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Abstract

This paper studies how large shareholders with benefits of control affect firms' equity issue behavior and investment decisions. I introduce an explicit agency cost structure based on the large shareholder's benefits of control. In a simple extension of Myers and Majluf [1984], I show that underinvestment is aggravated when there are benefits of being in control, and these benefits are diluted if equity is issued to finance the investment project. I assume that large shareholders are constrained from further investments in their firms, and that they maximize their own wealth, which includes the value of security benefits paid to all shareholders in proportion of ownership stake plus the value of private benefits from voting rights. Potential loss of control is calculated as the difference in the largest shareholder's voting power before and after a hypothetical equity issue. I use voting power as a representation of the large shareholders' expected private benefits. Using a large panel of U.S. data, I find that large shareholders' concern with dilution of ownership and control cause firms to issue less equity and to invest less. I also find that it has no significant effect whether new shares are issued to old shareholders or new shareholders.

JEL Classification: G30, G32, G34

Keywords: Underinvestment, equity issue, ownership structure, influence, voting power, private benefits of control, potential loss of control

1 Introduction

The rent-protection theory by Bebchuk [1999] argues that concentrated ownership structures arise because control is too valuable to large shareholders to leave it up for grabs. In such cases, to preclude a "control grab", large shareholders prefer to bear agency costs rather than give up their control. This paper studies how concentrated ownership structures with large shareholders with benefits of control affect capital constrained firms' equity issue and investment decisions.

Finance theory advises firms to evaluate investment opportunities as if they had ample cash on hand. In efficient capital markets, the net present value of selling securities is always zero because the cash raised exactly balances the present value of the liability created. The decision rule is: accept all projects with a positive net present value, regardless of whether internal or external sources are used to pay for it. The adverse selection model by Myers and Majluf [1984] shows that firms with profitable investment opportunities may be unable to finance them because asymmetric information about future states causes new equity to be underpriced. This is because the firm's management acts in the interest of the existing/controlling shareholders. Such agency costs create adverse selection problems and constrain the supply side in the provision of equity capital. In this paper, there is no uncertainty about the price that new shares command. The adverse selection problem comes from the demand side instead.

I introduce an explicit agency cost structure based on the largest shareholder's benefits of control. In a simple extension of Myers and Majluf [1984], I show that underinvestment is aggravated when there are benefits of being in control, and these benefits are diluted if equity is issued to finance the investment project. I assume that large shareholders are constrained from further investments in their firms, and that they maximize their own wealth, which includes the value of security benefits paid to all shareholders in proportion

of ownership stake plus the value of private benefits from voting rights.[1] Dyck and Zingales [2004] document that substantial private benefits are available to controlling shareholders.

A central idea in this paper is that of potential loss of control as an estimate of large shareholders' resistance towards equity increases. Potential loss of control is calculated as the difference in the largest shareholder's voting power before and after a hypothetical equity issue. If the potential loss of control is higher, the largest shareholder would lose more benefits in an equity expansion. I want to test empirically if there is a negative relation between potential loss of control and actual equity issue (net of repurchase). This is the first hypothesis. If this is the case, I would also expect lower investment. This is the second hypothesis.

Concentrated ownership structures are often associated with countries in continental Europe, ostensibly because of relatively weak investor protection environments. However, even in the United States, the presence of concentrated ownership structures with large shareholders is common. This has recently been documented by Dlugosz et al. [2006] and Gadhoum et al. [2005]. Using a sample of firms from the United States that have at least one large shareholder with more than or equal to 5% of the voting rights, I find that large shareholders are, indeed, concerned with dilution of ownership and benefits of control. The more control the largest shareholder stands to lose from an equity issue, the lower is the actual equity issue. This effect is even stronger if the largest shareholder is also an insider. I also find that the more control the largest shareholder stands to lose, the lower is the investment. It makes little difference whether the new shares are issued to existing shareholders, except the largest, or to new shareholders.

This paper is related to Wu and Wang [2005]. In this paper, benefits of control come from assets in place, whereas in their model benefits of control come from an investment opportunity. The difference is that their model has overinvestment as a potential out-

[1] In this paper, the terms "benefits of control" and "private benefits" are used interchangeably as synonyms.

come (when there are high benefits of control, investment opportunities with negative net present values may be approved). This paper is also related to Müller [2007] who analyzes how attaching relatively high importance to control influences the development of privately held small and medium sized firms in the United Kingdom.

I proceed as follows. Section 2 presents the framework of analysis and the two hypotheses. I describe the concept of benefits of control, and the investment decision subject to large shareholders' benefits of control. Section 3 describes data sources, construction of variables, and presents descriptive statistics of these variables. Section 4 presents my results in more detail, and section 5 concludes.

2 Benefits of control and investment decisions

In this framework, I consider a public firm with assets in place and an investment opportunity with a positive net present value. The firm has a large shareholder with private benefits of control. This shareholder owns w_1 percent of the shares, the remaining $(1-w_1)$ being widely dispersed among small shareholders.

I consider pecuniary benefits of control most relevant for the type of firms considered in this paper. I assume that these benefits are costly and model them to reduce firm value. Examples include self-dealing such as transfer pricing, self-served financial transactions such as directed equity issuance, or, if the large shareholder is also the firm's management, excessive compensation (Djankov et al. [2005]).

The large shareholder uses the firm's management to extract private benefits of control from the small shareholders. z' is the value of these benefits if the firm's management decides to invest, and z is the value if it decides to do nothing. They are costs to the firm borne by all shareholders; however, the small shareholders have no share in the benefits. Though, the higher the large shareholder's ownership stake is, the lower the marginal net

benefit from entrenched behavior is.

If there is an equity issue, besides the price of the new shares, the large shareholder is concerned with dilution of ownership and potential loss of control. This is because ownership is the vehicle for benefits of control; the larger the ownership stake, the more power to dictate management's actions.[2] It follows that z' is smaller than or equal to z when benefits of control come from assets in place, which is the case in this paper.[3]

Hypothesis 1 There should be a negative relation between the large shareholder's private benefits of control and the size of the equity increase.

Such a resistance towards equity increases should affect the firm's investment. Next I will therefore try to formalize the firm's investment decision subject to the large shareholder's benefits of control.

The investment decision is made by the firm's management. I assume that its objective is the interest of the large shareholder, and that the large shareholder responds passively to the management's decision (the large shareholder is more likely than other shareholders to be wealth or portfolio constrained).

When management realizes the true value of the assets in place and the investment opportunity, it decides whether to invest or do nothing. If the firm's management decides to invest, it has to issue equity because financial slack is less than the required investment. The firm is entirely equity-financed, debt financing is not considered. Theory suggests that, regardless of the financing decision, it should invest when the investment opportunity has a positive net present value.

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[2]Note that a large ownership stake also means that more costs are internalized. In terms of an optimal ownership structure, this indicates a solution similar to the coalition formation effect in Bennedsen and Wolfenzon [2000], which says that the coalition with the smallest cash flow stake wins because it has the largest group of shareholders to exploit.

[3]In general, benefits of control could also come from the investment. In that case, z' could be greater than z, and that would alleviate the underinvestment problem caused by the large shareholder's concern of dilution of ownership and potential loss of control. In some cases, the underinvestment problem would become an overinvestment problem. For a model in which the large shareholder's private benefits of control come from the investment opportunity, see Wu and Wang [2005].

Nonetheless, when the firm's management acts in the interest of the large shareholder, it may pass up an investment opportunity with a positive net present value. In Myers and Majluf [1984], this is because the management does not want to issue shares at a bargain price (due to asymmetric information about the true state of nature at the time of the decision). In this paper, it can also be because the dilution of ownership reduces the large shareholder's benefits of control. Adverse selection is therefore made worse by the concern for benefits of control.

On the other hand, the underinvestment problem may turn out to be an overinvestment problem if the large shareholder, prior to the investment decision, is the sole owner of the firm, and the equity issue, if the management decides to issue and invest, does not cause the large shareholder to lose the majority (so that the large shareholder maintains all the voting power). This is because the large shareholder transfers some of the costs of the benefits of control to the new shareholders without losing any benefits (because ownership, and more specifically voting power, is the vehicle for benefits of control).

As mentioned, the large shareholder may dictate the firm's management to pass up the valuable equity financed investment opportunity in order to keep the private benefits of control intact. In that case, the expected value to the large shareholder is

$$w_1(a + S - z) + z \ . \tag{1}$$

where w_1 is the largest shareholder's share of the firm, a is the realized value of the assets in place, S is the financial slack in the firm, and z is the value of the largest shareholder's benefits of control.

If the firm's management decides to issue and invest, the expected value to the large shareholder is

$$w_1 \frac{P'}{P' + E}(a + S + b + E - z') + z' \ , \tag{2}$$

where P' is the market value of the old shareholders' shares, E is the market value of the new shares, b is the realized value of the investment opportunity, and z' is the value of the largest shareholder's benefits of control if the firm's management decides to invest. The first part is the large shareholder's fraction of the firm's value conditional on the equity issue, and the second part is the benefits of control.

Thus, acting in the interest of the large shareholder, the firm's management will issue and invest if

$$w_1(a+S-z)+z \leq w_1\frac{P'}{P'+E}(a+S+b+E-z')+z' \ . \tag{3}$$

Solving this condition for the value of the investment opportunity that makes the large shareholder indifferent to a decision either to do nothing or issue and invest, I get

$$b=\frac{E}{P'}a+E\left(\frac{S}{P'}-\frac{z}{P'}-1\right)+\Delta z\left(1-\frac{1}{w_1}-\frac{E}{w_1P'}\right) \ , \tag{4}$$

where $\Delta z = z'-z$.[4]

The last part of equation (4) is the effect of the dilution of benefits of control; it is always positive, i.e. it increases the minimum net present value of the investment opportunity that the firm's management requires to issue and invest. The magnitude of the increase depends primarily on the market value of the new shares that are used to finance the investment and the large shareholder's ownership stake. There is a negative correlation between the value of the new shares and the value of the benefits of control conditional on an equity issue, because new shares dilute the large shareholder's ownership and thus z'. On the other hand, the higher the large shareholder's ownership stake is, the more the large shareholder internalizes the costs of benefits of control.

Hypothesis 2 There should be a negative relation between the large shareholder's

[4]The indifference line in the model of Myers and Majluf [1984] is $b=\frac{E}{P'}a+E\left(\frac{S}{P'}-1\right)$.

private benefits of control and the firm's investments.

Contrary to the situation just described, there is a risk of overinvestment when the fraction of the shares held by the large shareholder approaches unity. Setting $w_1 = 1$ in equation (4), the indifference line shifts to the right, hence increasing the probability of a decision to issue and invest. The large shareholder simply transfers some of the costs of the benefits of control to the new shareholders without losing any benefits. Thus, as long as the large shareholder does not lose majority, there should not be a negative relation between the large shareholder's private benefits of control and the firm's investments.

3 Data and sample construction

With that the analytical framework and the two testable hypotheses. In this section, I describe data sources and the construction of the variables relevant for testing these hypotheses. In particular, a description of how the potential loss of control is found empirically is needed. The empirical models are specified in the next section.

My data is composed of Compustat Industrial Annual firms for which I could determine the ownership structure by matching with Dlugosz et al. [2006] who have recorded the distribution of voting rights, including the distinction between inside ownership and outside ownership, in a large sample of U.S. firms in the period from 1996 to 2001.[5] This data set is especially suitable for this paper because they focus explicitly on both blockholders and voting rights. I restrict the sample to leave out financial firms and individual firm-year outliers. Outliers are fixed by winsorizing all variables at the one-percent level. Although the data spans a six-year period, the average firm is observed for less than four years (3.48). Thus, the data set is a typical corporate finance panel with a large number

[5]Dlugosz et al. [2006] document problems with currently available data, propose a consistent set of solutions to these problems, and make a "clean" database freely available. This can be downloaded from http://finance.wharton.upenn.edu/~metrick/data.htm.

of cross-sectional observations and only a few periods.

3.1 Variables

While both hypotheses are formulated with the same concept of dilution of ownership as the key exogenous variable, there are two different endogenous variables. For hypothesis 1, I need to calculate the net equity issue. For hypothesis 2, I need to calculate each firm's investment. The construction of these endogenous variables is described next. After that, I describe the exogenous variables.

3.1.1 Endogenous variables

Using the identity that book equity equals balance sheet retained earnings plus paid-in share capital, I define net equity issue as the change in book equity minus the change in balance sheet retained earnings divided by total assets. I define book equity as total assets less total liabilities and preferred stock plus deferred taxes and convertible debt. When preferred stock is missing, it is replaced with the redemption value of preferred stock.

I define investment as after tax profits plus depreciation minus dividends plus net equity and debt issues. Net equity issue follows from the above. Net debt issue is the change in total assets after net equity issue and retained earnings divided by total assets. These definitions follow Baker and Wurgler [2002]. Research and development and advertisement are also included because they are supposed to produce intangible capital, which contributes to a firm's market value (Gugler et al. [2004]).

3.1.2 Exogenous variables

Potential loss of control The key right hand side variable is the largest shareholder's potential loss of benefits of control in an equity issue (voting power as the probability

the largest shareholder uses to find the expected benefits). One way of measuring this is to calculate how much control the largest shareholder would lose in a hypothetical equity increase (Müller [2007]). This approach is well suited for this analysis because it mitigates a serious endogeneity problem: that it is not possible to investigate directly the relationship between loss of control due to actual ownership changes and the dependent variable of interest because actual ownership changes are inherently endogenous.

The large shareholder's private benefits are latent. The firm's ownership structure and the distribution of voting power that I can calculate from it is an observable indicator of the variable. Potential loss of control is thus a proxy variable. The usual treatment of such variables is in the measurement error framework (Greene [2003]). To test whether the least square estimate of potential loss of control is inconsistent, an alternative set of results can be build around the method of instrumental variables. Hausman's specification test for all empirical models produce test statistics between 0 and 1, indicating that the least square estimate of potential loss of control is consistent and unbiased.[6]

Control is measured as the probability for the largest shareholder of winning a vote in a binary decision that is taken with simple majority. The underlying voting model is a simple (in the sense that it maps coalitions to 0 or 1) cooperative game with multiple players that I solve using Shapley and Shubik [1954].[7] The potential loss of control is then the difference between the probability that the largest shareholder will win a vote given the current ownership structure and the probability that the largest shareholder will win a vote given the new ownership structure after a hypothetical equity increase.

Calculating the probability of winning a vote by means of voting power requires a

[6]It is not clear where a proper instrument is to be found. I use an instrument based only on the data in hand (suggested in Greene [2003]). The instrument is equal to 1 if the potential loss of control is larger than the median value and -1 if the potential loss of control is less than the median.

[7]The choice of Shapley and Shubik [1954] is motivated by the notion of power as the expected relative share of benefits available to the controlling coalition of shareholders (Felsenthal and Machover [1998]). It captures the idea that the largest shareholder's attempt to maintain control by preventing equity issues is unfavorable to other shareholders.

complete account of the distribution of votes. However, the data only includes those shareholders with at least five percent of the voting rights. This incompleteness calls for a decision on how to handle the missing observations. Two procedures can be found in the literature. One assumes that they are not influential, and the other assumes that they are influential with some positive probability. Since the largest shareholder is concerned about losing control in an equity issue, there is an obvious consideration of all shareholders and hence the small shareholders should be included in the calculations. I use a finite representation proposed by Guedes and Loureiro [2002] to approximate the actual distribution of votes. It simply assumes that each small shareholder holds one percent of the votes and then adds shareholders until the joint votes of all shareholders add up to one hundred percent.

One potential concern of this measure is the influence that it attaches to the largest shareholder; it is implicitly assumed that the largest shareholder is influential in financing decisions. Another potential concern has to do with the endogeneity problem. Since the measure is a function of ownership structure, so is the potential loss of control if ownership structure is indeed endogenous. Nonetheless, by analyzing hypothetical equity increases instead of actual equity increases, this problem is reduced.

For the equity issue, it is assumed that all shareholders, except the largest, increase their ownership stake with the average of actual equity increases. Here the idea is that the largest shareholder is more likely to be wealth constrained. Another possibility for the equity issue is that it is public and that a set of new equally small shareholders enters the firm. Section 4 presents results for both assumptions.

I include the size of the ownership stake of the largest shareholder and an interaction term between the largest shareholder's potential loss of control and ownership stake. Potential loss of control is a constituent effect, and it should be interacted with the largest shareholder's ownership stake to account for the varying intensities with respect

to the ownership stake. This is necessary because voting power is monotonic in size and thus conditional upon the size.[8] As the largest shareholder's ownership stake increases, so does the potential expropriation and, in the case of an equity issue, the loss of benefits of control.

Finally, for both models, I include a dummy variable equal to one if the largest shareholder is also a manager in the firm and zero otherwise because such a position allows the owner-manager to influence the decision-making process more effectively.

Controls There are some characteristics of each firm that are likely to be correlated with the different endogenous variables. To identify the effect of the private benefits of control, I should control for these characteristics in the regression models. The control variables are taken from papers explaining firms' choice of capital structure and investment decisions, including Welch [2004], Gugler et al. [2004], Baker and Wurgler [2002], Rajan and Zingales [1995], Harris and Raviv [1991], amongst others.

For hypothesis 1, the variables are market to book value, leverage, profitability, and firm size. Market to book is defined as total assets minus book equity plus the market value of equity, all divided by total assets. It is used to pick up what have been perceived as transient market timing opportunities for past financing opportunities. Leverage is defined as book debt divided by the result of total assets minus book equity plus the market value of equity. Book debt is defined as total assets minus book equity, and the market value of equity is defined as common shares outstanding times price.[9] I leave out firm-year observations where the resulting value is above one. According to the pecking order theory, firms will use debt financing until their debt capacity is reached, and then

[8] See Felsenthal and Machover [1998] for more on the monotonicity condition.

[9] Rajan and Zingales [1995] adjust debt by subtracting cash and marketable securities from total debt, and equity by adding provisions and deferred taxes and subtracting intangibles. This makes sense in an international comparison, but the adjustments need not be the optimal way to study leverage. For example, accounting differences may be an optimal response to the existing legal environment. I therefore choose to use the raw measures and draw inferences from the basic information provided by accounting data.

they will issue new shares. Profitability is defined as earnings before interest, taxes, and depreciation divided by total assets. Profitability is positively correlated with accumulated retained earnings and thus negatively correlated with equity issue. Finally, size is defined as the log of net sales. It is included to control for any level effects.

For hypothesis 2, the control variables are market to book, cash flow, an interaction term between market to book and cash flow, and marginal q. Market to book is a way to control for capital market constraints on the managers' actions. Managers favor internal cash flow as a source of financing, but this does not preclude their resorting to the external capital market. Their motivation to do so is likely to be positively correlated with the market to book value. Market to book follows from the above. Under neoclassic theory, a firm's marginal return on investment will always equal its cost of capital. However, in the presence of asymmetric information, a firm may find it difficult to externally finance investment opportunities. Investment should then be positively correlated with cash flow.[10] I include an interaction term between market to book and cash flow to account for the varying intensities of the constraints on managers with respect to the use of cash flow to finance investment. Cash flow is the sum of after tax profits and depreciation minus dividends divided by total assets.

I focus on marginal q instead of average q or Tobin's q because what is relevant for the investment decision is the marginal return on a firm's capital instead of the average return (Gugler et al. [2004]). It controls for differences in investment opportunities, and it should be positively correlated with investment. This is because high marginal q firms can afford higher cost of capital and thus face more positive net present value investment opportunities. Appendix A describes the methodology for estimation.

[10]Notice that managerial discretion (with a view to the manager's own benefit, and not the benefit of the large shareholder as it is modeled in the analytical framework) manifests itself as overinvestment out of cash flows. Jensen [1986] argues that, by imposing a claim on the firm's cash flow, debt limits the managers' incentives to engage in non-optimal activities such as overinvestment. Including market leverage as a control variable does not change my results (not reported).

3.2 Descriptive statistics

Table 1 presents descriptive statistics for variables used in this study. This paper does not test the pecking order theory, but let me remark that firms frequently issue stock: 44% of the firms in the balanced sample issued equity during the period 1996-2001 (not tabulated). This is somewhat contrary to what the theory predicts, but similar to what Fama and French [2005] find. The average annual equity issue is 9.17% of total assets. This is the size of the hypothetical equity increase used to calculate the largest shareholder's potential loss of benefits of control. Note the skewness to the right in the equity issue. The log transformed variable is normally distributed, but my results are not qualitatively sensitive to this.

The average largest shareholder has 14.58% of the voting rights, and the average firm has 72.50% of the shares widely dispersed among small shareholders (prior to the equity issue). The remaining shares are held by a number of inferior blockholders, the average number of blockholders being 2.71 (not tabulated). Figure 1 shows the full distribution of the number of blockholders along with the size of the largest shareholder. Though the framework is set up with only one blockholder, this does not cause a problem. Inferior blockholders simply reduce the power and hence the benefits of control of the largest shareholder. If anything, inferior blockholders create a bias against the results reported.

The average voting power of the largest shareholder is 0.1652. In other words, the largest shareholder's probability of winning a vote is 0.1652. This probability decreases by almost 11% if new shares are issued to old (existing) shareholders. If new shares are issued to new equally small shareholders instead, the largest shareholder's probability of winning a vote decreases by more than 13%. Remember that ownership is the vehicle for benefits of control, and that the resulting voting power is used to find the expected benefits. Considering the private benefits reported in Dyck and Zingales [2004] (1% of firm equity for U.S. firms), the economic significance of such a decrease therefore seems

important.

Figures 2 and 3 show the potential loss of control measures by plotting them with respect to the ownership stake of the largest shareholder. We see that if the largest shareholder holds an ownership stake that is sufficiently above the 50% majority rule, then the potential loss of control is zero. This is because the shareholder has full control both before and after the equity issue. In a few instances (52 to be precise), the equity issue causes the largest shareholder to lose full control, i.e. to go from having all the voting power to sharing it with other shareholders. The number of instances when equity is issued to new shareholders is 97. We also see that if the largest shareholder is relatively small, then the potential loss of control is relatively high. This is because the equity increase enhances the competition for control.

In 31% of firms, the largest shareholder is also an insider. This dual role increases the effectiveness of the largest shareholder in influencing the decision-making process. The voting power calculations do not take this into account. The largest shareholder's ownership stake, voting power, and potential loss of control, conditional on the largest shareholder being an insider, are unchanged though (not tabulated).

4 Results

In this section, I present the empirical results of the largest shareholder's potential loss of control from a hypothetical equity issue. In particular, I try to estimate the effect on the actual net equity increase (hypothesis 1) and the level of investment (hypothesis 2). Both models are pooled ordinary least squares estimated on the basis of the discussion in the previous section. Given the parsimonious nature of my specification, I include firm fixed effects to control for a possible correlation between the exogenous variables and some firm specific omitted variables. In addition to firm fixed effects, I also include year dummies

to address possible correlation within clusters. This specification should provide robust standard errors (see Petersen [2007] for a recent review of standard error econometrics in finance panel data).

Accounting variables are lagged one period to reduce the problem of endogeneity. Finally, interaction terms in linear models can drastically increase the level of collinearity. Both models have been checked for collinearities among the regressor variables (using the variance inflation factor with 10 as threshold value) without causing any changes.

4.1 Testing hypothesis 1

From a theoretical point of view there is no prediction on the relationship between potential loss of control and equity decreases. Therefore, only firms with a non-negative growth rate in equity are included in this analysis.[11] I use an ordinary least squares model instead of a truncated least squares model precisely because there is no justification for the model when growth rates are negative, i.e. I am not trying to make inferences from a sample drawn from a restricted part of the population.

The following model is estimated.

$$\begin{aligned}\Delta E_{i,t} &= \beta_1 \Delta\phi_{1,i,t} + \beta_2 w_{1,i,t} + \beta_3(\Delta\phi_{1,i,t} \times w_{1,i,t}) + \beta_4 \text{Insider}_{i,t} + \beta_5 \text{Market to book}_{i,t-1} \\ &\quad + \beta_6 \text{Leverage}_{i,t-1} + \beta_7 \text{Profitability}_{i,t-1} + \beta_8 \text{Size}_{i,t-1} + \beta_9 \text{Year}_t + \alpha_i + \varepsilon_{i,t} \ , \quad (5)\end{aligned}$$

where $\Delta E_{i,t}$ is firm i's net equity issue relative to total assets at time t, $\Delta\phi_{1,i,t}$ is the potential loss of control of the largest shareholder in firm i from a hypothetical equity issue at time t, $w_{1,i,t}$ is the ownership stake of the largest shareholder in firm i at time

[11] I excluded firm-year observations with a net repurchase of shares. However, a measure of the potential gain of control from an equity decrease could easily be constructed to study the effect of this on the level of repurchase. I leave this to future work.

t, and α_i is the unobserved firm fixed effect. Table 2 reports parameter estimates and robust t-statistics.

In regression (1), where the new shares are issued to old shareholders, the coefficient of the largest shareholder's potential loss of control is statistically significant. The negative coefficient lends support to the conclusion that the largest shareholder is concerned with dilution of ownership and potential loss of control, hence confirming hypothesis 1, which states that there should be a negative relation between the large shareholder's private benefits of control and the size of the equity increase. As mentioned in a previous section, this is because ownership is the vehicle for benefits of control; the larger the ownership stake, the more power to dictate management's actions.

This conclusion is reinforced by looking at the largest shareholder's ownership stake; the coefficient is negative and statistically significant as well, and it shows that firms with large shareholders (with more power to lose) are more reluctant to issue equity. There are other ways to think of ownership though: for example, it may approximate the size of the firm. Pursuing this interpretation, smaller firms tend to have larger owners as well as higher growth rates. Then there should be a positive relation to net equity issue instead of a negative relation, as is the case here. Thus, this interpretation is rejected. Note, finally, that the interaction between the largest shareholder's potential loss of control and ownership stake, which is important to avoid an omitted variable problem, is also significant.[12]

If the largest shareholder is also an insider, de facto influence on the decision-making process is higher than warranted by the voting power. In this situation, an equity increase does not only dilute the ownership stake of the largest shareholder, it may also endanger

[12]If the largest shareholder's ability to dictate the firm's management fails, managerial discretion becomes an issue to consider. One source of managerial discretion is carelessness in monitoring by shareholders and the market for corporate control. In this situation, the negative coefficient of the largest shareholder's ownership stake lends support to the conclusion that better incentives to exert effort or better incentives to monitor lead to smaller equity increases. It could be that empire building is prevented this way (Müller [2007]).

the position as manager through the market for corporate control (Stulz [1988]) and the managerial labor market (Fama [1980]). Resistance towards an equity issue should therefore be stronger, and the coefficient of the insider dummy variable is indeed negative and significant. In firms with such a dualism, net equity issue is more than 2% lower.[13]

As regards the first control variable, theory predicts that firms with high market to book values have higher costs of financial distress. One reason for the positive coefficient may be that equity succeeds debt in the pecking order theory. There are other potential reasons for the positive correlation with net equity issue though: for example, firms may issue shares when their price is high relative to book value (Baker and Wurgler [2002]). Considering the broad increase in stock prices during the first two thirds of the sample period, this is a likely reason. Either way, there is a positive relation between the market to book ratio and net equity issue, and it is statistically significant.

Second, the regression also shows that firms with higher leverage rely less on equity finance. This effect is also somewhat contrary to the pecking order theory, which states that firms will use debt financing until their debt capacity is reached, and only then will they issue new shares. But it supports hypothesis 1: large and powerful shareholders sometimes do not accept additional equity finance, even if it is available, because they want to remain in control. The effect on investment is formulated in hypothesis 2, and empirical results are presented in the next section.

In relation to the third control variable, the theoretical implication of past profitability on equity issue is ambiguous. On the one hand, firms that were successful and profitable in the past have accumulated retained earnings and do not need to rely on equity financing. On the other hand, if success is persistent, profitable firms have more growth opportunities and require more capital to expand. Clearly, the first effect dominates in the regression. The coefficient of profitability is negative and significant.

[13] With managerial discretion, this could again be an indication that empire building is prevented.

Finally, as I have already noted, the size of the firm could have an effect on the net equity issue. Smaller firms tend to grow faster and rely more on external capital. The coefficient of size has the expected negative sign, but it is not significant.

Regression (2) in table 2 shows that nothing really changes when the new shares are issued to new shareholders instead of old shareholders. A re-calculation of the potential loss of control grounded on a new basis of allocation of shares is the only difference in the data compared to regression (1). As the number of shareholders increases, the competition for control increases, and the voting power of the largest shareholder decreases (the increase in potential loss of control is from 0.11 to 0.13, cf. table 1). In accordance with this, the coefficient is also more negative. Note that the effect of competition for control increases as the size of the largest shareholder increases. The interaction between the largest shareholder's potential loss of control and ownership stake has about half the impact compared to regression (1). Otherwise, all coefficients are similar to those in regression (1) and do not require further comments.

4.2 Testing hypothesis 2

The following model is estimated.

$$\begin{aligned} I_{i,t} &= \beta_1 \Delta\phi_{1,i,t} + \beta_2 w_{1,i,t} + \beta_3(\Delta\phi_{1,i,t} \times w_{1,i,t}) + \beta_4 \text{Insider}_{i,t} + \beta_5 \text{Market to book}_{i,t-1} \\ &\quad + \beta_6 \text{Cash flow}_{i,t-1} + \beta_7(\text{Market to book}_{i,t-1} \times \text{Cash flow}_{i,t-1}) \\ &\quad + \beta_8 \text{Marginal } q_{i,t-1} + \beta_9 \text{Year}_t + \alpha_i + \varepsilon_{i,t} \ , \end{aligned} \tag{6}$$

where $I_{i,t}$ is firm i's investment relative to total assets at time t, $\Delta\phi_{1,i,t}$ is the potential loss of control of the largest shareholder in firm i from a hypothetical equity issue at time t, $w_{1,i,t}$ is the ownership stake of the largest shareholder in firm i at time t, and α_i is the

unobserved firm fixed effect. Table 3 reports parameter estimates and robust t-statistics.

In regression (1), where the new shares are issued to old shareholders, the coefficient of the largest shareholder's potential loss of control is again statistically significant, and the negative coefficient lends support to the conclusion that the largest shareholder's concern with dilution of ownership and potential loss of control reduces the firm's investment, hence confirming hypothesis 2. In order to stay in control, the largest shareholders use their power to dictate the firms' management to give up investments and thus forego some growth opportunities. Similarly, the coefficient of the largest shareholder's ownership stake is again negative, showing that firms with large shareholders (with more power to lose) are more reluctant to invest. The coefficient is not statistically significant though. In this model, ownership does not approximate the size of the firm either. Small firms have relatively larger shareholders, higher growth, and more investment opportunities, which is again contrary to the estimated sign. The interaction between the largest shareholder's potential loss of control and ownership stake is significant, and the association between the largest shareholder's potential loss of control and ownership stake grows stronger, the larger the largest shareholder is (which is an artifact of the voting power theory). Therefore, the underinvestment problem that follows from the potential loss of control decreases in the size of the largest shareholder because more of the costs of benefits of control are internalized.

If there is an equity increase, the largest shareholder will always consider reducing the firm's investment. We saw this in section 2. In the previous section, we saw that if the largest shareholder is also an insider, issuance of new shares is in fact lower. To the extent that profitable investment opportunities can be exercised without equity financing, the largest shareholder's concern with dilution of ownership need not carry over to investment, and from the positive and significant coefficient of the insider dummy variable, it can be concluded that this is not the case. Other effects of the largest shareholder's dual position

dominate.[14] In this sample, the level of investment is more than 5% higher if the largest shareholder is also an insider.

There is one exception to this behavior. Very powerful shareholders may invest more with equity financing because the large shareholder transfers some of the costs of the benefits of control to the new shareholders without losing any benefits. As long as the issuance of new shares does not cause the large shareholder to lose majority (and thus voting power, which determines the expected benefits), there should be a positive relation between the large shareholder's private benefits of control and the firm's investments, provided that there are attractive investment opportunities, of course. On the contrary, a dummy variable equal to one if the largest shareholder loses control and zero otherwise should have a negative relation to investment. The results for the model that takes this into account are very similar and therefore only presented in abbreviated form. Loss of majority has a negative coefficient, but it is not statistically significant. Another explanation is offered by the size of the inside shareholder's ownership stake. The potential underinvestment problem that follows from the potential loss of control decreases (you invest more) in the size of the largest shareholder because more of the costs of benefits of control are internalized. In my data, the average ownership stake is 6%-points larger if the largest shareholder is also an insider.

It is important to control for the attractiveness of the firm's investment opportunities. I have advocated marginal q as a variable well suited for this purpose. The coefficient is, somewhat surprisingly, negative and highly significant. This effect is due to the ownership structure variables; estimating the model without these variables, I get the expected positive coefficient. I conjecture that the increased likelihood of a decision to invest that follows from an improvement in investment opportunities causes the large shareholder to resist, provided that equity is used to finance the investment. Including an interaction

[14] Ibid.

term between the largest shareholder's potential loss of control (as an approximation for resistance) and marginal q, its coefficient is indeed positive (not tabulated). For a given level of resistance, there is a positive relation between the attractiveness of investment opportunities and investment.

The coefficients of market to book and cash flow are both significant. The market to book variable approximates the firm's access to external capital. Firms with high market to book values invest more because they have easier access to external capital. This interpretation of market to book is reinforced by looking at the interaction with cash flow. The negative coefficient implies that the sensitivity of a firm's investment to the level of its cash flow declines as the value that the market places on its existing capital rises, and thus as its access to external capital improves. Similarly, the link between market to book and investment grows weaker, the greater the firm's cash flows are and thus the less important access to the external capital market becomes (Gugler et al. [2004]). The interaction is not statistically significant though. Note, finally, that the coefficient of cash flow is positive, as expected, and significant.

Regression (2) in table 3 shows again that nothing really changes when the new shares are issued to new shareholders instead of old shareholders, except for the smaller coefficient of the interaction between the largest shareholder's potential loss of control and ownership stake.

5 Conclusion

This paper contributes to the literature on equity financed investment decisions in firms with large shareholders by presenting a framework based on the potential loss of control from an equity increase. It is hypothesized that firms in which the largest shareholder would lose more influence in an equity increase have smaller equity increases and lower

investments. I present evidence in support of the predicted effects.

This paper shows that powerful shareholders' concern with dilution of ownership and control can affect firm characteristics such as capital structure and growth. Pushing the argument further, powerful shareholders appear to take advantage of the discretion they have to prevent their firms from reaching the point that is optimal from the point of view of the shareholders in general. The policy implication from these results is that when observing firms that have investment opportunities which they do not exploit completely, we need to be careful to consider both demand and supply side constraints in the provision of equity capital.

This conclusion hinges on the assumptions that there are benefits to large shareholders from being in control, and that these benefits are divisible and allocated to each shareholder according to the shareholder's strategic importance in forming controlling coalitions. Furthermore, I have assumed that benefits of control are costs to the firm borne by all shareholders.

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A Estimation of marginal q

Since there is no common methodology for the estimation of marginal q, this appendix describes the one used in this paper. I follow Gugler and Yurtoglu [2003]. The idea is that I want to know whether additional investment adds value to the firm or not, i.e. whether the firm underinvests or overinvests.

Let the present value of investment I at time t be

$$PV_t = \sum_{j=1}^{\infty} \frac{C_{t+j}}{(1+i_t)^j} = \frac{I_t r_t}{i_t} = q_{m,t} I_t \ . \tag{7}$$

$q_{m,t}$ is the return, r_t, on the investment relative to the firm's cost of capital, i_t. It is marginal q because it states the change in the market value of the firm relative to the change in its capital stock that caused it. In contrast, average q is the market value of the firm relative to its capital stock.

$$M_t - M_{t-1} = q_{m,t} I_t - \delta_t M_{t-1} \tag{8}$$

is then the change in market value from period $t-1$ to t where δ_t is the depreciation rate for the firm's total capital. Change in market value is due to changes in assets in place as a result of investment and depreciation. The only variable that is not directly available from data is the depreciation rate.

Assuming that it is constant within industries and over time, I can divide equation (8) by M_{t-1} and run ordinary least squares regressions to estimate separate δ_D for each SIC division of industries. With these estimates, I can calculate marginal q for each firm and each year in the following way.

$$q_{m,t} = \frac{M_t - (1-\delta_D) M_{t-1}}{I_t} \ . \tag{9}$$

Figure 1: Distribution of the number of large shareholders

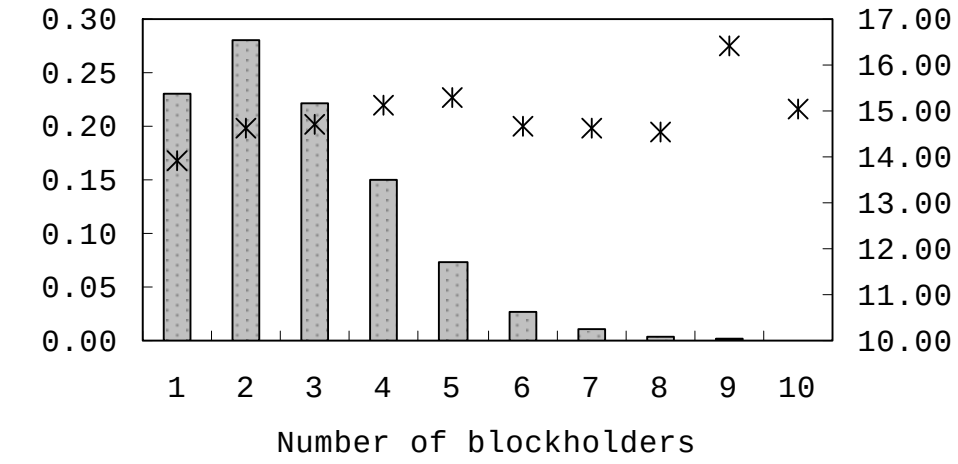

Figure 2: Potential loss of control according to the largest shareholder

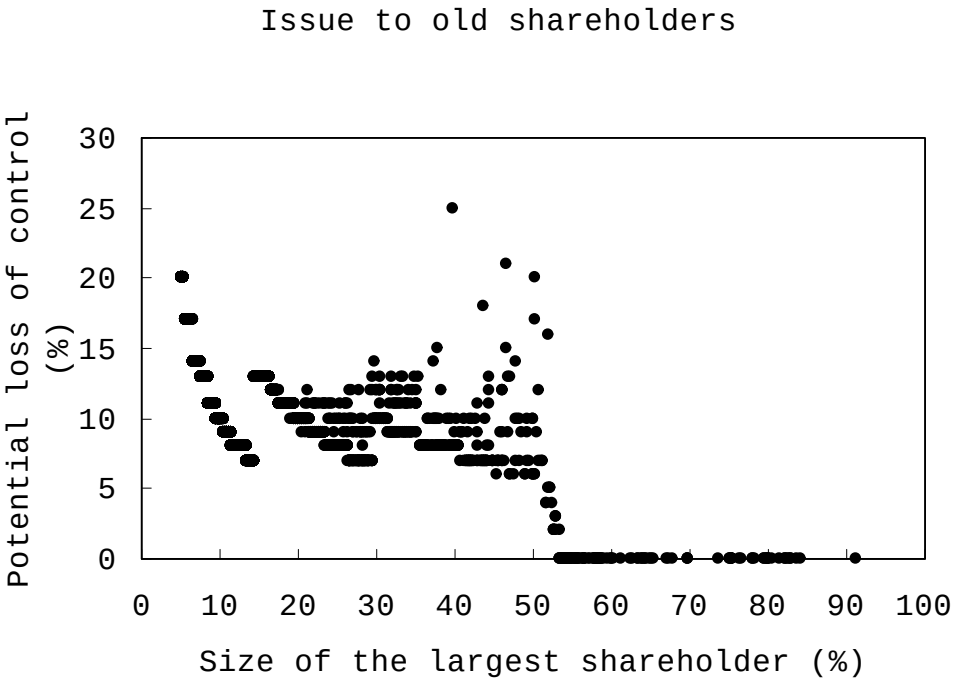

Figure 3: Potential loss of control according to the largest shareholder

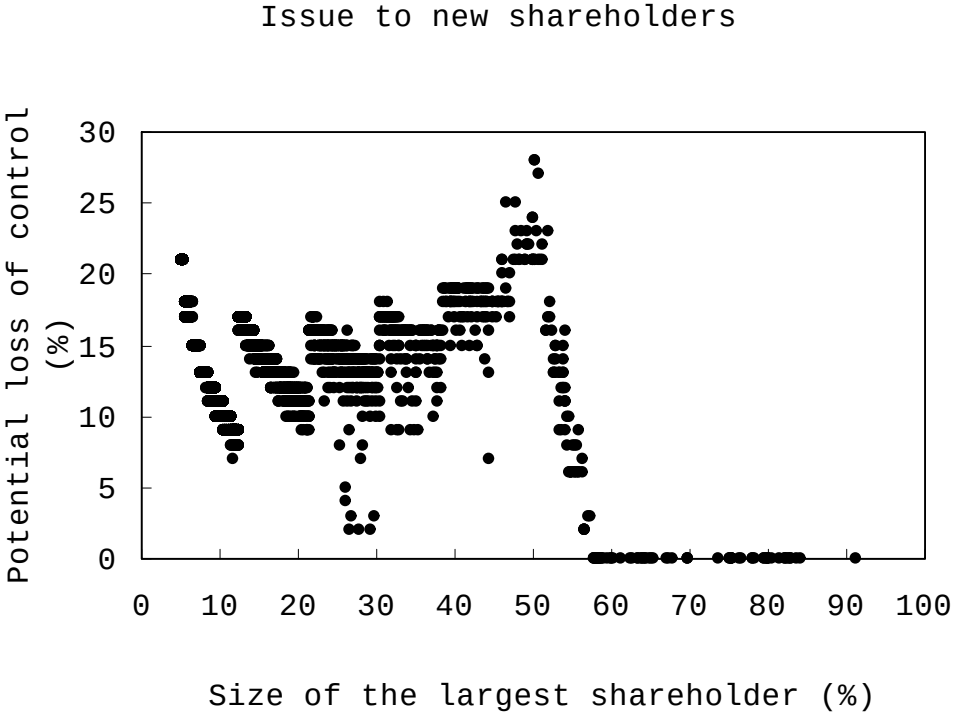

Table 1: Descriptive statistics

This table presents statistics for a large panel of U.S. firms composed of Compustat Industrial Annual firms for which I could determine the ownership structure by matching with Dlugosz et al. [2006]. Equity issue is the change in book equity minus the change in balance sheet retained earnings (Compustat Industrial Annual item 36) divided by total assets (item 6). Book equity is total assets (item 6) less total liabilities (item 181) and preferred stock (item 10) plus deferred taxes (item 35) and convertible debt (item 79). When preferred stock is missing, it is replaced with the redemption value of preferred stock (item 56). Investment is after tax profits (item 18) plus depreciation (item 14) minus dividends (item 21) plus net equity and debt issues. Net equity issue follows from the above. Net debt issue is the change in total assets (item 6) after net equity issue and retained earnings (item 36) divided by total assets (item 6). Research and development (item 46) and advertisement (item 45) are also included in investment. Ownership is the largest shareholder's share of the voting rights. Voting power is the largest shareholder's Shapley and Shubik [1954] power index. Potential loss of control is the difference between the largest shareholder's voting power before and after a hypothetical equity increase equal to the average actual equity increase across the entire sample. The new shares can be issued to old or new shareholders. Insider is a dummy variable equal to one if the largest shareholder is also a manager in the firm and zero otherwise. Cash flow is the sum of after tax profits (item 18) and depreciation (item 14) minus dividends (item 21) divided by total assets (item 6). Marginal q is the marginal return on a firm's capital (see appendix A). Market to book is total assets (item 6) minus book equity (follows from the above) plus market value of equity (item 25 * item 199), all divided by total assets (item 6). Leverage is book debt divided by the result of total assets (item 6) minus book equity (follows from the above) plus market value of equity (follows from the above). Book debt is total assets (item 6) minus book equity. Profitability is earnings before interest, taxes, and depreciation (item 13) divided by total assets (item 6). Finally, size is the log of net sales (item 12).

Variable	Mean	Std dev	Q1	Q2	Q3
Equity issue	0.0917	0.2236	0.0077	0.0209	0.0707
Investment	0.4223	0.3738	0.1485	0.3047	0.5743
Ownership	0.1458	0.1081	0.0850	0.1120	0.1550
Voting power	0.1652	0.1724	0.0851	0.1106	0.1562
Potential loss of control (old)	0.1072	0.0338	0.0833	0.1000	0.1250
Potential loss of control (new)	0.1324	0.0340	0.1077	0.1324	0.1534
Insider	0.3106	0.4627	0.0000	0.0000	1.0000
Cash flow	0.3919	0.3841	0.1432	0.2802	0.5193
Marginal q	0.6103	1.7604	-0.2716	0.3044	1.3587
Market to book	1.8580	0.9681	1.1769	1.5325	2.1920
Leverage	0.3589	0.2053	0.1859	0.3438	0.5098
Profitability	0.1520	0.0638	0.1075	0.1491	0.1962
Size	3.0344	0.4948	2.6729	3.0034	3.3767

Table 2: Ordinary least squares estimates of the relation between net equity issue and potential loss of control

The dependent variable is net equity issue defined as the change in book equity minus the change in balance sheet retained earnings (Compustat Industrial Annual item 36) divided by total assets (item 6). Book equity is total assets (item 6) less total liabilities (item 181) and preferred stock (item 10) plus deferred taxes (item 35) and convertible debt (item 79). When preferred stock is missing, it is replaced with the redemption value of preferred stock (item 56). Potential loss of control is the difference between the largest shareholder's Shapley and Shubik [1954] voting power before and after a hypothetical equity increase equal to the average actual equity increase across the entire sample. Ownership is the largest shareholder's share of the voting rights. Insider is a dummy variable equal to one if the largest shareholder is also a manager in the firm and zero otherwise. Market to book is total assets (item 6) minus book equity (follows from the above) plus market value of equity (item 25 * item 199), all divided by total assets (item 6). Leverage is book debt divided by the result of total assets (item 6) minus book equity (follows from the above) plus market value of equity (follows from the above). Book debt is total assets (item 6) minus book equity. Profitability is earnings before interest, taxes, and depreciation (item 13) divided by total assets (item 6). Finally, size is the log of net sales (item 12). I include firm fixed effects and year dummies. T-statistics are based on robust standard errors.

Variables	Old shareholders Coefficient	T-statistic	New shareholders Coefficient	T-statistic
	(1)		(2)	
1. Potential loss of control	-0.30	-2.31	-0.37	-2.44
2. Ownership	-0.13	-2.89	-0.12	-2.50
3. Interaction (1,2)	0.01	2.38	0.01	2.18
4. Insider	-2.14	-2.65	-1.98	-2.46
5. Market to book	3.49	3.94	3.51	3.96
6. Leverage	-9.11	-3.91	-9.07	-3.91
7. Profitability	-0.34	-2.61	-0.34	-2.62
8. Size	-0.09	-0.10	-0.06	-0.06
Adjusted R^2	0.07		0.07	
F test	4.67		4.57	
Number of observations (firms)	2,045	(831)	2,045	(831)

Table 3: Ordinary least squares estimates of the relation between investment and potential loss of control

The dependent variable is investment defined as after tax profits (item 18) plus depreciation (item 14) minus dividends (item 21) plus net equity and debt issues. Net equity issue follows from the above. Net debt issue is the change in total assets (item 6) after net equity issue and retained earnings (item 36) divided by total assets (item 6). Research and development (item 46) and advertisement (item 45) are also included in investment. Ownership is the largest shareholder's share of the voting rights. Potential loss of control is the difference between the largest shareholder's Shapley and Shubik [1954] voting power before and after a hypothetical equity increase equal to the average actual equity increase across the entire sample. Ownership is the largest shareholder's share of the voting rights. Insider is a dummy variable equal to one if the largest shareholder is also a manager in the firm and zero otherwise. Market to book is total assets (item 6) minus book equity (follows from the above) plus market value of equity (item 25 * item 199), all divided by total assets (item 6). Cash flow is the sum of after tax profits (item 18) and depreciation (item 14) minus dividends (item 21) divided by total assets (item 6). Marginal q is the marginal return on a firm's capital (see appendix A). Finally, loss of majority is a dummy variable equal to one if the largest shareholder lose control as a result of the equity issue and zero otherwise. I include firm fixed effects and year dummies. T-statistics are based on robust standard errors. The number of firm-year observations available in these regressions is larger than in the previous table because of better coverage in Compustat Industrial Annual.

Variables	Old shareholders Coefficient	T-statistic	New shareholders Coefficient	T-statistic
	(1)		(2)	
1. Potential loss of control	-0.67	-2.05	-0.64	-2.03
2. Ownership	-0.15	-1.14	-0.13	-0.98
3. Interaction (1,2)	0.06	3.69	0.03	2.80
4. Insider	5.31	2.40	6.30	2.85
5. Market to book	7.23	4.48	7.42	4.61
6. Cash flow	13.08	2.24	14.35	2.44
7. Interaction (5,6)	-0.53	-0.24	-0.95	-0.43
8. Marginal q	-1.65	-4.78	-1.67	-4.91
Adjusted R^2	0.10		0.10	
F test	17.54		17.43	
Number of observations (firms)	3,043	(945)	3,043	(945)
Abbreviated regression results	(3)		(4)	
9. Loss of majority	-0.76	-0.19	-3.21	-0.95

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