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

Rui Albuquerque† Enrique Schroth‡

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Abstract

We study the determinants of private benefits of control in negotiated block transactions. We estimate the block pricing model in Burkart, Gromb, and Panunzi (2000) explicitly dealing with the existence of both block premia and block discounts in the data. We find evidence that the occurrence of block premia and block discounts depends on the controlling block holder's ability to fight a potential tender offer for the target's stock. Private benefits represent approximately 3% to 4% of the target firm's stock market value. Private benefits increase with the target's cash holdings and decrease with its short term debt providing evidence in favor of Jensen's free cash flow hypothesis. Each $1 of private benefits costs shareholders approximately $1.7 of equity value.

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†Boston University School of Management, ECGI and CEPR. Address at BU: Finance and Economics Department, Boston University School of Management, 595 Commonwealth Avenue, Boston, MA 02215. Email: ralbuque@bu.edu. Tel.: 617-353-4614. Fax.: 617-353-6667.

‡Finance Group, University of Amsterdam. Address: Roeterstraat 11, 1018 WB Amsterdam, The Netherlands. E-mail: enrique.schroth@uva.nl. Tel.: +31 20 525 7317. Fax.: +31 20 525 5285.

1 Introduction

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

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

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

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

The paper offers three main results. First, we show that the BGP model fits well 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

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

[2] For a review of the literature see Benos and Weisbach (2004).

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. 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 \$1.7 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 20% at the time of the block trade.

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; and, the target firm's ratio of intangible assets to total assets is low, providing supporting evidence for Himmelberg et al. (1999). Private benefits also appear lower when firm or 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.

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

One difficulty that arises is that the block premium is not a clean measure of private benefits, because the block premium combines information from private benefits with information from the change in share value.[3] Dyck and Zingales (2004) disentangle the effect of private benefits from that of changes in share value with an elegant, model-based adjustment to the block premium. According to their model, the adjusted block premium is the average private benefit between seller and buyer. However, their estimation takes the increase in share value as given and does not internalize the fact that any increase in private benefits occurs simultaneously with a decrease in share value.

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

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

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

The main disadvantage of a structural estimation is the reliance on a specific theoretical model, with the following consequences. First, it implies that we have to be careful in selecting the deals that fit the assumptions in the model. 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

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

are amenable to hypothesis testing. Third, the non-linearities in the model impose strong restrictions on the data, making the estimation significantly more computationally intensive than in linear models. On the positive side, under the null hypothesis that the BGP model is true, imposing restrictions on the data has the effect of increasing the power to reject the null hypothesis. Fourth, we exhaustively search the parameter space for a global minimum, which adds to computation time. Finally, some assumptions, such as risk neutrality of controlling shareholders, are made for implementability reasons and cannot be dealt with in any simple way. Dealing with these may be deemed more or less necessary in future work depending on the success of our estimation in capturing cross sectional variation in the block premium and in other dimensions of block trading data.

In the paper, we discuss a variety of models of block pricing and demonstrate our preference for the BGP model because of its potential to address, in a unified way, a richer set of features on block trades. Among those features, we highlight two here. First, the BGP model combines a model of block premiums with a model of block discounts. Second, the BGP model can explain the observed large changes in share value around block trades. In addition, despite being very general, the BGP model remains tractable for structural estimation.

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

2 Theory

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

The model studies the interaction between a leading minority investor with fractional ownership of $\alpha < \frac{1}{2}$, called the incumbent I or seller, and a potential acquirer called the rival R or buyer, who owns no shares. Each remaining shareholder is atomistic. Whoever owns a block of size α or larger gains control. The total *security benefits* are worth v_X under the control of $X \in \{I, R\}$. 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.[4] 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, $\Pi = P - P^1$.

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

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 bid b^* represents I's threat value. I can always get b^* at a tender offer, hence I must get at least b^* in the private negotiation. The term in square brackets describes I's share, ψ, of the surplus accrued to the coalition of I and R from avoiding the tender offer: Trading the block privately represents a coalition value of $\alpha\,(1-\phi_R^\alpha)\,v_R + d_R^\alpha v_R$ to I and R whereas trading the block at the tender offer represents a coalition value of $\beta^*\left(1-\phi_R^{\beta^*}\right)v_R + d_R^{\beta^*}v_R - \beta^* b^* + \alpha b^* = \alpha b^* + d_R^{\beta^*}v_R$. 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^*, is larger than the post-trade announcement price of $(1-\phi_R^\alpha)\,v_R$. Second, I and R share a surplus from avoiding a tender offer. As BGP note, the second component of the block premium is special to their theory which views a tender offer as an alternative to a block transaction.

2.2 Model Solution Under Ineffective Competition

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

BGP show that there are two sub-cases to consider. In the first, the block's share value and the private benefits to I are greater than the share value under R: $v_I < (1-\phi_R^\alpha)\, v_R \leq (1-\phi_I^\alpha)\, v_I + \frac{d_I^\alpha}{\alpha} v_I$. BGP show that R pays the post-announcement security value to I, $P^1 = (1-\phi_R^\alpha)\, v_R$, and that $\Pi = 0$. At a tender offer, any bid by R below $(1-\phi_R^\alpha)\, v_R$ attracts less than α shares and leaves I in control, whereas a bid of $(1-\phi_R^\alpha)\, v_R$ has I tendering all his shares. I does not counter with a bid $b > (1-\phi_R^\alpha)\, v_R$, despite his valuation $(1-\phi_I^\alpha)\, v_I + \frac{d_I^\alpha}{\alpha} v_I \geq (1-\phi_R^\alpha)\, v_R$, because such a bid would attract all the shares from dispersed shareholders preferring b to v_I, the value they could get by not tendering. However, the value to I of getting all the shares is less than the value of just tendering the block at $(1-\phi_R^\alpha)\, v_R$: $v_I - (1-\alpha)\, b < \alpha v_I < \alpha\, (1-\phi_R^\alpha)\, v_R$. 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, $P = (1-\phi_R^\alpha)\, v_R$.

If I's valuation is sufficiently low, i.e., if $(1-\phi_R^\alpha)\, v_R > (1-\phi_I^\alpha)\, v_I + \frac{d_I^\alpha}{\alpha} v_I$, then BGP show that R gains control in a tender offer by bidding less than $(1-\phi_R^\alpha)\, v_R$. This bid attracts $\gamma < \alpha$ shares from I and breaks up the block. Indeed, I accepts a bid below the post-tender offer price, $b^* < \left(1-\phi_R^\gamma\right) v_R$, while no dispersed shareholder tenders any shares at that bid. For I, the marginal cost of the extra share sold is the opportunity cost $\left(1-\phi_R^\gamma\right) v_R$ whereas the marginal benefit is b^* plus the increase in value of I's untendered shares, which results from R's increased incentive alignment. Because no dispersed shareholder recognizes this second marginal benefit –each only owns one share–, only I sells. In addition, when

$$\alpha\, (1-\phi_I^\alpha)\, v_I + d_I^\alpha v_I < (1-\phi_R^\alpha)\, v_R, \tag{4}$$

the bid can be made sufficiently close to the post-announcement price $(1-\phi_R^\alpha)\, v_R$. The left hand side of inequality (4) is I's value of the block if he holds on to it and runs the firm, whereas the right hand side of the inequality is the post-announcement stock price if R is in control. When I's valuation is sufficiently low, 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.

The smaller block size at the tender offer is welfare decreasing leading to a surplus from avoiding the tender offer that can be shared between I and R. Building on these results from BGP, we derive the per share block price in this case to be

$$\begin{aligned} P &= \frac{1}{\alpha}\left[\gamma b^* + (\alpha-\gamma)\left(1-\phi_R^\gamma\right) v_R\right] \\ &\quad + \psi\left[(1-\phi_R^\alpha)\, v_R + \frac{d_R^\alpha}{\alpha} v_R - \left(\left(1-\phi_R^\gamma\right) v_R + \frac{d_R^\gamma}{\alpha} v_R\right)\right]. \end{aligned} \tag{5}$$

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

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

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

Proposition 2 shows that the BGP model is able to produce block discounts, i.e., block prices below post-announcement prices, even in the absence of any liquidity reason.

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.

Assumption 3 imbeds an important property of the BGP model: At the optimum, private benefits decrease with ownership concentration, i.e., Jensen's incentive alignment effect holds. This is a desirable property in light of the evidence in Claessens et al. (2002) who are able to isolate the incentive effect from the entrenchment effect of ownership (see also Masulis et al., 2008). Jensen's alignment effect results directly from the concavity of the private benefits function. Another implication of Assumption 3 is that the solution for the optimal extraction rate is interior.[5]

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

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

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. The strategy is best compared to estimating 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 (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 slopping. Appendix B.1 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 B.1 is that in the BGP model the slope of the iso-price-impact curve is steeper than that of the iso-block-premium curve. 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.[6]

<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

[6] Identification changes somewhat when comparing deals with identical block *discount* and block size, but different price impact. Appendix B.1 treats this case, model identification when only deal size differs across deals, and provides a mathematical derivation of the arguments above.

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

We compute the optimal extraction rate $\phi_{X,i}^{\alpha}$ from the optimality condition (1):

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

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,

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

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

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

A few comments about our approach are in order. First, our estimation strategy can over predict the size of the price impact. To see this note that when Assumption 2 does not bind, the estimated price impact must equal the realized price impact. However, when Assumption 2 binds, and $\omega_i = 1$,[7] the model's estimated price impact is

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

Second, the ability to disentangle the change in security benefits from the price impact relies on the assumption that information is complete and the ability of the chosen d_X to capture differences in efficiency in the extraction of private benefits across agents. The

[7] 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.

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 as opposed to differences in sensitivities to characteristics (see (6)). 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.

Third, our approach sidesteps the difficult problem of modelling v_{Ii}/v_{Ri} as a function of agent and target characteristics. A concern can arise 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.2, 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 main advantage of our approach 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 disadvantage 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 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 $\mathbf{\Omega}$ 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 $\hat{\mathbf{\Omega}}$ with generic term $\hat{\varepsilon}_i^2$. In the second step, we solve (14) using $\hat{\mathbf{\Omega}}$. This procedure is explained in detail in Appendix B.3.

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 a parameter to be estimated and represents 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 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, $d_X^{\alpha} = \sigma^{-1}\delta_X^{\frac{1}{1-\sigma}}\alpha^{-\frac{\sigma}{1-\sigma}}$.

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 $\sigma \geq 1/2$.[8] 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 $\delta_X \leq \underline{\alpha} \leq \alpha_i$, then $d_X(\phi) \leq \sigma^{-1}\underline{\alpha}$. 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).

Fourth, the private benefits function (15) allows for large differences in extraction rates for small rather than large blocks. Indeed, the variation in optimal extraction rates declines substantially as the block size increases past 30% because ϕ_X^α is convex in α: The slope of ϕ_X^α is smaller than one in absolute value for all $\alpha \geq 27\%$.[9] The implicit assumption in the constant elasticity function is therefore that the incentive role of larger blocks, which makes block owners divert little, kicks in at reasonably low values of α. While we do not know whether such cut-off exists we note that roughly 70% of the blocks in our sample are smaller than 34%. If block size were equally distributed between 10% and 50% this proportion should

[8] 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.

[9] Differentiating (16) yields $\frac{d\phi_X^\alpha}{d\alpha} = -(1-\sigma)^{-1}(\delta_X/\alpha)^{1/(1-\sigma)}\alpha^{-1} > -(1-\sigma)^{-1}(\underline{\alpha}/\alpha)^{1/(1-\sigma)}\alpha^{-1}$, where the inequality follows because $\delta_X < \underline{\alpha}$. The lower bound on the derivative equals minus one for values of α that decline from 0.27 as $\sigma \geq 1/2$ increases.

instead be $60\% = (34\% - 10\%)/(50\% - 10\%)$. This implies that (15) has the potential to capture the existing, though unobservable, variation in extraction rates in the data.

Finally, the private benefits function (15) allows for a quasi close-form solution to b^* and γ in Case II of ineffective competition. The proof of the proposition is in Appendix B.4.

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.*

This is the solution we use to implement (12).

4 Data

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

<INSERT TABLE I ABOUT HERE>

4.1 Sample Selection

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

The main difference between our sample construction and that of previous studies of the block premium is that we exclude majority blocks from the analysis. Except for Mikkelson and Regassa (1991), all previous samples combine minority and majority blocks. What motivates our departure is the observation that, contrary to firms with majority blocks, in firms with minority blocks control can be obtained outside a private negotiation. Therefore, minority blocks are priced differently than majority blocks. Despite the fact that we exclude majority blocks, our sample has more trades in total, and per year, than Dyck and Zingales' (2004) US sample of 46 trades, also based on SDC. This is because Dyck and Zingales restrict their search universe to the first 20 trades in each year in order to counter SDC's US oversampling bias and achieve a balanced cross-country sample. Barclay, Holderness and Sheehan (2001) use the largest sample of block trades known to us. From *The Wall Street Journal Corporate Index* they construct a sample of 204 block trades between 1978 and 1997. Our sample has fewer deals because our criteria are more restrictive: They consider all blocks larger than 5%. Also, as we explain below, we rule out trades where the block being traded is not the largest block. Finally, our 10% minimum size guarantees that, in the case of ineffective competition, the alternative of a tender offer does not end up with a non-controlling block.

To fit the BGP model, we focus on trades leading to a control change. Thus, we follow Dyck and Zingales (2004) and select only those transactions where the buyer owned less than 20% of the shares before the trade but more than 20% as a result of the trade.[10] In addition, we keep only those trades where the block is the largest block held by an insider and confirm that the trade leads to a control change using news about the deal. Barclay and Holderness (1991) and Bethel, Liebeskind and Opler (1998) show that trades of minority blocks are generally followed by significant changes in various target-firm policies, and by CEO or board turnover. After applying these filters we have a sample of 250 deals.

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

Finally, our sample excludes firms that cannot be matched to COMPUSTAT and for which we fail to obtain prices in the CRSP tapes from 51 trading days prior to the deal announcement to 21 trading days after the deal is announced. We use the first 30 days in this trading window (and earlier data if available) to compute a measure of the target firm's market beta. The estimated beta is used to adjust the target firm's price impact over the event window for changes in systematic risk according to the market model (e.g. Dyck and Zingales, 2004). This last filter leads to the exclusion of 13 deals, leaving 120 observations.

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

We complete our data set by matching the sample of trades to the COMPUSTAT records of the target firm and of the block buyer if the buyer is a corporation.

4.2 Block Premium and Price Impact

The percentage block premium captures the acquirer's payment over and above the new target value as perceived by dispersed shareholders (Barclay and Holderness (1989)). We follow Dyck and Zingales (2004) and set P^1 to be the stock exchange price two trading days after the public announcement of the block trade, adjusted using a market model of returns. As Figure 3 shows, the two-trading-day-post-announcement price fully internalizes any gains from the change in control. Figure 3 shows the average normalized price path from -21

[10] 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.

trading days to +21 trading days around the announcement. The price path is displayed for prices that are market adjusted and market-model adjusted. The market model adjustment shows a less pronounced price increase before the public announcement and a smaller price jump at the announcement. Otherwise the price patterns are quite similar, including the speed at which the price incorporates the new information.

<INSERT FIGURE 3 ABOUT HERE>

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. Figure 3 and 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, 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 trades 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, Barclay, Holderness and Sheehan, 2001, report 32% of discounts, and Dyck and Zingales, 2004, report 41% of discounts).[11] 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).

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

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 average target firm in our sample holds a similar fraction of cash to assets but a smaller fraction of short term debt to assets than the average COMPUSTAT firm.

The effect of the target's size on private benefits is ambiguous. On the one hand, the controlling party may be less able to derive private benefits because larger firms are more tightly monitored by the business media, the SEC, the IRS, or by security analysts. On the other hand, the agent in control may derive larger pecuniary and non-pecuniary benefits from a larger firm. This second effect, however, need not imply that private benefits as a fraction of security benefits increases with firm size; for this to be true, the elasticity of private benefits with respect to firm size must be greater than one in absolute value. The average target firm in our sample is about one third the size of the average COMPUSTAT firm.

We hypothesize that the target's recent performance is positively associated with private benefits because poor performance may bring the firm closer to financial distress, increasing scrutiny and making it harder to extract benefits. 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. The average target in our sample has a significantly larger fraction of intangible assets than the average COMPUSTAT firm.

Finally, we consider the impact of Sarbanes-Oxley (SOX) on the ability of firms to extract private benefits by including a dummy variable that takes the value of one in all 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 it has already acquired specific knowledge about how to extract such benefits within the firm. However, the block purchaser that has been previously active in the target may also have incentives that are aligned with those of the company, which limit income diversion. To evaluate these effects we construct a dummy variable that equals one if the acquirer is an active shareholder before the trade announcement, i.e., if R has a toehold of more than 5% but less than 10% of the target's shares. The mean value of the dummy is 0.133 which is comparable with the presence of toeholds in merger bids and tender offers (Betton et al. (2009)).

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 benefits that the corporate acquirer derives from the target's cash holdings discussed above, may be smaller if the acquirer already is cash rich. To test this hypothesis we construct the ratio of the target's cash and marketable securities to the acquirer's cash and marketable securities. We expect this ratio to have a positive effect on private benefits, over and above the effect of the target's proportion of cash to assets.

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

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

<INSERT TABLE III ABOUT HERE>

5 Results

5.1 Overall Model Fit

Panel A of Table IV reports parameter estimates and quality of fit statistics of the estimated BGP model for three different specifications of $\mathbf{w}_i^X$ and $\mathbf{w}_i$. The table shows that the specifications are not rejected (p-values below 0.01) and that the R^2 coefficient is between 0.07 and 0.1. Even after we include characteristics popularly 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 IV 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.[12] 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.[13] 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 IV evaluates the fit of the model by comparing the model's in-sample predictions of several stylized facts to their corresponding values in the data. Overall, the estimated model does well in 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 the sample counterpart, though not statistically different from it in specifications 1 and 3. 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.[14]

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

[13] 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.

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

The estimation underpredicts the number of actual discounts, but across all specifications we cannot reject that the predicted average discount equals the sample average discount. The main reason for underpredicting the number of discounts is that the BGP model rules out block prices below the pre-announcement share price, which exist in the data. The BGP predicts that all discounts are associated with positive price impact compared to the data where 78% of discounts are associated with positive price impact.[15]

Another dimension of the quality of fit is reported in Figure 4.[16] The figure plots the actual block premium against the predicted block premium and identifies each observation depending on whether it represents a case of effective competition, or Cases I or II of ineffective competition. The figure includes 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 line. The 45 degree line is also plotted. The figure 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 4 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 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 very few violations of Assumption 1 in specifications 1 and 2, respectively, 7 and 5. 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.

[15] Under ineffective competition $(1 - \phi_I^\alpha)\, v_I < v_I < (1 - \phi_R^\alpha)\, v_R$, so that discounts are always associated with positive price impact.

[16] 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.

5.2 Private Benefits of Control

We use the estimates in Table IV to compute the implied increase in security benefits, the extraction rates and the level of private benefits of control. These are reported in Table V. The table first reports the estimated average increase in security benefits, v_R/v_I. The point estimate is about 19% across specifications, which is close but higher than the observed average price impact of 14% because rivals have higher extraction rates on average.

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. These estimates are significantly different from zero and larger than in previous studies. Dyck and Zingales (2004) estimate private benefits in the US to be 2.7% on average, but cannot reject that their estimate is zero (see their Table III, specification 2). Our estimates are about 50 percent higher than Nenova's (2003).

The average private benefits does not give a complete picture of the distribution of private benefits across firms. Panels (a) and (b) of Figure 5 give the predicted histograms of private benefits for sellers and buyers. These are very similar, displaying a positive skew: 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 V ABOUT HERE>

<INSERT FIGURE 5 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. However, controlling minority blockholders are also likely to derive private benefits. The question then arises as to how we should interpret our results in light of this sample selection. The next proposition demonstrates the informativeness of our estimates to the unconditional mean private benefits, i.e. $E\left[d_I^{\alpha}\right]$ and $E\left[d_R^{\alpha}\right]$. The proof is in Appendix B.5.

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

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

Proposition 4 shows that $E[d_I^\alpha|\text{trade}]$ and $E[d_R^\alpha|\text{trade}]$ are respectively lower and upper bounds to the unconditional average private benefits of control. The intuition for this result is that when a block is traded it is likely that the 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 V 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 IV, we proceed to compute conditional elasticities of private benefits of control with respect to the various characteristics. We focus on private benefits to R. We run a censored linear regression model of estimated private benefits as a fraction of equity, denoted by $\hat{x}_{R,i} \equiv d_R\left(\hat{\phi}\right) / \left(1-\hat{\phi}\right)$, on the various characteristics, $\mathbf{w}_i^R$ and $\mathbf{w}_i$, and the block size, α_i. The model is:

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

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

Table VI presents the estimated elasticities obtained from the censored regression model. The model estimates that a 1% increase in block size leads to a statistically significant change in private benefits as of fraction of equity between -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 in private benefits (elasticity between .05 and .14). The estimations indicate that the effect of the level of the target's cash 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 to Jensen's (1986) hypothesis that debt reduces the agency cost of free cash flow (see also Stulz, 1990, and Hart and Moore, 1995). In contrast to our results, previous work has failed to find a systematic effect from either cash or debt. In Barclay and Holderness (1989) neither leverage nor cash affects the block premium (see also Hwang, 2005). In addition, in our sample as well, ordinary least squares regressions of the block premium on various independent variables show no statistical significance for 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 firm leverage.

<INSERT TABLE VI ABOUT HERE>

Private benefits as a fraction of equity increase with asset intangibility (elasticity of .2) providing evidence in support of the hypothesis in Himmelberg et al. (1999). Dyck and Zingales (2004) and Hwang (2005) also find that the block premium increases with the level of intangible assets, though in Dyck and Zingales the effect is insignificant.

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 neither Barclay and Holderness (1989) nor Hwang (2005) find a significant relationship between firm size and the block premium. Using a sample of Russian firms, Mironov (2008) provides estimates showing that larger firms extract less private benefits. The impact of firm size on the voting premium is controversial (e.g., Ødegaard, 2007, Zingales, 1995, Guadalupe and Pérez-González, 2005, and Nicodano and Sembenelli, 2004).

Private benefits display significant positive variation with respect to past performance (elasticities between .16 and .21). This supports our prediction that it is harder to extract private benefits from firms with poor performance who might be in financial distress and under significant monitoring. Barclay and Holderness (1989) find that past performance leads to higher block premium, but Hwang (2005) finds no effect of stock returns on the block premium. Using measures of accounting performance, Carvalhal da Silva and Subrahmanyam (2007) find a positive impact on the voting premium whereas Guadalupe and Pérez-González (2005) find a negative impact.

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, and Hwang (2005) finds a positive effect on the block premium.

Finally, specification 3 suggests that SOX has had a significant impact on private benefits: Deals that took place after SOX have private benefits reduced by 46%. Qualitatively, this evidence is consistent with Holderness and Sheehan (2000) who argue that the legal environment works as a constraint on extracting private benefits (see also Nenova, 2003). Quantitatively, this is a crude attempt at capturing country-wide governance effects and its magnitude may be overstated by concurrent changes in the overall stock market.

5.5 Firm governance

Firm level governance can also act as a deterrent of private benefits extraction. To investigate this effect, we tried to match our sample with several common measures of governance without success.[17] The measure of firm governance quality for which we obtain the most matches with our sample is earnings management. We proxy earnings management with an estimate of discretionary accruals. The modified Jones model estimates discretionary accruals as the residual from a cross-sectional regression of total accruals on the inverse of lagged total assets, the difference of change in sales and change in receivables, and the level of property, plant and equipment, all scaled by lagged total assets (see Dechow, Sloan, and Sweeney, 1995). In addition, we also include as an independent variable the lagged value of ROA. We hypothesize that private benefits of control increase with the modified Jones' earnings management measure.

We are able to estimate the modified Jones model for 83 of our 120 target firms. Missing data in COMPUSTAT on current assets and current liabilities as well as PP&E for our target firms is the cause of the reduced sample. Table VII shows the estimates of specification 3 above after adding the measure of earnings management. The fit of the BGP model in this sub-sample is similar to that of the full sample. In addition, panel A shows that earnings management is positively and significantly associated with private benefits of control (coefficient of 15.16 and p-value< 0.05). Despite its statistical significance, the economic significance of earnings management is small (see also Mironov, 2008). Repeating the approach in subsection 5.4, we compute an elasticity of private benefits to earnings management of 2.13%. An increase of one standard deviation in earnings management (i.e., 0.122) implies an increase in private benefits of $2.13\% \times .122 = 0.26\%$. Qualitatively, our evidence is consistent with the findings in Doidge (2004), but contrasts with the findings in Nenova (2003).

<INSERT TABLE VII ABOUT HERE>

6 Discussion of Alternative Models of Block Pricing

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

[17] Our sample has only 27 matches with the GIM index (IRRC's Governance database) and 10 matches with IRRC's directors data. We manually matched our firms to the respective electronic Definition 14A statements in EDGAR. We were able to obtain a full description of all the directors for 64 of our 120 firms. We have estimated our model with the data from the 14A's. While we obtain qualitatively similar results, and a significant negative relation between private benefits and the proportion of independent directors, the loss of degrees of freedom leads to significant loss of power in estimating other determinants of private benefits.

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 VIII. The table reveals that most parameter estimates are insignificant, with some having the wrong sign (e.g., cash to assets), and that the R^2's are quite small.[18]

<INSERT TABLE VIII ABOUT HERE>

Following Dyck and Zingales (2004), an estimate of I's bargaining power, ψ, can be obtained from the coefficient associated with the price impact adjusted for the block size (i.e.,

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

$\alpha\frac{P^1-P^0}{P^1}$). The table reports estimates of ψ between 0.67 and 0.72 in the OLS regressions and over 1 in the IV regression (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 a large number of observations where estimated private benefits are negative. Without a restriction that explicitly recognizes that private benefits are positive, the estimation uses the variation in the independent variables –meant to capture private benefits– to capture the discounts in the sample thus biasing downwards any estimates of private benefits. Estimated private benefits in these regressions are all insignificant at the 10% level. This may explain why Dyck and Zingales' estimates of private benefits are insignificant.

6.2 The Overpayment Hypothesis

Barclay and Holderness (1989) hypothesize that block premiums can be the result of overpayment by the block acquirer because of either systematic overconfidence of buyers or the winner's curse. The results above contain evidence consistent with the overpayment hypothesis, in contrast with those in Barclay and Holderness (1989).

To analyze the overpayment hypothesis, Barclay and Holderness (1989) study the stock price reaction of publicly traded acquirers upon the announcement of the block trade. The returns to these firms around the announcement are statistically insignificant indicating no overpayment (see also Dyck and Zingales, 2004). We repeat the same exercise with the public corporations in our sample and obtain the same result (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 reservation value. We compute the acquirer's percentage surplus implied by our estimates by subtracting the actual per share block price P from the value per share of the block to the buyer, that is,

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

Panel A of Table IX shows that between 44% and 68% of the acquirers overpay (the table uses a more complete formula which adjusts for toeholds). For the subsample of publicly traded acquirers, the proportion of overpayers is zero and the average acquirer's surplus is much larger (Panel B). Third, whether or not public corporate acquirer's overpay, it is unlikely that the outcome of the trade affects the acquirer's stock price because the average target size (total assets) in the subsample is several orders of magnitude smaller than the average acquirer's size (see Panel C).

<INSERT TABLE IX ABOUT HERE>

Overpayment in our estimations could reflect an omitted variable. For example, it could reflect non-pecuniary private benefits as these are not modelled in BGP. It could also reflect the seller's risk aversion (Barclay and Holderness, 1989): Large corporate acquirer's may pay more for the block with respect to smaller corporations or individuals when buying from risk averse sellers. While shareholders of large, public corporations can effectively diversify their portfolios using the capital market, the block may represent a large fraction of the individuals' or private owners' own wealth and overexpose them to the target's idiosyncratic risk. To test this hypothesis, we regress $\hat{c} + \hat{\varepsilon}_i$ on a constant, the volatility of the target's daily returns, and on the daily returns' volatility interacted with the public acquirer's dummy variable. In untabulated results, we find that the independent regressors do not significantly reduce the size of the overpayment.

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, Barclay and Holderness (1989) argue that blocks that trade at a discount should show a negative price impact and blocks that trade at a premium should show a positive price impact. However, in our sample over 78% of discounts show a positive price impact. Similar evidence is found in Barclay and Holderness (1991) and Dyck and Zingales (2004).

Another reason for a block premium is that it takes time, and is costly, to build a controlling minority block.[19] We should then observe that larger minority blocks carry a larger block premium, holding all else constant. To evaluate this alternative hypothesis, we regress the residuals from the estimations in specifications 1 through 3 above on the block size and other variables. 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

[19] 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.

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 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 observed change in the target firm's exchange price and the other is the seller's ability to compete in the event of a tender offer. The former is critical to identify the increase in security benefits due to the control transfer, while the later is critical to explain why blocks trade at a premium or discount. Future research should aim to enrich the specification of the private benefits function by gathering data from the block seller. These data may improve the estimation of private benefits and help identify the causes of sellers' ability to compete in tender offers.

Appendix

A. Additional results on the BGP model

A.1. Effective competition

Consider first the case where I values each share more than R does even if I were to own all the stock, that is, $(1-\phi_R^\alpha)\,v_R < v_I$. In this case, I presents effective competition to R. BGP start by showing that, in the bidding contest stage, R wins control by bidding $b^* = v_I$ for a block of size β^*, satisfying $\left(1-\phi_R^{\beta^*}\right)v_R = v_I$. The size of the bid is such that I has no incentive to counter. Indeed, any bid by R smaller than v_I can be successfully countered if I offers v_I. Obviously, the higher bid is preferred by the remaining investors and BGP show that it is optimal for I as well. Moreover, it is enough for R to bid v_I. I would never bid more than v_I because he would get all the shares at a price higher than the security benefits he can generate as a sole owner whereas he could sell his shares to R at v_I.

At the first stage, where I and R negotiate privately, I and R choose to optimally enter into a standstill agreement where I transfers all his α shares to R. We thus obtain that at the first stage the per share block price is as in (3). The block premium is the block price minus the post-transfer securities price, $\Pi = P - (1-\phi_R^\alpha)\,v_R$. Under effective competition, BGP show that the block premium is positive and equals

$$\Pi = \psi\frac{d_R^\alpha - d_R^{\beta^*}}{\alpha}v_R + (1-\psi)\left(\left(1-\phi_R^{\beta^*}\right)v_R - (1-\phi_R^\alpha)\,v_R\right). \tag{19}$$

A.2. Proof of Proposition 2

This proof follows BGP closely. It is necessary to consider two cases. In the first case, the security value and private benefits of the block to I are greater than the value of the security benefits under R: $v_I < (1-\phi_R^\alpha)\,v_R \le (1-\phi_I^\alpha)\,v_I + \left(\frac{d_I^\alpha}{\alpha}\right)v_I$. Any bid lower than $(1-\phi_R^\alpha)\,v_R$ attracts less than α from dispersed shareholders leaving control with I, which makes it suboptimal. Obviously, I would not tender any shares because by remaining in control he gets $(1-\phi_I^\alpha)\,v_I + \left(\frac{d_I^\alpha}{\alpha}\right)v_I \ge (1-\phi_R^\alpha)\,v_R$ which in turn is more than what he could get by tendering a fraction or all of his shares and control to R. On the other hand, if R bids $b^* = (1-\phi_R^\alpha)\,v_R$, then he attracts α shares from I and gains control. Dispersed shareholders prefer R as the block owner to I because $(1-\phi_I^\alpha)\,v_I < v_I < (1-\phi_R^\alpha)\,v_R$. Because the sum of private and security benefits for I is higher than b^* perhaps I could make a counter offer that would prevail over b^*. However, I does not counter b^* because it is never optimal to offer $b > b^* = (1-\phi_R^\alpha)\,v_R > v_I > (1-\phi_I^\alpha)\,v_I$. Such bid attracts all shares by dispersed shareholders who gain b by selling to I or gain $v_I < b$ by holding on to the shares (note that each dispersed shareholder is atomistic and thinks the deal will go through independently of his tendering decision). Thus I ends up with payout $v_I - (1-\alpha)\, b < \alpha v_I < \alpha\left(1-\phi_R^{\alpha}\right) v_R$, which means he prefers not to counter. Therefore, at b^* exactly α shares are tendered in a tender offer implying that the coalition of I and R does not gain by avoiding a tender offer. Thus, $P = \alpha b^*$ and $\Pi = P - \alpha\left(1-\phi_R^{\alpha}\right) v_R = 0$.

In the second case, $\left(1-\phi_R^{\alpha}\right) v_R > \left(1-\phi_I^{\alpha}\right) v_I + \frac{d_I^{\alpha}}{\alpha} v_I$, we use the results in Burkart, Gromb, and Panunzi (1998). Their lemma is reproduced here for completeness.

Lemma 14 (Burkart et al. (1998)) For $\left(1-\phi_R^{\alpha}\right) v_R > \left(1-\phi_I^{\alpha}\right) v_I + d_I^{\alpha} v_I/\alpha$, R bids $b < \left(1-\phi_R^{\alpha}\right) v_R$, and gets $\gamma < \alpha$ shares.

Before proving the result, define $\beta(b)$ implicitly by $\left(1-\phi_R^{\beta(b)}\right) v_R = b$ for $b \in [0, v_R]$ and $\beta(b) = 100\%$ for $b > v_R$. Notice that $\beta(b)$ is continuous and strictly increasing on $[0, v_R]$. Denote by β be the shares tendered by I after R's bid.

Proof. The proof proceeds in three steps.

Step 1: There exists $b < \left(1-\phi_R^{\alpha}\right) v_R$ such that R wins control.

Consider $b = \left(1-\phi_R^{\alpha-\varepsilon}\right) v_R$ with $\varepsilon > 0$ but arbitrarily small. R wins iff the shares tendered by I, $\beta \geq \varepsilon$, such that $b \geq \left(1-\phi_R^{\alpha-\beta}\right) v_R$, or equivalently $\beta(b) \geq \alpha - \beta$ holds, implying that R is the largest shareholder. If R wins, I's payoff is arbitrarily close to $\alpha b = \alpha\left(1-\phi_R^{\alpha-\varepsilon}\right) v_R$. If R fails, it must be that $\beta < \varepsilon$ and so I's payoff is arbitrarily close to $\alpha\left(1-\phi_I^{\alpha}\right) v_I + d_I^{\alpha} v_I$ which is strictly less than $\alpha\left(1-\phi_R^{\alpha-\varepsilon}\right) v_R$ for ε small enough. This concludes the proof of Step 1.

Step 2: For all $b < \left(1-\phi_R^{\alpha}\right) v_R$ (or $\beta(b) < \alpha$) where R gains control, only I tenders and $b < \left(1-\phi_R^{\beta}\right) v_R$, where β is the number of shares tendered by I.

If $b \geq \left(1-\phi_R^{\beta}\right) v_R$ and R wins getting β shares from I, then R ends up with $\gamma = \beta(b)$, and I's payoff is αb. But then $b \geq \left(1-\phi_R^{\alpha}\right) v_R$ which is a contradiction. If $b < \left(1-\phi_R^{\beta}\right) v_R$ and R wins, it must be that $\gamma = \beta > \alpha/2$. Hence, given the shares tendered β, I's payoff is $\pi = \beta b + (\alpha-\beta)\left(1-\phi_R^{\beta}\right) v_R$. But

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

because $b - \left(1-\phi_R^{\beta(b)}\right) v_R = 0$, $\alpha - \beta(b) > 0$, and $\left.\frac{\partial\left(1-\phi_R^{\beta}\right) v_R}{\partial \beta}\right|_{\beta=\beta(b)} > 0$. Hence, it is optimal for I to tender $\beta > \beta(b)$. This implies that $\gamma = \beta$ and so $b < \left(1-\phi_R^{\gamma}\right) v_R$. This concludes the proof of Step 2.

Step 3: R will bid some $b < \left(1-\phi_R^{\alpha}\right) v_R$.

Take b as in Step 2. R wins with $\gamma < \alpha$ and $\gamma > \beta(b)$ and realizes

$$-\gamma b + \gamma\left(1-\phi_R^{\gamma}\right) v_R + d_R\left(\phi_R^{\gamma}\right) v_R > d_R\left(\phi_R^{\gamma}\right) v_R > d_R\left(\phi_R^{\alpha}\right) v_R.$$

Instead, with a winning bid $b \geq (1-\phi_R^{\alpha})\, v_R$, R realizes $d_R\left(\phi_R^{\beta(b)}\right) v_R \leq d_R\left(\phi_R^{\alpha}\right) v_R$. This completes the proof of Step 3 and of the lemma.■

To complete the proof of the proposition, note that with $b < \left(1-\phi_R^{\gamma}\right) v_R$, from Step 2, and $\gamma < \alpha$, implies $\Pi < 0$. To see this last step, consider the bargaining process at the negotiation stage:

$$\max_P \left[\alpha P - \left(\gamma b + (\alpha-\gamma)\left(1-\phi_R^{\gamma}\right) v_R\right)\right]^{\psi} \times$$
$$\left[\alpha\left(1-\phi_R^{\alpha}\right) v_R + d_R^{\alpha} v_R - \alpha P - \left(\gamma\left(1-\phi_R^{\gamma}\right) v_R + d_R^{\gamma} v_R - \gamma b\right)\right]^{1-\psi}.$$

The first order condition yields the per share block price P shown in the paper in equation (3):

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

Subtracting the post-announcement market price $(1-\phi_R^{\alpha})\, v_R$, we obtain the per share premium, $\Pi = P - P_1$. After rearranging we obtain:

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

The first term is negative because $\gamma < \alpha$ and optimal benefits are decreasing in ownership. Again, because $\gamma < \alpha$, the second term is negative as well (see above). Finally, because $\gamma < \alpha$, extraction is higher under smaller ownership which makes the last term also negative. This concludes the proof that the premium is negative under ineffective competition.■

B. Additional results on the empirical strategy

B.1. Identification

For simplicity, the derivations in the appendix use the square root specification of equation (15) by setting $\sigma = 1/2$. 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.

We start with the model predictions regarding price impact. We have that:

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

Not surprisingly, all else equal, the price impact increases with security benefits and decreases with R's ability to extract benefits. Hence, when comparing any two deals with identical price impact, if one deal has higher increase in security benefits it must also have higher private benefits. All else equal, price impact varies positively with block size if and only if $\phi_{R,i}(\alpha) > \phi_{I,i}(\alpha)$; i.e., the incentive effect works best when the extraction rate of R is higher.

We now turn to the predictions regarding the block premium. For a cleaner analysis of the comparative statics, and without loss of generality, here 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:

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

All else equal, the block premium decreases with security benefits because at a tender offer R would bid for less shares (I is less of an effective competitor) and private benefits would increase. This lowers the savings from avoiding a tender offer. In addition, the bid, v_I, is now lower relative to the post-announcement price. In contrast, all else equal, the block premium increases with R's ability to extract private benefits: an increase in δ_R increases I's competitiveness and the shares that need to be bought at a tender offer and thus also the savings form avoiding a tender offer. In addition, it also increases the difference between tender offer bid and post-announcement price. Finally, all else equal, a higher block size leads to a higher incentive effect and lower extraction rates, higher price impact and lower block premium.

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 one of two outcomes must have occurred. The acquirer in deal A, R_A, is able to generate more private benefits, in which case, to keep price impact from decreasing, R_A must also generate a higher increase in security benefits than R_B. Alternatively, R_A generates a lower increase in security benefits than R_B, in which case, to keep price impact from decreasing, R_A must also generate lower private benefits than R_B. It turns out that we can show that the slope of the iso-price-impact curve is steeper than that of the iso-block-premium curve. Hence, the deal with higher private benefits and security benefits must have lower block premium. To demonstrate this result we first take the total differential of the price impact:

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

Equate to zero, solve for $d\frac{v_R}{v_I}$ and substitute in the total differential of the block premium (bp),

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

Thus an increase in private benefits leads to a decrease in the block premium while 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 while noting that from the first order condition, $\beta^* = \delta_R \left(\phi_R^{\beta^*} \right)^{-1/2}$, we can show that this inequality always holds.

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. The deal with higher price impact, must have lower security benefits and private benefits if it is to have the same block premium. Likewise, a deal with both higher price impact and higher block premium 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**):

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

We have:

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

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

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

Under ineffective competition, the block premium is invariant to security benefits because the outcome of the tender offer is solely determined by R's fundamentals. The reason why discounts are invariant to changes in security benefits, v_R/v_I, is that, with ineffective competition, I's own valuation of the shares is very low and R's bid only depends on the new value, v_R. Hence, the block price only depends on v_R and the ratio of the block price to the post-announcement price is independent of v_R or v_I. In contrast, all else equal, the block premium varies negatively with R's ability to extract private benefits: intuitively, higher private benefits to R make I more willing to sell at a tender offer (since the retained shares are worth less) leading to a lower equilibrium bid and lower block price. Finally, all else equal, a higher block size leads to a higher incentive effect and lower extraction rates. The lower extraction rates lower I's incentive to sell at a tender offer, which forces a higher bid price (to obtain the same number of shares, γ) and leads to a higher block premium.

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. The model infers this because only a large increase in security benefits associated with R leads to ineffective competition (and hence discounts). Moreover, conditional on generating a discount, the high private benefits to R lead also to lower price impact, so only an increase in security benefits keeps 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 assume 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). Define

$x = \eta' w$. Then

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

Noting that on average $\phi_{R,i}(\alpha) > \phi_{I,i}(\alpha)$, $\frac{1-\phi_{R,i}(\alpha)}{1-\phi_{I,i}(\alpha)}\frac{\phi_I^{\alpha}}{\phi_R^{\alpha}} < 1$. Thus, the effect of firm characteristics through δ_R dominates the impact on price impact if also the elasticities: $\frac{\partial\delta_R}{\partial x}\frac{x}{\delta_R} \geq \frac{\partial\delta_I}{\partial x}\frac{x}{\delta_I}$. On average these elasticities are of similar magnitudes because the volatilities of estimated private benefits to R and to I are similar as well.

B.2. Unmodeled dependence of $\frac{v_I}{v_R}$ on agent and target characteristics

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

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

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 $\mathbf{w}_i$. In particular, $\mathbf{z}$ could have all of the variables already in $\mathbf{w}$. Suppose we estimate the model imposing the constraint that the price impact, denoted by p_i, can be written as $p_i = g\left(\boldsymbol{\eta}'\mathbf{w}_i\right)\boldsymbol{\beta}'\mathbf{z}_i$, as in the BGP model. The 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. As we alternatively do, we could estimate

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

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

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

B.3. Details of the estimation procedure

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

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

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

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

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

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

This procedure is repeated two times. In the first stage, we take $\boldsymbol{\Omega} = \mathbf{I}$, the identity matrix. Using the estimated $\hat{\boldsymbol{\theta}}$ we construct the error vector $\boldsymbol{\varepsilon}(\hat{\boldsymbol{\theta}})$. The estimated $\hat{\boldsymbol{\Omega}}$ is constructed as a diagonal matrix with typical element $\left(\hat{\varepsilon}_i^2\right)$. With the new $\hat{\boldsymbol{\Omega}}$ we repeat the search algorithm to obtain the second stage estimates.

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

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

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

B.4. 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 $I_0 = \alpha(1-\phi_I^\alpha) v_I + d_I^\alpha v_I$ be the incumbent's block value when he is in control. Formally,

$$b^* = \arg\max_b \left(\gamma(b)\left(1-\phi_R^{\gamma(b)}\right) v_R + d_R^{\gamma(b)} v_R - \gamma(b) b\right), \tag{20}$$

subject to

$$\begin{aligned} \gamma(b) &\geq \frac{1}{2}\alpha & (21)\\ I_0 &\leq \gamma(b) b + (\alpha - \gamma(b))\left(1-\phi_R^{\gamma(b)}\right) v_R & (22)\\ \gamma(b) &= \arg\max_\gamma \left(\gamma b + (\alpha-\gamma)\left(1-\phi_R^\gamma\right) v_R\right). & (23)\end{aligned}$$

Constraint (21) guarantees that control is attained at the tender offer, constraint (22) 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 (23) imposes consistency with I's optimization.

To solve this problem we proceed in three steps.

Step 1. Solve the problem assuming constraints (21) and (22) do not bind. To do this, first note that the problem defined in (23) is concave, which implies that we can replace it by the corresponding first order condition:

$$b - \left(1-\tilde{\phi}_R^\gamma\right) v_R + (\alpha-\gamma) \left.\frac{\partial\left(1-\tilde{\phi}_R^\beta\right) v_R}{\partial\beta}\right|_{\beta=\gamma} = 0. \tag{24}$$

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

$$b = \left(1 - \left(1 + \frac{1}{1-\sigma}\frac{\alpha-\gamma}{\gamma}\right)\left(\frac{\delta_R}{\gamma}\right)^{\frac{1}{1-\sigma}}\right) v_R. \tag{25}$$

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

$$\begin{aligned} b^* &= \left(1 - A(x)\left(\frac{\delta_R}{\alpha}\right)^{\frac{1}{1-\sigma}}\right) v_R, & (26)\\ A(x) &= -\frac{\sigma}{1-\sigma} x^{-\frac{1}{1-\sigma}} + \frac{1}{1-\sigma} x^{\frac{\sigma-2}{1-\sigma}}. \end{aligned}$$

R solves (20) subject to the best reply function, $\gamma(b)$. The first order condition is:

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

which, after we replace the value of b that solves (24), 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 (21) binds and (22) is slack. Set $\gamma(b)=\frac{1}{2}\alpha$. To ensure that this solution satisfies (23) we replace the value of $\gamma=\frac{1}{2}\alpha$ on (24) to obtain the bid level consistent with the incumbent tendering half of his block. Using (25):

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

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 (22). Replacing the proposed optimal solution in (22), we see that (b^*,γ^*) is optimal iff

$$I_0\leq\alpha\left(1-2^{\frac{1}{1-\sigma}}\frac{3-2\sigma}{2-2\sigma}\phi_R^{\alpha}\right)v_R. \tag{27}$$

Otherwise, we proceed to:

Step 3. If (27) does not hold, then R must raise his bid to a level such that (22) 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 (22) increases. Thus, at the new optimum, (21) will not bind as we confirm below.

Combining (24) with (22) ((22) 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 $\frac{1}{1-\sigma}$:

$$(I_0-\alpha v_R)\,\gamma^{\frac{1}{1-\sigma}}-\frac{1}{1-\sigma}\gamma\delta_R^{\frac{1}{1-\sigma}}v_R+\frac{2-\sigma}{1-\sigma}\alpha\delta_R^{\frac{1}{1-\sigma}}v_R=0. \tag{28}$$

Let $h(\gamma)$ be the left hand side of (28). We can show the following properties: (1) $h'(\gamma)<0$; (2) $h(\alpha)<0$; and, (3) whenever (27) 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 (25) 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.■

B.5. Proof of Proposition 4

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

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

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,

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

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.■

C. Dataset construction

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

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

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

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

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

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

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

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

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

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

We use Datastream to see if the targets in our sample have also non-voting shares. We found that only eight targets had also shares without voting rights at the time of the trade. For four of these, the percentage of non-voting shares is small and does not exceed 12%. There are only two firms where Class B shares represent more than half of the outstanding stock. BGP show that a larger number of non-voting shares leads to larger block premiums provided that I holds all of the voting shares. However, this result depends on whether there are still voting shares left to be bid. Theoretically, it is not possible to tell whether we under or overestimate private benefits. Also, empirically, because the issue of dual class shares arises only for two firms, we believe there is little risk of biasing our private benefits measure. We do not exclude deals where there are toeholds. In the BGP model, toeholds help reduce the block premium, because the costs associated with a tender offer are smaller; a toehold facilitates the incentive alignment. The fact that the active blockholder dummy is often insignificant in our estimations suggest that the effect of toeholds is second order.

While we exclude block trades where the block is not the largest block, we do not exclude block trades on target firms where another, smaller blockholder exists. Strictly speaking, the BGP model calls for an investor population composed of a single blockholder and atomistic shareholders. In our sample, we find 49 target firms with a second blockholder. In spite of the many targets with a second blockholder, we note that the average size of the second largest block is 5.47% (recall that the average size of the largest block is 30%). A related issue is that we have shown (see Proposition 2) that in the alternative of a tender offer in case II of ineffective competition, the rival acquires a block of size γ. If there exists another blockholder that owns a block $\gamma < \alpha' < \alpha$, then the rival gains control provided he ends up with a block of size $\max(\alpha', \gamma)$. There are fewer than nine cases in our sample where $\gamma < \alpha'$ across all three specifications in Table IV. We have reestimated the model including the constraint that at a successful tender offer at least $\max(\alpha', \gamma)$ shares have to be tendered. The results are quantitatively very similar to those reported in the main text.

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

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

	Cash to assets	Short-term debt to assets	Total assets	Average daily returns	Intangible to total assets	Post SOX?	Corporate acquirer's	Target's cash to acquirer?	Active acquirer?	Same industry acquirer?
Cash to assets	1									
Short-term debt to assets	0.014	1								
Total assets	−0.129	−0.064	1							
Average daily returns	0.102	0.159	−0.087	1						
Intangible to total assets	−0.236	−0.149	0.001	0.003	1					
Post SOX?	0.148	−0.069	−0.006	−0.014	−0.001	1				
Public acquirer?	0.110	−0.020	−0.087	0.117	−0.017	−0.046	1			
Active acquirer?	−0.029	0.005	−0.017	0.210	0.225	−0.076	0.270	1		
Target's to acquirer's cash	−0.101	−0.078	−0.008	−0.113	0.053	−0.129	−0.064	0.034	1	
Same industry?	0.019	−0.062	−0.026	0.011	0.143	0.051	0.257	0.094	−0.128	1

Table IV: Estimates of the private benefits function parameters

Panel A shows the estimates of the block seller's bargaining power, ψ, and of the 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 IV: 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						
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	
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 all the model parameters 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 and the predicted sample mean are different from zero.

Table V: Estimates of the private benefits of control

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

	(1)		(2)		(3)	
	Sample mean	Std error[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	(0.001)	0.003	(0.001)	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)	0.001	(0.001)	0.007	(0.003)

[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 VI: In-sample predictions of the estimated BGP model

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

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

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

	(1)		(2)		(3)	
	Elasticity	(Std error)[a]	Elasticity	(Std error)[a]	Elasticity	(Std error)[a]
Block size	−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 VII: Private Benefits of Control and Corporate Governance

This table shows the effects of incorporating the modified measure of earnings management in Dechow, et al. (1995)) as a determinant of private benefits of control (PBoC). The modified earnings management variable measures discretionary accruals with the residual from a cross-sectional regression of firms' total accruals on the inverse of lagged total assets, the difference of change in sales, the change in receivables, the level of property, plant and equipment (all scaled by lagged total assets), and the lagged value of ROA. Panel A reports the estimates of the parameters of the optimal PBoC function, where we use specification (3) of Table IV, but add the earnings management measure. Panel B summarizes the distribution of the predicted PBoC. 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, for target firms where the earnings management measure is available. Blocks are larger than 10% and smaller than 50% of the outstanding stock, and they are the largest block held. The resulting estimation sample has 83 observations.

Panel A: Estimates of the PBoC Function

	Estimates	Standard Error[a]
ψ	0.513**	(0.208)
σ^b	0.524	(0.007)
η_{TCASH_ASSETS}	6.766*	(3.941)
η_{TSTD_ASSETS}	−3.384	(3.897)
η_{TSIZE}	−27.076***	(0.213)
η_{TAVG_RET}	32.428***	(4.427)
η_{TINT_ASSETS}	6.181*	(3.131)
η_{SOX}	−9.027***	(1.832)
η_{EARN_MGMT}	15.161**	(7.561)
η_R	−1.378	(1.755)
η_{ACORP}	6.594***	(1.845)
$\eta_{CASHRATIO}$	2.555**	(1.118)
η_{AACT}	21.504***	(1.192)
$\eta_{ASAMEIND}$	4.997***	(1.467)
η_I	0.794	(1.110)
Constant	0.040***	(0.007)
Observations	83	
Wald statistic $(\chi^2)^c$	6,295.669***	
$R^{2,d}$	0.124	

Panel B: In-sample Predictions

	Sample mean	Standard Error[e]
Increase in security benefits $(\frac{v_R - v_I}{v_I})$	0.201	(0.035)
Buyer's extraction rate (ϕ_R^α)	0.069	(0.010)
Seller's extraction rate (ϕ_I^α)	0.052	(0.008)
Buyer's private benefits, as a fraction of outstanding equity $(\frac{d(\phi_R^\alpha)}{1-\phi_R^\alpha})$	0.036	(0.005)
Seller's private benefits, as a fraction of outstanding equity $(\frac{d(\phi_I^\alpha)}{1-\phi_I^\alpha})$	0.030	(0.004)

[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 all the model parameters are zero.
[d] The R^2 is computed as 1 minus the sum of squares of the errors of the predicted block premium divided by the total sum of squares of the actual block premium.
[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 and the predicted sample mean are different from zero.

Table VIII: 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.

Table IX: Analysis of the Acquirer's Surplus

This table summarizes the sample distribution of the acquirer's surplus in the general BGP model, predicted using the estimates of the private benefits function reported in Table IV (1,2 and 3) and Table VII (4).

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

Specification	Observations	Mean	Standard error[a]	Median	Proportion of trades with overpayment
(1)	120	−0.008	0.016	−0.044	63.33%
(2)	120	0.085	0.021	0.010	44.17%
(3)	120	−0.028	0.017	−0.074	68.33%
(4)	83	0.072	0.026	−0.007	50.60%

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

Specification	Observations	Mean	Standard error[a]	Median	Proportion of trades with overpayment
(1)	31	0.066	0.005	0.000	0.00%
(2)	31	0.179	0.006	0.190	0.00%
(3)	31	0.102	0.006	0.027	0.00%
(4)	26	0.351	0.027	0.285	0.00%

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

Variable	Observations	Mean	Standard deviation	Median
Acquirer's assets ($ Billions)	27	17.152	68.097	0.729
Target's assets ($ Billions)	31	0.176	0.266	0.083
Block size	31	29.19%	10.08%	28.16%

[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.

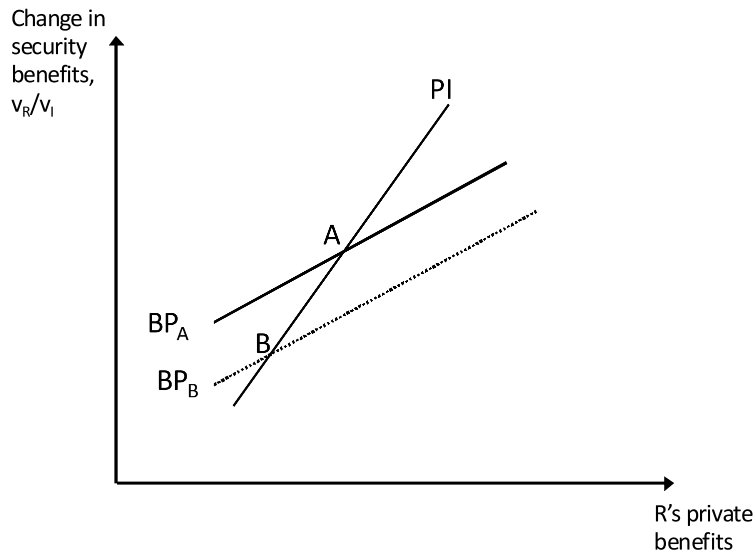

FIGURE 1: Identification of private benefits of control when deals differ on the block premium alone. Deal A has a lower block premium than deal B. BP_i is the iso-block-premium curve for deal $i = A, B$, and PI is the iso-price-impact curve for both deals A and B.

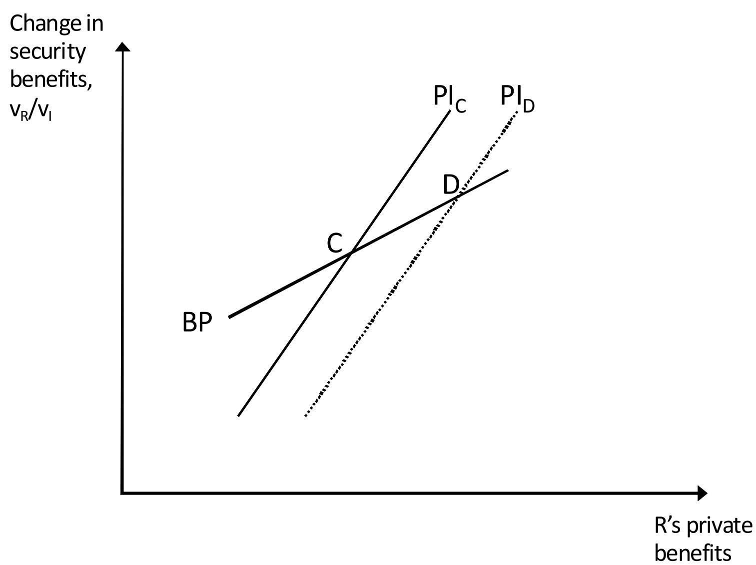

FIGURE 2: Identification of private benefits of control when deals differ on the price impact alone. Deal C has higher price impact than deal D. BP is the iso-block-premium curve for both deals C and D, and PI_i is the iso-price-impact curve for deal $i = C, D$.

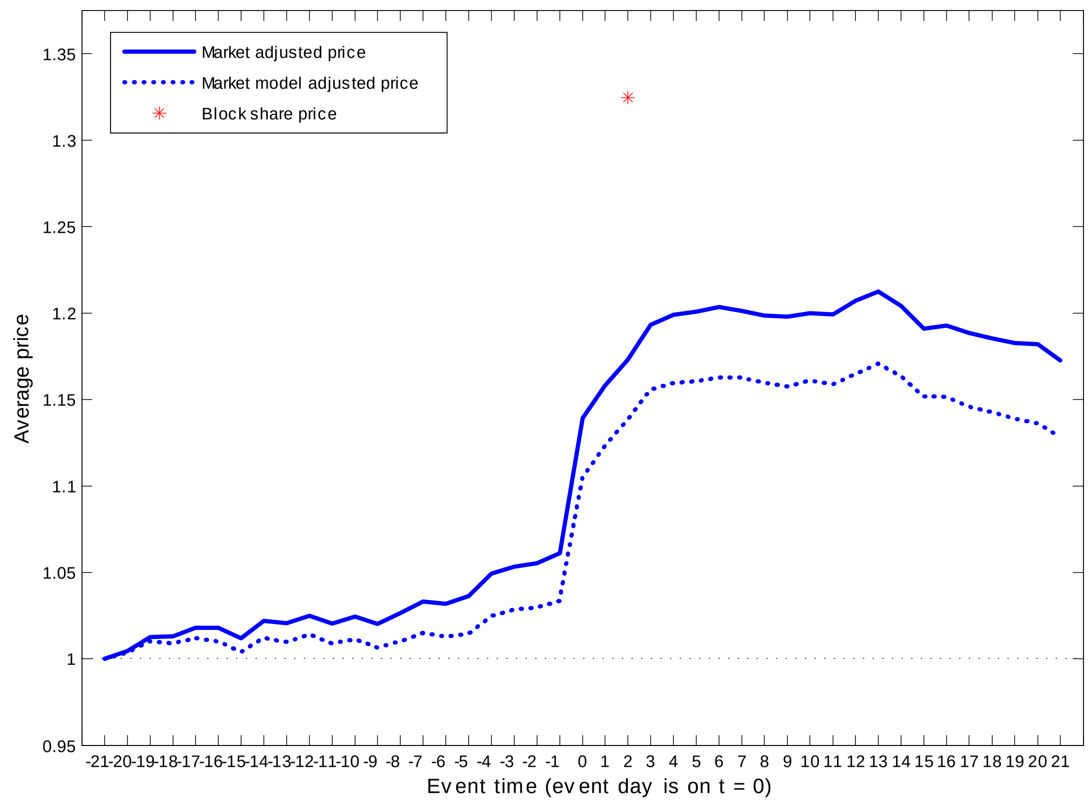

FIGURE 3: Average share price 21 trading days before and after the block trade.

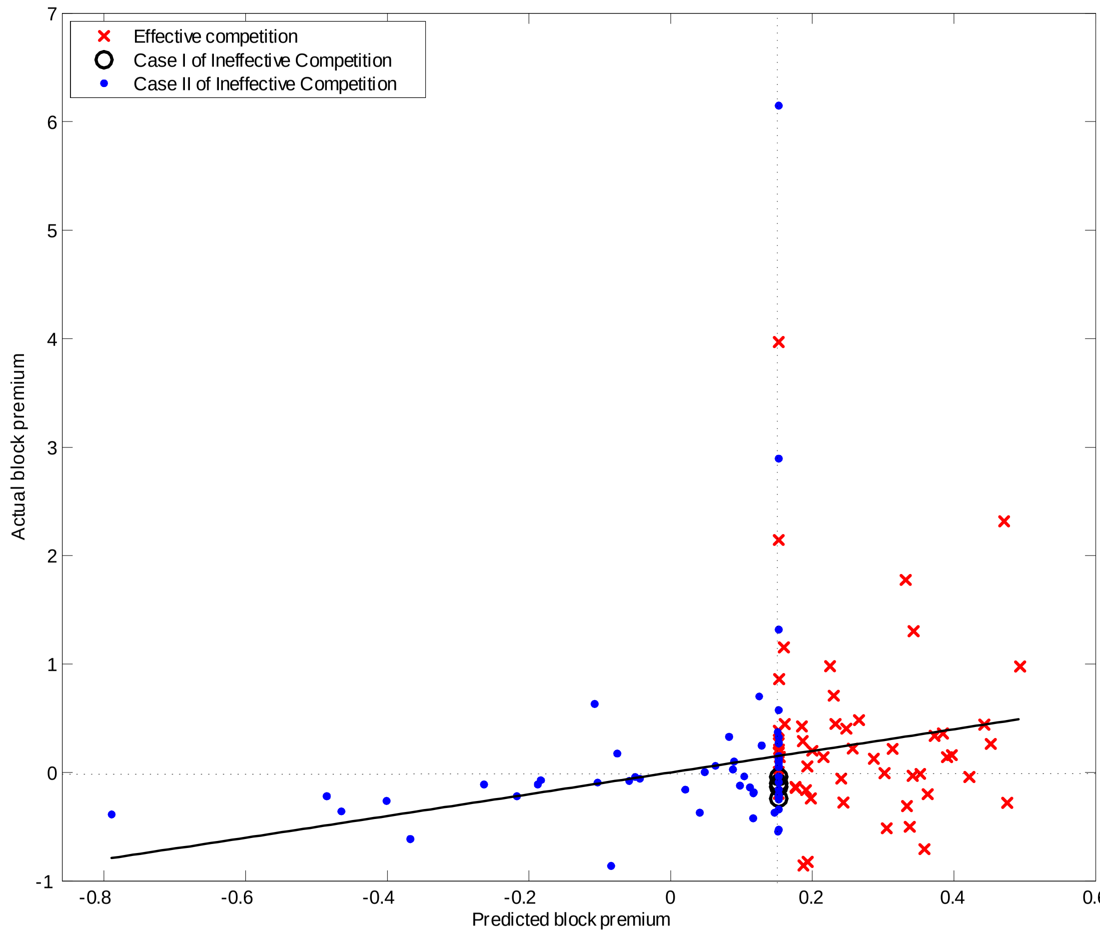

FIGURE 4: Fit of the estimated general BGP model. The block premium is estimated using the coefficients of specification (3) in Table IV.

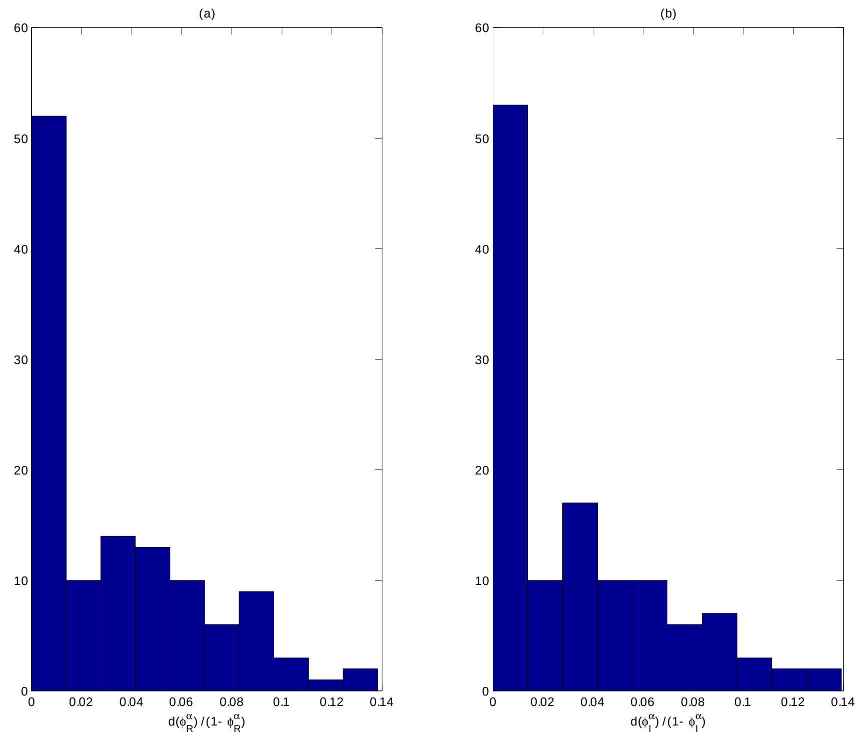

FIGURE 5: Predicted histogram of the private benefits of control of the incumbent, I, (panel (a)) and of the buyer, R, (panel (b)) in the estimated general BGP model. The histograms are constructed using the coefficients of specification (3) in Table IV.