Quantifying private benefits of control from a structural model of block trades

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Keywords: Block pricing, block trades, control transactions, private benefits of control, structural estimation, deadweight loss

JEL Classifications: G12, G18, G34

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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 accounting for both block premia and block discounts in the data. The evidence suggests that the occurrence of a block premium or discount depends on the controlling block holder's ability to fight a potential tender offer for the target's stock. We find evidence of large private benefits of control and of associated deadweight losses, but also of value creation by controlling shareholders. Finally, we provide evidence consistent with Jensen's free cash flow hypothesis.

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1 Introduction

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.[1] This paper offers an alternative approach to estimating private benefits of control by introducing a structural model of the determination of the block premium in private negotiations of minority blocks, and using data on control transactions to estimate the corresponding structural parameters.

The structural model deals with three main issues present in the current literature. First, 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 associated with the new block holder.[2] 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.

Second, 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 and we show that this approach leads to a downward-biased, and often negative, estimate of private benefits of control.

Third, the current literature is potentially subject to a selection bias in that it analyzes private benefits only in target firms whose block is traded. 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 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 depends on how effective the block owner

[1] The block premium is the difference between the negotiated price per share in the traded block and the closing exchange price per share after the trade is announced (see the seminal paper by Barclay and Holderness, 1989). For a review of the literature see Benos and Weisbach (2004). Eckbo and Thorburn (?) offer an alternative approach to inferring private benefits.

[2] 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) producing generally an increase in share value and a transfer of private benefits to the new block owner (e.g., Barclay and Holderness, 1989, and Dyck and Zingales, 2004). The voting premium, too, contains information on private benefits of control and on changes in share value (e.g. Zingales, 1995).

can be in opposing a tender offer by a potential buyer.

The identification strategy uses data on observable variables – the block premium, the price impact, i.e., the stock price change around the block trade, and the block size – to infer properties of unobservable variables – the extraction rate, the private benefits and the change in security values. From the model, we obtain equations for the optimal extraction rates and private benefits, the price impact and the block premium. After eliminating all unobservable, endogenous variables, we arrive at a single equation that describes the block premium as a function of structural parameters that can be estimated with non-linear methods.

The paper offers three main results. First, we show that the BGP model fits several features of the data on block trades. Block premiums (discounts) in the data tend to occur when the block owner is predicted to be effective (ineffective) in opposing a tender offer. 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 hostile tender offers for target firms where a controlling, minority block exists.

Second, we estimate that private benefits represent approximately 3% to 4% of the target firm's equity value or 10% of the value of the block. 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 35% (40%) 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 $1.76 of equity value.

The presence of private benefits of control does not mean that dispersed shareholders have nothing to gain from having a controlling shareholder. We estimate an increase in share value (absent private benefits) of 19% at the time of the block trade. This estimate implies that blockholders –and the identity of specific blockholders– matter for firm 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 similar in size (in absolute value). This evidence supports Jensen's (1986) free cash flow hypothesis (see also Stulz, 1990, and Hart and Moore, 1995) and contrasts with previous literature, which failed to identify an unambiguous effect of leverage on private benefits. Private benefits also are smaller when: Total target assets are high and past stock performance is low, suggesting increased monitoring of large firms and weak performers; the target firm's ratio of intangible assets to total assets is low, providing supporting evidence for Himmelberg et al. (1999); and, when country-wide governance is stronger.

Third, we find evidence that acquirers' overpay an average between 2% and 5% 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.

The structural estimation we pursue has both advantages and disadvantages over the previous literature. The main advantage is that the theory's explicit constraints allow us to disentangle the effect of private benefits of control from that of changes in share value on the block premium, while taking into account that share values are not independent of private benefits. We therefore obtain direct estimates of the value added by a new controlling shareholder and of the block owner's surplus. Estimates of the block owner surplus are impossible to obtain in the current literature unless one assumes that sellers have all the bargaining power, in which case the models, counterfactually, predict no discounts. Likewise, we 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).

The main disadvantage of a structural estimation is the reliance on a specific theoretical model, with the following consequences. First, the deals we analyze must fit the assumptions in the model (e.g., no white knights). Second, some 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. Also, for robustness we consider alternate sets of assumptions and show that our chosen assumptions fit the data better. Specifically, compared to other models, our model explains better the existence of both block premiums and discounts, and it also better explains the large changes in share value around block trades. Third, the non-linearities in the model impose strong restrictions on the data, making the estimation significantly more computationally intensive than in linear models.

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 estimation method.

2 Theory

This section starts with a brief overview to the Burkart, Gromb, and Panunzi (2000) model, focusing on its ability to explain known facts about block trades. For a more rigorous and complete discussion see Albuquerque and Schroth (2009). Following this overview is a discussion of the main assumptions in BGP and how they constrain or inform our exercise.

The model studies the interaction between a controlling 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. Total shares are normalized to 1. 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 $X \in \{I, R\}$. Diverting a fraction $\phi \in [0, 1]$ of cash flows results in *private benefits* of $d_X(\phi) v_X$ and implies a share value 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 negotiate a price αP to exchange the block α. 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. In the takeover contest, R makes a tender offer that I may counterbid. Tendering is assumed to be sequential: I and R tender first, followed by the dispersed shareholders. Dispersed shareholders are assumed to believe that the tender offer outcome is independent of their individual tendering decisions. 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. Assumption 2 ensures that the target firm generates more security benefits under R. The assumption guarantees that R gains control. Assumption 3 guarantees a unique interior solution to the optimal extraction of private benefits problem. The controlling shareholder, X, with a block of 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 $\phi_X^\alpha = d_X'^{-1}(\alpha)$. Because d_X is concave, the optimal extraction rate displays Jensen's incentive effect: Larger block sizes lead to lower extraction rates (i.e., ϕ_X^α is decreasing in α). Using ϕ_X^α we define the optimal private benefits to be $d_X^\alpha \equiv d_X(\phi_X^\alpha)$.

If the block α is traded, we denote the post-announcement price by $P^1 = (1-\phi_R^\alpha)\, v_R$ and the *price impact* of the news announcement by

$$\frac{P^1}{P^0} = \frac{(1-\phi_R^\alpha)\, v_R}{(1-\phi_I^\alpha)\, v_I}. \tag{2}$$

The block premium is the block price minus the post-announcement share price, $\Pi = P - P^1$.

2.1 Model Solution Under Effective Competition

The outcome of this model depends crucially on I's ability to fight R's takeover attempt. We say that I presents *effective competition* to R if I's security benefits are 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 of v_I attracts all of I's shares plus shares from dispersed shareholders. R's block size is therefore $\beta^* > \alpha$ and the post-tender offer price is $\left(1-\phi_R^{\beta^*}\right) v_R = v_I > (1-\phi_R^\alpha)\, v_R$.

The increase in block size that results from the tender offer is welfare increasing. However, BGP show that in the first stage I and R do not internalize the positive incentive effect of increased ownership for two reasons. First, the increased ownership leads to lower private benefits for I and R as a coalition. Second, 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. The first stage per share block price is

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

The first term on the right hand side of (3) represents I's threat value. I gets b^* at a tender offer and hence must be paid at least b^* in the private negotiation. The second term describes I's share of the surplus accrued to the coalition of I and R from avoiding the tender offer. This surplus obtains because the coalition value of trading the block privately is $\alpha(1-\phi_R^\alpha)\, v_R + d_R^\alpha v_R$ whereas the coalition value of trading the block at the tender offer is $\beta^*\left(1-\phi_R^{\beta^*}\right) v_R + d_R^{\beta^*} v_R + (\alpha - \beta^*)\, b^* = \alpha b^* + d_R^{\beta^*} v_R$. 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 that I can claim is the tender offer bid, b^*.

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, $b^* = v_I$, 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.

2.2 Model Solution Under Ineffective Competition

Consider now the alternative case where I is an *ineffective competitor,* i.e., $v_I < (1 - \phi_R^\alpha)\, v_R$. The main result in this case is that discounts occur for sufficiently low values of v_I.

BGP show that there are two sub-cases to consider. In case I, I's valuation of the block is not too low: $v_I < (1 - \phi_R^\alpha)\, v_R$ but $(1 - \phi_R^\alpha)\, v_R \leq (1 - \phi_I^\alpha)\, v_I + \frac{d_I^\alpha}{\alpha} v_I$. BGP show that at the tender offer any bid by R below $(1 - \phi_R^\alpha)\, v_R$ attracts less than α shares and leaves I in control, which makes R bid $b^* = (1 - \phi_R^\alpha)\, v_R$. I does not counterbid by offering $b > b^*$, because doing so would mean attracting all the shares from dispersed shareholders. To show that every dispersed shareholder's best response to b is to tender their shares, note that the value of each share when I is the sole owner is v_I. An atomistic shareholder who deviates from this strategy would get $v_I < (1 - \phi_R^\alpha)\, v_R < b$. Moreover, I tenders all his shares at b^*. By tendering the block, I realizes $\alpha\,(1 - \phi_R^\alpha)\, v_R$. Instead, if I bids b and becomes the sole owner his valuation is $v_I - (1 - \alpha)\, b < \alpha v_I < \alpha\,(1 - \phi_R^\alpha)\, v_R$. In summary, because at the tender offer the block remains intact, there is no surplus to the coalition to be split at the negotiation stage. Thus, at a private negotiation, R offers a block price equal to the tender offer bid, $P = (1 - \phi_R^\alpha)\, v_R$, and the block premium is zero.

In case II, I's valuation is the lowest, i.e., $(1 - \phi_R^\alpha)\, v_R > (1 - \phi_I^\alpha)\, v_I + \frac{d_I^\alpha}{\alpha} v_I > v_I$. Consider the game played at the tender offer stage. For each tendered share, the incumbent trades off the share's post-tender-offer market price for the sum of the tender offer bid plus the increase in the market value of the untendered shares, which itself is the result of the improved incentive alignment under R's control. The latter effect arises if, and only if, the incumbent does not tender all his shares. In equilibrium then the bid value is below the post-tender-offer market price and it is optimal for I not to tender all the shares. As BGP also show, the remaining dispersed shareholders' marginal benefit from tendering their *only* share is always smaller then the incumbent's. Hence, they choose to hold on to their share. Combining the tendering decisions, R acquires a controlling block that is smaller than the original block, which implies that the post tender offer market price is below the price that would prevail if all the block shares were tendered. Formally, let b denote the tender offer bid and $\gamma < \alpha$ the post tender offer block size. In the tender offer equilibrium, $b < \left(1 - \phi_R^\gamma\right) v_R < (1 - \phi_R^\alpha)\, v_R$.

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

$$\begin{aligned} P &= \frac{1}{\alpha}\left[\gamma b^* + (\alpha - \gamma)\left(1 - \phi_R^\gamma\right) v_R\right] \\ &\quad + \psi\left[(1 - \phi_R^\alpha)\, v_R + \frac{d_R^\alpha}{\alpha} v_R - \left(\left(1 - \phi_R^\gamma\right) v_R + \frac{d_R^\gamma}{\alpha} v_R\right)\right]. \end{aligned} \tag{4}$$

The first term represents the value of I's shares if a tender offer occurs: γ shares are sold at b^* and the rest, $\alpha-\gamma$, are valued at the post-tender-offer price $\left(1-\phi_R^{\gamma}\right)v_R$. Both components are smaller than the price prevailing if the private negotiation takes place, $\left(1-\phi_R^{\alpha}\right)v_R$, because with a 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. The surplus is the result of a smaller, more inefficient controlling block at the tender offer stage. As proposition 2 shows, I's valuation of the block is so low that even the savings from avoiding the tender offer cannot prevent a block price below the post-announcement price, i.e., a block discount.

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

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

The reason the incumbent accepts the prescribed low bid at the tender offer, and the resulting discount at the negotiation stage, is that the bid value can be made sufficiently close to the post-announcement price whenever

$$\alpha\left(1-\phi_I^{\alpha}\right)v_I+d_I^{\alpha}v_I<\left(1-\phi_R^{\alpha}\right)v_R. \tag{5}$$

This condition is precisely the one that defines case II of ineffective competition. The left hand side of the inequality is I's value of the block if he runs the firm, whereas the right hand side of the inequality is the post-announcement stock price if R is in control. I's valuation is so low in case II that he can be offered a bid below the post-announcement price and still be better off than if he were to hold on to the block. For completeness, it can also be shown that (5) guarantees that I cannot be offered a block price below P^0.

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 restrictions on the environment surrounding them. Here we discuss some of the main restrictions and how we deal with them.

The concavity of $d_X(.)$ in Assumption 3 guarantees that 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 (see also Masulis et al., 2008).

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. We deal with these assumptions via sample selection. 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.

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 premiums and discounts in a 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 $\left(1-\phi_R^{\gamma}\right)v_R - b^*$. 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. In addition, we observe in our sample of privately negotiated transactions that the size of the block being traded equals the size of the largest existing block.

The other result is that tender offers on targets with minority controlling blocks are an off-equilibrium outcome and should not be observed. As a preliminary test of the BGP model, 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

3.1 Identification

The identification strategy is to use data on observable variables – the block premium, the price impact and the block size – to infer properties of unobservable variables – the extraction rate, the private benefits and the change in security values. We estimate the model using an exactly identified system of equations. Using the first order condition (1), we write the optimal extraction rate, ϕ_X^{α}, and private benefits, d_X^{α}, as a function of the block size and characteristics associated with I, R and the target firm. Using equation (2), we recover the change in security benefits, v_R/v_I, conditional on extraction rates. We use these equations to eliminate all endogenous, unobserved variables arriving at a single equation that describes the theoretical block premium as a function of the structural parameters, which can then be compared with data on the block premium.

To further explain how the model identifies security benefits from private benefits consider the locus of points in the space $(v_R/v_I, d_R^\alpha)$ that keep the price impact constant, i.e., the iso-price-impact curve, and the locus of points in the space $(v_R/v_I, d_R^\alpha)$ that keep the block premium constant, i.e., the iso-block-premium curve. We trace out these curves assuming a specific functional form for d_X that we describe below. These curves are upward sloping. Appendix A shows that to keep price impact constant a higher change in security benefits must be met with higher private benefits. Likewise for the block premium: What makes the difference $v_I - (1 - \phi_R^\alpha)\, v_R$ larger, makes I a more effective competitor and increases the block premium. The main result that we show in Appendix A is that in the BGP model the slope of the iso-price-impact curve is steeper than that of the iso-block-premium curve. This result relies on the fact that the price impact is significantly more sensitive to changes in private benefits (in absolute value) than the block premium. Intuitively, the price impact depends on the *level* of extraction, ϕ_R^α, whereas the block premium depends on the *difference* in extraction rates after a negotiated trade or a tender offer, i.e., $\phi_R^\alpha - \phi_R^\beta$. The point of intersection of both curves gives the unique values for v_R/v_I and d_R^α that solve for values of the block premium and the price impact.

Consider two deals in the data, A and B, with identical block size and price impact, but deal A has a smaller block premium than deal B. Figure 1 plots the iso-curves for both deals. Clearly, both deals must be along the same iso-price-impact curve. However, the iso-block-premium curve for deal B, labeled as BP_B, is to the right and below the iso-block-premium curve for deal A, labeled as BP_A, because for each v_R/v_I, the block premium increases with private benefits to R. Surprisingly, the model infers that deal B, which has the *larger* block premium, also has *lower* private benefits and lower v_R/v_I.

<INSERT FIGURE 1 ABOUT HERE>

Consider now two deals in the data, call them C and D, that have identical block premium and block size, but deal C has higher price impact than deal D. Figure 2 plots the iso-curves for deals C and D. Clearly, both deals must be along the same iso-block-premium curve. The iso-price-impact curve for deal C, labeled as PI_C, is to the left and above the iso-price-impact curve for deal D, labeled as PI_D, because for each d_R^α, the price impact increases with v_R/v_I. We conclude that the model infers that the increase in security benefits is *less* pronounced in deal C, which has the *higher* price impact. The model also infers that private benefits to R are lower in deal C.[3]

[3] Identification changes somewhat when comparing deals with identical block *discount* and block size, but different price impact. Appendix A treats model identification in the previous case, and when only deal size differs across deals, and provides a mathematical derivation of the arguments above.

<INSERT FIGURE 2 ABOUT HERE>

Our approach to model variation in private benefits and in security benefits uses the model inferred variation in private benefits (from the observed variation in block premium and price impact as described above) to determine how private benefits vary with target firm and deal characteristics. Only the variation in private benefits that can be explained with these characteristics is then allowed in the procedure described above. That is, the effect of target firm and deal characteristics on private benefits is estimated jointly with the remaining estimation, constraining the predicted variation and size in estimated private benefits of control.

3.2 Solving for the Endogenous Unobserved Variables

We specify a function d_X that is 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. Each deal is indexed by $i = 1, ..., N$, where N is the total number 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. The parameterized private benefits function is

$$d_{X,i}(\phi) \equiv d\left(\phi; \boldsymbol{\eta}^{X\prime}\mathbf{w}_i^X + \boldsymbol{\eta}'\mathbf{w}_i\right), \tag{6}$$

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.

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, which equal $d_X^{\alpha} v_X$, and share values, which equal $(1 - \phi_X^{\alpha}) v_X$. This consistency requirement implies that changes in the characteristics in $\mathbf{w}_i^X$ and $\mathbf{w}_i$ that affect private benefits must also affect share values and the price impact. Imposing this consistency cannot be done outside a structural model estimation and is ignored in all the previous literature.

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. Noting that in the BGP model the block is always traded intact,

$$P_i^1 = \left(1 - d_{R,i}'^{-1}(\alpha_i)\right) v_{R,i}, \text{ and } P_i^0 = \left(1 - d_{I,i}'^{-1}(\alpha_i)\right) v_{I,i}, \tag{7}$$

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

$$\omega_i \equiv \frac{v_{Ii}}{v_{Ri}} = \min\left\{\frac{P_i^0}{P_i^1}\frac{1 - d_{R,i}'^{-1}(\alpha_i)}{1 - d_{I,i}'^{-1}(\alpha_i)}, 1\right\}. \tag{8}$$

The estimation strategy can over predict the size of the price impact because when Assumption 2 binds, and $\omega_i = 1$,[4] the model's estimated price impact is

$$\frac{\widehat{P_i^1}}{P_i^0} = \frac{1 - d'^{-1}_{R,i}(\alpha_i)}{1 - d'^{-1}_{I,i}(\alpha_i)} \frac{1}{\hat{\omega}_i} \geq \frac{P_i^1}{P_i^0}. \tag{9}$$

The ability to disentangle the change in security benefits from the price impact relies on the assumption that information is complete and on 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, and we leave it for future work to determine the implications of such an assumption. To capture differences in efficiency in the extraction of private benefits across agents we rely on differences in characteristics, $\mathbf{w}_i^R, \mathbf{w}_i^I, \mathbf{w}_i$, as opposed to differences in sensitivities to characteristics, $\boldsymbol{\eta}^X$ and $\boldsymbol{\eta}$. 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 a priori clear theoretical motivation to have the function d_X differ between I and R more than we already allow it to.

Our approach sidesteps the difficult problem of (simultaneously) modeling v_{Ii}/v_{Ri}. The concern is that if v_{Ii}/v_{Ri} depends on some of the same characteristics already in $\mathbf{w}_i^X$ or $\mathbf{w}_i$, then estimates of the elasticities $\boldsymbol{\eta}^X$ and $\boldsymbol{\eta}$ have an omitted variables-type bias. In Appendix B, we show that treating the ratio v_{Ii}/v_{Ri} as given does not bias the estimates of $\boldsymbol{\eta}^X$ and $\boldsymbol{\eta}$. The intuition for the result is that any dependence implicit in v_{Ii}/v_{Ri} has to be consistent with (8), which we already impose. The implication of this result is that we do not need to be explicit about the sources of security benefits present in each deal: Whether gains in security benefits arise from greater production efficiency, greater efficiency at monitoring management, or greater ability to procure contracts is irrelevant to the estimation of private benefits given our empirical approach. The only drawback is that while our estimates of $\boldsymbol{\eta}^X$ and $\boldsymbol{\eta}$ capture the comparative statics of private benefits with respect to the characteristics in $\mathbf{w}_i^X$ or $\mathbf{w}_i$, they do not capture the comparative statics of the block premium.

3.3 Solving for the Block Premium

We are now able to construct the theoretical value of the block premium as a function of exogenous variables only. Following Barclay and Holderness (1989), we solve for the percentage block premium. 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

[4]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 1, R values the block more than I.

two additional endogenous variables, β^* and b^*, using the optimal bidding conditions in the tender offer: $b^* = v_{I,i}$ and

$$\phi_{R,i}^{\beta^*} = 1 - \frac{v_{I,i}}{v_{R,i}} = 1 - \omega_i. \tag{10}$$

Let BP_i^{eff} be the percentage block premium under effective competition. Using (3), (7), and the definitions of b^* and Π, we obtain:

$$BP_i^{eff} \equiv (1-\psi)\left(\frac{P_i^0}{P_i^1\left(1-d_R'^{-1}(\alpha_i)\right)} - 1\right) + \psi \frac{d_R\left(\phi_{R,i}^{\alpha}\right) - d_R\left(\phi_{R,i}^{\beta^*}\right)}{\alpha_i\left(1-d_R'^{-1}(\alpha_i)\right)}. \tag{11}$$

For Case II of ineffective competition, we 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 Subsection 3.5, we provide a quasi closed-form solution for b_i^* and γ_i obtained with our specific choice for d_X. 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

$$BP_i^{ineff} \equiv \frac{\psi\left(d_R\left(\phi_{R,i}^{\alpha}\right) - d_R\left(\phi_{R,i}^{\gamma}\right)\right) + \gamma_i\left(\frac{b_i^*}{v_{R,i}} - \left(1-\phi_{R,i}^{\gamma}\right)\right) + (1-\psi)\,\alpha_i\left(\phi_{R,i}^{\alpha} - \phi_{R,i}^{\gamma}\right)}{\alpha_i\left(1-d_R'^{-1}\left(\phi_{R,i}^{\alpha}\right)\right)}. \tag{12}$$

There are several advantages of using the percentage block premium as a dependent variable. First, in the BGP model the percentage block premium eliminates all level effects. Second, equations (11) and (12) 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 (8) and of a simple implementation of Assumption 2.

3.4 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 premiums and discounts, a nonzero constant implies overpayment or underpayment, net of transactions costs, by R *relative to the BGP benchmark*. 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

$$\varepsilon_i \equiv y_i - c - \mathbf{1}_i^{eff} BP_i^{eff} - \mathbf{1}_i^{ineff} BP_i^{ineff}. \tag{13}$$

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.

We estimate the parameter vector $\boldsymbol{\theta}$ 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

$$\min_{\theta} \boldsymbol{\varepsilon}(\boldsymbol{\theta})' \boldsymbol{\Omega}^{-1} \boldsymbol{\varepsilon}(\boldsymbol{\theta}), \tag{14}$$

subject to $\psi \in [0, 1]$ for all $i = 1, ..., N$. The constraint associated with Assumption 2 is imposed via (8). Assumption 3 is discussed in the next subsection, where we model the private benefits function. We estimate the model without imposing Assumption 1 under the belief that if a deal goes through the acquirer must value the block more than the seller and verify ex-post that the assumption holds at the minimizer.

There are two main advantages of using a FGNLS 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 (14) 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 (14) using $\hat{\boldsymbol{\Omega}}$. This procedure is explained in detail in Appendix C.

3.5 Functional Form for Private Benefits

We specify a constant elasticity function for private benefits,

$$d_X(\phi) = \sigma^{-1} \delta_X \phi^{\sigma}, \tag{15}$$

where σ is the elasticity of private benefits to the extraction rate. To guarantee strict monotonicity and concavity $\sigma \in (0, 1)$. 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 allowed 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 premium.

Assumption 3 provides conditions that guarantee 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 specification (15). The unique optimal rate of extraction that solves (1) is:

$$\phi_X^{\alpha} = \left(\frac{\delta_X}{\alpha}\right)^{\frac{1}{1-\sigma}}, \tag{16}$$

where our choice of δ_X guarantees that $\phi_X^\alpha \in (0,1)$. We can also compute the optimal level of private benefits, $d_X^\alpha = \sigma^{-1}\delta_X^{\frac{1}{1-\sigma}}\alpha^{-\frac{\sigma}{1-\sigma}}$.

To understand how the model identifies the parameter σ note that σ regulates how changes in δ_X affect private benefits. A higher value of σ implies that the same cross sectional variation in δ_X is able to generate a greater cross-sectional variation in d_X (which in turn leads to cross-sectional variation in the block premium and price impact). In the extreme of $\sigma \to 1$, the model displays the most cross-sectional variation in private benefits with $d_X = \delta_X$ if $\delta_X > \alpha$ and $d_X = 0$ otherwise.

The chosen d_X function has several properties. First, because of concavity ($\sigma < 1$), the extraction rate decreases with the block size, consistent with Jensen's incentive alignment effect. 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 $\phi_X^\alpha - d_X^\alpha = \left(1 - \sigma^{-1}\alpha\right)\phi_X^\alpha$ is positive if and only if $\alpha < \sigma$. Because $\alpha < 1/2$, we must then have that $\sigma \geq 1/2$.[5] In our estimations, we constrain the value of σ to the interval $[1/2, 1)$. While the inefficiency with which X extracts private benefits depends on other arguments, e.g., on δ_X, the *relative inefficiency* of private benefits depends only on σ and the block size. Using the first order condition (1), the relative inefficiency evaluated at the optimal extraction rate is

$$\frac{\phi_X^\alpha - d_X^\alpha}{d_X^\alpha} = \frac{\sigma}{\alpha} - 1. \tag{17}$$

The relative inefficiency measures the cost-to-benefit ratio of private benefits extraction. We provide estimates of the relative inefficiency of private benefits extraction below.

Third, because $\delta_X \leq \underline{\alpha} \leq \alpha_i$, we have $d_X(\phi) \leq \sigma^{-1}\underline{\alpha}$. Therefore, the maximum predicted private benefits depend on the choice of $\underline{\alpha}$ and on the elasticity parameter to be estimated, σ. With $\sigma \geq 1/2$, maximum private benefits are constrained by $2\underline{\alpha}$. Intuitively, the incentive alignment effect present in the private benefits function implies that any lower bound on ownership for control constitutes an upper bound on private benefits of control. In our data, $\underline{\alpha} = 0.1$ and the lowest block size is 12%, so private benefits are capped at 24%. The lower bound that we impose in the data is somewhat arbitrary, implying necessarily that the upper bound on private benefits is also arbitrary. However, we are constrained in choosing minority blocks that are also controlling blocks and the 10% threshold is common in the literature (e.g., Dyck and Zingales, 2004).

[5] In general private benefits are inefficient if, and only if, $\phi - d_X(\phi) > 0$, or $\phi > (\delta_X/\sigma)^{1/(1-\sigma)}$. Because $\alpha < 1/2 \leq \sigma$, $\phi_X^\alpha > 2^{1/(1-\sigma)}\delta_X^{1/(1-\sigma)} > (\delta_X/\sigma)^{1/(1-\sigma)}$, which means that extraction rates for any 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 5, 3 and 1 cases out of 120 for three different specifications of δ_X. The extraction rates are so low in these cases that they have no significant adverse effect on the results.

Fourth, the private benefits function allows for larger cross-sectional variation in extraction rates for smaller blocks. The extraction rate takes values in between zero and $(\underline{\alpha}/\alpha)^{1/(1-\sigma)}$ as δ_X takes values in $(0, \underline{\alpha})$. Because of the incentive alignment effect, the upper bound extraction rate decreases with α, but at a slower rate when α is larger. For $\sigma = 1/2$ and $\underline{\alpha} = 0.1$, the upper bound goes from 1 to 0.1 as the block size increases from 0.1 to 0.3. Implicitly, equation (15) assumes that the incentive role of larger blocks kicks in at reasonably low values of α. It is noteworthy 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 $60\% = (34\% - 10\%)/(50\% - 10\%)$.

Finally, the private benefits function (15) allows for a quasi close-form solution to b^* and γ in Case II of ineffective competition, which we use to implement (12). The proof of the proposition is in Appendix D.

Proposition 3 *Assume that the private benefits function is of the constant elasticity form, $d_X(\phi) = \sigma^{-1}\delta_X\phi^{\sigma}$. A solution to the tender offer game under case II of ineffective competition exists and is unique.*

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 variables used. The details are given in Table I.

<INSERT TABLE I ABOUT HERE>

4.1 Sample Selection

We use all US block trades in Thomson's *Mergers and Acquisitions database* between 1/1/1990 and 31/08/2006, where $10\% < \alpha < 50\%$. Except for Mikkelson and Regassa (1991), all previous studies of the block premium combine minority with majority blocks. What motivates our departure is the observation that the existence of alternative forms of control contest in the presence of minority blocks suggest that these blocks are priced differently. Other than this aspect, we follow Dyck and Zingales, who also use Thomson (formerly known as SDC), in the design of the data selection. To focus on trades leading to a control change, we 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.[6] In addition, we keep only those trades where the block is the largest block held and confirm that the trade leads to a control change using

[6] 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.

news about the deal. After applying these filters we have a sample of 250 deals. Our sample has more trades in total, and per year, than Dyck and Zingales' (2004) US sample of 46 trades. This is because Dyck and Zingales restrict their search universe to the first 20 trades in each year in order to counter Thomson's US oversampling bias and achieve a balanced cross-country sample.

We exclude deals where the block is paid with instruments that may lead to further acquisition of shares by the buyer (e.g., warrants). 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. This filter leads to a further drop of 103 deals. Likewise, we exclude 14 deals where the buyer subsequently makes a tender offer to acquire more shares.

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, and to the CRSP tapes. Failure to match to either data set results in the exclusion of 13 other deals, leaving 120 observations. From CRSP we obtain prices 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 measure over the event window for changes in systematic risk according to the market model.

Albuquerque and Schroth (2009) contains a detailed description of the selection procedure including a discussion of deals that were excluded in a first pass at the Thomson selection (e.g., white knights, share repurchases, private placement of newly issued shares, dual class shares) and the potential biases such exclusion may introduce in the sample.

4.2 Block Premium and Price Impact

The percentage block premium captures the acquirer's payment over and above the new target value as perceived by dispersed shareholders (Barclay and Holderness, 1989). Define P^1 as the stock price two trading days after the public announcement of the block trade, adjusted using a market model of returns. As in Dyck and Zingales (2004), the two-trading-day-post-announcement price fully internalizes any gains from the change in control.

For the price impact, P^0 is chosen so that it precedes any build up of expectations and information leakage about the trade; such price run up should be attributable to the new blockholder. Our data, and evidence from Dyck and Zingales (2004), support the use of the stock exchange price 21 trading days before the 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, and 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>

Block often trade at a discount. Table II shows that half of the blocks in our sample trade at a discount with an average discount of 24% of the post-announcement market-adjusted price. 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, and with more recent samples, report 32% of discounts, and Dyck and Zingales, 2004, report 41% of discounts).[7] One notable property of block discounts is that 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 premiums show a positive price impact (untabulated).

4.3 Determinants of Private Benefits

We turn to the determinants of private benefits of control, embedded in δ_X. 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: $\mathbf{w}_i$

A 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: The proportion of the target's cash and marketable securities to the target's assets, and 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 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

[7]Discounts are also preeminent in studies of the voting premium (e.g., Lease, McConnell and Mikkelson, 1983, and Zingales, 1995).

other hand, the agent in control may derive more pecuniary and non-pecuniary benefits from a larger firm. A positive association between private benefits as a fraction of security benefits and firm size may thus occur if the elasticity of private benefits with respect to firm size is greater than one in absolute value.

We hypothesize that the target's recent performance is positively associated with private benefits because poor performance may bring the firm closer to financial distress, leading to increased scrutiny. We measure the target's recent performance by the target firm's average daily returns for the year ending two months before the trade. Following Himmelberg et al. (1999), we hypothesize that it is easier to extract private benefits from a firm with relatively more intangible assets. Finally, we consider the impact of the Sarbanes-Oxley Act (SOX) on the ability of firms to extract private benefits by including a dummy variable that takes the value of one for trades occurring after July of 2002, when SOX became law.

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

The block purchaser may derive more private benefits if he has already acquired specific knowledge about how to extract such benefits within the firm. On the other hand, the block purchaser that has been previously active in the target may also have incentives that are aligned with those of the company. 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.

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 4-digit SIC 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.

The private 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.

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.

The correlation matrix of the various characteristics discussed above indicates low collinearity between the various determinants of private benefits. The highest correlation is 0.27

between the corporation dummy and the ratio of target's to acquirer's cash (untabulated).

5 Results

5.1 Overall Model Fit

Panel A of Table III 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 we cannot reject the joint significance of ψ, $\boldsymbol{\eta}^R$ and $\boldsymbol{\eta}^I$ (p-values below 0.01) and that the R^2 coefficient is between 0.07 and 0.1. Even after we include characteristics commonly believed to affect private benefits, there is still a large amount of unexplained block premium variation, which calls for more research to explain the cross section of private benefits.

<INSERT TABLE III ABOUT HERE>

The various specifications deliver qualitatively similar estimates. The constant in the regression model is estimated to be significant and with point estimates between 7% and 15% of the block value. 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 $2\% = .3 \times .07$ and $5\% = .3 \times .15$, for an average block size of 30% (see Table II). Our estimates of overpayment are lower though than estimates found for M&As of public target companies.[8] The seller's bargaining power is significant in specifications 1 and 2, and has point estimates between 0.29 and 0.49 that are not statistically different than 0.5. The table also presents estimates of σ close to 0.5 although only for specification 1 do we reject that the estimate is not 0.5. At an average estimated σ of 0.53, the relative inefficiency of private benefits extraction (see equation (17)) is $0.53/0.3 - 1 = 0.76$ for an average block of size 30%: Each \$1 of private benefits is estimated to cost \$1.76 to shareholders.

Panel B of Table III 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 replicating these features of the data, even though the estimation did not target any one of them specifically. The predicted average block premium is lower than its sample counterpart, though not statistically different from it in specifications 1 and 3.[9] Focusing only on blocks that trade at a discount, across all specifications we cannot reject

[8] 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.

[9] 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 (14) under FGNLS. Using (13), and letting f_i denote

that the predicted block discount equals the sample average discount. Moreover, the BGP model predicts that all discounts are associated with positive price impact compared to the data where 78% of discounts are associated with positive price impact.[10]

The model predicts discounts in 13-20% of block trades, compared to 50% in the actual data. While our estimation of the BGP model moves us closer to understanding why discounts occur, a significant portion of discounts cannot be accounted for. The inability to explain discounts is due mostly to the presence of the constant term. Panel B of Table III shows that excluding the constant, the model predicts a much higher fraction of discounts, which we cannot reject to be equal to the fraction of discounts in the data. This point can be made more transparent with Figure 3.[11] The figure plots the actual block premium against the predicted block premium and identifies each observation as a case of effective competition or as Case I or II of ineffective competition. The 45 degree line through the origin –depicting the perfect fit– is also plotted. The figure includes a displaced origin where the actual block premium equals zero and the predicted block premium equals $\hat{c}$. Shifting the axis in this way places all of the predicted discounts under BGP (which excludes the constant) to the left of the vertical dotted line. The figure shows a large number of predicted discounts, excluding the constant. The figure also shows that a disproportionate number of actual discounts (premiums) occur when the model predicts the seller to be an ineffective (effective) competitor. This observation is consistent with BGP's prediction that the sign of the block premium derives from the seller's ability to fight a tender offer.

<INSERT FIGURE 3 ABOUT HERE>

In addition, we estimate Logit models to determine what makes an incumbent an effective competitor. In untabulated results, we find two significant predictors of effective competition: The target firm's average past performance predicts a greater likelihood that the seller is an effective competitor whereas the block size predicts the reverse. The findings are intuitive. Firms with high past performance have high pre-announcement price, P_0. Because P_0 is a proxy for v_I, firms with high past performance are more likely to be effective competitors (i.e., have higher $v_I - (1-\phi_R^\alpha)\,v_R$). Also, larger blocks imply greater incentive alignment

the third and fourth term on the right hand side of the expression, we can write the first order condition associated with the constant as $\hat{c} = \sum_i w_i \left(y_i - \hat{f}_i \right)$ where w_i are weights inversely related to the error variances. Hence, $\hat{c} + N^{-1} \sum_i \hat{f}_i$ is not equal to the sample mean of the block premium unless $w_i = N^{-1}$. Because the distribution of the block premium is positively skewed, the first pass residual that we use to estimate the error variances is large for those observations that would push the mean block premium up. Thus, we tend to underpredict the mean block premium.

[10] Under ineffective competition $P^0 = (1-\phi_I^\alpha)\,v_I < v_I < (1-\phi_R^\alpha)\,v_R = P^1$, i.e., discounts are associated with positive price impact.

[11] 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.

and smaller extraction rates, ϕ_R^α, which implies that the seller is less likely to be an effective competitor.

We verify ex-post whether our estimates satisfy Assumption 1. In untabulated results, we find 7 (5) violations of Assumption 1 in specification 1 (2). We find 18 violations of Assumption 1 in specification 3, but a mean violation of 0.8%. The fact that none of our results vary considerably across the three specifications is confirmation that the violations of Assumption 1 have no material impact.

5.2 Private Benefits of Control

We use the estimates in Table III to compute the implied increase in security benefits, the extraction rates and the level of private benefits of control. These are reported in Table IV. The table first reports the estimated average increase in security benefits, v_R/v_I. The point estimate is about 19% across specifications. In other words, firms' intrinsic value is on average 19% higher under the block buyer than under the incumbent blockholder. This estimate confirms the view that blockholders –and the identity of specific blockholders– can have a large, positive impact on firm value. Moreover, because buyers have higher extraction rates on average than sellers, we argue that the price impact can be used as a lower bound for the increase in security benefits.

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 3.2% and 3.7% of the firm's equity value. This is a sizable component of the block's value. Recall that the value of a block is $\alpha\,(1-\phi_X)\,v_X + d_X^\alpha v_X$. Thus, for an average block of 30%, private benefits represent $10\% \approx d_X^\alpha/\,(1-\phi_X)\,/\,[\alpha + d_X^\alpha/\,(1-\phi_X)] = .032/(.3+.032)$ of total block value. Our estimates for private benefits 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).

The average private benefits does not give a complete picture of the distribution of private benefits across firms. Panels (a) and (b) of Figure 4 give the predicted histograms of private benefits for sellers and buyers. These are very similar, displaying a positive skew: 35% (40%) of all buyers have less than 0.1% (1%) of private benefits as a fraction of security benefits. The maximum private benefits are 15% of security benefits, which occur in specification 2.

<INSERT TABLE IV ABOUT HERE>

<INSERT FIGURE 4 ABOUT HERE>

5.3 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 exclude 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. How should the results above be interpreted 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 E.

Proposition 4 *If private benefits of incumbents and rivals have the same unconditional mean, i.e.,* $E\left[d_I^{\alpha}\right] = E\left[d_R^{\alpha}\right] = E\left[d^{\alpha}\right]$, *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,*

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

The intuition for this result is that when a block is traded it is likely that the buyer has a greater than average ability to extract private benefits and also that the seller has a lower than average ability to extract private benefits. We conclude from Proposition 4 and Table IV that mean private benefits of control as a fraction of security benefits are estimated to lie between approximately 3% and 4%.

5.4 Determinants of Private Benefits of Control

To understand the significance of the parameters in Table III, we proceed to compute conditional elasticities of private benefits of control with respect to the various characteristics. We focus on private benefits to R. Because the distribution of private benefits is truncated at zero, we estimate a censored regression of the estimated private benefits as a fraction of equity, $d_{R,i}/\left(1-\phi_{R,i}\right)$, on the various characteristics, $\mathbf{w}_i^R$ and $\mathbf{w}_i$, and the block size, α_i. The conditional elasticities are given by the marginal effect associated with each characteristic 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. A 1% increase in block size leads to a statistically significant change in private benefits as of fraction of equity between -1.06% and -1.22%, 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 positive effect on private benefits (elasticity between .05 and .14). The estimations indicate that this effect does not depend on whether the target's cash relative to the buyer's cash is also high. Short-term debt has a significantly negative effect on private benefits (elasticity between $-.11$ to $-.25$). The similarity of the elasticities for cash and short-term debt suggests that cash and short-term debt are substitutes in controlling the extraction of private benefits and that short-term debt acts as a hard claim. These results provide support for Jensen's hypothesis that debt reduces the agency cost of free cash flow. In contrast to our results, previous work has failed to find a systematic effect from either cash or debt (e.g., Barclay and Holderness, 1989). In addition, in our sample as well, ordinary least squares regressions of the block premium on various controls show no effect of cash or short term debt (see below). In a study of the voting premium in Brazil, Carvalhal da Silva and Subrahmanyam (2007) find that the voting premium increases with leverage.

<INSERT TABLE V ABOUT HERE>

Private benefits as a fraction of equity increase with asset intangibility (elasticity of .2). Dyck and Zingales (2004) also find that the block premium increases with the level of intangible assets, though in Dyck and Zingales the effect is insignificant.

In the larger specifications 2 and 3, 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 Barclay and Holderness (1989) find a significant relationship between firm size and the block premium. The impact of firm size on the voting premium is controversial (e.g., Zingales, 1995, and Guadalupe and Pérez-González, 2005).

Private benefits display significant positive variation with respect to past performance (elasticities between .16 and .21), supporting the prediction that firms with poor performance may be under increased monitoring. Barclay and Holderness (1989) find that past performance leads to higher 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.

The corporate acquirer dummy cannot be well estimated in the model and its significance and sign change across all three specifications. Also, block buyers with minority holdings before the trade (toeholds) or in the same industry do not appear to be more effective in extracting benefits than buyers with no previous holdings or in different industries. 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.

Finally, specification 3 suggests that SOX has had a significant impact on private benefits. Post-SOX deals show 46% less private benefits of control on average than pre-SOX deals. This is evidence that SOX and, more generally, the legal environment, constrain the ability to extract private benefits (see also Holderness and Sheehan, 2000). This, however, is a crude attempt at capturing country-wide governance effects as its effect may be overstated by concurrent changes in the overall stock market.[12]

[12] We also analyze the effect of firm level governance. Unfortunately, our sample has only 27 matches

6 Discussion of Alternative Models of Block Pricing

This section discusses models 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 1-3 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:

$$\Pi = \frac{(1-\psi)\, d_I^\alpha v_I + \psi d_R^\alpha v_R}{\alpha} - (1-\psi)\left[(1-\phi_R^\alpha)\, v_R - (1-\phi_I^\alpha)\, v_I\right]. \tag{18}$$

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 a large positive increase in share value and low bargaining power for I. Because a positive price impact is a necessary condition for a discount, we conclude that this model also overpredicts the number of discounts which occur with positive price impact.

To further assess model (18), 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 ordinary least squares (OLS) but also instrumental variables (IV) to account for possible endogeneity of the price impact. The results are displayed in Table VI. The table reveals that most parameter estimates are insignificant, with some having the wrong sign (e.g., cash to assets), and as is typical in the literature that the R^2's are quite small.

with the GIM index (IRRC's Governance database) and 10 matches with IRRC's directors data, ruling out these popular data sources. We thus manually matched our firms to the respective electronic Definition 14A statements in EDGAR and obtained a full description of all the directors for 64 of them. The estimations reveal qualitatively similar results and a significant negative relation between private benefits and the proportion of independent directors. However, the loss of degrees of freedom leads to significant loss of power in estimating other determinants of private benefits.

<INSERT TABLE VI ABOUT HERE>

The table reports estimates of ψ (obtained from the coefficient associated with the price impact adjusted for the block size) between 0.67 and 0.72 in the OLS regressions and over 1 in the IV regression (see also Dyck and Zingales, 2004). 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 (18)) are negative. Indeed, at the bottom of the table we report that a large number of observations have estimated negative private benefits and that we cannot reject that mean private benefits is zero. 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

Block premiums can be the result of overpayment by the block acquirer due to non-pecuniary benefits, systematic overconfidence of buyers or the winner's curse. The results above contain evidence consistent with the overpayment hypothesis, in contrast with those in Barclay and Holderness (1989).

To analyze the overpayment hypothesis, Barclay and Holderness (1989) and Dyck and Zingales (2004) study the stock price reaction of publicly traded acquirers upon the announcement of the block trade. The returns to these firms around the announcement are statistically insignificant indicating no overpayment. We obtain the same result for the public corporations in our sample (available upon request). However, at least based on our sample, this evidence is not inconsistent with our finding of overpayment. First, 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) test toward rejecting overpayment because public corporations tend to pay lower premiums 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%. Second, an overpayment with respect to the BGP equilibrium price need not imply an overpayment with respect to the acquirer's surplus. Our estimations of specifications 1 through 3 above imply that between 44% and 68% of all acquirers overpay, but none of the publicly traded acquirers do. Moreover, the average acquirer's surplus for the full sample is either positive and significant or negative but insignificant, whereas it is always positive and significant for the publicly traded acquirers (we measure the acquirer's surplus as the total block value to the buyer minus the block price normalized by the block value).

Overpayment could be an omitted variable problem. For example, large corporate acquirer's may pay more for the block with respect to smaller corporations or individuals when buying from risk averse sellers under the assumptions that shareholders of large, public corporations can effectively diversify their portfolios using the capital market, whereas the block may overexpose individuals 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.

6.3 Other Models

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, blocks that trade at a discount (premium) should show a negative (positive) price impact. However, in our sample, as in others, over 78% of discounts show a positive price impact.

Another reason for a block premium is that it takes time, and is costly, to build a controlling minority block.[13] We should then observe that, all else constant, larger minority blocks carry a larger block premium. To evaluate this hypothesis, we regress the residuals from the estimations in specifications 1 through 3 above on the block size and other variables. We find that the coefficient on the block size is often positive but 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 that 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

[13] 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.

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, suppose the blockholder owns restricted stock, perhaps 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 may be successful at buying at a discount because the seller is compensated by the increase in value of the restricted stock. To investigate this possibility we match 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 investigate a possible cause of underestimation of the size of private benefits of control in previous approaches.

The paper shows that there are two crucial elements in fitting the model to the data. One is the change in the target firm's stock market 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 trade at a premium or discount. Future research should 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.

This study represents a first step toward estimating the private benefits of control using a structural model. Our model ignores several features of the data, such as risk neutrality of controlling shareholders. While we have explored a few alternate models, we have not explored all possible models, and it is possible that future research will produce a model that can fit the data better and yet produce smaller estimates of private benefits of control.

Appendix A: Identification

The derivations below assume $\sigma = 1/2$ in equation (15). We measure changes in private benefits as caused by changes in δ_R. The discussion assumes that δ_I is constant across deals. Below we return to this last assumption. The comparative statics for price impact are:

$$\begin{aligned}
\frac{\partial}{\partial \frac{v_{Ri}}{v_{Ii}}}\left(\frac{P_i^1}{P_i^0}\right) &= \frac{1-\phi_{R,i}(\alpha)}{1-\phi_{I,i}(\alpha)} > 0, \\
\frac{\partial}{\partial \delta_{Ri}}\left(\frac{P_i^1}{P_i^0}\right) &= -\frac{1}{1-\phi_{I,i}(\alpha)} 2 \frac{\delta_R}{\alpha^2}\frac{v_{Ri}}{v_{Ii}} < 0, \\
\frac{\partial}{\partial \alpha}\left(\frac{P_i^1}{P_i^0}\right) &= \frac{2}{\alpha}\frac{\phi_{R,i}(\alpha)-\phi_{I,i}(\alpha)}{\left[1-\phi_{I,i}(\alpha)\right]^2}\frac{v_{Ri}}{v_{Ii}}.
\end{aligned}$$

For a cleaner analysis of the comparative statics of the block premium, we use a slightly different measure of the block premium than the one used in the empirical estimations. Under effective competition, the block premium equals:

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

with $\phi_R^{\beta^*} = 1 - \frac{v_{Ii}}{v_{Ri}}$. We have that:

$$\begin{aligned}
\frac{\partial}{\partial \frac{v_{Ri}}{v_{Ii}}}\left(\frac{\alpha \Pi}{v_R}\right) &= -\psi \delta_R \left(\phi^{\beta^*}\right)^{-1/2}\left(\frac{v_{Ii}}{v_{Ri}}\right)^2 - (1-\psi)\,\alpha\left(\frac{v_{Ii}}{v_{Ri}}\right)^2 < 0, \\
\frac{\partial}{\partial \delta_{Ri}}\left(\frac{\alpha \Pi}{v_R}\right) &= \psi\left(2d_X^{\alpha} - d_R^{\beta^*}\right)\frac{1}{\delta_R} + (1-\psi)\, 2\frac{\delta_R}{\alpha} > 0, \\
\frac{\partial}{\partial \alpha}\left(\frac{\alpha \Pi}{v_R}\right) &= -\frac{1}{\alpha}\psi d_R^{\alpha} - (1-\psi)\left(\phi_R^{\alpha} + \phi_R^{\beta^*}\right) < 0.
\end{aligned}$$

To use this information for identification, imagine two deals in the data – call them A and B – that have identical price impact and block size, but deal A has a larger block premium than deal B, and that both premiums are positive. The model infers that: The acquirer in deal A, R_A, is able to generate more (less) private benefits, in which case, to keep price impact from decreasing (increasing), R_A must also generate a higher (lower) increase in security benefits than R_B. Because, the slope of the iso-price-impact curve is steeper than that of the iso-block-premium curve, the deal with higher private benefits and security benefits must have lower block premium. To demonstrate this result, compute the total differential of the price impact:

$$dp = \frac{\partial p}{\partial \delta_R} d\delta_R + \frac{\partial p}{\partial \frac{v_R}{v_I}} d\frac{v_R}{v_I}.$$

Set $dp = 0$, solve for $d\frac{v_R}{v_I}$ and substitute in the total differential of the block premium (bp),

$$\begin{aligned} dbp &= \frac{\partial bp}{\partial \delta_R} d\delta_R + \frac{\partial bp}{\partial \frac{v_R}{v_I}} d\frac{v_R}{v_I} \\ &= \left(\frac{\partial bp}{\partial \delta_R} - \frac{\partial bp}{\partial \frac{v_R}{v_I}} \left(\frac{\partial p}{\partial \delta_R} \Big/ \frac{\partial p}{\partial \frac{v_R}{v_I}} \right) \right) d\delta_R. \end{aligned}$$

An increase in private benefits leads to a decrease in the block premium keeping price impact constant iff

$$- \frac{\partial bp}{\partial \frac{v_R}{v_I}} \Big/ \frac{\partial bp}{\partial \delta_R} = \left. \frac{d\delta_R}{d\frac{v_R}{v_I}} \right|_{\overline{bp}} > \left. \frac{d\delta_R}{d\frac{v_R}{v_I}} \right|_{\overline{p}} = - \frac{\partial p}{\partial \frac{v_R}{v_I}} \Big/ \frac{\partial p}{\partial \delta_R}.$$

Using the partial derivatives above, that $\beta^* = \delta_R \left(\phi_R^{\beta^*} \right)^{-1/2}$ from the first order condition, and $\beta^* > \alpha$, we can show that this inequality always holds. The inequality, states that the slope of the iso-price-impact curve in $\left(\frac{v_R}{v_I}, \delta_R \right)$ space is steeper than that of the iso-block-premium curve.

A similar reasoning applies for two deals that have identical positive block premium and block size, but deal A has a larger price impact than deal B. Likewise, if deal A has both higher price impact and higher block premium than deal B then deal A is inferred to have both lower security benefits and private benefits. Specifically, higher price impact and higher security benefits are feasible if and only if $d\delta_R < 0$ and

$$- \frac{\partial bp}{\partial \frac{v_R}{v_I}} \Big/ \frac{\partial bp}{\partial \delta_R} d\delta_R < d\frac{v_R}{v_I} < - \frac{\partial p}{\partial \frac{v_R}{v_I}} \Big/ \frac{\partial p}{\partial \delta_R} d\delta_R.$$

To discuss identification under case II of ineffective competition we must solve for γ and b^*. We use the approximate solution (see Proposition **3**) that $\gamma = \frac{1}{2}\alpha$, and $b^* = \left(1 - 12 \left(\frac{\delta}{\alpha} \right)^2 \right) v_R$. The block premium is:

$$\frac{\alpha \Pi}{v_R} = \gamma \left(\phi_R^{\gamma} - 12 \phi_R^{\alpha} \right) + \alpha \left(1 - \psi \right) \left(\phi_R^{\alpha} - \phi_R^{\gamma} \right) + \psi \left(d_R^{\alpha} - d_R^{\gamma} \right).$$

Clearly, $\frac{\partial}{\partial \omega_i} \left(\frac{\alpha \Pi}{v_R} \right) = 0$ and

$$\begin{aligned} \frac{\partial}{\partial \delta_{Ri}} \left(\frac{\alpha \Pi}{v_R} \right) &= 2 \left(-7 + \psi \right) \frac{\delta_R}{\alpha} < 0, \\ \frac{\partial}{\partial \alpha} \left(\frac{\alpha \Pi}{v_R} \right) &= - \left(-7 + \psi \right) \frac{\delta_R^2}{\alpha^2} > 0. \end{aligned}$$

Now consider two deals with similar block size and price impact, but one with a larger discount. The larger discount must be obtained with larger private benefits, which means that such deal also has larger increase in security benefits in order to keep the price impact the same. Alternatively, two deals with similar discount and block size but different price impact would be captured by setting the same δ_R for both deals but higher security benefits for the deal with higher price impact.

Consider now two deals in the data that have identical price impact and block size, but one block is traded at a premium and the other at a discount. The model infers that the discounted block must have both higher increase in security benefits and higher private benefits to R. Security benefits increase so that R becomes an ineffective competitor (and hence discounts). Private benefits increase, because, conditional on generating a discount, they are required to keep the price impact constant.

Finally, consider two deals with identical block price and price impact, but different block size. Because high block size increases incentive alignment and reduces private benefits extraction, to keep block price and price impact constant, the deal with higher block size is inferred to have higher private benefits and possibly also lower security benefits.

We have thus far assumed that δ_I is constant when referring to changes in δ_R. Because δ_R and δ_I share the dependency on some variables, changes in those variables act through δ_R and δ_I. Obviously, the assumption is without loss of generality when δ_R varies only due to changes in R's characteristics. When δ_R and δ_I vary due to changes in target firm's characteristics, then our predictions above remain the same if changes in price impact are dominated by changes in δ_R (note that the block premium does not depend on δ_I). We can show that in light of the characteristics of our data the effect of firm characteristics through δ_R dominates the impact on price impact.

Appendix B: Unmodeled dependence of $\frac{v_I}{v_R}$ on agent and target characteristics

This appendix proves that the estimators of the sensitivities of private benefits to firm characteristics remain unbiased by not modeling v_I/v_R. The concern arises when v_I/v_R depends on the same (or correlated) firm characteristics as private benefits. For example, some blockholders are more efficient (higher v_X) if there is more cash in the target firm. Suppose the block premium is given as in our model by:

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

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., $\frac{v_{Ii}}{v_{Ri}} = \boldsymbol{\beta}' \mathbf{z}_i$. 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 $\mathbf{w}_i$. 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 minimization 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. Alternatively, we 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 $\mathbf{z}$.

The formulation we adopt has the advantages that we gain degrees of freedom by not having 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 $\mathbf{z}$.

Appendix C: 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 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.

The specification has parameters $\boldsymbol{\theta} = \left(\eta_I, \boldsymbol{\eta}^R, \boldsymbol{\eta}, \psi_0, \psi, \sigma\right)$. We search for a minimizer for each vector of initial values. 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 seven initial conditions for η_{AVRET}, seven for η_{ASSETS} and 11 for η_{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 $\boldsymbol{\Omega}$ to be the identity matrix. Using the estimated $\hat{\boldsymbol{\theta}}$ we construct the error vector $\boldsymbol{\varepsilon}(\hat{\boldsymbol{\theta}})$. Then $\hat{\boldsymbol{\Omega}}$ is constructed as a diagonal matrix with generic element $\left(\hat{\varepsilon}_i^2\right)$. We repeat the search algorithm to obtain the second stage estimates using $\hat{\boldsymbol{\Omega}}$. 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 locally identified by checking that the Hessian evaluated at $\hat{\boldsymbol{\theta}}$ is non-singular.

Appendix D: Proof of proposition 3

The problem solved by R is to choose a bid at which the incumbent is willing to sell enough shares to give control of the firm to R. Let $I_0 = \alpha\left(1-\phi_I^{\alpha}\right)v_I + d_I^{\alpha}v_I$ be the incumbent's block value when he is in control. Formally,

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

subject to

$$\begin{aligned} \gamma(b) &\geq \frac{1}{2}\alpha \qquad (20)\\ I_0 &\leq \gamma(b)\,b + (\alpha-\gamma(b))\left(1-\phi_R^{\gamma(b)}\right)v_R \qquad (21)\\ \gamma(b) &= \arg\max_{\gamma}\left(\gamma b + (\alpha-\gamma)\left(1-\phi_R^{\gamma}\right)v_R\right). \qquad (22) \end{aligned}$$

Constraint (20) guarantees that control is attained at the tender offer, constraint (21) guarantees that the incumbent is better off selling than sticking to the block and running the firm (where he obtains I_0), and finally constraint (22) imposes consistency with I's optimization.

To solve this problem we proceed in three steps.

Step 1. Solve the problem assuming constraints (20) and (21) do not bind. To do this, first note that the problem defined in (22) is concave, which implies that we can replace it by the corresponding first order condition:

$$b - \left(1-\tilde{\phi}_R^{\gamma}\right)v_R + (\alpha-\gamma)\left.\frac{\partial\left(1-\tilde{\phi}_R^{\beta}\right)v_R}{\partial\beta}\right|_{\beta=\gamma} = 0. \tag{23}$$

Concavity guarantees a unique solution. Further,

$$\gamma'(b) = \frac{1}{\left(\frac{2-\sigma}{1-\sigma}\frac{\alpha}{\gamma} - \frac{\sigma}{1-\sigma}\right)\frac{1}{1-\sigma}\frac{1}{\gamma}\left(\frac{\delta_R}{\gamma}\right)^{\frac{1}{1-\sigma}}v_R} > 0.$$

Using (23), we also solve for the inverse function $\gamma^{-1}(b)$:

$$b = \left(1-\left(1+\frac{1}{1-\sigma}\frac{\alpha-\gamma}{\gamma}\right)\left(\frac{\delta_R}{\gamma}\right)^{\frac{1}{1-\sigma}}\right)v_R. \tag{24}$$

Let $x = \gamma/\alpha$. Then the optimal bid is

$$\begin{aligned} b^* &= \left(1 - A(x)\left(\frac{\delta_R}{\alpha}\right)^{\frac{1}{1-\sigma}}\right)v_R, \qquad (25)\\ A(x) &= -\frac{\sigma}{1-\sigma}x^{-\frac{1}{1-\sigma}} + \frac{1}{1-\sigma}x^{\frac{\sigma-2}{1-\sigma}}. \end{aligned}$$

R solves (19) subject to the best reply function, $\gamma(b)$. The first order condition is:

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

which, after we replace the value of b that solves (23), leads to

$$-\frac{1}{1-\sigma}\alpha+\frac{2\sigma-1}{1-\sigma}\gamma<0.$$

Thus, it is always optimal to set the lowest bid possible.

Step 2. Suppose the lowest bid is such that (20) binds and (21) is slack. Set $\gamma(b)=\frac{1}{2}\alpha$. To ensure that this solution satisfies (22) we replace the value of $\gamma=\frac{1}{2}\alpha$ on (23) to obtain the bid level consistent with the incumbent tendering half of his block. Using (24):

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

As desired, it is easy to see that $b^*<\left(1-\phi_R^{\gamma}\right)v_R<\left(1-\phi_R^{\alpha}\right)v_R$. The fact that $b^*<\left(1-\phi_R^{\gamma}\right)v_R$ also implies that R's payoff is positive and hence that he is optimizing at the tender offer. It remains to verify (21). Replacing the proposed optimal solution in (21), we see that (b^*,γ^*) is optimal iff

$$I_0\le\alpha\left(1-2^{\frac{1}{1-\sigma}}\frac{3-2\sigma}{2-2\sigma}\phi_R^{\alpha}\right)v_R. \tag{26}$$

Otherwise, we proceed to:

Step 3. If (26) does not hold, then R must raise his bid to a level such that (21) holds. Realizing that $\gamma'(b)>0$, the optimal level of shares tendered also increases. With higher bid and shares tendered, the right hand side of (21) increases. Thus, at the new optimum, (20) will not bind as we confirm below.

Combining (23) with (21) ((21) written with an equality sign) we get

$$I_0-\alpha\left(1-\phi_R^{\gamma}\right)v_R+\gamma(\alpha-\gamma)\left.\frac{\partial\left(1-\tilde{\phi}_R^{\beta}\right)v_R}{\partial\beta}\right|_{\beta=\gamma}=0.$$

We can rewrite this expression as a polynomial on γ of order $\frac{1}{1-\sigma}$:

$$\left(I_0-\alpha v_R\right)\gamma^{\frac{1}{1-\sigma}}-\frac{1}{1-\sigma}\gamma\delta_R^{\frac{1}{1-\sigma}}v_R+\frac{2-\sigma}{1-\sigma}\alpha\delta_R^{\frac{1}{1-\sigma}}v_R=0. \tag{27}$$

Let $h(\gamma)$ be the left hand side of (27). We can show the following properties: (1) $h'(\gamma)<0$; (2) $h(\alpha)<0$; and, (3) whenever (26) does not hold, $h\left(\frac{1}{2}\alpha\right)>0$. Taken together these properties imply that there is a unique solution $\gamma^*\in\left(\frac{1}{2}\alpha,\alpha\right)$. Again, inspection of (24) shows that because $\frac{1}{1-\sigma}\frac{\alpha-\gamma}{\gamma}>0$, we have $b^*<\left(1-\phi_R^{\gamma^*}\right)v_R$ and because $\gamma^*<\alpha$, $\left(1-\phi_R^{\gamma^*}\right)v_R<$

$(1-\phi_R^\alpha)\, v_R$. Again, the fact that $b^* < \left(1-\phi_R^\gamma\right) v_R$ also implies that R's payoff is positive and hence that he is optimizing at the tender offer.■

Appendix E: 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. 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 constant elasticity form:

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

This identity uses the first order condition on ϕ to arrive at: $\alpha\phi = \delta_X \phi^\sigma = \sigma d_X$. Let $\lambda = (1-\sigma)/\sigma$. Observe that a deal occurs if, and only if,

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

We are interested in comparing the mean private benefits conditional on observing a block trade, $E\left[d_{X,i}^\alpha | 1 + \lambda\phi_{I,i}^\alpha < \left(1+\lambda\phi_{R,i}^\alpha\right)\frac{v_{R,i}}{v_{I,i}}\right]$, which we can estimate, with the unconditional mean private benefits, $E\left[d_{X,i}^\alpha\right]$, which we cannot estimate. Trivially, because the function d is strictly increasing,

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

Likewise, $E\left[d_{R,i}^\alpha | \phi_{R,i}^\alpha > \lambda^{-1}\left(\left(1+\phi_{I,i}^\alpha\right)/\frac{v_{R,i}}{v_{I,i}} - 1\right)\right] \geq E\left[d_{R,i}^\alpha\right]$. Suppose now that $d_{R,i}^\alpha$ and $d_{I,i}^\alpha$ have the same unconditional means, $E\left[d_{I,i}^\alpha\right] = E\left[d_{R,i}^\alpha\right]$. Hence, we must have

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

Therefore, we conclude that if $d_{R,i}^\alpha$ and $d_{I,i}^\alpha$ 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.■

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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
	$TSTD\_ASSETS$	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 (\$ Billion) before the block trade announcement (ITEM 6)	COMPUSTAT
	$TAVG\_RET$	Target's average daily % return for the 12 month-period ending two months before the trade announcement	CRSP
	$TINT\_ASSETS$	Target's proportion of intangible to total assets (ITEM 33 / ITEM 6)	COMPUSTAT
	SOX	Did the trade occur after the Sarbanex-Oxley Act (July 20th 2002)? (1 if yes, 0 if no)	SDC
Acquirer-specific	$ACORP$	Is the acquirer a publicly traded corporation? (1 if yes, 0 if no)	SDC
	$CASHRATIO$	Ratio of the traget's cash to the acquirer's total cash before the trade announcement	COMPUSTAT
	$AACTIVE$	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
	$ASAMEIND$	Is the acquirer in the same industry, i.e., 4-digit SIC, as the target? (1 if yes, 0 if no)	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
	Short-term debt to assets	0.332	0.595	0.003	0.109	0.194	0.403	6.041	0.070***
	Total assets ($ Billions)	0.372	1.341	0.001	0.021	0.090	0.316	14.067	1.270***
	Average daily returns	0.20%	0.56%	−1.42%	−0.06%	0.13%	0.31%	3.40%	0.08%*
	Intangibles to assets	0.240	0.275	0.000	0.020	0.104	0.384	0.981	0.081***
	Post Sarbanex-Oxley trade? (1 if yes)	0.192	0.395	0	0	0	0	1	
Acquirer	Public corporation? (1 if yes)	0.258	0.440	0	0	0	1	1	
	Target's to acquirer's cash	2.399	15.107	0.000	0.000	0.000	0.001	148.100	
	Active shareholder? (1 if yes)	0.133	0.341	0	0	0	0	1	
	In the same industry? (1 if yes)	0.342	0.476	0	0	0	1	1	

[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: Estimates of the private benefits function parameters

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

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

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	0.493**	(0.190)	0.430***	(0.133)	0.294	(0.188)
σ^b	0.509	(0.029)	0.522***	(0.004)	0.556***	(0.002)
η_{TCASH_ASSETS}	4.216***	(0.514)	7.315***	(1.669)	11.842**	(2.244)
η_{TSTD_ASSETS}	−3.639***	(0.553)	−6.549*	(3.747)	−8.741***	(3.246)
η_{TSIZE}	0.999***	(0.009)	−12.502***	(3.262)	−20.986***	(6.832)
η_{TAVG_RET}	5.016***	(0.512)	41.053***	(8.340)	31.807***	(11.378)
η_{TINT_ASSETS}					11.342**	(3.808)
η_{SOX}					−7.825**	(3.462)
η_R	0.397***	(0.137)	−0.704**	(0.352)	−1.097*	(0.567)
η_{ACORP}	−0.673***	(0.193)	7.139***	(2.667)	6.270**	(2.807)
$\eta_{CASHRATIO}$	−0.894*	(0.470)	2.478	(5.650)	0.791**	(0.348)
η_{AACT}			−6.545***	(1.847)	0.570	(0.428)
$\eta_{ASAMEIND}$			4.175***	(1.020)	2.665***	(0.806)
η_I	−0.263	(0.166)	−1.945*	(1.017)	0.434	(1.602)
Constant	0.155***	(0.007)	0.070***	(0.003)	0.152***	(0.001)
Wald statistic $(\chi^2)^c$	1,124.299***		1,058.551***		1,194.970***	
$R^{2,d}$	0.066		0.096		0.090	

Table III: continued

Panel B: Summary statistics generated by the model

	(1)		(2)		(3)	
	Sample mean	Standard error[e]	Sample mean	Standard error[e]	Sample mean	Standard error[f]
Block premium						
predicted	0.134	(0.017)	0.051	(0.023)	0.143	(0.018)
actual	0.196	(0.079)	0.196	(0.079)	0.196	(0.079)
p value	0.447		0.079		0.510	
Fraction of blocks traded at a discount (including intercept)						
predicted	0.158	(0.034)	0.200	(0.037)	0.133	(0.031)
actual	0.500	(0.046)	0.500	(0.046)	0.500	(0.046)
p value	0.000		0.000		0.000	
Fraction of blocks traded at a discount (excluding intercept)						
predicted	0.475	(0.048)	0.517	(0.046)	0.442	(0.045)
actual	0.500	(0.046)	0.500	(0.046)	0.500	(0.046)
p value	0.699		0.797		0.370	
Block discount						
predicted	0.198	(0.101)	0.315	(0.139)	0.243	(0.054)
actual	0.240	(0.040)	0.240	(0.040)	0.240	(0.040)
p value	0.642		0.553		0.976	
Fraction of discounts with a positive price impact						
predicted	1.000	(0.000)	1.000	(0.000)	1.000	(0.000)
actual	0.783	(0.054)	0.783	(0.054)	0.783	(0.054)
p value	0.027		0.027		0.042	

[a] Estimates followed by ***, ** and * are statistically different from zero with 0.01, 0.05 and 0.1 significance levels, respectively.
[b] The significance level of this test is computed under the null hypothesis that the elasticity of private benefits to the extraction rate, σ, is 0.5 and the alternative that $\sigma > 0.5$.
[c] The χ^2 statistic is computed under the null hypothesis that the parameters $\boldsymbol{\eta}^{\mathbf{R}}, \boldsymbol{\eta}^{\mathbf{I}}$ and ψ, are zero.
[d] The R^2 is computed as one minus the sum of squares of the errors of the predicted block premium divided by the total sum of squares of the actual block premium.
[e] The standard errors of the sample moments and the predicted sample moments are equal to the sample standard deviation divided by the square root of the sample observations. The reported p value is for the alternative hypothesis that the sample mean minus the predicted sample mean is different from zero.

Table IV: 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 III. 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[a]	Sample mean	Std error[a]	Sample mean	Std error[a]
Increase in security benefits ($\frac{v_R - v_I}{v_I}$)	0.193	(0.028)	0.201	(0.028)	0.186	(0.028)
Buyer's extraction rate (ϕ_R^α)	0.064	(0.006)	0.077	(0.007)	0.064	(0.007)
Seller's extraction rate (ϕ_I^α)	0.060	(0.006)	0.065	(0.008)	0.063	(0.007)
Difference in extraction rates ($\phi_R^\alpha - \phi_I^\alpha$)	0.004	(0.004)	0.012	(0.005)	0.002	(0.002)
Buyer's private benefits, as a fraction of						
security benefits ($d(\phi_R^\alpha)$)	0.032	(0.002)	0.038	(0.003)	0.029	(0.003)
outstanding equity ($\frac{d(\phi_R^\alpha)}{1-\phi_R^\alpha}$)	0.036	(0.003)	0.044	(0.004)	0.033	(0.003)
Seller's private benefits, as a fraction of						
security benefits ($d(\phi_I^\alpha)$)	0.029	(0.002)	0.031	(0.003)	0.028	(0.003)
outstanding equity ($\frac{d(\phi_I^\alpha)}{1-\phi_I^\alpha}$)	0.033	(0.003)	0.037	(0.004)	0.032	(0.003)
Difference in private benefits, fraction of						
security benefits ($d(\phi_R^\alpha) - d(\phi_I^\alpha)$)	0.003	(0.002)	0.007	(0.002)	0.001	(0.001)
outstanding equity ($\frac{d(\phi_R^\alpha)}{1-\phi_R^\alpha} - \frac{d(\phi_I^\alpha)}{1-\phi_I^\alpha}$)	0.003	(0.002)	0.007	(0.003)	0.001	(0.001)

[a] The standard errors of the sample moments and the predicted sample moments are equal to the sample standard deviation divided by the square root of the sample observations.

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 and the block size. The elasticities are recovered from the parameter estimates of a censored regression model of the estimated private benefits as a fraction of equity on these characteristics. Estimated private benefits come from the results in Table III. The censored regression guarantees that private benefits are 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	−1.217***	(0.174)	−1.169***	(0.209)	−1.063***	(0.233)
Cash to total assets	0.138***	(0.046)	0.048	(0.049)	0.104**	(0.048)
Short-term debt to total assets	−0.107**	(0.050)	−0.253***	(0.077)	−0.214**	(0.093)
Total assets	0.061***	(0.008)	−0.096***	(0.026)	−0.186***	(0.038)
Average daily returns	0.159***	(0.026)	0.206***	(0.059)	0.178***	(0.055)
Intangible assets to total assets					0.205***	(0.058)
Sarbanes-Oxley					−0.463***	(0.140)
Corporate acquiror dummy	−0.431***	(0.115)	0.319**	(0.152)	0.220	(0.155)
Acquirer's to target's cash holdings	−0.013***	(0.003)	0.011	(0.011)	0.007	(0.013)
Active shareholder dummy					0.206	(0.269)
Same industry acquiror					−0.004	(0.130)

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

Table VI: 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)
Average predicted private benefits ($\hat{d}$)	0.061	0.062	0.062	0.045	0.042	0.042
Standard deviation	(0.000)	(0.075)	(0.075)	(0.000)	(0.077)	(0.077)
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.

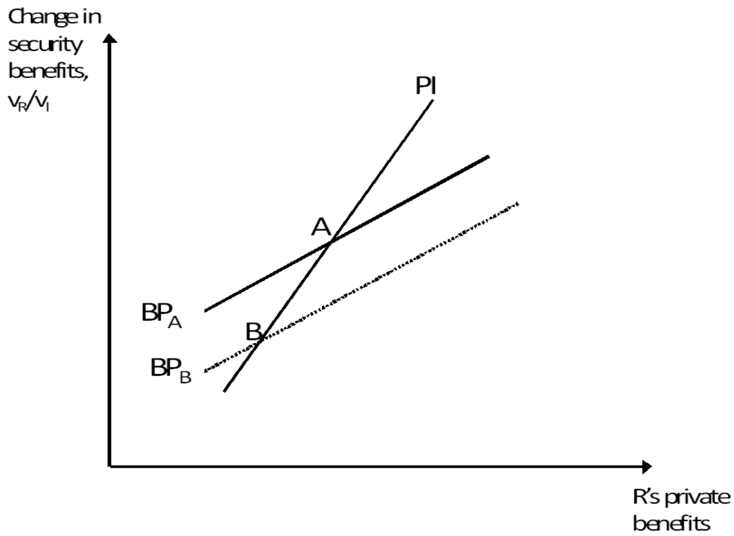

FIGURE 1: Identification of private benefits of control when deals differ on the block premium alone. Deal A has a lower block premium than deal B. BP_i is the iso-block-premium curve for deal $i = A, B$, and PI is the iso-price-impact curve for both deals A and B.

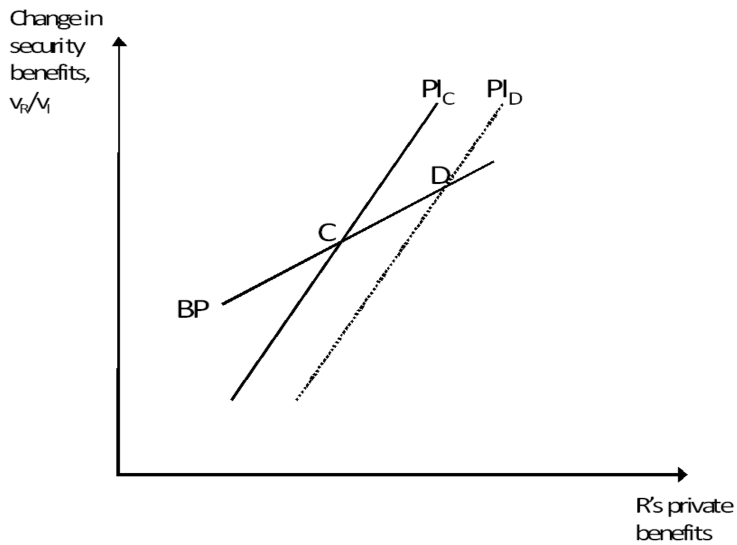

FIGURE 2: Identification of private benefits of control when deals differ on the price impact alone. Deal C has higher price impact than deal D. BP is the iso-block-premium curve for both deals C and D, and PI_i is the iso-price-impact curve for deal $i = C, D$.

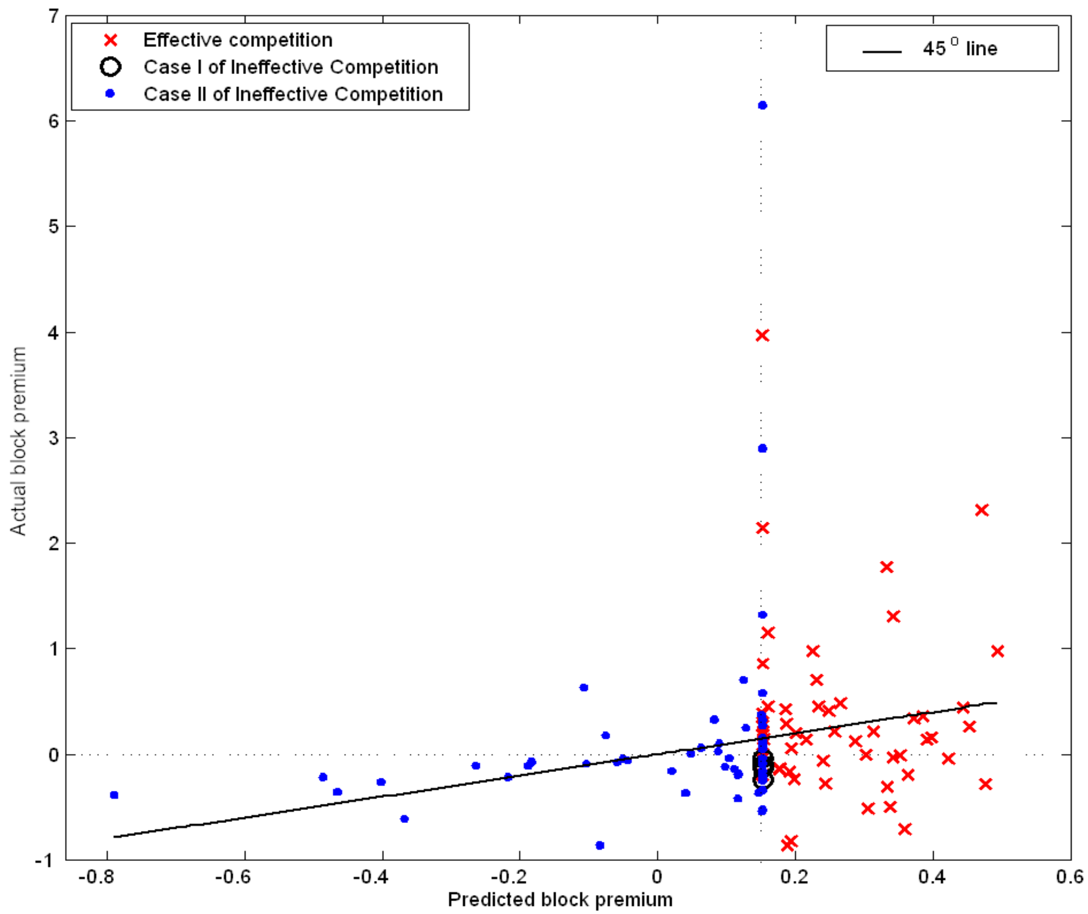

FIGURE 3: Fit of the estimated general BGP model. The block premium is estimated using the coefficients of specification (3) in Table III.

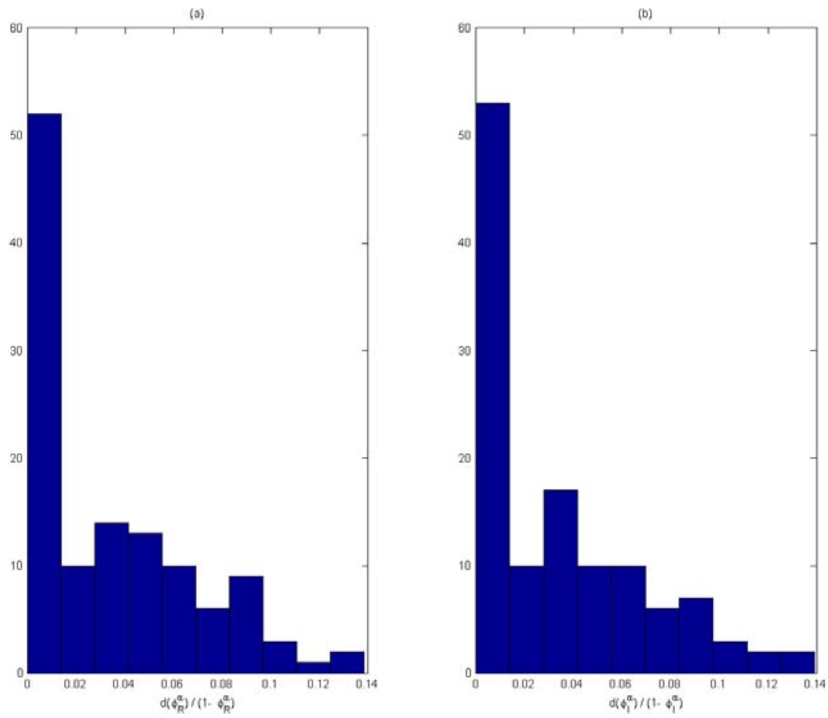

FIGURE 4: Predicted histogram of the private benefits of control of the incumbent, I, (panel (a)) and of the buyer, R, (panel (b)) in the estimated general BGP model. The histograms are constructed using the coefficients of specification (3) in Table III.

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