGP start by showing that, in the bidding contest stage, R wins control by bidding $b^* = v_I$ resulting on a final holding of β^* satisfying $\left(1-\phi_R^{\beta^*}\right)v_R = v_I$. The size of the bid is such that I has no incentive to counter. Loosely speaking any bid by R smaller than v_I can be successfully countered if I offers v_I. Obviously, the higher bid is preferred by the remaining investors and BGP show that it is optimal for I as well. Moreover, it is enough for R to bid v_I. I would never bid more than v_I because he would get all the shares at a price higher than the security benefits he can generate as a sole owner whereas he could sell his shares to R at v_I.

In stage 1, where I and R negotiate privately, I and R choose to optimally enter into a standstill agreement where I transfers all his α shares to R. Therefore, the privately negotiated block trade results in a smaller ownership concentration than the tender offer. To see this, note that under Assumption 4 of effective competition, $\left(1-\phi_R^{\alpha}\right)v_R < v_I = \left(1-\phi_R^{\beta^*}\right)v_R$, where the equality results from the definition of β^*. Because $\phi_X\left(.\right)$ is a decreasing function, we get $\beta^* > \alpha$.

BGP show that when choosing the control transfer mode, I and R fail to internalize the positive incentive effect associated with tender offers. This is because (i) the tender offer results in a larger share ownership, which in turn implies lower private benefits for I and R as a coalition, and (ii) dispersed shareholders free-ride on each other to tender the shares and, thus, any shares tendered have to be bid at their (high) post-acquisition value. Hence, I and R prefer to trade privately, even though the tender offer would lead to a higher firm value.

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BGP show that at stage 1 the block price is

$$P = \alpha b^* + \psi \left[\alpha \left(1 - \phi_R^\alpha \right) v_R + d_R^\alpha v_R - \left(\alpha b^* + d_R^{\beta^*} v_R \right) \right].$$

The term αb^* is I's threat value of going through a tender offer and tendering shares at b^*. The term in square brackets describes the surplus that accrues to I and R as a coalition when a tender offer is avoided; the block price compensates I for his share ψ of the surplus. When I has all the bargaining power and $\psi = 1$, the block price compensates I for the ex-post security benefits plus the gain in private benefits from avoiding a tender offer. On the other hand if R has all the bargaining power and $\psi = 0$, all that I can claim is the bid price under a tender offer, b^*.

The block premium is the block price minus the post-transfer securities price, $\Pi = P - \alpha \left(1 - \phi_R^\alpha \right) v_R$.

Proposition 1 (BGP Corollary 2) *Under effective competition, the block premium is*

$$\Pi = \psi \left(d_R^\alpha - d_R^{\beta^*} \right) v_R + (1 - \psi) \alpha \left(\left(1 - \phi_R^{\beta^*} \right) v_R - \left(1 - \phi_R^\alpha \right) v_R \right). \tag{2}$$

Under Assumption 4 of effective competition, the block premium is positive.

A positive block premium occurs for two reasons. First, a successful tender offer attracts more than α shares and must occur at a price b^* above the post-announcement price of $\left(1 - \phi_R^\alpha \right) v_R$. Second, having to acquire β^* shares makes the tender offer expensive because of the high price paid but also because of the loss in private benefits. The coalition surplus from avoiding the tender offer is shared between I and R and the part that goes to I increases the block premium. As BGP note, the second component of the block premium is special to their theory which views a tender offer as an alternative to a block transaction. Another special feature of the BGP model is that only R's private benefits function enters the block premium calculation, as suggested by Barclay and Holderness (1989).

3.2 The BGP Model Under Ineffective Competition

In this subsection, we drop Assumption 4 of effective competition. When I is an ineffective competitor the security benefits under I's management are smaller than the security benefits net of stealing under R's management, $v_I < \left(1 - \phi_R^\alpha \right) v_R$. The main result under this alternative assumption on I's relative valuation is that if a tender offer were to occur, I could not counterbid with a price higher than $\left(1 - \phi_R^\alpha \right) v_R$. Therefore, in a tender offer, R could force a partitioning of the block by acquiring only a fraction of I's shares (no smaller than 50%) and still obtaining control.

For parsimony, the complete discussion of the equilibrium strategies when I is an ineffective competitor is left to the Appendix. There are two cases to consider. In the first case, the

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share value and private benefits of the block to I are greater than the share value under R: $v_I < (1 - \phi_R^\alpha) v_R \leq (1 - \phi_I^\alpha) v_I + \frac{d_I^\alpha}{\alpha} v_I$. BGP show that R must pay the post-announcement security value to I, i.e., $P = \alpha b^*$ and $\Pi = P - \alpha (1 - \phi_R^\alpha) v_R = 0$. In the second case, $(1 - \phi_R^\alpha) v_R > (1 - \phi_I^\alpha) v_I + \frac{d_I^\alpha}{\alpha} v_I$, and R can gain control in a tender offer by offering less than $(1 - \phi_R^\alpha) v_R$. This price attracts $\gamma < \alpha$ shares from I and breaks up the block. Indeed, I accepts a bid price below the post-tender offer share value, i.e., $b^* < \left(1 - \phi_R^\gamma\right) v_R$. At b^* no dispersed (atomistic) shareholder tenders his shares. However, I optimally chooses to tender shares because he is not an atomistic investor and realizes that by tendering another share, the value of the untendered shares increases. At the margin, this benefit of tendering shares compensates for the difference $\left(1 - \phi_R^\gamma\right) v_R - b^*$.

Building on these results from BGP, we derive the block price in this case:

$$
\begin{aligned}
P &= \gamma b^* + (\alpha - \gamma) \left(1 - \phi_R^\gamma\right) v_R \\
&\quad + \psi \left[\alpha (1 - \phi_R^\alpha) v_R + d_R^\alpha v_R - \left(\alpha \left(1 - \phi_R^\gamma\right) v_R + d_R^\gamma v_R \right) \right].
\end{aligned}
$$

R bids $b^* < \left(1 - \phi_R^\gamma\right) v_R < (1 - \phi_R^\alpha) v_R$ at a tender offer and attracts $\gamma < \alpha$ shares.[7]

The first two terms in the block price represent the value of I's shares if a tender offer occurs (i.e., I's threat point). Their sum is below $\alpha (1 - \phi_R^\alpha) v_R$, the post-announcement share value. This is because R offers $b^* < (1 - \phi_R^\alpha) v_R$ in the tender offer and because the remaining shares are valued below $(1 - \phi_R^\alpha) v_R$ (with $\gamma < \alpha$ there is greater extraction of private benefits and firm value declines). The last term is I's share of the coalition surplus from avoiding a tender offer. The tender offer results in a loss of value to the coalition because in spite of the higher private benefits, the block is valued at a lower price. Intuitively, because the value of the block to I is sufficiently small, R does not need to acquire the whole block through a tender offer to gain control. Instead, R can place a bid below the post-announcement security value and yet secure most of I's shares.

Note that if the block α is privately traded, the block premium is $\Pi = P - \alpha (1 - \phi_R^\alpha) v_R$. After some rearranging we obtain

$$
\begin{aligned}
\Pi &= \psi \left(d_R^\alpha - d_R^\gamma \right) v_R + \gamma \left(b^* - \left(1 - \phi_R^\gamma\right) v_R \right) \\
&\quad + (1 - \psi) \alpha \left(\left(1 - \phi_R^\gamma\right) v_R - (1 - \phi_R^\alpha) v_R \right).
\end{aligned} \tag{3}
$$

Because $\gamma < \alpha$ and ϕ_R is a decreasing function, $\Pi < 0$ and the block trades at a discount. The next proposition summarizes these results.

Proposition 2 *Under ineffective competition, the block premium is:*

1. *$\Pi = 0$, if $(1 - \phi_R^\alpha) v_R < (1 - \phi_I^\alpha) v_I + \frac{d_I^\alpha}{\alpha} v_I$ (Case I);*

2. *$\Pi < 0$ is given by (3), if $(1 - \phi_R^\alpha) v_R \geq (1 - \phi_I^\alpha) v_I + \frac{d_I^\alpha}{\alpha} v_I$ (Case II), for $\frac{\alpha}{2} \leq \gamma < \alpha$.*

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[7]See the Appendix for details.

3.3 An Alternative Model of Block Pricing

This section presents the model of block pricing analyzed in Dyck and Zingales (2004) and Nicodano and Sembenelli (2004). We keep Assumptions A1-A3 and add the assumption that R can commit not to enter into a takeover contest if the private negotiation with I fails. This new assumption is guaranteed if the block size $\alpha \geq \frac{1}{2}$ but, as in Dyck and Zingales (2004), and Nicodano and Sembenelli (2004), we shall assume in this subsection that it holds for minority blocks as well.

The Nash bargaining solution yields a block price equal to the weighted average of the block value under R and I:

$$P = (1 - \psi)\left(\alpha\left(1 - \phi_I^\alpha\right)v_I + d_I^\alpha v_I\right) + \psi\left(\alpha\left(1 - \phi_R^\alpha\right)v_R + d_R^\alpha v_R\right).$$

The block premium $\Pi = P - \alpha\left(1 - \phi_R^\alpha\right)v_R$ can then be determined as

$$\Pi = (1 - \psi)d_I^\alpha v_I + \psi d_R^\alpha v_R - (1 - \psi)\alpha\left[\left(1 - \phi_R^\alpha\right)v_R - \left(1 - \phi_I^\alpha\right)v_I\right]. \tag{4}$$

The block premium is the average private benefits of R and I minus the increase in share value, i.e., the dollar price run-up $\left(1 - \phi_R^\alpha\right)v_R - \left(1 - \phi_I^\alpha\right)v_I$, that R can claim to himself given his bargaining power $1 - \psi$. Controlling for changes in security benefits, Π measures R's benefits if and only if I has all the bargaining power, i.e., $\psi = 1$.

The block premium can be positive or negative; it is negative if there is a large positive price run-up that does not get passed on to I because of I's low bargaining power. Therefore, a negative block premium requires both: (i) a large positive price run-up and (ii) a low bargaining power for I. Note also that the block premium relative to the pre-announcement price $P - \alpha\left(1 - \phi_I^\alpha\right)v_I$ can never be negative because the price is a weighted average of the valuations under R and I and, by Assumption 3, R values the block more than I. Thus, the block price is larger than I's valuation of the block.

3.4 Comparing the Models

This subsection compares the models above regarding the potential to address facts 3 through 5 listed in Section 2. We argue that the BGP model nesting both premia and discounts has a greater potential to explain the observed variation in block premia.

Fact 3 documents a large fraction of discounts in negotiated block transactions. This means that Assumption 4 limits the ability of the BGP model to capture a significant amount of variation in block premia (see Proposition 1). However, discounts are pervasive in BGP if one is willing to give up the assumption of effective competition as shown in Proposition 2. The model discussed in subsection 3.3 can also generate discounts, though, as argued above, it requires (i) large positive price run-ups and (ii) low bargaining power for I. Based on (4), and following Dyck and Zingales (2004), an estimate of I's bargaining power, ψ, can

be obtained by running a regression of the percentage block premium as a fraction of total equity (i.e., $\alpha\frac{P-P^1}{P^1}$) on the price run-up adjusted for the block size (i.e., $\alpha\frac{P^1-P^0}{P^1}$), and on variables that describe the private benefits of I and R. The linear unconditional association between the two variables reveals an estimate of ψ of 0.72. Adding control variables to capture variation in private benefits changes only minimally the size of this estimate (results available from the authors upon request). A relatively high estimate of ψ is also confirmed by both, our structural estimates below, and the world wide sample of Dyck and Zingales (2004) who estimate ψ equal to 0.65.

Consider structurally estimating the model in (4) under the assumption that I's bargaining power is high. In order to capture variation implied in block discounts any estimation is likely to: (i) force a downward bias in ϕ_R^α and an upward bias in ϕ_I^α; or (ii) force measured private benefits $(1-\psi)\,d_I^\alpha v_I + \psi d_R^\alpha v_R$ (see (4)) to be negative. The consequence of (i) is an upward bias in the estimated price run-up. As we will show below this may result in a bias in the evaluation of the Mandatory Bid Rule. As for (ii), the linear regression mentioned above –of the percentage block premium on control variables and the price run-up– generates between 10% and 20% of observations with *negative* estimated values of average private benefits. Without a restriction that explicitly recognizes that private benefits are positive, the estimation uses the variation in the independent variables –meant to capture private benefits– to capture the discounts in the sample thus biasing downwards any estimates of private benefits.

Fact 4 documents that discounts normally are associated with positive price run-ups. This fact is desirable in light of the models in subsections 3.2 and 3.3 because both require as a necessary condition for a discount that there is a positive price run-up.

Fact 5 documents the existence of discounts also relative to the pre-announcement price, $P^0 = (1-\phi_I^\alpha)\,v_I$. As argued above this is never possible within model (4) because the block price is larger than the smallest of the valuations between R and I, which, under Assumption 3, is I's valuation. It is, however, possible under ineffective competition if I is an ineffective competitor and the increase in share value is bounded above by the value of R's private benefits. Our estimations confirm the ability of the BGP model to capture variation in these observations.

3.5   Other Models of the Block Premium

Barclay and Holderness (1989) consider the possibility that the block premium is due to the trading parties' superior information about the value of the stock which is not shared with the remaining investors. If this were the case, Barclay and Holderness (1989) argue that blocks that trade at a discount should show a negative price run-up and blocks that trade at a premium should show a positive price run-up. Fact 4 above suggests that this is not the case as a significant fraction of discounts show a positive price run-up. We have also repeated

Figure 1 for discounts and premia separately observing that in both cases there is a positive price run-up on average. Similar evidence is found in Barclay and Holderness (1991) and Dyck and Zingales (2004).

Bolton and Von Thadden (1998) suggest that discounts are required as compensation for the illiquidity of the block and the monitoring costs of the block holder. Theirs is a model of block issues so it is not clear that the results would hold when the block is subsequently traded. However, we offer a conjecture that there is an equilibrium where the block price is systematically below the exchange price and yet the current block holder chooses not to sell the block, fully or partially at the exchange price. This equilibrium outcome would be supported by an off-the-equilibrium strategy by minority shareholders' whose valuations drop below the block price under the belief that the benefits of monitoring disappear with the block holder's stock sale. In the absence of a fully spelled out model it is difficult to make further predictions which would allow for a comparison with the BGP model adopted in our estimations.

Barclay and Holderness (1989) hypothesize that block premia can be the result of over-payment by the block acquirer because of either systematic overconfidence of buyers or the winner's curse. To analyze this hypothesis they study the stock price reaction of the acquirer when the acquirer is an exchange traded corporation upon the announcement of the block trade. Barclay and Holderness (1989) and Dyck and Zingales (2004) observe that the returns to the publicly listed buyer around the announcement are statistically insignificant and conclude that there is no overpayment. Our approach to measure overpayment is not restricted to the subsample of corporate buyers. Focusing on corporate buyers only may introduce a bias in the Barclay and Holderness (1989) test in favor of rejecting the overpayment hypothesis because there is a disproportionate fraction of corporate buyers in the subsample with large block premia: the overall proportion of corporate buyers is 66% whereas the proportion of corporate buyers in the top 25% block premia is 77%. In this paper, we are able to re-evaluate the overpayment hypothesis by focusing in the full sample of deals. Under the null hypothesis that the BGP model is the correct pricing model, we directly estimate overpayment relative to the BGP model.

4   Empirical Strategy

The primitive of the BGP model is the private benefits function of the incumbent and of the rival, $d_X (\phi)$. Our empirical strategy consists of choosing the parameters of this function to match the model's predicted block premium to the observed premium in our sample of block trades. To do so, we must solve for all the model's endogenous variables as a function of the parameters of $d_X (\phi)$.

Formally, let each deal be indexed by $i = 1, ..., N$, where N is the total number of block

trades in our sample. The vector of characteristics associated with agent $X = I, R$ in deal i is $\mathbf{w}_i^X$, and the vector of agent-independent characteristics in deal i is $\mathbf{w}_i$. The parameterized private benefits function is therefore written as

$$d_{X,i}(\phi) = d_X\left(\phi_{X,i}; \boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X + \boldsymbol{\eta}'\mathbf{w}_i\right),$$

where $\boldsymbol{\eta}^X$ and $\boldsymbol{\eta}$ are the sensitivities of private benefits to the characteristics in $\mathbf{w}_i^X$ and $\mathbf{w}_i$, respectively. The sensitivities $\boldsymbol{\eta}^X$ and $\boldsymbol{\eta}$ are fixed across deals and any variation in private benefits is due to cross sectional variation in the data vector $\left(\Pi_i, \alpha_i, , P_i^1, P_i^0, \mathbf{w}_i^R, \mathbf{w}_i^I, \mathbf{w}_i\right)$.

We obtain the extraction rate $\phi_{X,i}^\alpha$ from the optimality condition (1). Hence, $\phi_{X,i}^\alpha = d'^{-1}\left(\alpha_i; \boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X + \boldsymbol{\eta}'\mathbf{w}_i\right) \equiv d_{X,i}'^{-1}(\alpha_i)$.

To capture variation in efficiency levels, v_{Ii} and v_{Ri}, we use the information content of the price run-up. Since the exchange share prices before and after the trade announcement are observable, we can use the pricing equations

$$P_i^1 = \left(1 - d_{R,i}'^{-1}(\alpha_i)\right) v_{R,i} \text{ and } P_i^0 = \left(1 - d_{I,i}'^{-1}(\alpha_i)\right) v_{I,i}, \tag{5}$$

to solve for the relative efficiency of the incumbent firm, $\frac{v_{Ii}}{v_{Ri}} \equiv \omega_i$.[8] Thus,

$$\omega_i = \min\left\{\frac{P_i^0}{P_i^1}\frac{1 - d_{R,i}'^{-1}(\alpha_i)}{1 - d_{I,i}'^{-1}(\alpha_i)}, 1\right\}. \tag{6}$$

By imposing the constraint that $\omega_i \leq 1$ we guarantee that Assumption 2 holds weakly.[9]

Estimating the change in efficiency gains using the price run-up means that the model captures variation in the price run-up well. When the estimated $\omega_i < 1$, the model estimated price run-up equals the actual price run-up. When the estimated $\omega_i = 1$, the model estimated price run-up over-predicts the actual price run-up. To see this note that when $\hat{\omega}_i = 1$, we can use (6) to get

$$\frac{P_i^1}{P_i^0} \leq \frac{1 - d_{R,i}'^{-1}(\alpha_i)}{1 - d_{I,i}'^{-1}(\alpha_i)}\frac{1}{\hat{\omega}_i} = \frac{\widehat{P_i^1}}{P_i^0}. \tag{7}$$

In addition, $\omega_i \leq 1$ means that observations associated with a negative price run-up, i.e., $P_i^0 \geq P_i^1$, necessarily have a higher stealing fraction for rivals than for incumbents, i.e., $d_{R,i}'^{-1}(\alpha_i) \geq d_{I,i}'^{-1}(\alpha_i)$.

Note that our approach acknowledges the dependence between private benefits and security benefits. Intuitively, by explicitly modeling the interdependence between private benefits and security benefits, we require that the level of private benefits, i.e., $d_X^\alpha v_X$, be consistent with the extraction rate needed to generate those benefits, i.e., $\phi_X^\alpha v_X$.

Next, we define the estimation problem. We discuss the choice of the function $d_{X,i}(\phi)$ in Section 4.2.

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[8]In the BGP model, the block α is always fully traded in a private negotiation. Thus, the expression for P_i^1 is the same in the effective and ineffective competition cases.

[9]In the actual estimations we find that $\hat{v}_{I,i} = \hat{v}_{R,i}$ for some deals. In these cases there still is an advantage to trade because, under Assumption 3, R values the block more than I.

4.1 Estimation Setup

4.1.1 Solving for the block premium

To estimate the BGP model, we need to solve additionally for β^* in the case of effective competition and for γ in the case of ineffective competition. We start with the case of effective competition. We obtain β^* from the optimal bidding condition in the tender offer, $\left(1 - \phi_{R,i}^{\beta^*}\right) v_{R,i} = v_{I,i}$:

$$\phi_{R,i}^{\beta^*} = 1 - \frac{v_{I,i}}{v_{R,i}} = 1 - \omega_i. \tag{8}$$

We define the percentage block premium, BP_i^{eff}, as the per share block premium normalized by the post announcement price, P_i^1. We have:

$$BP_i^{eff} \equiv (1 - \psi) \left(\frac{P_i^0}{P_i^1 \left(1 - d_R'^{-1}(\alpha_i)\right)} - 1 \right) + \psi \frac{d_R\left(\phi_{R,i}^{\alpha}\right) - d_R\left(\phi_{R,i}^{\beta^*}\right)}{\alpha_i \left(1 - d_R'^{-1}(\alpha_i)\right)}. \tag{9}$$

We now turn to the case of ineffective competition $v_{I,i} \leq \left(1 - \phi_{R,i}^{\alpha}\right) v_{R,i}$. Under Case II in Proposition 2, we need to solve for two additional endogenous variables, b_i^* and γ_i. Recall that γ_i is the size of the controlling block that would result under a tender offer. Because under ineffective competition $\gamma_i < \alpha_i$ the initial block is broken up. In general, solving for b_i^* and γ_i requires numerical approximation methods to solve for an ordinary differential equation. This can be a very time consuming process inside the estimation loop. Instead, we use an approximate solution to b_i^* and γ_i, that relies on approximating the stealing function $\phi(\beta)$ by an affine function of β. The solution to b_i^* and the proof to the proposition below are in Appendix.4

Proposition 3 *Assume that the stealing function $\phi(\beta)$ is an affine function of β. Then $\gamma = \frac{1}{2}\alpha$.*

The block premium can then be written as

$$\left\{ \begin{array}{ll} 0 & \text{, for Case I} \\ BP_i^{ineff} & \text{, for Case II} \end{array} \right. ,$$

where Cases I and II are identified in Proposition 2 and BP_i^{ineff} is given by

$$BP_i^{ineff} \equiv \frac{\psi\left(d_R\left(\phi_{R,i}^{\alpha}\right) - d_R\left(\phi_{R,i}^{\gamma}\right)\right) + \gamma_i\left(\frac{b_i^*}{v_{R,i}} - \left(1 - \phi_{R,i}^{\gamma}\right)\right) + (1 - \psi)\alpha_i\left(\phi_{R,i}^{\alpha} - \phi_{R,i}^{\gamma}\right)}{\alpha_i\left(1 - d_R'^{-1}\left(\phi_{R,i}^{\alpha}\right)\right)}. \tag{10}$$

Recall that $BP_i^{ineff} < 0$ so discounts are explicitly modeled.

The definition of the block premium is consistent with that in Barclay and Holderness (1989) and with the one used in Section 2 above. Within the BGP model, there are several

advantages to using the percentage block premium. First, conditional on the BGP model, there are no price-level effects across deals. Second, equations (9) and (10) show that the percentage block premium can be fully expressed in terms of the private benefits function and its parameters $\boldsymbol{\eta}^I, \boldsymbol{\eta}^R$ and η. Third, it allows for the estimation of the efficiency gains associated with I and R via the estimation of ω_i and of a simple implementation of the constraint in Assumption 2.

4.1.2 The estimation problem

We make two more assumptions to estimate the model. First, we assume that there is an unobservable source of randomness, ε_i, in the determination of the block premium. Second, we introduce a constant term, c. Because the BGP model explicitly accounts for premia and discounts, a nonzero constant must imply overpayment or underpayment by R relative to the BGP benchmark.[10] We then have

$$\varepsilon_i \equiv \frac{\Pi_i}{\alpha_i P_i^1} - c - \mathbf{1}_i^{eff} BP_i^{eff} - \mathbf{1}_i^{ineff} BP_i^{ineff}, \tag{11}$$

where the function $\mathbf{1}_i^{eff}$ equals 1 if I is an effective competitor and zero otherwise, and $\mathbf{1}_i^{ineff}$ equals 1 in the Case II of ineffective competition (i.e., when $\left(1 - \phi_{R,i}^\alpha\right) v_{R,i} \geq \left(1 - \phi_{I,i}^\alpha\right) v_{I,i} + \frac{d_{I,i}^\alpha}{\alpha_i} v_{I,i}$) and zero otherwise.

We estimate the parameter vector $\boldsymbol{\theta} = \left(\boldsymbol{\eta}^I, \boldsymbol{\eta}^R, \boldsymbol{\eta}, c, \psi\right)$ by feasible generalized non-linear least squares (FGNLS). Let $\boldsymbol{\varepsilon} = (\varepsilon_1, ..., \varepsilon_N)'$ and $\boldsymbol{\Omega} = \mathbf{E}\left(\boldsymbol{\varepsilon}\boldsymbol{\varepsilon}'\right)$. The FGNLS estimator of $\boldsymbol{\theta}$ solves

$$\min_\theta \boldsymbol{\varepsilon}\left(\boldsymbol{\theta}\right)' \boldsymbol{\Omega}^{-1} \boldsymbol{\varepsilon}\left(\boldsymbol{\theta}\right), \tag{12}$$

subject to $\psi \in [0,1]$ for all $i = 1, ..., N$. The constraint associated with Assumption 2 is imposed via (6). We do not constrain the model to comply with Assumption 3. Below, we give conditions under which Assumption 3 holds and later show that it does not bind in our estimation. Assumption 4 is explicitly modelled by considering the several cases under the BGP model. Assumption 1 is discussed in the next subsection where we model the private benefits function d_X.

The theoretical percentage block premium, being a scaled variable, has no price-level effect across deals. The use of FGNLS corrects for potential price-level effects that act through the conditional heteroskedasticity of the errors across deals. We compute this estimator in two steps. In the first step, we solve (19) setting $\boldsymbol{\Omega}$ equal to the identity matrix. Because the estimation is non-linear, we repeat the minimization algorithm over a fine grid of initial parameter values in order to find the global minimum. We use the residuals from the first step, $\hat{\varepsilon}_i$, to construct a diagonal weighting matrix $\hat{\boldsymbol{\Omega}}$ with generic term $\hat{\varepsilon}_i^2$. In the second step, we solve (19) using $\hat{\boldsymbol{\Omega}}$. This procedure is explained in detail in Appendix 2

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[10]Note that transactions costs in tender offers are also measured in c.

4.2 Functional Form for Private Benefits

The private benefits function describes the expected value of the private benefits that the controlling shareholder gets. We specify a square root function for private benefits

$$d_X(\phi) = 2\delta_X \sqrt{\phi}, \tag{13}$$

where δ_X is the logistic function

$$\delta_X = \underline{\alpha} \times \frac{\exp\left(\boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X + \boldsymbol{\eta}'\mathbf{w}_i\right)}{1 + \exp\left(\boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X + \boldsymbol{\eta}'\mathbf{w}_i\right)},$$

and $\underline{\alpha} \leq \min_i\{\alpha_i\}$, the minimum block size in the sample.[11] Note that this specification does not meet all the requirements under Assumption 1. In particular, it does not meet the requirements that $d_X'(0) = 1$ and $d_X'(1) = 0$. These requirements are only sufficient conditions to obtain two results: (i) that a solution exists to private benefits extraction, and (ii) that private benefits extraction is inefficient. As we demonstrate next, these results also obtain under the square root specification (13).

Under the square root specification of private benefits, there exists a unique optimal rate of extraction of private benefits which solves (1):

$$\phi_X^\alpha = \left(\frac{\delta_X}{\alpha}\right)^2. \tag{14}$$

Private benefits evaluated at the optimal extraction rate are $d_X^\alpha = 2\delta_X^2/\alpha$. The choice of δ_X guarantees that $\phi_X^\alpha \in (0,1)$ and, because $\underline{\alpha} \leq \alpha_i < \frac{1}{2}$, we have that $d_X(\phi) \in (0, 2\underline{\alpha})$. The difference $\phi_X^\alpha - d_X^\alpha$ measures the dollar value of the inefficiency with which private benefits are extracted. This difference $\phi_X^\alpha - d_X^\alpha = \frac{\delta_X^2}{\alpha} \times \left(\frac{1}{\alpha} - 2\right)$ is positive if, and only if, $\alpha < \frac{1}{2}$.[12] The dollar value of the inefficiency with which X extracts private benefits is therefore determined by two factors: (i) the size of δ_X, which depends on deal and firm characteristics; and (ii) the fact that d is a square root function which implies that the inefficiency of private benefits extraction (and optimal private benefits) increases with δ_X at an increasing rate. The *relative inefficiency* of private benefits evaluated at the optimal extraction rate is given by

$$\frac{\phi_X^\alpha - d_X^\alpha}{d_X^\alpha} = \frac{1}{2\alpha} - 1, \tag{15}$$

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[11]We may interpret $\frac{\delta_X}{\underline{\alpha}}$ as the probability of not being caught stealing given $\boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X + \boldsymbol{\eta}'\mathbf{w}_i$. Let $y_i = \boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X + \boldsymbol{\eta}'\mathbf{w}_i + \zeta_i$, where ζ_i is an iid random variable with the logistic distribution. Let the event $\{X_i \text{ is caught stealing}\}$ be described by $y_i \leq 0$. We therefore have that the probability of being caught stealing is $\frac{1}{1+\exp\left(\boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X+\boldsymbol{\eta}'\mathbf{w}_i\right)}$ and the expected private benefits are $[1 - \Pr(X_i \text{ is caught stealing})] \times 2\underline{\alpha}\sqrt{\phi}$.

[12]In general private benefits are inefficient if, and only if, $\phi - 2\delta_X\sqrt{\phi} > 0$, or $\phi > 4\delta_X^2$. Because $\alpha < 1/2$, $\phi_X^\alpha > 4\delta_X^2$, which means that extraction rates for a block of size $\alpha < 1/2$ are inefficient. Under ineffective competition, a tender offer would result in a smaller block $\gamma < \alpha$ and in $\phi^\gamma > \phi^\alpha$, which would also lead to inefficient private benefits. Under effective competition, a tender offer would result in a larger block $\beta^* > \alpha$ and in $\phi^{\beta^*} < \phi^\alpha$, which could lead to efficient extraction of private benefits. In our simulations below, estimated β^* is only large enough to imply efficient extraction of private benefits in at most 4 cases out of 120. The extraction rates is so low in these cases that they have no significant adverse effect on the results.

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and is independent of δ_X. The relative inefficiency measures the cost-to-benefit ratio of private benefits extraction. Because $0.1 < \alpha < 0.5$, the relative inefficiency of private benefits extraction at the optimum lies between 0 and 4. That is, for a block of minimum size $\alpha = 0.1$, each \$1 of private benefits cost \$5 to all shareholders. Larger blocks are less inefficient; for an average-size block of 30% (see below), each \$1 of private benefits cost \$2.67 to shareholders.

Figure 3 plots the optimal extraction rate, ϕ_X^α, against α and δ_X. Variation in δ_X represents the sample variation in the explanatory variables. We vary δ_X while keeping $\underline{\alpha}$ fixed at 0.1. By construction, δ_X lies between 0 and the minimum block size $\underline{\alpha}$. The figure shows that the private benefits function in (13) allows for large differences in extraction rates for small rather than large blocks. Indeed, the variation in optimal extraction rates declines substantially as the block size increases past 30% because ϕ_X^α is convex in α. In particular, the slope of ϕ_X^α is smaller than 1 in absolute value for all $\alpha \geq 27\%$.[13]

The implicit assumption of the square root function is therefore that the incentive role of larger blocks, which makes block owners divert little, kicks in at reasonably low values of α. While we do not know whether such cut-off exists we note that roughly 70% of our observations have block sizes lower than 34%. If block sizes were equally distributed between 10% and 50% this proportion should instead be $60\% = (34\% - 10\%)/(50\% - 10\%)$. This implies that (13) has a potential for capturing the existing, though unobservable, variation in extraction rates in the data.

<center><INSERT FIGURE 3 ABOUT HERE></center>

The variation in optimal extraction rates observed in Figure 3 can lead to significant variation in private benefits. Figure 4 plots the function d_X^α against α and δ_X. While the square root specification of $d_X(\phi)$ cannot capture private benefits larger than $2\underline{\alpha} = 20\%$, a significant variation in private benefits is still allowed. In our data, $\underline{\alpha} = 0.12$ so private benefits are capped at 24%.

<center><INSERT FIGURE 4 ABOUT HERE></center>

The choice of d_X is convenient for one additional important property. The choice of functional form for d_X, together with Assumption 2, imply that we can ignore Assumption 3 in our estimations. This property turns out to be particularly useful because imposing Assumption 3 explicitly is not easy. In the Appendix we show that: (i) Assumption 3 holds if

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[13]Differentiating (14) yields $\frac{d\phi_X^\alpha}{d\alpha} = -2\delta_X^2\alpha^{-3} > -2\underline{\alpha}^2\alpha^{-3} = -.02\alpha^{-3}$, where the inequality follows because $\delta_X < \underline{\alpha}$ and the last equality arises when $\underline{\alpha} = .1$. This derivative equals 1 at $\alpha = 0.27$.

<center>18</center>

there is a negative price run-up; and, (ii) Assumption 3 holds for all $\phi_I < \bar{\phi}\left(\phi_R, \frac{P^1}{P^0}\right) < 1$ if there is a positive price run-up. The cut-off $\bar{\phi}$ is an increasing function of ϕ_R and of the price run-up. Therefore, Assumption 3 may fail to hold only for large values of ϕ_I as compared to ϕ_R, but as the price run-up gets bigger this is less likely to occur. As we will show below, the estimates of the general model produce estimates of ϕ_I^α close in magnitude to the estimates of ϕ_R^α.

Finally, the per share block premium (see (2)) can be shown to be a decreasing and convex function of α under the square root specification. This feature of (13) is consistent with the finding in Barclay and Holderness (1989) of a US per share block premium convex in block size.

5 Data

Our data set combines information from three databases, Thomson One Banker, COMPUS-TAT and CRSP, as described next.

5.1 Sample Selection

Our sample includes all block trades in the US between 1/1/1990 and 31/08/2006 in the *Mergers and Acquisitions database* from Thomson One Banker (formerly SDC) where a minority block is traded, i.e., $10\% < \alpha < 50\%$. We follow Dyck and Zingales (2004) and select only those transactions where the buyer, R, owned less than 20% of the shares before the trade but more than 20% as a result of the trade.[14] Further, we keep only those trades where the block traded is the largest block held by an insider and look for news that indicate a transfer of control from I to R.[15] A detailed description of the selection procedure can be found in Appendix A.1

Despite the fact that we exclude majority blocks, our sample has more trades in total, and per year, than Dyck and Zingales' (2004) US sample. This is because Dyck and Zingales restrict their search universe to the first 20 trades in each year with the goal of constructing a balanced cross-country sample, knowing that SDC over-samples in the US. However, we cannot reject the hypothesis that both samples have the same population mean.[16] Barclay,

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[14] See Zwiebel (1995) for a theory predicting a threshold level above which a large minority shareholder is not challenged and a discussion of the reasonableness of such threshold to be 20%.

[15] There is evidence supporting the assumption that block trades result in control transfers even if the firm is not subsequently fully acquired. For example, Barclay and Holderness (1991) and Bethel, Liebeskind and Opler (1998) show that these trades are generally followed by changes in operations, and by CEO or board turnover.

[16] Dyck and Zingales (2004) report an average block premium, expressed as a percentage of the value of equity, i.e., $\frac{P-P^1}{P^1} \times \alpha$, of 0.01 (standard deviation of 0.09) using 46 trades in the US between 1990 and 2000. In our sample, the average of $\frac{P-P^1}{P^1} \times \alpha$ is 0.04 (standard deviation of 0.29) for the 112 blocks in the same period. The p-value for the difference of means test is 0.46.

Holderness and Sheehan (2001) use the largest sample of block trades known to date. Using *The Wall Street Journal Corporate Index* they construct a sample of 204 block trades between 1978 and 1997. Our sample has fewer deals per year because our selection criteria are slightly more restrictive: we consider blocks with size between 10% and 50%, whereas they consider all blocks larger than 5%. Also, we rule out trades where the block being traded was not the largest held by an insider.

Our selection criteria exclude deals where the payment for the block trade is in the form of instruments that may lead to further acquisition of shares by the buyer. The reason for this exclusion is to guarantee that the buyer's share ownership in the firm will remain constant and that incentives do not vary over time in a predictable fashion. We also exclude deals where subsequently the buyer does a tender offer to acquire more shares. This requirement is imposed in keeping with the model result that both I and R will always optimally choose to trade privately and avoid a tender offer. Deals where a tender offer is preferred must then have considerations that are absent from the BGP model.

Finally, our sample excludes firms for which we fail to obtain prices in the CRSP tapes from at least 51 trading days prior to the deal announcement to 21 trading days after the deal is announced. We use the first 30 days in this trading window (and earlier data if available) to compute a measure of the target firm's systematic risk, or β. We then estimate the price run-up leading up to the announcement of the trade using the market model. That is, we adjust the price run-up for changes in prices attributable to changes in systematic risk.

As demonstrated above, our empirical strategy is to disentangle the cross-sectional variation in private benefits from the cross-sectional variation in block premia using the BGP model as well as the cross-sectional variation in the block size, the price run-up and the observable characteristics of the target firm, the incumbent block holder, and the buyer. Therefore, we complete our data set by matching the sample of trades to the COMPUSTAT records of the target firm and of the block buyer if the buyer is a corporation.

5.2 Specification

Below, we list the characteristics that we predict to be determinants of expected private benefits of control through δ_X. Table I describes their sources and how they are constructed.

<INSERT TABLE I ABOUT HERE>

5.2.1 Target and deal characteristics: $\mathbf{w}_i$

For the most part, we rely on the previous literature to specify target and deal characteristics. We include the proportion of target's cash and marketable securities to assets because more cash should imply that the block holder can more easily redirect investment, increase their

compensation or have more free cash flow for perquisites (Jensen (1986)). Similarly, we predict that the proportion of short-term debt to assets will decrease expected private benefits because it constraints the free use of the cash balance by the controlling party. This view of the role of debt present in Jensen (1986) contrasts with the view in Harris and Raviv (1988) and Stulz (1988) where managers use firm leverage to concentrate their ownership and extract more private benefits.

We include the target firm's size, measured by total assets, but note that its effect on private benefits may be ambiguous. On the one hand, the controlling party may be less able to derive these benefits because larger firms are more tightly monitored by the business media, the SEC, the IRS, or by security analysts. On the other hand, the agent in control may derive larger pecuniary and non-pecuniary benefits from a larger firm. This second effect may not be dominant because we measure private benefits as a fraction of security benefits, and it is not obvious why a larger fraction of private benefits could be derived from a larger firm.

We include the firm's average daily returns for the year ending two months before the trade as a measure of the target's recent performance. We expect that with poor performance there will be lower private benefits. One reason is that poor performance may bring the firm closer to financial distress, increasing scrutiny and making it harder to extract benefits. Another reason is that the purchaser of the block derives more non-pecuniary benefits the better the performance of the target.

We predict that it is easier to extract private benefits from a firm with relatively more intangible assets. As Himmelberg et al. (1999) argue, intangible assets are harder to monitor and it is therefore easier to steal from firms with relatively more intangible assets or relatively lower fixed assets.[17]

5.2.2 Agent-specific characteristics: $\mathbf{w}_i^X$

The block purchaser may derive more private benefits if it has already acquired specific knowledge about how to extract such benefits within the firm. However, the block purchaser that has been previously active in the target may have also incentives that are aligned with those of the company which limit income diversion. To measure the net of these effects we include a dummy variable that equals one if the acquirer is an active shareholder before the trade announcement, i.e., if R has a toehold of more than 5% but less than 10% of the shares of the target.

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[17]Unfortunately, we are not able to include governance variables in our analysis, following the work of Nenova (2003) and Doidge (2004). Matching our sample with the GIM index by CUSIP yields only 27 observations. We also considered estimating a Jones Model cross-sectionally to obtain a measure of earnings management as a proxy for governance, but again the match would reduce our sample to about half of its current size. Dyck and Zingales (2004) and Desai, Dyck and Zingales (2007) consider other variables with little or no time series variation, but use their cross-country variation to identify their impact.

We distinguish between corporate and individual block purchasers with a dummy variable that equals one if the purchaser is a corporation and zero if it is an individual. We do this for two reasons. First, we hypothesize that individuals may have a stronger tendency than corporations to enjoy perks (Demsetz and Lehn (1985)). Second, corporations may derive more private benefits to the extent that the target belongs to the same industry or are vertically integrated so that their assets have synergies that more easily allow for income transfer across firms. Therefore, we include the corporation dummy by itself and its interaction with a dummy variable that equals one if the acquirer and the target have the same 4-digit SIC code.

The benefits that the corporate acquirer derives from the target's cash holdings may not be as large if the acquirer already is cash rich. Therefore, we include the ratio of the target's cash and marketable securities to the acquirer's cash and marketable securities. We expect this ratio to have a positive effect on private benefits, over and above the effect of the target's proportion of cash to assets.

Finally, because we lack characteristics of the block seller, we specify the term $\boldsymbol{\eta}^I \mathbf{w}_i^I$ simply as a constant parameter, η_I. Hence, the difference between the index of purchaser's characteristics, $\boldsymbol{\eta}^R \mathbf{w}_i^R$, and η_I captures the differences between the benefits and extraction rates of a given block buyer and the *average* block seller.

5.3   Summary Statistics

Table II summarizes the variables in our sample. The median block size is 28% of the target's equity. The table shows that the average price run-up is large and right-skewed: it has a mean of 14.1% and a median of 9.3%. The block premium itself is also right-skewed. The skewness in both distributions is the main motivation for using a Feasible Generalized Least squares estimator instead of only Least Squares with a covariance matrix correction. Indeed, with a potentially strong heteroskedasticity and a sample size of 120, the consistency of the latter estimator may be seriously compromised.

<INSERT TABLE II ABOUT HERE>

The average target firm in our sample holds 14% of its assets as cash and marketable securities, which is not significantly different from the average COMPUSTAT firm in the same time period. However, the average target in our sample has a significantly larger proportion of intangible assets as well as of short term debt. Also, as perhaps expected, the firms in our sample are smaller than the COMPUSTAT average, with a ratio of 1 to 3.5.

Our sample exhibits also significant variation in the acquirer's data. There are 16 trades where the acquirer is an active shareholder, 41 where it is a corporation, and 31 where the

buying corporation belongs to the same 4-digit SIC group. The majority of corporate block buyers (30 of 41) in the sample have less cash than their targets, whereas only 8 acquirers have at least twice the target's cash.

Table III presents the correlation matrix of the various characteristics discussed above. While our estimation is a non-linear one, we are concerned that high correlations across the characteristics may limit our ability to identify their separate effects. Table III shows that correlations are fairly low, with the highest correlation being 0.27 between the corporation dummy and the ratio of target's to acquirer's cash.

<center><INSERT TABLE III ABOUT HERE></center>

6 Estimation Results

In this section, we discuss the results on the full BGP model, where discounts and premia are explicitly modeled. In the appendix, we present the results of estimating a version of the BGP model under the assumption of effective competition.

6.0.1 Overall fit and parameter estimates

We start by contrasting the performance of the model estimates against the 5 facts we set out in Section 2. Table IV reports the quality of fit of the general BGP model for three different specifications of $\mathbf{w}_i^X$ and $\mathbf{w}_i$ along various dimensions.

First, Panel A shows that the specifications are not rejected (p-values below 0.01) and that the R^2 coefficient is between 0.08 and 0.15.[18] Panel B evaluates the fit of the model further by comparing the model's in-sample predictions to Facts 1 through 5 described above. The predicted average block premium (0.209 in specification (1) and 0.15 in specifications (1) and (2)) is very close to the actual average block premium of 0.196 (see Fact 1 above). Note that, matching the average value of the dependent variable (i.e., the block premium) is not a direct implication of the first order conditions associated with (12) under FGNLS.

Second, the model predicts an average price run-up of 18%, which is very close to the 14.1% in the data (see Fact 2 above). Notice the discussion surrounding (7) which proves that the model must overpredict the price run-up. Notwithstanding the higher estimated mean price run-up, the estimated price run-up explains 93% of the actual price run-up variation in each of the three specifications. Third, the estimation somewhat under-predicts the number of actual discounts. However, specification (1) is quite close in predicting the size of the average discount (see Fact 3). The main reason for under-predicting the number of discounts has to

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[18]Some caution in interpreting the size of the R^2 is warranted because with weighted least squares the coefficient is not bounded between 0 and 1.

<center>23</center>

do with the large estimated constant that pushes up some of the small discounts predicted by the BGP model. Fourth, we predict that all discounts are associated with positive price run-ups (see Fact 4 above). And, fifth, the estimation predicts that between 12% and 19% of discounts are also discounts relative to the pre-announcement price. In the data that number is 34% (see Fact 5 above). Recall that, as argued above, this fact constitutes a serious challenge to the model of the block premium in subsection 3.3.

<center><INSERT TABLE IV ABOUT HERE></center>

Another dimension of the quality of fit is reported in Figure 5. The figure plots the actual block premium against the predicted block premia and identifies each observation depending on whether it represents a case of effective competition, or Case I or Case II of ineffective competition. The figure includes an horizontal line going through actual block premium of zero and a vertical line crossing the horizontal line at $\hat{c}$. Shifting the axis in this way places all of the predicted discounts under BGP (which excludes a constant) to the left of the vertical line. The 45 degree line is also plotted. The figure shows that a disproportionate number of actual discounts occur when the model predicts the seller to be an ineffective competitor and, likewise, a disproportionate number of actual block premia occur when the model predicts that the seller is an effective competitor. This observation provides strong support for the BGP model that the sign of the block premium derives from the ability of the seller to fight a tender offer.

<center><INSERT FIGURE 5 ABOUT HERE></center>

We note finally that, even though Assumption 3 is not imposed at all in the estimation, it is generally satisfied by our estimates. There are only 5 violations (4%) of Assumption 3 for specification 1, all of which are virtually equal to the lower bound. There are no violations of Assumption 3 in the case of specifications 2 and 3. The fact that none of our results vary considerably across the three specifications is confirmation that the violations of Assumption 3 in specification 1 have no material impact.

We now analyze the parameter estimates reported in Panel A of Table IV. We start with the estimate of the constant term. Across the three specifications the constant is estimated to be significant and equal to 20% to 25% of the block value.[19] These estimates imply that

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[19]While this estimate may seem large, it is actually smaller than the intercepts reported previously in the literature. The estimated constant for the regressions of the block premium as a precentage of the exchange price is between 90% and 96% in Barclay and Holderness (1989) and between 28.4% and 35% in Barclay, Holderness and Sheehan (2001).

there is significant overpayment relative to the BGP benchmark. As a percentage of the target firm's exchange price, overpayment is between $6\% = .3 \times .2$ and $7.5\% = .3 \times .25$, where .3 is the average block size (see Table II).[20]

As an alternative hypothesis to overpayment we consider whether risk aversion on the part of the seller explains the estimated constant term. Barclay and Holderness (1989) hypothesize that for individuals, shares of blocks may represent a significant fraction of own wealth and may overexpose them to undesirable idiosyncratic risk. In contrast, shareholders of large corporations can diversify their portfolios using the capital market. Therefore, corporations may be willing to pay more when buying from risk averse sellers. As a back of the envelope calculation, we regress $\hat{c} + \hat{\varepsilon}_i$ on a constant, on the standard deviation of daily returns, and on the standard deviation of daily returns interacted with a dummy for when the buyer is a corporation. In untabulated results, we find that the independent regressors do not significantly reduce the size of the overpayment.

We also consider the possibility that overpayment is caused by an unmeasured weak corporate governance effect of the target firm. We use an estimate of earnings management to capture the level of corporate governance. Our sample is reduced in approximately half because of the lack of earnings management estimates for many firms. Again we regress $\hat{c} + \hat{\varepsilon}_i$ on a constant and on the governance measure. Our results suggest no significant increased overpayment for firms with weak governance.

The estimated seller's bargaining power is between 0.62 and 0.82. The lower of these estimates is very close to that found in Dyck and Zingales' (2004) of 0.66 for their cross-country sample. In the appendix, we show that this estimate is lower than that obtained under the assumption of effective competition.

Now we turn to the estimates of the sensitivities of private benefits to the various firm and deal charateristics. To understand the economic significance of these effects, we compute the estimated elasticity of private benefits as a function of the target's equity with respect to each variable evaluated at the sample mean in the data.[21] For any continuous characteristic z, the elasticity is given by:[22]

$$\frac{\partial \ln\left(\frac{d_X(z)}{1-\phi_X(z)}\right)}{\partial \ln z}.$$

---

[20] Using repeat bidders, Fuller et al. (2002) estimate that bidders in M&As of public targets (thus comparable to our exercise) overpay in about 6.7% as a fraction of the target's value. This number is obtained by dividing the cumulative abnormal return of the bidder of -1% by the relative size of the target 15% (authors' calculation using estimates from Table VI in Fuller et al. (2002)). Hietala, Kaplan, and Robinson (2003) estimate that Viacom overpaid for Paramount more than $2 billion, or 22% of Paramount's value.

[21] The covariance matrix of the vector of elasticities, $\mathbf{G}(\boldsymbol{\theta})$, is estimated with the delta method, i.e.,

$$var\left(\mathbf{G}\left(\boldsymbol{\theta}\right)\right) = \frac{\partial \mathbf{G}\left(\boldsymbol{\theta}\right)}{\partial \boldsymbol{\theta}} var\left(\boldsymbol{\theta}\right) \frac{\partial \mathbf{G}\left(\boldsymbol{\theta}\right)'}{\partial \boldsymbol{\theta}}.$$

[22] For a dummy characteristic z we instead measure $\frac{d_X(z=1)}{1-\phi_X(z=1)} \big/ \frac{d_X(z=0)}{1-\phi_X(z=0)} - 1.$

Cash has a significantly positive effect in private benefits as a fraction of equity (elasticity between .11 and .43). The estimations also suggest that the effect of the *level* of the target's cash is higher when the target's cash *relative* to the buyer's cash is also high. Short-term debt has a significantly negative effect in private benefits as a fraction of equity (elasticity of −.14 to −.42). The similarity of the elasticities for cash and short-term debt suggests that cash and short-term debt are substitutes in extracting private benefits. These results provide support to Jensen's (1986) hypothesis that debt reduces the agency cost of free cash flow and are surprising in light of previous work that has failed to find a systematic effect from either variable. In Barclay and Holderness (1989) neither leverage nor cash affects the block premium. Also, Hwang (2005) finds no robust effect of leverage on the block premium. In a study of the voting premium in Brazil, Carvalhal da Silva and Subrahmanyam (2007) find that the voting premium increases with firm leverage.

Private benefits as a fraction of equity value increase with asset intangibility (elasticity of .29) providing evidence in support of the hypothesis in Himmelberg et al (1999). Dyck and Zingales (2004) and Hwang (2005) also find that the block premium increases with the level of intangible assets.

We find that private benefits of block holders as a fraction of equity value decrease with the target's size suggesting that the costs of higher monitoring outweigh the pecuniary and non-pecuniary benefits of running larger corporations. This is a novel effect as neither Barclay and Holderness (1989) nor Hwang (2005) find a significant relationship between firm size and the block premium. Zingales (1995) and Nenova (2003) also fail to find a significant effect of size on the voting premium. However, Carvalhal da Silva and Subrahmanyam (2007) and Guadalupe and Pérez-González (2005) find a positive effect of size on the voting premium. Our results may differ from the later because the average size of the targets in our sample is quite small. It may be that the effect of non pecuniary benefits and perquisites only kicks in for larger firm sizes.

Private benefits display significant positive variation with respect to past performance (elasticities between .18 and 2). This supports our prediction that it is harder to extract private benefits from firms with poor performance who might be in financial distress and under significant monitoring. Barclay and Holderness (1989) find that past performance leads to higher block premium, but Hwang (2005) finds no effect of stock returns on the block premium. Using measures of accounting performance, Carvalhal da Silva and Subrahmanyam (2007) find a positive impact on the voting premium whereas Guadalupe and Pérez-González (2005) find a negative impact.

Specifications (2) and (3) show that corporations can extract significantly more private benefits than individual block holders. However, this effect is not robust across specifications. Block buyers with minority holdings before the trade (toeholds) do not appear to be more effective in extracting benefits than buyers with no previous holdings. In previous literature,

Barclay and Holderness (1989) find that active buyers have a negative effect on the block premium, whereas Dyck and Zingales (2004) find no effect on the block premium, and Hwang (2005) finds a positive effect on the block premium.

6.0.2 Security benefits and private benefits

We use the estimates in Table IV to compute the implied increase in security benefits, the extraction rates and the level of private benefits of control. These are reported in Table V

The average increase in security benefits, $\frac{\hat{v}_{R,i}}{\hat{v}_{I,i}}$, is about 20%, which is close but higher than the observed average price run-up of 14%. The fraction of private benefits derived by the different block holders before and after the trade is very similar. On average, the block buyer's private benefits are between 2.5% and 4.1% of the firm's security benefits or between 2.9% and 4% of the firm's equity value. These estimates are significantly different from zero. Panels (a) and (b) of Figure 6 give the predicted histograms of private benefits for sellers and buyers. These are very similar, displaying a positive skew: a strikingly large fraction of 28% (50%) of all buyers has less than 0.1% (1%) of private benefits as a fraction of security benefits. The maximum private benefits is 10% of security benefits.

<INSERT TABLE V ABOUT HERE>

<INSERT FIGURE 6 ABOUT HERE>

As discussed in section 3.4, there is a downward bias in measuring private benefits of control in other approaches that do not explicitly model discounts. For example, in a sample that contains 41% of blocks with discounts, Dyck and Zingales (2004) estimate private benefits in the US to be 2.7% on average, but statistically insignificantly different from zero (see Table III, specification 2, in Dyck and Zingales (2004)). Also, our estimates of the private benefits in the US are about 50 percent higher than those in Nenova (2003), where the voting premium is used to measure private benefits.

Besides being able to estimate private benefits, our empirical approach allows us to estimate the efficiency with which private benefits are extracted. The efficiency of private benefits extraction is given by the difference $\phi_{X,i}^{\alpha} - d_{X,i}^{\alpha}$ since the extraction of $\phi_{X,i}^{\alpha} v_{X,i}$ dollars from shareholders results in only $d_{X,i}^{\alpha} v_{X,i}$ dollars of private benefits. As discussed in subsection 4.2, $\phi_{X,i}^{\alpha} - d_{X,i}^{\alpha} = \left(\frac{1}{2\alpha_i} - 1 \right) d_{X,i}^{\alpha}$ (see (15)). Table V shows that on average the difference in $\phi_{X,i}^{\alpha} - d_{X,i}^{\alpha}$ for both $X = R, I$ is approximately equal to the size of private benefits. That is, for each dollar extracted from shareholders, a controlling shareholder is able to benefit in 50 cents on average.

The main prediction of the BGP model is that the block premium reflects the seller's threat point of going to a tender offer, plus the buyer and seller's coalition payout from

avoiding a costly tender offer. Table V reports the predicted value of the savings to both parties from negotiating privately. We estimate these savings by computing

$$
\mathbf{1}_i^{eff} \left[\alpha_i \left(1 - \hat{\phi}_{R,i}^{\alpha} \right) \hat{v}_{R,i} + \hat{d}_R^{\alpha} \hat{v}_{R,i} - \left(\alpha_i \left(1 - \hat{\phi}_{R,i}^{\beta^*} \right) \hat{v}_{R,i} + \hat{d}_{R,i}^{\beta^*} \hat{v}_{R,i} \right) \right] +
$$
$$
\mathbf{1}_i^{ineff} \left[\alpha_i \left(1 - \hat{\phi}_{R,i}^{\alpha} \right) \hat{v}_{R,i} + \hat{d}_R^{\alpha} \hat{v}_{R,i} - \left(\alpha_i \left(1 - \hat{\phi}_{R,i}^{\gamma} \right) \hat{v}_{R,i} + \hat{d}_R^{\gamma} \hat{v}_{R,i} \right) \right],
$$

and expressing them as a percentage of the post-announcement exchange price, P_i^1. These savings are considerable and amount to about 5% of the exchange price or $20\% = \psi \times .05/.196$ of the block premium, with $\psi = .8$. The magnitude of this number provides additional evidence in favor of the significance of the mechanism in BGP.

7 Quantifying the effects of the Mandatory Bid Rule

This section evaluates the benefits of the Mandatory Bid Rule. The MBR forces a public tender offer so that even dispersed shareholders participate in the trade and obtain the same terms as the incumbent. In contrast, the Market Rule (MR) allows for private negotiations. The debate around the MBR versus the MR has recently regained interest with the European Commission's desire to introduce Europe-wide takeover regulation and a strict MBR (Berglöf and Burkart (2003)).[23]

The usual argument in favor of the MBR is that it prevents value decreasing control transfers (e.g., Bebchuk (1994)). BGP provide another rationale. Under effective competition, the MBR must produce gains to shareholders because the free-riding behavior of dispersed shareholders forces the buyer to bid higher and to buy a larger block of shares resulting in a smaller extraction of private benefits.

The usual argument against the MBR is that it may deter value increasing transfers of control (e.g., Barclay and Holderness (1992) and Bebchuk (1994)). The BGP model indicates that there is another cost of the MBR that occurs if the seller is an ineffective competitor. Under ineffective competition, the value of the block to the incumbent is small enough so that the buyer bids only for a fraction of the incumbent's block. Hence, the block is broken up and the buyer ends up extracting more benefits and destroying shareholder value relative to the negotiated trade.

Our structural estimation approach allows us to conduct a direct, quantitative evaluation of the MBR and its various costs and benefits. Such evaluation has not been done before. To do so, we conduct the counterfactual exercise of asking what would happen in the model if the buyer was forced to a tender offer.[24]

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[23]In the US, Section 33 of the Revised Security Code, establishes a MBR to US companies bidding for majority control of listed companies, but no such requirement exists for minority blocks (see Dyck and Zingales (2004)).

[24]Absent a structural estimation analysis like ours, empirical tests of the MBR are necessarily indirect tests.

We first determine what is the size of the controlling block under the MBR. By forcing a tender offer, the MBR leads to a final block size of $\beta_i^* > \alpha_i$, if Assumption 4 holds, or, when Assumption 4 does not hold, α_i in Case I and $\gamma_i < \alpha_i$ in Case II. We denote by α^{TO} the resulting block size, and by $\phi_R^{TO} = \phi_R\left(\alpha^{TO}\right)$ the corresponding extraction rate.[25]

Next, we determine what deals go through under one rule, but not the other. As argued above this is an important dimension of the possible welfare effects of moving to a MBR. Recall that our sample originates in a regime where the Market Rule applies (i.e., US law). The block trades that would go through under the MR include those that would also go through under the MBR, as well as others, both efficient and inefficient (see Bebchuk (1994)). Therefore, there is no selection bias in our estimates of welfare change, in that we are not omitting deals that would have gone through under the MBR but not under the MR. However, some deals in our sample may not take place under a MBR. These are block trades where the buyer's value of the block α^{TO} is smaller than the seller's value of the block α:

$$\frac{\alpha_i^{TO}\left(1 - \hat{\phi}_{R,i}^{TO}\right)\hat{v}_{R,i} + d\left(\hat{\phi}_{R,i}^{TO}\right)\hat{v}_{R,i}}{\alpha_i\left(1 - \hat{\phi}_{I,i}^{\alpha}\right)\hat{v}_{I,i} + d\left(\hat{\phi}_{I,i}^{\alpha}\right)\hat{v}_{I,i}} - 1 < 0.$$

Let the indicator function $\mathbf{1}_{MBR,i}$ equal 1 if the above inequality is not satisfied and 0 otherwise. The indicator function $\mathbf{1}_{MBR,i}$ is active for trades that take place even under the MBR.

For any deal i, the increase in welfare with the MBR is 0 if $\mathbf{1}_{MBR,i} = 0$ and is

$$\frac{\left(1 - \hat{\phi}_{R,i}^{TO}\right)\hat{v}_{R,i} + d\left(\hat{\phi}_{R,i}^{TO}\right)\hat{v}_{R,i}}{\left(1 - \hat{\phi}_{I,i}^{\alpha}\right)\hat{v}_{I,i} + d\left(\hat{\phi}_{I,i}^{\alpha}\right)\hat{v}_{I,i}},$$

otherwise. Likewise, the increase in welfare with the MR is

$$\frac{\left(1 - \hat{\phi}_{R,i}^{\alpha}\right)\hat{v}_{R,i} + d\left(\hat{\phi}_{R,i}^{\alpha}\right)\hat{v}_{R,i}}{\left(1 - \hat{\phi}_{I,i}^{\alpha}\right)\hat{v}_{I,i} + d\left(\hat{\phi}_{I,i}^{\alpha}\right)\hat{v}_{I,i}}.$$

The incremental welfare gains under the MBR versus the welfare gains under the MR can

---

Nenova (2006) and Carvalhal da Silva and Subrahmanyam (2007) pursue an indirect approach by looking at the effect on the *voting* premium of the removal of the MBR. The analysis is done with data from Brazil. They reach opposite conclusions, perhaps due to the confounding effects of the removal of the MBR on the voting premium and of the different samples they use.

[25]Let $\hat{\phi}_{R,i}^{TO}$ equal $\hat{\phi}_{R,i}^{\gamma}$ under ineffective competition (Case II), $\hat{\phi}_{R,i}^{\alpha}$ under ineffective competition (Case I), and $\hat{\phi}_{R,i}^{\beta^*}$ under effective competition, where $\hat{\phi}_{R,i}^{\gamma} > \hat{\phi}_{R,i}^{\alpha} > \hat{\phi}_{R,i}^{\beta^*}$.

then be shown to equal:

$$\left(\frac{\left(1 - \hat{\phi}_{R,i}^{TO} \right) \hat{v}_{R,i} + d \left(\hat{\phi}_{R,i}^{TO} \right) \hat{v}_{R,i}}{\left(1 - \hat{\phi}_{R,i}^{\alpha} \right) \hat{v}_{R,i} + d \left(\hat{\phi}_{R,i}^{\alpha} \right) \hat{v}_{R,i}} - 1 \right) \frac{\left(1 - \hat{\phi}_{R,i}^{\alpha} \right) \hat{v}_{R,i} + d \left(\hat{\phi}_{R,i}^{\alpha} \right) \hat{v}_{R,i}}{\left(1 - \hat{\phi}_{I,i}^{\alpha} \right) \hat{v}_{I,i} + d \left(\hat{\phi}_{I,i}^{\alpha} \right) \hat{v}_{I,i}} \qquad (16)$$

$$- \left(1 - \mathbf{1}_{MBR,i} \right) \left(\frac{\left(1 - \hat{\phi}_{R,i}^{TO} \right) \hat{v}_{R,i} + d \left(\hat{\phi}_{R,i}^{TO} \right) \hat{v}_{R,i}}{\left(1 - \hat{\phi}_{I,i}^{\alpha} \right) \hat{v}_{I,i} + d \left(\hat{\phi}_{I,i}^{\alpha} \right) \hat{v}_{I,i}} - 1 \right).$$

The first term describes the additional welfare gains holding fixed the number of deals under MR and MBR, i.e., the BGP effects. The second term describes the welfare gain (loss) for dropping deals that are value decreasing (increasing), i.e., the Bebchuk (1994) effects.

7.1   MBR gains holding fixed the number of deals

To understand the source of the costs and benefits of the MBR, this subsection focuses on the first term in (16). Therefore, this subsection considers only the costs and benefits associated with the MBR as implied by the BGP model.

Table VI shows the change in extraction rates caused by the forced tender offer, $\phi_R^{TO} - \phi_R^{\alpha}$. Because most blocks in the sample have ineffectively competitive sellers (Case II), the average extraction rate is higher under the MBR (roughly 2 percentage points). The distribution of change in extraction rates, for the case of specification (1) from Table IV is shown in panel (a) of Figure 7. Extraction rates can be reduced by up to 20%, but they increase in most of the sample.

<center><INSERT TABLE VI ABOUT HERE></center>

<center><INSERT FIGURE 7 ABOUT HERE></center>

Panel (b) of Figure 7 shows the predicted histogram of the additional benefits from the MBR (or increase in total welfare) over and above the gains associated with the new block owner. The additional benefits from MBR are

$$\frac{\left(1 - \hat{\phi}_{R,i}^{TO} \right) \hat{v}_{R,i} + d \left(\hat{\phi}_{R,i}^{TO} \right) \hat{v}_{R,i}}{\left(1 - \hat{\phi}_{R,i}^{\alpha} \right) \hat{v}_{R,i} + d \left(\hat{\phi}_{R,i}^{\alpha} \right) \hat{v}_{R,i}} - 1.$$

The histogram shows that in most cases these benefits are negative. Table VI indicates that on average the MBR represents a loss of 3% (statistically significant) of total firm value. Our exercise demonstrates that the blunt implementation of the MBR can be costly because, in too many cases, the seller would not be an effective competitor in a tender offer. It turns

<center>30</center>

out that a substantial part of this loss is incurred by dispersed shareholders. The additional value to dispersed shareholders of the MBR is given by

$$\frac{\left(1 - \hat{\phi}_{R,i}^{TO}\right)\hat{v}_{R,i}}{\left(1 - \hat{\phi}_{R,i}^{\alpha}\right)\hat{v}_{R,i}} - 1.$$

As Table VI shows the average additional gain to dispersed shareholders with the MBR is about -2.8%.

If the MBR does not add value, are shareholders better off with the private negotiation? We answer this question in two steps. First, we compute the average total efficiency gain (or increase in total welfare) from the block trade that accrues to block holder and dispersed shareholders under the Market Rule. These gains are equal to

$$\frac{\left(1 - \hat{\phi}_{R,i}^{\alpha}\right)\hat{v}_{R,i} + d\left(\hat{\phi}_{R,i}^{\alpha}\right)\hat{v}_{R,i}}{\left(1 - \hat{\phi}_{I,i}^{\alpha}\right)\hat{v}_{I,i} + d\left(\hat{\phi}_{I,i}^{\alpha}\right)\hat{v}_{I,i}} - 1. \tag{17}$$

Table VI shows that on average the total gains from trade are a significant 19%. Second, we compute the average shareholder's gain in a negotiated trade. This is equivalent to the average price run-up, or

$$\frac{\left(1 - \hat{\phi}_{R,i}^{\alpha}\right)\hat{v}_{R,i}}{\left(1 - \hat{\phi}_{I,i}^{\alpha}\right)\hat{v}_{I,i}} - 1.$$

As expected, Table VI shows that the gains to the average dispersed shareholder are also very high, on the order of 18% on average. These gains are the main source of increased firm value (17) because private benefits do not change much.

These large gains to dispersed shareholders, or price run-up, have led Barclay and Holderness (1992) to hypothesize that the additional gains from the MBR to dispersed shareholders should be small. A simple test of this conjecture is given in Figure 8. Panel (a) plots the actual price run-up against the predicted gains from the MBR. There is a clearly marked negative relationship as hypothesized by Barclay and Holderness (1992). Note that there are no deals in the third quadrant where the price run-up is negative and the gains from the MBR are also negative. This is because a negative price run-up, $P^0 > P^1$, implies $\phi_R^\alpha > \phi_I^\alpha$ given that $\omega_i \leq 1$ (see discussion after (6)). The high ϕ_R^α makes it more likely that I is an effective competitor (i.e., $(1 - \phi_R^\alpha)v_R \leq v_I$) and hence that the MBR produces gains.

For comparison, panel (b) plots the actual block premium against the predicted gains from the MBR. There is apparently no relationship between the two. Our results thus bear strong support to the view in Barclay and Holderness (1992) shared by Berglöf and Burkart (2003) and Wymeersch (1992). However, as our analysis above also shows, the substantial price run-ups in the data do not preclude large private benefits of control.

<INSERT FIGURE 8 ABOUT HERE>

Our results on the negative effects of the MBR are quite robust and rely mostly on the existence of a large price run-up in the data. We argue that any model which is successful in matching the price run-up in the data produces small gains for the MBR. To see this note that, on the one hand, the extraction rates ϕ_R^α and ϕ_I^α are quite similar (see Table V). This means that the price run-up measures mostly the change in security benefits $\frac{v_L}{v_R}$ (see (6)). On the other hand, as shown in Figure 4, changes in block size (say from α to β^* as forced by a tender offer) produce little effects on private benefits d_X for an average block of size 0.3. The large price run-ups then dictate the large gains in shareholder value in the presence of the MR (see (17)) and the small incremental gains of implementing the MBR.

Figure 9 explores further the distribution of gains and losses due to the MBR. Panel (a) shows that there are efficiency gains from the MBR if and only if the control transfer through the tender offer leads the buyer to purchase a larger block and extract less benefits (which occurs under effective competition). The gains from the MBR are decreasing in the additional shares purchased through the tender offer, and they become negative if the seller is an ineffective competitor in which case the tender offer leads to a split of the block and higher private benefits.

<INSERT FIGURE 9 ABOUT HERE>

Panel (b) of Figure 9 is useful to evaluate the many regulatory environments where the implementation of the MBR is conditional on the block size (see Berglöf and Burkart's (2003) survey of European regulations). In one view, smaller size blocks should be forced into a tender offer to avoid a "sale of office" (see Kahan (1993)). In another view, the MBR should be forced on buyers that acquire a block representing a significant fraction of the equity (the UK City Code on Takeovers and Mergers forces a tender offer on blocks of 30% or higher). Given the evidence in panel (a), if most smaller blocks are also those blocks where the seller is an effective competitor, then the MBR applied to these blocks will generally result in additional gains. However, panel (b) shows that this is not necessarily the case. The points marked with a cross refer to observations where the seller is an effective competitor: by and large, the smaller the block, the larger are the gains from the MBR. The points marked with a dot refer to observations where the seller is an ineffective competitor (Case II): here the opposite occurs as the smaller blocks are those that stand to loose the most with the introduction of the MBR because they are broken up in the tender offer and lead to high private benefits of control. The reduction in dispersion (of gains and losses with the MBR) as the block size increases occurs because there is less extraction of private benefits with

larger blocks. Panel (a) of Figure 9 suggests that making the MBR conditional on negative price run-ups is a better approach to implementing it (see also Berglöf and Burkart (2003)). However, because incentives change when regulations change, further analysis is required to assess the full impact of conditioning the MBR on negative price run-ups.

7.2 MBR additional gains when number of deals changes

We now consider the other source of costs and benefits associated with the MBR, which is associated with the fact that the MBR can potentially make control contests more expensive and result in the elimination of welfare increasing as well as welfare decreasing block trades.

Table VI reports the additional gains that result when we let the number of deals vary. These gains are described by the second term in (16). Across all three specifications, welfare is reduced by an average of 10% because many value increasing deals will not take place under the MBR. Thus, the selection effect present in the MBR significantly adds to the overall loss with the MBR, bringing the overall average total welfare loss which results from the introduction of the MBR to about 13%.

<INSERT TABLE VII ABOUT HERE>

To better understand these numbers, Table VII reports the number of deals that are welfare decreasing and those that are welfare increasing under the MR. It also reports how many of either of these deals would still be taken up by the buyer under the MBR. Finally, the table shows the number of deals in each case that is welfare decreasing under the MR. The table uses the estimations from specification (1) through (3) in Table IV

Using specification (1), we see that 25% of the deals in our sample are predicted to be value decreasing (30 deals in 120 possible). Surprisingly, none of these deals would be eliminated if the MBR were in place (likewise with the other specifications). This is because of two reasons. First, in these deals I is an effective competitor (the condition that $v_I \geq (1 - \phi_R^\alpha) v_R$ is a necessary condition for a deal to be welfare decreasing when private benefits are similar across R and I). Therefore, $\alpha^{TO} = \beta^* > \alpha$. Second, because the value of a block to X increases with the block size, buyer's welfare must increase under the MBR and all these deals are implemented. While the MBR fails to prevent these welfare decreasing trades, there is a positive incentive effect of the tender offer when I is an effective competitor because $\alpha^{TO} = \beta^* > \alpha$, which transforms about half of these deals into welfare increasing deals.

Also surprisingly is that for specification (1), 58% (i.e. 70/120) of the block trades that took place under the MR and were welfare increasing, would not take place under the MBR in spite of the fact that only a small fraction of these trades is welfare decreasing under the MBR. There are two reasons for this. First, in these deals I is likely an ineffective competitor

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$(v_I < (1 - \phi_R^\alpha) v_R$ is a necessary condition for a deal to be welfare increasing when private benefits are similar across R and I). Second, because I is an ineffective competitor in these deals a tender offer would result in a partitioned block $\alpha^{TO} = \gamma < \alpha$. Thus, buyer's surplus goes down under the tender offer. Finally, if deals are welfare increasing under the MR, they are also likely to be welfare increasing under the MBR, if adopted. The large decline in the number of efficient deals implies that a significant cost of the MBR is the deterrence effect on value increasing deals and explains the large welfare losses associated with the MBR reported in Table VI

Table VII also highlights a substantial decline in turnover in the market for corporate control under the MBR. There are between 45% and 58% fewer deals under the MBR than under the MR.

8   Conclusion

This paper uses data on block transactions and the block premium to measure private benefits of control and its determinants. The identification is accomplished via the theoretical constraints implied in the Burkart, Gromb and Panunzi (2000) model. The paper shows that there are two crucial elements in fitting the model to the data. One is the observed run-up in the target firm's exchange price and the other is the seller's ability to compete in the event of a tender offer. The price run-up is critical in identifying the increase in security benefits due to the control transfer, while inferring whether the seller is an effective competitor is critical to explain why blocks are traded at a discount. We show that by not modeling discounts, the previous literature is likely to have underestimated private benefits of control.

Our paper conducts an extensive evaluation of the merits of the Mandatory Bid Rule versus those of the Market Rule. We estimate significant welfare losses of implementing the MBR arising from a deterrence effect of the MBR on welfare increasing deals, and from a loss of welfare that arises when block sellers are ineffective competitors in tender offers.

Future research should aim to enrich the specification of the private benefits function by gathering data from the block seller. These data may help to identify the reasons why sellers appear to be at a disadvantage in control contests where tender offers occur, which lead to discounts.

Appendix

A.1: Dataset construction

We construct a database of all negotiated block purchases in the US. Following Dyck and Zingales (2004) we look for transactions where control is transferred from seller to buyer. According to their procedure, we include all acquisitions between January 1st of 1990 and August 31st of 2006 in the SDC *Acquisitions* database where:

1. the block traded includes more than 10% of the outstanding shares but less than 50%; the acquirer must have owned less than 20% of the shares before the acquisition and owned more than 20% as a result.

2. the block is the largest block held in the firm; to rule out trades of blocks in firms where other insiders may be holding larger blocks, we merged SDC with the TFN Insider Filing Data using the 6-digit CUSIPS and the date of the acquisition;

3. the acquirer is not the current manager or the transfer is not between a subsidiary and a parent company;

4. the sample contains only privately negotiated acquisitions of minority stakes. Our sample does not include white knights or squires, nor share repurchases. Further, none of our trades corresponds to a private placement of newly issued shares (e.g., PIPES). Both white knights and private placements of newly issued shares are known to trade at discounts for reasons unrelated to the BGP model.

5. the price per share in the block is observable and confirmed by the deal synopsis; further, the transfer of control is confirmed in articles found in either Lexis-Nexis or the Dow-Jones Newswires for a random selection of 30 deals;

6. transactions paid with securities that cannot be objectively priced, e.g., deals paid with warrants, convertible bonds, notes, liabilities, debt-equity swaps or any form of options. These transactions also have the potential to bias the results because outside investors may expect the buyer to acquire more shares in the future.

7. the exchange share price of the company whose block of shares is acquired must be available in CRSP for a period of at least 21 trading days after the trade and 51 trading days before the trade. We require 51 days of trading before the block transaction because we use the first 30 trading days in the sample to construct a measure of firm-β for each firm that we then use for the market-model price adjustment.

As in Barclay and Holderness (1989) and Dyck and Zingales (2004) we exclude deals in proximity with takeover events or going-private deals. These include acquisitions of remaining interest, exchange offers, recapitalizations, buy-backs, open market purchases, tender offers, private tender offers, Dutch auction tender offers, liquidations, spin-offs, two-step spin-offs, bankruptcies, failed bankruptcies, equity carve-outs, three-way mergers, take-overs and reverse take-overs. In contrast with Barclay and Holderness (1989) and Dyck and Zingales (2004), we restrict attention to minority blocks, where $\alpha < 50\%$. The reason is discussed in the main text and has to do with the fact that the pricing implications of minority versus majority blocks are very different.

We match each transaction with the target firm's balance sheet data in COMPUSTAT using 9-digit CUSIP numbers. Our final sample, which satisfies all the criteria above, consists of 120 negotiated block trades.

A.2: Details of the estimation procedure

The theoretical restrictions imposed by the model on the private benefits function and the equilibrium block premium imply that the regression error is potentially highly non-linear in the parameters to estimate. In order to find the global minimum of $\boldsymbol{\varepsilon}(\boldsymbol{\theta})'\boldsymbol{\Omega}^{-1}\boldsymbol{\varepsilon}(\boldsymbol{\theta})$, we perform a search algorithm over initial starting parameter values.

Our full specification has parameters $\boldsymbol{\theta} = \left(\boldsymbol{\eta}^I, \boldsymbol{\eta}^R, \boldsymbol{\eta}, \psi_0, \psi\right)$, where

$$
\begin{aligned}
\boldsymbol{\eta}^I &= \eta_I, \\
\boldsymbol{\eta}^R &= [\eta_R \ \eta_{ACT} \ \eta_{CORP} \ \eta_{IND} \ \eta_{CRAT}]', \text{ and} \\
\boldsymbol{\eta} &= [\eta_{CASH} \ \eta_{INT} \ \eta_{STD} \ \eta_{SIZE} \ \eta_{RET}]'.
\end{aligned}
$$

We search for a minimizer, $\boldsymbol{\theta}_j^*$, for each vector of initial values, $\boldsymbol{\theta}_j^0$. We vary the initial conditions over a grid on the ranges of $\eta_{AVRET}, \eta_{ASSETS}$, and η_{CASH}, keeping fixed the starting values for the other parameters at the center of their own range. Our grid has 539 points, i.e., all the combinations of 7 initial conditions for η_{AVRET}, 7 for η_{ASSETS} and 11 for cash. The global minimizer, $\hat{\boldsymbol{\theta}}$, is such that

$$
\min \boldsymbol{\varepsilon}(\hat{\boldsymbol{\theta}})'\hat{\boldsymbol{\Omega}}^{-1}\boldsymbol{\varepsilon}(\hat{\boldsymbol{\theta}}) \leq \min \boldsymbol{\varepsilon}(\boldsymbol{\theta}_j^*)'\boldsymbol{\Omega}^{*-1}\boldsymbol{\varepsilon}(\boldsymbol{\theta}_j^*) \ \forall j = 1, ..., 539.
$$

We set the upper and lower bounds for the search of $\hat{\boldsymbol{\theta}}$ such that the elasticity of the private benefits function to the variable associated to each parameter in $\boldsymbol{\eta}^I, \boldsymbol{\eta}^R$ and η is zero. Hence, we gain speed by ruling out solutions where the private benefits is insensitive to the linear index $\boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X + \eta'\mathbf{w}_i$.

This procedure is repeated two times. In the first stage, we take $\boldsymbol{\Omega} = \mathbf{I}$, the identity matrix. Using the estimated $\hat{\boldsymbol{\theta}}$ we construct the error vector $\boldsymbol{\varepsilon}(\hat{\boldsymbol{\theta}})$. The estimated $\hat{\boldsymbol{\Omega}}$ is

constructed as a diagonal matrix with typical element $\left(\hat{\varepsilon}_i^2\right)$. With the new $\hat{\boldsymbol{\Omega}}$ we repeat the search algorithm to obtain the second stage estimates.

Using the second stage minimizer $\hat{\boldsymbol{\theta}}$, we estimate the covariance matrix of our estimators

$$Var(\hat{\boldsymbol{\theta}}) = (\mathbf{X}(\hat{\boldsymbol{\theta}})'\hat{\boldsymbol{\Omega}}\mathbf{X}(\hat{\boldsymbol{\theta}}))^{-1}.$$

In this formula, $\mathbf{X}(\hat{\boldsymbol{\theta}})$ is the Jacobian of the block premium function, evaluated at the optimal solution. Finally, we verify that our solution is globally identified, i.e., that the Hessian evaluated at $\hat{\boldsymbol{\theta}}$ is non-singular.

A.3: Estimation of the model under the assumption of effective competition

To estimate the BGP model as described in Proposition 1 and equation (2), we define the error of the model by

$$\varepsilon_i \equiv \frac{\Pi_i}{\alpha_i P_i^1} - c - BP_i^{eff}, \tag{18}$$

where BP_i^{eff} is given in (9). We estimate the parameter vector $\boldsymbol{\theta} = \left(\boldsymbol{\eta}^I, \boldsymbol{\eta}^R, \boldsymbol{\eta}, c, \psi\right)$ by FGNLS. Letting $\boldsymbol{\varepsilon} = (\varepsilon_1, ..., \varepsilon_N)'$ and $\boldsymbol{\Omega} = \mathbf{E}\left(\boldsymbol{\varepsilon}\boldsymbol{\varepsilon}'\right)$, the FGNLS estimator of $\boldsymbol{\theta}$ solves

$$\min \boldsymbol{\varepsilon}\left(\boldsymbol{\theta}\right)' \boldsymbol{\Omega}^{-1}\boldsymbol{\varepsilon}\left(\boldsymbol{\theta}\right), \tag{19}$$

subject to $\psi \in [0, 1]$, $i = 1, ..., N$. Assumption 2 is guaranteed via (6). We do not impose Assumptions 3 and 4 explicitly here. In the main text, we present conditions under which Assumption 3 holds and later verify that it is not a binding constraint in our estimation. As for Assumption 4, that I is an effective competitor, we will check if this assumption is borne by the data by ex-post counting the observations which violate it.

Table VIII shows the parameter estimates and quality of fit statistics for the model in (9) through (19). For parsimony, we report only two basic specifications of $\mathbf{w}_i^X$ and $\mathbf{w}_i$. As a measure of overall fit, we compute the R^2 coefficient as the ratio of the predicted sum of squares of the block premium to the actual sum of squares. The reported R^2 is much lower than those reported in the main text for a full specification of the BGP model even though the models are not rejected (p-values under 0.01).

The intercept in both specifications is estimated to be significant, but quite small. The size of the constant term could be viewed as a triumph of the BGP model as estimated here (under Assumption 4), since the constant was exogenously imposed. However, as we argue below, the estimation uses the constant to try to capture two opposing effects in the data: the presence of overpayment and the need to account for the discounts in the sample.

We now turn to an analysis of the parameter estimates. The estimated bargaining power of the seller is large under both specifications, with point estimates over .96 and significant. These estimates a significantly higher than in the full model estimation presented in the

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main text. To see why, note that ψ multiplies the gains from avoiding a tender offer (see (2)). In the estimation of (19), there is a downward bias in the gains from avoiding a tender offer motivated by the need to capture discounts (see below). To magnify this effect, the estimation under effective competition also introduces an upward bias in ψ.

As opposed to the results in the full model, the estimates are generally inconsistent across the specifications. The target's cash and short term debt are both significant drivers of private benefits: the block holder derives more private benefits from firms with more cash and from firms with less short term debt. In specification (1), private benefits as a function of firm equity increase by .4% for each 1% increase in the proportion of cash to assets, and decrease by 1.3% for each 1% increase in the proportion of short-term debt to assets. In addition, specification (2) finds that the ratio of the target's cash holdings to the buyer's cash holdings is not an important determinant of private benefits. The results suggest that the target's past performance increases the owner's ability to extract private benefits, but uncover no systematic effect of firm size; the elasticity of private benefits to the target's size is insignificant in specification (2). A corporate block owner appears to be able to derive 3 to 4 times as much private benefits than individual block owners.

<INSERT TABLE VIII ABOUT HERE>

Table IX shows further implications of the estimates in Table VIII. Using (6) and the fact that $\omega_i = \frac{v_{Ii}}{v_{Ri}}$, we estimate the implied change in security benefits in each block trade. The average increase in security benefits is large: 5.6% and 18.5% for specifications (1) and (2), respectively. The size of this estimate is largely explained by the average price run-up of $\frac{1}{120} \sum_i \frac{P_i^1}{P_i^0} = 14.1\%$.

<INSERT TABLE IX ABOUT HERE>

The rates of extraction by the new controlling block holder are below 1.3% and are much smaller than the extraction rates by the seller. The smaller predicted extraction rates by the buyer are required in order to match the large increase in security values with the new owner. These differences in extraction rates are also borne in large differences in private benefits.

The absence of a model of discounts forces a lower constant in model (18) in order to capture the block discounts in the data. This implies that the predicted in-sample average block premium is lower than the actual sample mean in both specifications (2% and −.23% in specifications (1) and (2), respectively against 19.6% in the data). However, the intercept alone cannot do a good job in capturing these discounts, because there is significant dispersion in discounts. The other mechanism in (18) to generate discounts is to force tender offers to

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result in a better outcome for everyone, i.e., with $\beta_i^* \leq \alpha_i$ and $d_{R,i}(\alpha_i) \leq d_{R,i}(\beta_i^*)$. In these instances, tender offers are predicted to yield a partitioning of the block and generate higher benefits ex post. In addition, such considerations may imply an underestimation of private benefits $d_{R,i}(\alpha_i)$.

This discussion suggests that the presence of discounts in the sample invalidates the effective competition assumption which implies that $\beta_i^* \geq \alpha_i$ (Assumption 4 above). To evaluate this hypothesis, we compute the predicted extraction rate in the alternative of a tender offer using $\hat{\phi}_{R,i}^{\beta^*} = 1 - \frac{\hat{v}_{I,i}}{\hat{v}_{R,i}}$. In a tender offer under effective competition, the buyer acquires a block larger than the incumbent's block and as a result extracts less private benefits. Hence, any block trade observation where our estimates predict that $\hat{\phi}_{R,i}^{\beta^*} > \hat{\phi}_{R,i}^{\alpha}$ violates the assumption used to derive the block premium equation. Table IX shows that there are 59 such violations in specification (1) and 81 violations in specification (2) (49% and 67.5% of observations, respectively).

Not surprisingly, Table IX shows that the actual block premium is on average larger in the sub-sample that satisfies the condition for effective competition than in the sub-sample where the condition is violated (.33 versus .06 in specification (1) and .33 versus .13 in specification (2)). This suggests that discounts occur mostly under ineffective competition and that the model has a hard time accounting for variation in these observations. We conclude that the BGP model under the assumption of effective competition fits the data poorly.

A.4: Proofs and additional results

A.4.i. Additional results for the BGP model with ineffective competition

It is necessary to consider two cases. In the first case, the security value and private benefits of the block to I are greater than the value of the security benefits under R: $v_I < (1 - \phi_R^{\alpha}) v_R \leq (1 - \phi_I^{\alpha}) v_I + \left(\frac{d_I^{\alpha}}{\alpha}\right) v_I$. Any bid lower than $(1 - \phi_R^{\alpha}) v_R$ attracts less than α from dispersed shareholders leaving control with I, which makes it suboptimal. Obviously, I would not tender any shares because by remaining in control he gets $(1 - \phi_I^{\alpha}) v_I + \left(\frac{d_I^{\alpha}}{\alpha}\right) v_I \geq (1 - \phi_R^{\alpha}) v_R$ which in turn is more than what he could get by tendering a fraction or all of his shares and control to R. On the other hand, if R bids $b^* = (1 - \phi_R^{\alpha}) v_R$, then he attracts α shares from I and gains control. Dispersed shareholders prefer R as the block owner to I because $(1 - \phi_I^{\alpha}) v_I < v_I < (1 - \phi_R^{\alpha}) v_R$. Because the sum of private and security benefits for I is higher than b^* perhaps I could make a counter offer that would prevail over b^*. However, I does not counter b^* because it is never optimal to offer $b > b^* = (1 - \phi_R^{\alpha}) v_R > v_I > (1 - \phi_I^{\alpha}) v_I$. Such bid attracts all shares by dispersed shareholders who gain b by selling to I or gain $v_I < b$ by holding on to the shares (note that each dispersed shareholder is atomistic and thinks the deal will go through independently of his tendering decision). Thus I ends up with payout $v_I - (1 - \alpha) b < \alpha v_I < \alpha (1 - \phi_R^{\alpha}) v_R$, which means he prefers not

to counter. Therefore, at b^* exactly α shares are tendered in a tender offer implying that the coalition of I and R does not gain by avoiding a tender offer. Thus, $P = \alpha b^*$ and $\Pi = P - \alpha (1 - \phi_R^\alpha) v_R = 0$.

In the second case, $(1 - \phi_R^\alpha) v_R > (1 - \phi_I^\alpha) v_I + \frac{d_I^\alpha}{\alpha} v_I$. The inequality implies that R can gain control by offering less than $(1 - \phi_R^\alpha) v_R$, attracting shares from I. We now show that such offer induces I to sell a majority of the block, though not the whole block. Given a bid of b, I optimally chooses to tender

$$\gamma (b) = \arg \max_\beta \left\{ \beta b + (\alpha - \beta) \left(1 - \phi_R^\beta\right) v_R \right\},$$

which yields the first order condition:

$$b - \left(1 - \phi_R^\gamma\right) v_R + (\alpha - \gamma) \left. \frac{\partial \left(1 - \phi_R^\beta\right) v_R}{\partial \beta} \right|_{\beta = \gamma} = 0. \tag{20}$$

The third term recognizes I's non atomistic behavior and perception of price impact; by tendering one additional share he benefits from lower extraction by R on the untendered shares $\alpha - \gamma$. Thus, unless $\alpha = \gamma$, $b < \left(1 - \phi_R^\gamma\right) v_R < (1 - \phi_R^\alpha) v_R$. Knowing how I will tender the shares, R's bid solves

$$b^* = \arg \max_b \left\{ \gamma (b) \left(1 - \phi_R^{\gamma(b)}\right) v_R + d_R^{\gamma(b)} v_R - \gamma (b) b \right\}. \tag{21}$$

At b^*, $\gamma (b^*) < \alpha$ and $b^* < (1 - \phi_R^\alpha) v_R$ because $\gamma (b^*) \left(1 - \phi_R^{\gamma(b^*)}\right) v_R + d_R^{\gamma(b^*)} v_R - \gamma (b^*) b^* > d_R^\alpha v_R$. If the equilibrium holds $\gamma (b^*) > \frac{\alpha}{2}$, R becomes the larger block holder and wins control. Otherwise, the equilibrium entails $\gamma^* = \frac{1}{2}\alpha$ and b^* satisfies (20).

A.4.ii. Proofs

Proof to Proposition 2. Assume that $\phi(\beta)$ is well approximated by a first order Taylor series expansion, $\phi(\beta) \simeq \tilde{\phi}(\beta) = c_0 + c_1 \beta$. Using $\tilde{\phi}(\beta)$ we solve the system of equations (20)-(21). Recall that (20):

$$b - \left(1 - \tilde{\phi}_R^\gamma\right) v_R + (\alpha - \gamma) \left. \frac{\partial \left(1 - \tilde{\phi}_R^\beta\right) v_R}{\partial \beta} \right|_{\beta = \gamma} = 0,$$

or

$$b - (1 - c_0 - c_1 \gamma) v_R - (\alpha - \gamma) c_1 v_R = 0.$$

This yields the best reply function:

$$\gamma (b) = \frac{b - (1 - c_0 + \alpha c_1) v_R}{-2 c_1 v_R}.$$

Knowing $\gamma(b)$, R solves (21) which gives the first order condition

$$\gamma'(b)\left(1 - \phi_R^{\gamma(b)}\right)v_R - \gamma'(b)b - \gamma(b) = 0.$$

To derive this condition we used the envelope theorem and the optimality of the stealing fraction ϕ. This condition can be rewritten using the reply function $\gamma(b)$ to yield:

$$b^* = (1 - c_0 + \alpha c_1)v_R - \frac{2}{3}\alpha c_1 v_R.$$

Replacing this solution into $\gamma(b)$ yields:

$$\gamma(b^*) = \frac{1}{3}\alpha.$$

Because $\gamma(b^*) < \frac{1}{2}\alpha$, R does not get majority and hence cannot be an equilibrium. We then consider the constrained best reply function, by asking what the minimum bid is that R must pay so that he gets $\frac{1}{2}\alpha$ shares from I? The answer to this question is given by solving $\frac{1}{2}\alpha = \gamma(b)$, or $b = (1 - c_0)v_R$. This is the equilibrium bid provided $c_0 < 1$.

When $\gamma^* = \frac{1}{2}\alpha$ and using the functional form for $d_X(\phi)$, which implies $\phi(\beta) = \left(\frac{\delta}{\beta}\right)^2$, we get:

$$b^* = \left(1 - 12\left(\frac{\delta}{\alpha}\right)^2\right)v_R < \left(1 - \phi_R^{\gamma}\right)v_R < (1 - \phi_R^{\alpha})v_R.$$

We use γ^* and b^* in our estimations. ∎

Proof of the results in Subsection 4.2 on the validity of Assumption 3. First recall that at the optimum extraction rate $d_X(\phi_X^{\alpha}) = 2\alpha\phi_X^{\alpha}$. Therefore, the value of the block α under X is

$$\begin{aligned}\alpha(1 - \phi_X^{\alpha})v_X + d_X^a v_X &= \alpha(1 - \phi_X^{\alpha})v_X + 2\alpha\phi_X^{\alpha}v_X \\ &= \alpha(1 + \phi_X^{\alpha})v_X.\end{aligned}$$

There are two cases to consider. Suppose first that there is a non-positive price run-up, i.e., $P^0 \geq P^1$, or $(1 - \phi_I^{\alpha})v_I \geq (1 - \phi_R^{\alpha})v_R$. Under Assumption 2, $v_R > v_I$, so it must be that $1 - \phi_I^{\alpha} > 1 - \phi_R^{\alpha}$, or $\phi_R^{\alpha} > \phi_I^{\alpha}$. But then

$$\alpha(1 + \phi_R^{\alpha})v_R > \alpha(1 + \phi_I^{\alpha})v_I,$$

and Assumption 3 holds.

Suppose next that there is a positive price run-up, i.e., $P^1 > P^0$, or $(1 - \phi_R^{\alpha})v_R > (1 - \phi_I^{\alpha})v_I$. Again if $\phi_R^{\alpha} \geq \phi_I^{\alpha}$, then Assumption 3 holds trivially. If $\phi_I^{\alpha} > \phi_R^{\alpha}$, then

$$\frac{\alpha(1 + \phi_R^{\alpha})v_R}{\alpha(1 + \phi_I^{\alpha})v_I} = \frac{\alpha(1 + \phi_R^{\alpha})}{\alpha(1 + \phi_I^{\alpha})}\frac{(1 - \phi_I^{\alpha})}{(1 - \phi_R^{\alpha})}\frac{P^1}{P^0},$$

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where the equality follows from (5). Therefore, R values the block more than I if, and only if,

$$\frac{\alpha\left(1+\phi_R^\alpha\right)\left(1-\phi_I^\alpha\right)}{\alpha\left(1+\phi_I^\alpha\right)\left(1-\phi_R^\alpha\right)}\frac{P^1}{P^0} > 1.$$

Rewriting, yields a condition on $\phi_I^\alpha < \bar{\phi}\left(\phi_R, \frac{P^1}{P^0}\right)$ where:

$$\bar{\phi}\left(\phi_R, \frac{P^1}{P^0}\right) = \frac{\frac{1+\phi_R^\alpha}{1-\phi_R^\alpha}\frac{P^1}{P^0} - 1}{\frac{1+\phi_R^\alpha}{1-\phi_R^\alpha}\frac{P^1}{P^0} + 1} < 1.$$

Differentiation yields $\partial\bar{\phi}\left(\phi_R, \frac{P^1}{P^0}\right)/\partial\phi_R > 0$ and $\partial\bar{\phi}\left(\phi_R, \frac{P^1}{P^0}\right)/\partial\frac{P^1}{P^0} > 0$. ∎

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Table I: Description of variables used and their sources

Type	Variable name	Variable description	Source	Associated parameter
Trade-specific	P	Price per share in the block ($)	SDC	
	P^0, P^1	Market-model adjusted share prices, 21 trading days before and 2 trading dats after the trade announcement ($)	CRSP	
	α	Block size (%)	SDC	
	$\frac{P-P^1}{P^1}$	Block premium (%)	Constructed	
Target firm-specific	$TCASH\_ASSETS$	Target's ratio of cash and marketable securities to total assets before the block trade announcement (ITEM 1 / ITEM 6)	COMPUSTAT	γ_{CASH}
	$TINT\_ASSETS$	Target's proportion of intangible to total assets (ITEM 33 / ITEM 6)	COMPUSTAT	γ_{INT}
	$TSTD\_ASSETS$	Target's proportion of short term debt to total assets before the block trade announcement (ITEM 5 / ITEM 6)	COMPUSTAT	γ_{STD}
	$TSIZE$	Target's total assets ($ Million) before the block trade announcement (ITEM 6)	COMPUSTAT	γ_{SIZE}
	$TAVG\_RET$	Target's average daily return for the 12 month ending two month before the trade announcement	CRSP	γ_{RET}
Acquirer-specific	$AACTIVE$	Did the acquirer own already 5% or more, but less than 10%, of the target's stock before the trade announcement? (1 if yes, 0 if no)	SDC, TFN Insider	η_{ACT}
	$ACORP$	Is the acquirer a corporation? (1 if yes, 0 if no)	SDC	η_{CORP}
	$ASAMEIND$	Is the acquirer in the same industry, i.e., 4-digit SIC, as the target? (1 if yes, 0 if no)	COMPUSTAT	η_{IND}
	$CASHRATIO$	Ratio of the traget's cash to the acquirer's total cash before the trade announcement	COMPUSTAT	η_{CRAT}

Table II: Sample summary statistics

This table summarizes the characteristics of the 120 blocks traded in our sample, as well as all the potential determinants of the private benefits of control function. These variables are specific to the target firm and the acquiror. The sample consists of all US privately negotiated block trades in the Thomson One Banker's Acquisitions data (the former SDC) between 1/1/1990 and 31/08/2006, where the block traded is the largest held, and its size is between 10% and 50% of the target's outstanding stock. The target's characteristics are compared to those of the average COMPUSTAT firm, winsorized at the 5th and 95th percentiles, in the same time period, and to the equally weighted daily returns of all stocks in CRSP.

	Variable	Mean	Standard deviation	Min	First quartile	Median	Third quartile	Max	COMPUSTAT/ CRSP firms[a] N	Mean
Block trade	Block premium	19.62%	86.24%	−86.23%	−19.44%	−0.16%	27.44%	614.71%		
	Block size	29.99%	9.35%	12.00%	22.83%	28.34%	34.93%	49.90%		
	Price run-up	14.07%	34.20%	−52.92%	−3.69%	9.33%	21.31%	246.37%		
Target firm	Cash to assets	0.143	0.186	0.000	0.020	0.056	0.182	1.000	155,891	0.166
	Intangibles to assets	0.240	0.275	0.000	0.020	0.104	0.384	0.981	139,847	0.081***
	Short-term debt to assets	0.332	0.595	0.003	0.109	0.194	0.403	6.041	155,533	0.070***
	Total assets ($ Millions)	372.139	1,341.024	0.660	21.085	90.015	315.865	14,066.900	156,691	1,269.684***
	Average daily returns	0.20%	0.56%	−1.42%	−0.06%	0.13%	0.31%	3.40%	4,204	0.08%*
Acquirer	Active shareholder? (1 if yes)	0.133	0.341	0	0	0	0	1		
	Corporate acquirer? (1 if yes)	0.342	0.476	0	0	0	1	1		
	Same industry? (1 if yes)	0.258	0.440	0	0	0	1	1		
	Target's to acquirer's cash	2.399	15.107	0.000	0.000	0.000	0.001	148.100		

[a] Estimates followed by ***, ** and * indicate that the *p*-value for the differences of means test is smaller than 0.01, 0.05 and 0.1, respectively.

Table III: Correlation matrix of the determinants of the private benefits of control function

This table shows the correlation matrix for all the potential determinants of the private benefits of control function. The sample consists of all US privately negotiated block trades in the Thomson One Banker's Acquisitions data (the former SDC) between 1/1/1990 and 31/08/2006, where the traded block is the largest block held, and its size is between 10% and 50% of the target's outstanding stock. The number of observations is 120.

	Cash to assets	Intangible to total assets	Short-term debt to assets	Total assets	Average daily returns	Active acquirer?	Corporate acquirer?	Same industry acquirer?	Target's cash to acquirer's
Cash to assets	1.000								
Intangible to total assets	−0.236	1.000							
Short-term debt to assets	0.014	−0.149	1.000						
Total assets	−0.129	0.001	−0.064	1.000					
Average daily returns	0.102	0.003	0.159	−0.087	1.000				
Active acquirer?	−0.101	0.053	−0.078	−0.008	−0.113	1.000			
Coporate acquirer?	0.019	0.143	−0.062	−0.026	0.011	−0.128	1.000		
Same industry?	0.110	−0.017	−0.020	−0.087	0.117	−0.064	0.257	1.000	
Target's to acquirer's cash	−0.029	0.225	0.005	−0.017	0.210	0.034	0.270	0.094	1.000

Table IV: Estimates of the parameters of the private benefits function in the case of ineffective competition

This table shows the estimates of the private benefits of control function in the general BGP model, where we allow for the block seller to be an ineffective competitor in the alternative of a tender offer. The elasticities implied by the parameter estimates are all evaluated at the sample means of the specified variables. The elasticity for binary variables is the percentage change in private benefits when the indicator changes from 0 to 1. The data is for all negotiated block trades in the Thomson One Banker's Acquisitions data, US between 1/1/1990 and 31/08/2006, where all traded blocks are larger than 10% but smaller than 50% of the outstanding stock, and they are the largest block held. The number of observations is 120.

Panel A: Estimates of the Model's Parameters

	(1) Coefficient (Std error)[a]	(1) Elasticity (Std error)	(2) Coefficient (Std error)	(2) Elasticity (Std error)	(3) Coefficient (Std error)	(3) Elasticity (Std error)
ψ	0.822 (0.199)***		0.751 (0.251)***		0.618 (0.204)***	
η_{CASH}	6.455 (0.304)***	0.111 (0.019)***	6.934 (0.144)***	0.136 (0.008)***	9.534 (2.730)***	0.434 (0.200)**
η_{INT}			8.777 (0.184)***	0.289 (0.017)***		
η_{STD}	−5.377 (0.250)***	−0.215 (0.036)***	−3.034 (0.262)***	−0.138 (0.009)***	−3.951 (1.086)***	−0.418 (0.192)**
η_{SIZE}	−0.001 (0.000)***	−0.058 (0.010)***	−0.017 (0.000)***	−0.886 (0.052)***	−0.010 (0.002)***	−1.153 (0.520)**
η_{RET}	743.268 (28.117)***	0.182 (0.031)***	665.836 (33.464)***	0.185 (0.011)***	3,283.100 (586.610)***	2.122 (0.963)**
η_{R}	−0.458 (0.061)***		−2.483 (0.103)***		−0.783 (0.173)***	
η_{ACT}					0.586 (0.256)**	0.025 (0.030)
η_{CORP}	−1.537 (0.071)***	−0.372 (0.100)***	2.44 (0.228)***	3.189 (1.850)***	2.231 (0.346)***	0.061 (0.066)
η_{IND}					−0.441 (0.264)*	−0.016 (0.019)
η_{CRAT}	0.339 (0.019)***	0.098 (0.016)***	2.168 (0.388)***	0.713 (0.030)***	0.576 (0.100)***	0.439 (0.199)**
η_{I}	−1.663 (0.302)***		−4.533 (0.384)***		−2.28 (0.649)***	
Constant	0.251 (0.001)***		0.215 (0.009)***		0.192 (0.003)***	
Wald statistic $(\chi^2)^{b}$	1,587.015***		10,304.474***		3,993.356***	
$R^{2,c}$	0.078		0.135		0.153	

Table IV: continued

Panel B: Summary statistics generated by the model

	(1)		(2)		(3)	
	Sample mean	Standard error	Sample mean	Standard error	Sample mean	Standard error
Block premium						
predicted	0.209	(0.022)	0.157	(0.029)	0.152	(0.031)
actual	0.196	(0.079)	0.196	(0.079)	0.196	(0.079)
Fraction of blocks traded at a discount						
predicted	0.158	(0.033)	0.158	(0.033)	0.192	(0.036)
actual	0.500	(0.046)	0.500	(0.046)	0.500	(0.046)
Block discount						
predicted	0.193	(0.047)	0.381	(0.103)	0.386	(0.075)
actual	0.240	(0.028)	0.240	(0.028)	0.240	(0.028)
Fraction of discounts with a positive price run-up						
predicted	1.000	(0.000)	1.000	(0.000)	1.000	(0.000)
actual	0.783	(0.038)	0.783	(0.038)	0.783	(0.038)
Fraction of discounts with respect to the pre-announcement price						
predicted	0.125	(0.030)	0.150	(0.033)	0.192	(0.036)
actual	0.342	(0.043)	0.342	(0.043)	0.342	(0.043)
Price run-up						
predicted	0.180	(0.028)	0.178	(0.028)	0.182	(0.028)
actual	0.141	(0.031)	0.141	(0.031)	0.141	(0.031)
Price run-up $R^{2,c}$	0.929		0.932		0.927	

[a] Estimates followed by ***, **, and * are statistically different from zero with 0.01, 0.05 and 0.1 significance levels, respectively.
[b] The χ^2 statistic is computed under the null hypothesis that all the model's parameters are zero.
[c] The R^2 is computed as 1 minus the sum of squares of the errors of the predicted block premium (or price run-up) divided by the total sum of squares of the actual block premium (price run-up).

Table V: Estimates of the private benefits of control

This table summarizes the sample distribution of the private benefits in the general BGP model, predicted using the estimates of the private benefits function reported in Table IV. The model was estimated allowing the seller to be either an effective competitor or an ineffective competitor in the alternative of a tender offer. The number of observations is 120.

	(1)		(2)		(3)	
	Sample mean	Std error	Sample mean	Std error	Sample mean	Std error
Increase in security benefits $(\frac{v_R - v_I}{v_I})$	0.198	(0.028)	0.210	(0.028)	0.200	(0.028)
Buyer's extraction rate (ϕ_R^α)	0.049	(0.006)	0.054	(0.007)	0.081	(0.008)
Seller's extraction rate (ϕ_I^α)	0.035	(0.005)	0.030	(0.006)	0.081	(0.008)
Change in extraction rates $(\phi_R^\alpha - \phi_I^\alpha)$	0.014	(0.003)	0.024	(0.004)	0.003	(0.005)
Buyer's private benefits, as a fraction of						
security benefits $(d(\phi_R^\alpha))$	0.025	(0.003)	0.027	(0.003)	0.041	(0.003)
outstanding equity $(\frac{d(\phi_R^\alpha)}{1-\phi_R^\alpha})$	0.029	(0.003)	0.032	(0.004)	0.040	(0.005)
Savings per share of avoiding a tender offer	0.041	(0.006)	0.037	(0.006)	0.056	(0.008)
Seller's private benefits, as a fraction of						
security benefits $(d(\phi_I^\alpha))$	0.018	(0.002)	0.015	(0.003)	0.035	(0.003)
outstanding equity $(\frac{d(\phi_I^\alpha)}{1-\phi_I^\alpha})$	0.023	(0.003)	0.017	(0.003)	0.042	(0.004)
Change in private benefits, fraction of						
security benefits $(d(\phi_R^\alpha) - d(\phi_I^\alpha))$	0.007	(0.001)	0.013	(0.002)	0.008	(0.001)
outstanding equity $(\frac{d(\phi_R^\alpha)}{1-\phi_R^\alpha} - \frac{d(\phi_I^\alpha)}{1-\phi_I^\alpha})$	0.006	(0.001)	0.015	(0.002)	0.008	(0.002)

Table VI: Estimates of effects of the Mandatory Bid Rule

This table presents an evaluation of the costs and benefits associated with the implementation of the MBR. The estimates below make use of the model estimates in Table IV. The number of observations is 120.

	(1)		(2)		(3)	
	Sample mean	Std error	Sample mean	Std error	Sample mean	Std error
Welfare gains from trade with Market Rule	0.189	(0.028)	0.195	(0.028)	0.191	(0.028)
Dispersed shareholder's gains under the Market Rule ($\frac{\hat{P}^1-\hat{P}^0}{\hat{P}^0}$)	0.180	(0.028)	0.178	(0.028)	0.182	(0.028)

Panel A: Incremental gains of moving to the MBR, holding fixed the number of deals

	(1)		(2)		(3)	
Total additional welfare gains	−0.030	(0.009)	−0.035	(0.014)	−0.030	(0.009)
Dispersed shareholders' additional gains	−0.028	(0.013)	−0.035	(0.018)	−0.028	(0.013)
Buyer's extraction rates post-tender offer (ϕ_R^{TO})	0.067	(0.010)	0.075	(0.014)	0.067	(0.010)
Change in extraction rate post-tender offer ($\phi_R^{TO} - \phi_R^{\alpha}$)	0.018	(0.010)	0.021	(0.012)	0.018	(0.010)

Panel B: Incremental gains of moving to the MBR, varying the number of deals

	(1)		(2)		(3)	
Total additional welfare gains	−0.099	(0.017)	−0.101	(0.017)	−0.100	(0.017)
Dispersed shareholders' additional gains	−0.085	(0.017)	−0.089	(0.017)	−0.085	(0.017)

Table VII: Breakdown of deals according to their feasibility under the Mandatory Bid Rule

This table reports the deals that would be implemented under the MBR and whether they are welfare increasing or welfare decreasing under the Market Rule. The number after the /-sign indicates the number of deals that are welfare decreasing under the MBR. Table uses the model estimates in Table IV.

Number of cases		Mandatory Bid Rule						
		Deals pursued under MBR			Deals not pursued under MBR			Total
		Specification			Specification			
		(1)	(2)	(3)	(1)	(2)	(3)	
Welfare increasing	(1)	20/0			70/8			90
	(2)		22/2			64/6		86
	(3)			35/2			54/7	89
Welfare decreasing	(1)	30/0			0			30
	(2)		34/22			0		34
	(3)			31/12			0	31
Total		50	56	66	70	64	54	120 120 120

Market Rule

Table VIII: Estimates of the parameters of the private benefits function in the case of effective competition

This table shows the estimates of the private benefits of control function in the BGP model, under the assumption that buyer and seller are effective competitors in the alternative of a tender offer. The elasticities implied by the parameter estimates are all evaluated at the sample means of the specified variables. The elasticity for binary variables is the percentage change in private benefits when the indicator changes from 0 to 1. The data is for all negotiated block trades in the Thomson One Banker's Acquisitions data, US between 1/1/1990 and 31/08/2006, where all traded blocks are larger than 10% but smaller than 50% of the outstanding stock, and they are the largest block held. The number of observations is 120.

	(1)				(2)			
	Coefficient (Std error)[a]		Elasticity (Std error)		Coefficient (Std error)		Elasticity (Std error)	
ψ	0.975	$(0.019)^{***}$			0.958	$(0.003)^{***}$		
η_{CASH}	18.198	$(2.317)^{***}$	0.379	$(0.020)^{***}$				
η_{STD}	-14.482	$(1.704)^{***}$	-1.260	$(0.078)^{***}$	-18.197	$(4.552)^{***}$	-0.722	$(0.408)^{*}$
η_{SIZE}	0.009	$(0.001)^{***}$	0.508	$(0.025)^{***}$	0.002	(0.004)	0.072	(0.058)
η_{RET}	717.583	$(71.473)^{***}$	0.212	$(0.013)^{***}$	$1,893.799$	$(406.215)^{***}$	0.459	$(0.260)^{*}$
η_R	-26.016	$(3.247)^{***}$			-19.821	(56.481)		
η_{CORP}	11.065	$(1.300)^{***}$	2.024	$(0.010)^{***}$	13.754	(56.615)	2.957	$(0.231)^{***}$
η_{CRAT}					-4.331	(5.840)	-1.239	(0.867)
η_I	1.104	(1.051)			-6.373	$(2.951)^{**}$		
Constant	-0.003	$(0.001)^{***}$			-0.002	$(0.000)^{***}$		
Wald statistic $(\chi^2)^b$	771.936^{***}				$4,175.459^{***}$			
$R^{2,c}$	0.016				0.001			

[a] Estimates followed by ***, ** and * are statistically different from zero with 0.01, 0.05 and 0.1 significance levels, respectively.
[b] The χ^2 statistic is computed under the null hypothesis that all the model's parameters are zero.
[c] The R^2 is computed as 1 minus the sum of squares of the errors of the predicted block premium divided by the total sum of squares of the actual block premium.

Table IX: Estimates of the extraction rates and private benefits in the BGP model with effective competition

This table summarizes the sample distribution of the variables in the BGP model, predicted using the estimates of the private benefits function reported in Table VIII. The model was estimated under the assumption of effective competition between the buyer and seller in the alternative of a tender offer. The number of observations is 120.

|	(1)		(2)	
	Sample mean	Standard error	Sample mean	Standard error
Increase in security benefits $(\frac{v_R - v_I}{v_I})$	0.0555	(0.1067)	0.1852	(0.0276)
Buyer's extraction rate (ϕ_R^α)	0.0132	(0.0045)	0.0038	(0.0019)
Seller's extraction rate (ϕ_I^α)	0.1112	(0.0096)	0.0110	(0.0038)
Change in extraction rates $(\phi_R^\alpha - \phi_I^\alpha)$	−0.0980	(0.0094)	−0.0072	(0.0037)
Buyer's private benefits, as a fraction of				
security benefits $(d(\phi_R^\alpha))$	0.0058	(0.0019)	0.0021	(0.0010)
outstanding equity $(\frac{d(\phi_R^\alpha)}{1-\phi_R^\alpha})$	0.0072	(0.0024)	0.0023	(0.0012)
Seller's private benefits, as a fraction of				
security benefits $(d(\phi_I^\alpha))$	0.0541	(0.0034)	0.0055	(0.0018)
outstanding equity $(\frac{d(\phi_I^\alpha)}{1-\phi_I^\alpha})$	0.0681	(0.0058)	0.0066	(0.0022)
Change in private benefits, fraction of				
security benefits $(d(\phi_R^\alpha) - d(\phi_I^\alpha))$	−0.0483	(0.0034)	−0.0035	(0.0018)
outstanding equity $(\frac{d(\phi_R^\alpha)}{1-\phi_R^\alpha} - \frac{d(\phi_I^\alpha)}{1-\phi_I^\alpha})$	−0.0609	(0.0058)	−0.0043	(0.0022)
Buyer's extraction rates following a tender offer (ϕ_R^β)	0.0806	(0.0118)	0.1239	(0.0128)
Change due to the tender offer $(\phi_R^\beta - \phi_R^\alpha)$	0.0674	(0.0126)	0.1201	(0.0129)
Number of violations of $\phi_R^\beta - \phi_R^\alpha < 0$	59		81	
Proportion of violations	0.492		0.675	
Predicted block premium	0.0195	(0.0099)	−0.0023	(0.0027)
Actual block premium				
for data satisfying $\phi_R^\beta < \phi_R^\alpha$	0.3305	(0.1068)	0.3328	(0.1439)
for data violating $\phi_R^\beta < \phi_R^\alpha$	0.0574	(0.1140)	0.1305	(0.0936)
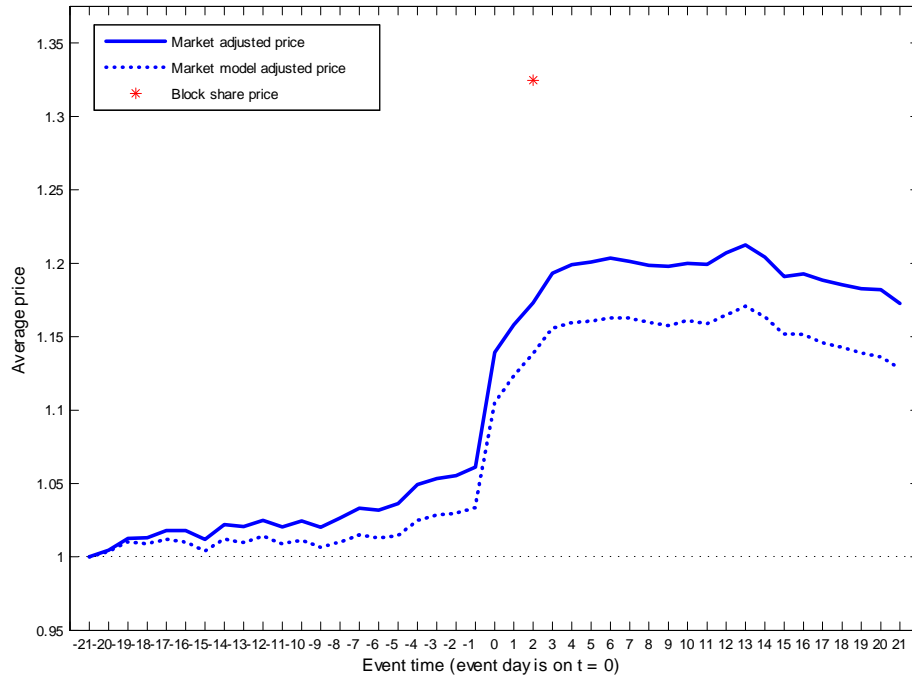
FIGURE 1: Average share price 21 trading days before and after the block trade.
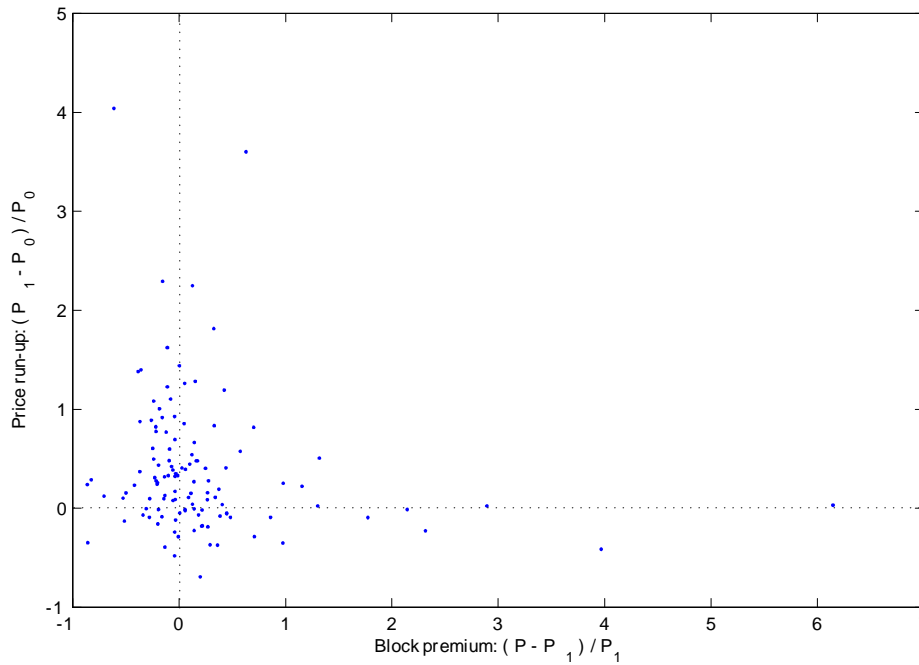

FIGURE 2: Scatter plot of the price run-up against the percentage block premium.
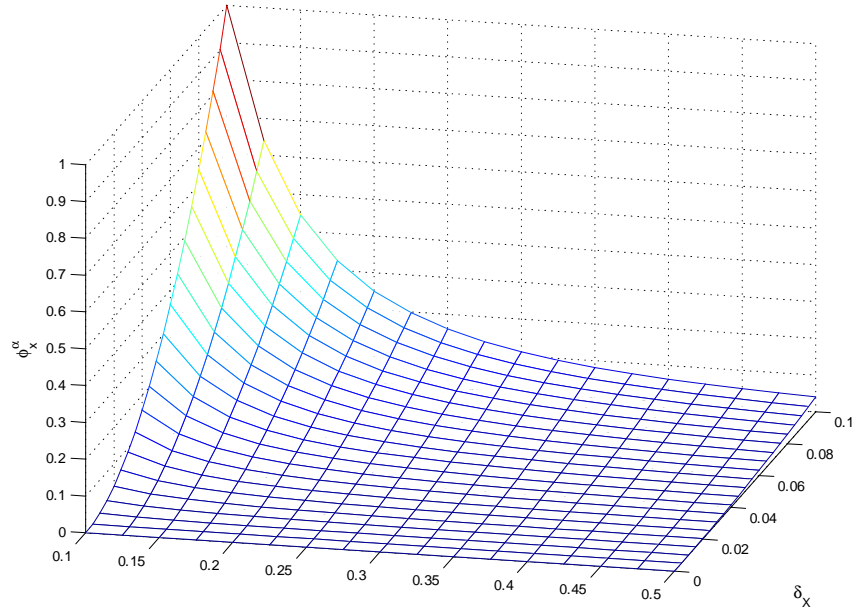
FIGURE 3: Optimal diversion rate, ϕ_X^{α}, as a function of block size, α and the index of deal characteristics, δ_X. The minimum block size in the sample, $\underline{\alpha}$, is set to 0.1.
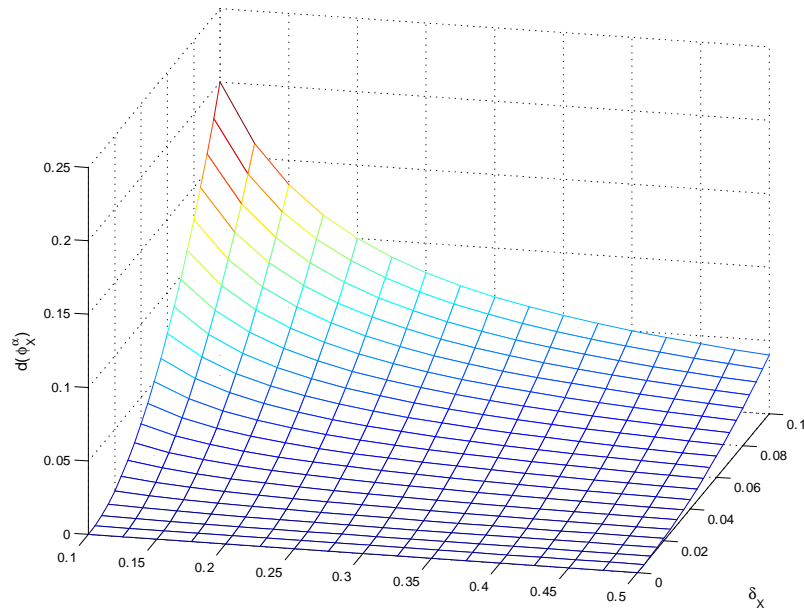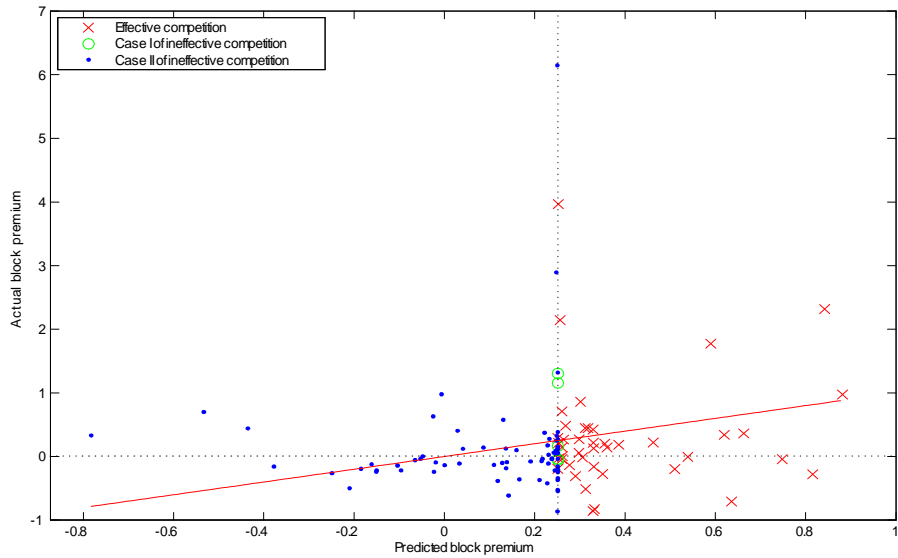

FIGURE 4: Private benefits, $d(\phi_X^{\alpha})$, as a function of block size, α and the index of deal characteristics, δ_X. The minimum block size in the sample, $\underline{\alpha}$, is set to 0.1.

FIGURE 5: Fit of the estimated general BGP model. The block premium is estimated using the coefficients of specification (1) in Table IV.
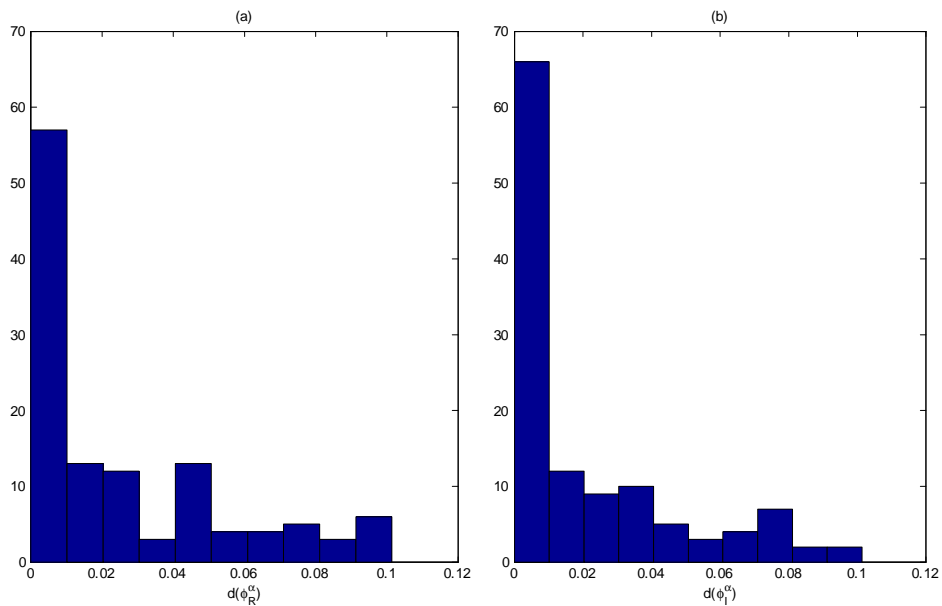
FIGURE 6: Predicted histogram of the private benefits of control of the incumbent, I, (panel (a)) and of the buyer, R, (panel (b)) in the estimated general BGP model. The histograms are constructed using the coefficients of specification (1) in Table IV.
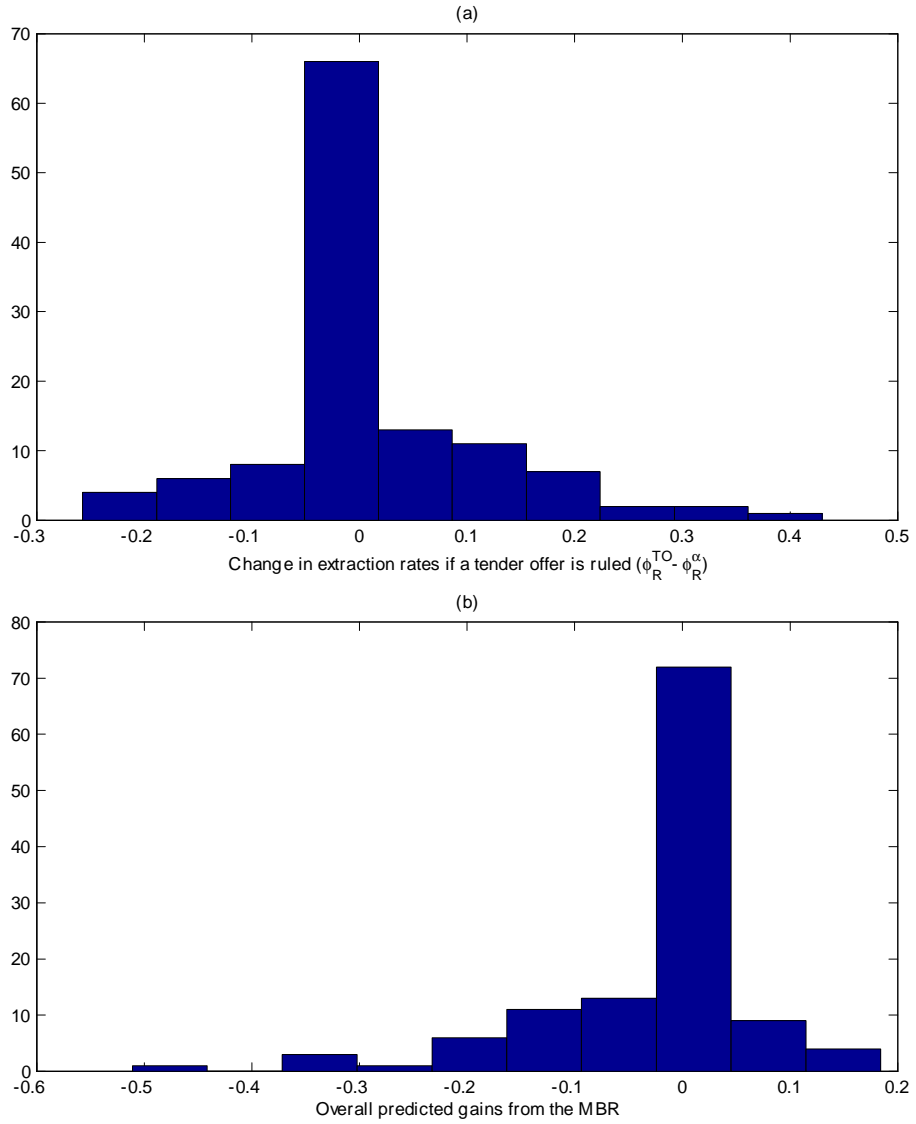
FIGURE 7: Predicted effects of the Mandatory Bid Rule on the distribution of extraction rates (panel (a)) and the distribution of the gains from the MBR (panel (b)) in the general BGP model. The estimates use the coefficients from specification (1) in Table IV.
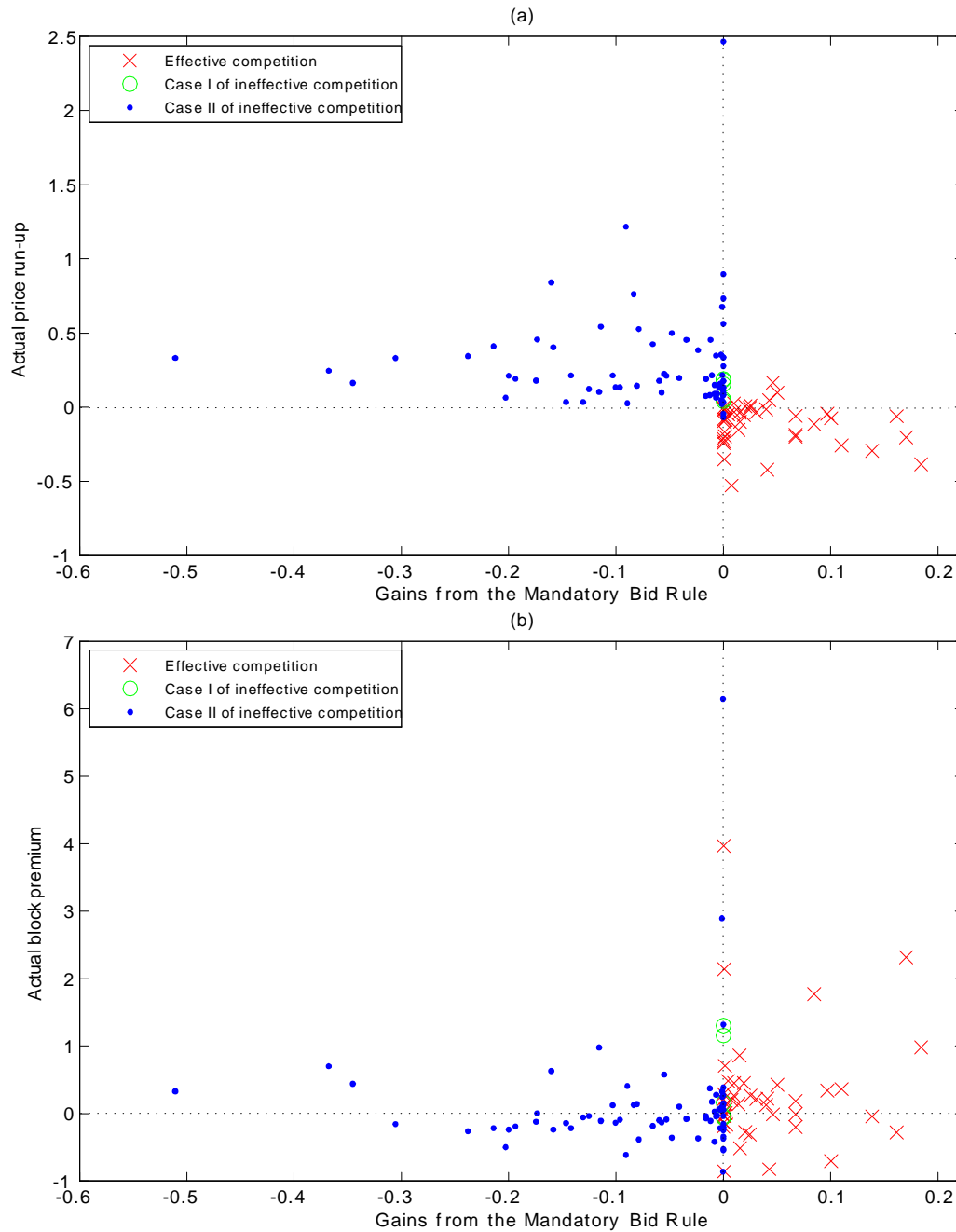
FIGURE 8: Analysis of the distribution of the gains from the Mandatory Bid Rule in the general BGP model. The estimates use the coefficients of specification (1) in Table IV.
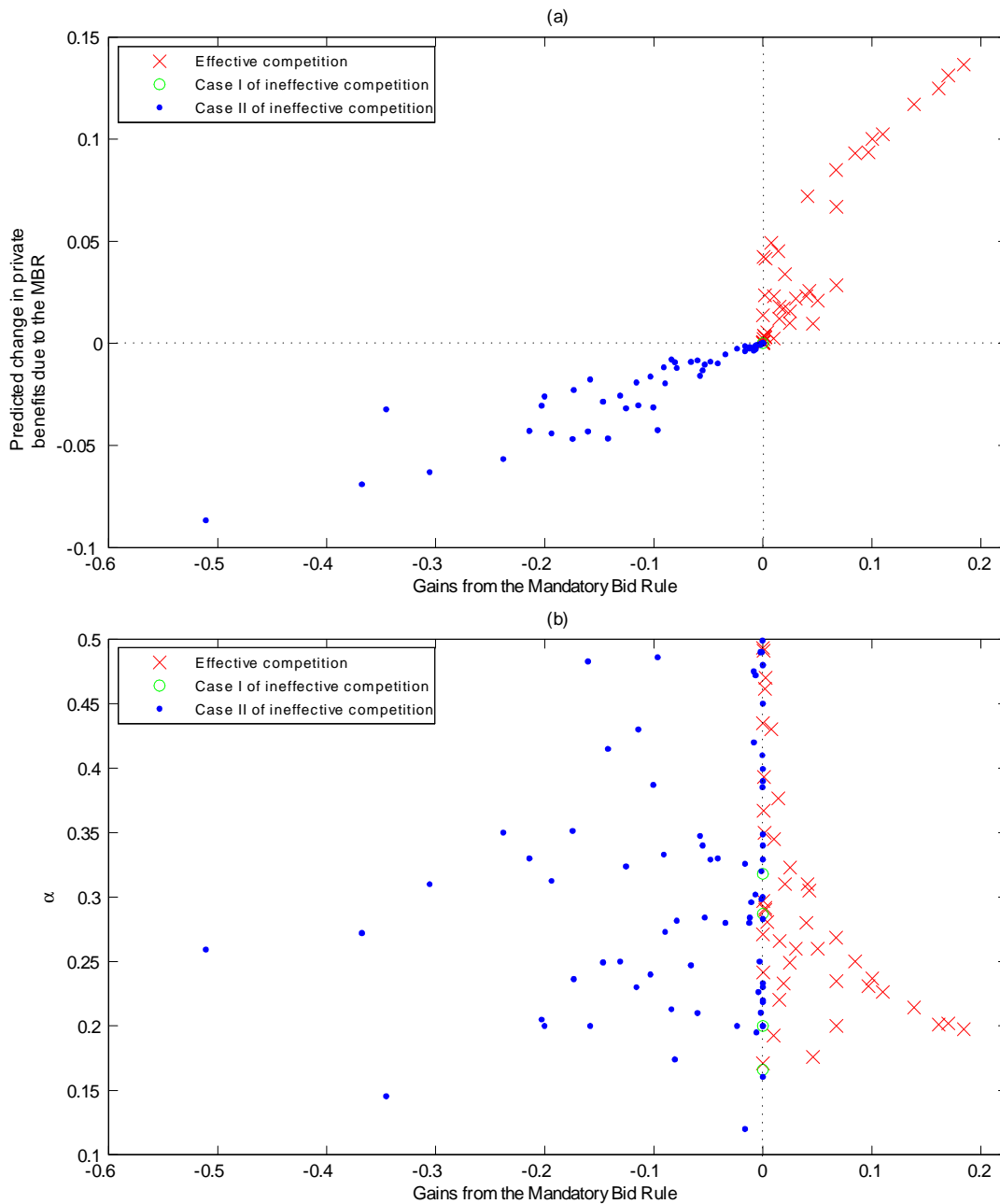
FIGURE 9: Analysis of the distribution of the gains from the Mandatory Bid Rule in the general BGP model. The estimates use the coefficients of specification (1) in Table IV.