Determinants 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) explicitly dealing with the existence of both block premia and block discounts in the data. We find evidence that the occurrence of block premia and block discounts depends on the controlling block holder's ability to fight a potential tender offer for the target's stock. Private benefits represent approximately 2% to 4% of the target firm's stock market value. Private benefits increase with the target's cash holdings and decrease with its short term debt providing evidence in favor of Jensen's free cash flow hypothesis. Each $1 of private benefits costs shareholders approximately $2 of equity value.

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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, recent work explores the 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.

Current approaches to estimating private benefits of control rely on empirical proxies, such as the block premium or the voting premium, and on the use of control variables to remove from these proxies aspects unrelated to private benefits of control.[2] This paper offers an alternative approach to estimating private benefits of control by introducing a structural model of the determination of control premia and using data on control transactions to estimate the corresponding structural parameters.

The backbone of our structural approach is the estimation of the block pricing model in Burkart, Gromb, and Panunzi (2000) (hereafter BGP). In the BGP model, if a private negotiation to trade a minority controlling 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. In particular, BGP show that the occurrence of a block premium or a block discount, relative to the post-announcement stock price, depends on how effective the block owner can be in opposing a tender offer by a potential buyer.

The empirical strategy is akin to estimating an exactly identified system of equations. From the BGP model, we obtain equations for the optimal extraction rates and private benefits, the stock price change around the block trade, and the block premium. We use these model equations and data on the stock price change to eliminate all endogenous variables. We then arrive at a single equation that describes the block premium as a function of structural parameters.

The paper offers three main results. First, we show that the BGP model fits well several features of the data on block trades: block premia (discounts) in the data occur mainly when the block owner is predicted to be effective (ineffective) in opposing a tender offer; and, the model is able to capture variation in blocks that trade at a discount relative to the pre-announcement stock price. As we discuss below, the ability to explain discounts relative

[1] See, for example, Dow, Gorton, and Krishnamurthy (2005) and Albuquerque and Wang (2008).
[2] For a review of the literature see Benos and Weisbach (2004).

to the pre-announcement stock price is a unique feature of the BGP model. Further, BGP predict that tender offers on targets with minority controlling blocks are an off-equilibrium outcome. Consistent with this prediction, we provide evidence that there are no tender offers for target firms where a controlling, minority block exists.

Second, we show that private benefits lie between 2% and 4% of the target firm's equity value. In contrast with other studies (e.g. Dyck and Zingales (2004)), these estimates of private benefits are statistically significantly different than zero. Despite these significant average private benefits, 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 provide the first estimate of the size of the deadweight loss associated with private benefits. On average, each $1 of private benefits costs shareholders approximately $2 of equity value.

We show that private benefits of control as a fraction of equity increase with the firm's cash holdings to total assets and decrease with short-term debt to total assets. Moreover, the elasticities of private benefits to cash holdings and to short term debt are almost equal to each other (in absolute value). This evidence strongly supports Jensen's (1986) free cash flow hypothesis (see also Stulz (1990) and Hart and Moore (1995)) and contrasts with the previous literature which has failed to identify an unambiguous effect of leverage on private benefits. Private benefits also are smaller when: the potential buyer is already an active shareholder in the target firm, suggesting that incentives play a role in limiting income diversion; with bad past stock performance, suggesting increased monitoring of weak performers; and, with the target firm's ratio of intangible assets to total assets, providing supporting evidence for Himmelberg et al. (1999).

Third, we find evidence that acquirers' overpay an average of 7% of the target firm's value relative to the BGP benchmark price. In contrast, the previous literature has suggested that buyers do not overpay. What may partially explain this 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 the sample composed of buyers who are not publicly traded corporations displays a larger block premium than the whole sample.

We use data on trades of blocks of stock to estimate private benefits of control. The evidence suggests that block trades 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). The evidence also suggests that block trades 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) argue, acquirers may thus be 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 clean measure of private benefits, because the block premium combines information from private benefits with information from the change in share value.[3] Dyck and Zingales (2004) disentangle the effect of private benefits from that of changes in share value with an elegant, model-based adjustment to the block premium. 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.

Another difficulty with using the block premium to measure private benefits is that blocks often trade at a discount with respect to the post-announcement stock price. In the US, both the size of the discount and the proportion of discounts in the data are large. The literature, however, has treated block discounts as if they were low realizations of the block premium. We show that this approach leads to a downward-biased, and often negative, estimate of private benefits of control.

A third aspect about the use of block trading data to measure private benefits, which has also not been addressed in the literature, is how to extrapolate the results to the universe of firms with controlling, minority blocks (i.e., to firms whose block never trades). We show in the paper that under a weak condition, data on block trades deliver lower and upper bound estimates of private benefits of control for firms with controlling blocks whether or not they are traded.

The structural estimation we pursue has advantages and limitations over the previous literature. Perhaps the main advantage is that it imposes explicit theoretical constraints on the data to identify private benefits of control. The constraints allow us to disentangle the private benefits from the changes in share value as they affect the block premium, while taking into account that share values are not independent of private benefits. We therefore obtain 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, counterfactually, predict no discounts. A second advantage is that we can estimate the deadweight loss associated with private benefits. To our knowledge there exists no such estimate in spite of their wide spread use in theoretical models (e.g. Pagano and Roell (1998) and Stulz (2005)). Thirdly, the predicted average block premium can be compared to the observed average block premium to yield a measure of overpayment.

The main disadvantage of a structural estimation is the reliance on a specific theoretical model. This reliance carries several potential disadvantages. First, it implies that we have to be careful in selecting the deals that fit the assumptions in the model. Second, some

[3] The same problem arises when using the voting premium to measure private benefits of control (e.g. Zingales (1995)).

assumptions, such as the choice of functional form for the private benefits function, represent a concern in any structural or non-structural estimation. Fortunately, in many instances the choices we make are amenable to hypothesis testing. Third, the non-linearities in the model impose strong restrictions on the data, making the estimation significantly more computationally intensive than in linear models. On the positive side, 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. Fourth, to guarantee that a global minimum is attained in our non-linear estimation, we exhaustively search the parameter space, adding to computation time. Finally, some assumptions, such as risk neutrality of controlling shareholders or the existence of takeover alternatives, are made for implementability reasons and cannot be dealt with in any simple way. Dealing with these and other assumptions may be deemed more or less necessary in future work depending on the success of our estimation in capturing cross sectional variation in block premia and in other dimensions of block trading data.

In the paper, we discuss a variety of models of block pricing and demonstrate our preference for the BGP model because of its potential to address, in a unified way, a richer set of features on block trades. Among those features, we highlight three here. First, the BGP model combines a model of block premia with a model of block discounts. Second, the BGP model can potentially explain the large number of blocks in the US that trade at a price below the pre-announcement stock price. Third, the BGP model can explain the observed large changes in share value around block trades. In addition, despite being very general, the BGP model remains tractable for structural estimation.

The paper proceeds by briefly reviewing the BGP model in Section 2. Section 3 describes our empirical approach. Section 4 gives a description of the data and Section 5 reports the results of our estimations. Section 6 discusses other theories of block pricing and Section 7 concludes the paper. The Appendix contains details on the data, the estimation method, and proofs that are omitted in the main text.

2 Theory

This section starts with a brief overview to the Burkart, Gromb, and Panunzi (2000) model, while focusing on its ability to explain known facts about block trades. Appendix A provides a more rigorous and complete discussion. Following this overview is a discussion of the main assumptions in BGP and how they constrain or inform our exercise. We leave to Section 6 an analysis of alternative theories of block pricing that we argue are dominated by the BGP model for the purpose of capturing variation in block prices.

The model studies the interaction between a leading minority investor with fractional ownership of $\alpha < \frac{1}{2}$, called the incumbent I, or seller, and a potential acquirer called the rival R, or buyer, who owns no shares. Each remaining shareholder is atomistic. Whoever owns a block of size α or larger gains control. The total *security benefits* are worth v_X under the control of $X \in \{I, R\}$, who diverts a fraction $\phi \in [0,1]$ to derive *private benefits* of $d_X(\phi) v_X$ and to yield a share value or price of $(1-\phi) v_X$. There are no transactions costs, all information is complete, agents are risk neutral and have a zero discount rate.

There is an initial stage of negotiations in which I and R can trade privately in a Nash bargaining game with respective bargaining powers $\psi \in [0,1]$ and $1-\psi$. At this stage, they agree to exchange a fraction of α at a price P. They may also enter into a standstill agreement where I pledges not to acquire more 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.[4] In the takeover contest, R makes a tender offer that I may counterbid. Tendering is assumed to be sequential: the dispersed shareholders tendering decision follows I and R's. Each remaining shareholder believes the tender offer outcome is independent of her tendering decision. Again, the party that gains control realizes security benefits and extracts private benefits.

BGP make the following assumptions regarding d_X, v_I and v_R:

Assumption 1 *R values the block more than I, i.e.,* $\alpha(1-\phi_R^\alpha) v_R + d_R(\phi_R^\alpha) v_R > \alpha(1-\phi_I^\alpha) v_I + d_I(\phi_I^\alpha) v_I$.

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

Assumption 3 *The function $d_X(\phi)$ is strictly increasing and strictly concave on* $[0,1]$, *with* $d_X(0) = 0$, $d'_X(0) = 1$ *and* $d'_X(1) = 0$.

Assumption 1 is a standard gains from trade condition. Under Assumption 2, the target firm generates more security benefits under R. It implies that R will achieve control independent of the means. Identifying the sources of these security benefits is not our purpose. They could include, for example, greater production efficiency, greater efficiency at monitoring management or greater ability to procure contracts. We return to this point in subsection 3.1 to show that our estimate of the private benefits function, $d_X(\phi)$, is unaffected by the source of the security benefits.

Assumption 3 guarantees a unique interior solution to the optimal extraction of private benefits problem. The controlling shareholder, X, with a block size α, maximizes the value of his block and private benefits by choosing ϕ that solves the first order condition:

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

The optimal extraction rate can thus be written as $\phi_X^\alpha = d'^{-1}_X(\alpha)$. Because d_X is concave, the optimal extraction rate displays Jensen's incentive effect: larger block sizes lead to lower

[4] Subsection 6.1 considers the model solution in its absence.

extraction rates, that is, ϕ_X^α is decreasing in α. Let the optimal private benefits be $d_X^\alpha \equiv d_X(\phi_X^\alpha)$.

2.1 Model Solution Under Effective Competition

The outcome of this model depends crucially on how tough I will be fighting R's takeover bid. We say that I presents *effective competition* to R if I's valuation of control is high enough, i.e., if $(1-\phi_R^\alpha)\,v_R < v_I$. In this case, BGP show that R must bid up to $b^* = v_I$ to win control. Intuitively, R must bid enough so that I has no incentive to counterbid. A bid as high as v_I attracts all of I's shares and some more from dispersed shareholders. R's block size is therefore $\beta^* > \alpha$ and the post-tender offer price is $\left(1-\phi_R^{\beta^*}\right) v_R = v_I > (1-\phi_R^\alpha)\,v_R$.[5]

The increase in block size that results from the tender offer increases welfare. However, BGP show that in the first stage I and R don't internalize the positive incentive effect of increased ownership for two reasons: (i) the increased ownership leads to 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 and share the surplus from avoiding a tender offer. Therefore, the first stage per share block price is:

$$P = b^* + \psi\left[(1-\phi_R^\alpha)\,v_R + \frac{d_R^\alpha}{\alpha}v_R - \left(b^* + \frac{d_R^{\beta^*}}{\alpha}v_R\right)\right]. \tag{2}$$

The bid b^* is I's threat value: I can always get b^* at a tender offer, hence I must get at least b^* in the private negotiation. The term in square brackets describes I's share, ψ, of the surplus accrued to the I and R coalition from avoiding the tender offer. When I has all the bargaining power ($\psi = 1$), the block price includes the ex-post security benefits plus the full gain in private benefits from avoiding a tender offer. When $\psi = 0$, all I can claim is the tender offer bid, b^*. The block premium is the block price minus the post-announcement share price, $\Pi = P - (1-\phi_R^\alpha)\,v_R$.

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

The block premium is positive for two reasons. First, the tender offer price, b^*, is larger than the post-trade announcement price of $(1-\phi_R^\alpha)\,v_R$. Second, I and R share a surplus from avoiding a tender offer. 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.

[5] The tender offer bid is unconditional. Making the bid conditional on buying only α shares while paying the same b^* however is not optimal because R's valuation increases with the block size.

2.2 Model Solution Under Ineffective Competition

Consider now the alternative case where I is an *ineffective competitor,* i.e., if $v_I < (1-\phi_R^\alpha)\,v_R$. The main result in this case is that discounts are possible because I's valuation is low enough.

BGP show that there are two sub-cases to consider. In the first, the block's share value and the private benefits to I are greater than the share value under R: $v_I < (1-\phi_R^\alpha)\,v_R \leq (1-\phi_I^\alpha)\,v_I + \frac{d_I^\alpha}{\alpha}v_I$. Hence, R will exactly pay the post-announcement security value to I, and the per share block premium is $\Pi = P - (1-\phi_R^\alpha)\,v_R = 0$.

If I's valuation is even lower, i.e., if $(1-\phi_R^\alpha)\,v_R > (1-\phi_I^\alpha)\,v_I + \frac{d_I^\alpha}{\alpha}v_I$, then R gains control in a tender offer by bidding 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 price, i.e., $b^* < \left(1-\phi_R^\gamma\right)v_R$, while no dispersed (atomistic) shareholder tenders any shares. However, I is pivotal and realizes that by tendering another share, the value of the untendered shares increases. At the margin, this benefit of tendering shares –which is not perceived by atomistic shareholders– compensates I for the difference $\left(1-\phi_R^\gamma\right)v_R - b^*$. Intuitively, because I's valuation is so low, R can place a bid below the post-announcement security value and yet secure most of I's shares. The smaller block size at the tender offer is welfare decreasing leading to a surplus from avoiding the tender offer that can be shared between I and R.

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

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

The first term in the block price represents the value of I's shares if a tender offer occurs: γ shares are sold for b^* and the rest are valued at the post-tender-offer price $\left(1-\phi_R^\gamma\right)v_R$. Both components are smaller than the post-announcement price, $(1-\phi_R^\alpha)\,v_R$ (with a smaller block $\gamma < \alpha$ the incentive effect is reduced leading to greater extraction of private benefits). The last term is I's share of the coalition surplus from avoiding a tender offer.

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

Proposition 2 shows that the BGP model is able to produce block discounts, i.e., block prices below post-announcement prices, even in the absence of any liquidity reason. Moreover, a unique feature of the BGP model is that it can generate discounts relative to the pre-announcement price, P,[0] (Case II), a common observation in block trades.[6] Intuitively,

[6] Appendix A provides a formal proof.

$P - P^0 < 0$ whenever the value of the block for I in a tender offer is small enough. Note that when I is offered a price $P < P^0$ in exchange of his block he no longer can (alternatively) sell a fraction of the block at P^0 in the stock market. In fact, failure to accept P would result in the immediate announcement by R of a tender offer at price $b^* < P$ at which only I would sell, thus realizing an outcome worse than P.

2.3 Discussion of the Main Assumptions in BGP

The BGP model is a model of block trades that features many relevant aspects of control events, but undoubtedly simultaneously imposes many restrictions on the environment surrounding them. Here we discuss some of the main restrictions and how we deal with them.

Assumption 3 imbeds an important property of the BGP model: at the optimum, private benefits decrease with ownership concentration, i.e., Jensen's incentive alignment effect holds. This is a desirable property in light of the evidence in Claessens et al. (2002) who are able to isolate the incentive effect from the entrenchment effect of ownership. Jensen's alignment effect results directly from the concavity of the private benefits function. Another implication of Assumption 3 is that the solution for the optimal extraction rate is interior.[7]

The BGP model assumes that whoever owns the minority block of size α has control of the firm. It also assumes that agents do not trade for liquidity reasons and that information is complete.[8] We deal with these constraints by selecting a dataset that is consistent with them. As discussed below, we follow Dyck and Zingales (2004) in applying several filters on data on private negotiations to guarantee that blocks being traded are controlling blocks. We also exclude from the sample deals where white knights or other liquidity providers are present. Finally, inspection of the average stock market price of target firms around the announcement of the block trade suggests that the price adjustment is concluded within two days of the announcement. While this fact does not preclude other information arrangements, it is consistent with a world of complete information.

Perhaps the main assumption in BGP is the alternative of a tender offer to the private negotiation. In equilibrium, the threat of the tender offer becomes an important determinant of the block price. There are two critical results associated with this assumption. One result is that it can account for both block premia and discounts as well as discounts relative to the pre-announcement price in an unified setting. The possibility of discounts under ineffective competition led BGP to suggest that tender offers may not be the most efficient means of transferring control. In particular, I would like to commit to sell some shares at their final price, thus reducing the marginal benefit from tendering and the discount implicit in

[7] Strict concavity of d_X, together with $d'_X(0) = 1$, imply that $d'_X(\phi) < 1$ for any $\phi > 0$. A restatement of $d'_X(\phi) < 1$ is that $d(\phi - d_X(\phi))/d\phi > 0$, i.e., that the cost of private benefits extraction increases with the amount extracted. This is a commonly used assumption (e.g. Stulz (2005)). Without this assumption, the optimal extraction is at the corner where $\phi_X^\alpha = 1$ because the block's value becomes strictly increasing in ϕ.

[8] We return to these issues in Section 6.

$\left(1-\phi_R^{\gamma}\right) v_R - b^*$. Whether such commitment is possible is a question that we cannot answer. However, if discounts were due to reasons other than I being an ineffective competitor, then the constraints placed on the data by the model would likely be rejected.

The other result is that tender offers on targets with minority controlling blocks are an off-equilibrium outcome and should not be observed. This result is strongly validated in the data. We searched the Thomson One Banker database for tender offers on target firms where a minority block existed. For our sample period (1/1/1990 to 31/08/2006), we find 1,677 tender offers in the US. After excluding 547 deals where the acquirer already owned at least 20% of the firm's stock, we find only 3 deals where the target had a minority block of at least 10%. Of these deals one is a going private deal and the other two were considered friendly takeovers by Thomson One Banker. Therefore, we could not find any hostile tender offer on targets with minority blocks, consistent with the prediction in BGP that private negotiations are a preferred means of transferring control relative to tender offers.

3 Empirical Strategy

Our empirical strategy to estimate the private benefits function, d_X^{α}, is best compared to estimating an exactly identified system of equations. As we show below, the BGP model gives us equations for the optimal extraction rates, ϕ_X^{α}, private benefits, d_X^{α}, change in security benefits, v_R/v_I, and block premium, Π. We use these equations to eliminate all endogenous variables, arriving at a single equation that describes the block premium as a function of the structural parameters. The upshot of the strategy is that the structural parameters are exactly identified.

3.1 Solving for the Endogenous Variables

The estimation procedure is as follows: suppose we are given a functional form for $d_X(\phi)$.[9] First, we use the first-order condition (1) to construct ϕ_X^{α} and d_X^{α} (unobservable) as a function of α (observable). Next, we recover v_R/v_I as a function of ϕ_X^{α}, d_X^{α} and α. To identify v_R/v_I we use the equation that defines the *price impact*, P^1/P^0, in terms of ϕ_X^{α} and v_R/v_I. This is the natural equation to choose because it ties share values with security values and because share values are observable. Having backed out v_R/v_I conditional on ϕ_X^{α}, d_X^{α} and α from the observed P^1/P^0, the final step is to express the percentage block premium, Π/P^1, only as a function of the model's structural parameters, which are exactly identified. This solution is then fit to the data.

We specify a function d_X that is sufficiently flexible so that by choosing its parameters we are able to match the model's predicted block premium to the observed premium in our sample of block trades. Let each deal be indexed by $i = 1, ..., N$, where N is the total number

[9] We discuss the choice of the functional form for $d_X(\phi)$ in Section 3.4.

of block trades in our sample. Let $\mathbf{w}_i^X$ denote the vector of characteristics of agent $X = I, R$ in deal i and $\mathbf{w}_i$ denote the vector of characteristics of the target firm. Let the parameterized private benefits function be

$$d_{X,i}(\phi) \equiv d\left(\phi; \boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X + \boldsymbol{\eta}'\mathbf{w}_i\right), \tag{4}$$

where $\boldsymbol{\eta}^X$ and $\boldsymbol{\eta}$ are structural parameters that measure the sensitivity 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 compute the optimal extraction rate $\phi_{X,i}^{\alpha}$ from the optimality condition (1):

$$\phi_{X,i}^{\alpha} = d'^{-1}\left(\alpha_i; \boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X + \boldsymbol{\eta}'\mathbf{w}_i\right) \equiv d_{X,i}'^{-1}(\alpha_i).$$

We thus acknowledge the dependence between private benefits and share values. Intuitively, by explicitly modeling the interdependence between private benefits and share values, 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., $\phi_X^{\alpha} v_X$, and hence with the share value, $(1 - \phi_X^{\alpha}) v_X$. This consistency requirement is lacking in all the previous literature that tries to estimate private benefits of control using block trades and cannot be imposed outside a structural model estimation.

To capture the change in security benefits, v_R/v_I, we use the information content of the price change from before the announcement to after the announcement of the block trade. We use the pricing equations,[10]

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

and solve for the relative efficiency of the incumbent firm, v_{Ii}/v_{Ri}. If, in addition, we impose Assumption 2, then we get

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

A few caveats about our approach are in order. First, our estimation strategy over-predicts the size of the price impact.[11] To see this note that when Assumption 2 does not bind, the estimated the price impact must equal the realized price impact. However, when Assumption 2 binds, and $\omega_i = 1$, the model's estimated price impact is

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

[10] 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.

[11] In the actual estimations, we sometimes find that the estimated $v_{I,i}/v_{R,i}$ equals one. In these cases there still is an advantage to trade because, under Assumption 3, R values the block more than I.

Second, the ability to disentangle the change in security benefits from the price impact, P^1/P^0, relies on (i) the assumption that information is complete and (ii) the ability of the chosen d_X to capture differences in efficiency in the extraction of private benefits across agents. The assumption of complete information guarantees that dispersed shareholders correctly price in the optimal amount of extraction. Like any extreme assumption, complete information is undesirable. However, as discussed in Subsection 2.3 above, it appears a reasonable approximation. To capture differences in efficiency in the extraction of private benefits across agents we rely on differences in characteristics as opposed to differences in sensitivities to characteristics (see (4)). While this choice is not imposed by the model, we make it in order to gain degrees of freedom at the expense of more flexibility in estimating the shape of d_X. Ideally, in the future, larger samples will allow researchers to increase the degrees of freedom while estimating a more flexible functional form for d_X. In any event, there is no apriori clear theoretical motivation to have the function d_X differ between I and R more than we already allow it to.

Third, our approach sidesteps the difficult problem of modelling v_{Ii}/v_{Ri} as a function of agent and target characteristics.[12] A concern may arise that if v_{Ii}/v_{Ri} depended on some of the same characteristics already in $\mathbf{w}_i^X$ or $\mathbf{w}_i$, then the estimates of the elasticities $\boldsymbol{\eta}^X$ and $\boldsymbol{\eta}$ would have an omitted variables-type of bias. In Appendix B.1, we show that treating the ratio v_{Ii}/v_{Ri} as given does not bias the estimates of $\boldsymbol{\eta}^X$ and $\boldsymbol{\eta}$. Intuitively, any dependence implicit in v_{Ii}/v_{Ri} has to be consistent with (6), which we already impose. The only disadvantage is that our estimates of $\boldsymbol{\eta}^X$ and $\boldsymbol{\eta}$ capture the comparative statics of private benefits, but not of the block premium, with respect to the characteristics in $\mathbf{w}_i^X$ or $\mathbf{w}_i$.

3.2 Solving for the Block Premium

Following Barclay and Holderness (1989), we solve for the percentage block premium per share. The percentage block premium is the premium per share normalized by the post announcement price, Π_i/P_i^1. For the case of effective competition, we eliminate the two additional endogenous variables, β^* and b^* from the optimal bidding conditions in the tender offer: $b^* = v_{I,i}$ and

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

Let BP_i^{eff} be the percentage block premium under effective competition. Using (2), (5), and the definitions of b^* and Π, we obtain:

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

[12] Modelling v_I/v_R would also lead to a further loss of degrees of freedom.

For Case II of ineffective competition, we also need to solve for the additional endogenous variables b_i^* and γ_i, where γ_i is the size of the controlling block that results from a tender offer. In general, solving for b_i^* and γ_i requires numerical approximation methods to solve for an ordinary differential equation. This is a very time consuming process inside the estimation loop. Instead, we approximate the solution to b_i^* and γ_i by approximating the stealing function $\phi(\beta)$ with an affine function of β. The solution to b_i^* and the proof to the proposition below are in Appendix B.2.

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

The percentage block premium under ineffective competition is

$$\begin{cases} 0 & \text{, for Case I} \\ BP_i^{ineff} & \text{, for Case II} \end{cases},$$

where Cases I and II are defined in Proposition 2, and BP_i^{ineff} is

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

There are several advantages of using the percentage block premium as a dependent variable. First, conditional on the BGP model, the percentage block premium eliminates all level effects. 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 change in security benefits associated with I and R via (6) and of a simple implementation of Assumption 2.

3.3 The Estimation Problem

We make two more assumptions in order to estimate the model. First, 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.*[13] Second, we assume that there is an unobservable source of randomness, ε_i, in the determination of the block premium. Letting y_i be the realized block premium in deal i, we define the error term as

$$\varepsilon_i \equiv y_i - c - \mathbf{1}_i^{eff} BP_i^{eff} - \mathbf{1}_i^{ineff} BP_i^{ineff}. \tag{11}$$

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 and zero otherwise.

[13] The overpayment may include transactions costs associated with tender offers.

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 $\boldsymbol{\Omega} = \mathbf{E}(\boldsymbol{\varepsilon}\boldsymbol{\varepsilon}')$. The FGNLS estimator of $\boldsymbol{\theta}$ solves

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

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 1. Below, we give conditions under which Assumption 1 holds and later show that it does not bind in our estimation. Assumption 3 is discussed in the next subsection, where we model the private benefits function, d_X.

There are two main advantages of using a Feasible Generalized Least Squares estimator. First, FGNLS corrects for additional potential price-level effects that act through the conditional heteroskedasticity of the errors. Second, as shown below, the percentage block premium is right-skewed. With a skewed distribution, the FGNLS estimator is more efficient in small samples than the more standard Least Squares estimator with a covariance matrix correction.

We compute this estimator in two steps. In the first step, we solve (12) 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 (12) using $\hat{\boldsymbol{\Omega}}$. This procedure is explained in detail in Appendix B.3.

3.4 Functional Form for Private Benefits

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 $\underline{\alpha}$ is the minimum block size in the sample. This functional form is both simple, to allow for tractable solutions to the endogenous variables, and flexible, to allow the data to capture cross sectional variation in block premia. In addition, because δ_X is a logistic function, d_X can be interpreted as the expected value of private benefits of control.[14]

[14] We can 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 $y_i^* = \boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X + \boldsymbol{\eta}'\mathbf{w}_i + \xi_i$, where ξ_i has a logistic distribution. Let the event $\{X_i \text{ is caught stealing}\}$ correspond to $y_i^* \leq 0$. Then, 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 $[1 - \Pr(X_i \text{ is caught stealing})] \times 2\underline{\alpha}\sqrt{\phi}$.

Assumption 3 guarantees that a unique, interior optimum rate of private benefits extraction exists, and that private benefits extraction is inefficient at the optimum. As we demonstrate next, these results also obtain under the square root specification (13). The unique optimal rate of extraction that solves (1) is:

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

where our choice of δ_X guarantees that $\phi_X^\alpha \in (0,1)$. The optimal level of private benefits is therefore $d_X^\alpha = 2\frac{\delta_X^2}{\alpha}$ and, because $\underline{\alpha} \leq \alpha_i < \frac{1}{2}$, $d_X(\phi) \in (0, 2\underline{\alpha})$.

Figure 1 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 : the slope of ϕ_X^α is smaller than 1 in absolute value for all $\alpha \geq 27\%$.[15] 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 the blocks in our sample are smaller than 34%. If block size were equally distributed between 10% and 50% this proportion should instead be $60\% = (34\% - 10\%)/(50\% - 10\%)$. This implies that (13) has the potential to capture the existing, though unobservable, variation in extraction rates in the data.

<INSERT FIGURE 1 ABOUT HERE>

The variation in optimal extraction rates observed in Figure 1 can lead to significant variation in private benefits. Figure 2 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 $2\underline{\alpha}$, a significant variation in private benefits is still allowed. In our data, $\underline{\alpha} = 0.12$ so private benefits are capped at 24%.

<INSERT FIGURE 2 ABOUT HERE>

Note that we have implicitly imposed that the elasticity of private benefits to the extraction rate is 1/2. More generally, the elasticity of private benefits to the extraction rate is σ, so $d_X(\phi) = \sigma^{-1}\delta_X\phi^\sigma$ and $\sigma \in (0,1)$ to guarantee strict monotonicity and concavity.

[15] 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 $\alpha = 0.27$.

Moreover, inefficiency of private benefits extraction requires that $\sigma > \alpha$ for any α. Because $\alpha < 1/2$, we must have $\sigma \in [1/2, 1)$. In summary, not all elasticities are allowed and the choice of a square root specification assumes the smallest possible value. Below, we test the validity of the square root specification by constructing a test statistic for $H_0 : \sigma = 1/2$ against $H_A : \sigma > 1/2$. Preempting our results, we never reject the null hypothesis. The likely reason is that, an increase in σ reduces the maximum amount of private benefits (i.e., $\max d_X^\alpha = \sigma^{-1}\underline{\alpha}$) predicted by the model, and thus, decreases the predicted cross sectional variation in private benefits.

The chosen d_X function has several other properties. First, the assumptions needed for the incentive alignment effect also guarantee that the per share block premium (see (17)) is a decreasing and convex function of α, consistent with the findings in Barclay and Holderness (1989).

Second, the choice of functional form has direct implications for the inefficiency with which private benefits are extracted, measured by $\phi_X^\alpha - d_X^\alpha$ (see Pagano and Roell (1998) and Stulz (2005)). The 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 $\alpha < \frac{1}{2}$.[16] The inefficiency with which X extracts private benefits is determined by two factors: (i) the size of δ_X, which depends on deal and firm characteristics; and, (ii) the block size, whereupon smaller blocks are less efficient, all else equal. The *relative inefficiency* of private benefits evaluated at the optimal extraction rate is given by

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

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 (10%), each \$1 of private benefits cost \$5 to all shareholders. Larger blocks are less inefficient; for an average-sized block of 30%, each \$1 of private benefits cost \$2.67 to shareholders.

Third, together with Assumption 2, it implies that we can ignore Assumption 1 in our estimations. This property turns out to be particularly useful because imposing Assumption 1 explicitly is cumbersome. In Appendix B.4 we show that Assumption 1 holds when: (*i*) there price impact is negative; or (*ii*) price impact is positive and $\phi_I^\alpha < \bar{\phi} < 1$. The cut-off $\bar{\phi}$ is an increasing function of ϕ_R^α and of the price impact. Therefore, Assumption 1 may fail to hold only for values of ϕ_I^α sufficiently larger than those of ϕ_R^α, but as the price impact

[16] 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 are so low in these cases that they have no significant adverse effect on the results.

becomes more positive 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.

4 Data

Our data set combines information from three databases: Thomson One Banker, COMPUSTAT and CRSP. This section provides an overview of the sample selection and defines the variable used. The details are given in Table I.

<INSERT TABLE I ABOUT HERE>

4.1 Sample Selection

We use all US block trades in the *Mergers and Acquisitions database* of Thomson One Banker (formerly SDC) between 1/1/1990 and 31/08/2006. As required by the BGP model, within this universe, we focus on trades of minority blocks, i.e., $10\% < \alpha < 50\%$. After applying all the filters in our selection criteria, we obtain a sample of 120 observations.

The main difference between our sample construction and that of previous studies of the block premium is that we exclude majority blocks from the analysis. Except for Mikkelson and Regassa (1991), all previous samples lump together minority and majority blocks. What motivates our departure is the observation that, contrary to firms with majority blocks, control can be obtained outside a private negotiation with the largest minority blockholder. Therefore, minority blocks are priced differently than majority blocks. 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 of 46 trades, also based on SDC. This is because Dyck and Zingales restrict their search universe to the first 20 trades in each year in order to counter SDC's US oversampling bias and achieve a balanced cross-country sample. Barclay, Holderness and Sheehan (2001) use the largest sample of block trades known to date. From *The Wall Street Journal Corporate Index* they construct a sample of 204 block trades between 1978 and 1997. Our sample has fewer deals because our criteria are more restrictive: they consider all blocks larger than 5%. Also, as we explain below, we rule out trades where the block being traded is not the largest block. Finally, our 10% minimum cut-off size guarantees that, in the case of ineffective competition, the alternative of a tender offer does not break the block into a non-controlling stake.

To fit the BGP model, we focus on trades leading to a control change. Thus, we follow Dyck and Zingales (2004) and select only those transactions where the buyer owned less than 20% of the shares before the trade but more than 20% as a result of the trade.[17] In addition,

[17] Zwiebel (1995) presents a theory where the minority shareholder's block must be large enough to ensure that his control is not challenged. He proposes a 20% threshold.

we keep only those trades where the block is the largest block held by an insider and confirm that the trade leads to a control change using news about the deal.[18] After applying these filters we have a sample of 250 deals.

Our selection excludes deals where the block is paid with instruments that may lead to further acquisition of shares by the buyer (e.g., warrants). This filter leads to a further drop of 103 deals. The reason for this exclusion is to guarantee that, as in the BGP model, the buyer's share ownership in the firm remains constant and that incentives do not vary over time in a predictable fashion. Likewise, we exclude 14 deals where the buyer subsequently makes a tender offer to acquire more shares.

Finally, our sample excludes firms that cannot be matched to COMPUSTAT and for which we fail to obtain prices in the CRSP tapes from 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 market beta. The estimated beta is used to adjust the target firm's price impact over the event window for changes in systematic risk according to the market model (e.g. Dyck and Zingales (2004)). This last filter leads to the exclusion of 13 deals.

Appendix C contains a detailed description of the selection procedure including a discussion of deals that were excluded in a first pass at the SDC selection and the potential biases such exclusion may introduce in the sample: white knights, share repurchases, private placement of newly issued shares (PIPES), dual class shares, and deals that occur in proximity to takeover events or going-private deals.

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.

4.2 Block Premium and Price Impact

The percentage *block premium,* $\frac{P-P^1}{P^1}$, is normalized by the post-announcement price, P^1. It captures the acquirer's payment over and above the new value assigned to the target by dispersed shareholders (Barclay and Holderness (1989)). We follow Dyck and Zingales (2004) and set P^1 to be the stock exchange price two trading days after the public announcement of the block trade, adjusted using a market model of returns. As Figure 3 shows, the two-trading-day-post-announcement price fully internalizes any gains from the change in control. Figure 3 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

[18] 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 significant changes in various target-firm policies, and by CEO or board turnover.

the price patterns are quite similar, including the speed at which the price incorporates the new information.

<INSERT FIGURE 3 ABOUT HERE>

The *price impact* due to the control change is defined as $\frac{P^1-P^0}{P^0}$, where the pre-announcement price, P^0, is the per share stock exchange price before the announcement of the block transaction. We choose the date for P^0 such that P^0 precedes any build up of expectations and information leakage about the trade; such price run up should be attributable to the new blockholder. Figure 3 and Dyck and Zingales (2004) support the use of the stock exchange price 21 trading days before the public announcement of the block trade.

Table II summarizes the block size, the block premium and the price impact in our sample. The mean block size is 30% of the target's equity. The average block premium in our sample is 19.6%. A large positive mean block premium is found in other datasets as well (e.g. Barclay and Holderness (1989), Barclay, Holderness and Sheehan (2001), Mikkelson and Regassa (1991)). 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. In our sample, the average of $\frac{P-P^1}{P^1} \times \alpha$ is 0.018. The average price impact with a market model adjustment is 14.1%. This number is surprisingly close to that found in Barclay and Holderness (1991), where the price impact is measured between 40 trading days before the announcement and the announcement date.

<INSERT TABLE II ABOUT HERE>

One important fact about block trades is that the block often trades at a discount. Table II shows that half of the blocks in our sample trade at a discount.[19] Discounts are a common feature of block transactions in other samples as well (20% and 15% of all observations in Barclay and Holderness (1989) and (1991), respectively; more recently, 32% of all observations in Barclay, Holderness and Sheehan (2001), and 41% of all observations in Dyck and Zingales (2004)).[20] There are two other notable properties of block discounts (untabulated). First, when a block trades at a discount it normally also shows a positive price impact. In our sample, 78% of the discounts show a positive price impact whereas only 58% of the premia showed a positive price impact. Second, the block premium measured relative to the pre-announcement price, $\frac{P-P^0}{P^0}$, is negative in 34.2% of the observations in spite of the fact that we explicitly exclude white knights from our sample. We shall argue that this last property

[19] The average discount in our sample is 24% of the post-announcement market-adjusted price.

[20] Discounts are also preeminent in studies of the voting premium (e.g., Lease, McConnell and Mikkelson (1983) and Zingales (1995)) and in studies of privately negotiated share repurchases (see Peyer and Vermaelen (2005)).

of the data is consistent with the BGP model but is hard to capture with other models of the block premium.

4.3 Determinants of Private Benefits

Below, we list the characteristics that we predict to be determinants of expected private benefits of control, embedded in δ_X. For the most part, we rely on the previous literature to specify the target and deal characteristics. As discussed above, whether these characteristics also affect the value of v_R/v_I is irrelevant as it does not influence the properties of the estimator of $\boldsymbol{\eta}$.

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

Perhaps one of the main hypothesis in the literature is that the block holder can more easily redirect investment, increase compensation or have more free cash flow for perquisites when the target has more net cash (Jensen (1986)). We therefore construct two variables to test this hypothesis. First, we construct the proportion of the target's cash and marketable securities to the target's assets. Second, we construct the proportion of the target's short-term debt to the target's assets. The view that debt is a hard claim that constrains the extraction of private benefits present in Jensen (1986), Stulz (1990) and Hart and Moore (1995), 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. 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, but holds significantly more short term debt as a percentage of its assets.

We consider the effect of the target firm's size, measured by total assets, on private benefits. The effect of the target's size on private benefits is ambiguous. On the one hand, the controlling party may be less able to derive private 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, however, need not imply that private benefits as a fraction of security benefits increases with firm size; for this to be true, the elasticity of private benefits with respect to firm size must be greater than one in absolute value. The average target firm in our sample is about one third the size of the average COMPUSTAT firm.

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

Finally, 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.[21] The average target in our sample has a significantly larger fraction of intangible assets than the average COMPUSTAT firm.

4.3.2 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 also have incentives that are aligned with those of the company, which limit income diversion. To evaluate these effects we construct 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 target's shares. The mean value of the dummy is 0.133.

Following Demsetz and Lehn (1985), we hypothesize that individuals or private corporations have a stronger tendency to enjoy perks relative to a public corporation. We therefore construct a dummy variable that equals one if the purchaser is a publicly traded corporation and zero otherwise. We also test whether corporations 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. Note however that these synergies constitute private benefits only if they are obtained at the cost of the target's dispersed shareholders. Thus, we include a dummy variable that equals one if the acquirer and the target have the same 4-digit SIC code. In our sample, 31 targets were the acquirer by a publicly traded corporation and 41 targets were acquired by a corporation that belongs to the same 4-digit SIC group as the target.

The benefits that the corporate acquirer derives from the target's cash holdings discussed above, may be smaller if the acquirer already is cash rich. To test this hypothesis we construct 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. The majority of corporate block buyers (23 of 31) in the sample have less cash than their targets, whereas only 7 acquirers have at

[21] 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.

least twice the target's cash.

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 buyer's characteristics, $\boldsymbol{\eta}^R \mathbf{w}_i^R$, and that of the seller's, η_I, captures the differences between the benefits and extraction rates of a given block buyer and the *average* block seller.

Table III presents the correlation matrix of the various characteristics discussed above. The data in the table indicate low collinearity between the various determinants of private benefits because all linear correlations are fairly low. The highest correlation is 0.27 between the corporation dummy and the ratio of target's to acquirer's cash.

<INSERT TABLE III ABOUT HERE>

5 Results

5.1 Overall Model Fit

Panel A of Table IV reports parameter estimates and quality of fit statistics of the estimated BGP model for three different specifications of $\mathbf{w}_i^X$ and $\mathbf{w}_i$. The table 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.

The various specifications deliver qualitatively similar estimates. The constant in the regression model is estimated to be significant and with point estimates between 20% and 25% of the block value.[22] These estimates imply that there is overpayment *relative to the BGP benchmark*. As a percentage of the target firm's exchange price, overpayment is between $6\% = .3 \times .2$ and $7.5\% = .3 \times .25$, for a .3 average block size (see Table II).[23] The seller's bargaining power is always significant with point estimates between 0.62 and 0.82, all within 2 standard deviations of each other. The lower of these estimates is very close to that found in Dyck and Zingales' (2004) of 0.66 for their cross-country sample.

<INSERT TABLE IV ABOUT HERE>

[22] 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).

[23] 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. Section 6.2 provides more information on the significance of overpayment.

In the table, we present the Lagrange Multiplier test statistic and p-value for the hypothesis $H_0 : \sigma = 1/2$ against the alternative that $H_A : \sigma > 1/2$, where σ is the elasticity of private benefits to the extraction rate in the generalized specification: $d_X = \sigma^{-1}\delta_X\phi^{\sigma}$. The null hypothesis thus corresponds to the constrained model that we estimate. The advantage of the Lagrange Multiplier test is that the test statistic is evaluated at the constrained model and thus, that we are not required to estimate the unconstrained model. Let $L = \sum_i \omega_i \varepsilon_i^2$ be the objective function in (12), where ω_i is the i-th diagonal element of Ω^{-1}. The Lagrange Multiplier test is (see Engle (1984)):

$$LM = \left(\frac{dL}{d\sigma}\right)^2 \left(-\frac{d^2L}{d\sigma^2}/N\right)^{-1} /N,$$

where LM has a χ^2 distribution with 1 degree of freedom. The test shows p-values in all specifications well above the standard level of significance of 0.05 implying that we cannot reject the null hypothesis that $\sigma = 1/2$.

Panel B of Table IV evaluates the fit of the model by comparing the model's in-sample predictions of several 'stylized facts' to their corresponding values in the data. Overall, the estimated model does well in capturing these facts, even though the estimation did not target any one of them specifically.

The predicted average block premium (0.209 in specification 1 and 0.15 in specifications 2 and 3) is very close to the actual average block premium of 0.196. 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.

The estimation somewhat under-predicts the number of actual discounts. However, specification 1 is quite close in predicting the size of the average discount. The main reason for under-predicting the number of discounts has to do with the large estimated constant that pushes up some of the small discounts predicted by the BGP model. In addition, BGP predicts that all discounts are associated with positive price impact compared to the data where 78% of discounts are associated with positive price impact.[24] Finally, the estimation predicts that between 12% and 19% of all discounts are also discounts relative to the pre-announcement price. In the data that number is 34%.

Regarding the price impact, the model predicts an average of 18%, which is very close to the 14.1% in the data. Notice the discussion surrounding (7), which suggests that the model may overpredict the price impact. Despite this tendency, Table IV shows that the estimated price impact explains 93% of the actual price impact variation in each of the three specifications.

[24] Under effective competition there are no discounts. Under ineffective competition, i.e., $v_I < (1 - \phi_R^{\alpha})\, v_R$, we must have $(1 - \phi_I^{\alpha})\, v_I < v_I < (1 - \phi_R^{\alpha})\, v_R$ so that discounts are always associated with positive price impact. The BGP model will therefore have a tendency to overpredict the fraction of discounts associated with positive price impact.

Another dimension of the quality of fit is reported in Figure 4.[25] The figure plots the actual block premium against the predicted block premium and identifies each observation depending on whether it represents a case of effective competition, or Cases I or II of ineffective competition. The figure includes an horizontal line going through zero and a vertical line crossing it 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.[26]

<INSERT FIGURE 4 ABOUT HERE>

We note finally that, even though Assumption 1 is not directly imposed in the estimation, it is generally satisfied by our estimates. In untabulated results, we find only 5 violations (4%) of Assumption 1 for specification 1, all of which are virtually equal to the lower bound. There are no violations of Assumption 1 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 1 in specification 1 have no material impact.

5.2 Determinants of Private Benefits of Control

To better understand the significance of the parameters in Table IV, we proceed to compute conditional elasticities of private benefits of control with respect to the various characteristics. We focus on private benefits to R. We run a censored linear regression model of estimated private benefits as of fraction of equity, denoted by $\hat{x}_{R,i} \equiv d\left(\hat{\phi}; \hat{\boldsymbol{\eta}}^{R\prime}\mathbf{w}_i^R + \hat{\boldsymbol{\eta}}'\mathbf{w}_i\right) / \left(1-\hat{\phi}\right)$, on the various characteristics, $\mathbf{w}_i^R$ and $\mathbf{w}_i$, and the block size, α_i. The model is:

$$x_i^* = \zeta\alpha_i + \boldsymbol{\zeta}_1'\mathbf{w}_i + \boldsymbol{\zeta}_2'\mathbf{w}_i^R + u_i,$$

[25] The figure shows several outliers in the data; these observations were confirmed by reading the deal synopsis in SDC. The influence of these observations is small with our 2-step approach because, by construction, the first step residual is large for these observations making their second step weight small.

[26] We have also estimated the model imposing effective competition on all deals, i.e., that $\mathbf{1}_i^{eff} = 1\ \forall i$. A summary of the results is the following: (i) for the same specifications, the R^2 are much lower than when $\mathbf{1}_i^{eff} = 1$ is not imposed; (ii) several parameter estimates show inconsistencies across specifications; (iii) ex-post verification of violations of the condition that I is an effective competitor shows that $\mathbf{1}_i^{eff} = 1$ binds generally when observation i is a discount; (iv) the estimated constant is close to zero; (v) point estimates of bargaining power are over 0.96 and significant. Findings (i)-(iii) indicate the poor model fit and (iii) also suggests that discounts cannot be explained by simply adding a constant to the BGP model under effective competition. It is likely that the constant is estimated to be small but positive because it tries to simultaneously capture overpayment and discounts in the sample. Finally, because bargaining power multiplies the gains from avoiding a tender offer, high values induce a downward bias in the block premium needed to capture discounts.

with $\hat{x}_{R.i} = x_i^*$ if $x_i^* > 0$ and $\hat{x}_{R.i} = 0$ if $x_i^* \leq 0$. The elasticities are given by the marginal effect associated with each characteristic (obtained from the vectors $\boldsymbol{\zeta}_1$ and $\boldsymbol{\zeta}_2$) times the mean value of the respective characteristic, divided by the mean value of private benefits conditional on having nonzero private benefits.

Table V presents the estimated elasticities obtained from the censored regression model. The model estimates that a 1% increase in block size leads to a statistically significant change in private benefits as of fraction of equity between $-.74\%$ and -1.05%, revealing a strong incentive alignment effect. In Dyck and Zingales (2004), the effect of block size on the block premium is insignificant and excluded from their regressions.

Cash has a significantly positive effect in private benefits as a fraction of equity (elasticity between .06 and .26). Moreover, the estimations 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, though this result is only significant under specification 1. Short-term debt has a significantly negative effect on private benefits (elasticity between $-.15$ to $-.44$). The similarity of the elasticities for cash and short-term debt suggests that cash and short-term debt are substitutes in extracting private benefits and that short-term debt acts as a hard claim. These results provide support to Jensen's (1986) hypothesis that debt reduces the agency cost of free cash flow (see also Stulz (1990) and Hart and Moore (1995)). In contrast to our results, previous work has failed to find a systematic effect from either cash or debt. 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 addition, in our sample as well, OLS regressions of the block premium on various independent variables show no statistical significance for cash (see below). In a study of the voting premium in Brazil, Carvalhal da Silva and Subrahmanyam (2007) find that the voting premium increases with firm leverage.

<INSERT TABLE V ABOUT HERE>

Private benefits as a fraction of equity increase with asset intangibility (elasticity of .51) 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, though in Dyck and Zingales the effect is insignificant.

We find that private benefits of block holders as a fraction of equity decrease with the target's size, suggesting that the costs of higher monitoring outweigh the 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. The impact of firm size on the voting premium is controversial: Ødegaard (2007) finds a negative association between firm size and the voting premium in the early part of his sample and a positive association in the later part of the sample; Zingales (1995) and Nenova (2003) find no significant effect; and, Carvalhal da Silva and Subrahmanyam (2007), Guadalupe and Pérez-González (2005), and Nicodano and Sembenelli (2004) find a positive effect of size on the voting premium.

Private benefits display significant positive variation with respect to past performance (elasticities between .15 and .3). 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 public 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.

In addition to the results above, we have estimated Logit models to determine what makes an incumbent be an effective or ineffective competitor. In untabulated results, we find that the biggest predictor of effective competition is the target firm's average past performance. This is not surprising, as firms with high past returns have high current prices, which are used to measure the efficiency gains.

5.3 Private Benefits of Control

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 VI. The table first reports the estimated average increase in security benefits, v_R/v_I. The point estimate is about 20% across specifications, which is close but higher than the observed average price impact of 14%.

The amount of private benefits derived by the different block holders before and after the trade is very similar, though the average private benefits for the buyer are higher than the average private benefits for the seller. On average, the seller's private benefits are between 1.7% and 4.2% of the firm's equity value. These estimates are significantly different from zero and larger than in previous studies. Dyck and Zingales (2004) estimate private benefits in the US to be 2.7% on average, but cannot reject that their estimate is zero (see their Table III, specification 2). Our estimates are about 50 percent higher than Nenova's (2003). Comparing the size of private benefits to the estimated extraction rates we note that for each dollar extracted from shareholders, a controlling shareholder only privately enjoys an average of 50 cents: extraction of private benefits is highly inefficient.

The average private benefits does not give a complete picture of the distribution of private benefits across firms. Panels (a) and (b) of Figure 5 give the predicted histograms of private benefits for sellers and buyers. These are very similar, displaying a positive skew: 28% (50%) of all buyers have less than 0.1% (1%) of private benefits as a fraction of security benefits. The maximum private benefits are 10% of security benefits.

<INSERT TABLE VI ABOUT HERE>

<INSERT FIGURE 5 ABOUT HERE>

5.4 Interpreting the Estimates of Private Benefits of Control

As is true with all studies that use the block premium to measure private benefits, our data excludes firms that have minority blocks that never trade. Thus block premium data at most yield estimates of the average private benefits of sellers and buyers conditional on a block being traded, i.e., $E\left[d_I^{\alpha}|\text{trade}\right]$ and $E\left[d_R^{\alpha}|\text{trade}\right]$, respectively. However, controlling minority blockholders are also likely to derive private benefits. The question then arises as to how we should interpret our results in light of this sample selection. The next proposition demonstrates the informativeness of our estimates to the unconditional mean private benefits, i.e. $E\left[d_I^{\alpha}\right]$ and $E\left[d_R^{\alpha}\right]$. The proof is in Appendix B.5.

Proposition 4 *If private benefits of incumbents and rivals have the same unconditional mean, i.e.,* $E\left[d_I^{\alpha}\right] = E\left[d_R^{\alpha}\right]$*, then* $E\left[d_I^{\alpha}|trade\right]$ *is a lower bound and* $E\left[d_R^{\alpha}|trade\right]$ *is an upper bound to the unconditional mean. Formally,*

$$E\left[d_I^{\alpha}|trade\right] \leq E\left[d_I^{\alpha}\right] = E\left[d_R^{\alpha}\right] \leq E\left[d_R^{\alpha}|trade\right].$$

Proposition 4 shows that $E\left[d_I^{\alpha}|\text{trade}\right]$ and $E\left[d_R^{\alpha}|\text{trade}\right]$ are respectively lower and upper bounds to the unconditional average private benefits of control. The intuition for this result is that when a block is traded, it is likely that the rival or buyer has a greater than average ability to extract private benefits and also that the incumbent or seller has a lower than average ability to extract private benefits.

We conclude from Proposition 4 and Table VI that mean private benefits of control as a fraction of security benefits are estimated to lie between approximately 2% and 4%.

6 Discussion of Alternative Models of Block Pricing

We argued above that the BGP model had potential to match the most important stylized facts of block trades and verified subsequently in the empirical analysis that it does so reasonably well. Here we discuss models of block pricing that we considered as alternative candidates for our exercise.

6.1 Block Pricing Without Takeover Contests

The model of block pricing analyzed in Dyck and Zingales (2004) and Nicodano and Sembenelli (2004) maintains Assumptions A1-A3 above and implicitly adds the assumption that the buyer can commit not to enter into a takeover contest if the private negotiation with the seller fails. This assumption is only valid for majority blocks, though the model is used in empirical analysis of both minority and majority blocks. In this model, the Nash bargaining outcome to the private negotiation is a per share block price that equals the weighted average of the block's value under R and I. The per share block premium $\Pi = P - (1 - \phi_R^\alpha) v_R$ can then be expressed as:

$$\Pi = \frac{(1-\psi)\, d_I^\alpha v_I + \psi d_R^\alpha v_R}{\alpha} - (1-\psi)\left[(1-\phi_R^\alpha)\, v_R - (1-\phi_I^\alpha)\, v_I\right]. \tag{16}$$

The block premium is the average private benefits of R and I minus the increase in share value (i.e., the dollar price impact $(1-\phi_R^\alpha)\, v_R - (1-\phi_I^\alpha)\, v_I$) that R can claim given his bargaining power $1-\psi$. In the particular case where I has all the bargaining power, i.e., $\psi = 1$, the block premium equals the private benefits of the acquirer. This case is ideal in that one would get clean measures of private benefits from one of the parties, but unfortunately it is also a case in which the model would not be able to explain discounts. More generally, the block can trade at a premium or a discount; it trades at a discount if there is a large positive increase in share value that does not get passed on to I because of I's low bargaining power. Therefore, a discount necessitates both: (i) a large positive increase in share value; and, (ii) low bargaining power for I. Because of (i), we conclude that this model also overpredicts the number of discounts which occur with positive price impact. However, no matter how large the price impact is, the block can never be priced below the pre-announcement price; the block price must be larger than the smallest of the valuations of R and I, which, under Assumption 1, is I's.

To further assess model (16), we estimate it by running a regression of the per share block premium on firm and target characteristics and on the price impact variable, using our sample of controlling minority blocks. We use OLS but also IV to account for possible endogeneity of the price impact. The results are displayed in Table VII. A brief look at the table reveals that most parameter estimates are insignificant, with some having the wrong sign (e.g., cash to assets), and that the R^2's are quite small.[27] The table indicates an insignificant but negative and convex association between the block premium and the block size (see Barclay

[27] It is a common feature of regressions that try to explain the block premium that target firm characteristics play a small role (e.g. Barclay and Holderness (1989)). Dyck and Zingales (2004) get most of their explanatory power via the country-country variation in their aggregate explanatory variables.

and Holderness (1989)); the coefficient on block size is negative but insignificant (as in Dyck and Zingales (2004)) and the coefficient on the variable that measures the block size in excess of 30% is positive but insignificant.

<INSERT TABLE VII ABOUT HERE>

Following Dyck and Zingales (2004), an estimate of I's bargaining power, ψ, can be obtained from the coefficient associated with the price impact adjusted for the block size (i.e., $\alpha \frac{P^1 - P^0}{P^1}$). The table reports estimates of ψ between 0.67 and 0.72 in the OLS regressions and over 1 in the IV regression.[28] Such high levels of ψ suggest that the model may have a hard time capturing discounts unless estimates of private benefits (as given by the first term on the RHS of (16)) are negative. Indeed, at the bottom of the table we report a large number of observations where estimated private benefits are negative. 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. This may explain why Dyck and Zingales' estimates of private benefits are insignificant.

6.2 The Overpayment Hypothesis

Barclay and Holderness (1989) hypothesize that block premia can be the result of overpayment by the block acquirer because of either systematic overconfidence of buyers or the winner's curse. The results above contain evidence consistent with the overpayment hypothesis. In contrast, Barclay and Holderness (1989) claim that there is no evidence on the overpayment hypothesis.

To analyze the overpayment hypothesis, Barclay and Holderness (1989) study the stock price reaction of publicly traded acquirers upon the announcement of the block trade. Barclay and Holderness (1989) observe that their returns around the announcement are statistically insignificant and conclude that there is no overpayment (see also Dyck and Zingales (2004)). We have repeated the same exercise with the public corporations in our sample and obtained the same result (available upon request). However, at least based on our sample, this evidence is *not* inconsistent with our finding of overpayment. In first place, our approach to measure overpayment is not restricted to the subsample of corporate buyers. Focusing only on buyers that are public corporations may introduce a bias in the Barclay and Holderness (1989) towards rejecting overpayment because public corporations tend to pay lower premia than other buyers. In our sample, the average block premium for public corporations is 14% whereas the average block premium for all other buyers is 21.5%. Secondly, an overpayment

[28] A relatively high estimate of ψ is also confirmed by both, our structural estimates above, and the world wide sample of Dyck and Zingales (2004), who estimate ψ equal to 0.65.

with respect to the BGP equilibrium price need not imply an overpayment with respect to the acquirer's reservation value. We compute the acquirer's percentage surplus implied by our estimates by subtracting the actual per share block price P from the value per share of the block to the buyer, that is,

$$S = \frac{\alpha\left(1-\phi_R^{\alpha}\right)v_R + d\left(\phi_R^{\alpha}\right)v_R - \alpha P}{\alpha\left(1-\phi_R^{\alpha}\right)v_R + d\left(\phi_R^{\alpha}\right)v_R}.$$

Table VIII shows that between 65% and 75% of the acquirers overpay (Panel A).[29] For the subsample of publicly traded acquirers, the proportion of overpayers is smaller while the average acquirer's surplus is much larger (Panel B). Thirdly, whether or not public corporate acquirer's overpay, it is unlikely that the outcome of the trade will affect the acquirer's stock price because the average target size (total assets) in the subsample is several orders of magnitude smaller than the average acquirer's size (see Panel C).

<INSERT TABLE VIII ABOUT HERE>

To be precise, our finding is of overpayment relative to the BGP benchmark. In that sense, overpayment could simply reflect an omitted variable. For example, it could reflect non-pecuniary private benefits as these are not modelled in BGP. It could also reflect the seller's risk aversion (Barclay and Holderness (1989)): large corporate acquirer's may pay more for the block with respect to smaller corporations or individuals when buying from risk averse sellers. While shareholders of large, public corporations can effectively diversify their portfolios using the capital market, the block may represent a large fraction of the individuals' or private owners' own wealth and overexpose them to the target's idiosyncratic risk. To test this hypothesis, we regress $\hat{c}+\hat{\varepsilon}_i$ on a constant, the volatility of the target's daily returns, and on the daily returns' volatility interacted with the public acquirer's dummy variable. 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. The regression of $\hat{c}+\hat{\varepsilon}_i$ on a constant and on the governance measure shows no significant increased overpayment for buyers with weak governance.

[29] The table uses a more complete formula which adjusts for toeholds.

6.3 Other Models

Here we explore some additional models of block pricing.[30] 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 impact and blocks that trade at a premium should show a positive price impact. However, in our sample over 78% of discounts show a positive price impact. Similar evidence is found in Barclay and Holderness (1991) and Dyck and Zingales (2004).

Another reason for a block premium is that it takes time, and is costly, to build a controlling minority block. We should then observe that larger minority blocks carry a larger block premium, holding all else constant. To evaluate this alternative hypothesis, we regress the residuals from the estimations in specifications 1 through 3 above on the block size and other variables and find that while the coefficient on the block size is often positive it is also often not statistically significant.

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. However, we emphasize that on average the discounts in our sample show positive price increases which would not be consistent with this story.

Discounts could be compensating the buyer for the costs he bears for creating value. One problem with this story is that it is not clear why the seller should be paying for these costs. Perhaps a more efficient arrangement, if there are such costs, is to have the buyer take a management position and have his executive pay cover the costs. These costs would then be paid out by the shareholders who actually benefit from the value creation.

Lastly, consider the following story of discounts relative to the pre-announcement price. Suppose the blockholder owns restricted stock (say because he has a management position in the firm) and that the price of restricted stock is below market. In addition, suppose the stock vests if control changes hands (i.e., the block is traded). In this situation a rival

[30] There is a vast literature on minority, non-controlling blocks that we do not address here. This literature is unrelated to our study of private benefits of control.

may be successful offering a price below the pre-announcement price because the seller is compensated by the increase in value of the restricted stock. To investigate this possibility we matched our sample with the TFN Insider database. The TFN Insider database shows the role of every insider that files holdings for the target. We find 31 deals where the seller has some managerial position (e.g., board member, CEO, treasurer, president). Of these 31 deals we look for owner-managers with any form of non-common stock holdings besides the block. We find no additional holdings by any of these insiders, including no restricted shares, deferred equity, and other non-common shares.

7 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. We discuss the suitability of the model to account for variation in block prices, including the fact that many negotiated block trades occur at a discount. We show that whether a block is traded at a premium or a discount depends on whether a seller can compete effectively or not at a tender offer initiated after the private negotiation collapses. We estimate lower and upper bounds of private benefits of control that are statistically significantly different than zero. These bounds reveal estimates of private benefits larger than in previous studies. We argue that by not modeling discounts, the previous approaches underestimate the size of private benefits of control.

The paper shows that there are two crucial elements in fitting the model to the data. One is the observed change 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 former is critical to identify the increase in security benefits due to the control transfer, while the later is critical to explain why blocks are traded at a premium or discount. Future research should aim to enrich the specification of the private benefits function by gathering data from the block seller. These data may improve the estimation of private benefits and help identify the causes of sellers' ability to compete in tender offers.

Appendix

A: Additional results on the BGP model

A.1. Effective competition

Consider first the case where I values each share more than R does even if I were to own all the stock, that is, $(1-\phi_R^{\alpha})\,v_R < v_I$. In this case, I presents effective competition to R. BGP start by showing that, in the bidding contest stage, R wins control by bidding $b^* = v_I$ for a block of size 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. Indeed, 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.

At the first stage, 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. We thus obtain that at the first stage the per share block price is as in (2). The block premium is the block price minus the post-transfer securities price, $\Pi = P - (1-\phi_R^{\alpha})\,v_R$. Under effective competition, BGP show that the block premium is positive and equals

$$\Pi = \psi \frac{d_R^{\alpha} - d_R^{\beta^*}}{\alpha} v_R + (1-\psi)\left(\left(1-\phi_R^{\beta^*}\right) v_R - (1-\phi_R^{\alpha})\,v_R\right). \tag{17}$$

A.2. Ineffective competition

This proof follows BGP closely. 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:

$$b - \left(1-\phi_R^\gamma\right) v_R + (\alpha-\gamma)\left.\frac{\partial\left(1-\phi_R^\beta\right) v_R}{\partial\beta}\right|_{\beta=\gamma} = 0. \tag{18}$$

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

$$b^* = \arg\max_b \left\{\gamma\,(b)\left(1-\phi_R^{\gamma(b)}\right) v_R + d_R^{\gamma(b)} v_R - \gamma\,(b)\, b\right\}. \tag{19}$$

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 (18).

Finally, we show that there can be discounts relative to P^0. There cannot be discounts relative to P^0 under effective competition, because in this case the block price must compensate the incumbent for his valuation. Equation (2) shows that $P > \left(1-\phi_R^{\beta^*}\right) v_R = v_I > (1-\phi_I^\alpha)\, v_I = P^0$. Similarly, the BGP model cannot predict such discounts in case I of ineffective competition, because $P = (1-\phi_R^\alpha)\, v_R > v_I > (1-\phi_I^\alpha)\, v_I = P^0$. However, discounts relative to P^0 may occur in case II of ineffective competition. To see this assume that I has no bargaining power so that the block price is the smallest possible. Also, assume that the condition $(1-\phi_R^\alpha)\, v_R \geq (1-\phi_I^\alpha)\, v_I + \frac{d_I^\alpha}{\alpha} v_I$ holds with equality and write $P^0 = (1-\phi_R^\alpha)\, v_R + \frac{d_I^\alpha}{\alpha} v_I$. From (3) we get

$$P - P^0 = \frac{1}{\alpha}\gamma\left(b^* - \left(1-\phi_R^\gamma\right) v_R\right) + \left(1-\phi_R^\gamma\right) v_R - (1-\phi_R^\alpha)\, v_R + \frac{d_I^\alpha}{\alpha} v_I.$$

The first term on the right hand side is negative. The sum of the next two terms is also negative. Finally, because the choice of b^* and γ do not depend on $d_I(\phi)$, we may choose $d_I(\phi)$ small enough to obtain a negative value on the right hand side of the expression. Intuitively, $P - P^0 < 0$ whenever the value of the block for I in a tender offer is small enough. Note that when I is confronted with price $P < P^0$ for his block he no longer can alternatively sell a fraction of the block at P^0 in the stock market. This is because failure to accept P would result in the immediate announcement by R of a tender offer at price $b^* < P$ at which only he would sell realizing an outcome worse than P.

B: Additional results on the empirical strategy and proof of proposition 4

B.1: Unmodelled dependence of v_I/v_R on agent and target characteristics

This appendix explains that while we do not model v_I/v_R, our ability to estimate the sensitivities of private benefits to firm characteristics is not affected. The problem that seems to arise is when v_I/v_R depends on the same firm characteristics (or correlated ones) that private benefits also do. For example, it could be that some blockholders are more efficient (higher v_X) if there is more cash in the target firm. The fact that this is not an issue can be illustrated in a simple way. Suppose the block premium is given as in our model by:

$$y_i = f\left(\boldsymbol{\eta}'\mathbf{w}_i, v_{Ii}/v_{Ri}\right) + \varepsilon_i,$$

where $\boldsymbol{\eta}'\mathbf{w}_i$ captures variation in private benefits of control. Let $\boldsymbol{\beta}'\mathbf{z}_i$ capture the variation in changes in security values, i.e., $v_{Ii}/v_{Ri} = \boldsymbol{\beta}'\mathbf{z}_i$. The function f is obtained using the BGP model. We impose no constraint on the relationship between the vector $\mathbf{z}_i$ and the vector $\mathbf{w}_i$; in particular $\mathbf{z}$ could have all of the variables already in $\mathbf{w}$. Suppose we estimate the model imposing the constraint that the price impact, denoted by p_i, can be written as $p_i = g\left(\boldsymbol{\eta}'\mathbf{w}_i\right)\boldsymbol{\beta}'\mathbf{z}_i$, as in the BGP model. The minization problem is

$$\min_{\boldsymbol{\eta},\boldsymbol{\beta}} \sum_i \varepsilon_i^2 = \sum_t \left(y_i - f\left(\boldsymbol{\eta}'\mathbf{w}_i, \boldsymbol{\beta}'\mathbf{z}_i\right)\right)^2,$$

subject to $p_i = g\left(\boldsymbol{\eta}'\mathbf{w}_i\right)\boldsymbol{\beta}'\mathbf{z}_i$ for all i. As we alternatively do, we could estimate

$$\min_{\boldsymbol{\eta}} \sum_i \varepsilon_i^2 = \sum_t \left(y_i - f\left(\boldsymbol{\eta}'\mathbf{w}_i, \frac{p_i}{g\left(\boldsymbol{\eta}'\mathbf{w}_i\right)}\right)\right)^2,$$

where we are silent about $\mathbf{z}$ but directly use the constraint $p_i = g\left(\boldsymbol{\eta}'\mathbf{w}_i\right)\boldsymbol{\beta}'\mathbf{z}_i$. As can be easily seen, both estimations must yield the same solution for $\boldsymbol{\eta}$. Hence, the properties of η are not affected by not modeling $\mathbf{z}$.

Overall, the formulation we adopt has the advantages that we gain degrees of freedom by not needing to model $\mathbf{z}$ and that we can still do comparative statics of private benefits on any variable in $\mathbf{w}$ (as given by the sensitivities $\boldsymbol{\eta}$). The disadvantage of our formulation is that, not having estimated $\boldsymbol{\beta}$, we cannot do comparative statics on the block premium, y, for any given variable in $\mathbf{w}$ that may also be in $\mathbf{z}$.

B.2: Proof of 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 (18)-(19). Recall that (18):

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

or

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

This yields the best reply function:

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

Knowing $\gamma(b)$, R solves (19) 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:

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

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

B.3: 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.

B.4: On the validity of Assumption 1 given the square root function

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

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

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

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

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

B.5: Block trades and selection bias in estimates of private benefits

Proof of Proposition 4. A problem of selection bias may show up in our sample because we consider only those firms whose minority controlling block is traded. We thus have no way of assessing the level of private benefits on all other firms with minority controlling blockholders. To see the direction of the bias consider the valuation of block α_i by controlling shareholder $X_i = I_i, R_i$. Under the square root functional form for private benefits this valuation equals

$$\alpha_i\left(1-\phi_{X,i}^\alpha\right)v_{X,i} + d_{X,i}^{\alpha_i}v_{X,i} = \alpha_i\left(1+\phi_{X,i}^\alpha\right)v_{X,i}.$$

Observe that a deal occurs if, and only if,

$$1 + \phi^{\alpha}_{I,i} < \left(1 + \phi^{\alpha}_{R,i}\right) \frac{v_{R,i}}{v_{I,i}}.$$

We are interested in comparing the mean private benefits conditional on observing a block trade,

$$E\left[d^{\alpha}_{X,i} | 1 + \phi^{\alpha}_{I,i} < \left(1 + \phi^{\alpha}_{R,i}\right) \frac{v_{R,i}}{v_{I,i}}\right],$$

with the unconditional mean private benefits, $E\left[d^{\alpha}_{X,i}\right]$, which we cannot estimate. Trivially, because the function d is strictly increasing,

$$\begin{aligned} E\left[d^{\alpha}_{I,i} | \phi^{\alpha}_{I,i} < \left(1 + \phi^{\alpha}_{R,i}\right) \frac{v_{R,i}}{v_{I,i}} - 1\right] &= E\left[d^{\alpha}_{I,i} | d\left(\phi^{\alpha}_{I,i}\right) < d\left[\left(1 + \phi^{\alpha}_{R,i}\right) \frac{v_{R,i}}{v_{I,i}} - 1\right]\right] \\ &\leq E\left[d^{\alpha}_{I,i}\right]. \end{aligned}$$

Likewise

$$E\left[d^{\alpha}_{R,i} | \phi^{\alpha}_{R,i} > \left(1 + \phi^{\alpha}_{I,i}\right) / \frac{v_{R,i}}{v_{I,i}} - 1\right] \geq E\left[d^{\alpha}_{R,i}\right].$$

Suppose now that $d^{\alpha}_{R,i}$ and $d^{\alpha}_{I,i}$ have the same unconditional means, $E\left[d^{\alpha}_{I,i}\right] = E\left[d^{\alpha}_{R,i}\right]$. Hence, we must have

$$\begin{aligned} E\left[d^{\alpha}_{I,i} | 1 + \phi^{\alpha}_{I,i} < \left(1 + \phi^{\alpha}_{R,i}\right) \frac{v_{R,i}}{v_{I,i}}\right] &\leq E\left[d^{\alpha}_{I,i}\right] \\ &= E\left[d^{\alpha}_{R,i}\right] \\ &\leq E\left[d^{\alpha}_{R,i} | 1 + \phi^{\alpha}_{I,i} < \left(1 + \phi^{\alpha}_{R,i}\right) \frac{v_{R,i}}{v_{I,i}}\right]. \end{aligned}$$

Therefore, we conclude that if $d^{\alpha}_{R,i}$ and $d^{\alpha}_{I,i}$ have the same unconditional means, then the estimated levels of mean private benefits under R and I constitute upper and lower bounds, respectively, for the mean of private benefits across all firms with minority controlling shareholders. ■

C: 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.

We use Datastream to see if the targets in our sample have also non-voting shares. We found that only eight targets had also shares without voting rights at the time of the trade. For four of these, the percentage of non-voting shares is small and does not exceed 12%. There are only two firms where Class B shares represent more than half of the outstanding stock. BGP show that a larger number of non-voting shares leads to larger block premia provided that I holds all of the voting shares. However, this result depends on whether there are still voting shares left to be bid. Theoretically, it is not possible to tell whether we under or overestimate private benefits. Also, empirically, because the issue of dual class shares arises only for two firms, we believe there is little risk of biasing our private benefits measure.

While we exclude block trades where the block is not the largest block, we do not exclude block trades on target firms where another, smaller blockholder exists. Strictly speaking, the BGP model calls for an investor population composed of a single blockholder and atomistic shareholders: atomistic shareholders are not pivotal in tender offers. In our sample, we find 49 target firms with a second large blockholder. In spite of the many targets with a second blockholder, we note that the average size of the second largest block is 5.47% (recall that the average size of the largest block is 30%). In addition, only in 11 target firms is the second largest block larger than half the size of the largest block, and in two of these cases the difference between the second largest block and half the size of the largest block is less than one percentage point. We are thus confident about the limited impact that these trades may have on our results. A related issue is that we have shown (see Proposition 3) that in the alternative of a tender offer in case II of ineffective competition, the rival acquires a block of size $\frac{\alpha}{2}$. If there exists another blockholder that owns a block $\frac{\alpha}{2} < \alpha' < \alpha$, then the rival gains control provided he ends up with a block of size $\max(\alpha', \alpha/2)$. We have reestimated the model including the constraint that at a successful tender offer at least $\max(\alpha', \alpha/2)$ shares have to be tendered. The results are quantitatively very similar to those reported in the main text, because in only five target firms is the second largest block larger than half the size of the largest block and the deal falls in case II of ineffective competition. Moreover, the difference between the second largest block and half the size of the largest block is less than 1 percentage point in two of these five target firms.

Finally, we do not exclude deals where there are toeholds. In the BGP model, toeholds help reduce the block premium, because the costs associated with a tender offer are smaller; a toehold facilitates the incentive alignment. Toeholds are present in 16 block trades (13.3% of 120) as shown in Table II above, thus generating a limited impact on the estimation. Moreover, in our estimations, toeholds appear inconsequential in terms of the ability to extract private benefits.

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Table I: Description of variables used and their sources

Type	Variable name	Variable description	Source
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
	$TINT\_ASSETS$	Target's proportion of intangible to total assets (ITEM 33 / ITEM 6)	COMPUSTAT
	$TSTD\_ASSETS$	Target's proportion of short term debt to total assets before the block trade announcement (ITEM 5 / ITEM 6)	COMPUSTAT
	$TSIZE$	Target's total assets ($ Million) before the block trade announcement (ITEM 6)	COMPUSTAT
	$TAVG\_RET$	Target's average daily return for the 12 month ending two month before the trade announcement	CRSP
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
	$ACORP$	Is the acquirer a publicly traded corporation? (1 if yes, 0 if no)	SDC
	$ASAMEIND$	Is the acquirer in the same industry, i.e., 4-digit SIC, as the target? (1 if yes, 0 if no)	COMPUSTAT
	$CASHRATIO$	Ratio of the traget's cash to the acquirer's total cash before the trade announcement	COMPUSTAT

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 acquirer. 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] 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 impact	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	0.166
	Intangibles to assets	0.240	0.275	0.000	0.020	0.104	0.384	0.981	0.081***
	Short-term debt to assets	0.332	0.595	0.003	0.109	0.194	0.403	6.041	0.070***
	Total assets ($ Millions)	372.139	1,341.024	0.660	21.085	90.015	315.865	14,066.900	1,269.684***
	Average daily returns	0.20%	0.56%	−1.42%	−0.06%	0.13%	0.31%	3.40%	0.08%*
Acquirer	Active shareholder? (1 if yes)	0.133	0.341	0	0	0	0	1	
	Public corporation? (1 if yes)	0.258	0.440	0	0	0	1	1	
	In the same industry? (1 if yes)	0.342	0.476	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			
Public acquirer?	0.110	−0.017	−0.020	−0.087	0.117	−0.064	1.000		
Same industry?	0.019	0.143	−0.062	−0.026	0.011	−0.128	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 private benefits function parameters

Panel A shows the estimates of the block seller's bargaining power, ψ, and of the sensitivities, $\boldsymbol{\eta}$ and $\boldsymbol{\eta}^X$, of the optimal private benefits of control function,

$$\hat{d}_{X,i} = \frac{2}{\alpha_i}\left[\underline{\alpha} \times \frac{\exp\left(\boldsymbol{\eta}'\mathbf{w}_i + \boldsymbol{\eta}^X\mathbf{w}_i^X\right)}{1+\exp\left(\boldsymbol{\eta}'\mathbf{w}_i + \boldsymbol{\eta}^X\mathbf{w}_i^X\right)}\right]^2,$$

in the BGP model. The dependent variable in the nonlinear regression is the percentage block premium, $\frac{P-P^1}{P^1}$, and the right hand side is the block premium predicted by the BGP model, as a function of the characteristics, $\mathbf{w}_i$ and $\mathbf{w}_i^X$, the block size, α_i, and the sample minimum block size, $\underline{\alpha}$. The model's parameters are estimated using FGNLS. Panel B summarizes the in-sample predictions of the estimated model. The data is for all US negotiated block trades in the Thomson One Banker's Acquisitions data between 1/1/1990 and 31/08/2006. Blocks are larger than 10% and 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 Private Benefits of Control Function

	(1)		(2)		(3)	
	Coefficient	Std error[a]	Coefficient	Std error[a]	Coefficient	Std error[a]
ψ	0.822	(0.199)***	0.751	(0.251)***	0.618	(0.204)***
η_{TCASH_ASSETS}	6.455	(0.304)***	6.934	(0.144)***	9.534	(2.730)***
η_{TINT_ASSETS}			8.777	(0.184)***		
η_{TSTD_ASSETS}	−5.377	(0.250)***	−3.034	(0.262)***	−3.951	(1.086)***
η_{TSIZE}	−0.001	(0.000)***	−0.017	(0.000)***	−0.010	(0.002)***
η_{TAVG_RET}	743.268	(28.117)***	665.836	(33.464)***	3,283.100	(586.610)***
η_R	−0.458	(0.061)***	−2.483	(0.103)***	−0.783	(0.173)***
η_{AACT}					0.586	(0.256)**
η_{ACORP}	−1.537	(0.071)***	2.440	(0.228)***	2.231	(0.346)***
$\eta_{ASAMEIND}$					−0.441	(0.264)*
$\eta_{CASHRATIO}$	0.339	(0.019)***	2.168	(0.388)***	0.576	(0.100)***
η_I	−1.663	(0.302)***	−4.533	(0.384)***	−2.280	(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	
LM statistic $(\chi^2)^d$	0.050		0.955		0.563	
p-value	0.823		0.328		0.453	

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 impact						
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 impact						
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 impact $R^{2,c}$	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 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 impact) divided by the total sum of squares of the actual block premium (or price impact).
[d] The LM statistic is computed under the null hypothesis that the elasticity of private benefits to the extraction rate, σ, is 0.5. The p-value is for the alternative that $\sigma > 0.5$.

Table V: In-sample predictions of the estimated BGP model

This table shows the elasticities of the estimated private benefits of control with respect to various target and acquirer's characteristics, $\mathbf{w}_i$ and $\mathbf{w}_i^R$, and the block size, α_i. Let $x_{R,i} = d_{R,i}/(1-\phi_{R,i})$, be the value of private benefits expressed as a fraction of total equity, and let a "^" indicate estimated values using the parameter estimates in Table IV. The elasticity for each characteristic, w^j, is recovered from the censored regression model,

$$x^*_{R,i} = \zeta\alpha_i + \boldsymbol{\zeta}_1'\mathbf{w}_i + \boldsymbol{\zeta}_2'\mathbf{w}_i^R + u_i,$$

with $\hat{x}_{R,i} = x^*_{R,i}$ if $x^*_{R,i} > 0$ and $\hat{x}_{R,i} = 0$ if $x^*_{R,i} \leq 0$. The level of private benefits is therefore truncated at zero. All elasticities for continuous characteristics are obtained by multiplying the coefficient associated with the characteristic by the sample mean of the characteristic and dividing by the average predicted private benefit, conditional on being positive. The elasticities for binary characteristics are the percentage change in private benefits when the indicator switches from 0 to 1. The data is for all US negotiated block trades in the Thomson One Banker's Acquisitions data between 1/1/1990 and 31/08/2006. Blocks are larger than 10% and smaller than 50% of the outstanding stock, and they are the largest block held. The number of observations is 120.

	(1)		(2)		(3)	
	Elasticity	(Std error)[a]	Elasticity	(Std error)[a]	Elasticity	(Std error)[a]
Block size	−0.851***	(0.217)	−0.743***	(0.210)	−1.051***	(0.230)
Cash to total assets	0.259***	(0.061)	0.225***	(0.062)	0.055	(0.046)
Intangible assets to total assets			0.511***	(0.074)		
Short-term debt to total assets	−0.439***	(0.077)	−0.149**	(0.067)	−0.238***	(0.078)
Total assets	−0.073***	(0.027)	−0.407***	(0.071)	−0.215***	(0.051)
Average daily returns	0.299***	(0.046)	0.149***	(0.045)	0.194***	(0.051)
Active shareholder dummy					0.216	(0.279)
Corporate acquiror dummy	−0.536***	(0.166)	0.648***	(0.189)	0.081	(0.160)
Same industry acquiror					−0.183	(0.130)
Acquirer's to target's cash holdings	0.062***	(0.022)	0.021	(0.022)	0.012	(0.011)

[a] Estimates followed by ***, ** and * are statistically different from zero with 0.01, 0.05 and 0.1 significance levels, respectively.

Table VI: Estimates of the private benefits of control

This table summarizes the sample distribution of private benefits, 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)
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 VII: Analysis of the Determinants of the Block Premium

This table shows the parameter estimates of the regression of the block premium per share, $\alpha(P - P^1)/P^1$, on the price impact adjusted for block size, $\alpha(P^1 - P^0)/P^1$, the block size and target and acquirer characteristics. The variable "Percent over 30%" equals 0 for values of the block below 30% and equals the value of the block minus 30% otherwise. Instruments for the price impact in the IV estimation are the target's average daily return for the 12 month ending two months before the trade announcement, and a binary indicator that equals one if the target's latest earnings per share are zero or negative. White's (1980) robust standard errors estimates are shown in brackets under the parameter estimates. The data is for all US negotiated block trades in the Thomson One Banker's Acquisitions data between 1/1/1990 and 31/08/2006. 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.

	OLS estimates			IV estimates[a]		
	(1)	(2)	(3)	(4)	(5)	(6)
Adjusted Price Impact	−0.276	−0.332	−0.329	0.570	0.737	0.736
	(0.259)	(0.302)	(0.301)	(0.641)	(0.805)	(0.807)
Implied $\hat{\psi}$	0.724**	0.668*	0.671*	1.570*	1.737*	1.736*
	(0.259)	(0.302)	(0.301)	(0.641)	(0.805)	(0.807)
p-value for $\psi = 1$	0.289	0.274	0.277	0.376	0.362	0.364
Block size (α)		0.029	−0.053		−0.054	−0.321
		(0.337)	(0.435)		(0.312)	(0.546)
Percent over 30%			0.128			0.420
			(0.753)			(0.894)
Cash to total assets		−0.227	−0.227		−0.12	−0.121
		(0.159)	(0.159)		(0.151)	(0.152)
Intangible assets to total assets		−0.121	−0.122		−0.116	−0.119
		(0.106)	(0.107)		(0.112)	(0.115)
Short-term debt to total assets		−0.045	−0.046		−0.013	−0.015
		(0.048)	(0.049)		(0.025)	(0.025)
Total assets		0.004	0.004		0.006	0.005
		(0.009)	(0.01)		(0.009)	(0.01)
Active shareholder dummy		−0.030	−0.0330		−0.0430	−0.0510
		(0.051)	(0.055)		(0.062)	(0.069)
Corporate acquirer dummy		−0.082*	−0.083*		−0.117*	−0.120*
		(0.049)	(0.049)		(0.068)	(0.071)
Same industry acquirer		0.092	0.093		0.097	0.100
		(0.058)	(0.058)		(0.062)	(0.062)
Acquirer's to target's cash holdings		0.002	0.002		0.003*	0.003*
		(0.001)	(0.001)		(0.002)	(0.002)
Constant	0.061**	0.117	0.137	0.045*	0.100	0.166
	(0.029)	(0.090)	(0.136)	(0.023)	(0.098)	(0.168)
Number of violations of $\hat{d} \geq 0$	0	19	19	0	29	30
F statistic[b]	1.135	1.177	1.091			
χ^2 statistic[b]				0.792	0.869	0.815
R^2	0.006	0.069	0.069			

[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 and F statistics are computed under the null hypothesis that all the model parameters are zero.

Table VIII: Analysis of the Acquirer's Surplus

This table summarizes the sample distribution of the acquirer's surplus in the general BGP model, predicted using the estimates of the private benefits function reported in Table IV.

Panel A: Distribution of the total acquirer's surplus for the full sample

Specification	Observations	Mean	Standard error	Median	Proportion of trades with overpayment
(1)	120	−0.104	0.220	−0.193	76.67%
(2)	120	−0.057	0.283	−0.173	74.17%
(3)	120	0.002	0.287	−0.097	64.17%

Panel B: Distribution of the total acquirer's surplus for the publicly listed acquirers only

Specification	Observations	Mean	Standard error	Median	Proportion of trades with overpayment
(1)	31	−0.140	0.223	−0.201	74.19%
(2)	31	0.077	0.435	0.017	48.39%
(3)	31	0.124	0.432	0.058	45.16%

Panel C: Size of targets and acquirers, when the acquirer is a publicly listed corporation

Variable	Observations	Mean	Standard deviation	Median
Acquirer's assets ($ Millions)	27	17,152.40	68,096.90	728.49
Target's assets ($ Millions)	31	176.02	266.13	83.16
Block size	31	29.19%	10.08%	28.16%

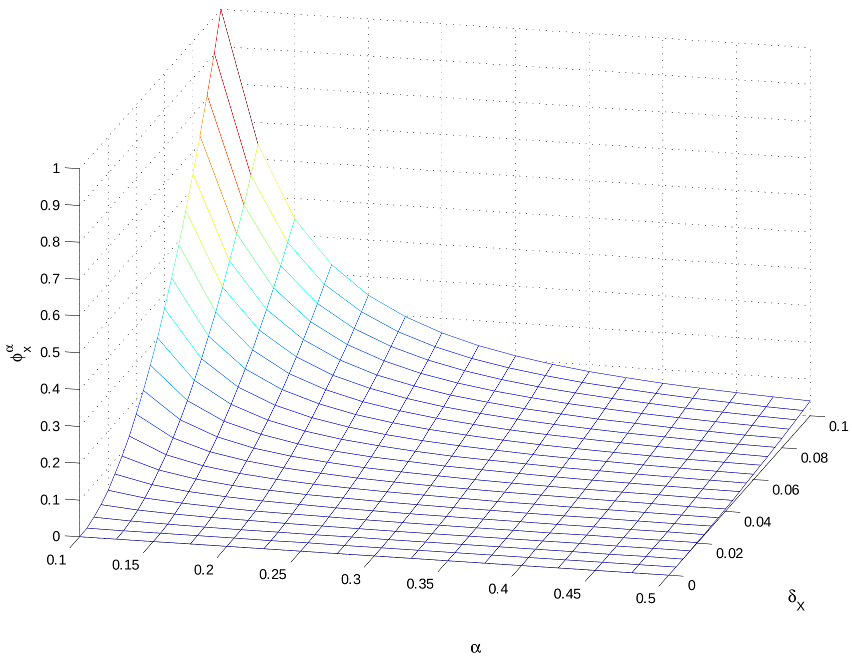

FIGURE 1: Optimal diversion rate, ϕ_X^α, as a function of block size, α and the index of deal characteristics, δ_X. The minimum block size in the sample, $\underline{\alpha}$, is set to 0.1.

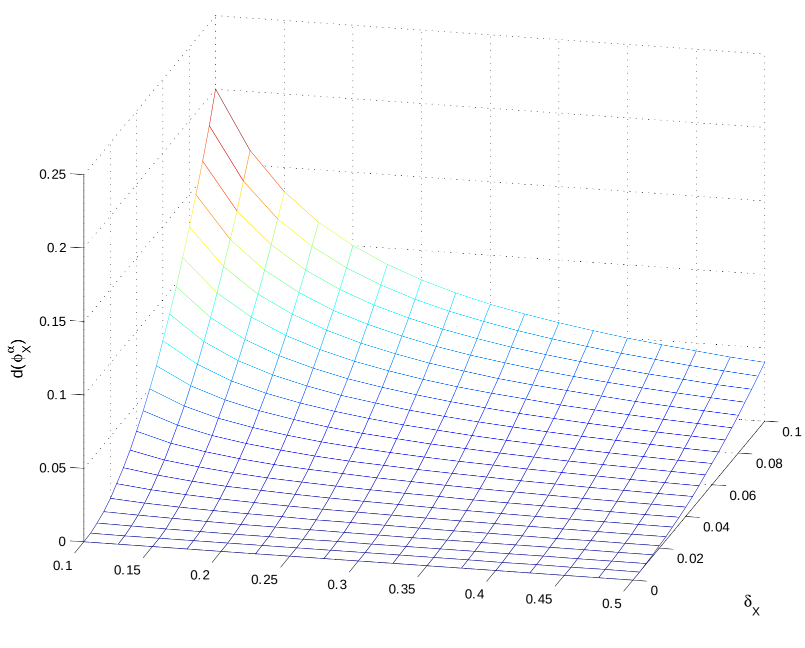

FIGURE 2: Private benefits, $d(\phi_X^\alpha)$, as a function of block size, α and the index of deal characteristics, δ_X. The minimum block size in the sample, $\underline{\alpha}$, is set to 0.1.

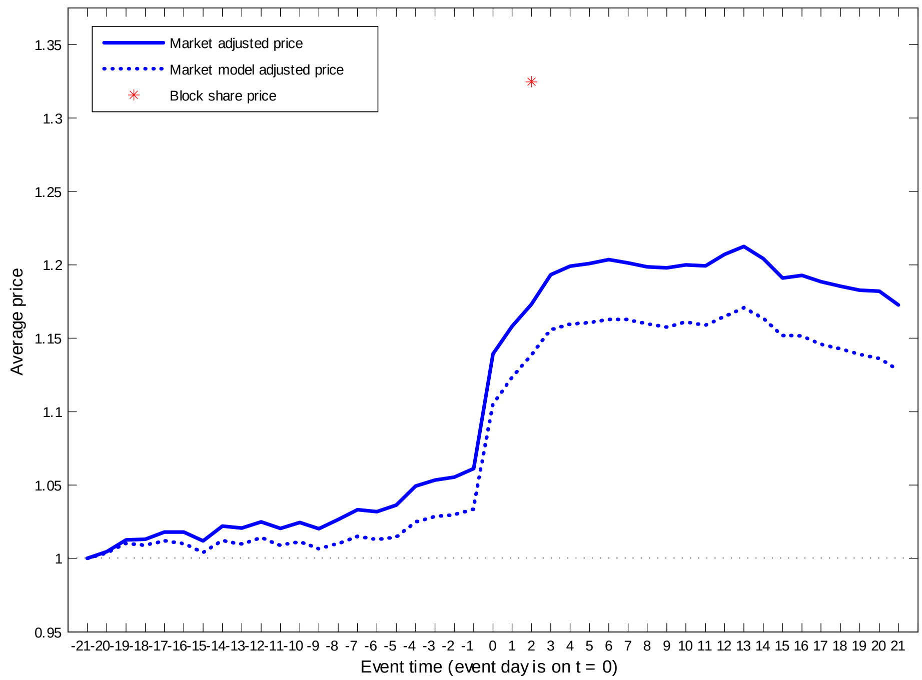

FIGURE 3: Average share price 21 trading days before and after the block trade.

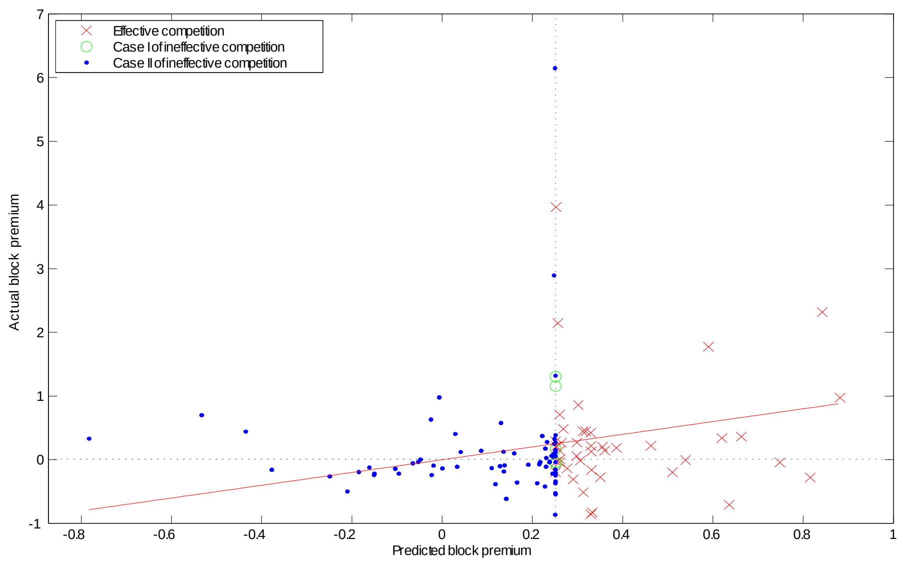

FIGURE 4: Fit of the estimated general BGP model. The block premium is estimated using the coefficients of specification (1) in Table IV.

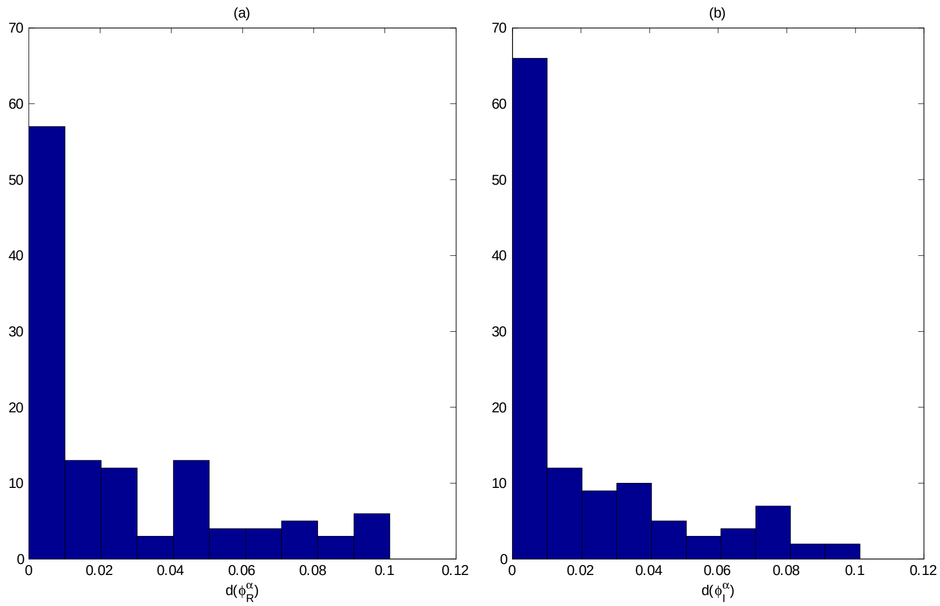

FIGURE 5: Predicted histogram of the private benefits of control of the incumbent, I, (panel (a)) and of the buyer, R, (panel (b)) in the estimated general BGP model. The histograms are constructed using the coefficients of specification (1) in Table IV.