

# Stock price and ownership concentration: Evidence from the Czech Republic – VERY PRELIMINARY

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This paper applies a similar method to used by (McConnell, Servaes, & Lins, 2008) to find out how a level of outside ownership concentration and structure affects a level of firm value by analyzing how firm value reacts to ownership changes. Such method circumvents a possible endogeneity of ownership that may drive the results in studies analyzing level data only. Using data for the Czech Republic, I find that the relationship is non-linear with the maximum firm value reached between 60% and 70% for the ownership concentration measured by sum of blocks. The larger firm value reaches the maximum in even higher levels of ownership concentration between 75% and 85%. When using Herfindahl index as an ownership concentration measurement, the results show that investors prefer a single large shareholder with a stake slightly above 50% in small firms. That may be explained by effects of the stock market liquidity on the share price. In larger firms, investors prefer more equally distributed ownership among block holders which goes in line with hypothesis that multiple large shareholders monitor each other.

## 1. Introduction

Does ownership affect firm value or is it vice versa or there is no link at all? The relation between ownership structure and firm performance has been heavily studied in last decades but the consensus has still not been reached.

Some studies looking at the effect of the insider ownership show that the ownership affects the firm performance. The relation is found to be not linear but rather roof-shaped. The firm value first increases with insider ownership because incentives alignment but starts to decrease after certain point as the insiders expropriate minority investors - e.g. (Morck, Shleifer, & Vishny, 1988), (Wruck, 1989), (McConnell & Servaes, 1990). On other side, several studies point that the link is not so obvious due to endogeneity of ownership and unobserved firm heterogeneity - e.g. (Demsetz & Lehn, 1985). Similarly, mixed evidence exists in literature studying link between blockholder (outside) ownership and firm value - (Gorton & Schmid, 2000) find a positive and non-linear relation in Germany when (Thomsen, Pedersen, & Kvist, 2006) a negative relation in Continental Europe.

A recent study of (McConnell, Servaes, & Lins, 2008) uses a more dynamic approach to deal with the problems of unobserved heterogeneity and endogeneity of ownership. They measure changes in firm value over the 6-day interval around announcements of insider share purchases and find that

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the cross-sectional variability in changes in value is described by a inverted U-shaped relation between firm value and insider ownership. In this paper, I use a similar approach but studying the relation between outside ownership concentration and firm value.

Concentrated ownership is more common in outside Anglo-Saxon countries. A presence of a large controlling shareholder may have a positive and but also a negative effects on the firm value from the minority shareholder perspective. The investors thus may require a monitoring of a controlling shareholder which may be provided by another large shareholder – e.g. (Gugler & Yurtoglu, 2003) or (Faccio, Lang, & Young, 2001) for Western European firms. On the other side, a presence of multiple large shareholder may lead to even large rent expropriation on expenses of minority shareholders if the large shareholder collude – e.g. (Faccio, Lang, & Young, 2001) for East Asian firms. Other aspect that enters the relation between firm value and ownership structure is the stock market liquidity. As the ownership concentration increases with another large shareholder stepping in, the free float decreases and the stock market liquidity may suffer and the stock price may be under pressure. The argumentation can go both directions and thus the relation is unclear. To answer the question about the direction, I search for a firm-value-maximizing ownership structure – i.e. whether investors prefer ownership to be distributed among multiple large shareholders - by using (McConnell, Servaes, & Lins, 2008) methodology with a Herfindahl index as an alternative measurement of the ownership concentration.

To study such dynamic process, the data with high frequency of outside ownership changes is valuable. However, such data from developed countries is rarely available. I use data from the Czech Republic due to a unique situation. The significant part of the economy was privatized and a setting of the privatization ensured that the initial ownership concentration was low. As the stocks of privatized firms were traded in the newly established stock market, we have observed significant and frequent changes in ownership structures. At the same time, the ownership structures were observable at the daily bases for most of the after-privatization period.

I find that the relationship is non-linear with the maximum firm value reached between 60% and 70% for the ownership concentration measured by sum of blocks larger of equal to 10%. Larger firms tend to reach maximum firm value in even higher levels of concentration – between 75% and 85%. The results from the analysis using Herfindahl index ownership measurement show that investors prefer a single large shareholder with a stake slightly above 50% in small firms. It may be explain by effects of the stock market liquidity on the share price. In larger firms, investors prefer more equally distributed ownership among block holders which goes in line with hypothesis that multiple large shareholders monitor each other.

The rest of the paper is organized as follows. In section 2, I summarize the existing literature. In Section 3, I define the model and come up with the hypotheses. In Section 4, I describe the data. In Section 5, I report the results.

## **2. Ownership structure and firm value**

The literature studying a relationship between ownership structure and firm value is extensive. The evidence is, however, still mixed. There are studies showing that the ownership affects the value but the link is non-linear. Other studies point out that the endogeneity of ownership plays a crucial role

and that the causality either does not exist or is even opposite, i.e. firm value affects ownership structure.

### **Inverted U-shaped relationship**

As insider ownership increases, the incentives of the managers become aligned with the other shareholders and the firm value increases. But as the ownership concentration reaches a certain level, the insiders start to enjoy private benefits of control at the expense of the other owners and the firm value decreases. Thus, there are both costs of dispersed ownership and concentrated ownership and the relationship between ownership and firm value is nonlinear. A number of studies find an inverted-U-shaped relationship between insider ownership and firm value (Morck, Shleifer, & Vishny, 1988), (Wruck, 1989), (McConnell & Servaes, 1990).

Several studies focused on outsider ownership since in countries outside the USA and the UK large shareholders are more common. The similar problem, however, can still rise as the large shareholder can expropriate the assets on expenses of other shareholders – e.g. (Claessens & Djankov, 1999) and (Thomsen, Pedersen, & Kvist, 2006).

(McConnell, Servaes, & Lins, 2008) use a dynamic approach and regress *changes* in firm value against *changes* in insider ownership. They find that the cross-sectional variability in stock price responses to announcements of share purchases by corporate insiders is described by a curvilinear relation between firm value and insider ownership where the value of the firm first increases, then decreases, as insider ownership increases.

### **No relation between ownership and firm performance**

Other researchers find no relationship at all. (Demsetz & Lehn, 1985) argue that the changes in the ownership structure are driven by a profit-maximization. Firms are always in equilibrium or at least close to it and any change in the ownership structure should increase the firm value as the ownership structure moves to the equilibrium. Using data from the USA for period 1976 to 1980, they do not find any link between ownership concentration and firm performance. (Himmelberg, Hubbard, & Palia, 1999) extend cross-sectional results of (Demsetz & Lehn, 1985) and argue that much of ownership variation may be explained by unobserved firm heterogeneity. (McConnell, Servaes, & Lins, 2008), however, find no evidence to support that firms are moving toward a new optimal equilibrium ownership level.

(Demsetz & Villalonga, 2001) find no relation between ownership and performance after controlling for the endogeneity of ownership. They argue that even if there is a systematic relation between ownership structure and firm performance, it should not survive for longer periods. The costs to changing a non-optimal ownership structure are not likely to insulate a clearly improper structure over periods. (McConnell, Servaes, & Lins, 2008), however, argue that their approach solves the problem of endogeneity of ownership.

### **Opposite causality**

As the studies mentioned above implicitly assume that the ownership affects the performance, there are studies investigating *the opposite causality*, i.e. the ownership structure is affected by the prior performance. Because changes in equity ownership and board composition are related to prior performance, the predominant direction of causality in governance-performance association is not clear (Denis & Sarin, 1999). As the market for corporate control represents an important corporate governance device, the significant ownership changes - like change in control (Heiss & Koke, 2004) or activist block share purchase (Bethel, Liebeskind, & Opler, 1998) - are more likely to appear in firms with poor performance, high financial pressure and in more diversified firms. Large changes in ownership structure are typically preceded by fundamental changes in business conditions facing the firm and followed by large-scale asset restructurings. (Denis & Sarin, 1999).

(Cho, 1998) replicates (Morck, Shleifer, & Vishny, 1988)'s study and finds a similar non-monotonic relation between  $Q$  and management share holdings. Further, he estimates a system of three equations in which insider ownership, Tobin's  $Q$ , and investment are both left- and right-hand-side variables. His estimates for this system of equations indicate that  $Q$  affects ownership structure but not vice-versa.

Also the stock market reaction to the changes in ownership may be affected by the prior performance. (Shome & Singh, 1995) study block formations and find that abnormal return around block formation is positively related to the preannouncement free cash flow (reduction in agency cost of free cash flow), to the level of discretionary assets in the firm (managers may manipulate these assets to increase the firm's risk), and to the size of a block (sign of higher potential synergies, higher takeover probability).

### 3. The curvilinear relation between stock price and ownership concentration

#### 3.1.(McConnell, Servaes, & Lins, 2008) model

In this paper, I use a similar approach to one of (McConnell, Servaes, & Lins, 2008). They assume that firm value (measured by Tobin's  $Q$ ) is function of insider ownership and some other ownership variables and firm characteristics. The starting point is the curvilinear relation reported by (McConnell & Servaes, 1990):

$$\text{Eq (1)} \quad Q_{jt} = b_0 + b_1 \cdot (INWON)_{jt} + b_2 \cdot (INOWN)_{jt}^2 + \text{other ownership var.} + \text{control var.}$$

The coefficient  $b_1$  is positive and  $b_2$  is negative. Thus, the maximum firm value is reached at certain insider ownership. The change in the ownership should thus leads to a change in the firm value. From the equation (1) implies that the change in Tobin's  $Q$  is a function of insider ownership and change in the insider ownership:

$$\text{Eq (2)} \quad \Delta Q = b_1 \cdot (\Delta INOWN) + b_2 \cdot (\Delta INOWN)^2 + 2 \cdot \Delta INOWN \cdot INOWN$$

A change in the stock price is used as a proxy for a change in the Tobin's  $Q$  of the firm. Coefficients  $b_1$  and  $b_2$  thus may be estimated with abnormal stock return as the depended variable and ownership

characteristics as the explanatory variables. This method has the advantage of controlling for firm fixed effects, since the firm characteristics are assumed to remain the same within the event window.

### 3.2. Sample selection

I apply two filters on data to exclude extreme cases following (McConnell, Servaes, & Lins, 2008). First, I exclude the cases when the change in the ownership structure is relatively high. The reason for doing that is as follows. Insider ownership in (McConnell, Servaes, & Lins, 2008) sample is observed precisely and thus the investors may see the exact precise changes in insider ownership and react to it. In my sample, stock market participants observe only the owners with blocks of at least 10%. In cases when somebody crosses the 10%-threshold without buying from the other block holders, the increase in the calculated concentration is larger than the increase in actual concentration. The investor may have some expectations about the *residual* ownership structure, i.e. stocks not held by large block holders with stake of at least 10%, but I do not observe it. Thus, their reaction may differ in situation when the large block holder buys another 10% to a situation when a new block holder with 10% of shares steps in. Thus, I use observations when the absolute change in the ownership concentration was smaller than or equal to 1%. Secondly, I exclude observations with extreme abnormal returns (absolute value of logarithmical return is above 50% within period T to T+5) and cheap stocks (price at time T under 50 CZK) from the sample.

### 3.3. My model

My approach is different to the one used by (McConnell, Servaes, & Lins, 2008) since instead of studying the effect of insider ownership, I analyze the relationship between firm value and ownership concentration. The equation I estimate is as follows:

$$\text{Eq (3)} \quad \Delta Q = b_1 \cdot (\Delta OWNCON) + b_2 \cdot (\Delta OWNCON^2 + 2 \cdot \Delta OWNCON \cdot OWNCON)$$

where *OWNCON* is a ownership concentration. I measure the concentration by sum of all blocks. Investors may prefer concentrated ownership since large shareholders have a big enough stake to spend private resources to monitor management. However, when they reach certain level of ownership, they may start to enjoy private benefits on expense of minority shareholders, similarly like management on expenses of all shareholders. The firm-value-maximizing ownership concentration is then equal to:

$$\frac{b_1}{-2b_2}$$

Since not only the ownership concentration but also the power of particular block holders may be important for valuation of firm by minority investors, I also estimate the coefficients in the equation with the Herfindahl index:

$$\text{Eq (4)} \quad \Delta Q = b_3 \cdot (\Delta HINDEX) + b_4 \cdot (\Delta HINDEX^2 + 2 \cdot \Delta HINDEX \cdot HINDEX)$$

The Herfindahl index is measured from all stakes of at least 10% of shares. That gives a picture whether the more equal distribution among large shareholders is preferable by investors as find out e.g. by (Maury & Pajuste, 2005). I use the Herfindahl index measured as follows:

$$\text{Herfindhal index} = \left( \sum_i x_i^2 \right)^{1/2}$$

where  $x_i$ s are the share blocks in percentage. The square root ensures that the Herfindahl index equals the share held by the block holder in case when there is only one block of shares.

To be able to estimate the firm-value-maximizing ownership structure, I use a specification with both measurement of ownership concentration together in one equation and estimate all the coefficients simultaneously:

$$\text{Eq (5)} \quad \Delta Q = b_1 \cdot (\Delta \text{OWNCON}) + b_2 \cdot (\Delta \text{OWNCON}^2 + 2 \cdot \Delta \text{OWNCON} \cdot \text{OWNCON}) + b_3 \cdot (\Delta \text{HINDEX}) + b_4 \cdot (\Delta \text{HINDEX}^2 + 2 \cdot \Delta \text{HINDEX} \cdot \text{HINDEX})$$

Similarly like (McConnell, Servaes, & Lins, 2008) study the abnormal return of the day and one week after the actual ownership change to ensure that the firm characteristics most likely remain same within the window period.

### 3.4. Hypotheses

(McConnell, Servaes, & Lins, 2008) document the curvilinear relationship between firm value and insider ownership. They find that the inflection point of the implied relationship between firm value and insider ownership is around 50% insider ownership. When they fix  $b_3 = 2 \cdot b_2$ , the maximum firm value is reached when the insider ownership equals about 40%. Similarly, (McConnell & Servaes, 1990) and (McConnell & Servaes, 1995) estimate the inflection point to be around 40% as well.

(Claessens & Djankov, 1999) use Czech data and document curvilinear relation between outside ownership concentration and firm performance. They measure ownership concentration by a sum of 5 largest shareholders. Since owners with stake under 10% were rarely observed, it is very similar measurement of ownership concentration to one used in this study. They find maximum profitability for concentration between 50 and 57% depending on the estimation method used.<sup>2</sup> The ownership concentration maximizing the firm value estimated by the method without time-period fixed effects is thus very similar found by (Claessens & Djankov, 1999).

First, I test whether the curvilinear relation between firm value and ownership concentration can be documented also by the stock market reaction to the changes in the ownership structure, i.e. whether  $b_1$  is positive and  $b_2$  is negative in Eq (3). Assuming that this holds, the maximum firm value is reached for ownership concentration equals  $-b_1/2 \cdot b_2$ . To ensure that the maximum is reached for concentration smaller than 100%,  $b_1$  has to be smaller than  $-2b_2$ .

#### Hypothesis 1:

**The relationship between firm value and ownership concentration is curvilinear, i.e.  $b_1 > 0$  and  $b_2 < 0$  and  $b_1 < -2b_2$ .**

Another aspect that may affect the firm-value-maximizing ownership structure is the firm size. Many firms traded in the Prague stock exchange would never go public under normal circumstances

<sup>2</sup> They also do similar analysis using labor productivity but the results are more depended on the estimation method.

because there were just too small. However, since the decision was made by authorities and was the part privatization process, it has led to number of very illiquid shares being traded in the Prague stock exchange. Since investors prefer liquidity, these shares were traded on very low prices. Investor thus may not prefer to have significantly large investor in small firms since then the stock market liquidity dries up.

On the other side, smaller firms are less followed by the media and thus a management has more room to misbehave. A large shareholder in small firm may improve performance significantly more than the large shareholder in a larger firm. Besides, to hold the share block in large firms is more expensive for most of the investors due to a budget constrain and portfolio diversification.

If the budget constraints and diversification effects overvalue the liquidity effects, the firm-value-maximizing level of ownership concentration will be lower for large firms. Hypothesis 2 is based on such scenario.

### **Hypothesis 2:**

**Large firms have a lower level of firm-value-maximizing ownership concentration than small firms, i.e.**

$$sum_{firm-value-max}^{small} = \frac{b_1^{small}}{-2b_2^{small}} > \frac{b_1^{large}}{-2b_2^{large}} = sum_{firm-value-max}^{large}$$

**where  $b_1^{small}$  and  $b_2^{small}$  are the coefficients for small firms and  $b_1^{large}$  and  $b_2^{large}$  are the coefficients for large firms.**

A single large shareholder may on one hand monitor the management but on the other hand enjoy private benefits that are not shared with other shareholders. Minority investors thus may rather prefer ownership structure with multiple blockholders where smaller blockholders monitor controlling shareholders and management is controlled by at least one blockholder. However, the smaller blockholders may collude with the controlling one and the rent extraction on expenses of minority shareholders may be even more severe. The behavior of blockholders varies with the environment. (Faccio, Lang, & Young, 2001) show that large shareholders collude in East Asia but compete in Western Countries. (Bena & Hanousek, 2008) find that a presence of a second large shareholder increases both the probability of dividend payment and pay-out ratio in Czech firms. Thus, I assume that the minority investors in the Czech Republic prefer an ownership structure with multiple large shareholders to an ownership structure with a single large controlling shareholder.

However, a single shareholder requires compensation for holding a large block in large firms, i.e. higher expected return alias lower stock price. Other potential block holders are willing to pay higher price per share in small stakes. Larger firms are also more covered by media and thus the rent extraction may be more costly. Thus, the more equal distribution of blocks is more stable ownership structure in large firms.

The Herfindahl index (as it is calculated in this paper) equals the sum of blocks only when the number of blocks equals one. Thus, if the minority investors prefer ownership structure with

multiple large shareholders, the firm-value-maximizing ownership structure would have a level of Herfindahl index smaller than a level of sum of blocks.<sup>3</sup>

**Hypothesis 3:**

The firm-value-maximizing ownership structure is defined with multiple blockholders in large firms, i.e.

$$sum_{firm-value-max}^{large} = \frac{b_1^{large}}{-2b_2^{large}} \gg \frac{b_3^{large}}{-2b_4^{large}} = Hindex_{firm-value-max}^{large}$$

**Hypothesis 4:**

The firm-value-maximizing ownership structure is defined with a single blockholder in small firms, i.e.

$$sum_{firm-value-max}^{small} = \frac{b_1^{small}}{-2b_2^{small}} = \frac{b_3^{small}}{-2b_4^{small}} = Hindex_{firm-value-max}^{small}$$

## 4. Data

### 4.1. Ownership data

The ownership data are provided by the Czech Security Register (Stredisko cennych papiru, Praha). The ownership structure of all firms with publicly traded stocks is available every day since August 1996 until December 2005. The owners with at least of 10% share are reported. The stock market data are provided by private company. It contains the price and trading volume for every day and every publicly traded stock.

I use following filters for the ownership data. First, I excluded firms with multiple issues of shares. Since only shareholders holding 10% of any issue of firm with publicly traded stocks has be disclosed it may be hard to identify the voting power of block holder in firm with multiple issues. For example, if the block holder owns above 10% in one issue but not in other, the actual voting power is unknown. Limitation to single-issue firms ensures that the voting power of all block holders is identified. This leaves 1,515 firms in the sample. During the studied period, there were 53,484 reported changes in the ownership structure of these firms.

Secondly, I exclude firms with no stock market data available. This leaves 1,505 firms in the sample. Since I have to estimate abnormal return around the ownership change, I need to observe the stock prices in the pre-window estimation period (which is 12 months prior to trading t-20 where t is a day

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<sup>3</sup> The optimum ownership structure for two largest shareholders can be calculated from the estimations of coefficients  $b_1$ ,  $b_2$ ,  $b_3$  and  $b_4$  (using Eq (4) and Eq (5)).

of ownership change). For some firms, the stock prices are not available for the whole period. This leaves 49,269 of ownership changes in the sample of 1,403 firms (101 firm did not experience the change in the ownership structure).

Further, I exclude firms that have price under 50 CZK (similarly to MSL (2008) when they exclude firms with stock price under 2 USD). This leaves 38,694 ownership changes in the sample of 1,165 firms.

## 4.2. Frequency of ownership changes

The frequency of ownership changes is relatively high compare to the studies using data from developed countries. (Denis & Sarin, 1999) show that 12.4% of firm-years had a bigger than 5% change in the ownership of directors and officers as a group. They used a random sample of 583 U.S. firms covered by CRSP in 1983 to 1992. (Bethel, Liebeskind, & Opler, 1998) report 351 block trades (above 5%) of Fortune 500 firms in 1980s. With 3,673 firm-year observations, the probability of significant ownership change in a single year for a single firm is 9.6%. (Heiss and Koke, 2004) reports 576 changes in control out of 7577 firm-year observations, i.e. 7.6% of cases.

Table 1: Frequency of ownership changes

Year	Number of changes in control	Number of stocks	Ratio of firms with control change
1997	529	1383	38.3%
1998	420	1360	30.9%
1999	347	1277	27.2%
2000	197	997	19.8%
2001	61	300	20.3%
2002	34	155	21.9%
2003	19	110	17.3%
2004	13	81	16.0%
2005	9	53	17.0%
<b>Total</b>	<b>1629</b>	<b>5716</b>	<b>28.5%</b>

I compare the frequency of ownership changes with (Heiss & Koke, 2004). In their study, they define the ownership change to be the one when control shifts. I define the firm having the controlling shareholder as follows:

- 1) majority shareholder, i.e. having more than 50% of shares;
- 2) when there is no majority shareholder the largest shareholder with at least 25% with conditions that no one else have 25%;
- 3) firm has no controlling shareholder.

Whenever the identity of the controlling shareholder changes or when the firm switches from/to no controlling shareholder, the firm experience a change in control. The ownership structures are compared at the end of the each year from 1997 to 2005. I identify 5,716 firm-year observations with available position in the previous year (needed to identify the change). In 1,629 cases (or 28.5%) I observed the change in control. Thus, the change in control was almost 4 times more likely

in my sample than in sample of (Heiss & Koke, 2004). The Table 1 shows that the changes in control were more frequent in early years of the sample period. In 1997, almost 2 out of 5 firms experienced a change in control. However, even in the latest year of my sample, the probability of change in control was still double compare to German companies studied by (Heiss & Koke, 2004).

### 4.3. Distribution of ownership changes

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## 5. Results

To check the robustness of the results, I focus on different subsets of ownership changes. (McConnell, Servaes, & Lins, 2008) include only open market purchases of at least 10.000 shares. I exclude small trades under 0.05% (sample II). (McConnell, Servaes, & Lins, 2008) estimate the curvilinear relation between insider ownership and firm value by using sample of insider purchase only. They argue that insider sales may have other incentives like diversification of portfolio. Thus, I also use net purchases only, i.e. only the cases when the concentration goes up (sample III).

### 5.1. Results from equation with time period fixed effects

The results of the estimation of Eq (3) to Eq (5) with time period fixed effects are in Table RESULTS 1. In Panel A, the basic sample is used. The results from analysis with sample II are in Panel B and from analysis with sample III in Panel C.

The results in first column in each panel, corresponding to equation (3), clearly support the curve-linear relation between ownership concentration and firm value. The estimations of coefficient  $b_1$  are statistically positive and of coefficient  $b_2$  are statistically negative. The maximum firm value is reached for ownership concentration level between 60% and 68%, which is significantly higher than what (McConnell, Servaes, & Lins, 2008) reports for insider trading and also what (Claessens & Djankov, 1999) reports for the Czech data (about 50%).

The results in the second column in each panel, corresponding to equation (4), show that the maximum firm value is reached for ownership structure with levels of Herfindahl index between 47% and 58%. That is about 10% lower than the levels of the concentration measured by sum of blocks. It supports the hypothesis 3 that investors prefer ownership structure with more than a single large shareholder at least for some shares.

The results in third column in each panel, corresponding to equation (5), show that results remain same even if both of the measurements are in the equation. However, the calculated firm-value-maximizing ownership structure corresponds to only one large shareholder. Thus, it does not support the hypothesis that investors prefer to have more than one large shareholder.

### 5.2. Large versus small firms

My sample contains in average smaller firms compare to the sample used by (McConnell, Servaes, & Lins, 2008). The mean market value in their sample is more than 1 billion USD and the median is about 140 million USD. The companies in my sample are much smaller. The mean of market

capitalization is 564 million CZK (cca. between 15 and 25 million USD) and median is about 33 million CZK (about 1 million USD). Only 4,812 ownership changes happened in firms with market capitalization at least 500 million CZK (about 20 million USD). Such fact may explain the findings of more concentrated firm-value-maximizing ownership structure in my sample.

To test the hypothesis 2, I focus on the subsample of large companies (with market capitalization over 500 million CZK) and on subsample of small companies (with market capitalization under 100 million CZK – around 4 million USD). The results (see [Table RESULTS 2](#)) support the curvilinear relation for both large firms (the first column) and small firms (the fourth column). However, the large firms reach the maximum value in higher levels of concentration (between 77 and 86%) than the small firms (between 53 and 66%). Thus, the liquidity effects overvalue the diversification effects which support the hypothesis 2. The absolute value of both coefficients is also much higher for large firms than for small firms. Thus, the difference between the maximum firm value and value of firm with dispersed ownership is much higher for large firms even in the relative terms.

The results from the analysis with Herfindahl index (column 2 and 5) show another significant difference between large firms and small firms. In large firms, investors prefer to have multiple large shareholders with stakes more equally distributed. The maximum firm value is reached for level of Herfindahl index between 44% and 51%. It is significantly less than the firm-value-maximizing ownership concentration for large firms (between 77% and 86%). It is in line with hypothesis 3.

In small firms, the estimated value of a firm-value-maximizing Herfindahl index is very similar to the firm-value-maximizing ownership concentration. Thus, investors prefer a single large shareholder in small firms which is in line with hypothesis 4.

The results for equation (5) – column 3 and 6 - support the hypothesis that the investors prefer more equally distributed ownership among large shareholders in large firms but not in small firms. I calculate the firm-value-maximizing ownership structure for case of two large shareholders. For large firms, it is defined by the largest stake to be 39%, 42% and 66% and the second largest stake 38%, 41% and 17%, respectively for different subsamples. For small firms, the largest shareholder's stake equal almost the sum of largest stake and thus the second shareholders owns less than 10% and is not visible.

## 6. Conclusion

I apply a dynamic approach similar to one used by (McConnell, Servaes, & Lins, 2008) to estimate the relationship between the firm value and ownership structure. Using data for the Czech Republic in period between 1996 and 2005, I find that the relationship is curve-linear with maximum value reached between 60 and 68% of ownership concentration held by large shareholders (with block of share of at least 10%). For large firms with market capitalization over 500 million CZK, the firm-value-maximizing ownership concentration is even larger (between 75% and 85%). For small firms with market capitalization less than 100 million CZK the firm-value-maximizing ownership concentration is between 53% and 65%. It can be explained by the liquidity reasons as a presence of a large shareholder in a small firm may dries up the stock market liquidity.

Using similar approach with the Herfindahl index as a measurement of the ownership structure, I show that firm-value-maximizing ownership structure is defined by multiple blockholders only for large firms.

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## Appendix 1: Results

TABLE - RESULTS 1

ALL FIMRS

Panel A

	Sum of blocks equation (3)		Herfindahl index equation (4)		Both equation (5)	
	coefficient	t-value	coefficient	t-value	coefficient	t-value
$b_1$	<b>5.317</b>	3.59			<b>5.43</b>	3.66
$b_2$	<b>-4.369</b>	-4.15			<b>-4.452</b>	-4.22
$b_3$			<b>3.754</b>	3.38	-0.137	-1.15
$b_4$			<b>-3.883</b>	-3.92	0.157	1.67
R-squared	0.05%		0.05%		0.07%	
observations	32819		32429		32819	
<i>firm-value-maximizing ownership structure</i>						
sum of blocks	60.85%		-		-	
H-index	-		48.34%		-	
Largest shareholder	-		-		62.00%	
2nd largest shareholder	-		-		0.00%	
Period fixed effects	yes		yes		yes	
Market capitalization	all		all		all	
change in ownership	abs(sum of blocks) < 1%		abs( d (H-index)) < 1%		abs(sum of blocks) < 1%	

**Panel B**

	Sum of blocks equation (3)		Herfindahl index equation (4)		Both equation (5)	
	coefficient	t-value	coefficient	t-value	coefficient	t-value
$b_1$	<b>5.826</b>	3.73			<b>5.563</b>	3.52
$b_2$	<b>-4.297</b>	-3.87			<b>-4.128</b>	-3.68
$b_3$			<b>3.519</b>	3.00	0.345	1.12
$b_4$			<b>-3.713</b>	-3.00	-0.274	-1.11
R-squared	0.13%		0.13%		0.14%	
observations	10294		8638		10294	
<i>firm-value-maximizing ownership structure</i>						
sum of blocks	67.79%		-		-	
H-index	-		47.39%		-	
Largest shareholder	-		-		67.00%	
2nd largest shareholder	-		-		0.00%	
Period fixed effects	yes		yes		yes	
Market capitalization	all		all		all	
change in ownership	0.05% < abs(change) < 1%		0.05% < abs( d (H-index)) < 1%		0.05% < abs(change) < 1%	

**Panel C**

	Sum of blocks equation (3)		Herfindahl index equation (4)		Both equation (5)	
	coefficient	t-value	coefficient	t-value	coefficient	t-value
$b_1$	<b>7.597</b>	4.28			<b>7.059</b>	3.88
$b_2$	<b>-5.779</b>	-4.69			<b>-5.436</b>	-4.32
$b_3$			<b>4.813</b>	3.42	0.566	1.37
$b_4$			<b>-4.196</b>	-3.51	-0.456	-1.36
R-squared	0.17%		0.15%		0.19%	
observations	9470		7829		9470	
<i>firm-value-maximizing ownership structure</i>						
sum of blocks	65.73%		-		-	
H-index	-		57.35%		-	
Largest shareholder	-		-		65.00%	
2nd largest shareholder	-		-		0.00%	
Period fixed effects	yes		yes		yes	
Market capitalization	all		all		all	
change in ownership	0.05% < change < 1%		0.05% < d (H-index) < 1%		0.05% < change < 1%	

Firms with the stock price under 50 CZK and absolute value of the stock price change within (t,t+5) window above 50% are excluded. The firm-value-maximizing ownership structure for multiple blockholders is calculated numerically.

TABLE - RESULTS 2      LARGE VS. SMALL FIRMS

Panel A	LARGE FIRMS						SMALL FIRMS					
	Sum of blocks equation (3)		Herfindahl index equation (4)		Both equation (5)		Sum of blocks equation (3)		Herfindahl index equation (4)		Both equation (5)	
	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
$b_1$	<b>12.873</b>	2.82			<b>12.979</b>	2.82	<b>3.22</b>	1.79			<b>3.338</b>	1.85
$b_2$	<b>-8.309</b>	-2.72			<b>-8.369</b>	-2.73	<b>-3.037</b>	-2.32			<b>-3.124</b>	-2.38
$b_3$			<b>9.734</b>	3.14	-0.129	-0.26			2.023	1.45	-0.145	-1.05
$b_4$			<b>-9.643</b>	-3.46	0.047	0.13			<b>-2.215</b>	-1.73	<b>0.187</b>	1.67
R-squared	0.21%		0.31%		0.18%		0.03%		0.02%		0.07%	
observations	4191		4220		4191		22825		22421		22825	
<i>firm-value-maximizing ownership structure</i>												
sum of blocks	77.46%		-		-		53.01%		-		-	
H-index	-		50.47%		-		-		45.67%		-	
Largest shareholder	-		-		39.00%		-		-		54.00%	
2nd largest shareholder	-		-		38.00%		-		-		0.00%	
Period fixed effects	yes		yes		yes		yes		yes		yes	
Market capitalization	>500 million CZK		>500 million CZK		>500 million CZK		<100 million CZK		<100 million CZK		<100 million CZK	
change in ownership	abs(sum of blocks) < 1%		abs( d (H-index)) < 1%		abs(sum of blocks) < 1%		abs(sum of blocks) < 1%		abs( d (H-index)) < 1%		abs(sum of blocks) < 1%	

Panel B	LARGE FIRMS						SMALL FIRMS					
	Sum of blocks equation (3)		Herfindahl index equation (4)		Both equation (5)		Sum of blocks equation (3)		Herfindahl index equation (4)		Both equation (5)	
	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
$b_1$	<b>16.528</b>	2.08			<b>17.074</b>	2.13	<b>4.019</b>	2.17			<b>3.982</b>	2.13
$b_2$	<b>-9.659</b>	-1.88			<b>-10.094</b>	-1.95	<b>-3.247</b>	-2.42			<b>-3.254</b>	-2.4
$b_3$			<b>11.465</b>	1.89	-0.641	-0.36			2.333	1.64	-0.017	-0.05
$b_4$			<b>-12.943</b>	-2.26	0.083	0.07			-2.002	-1.52	0.139	0.49
R-squared	0.59%		0.87%		1.16%		0.06%		0.05%		0.09%	
observations	1017		1114		1017		7828		6633		7828	
<i>firm-value-maximizing ownership structure</i>												
sum of blocks	85.56%		-		-		61.89%		-		-	
H-index	-		44.29%		-		-		58.27%		-	
Largest shareholder	-		-		42.00%		-		-		64.00%	
2nd largest shareholder	-		-		41.00%		-		-		0.00%	
Period fixed effects	yes		yes		yes		yes		yes		yes	
Market capitalization	>500 million CZK		>500 million CZK		>500 million CZK		<100 million CZK		<100 million CZK		<100 million CZK	
change in ownership	0.05% < abs(change) < 1%		0.05% < abs( d (H-index)) < 1%		0.05% < abs(change) < 1%		0.05% < abs(change) < 1%		0.05% < abs( d (H-index)) < 1%		0.05% < abs(change) < 1%	

Panel C	LARGE FIRMS						SMALL FIRMS					
	Sum of blocks equation (3)		Herfindahl index equation (4)		Both equation (5)		Sum of blocks equation (3)		Herfindahl index equation (4)		Both equation (5)	
	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value	coefficient	t-value
$b_1$	<b>25.816</b>	2.45			<b>19.26</b>	1.53	<b>5.212</b>	2.52			<b>5.3</b>	2.51
$b_2$	<b>-15.462</b>	-2.44			<b>-11.597</b>	-1.57	<b>-3.988</b>	-2.71			<b>-4.186</b>	-2.79
$b_3$			<b>14.419</b>	1.74	7.123	0.85			<b>3.078</b>	1.85	-0.111	-0.23
$b_4$			<b>-15.867</b>	-2.18	-5.223	-0.94			-2.19	-1.5	0.288	0.72
R-squared	0.60%		1.34%		0.54%		0.08%		0.06%		0.13%	
observations	814		876		814		7366		6103		7366	
<i>firm-value-maximizing ownership structure</i>												
sum of blocks	83.48%		-		-		65.35%		-		-	
H-index	-		45.44%		-		-		70.27%		-	
Largest shareholder	-		-		66.00%		-		-		67.00%	
2nd largest shareholder	-		-		17.00%		-		-		0.00%	
Period fixed effects	yes		yes		yes		yes		yes		yes	
Market capitalization	>500 million CZK		>500 million CZK		>500 million CZK		<100 million CZK		<100 million CZK		<100 million CZK	
change in ownership	0.05% < change < 1%		0.05% < d (H-index) < 1%		0.05% < change < 1%		0.05% < change < 1%		0.05% < d (H-index) < 1%		0.05% < change < 1%	

Firms with the stock price under 50 CZK and absolute value of the stock price change within (t,t+5) window above 50% are excluded.

The firm-value-maximizing ownership structure for multiple blockholders is calculated numerically.

## Appendix 2: Descriptive statistics

### *The process of concentration and frequency of ownership changes*

The setting of the voucher privatization ensured that the concentration of ownership was relative low when the stocks of privatized firms started to be traded in the stock market in middle of 1990s. The ownership data for the first years of trading are not available. However, the data shows that the process of concentration was continuing even after 1996. The average concentration (measured by sum of all shareholders having at least 10% of shares) increases in every year of the sample period (see Table 1). The annual pace of concentration decreases from 3.618% in 1997 to 0.076% in 2005.

**Table 1: Process of ownership concentration**

The ownership concentration is measured by sum of all shareholders having at least 10% of shares. Only firms with a single issue of stocks and those that were not delisted in particular year are included.

Time of the initial ownership structure	Initial ownership concentration	Next year ownership concentration	Change	Stocks	Ratio of increasing / decreasing stocks
Dec 31, 1996	62.604%	66.226%	+3.618%	1383	
Dec 31, 1997	66.004%	68.879%	+2.875%	1360	
Dec 31, 1998	68.421%	70.096%	+1.675%	1277	
Dec 31, 1999	69.050%	70.351%	+1.301%	997	
Dec 31, 2000	74.930%	75.823%	+0.893%	300	
Dec 31, 2001	75.665%	77.171%	+1.506%	155	
Dec 31, 2002	74.474%	76.595%	+2.121%	110	
Dec 31, 2003	75.145%	76.024%	+0.879%	81	
Dec 31, 2004	74.333%	74.409%	+0.076%	53	

As the ownership concentration was increasing, it does not necessary means that it was increasing in all firms similarly. Following tables show that the process was faster among firms with smaller concentration.

Only firms with initial ownership concentration (sum of all stakes above 10%) with less than 25%

Time of the initial ownership structure	Initial ownership concentration	Next year ownership concentration	Change	Stocks	Out of all stocks
Dec 31, 1996	18.376%	31.859%	+13.483%	55	3.98%
Dec 31, 1997	17.863%	29.035%	+11.172%	39	2.87%
Dec 31, 1998	17.756%	30.127%	+12.371%	27	2.11%
Dec 31, 1999	18.609%	19.419%	+0.810%	20	2.01%

<b>Dec 31, 2000</b>	17.030%	26.177%	+9.147%	3	1.00%
<b>Dec 31, 2001</b>	12.325%	14.910%	+2.585%	2	1.29%
<b>Dec 31, 2002</b>	14.185%	14.185%	+0.000%	2	1.82%
<b>Dec 31, 2003</b>	14.185%	14.095%	-0.090%	2	2.47%
<b>Dec 31, 2004</b>	12.800%	12.930%	+0.130%	1	1.89%

Only firms with initial ownership concentration (sum of all stakes above 10%) with less than 50% and at least 25%

<b>Time of the initial ownership structure</b>	<b>Initial ownership concentration</b>	<b>Next year ownership concentration</b>	<b>Change</b>	<b>Stocks</b>	<b>Out of all stocks</b>
<b>Dec 31, 1996</b>	40.561%	47.709%	+7.148%	277	20.03%
<b>Dec 31, 1997</b>	41.279%	47.803%	+6.524%	234	17.21%
<b>Dec 31, 1998</b>	41.662%	45.808%	+4.146%	196	15.35%
<b>Dec 31, 1999</b>	42.209%	46.354%	+4.145%	154	15.45%
<b>Dec 31, 2000</b>	44.408%	46.208%	+1.800%	24	8.00%
<b>Dec 31, 2001</b>	43.666%	50.604%	+6.938%	16	10.32%
<b>Dec 31, 2002</b>	44.500%	50.297%	+5.797%	12	10.91%
<b>Dec 31, 2003</b>	46.472%	50.671%	+4.199%	10	12.35%
<b>Dec 31, 2004</b>	46.785%	41.598%	-5.188%	4	7.55%

Only firms with initial ownership concentration (sum of all stakes above 10%) with less than 75% and at least 50%

<b>Time of the initial ownership structure</b>	<b>Initial ownership concentration</b>	<b>Next year ownership concentration</b>	<b>Change</b>	<b>Stocks</b>	<b>Out of all stocks</b>
<b>Dec 31, 1996</b>	63.306%	66.566%	+3.261%	695	50.25%
<b>Dec 31, 1997</b>	64.156%	66.938%	+2.783%	640	47.06%
<b>Dec 31, 1998</b>	63.884%	65.658%	+1.773%	543	42.52%
<b>Dec 31, 1999</b>	64.274%	65.632%	+1.358%	422	42.33%
<b>Dec 31, 2000</b>	64.420%	65.614%	+1.194%	109	36.33%
<b>Dec 31, 2001</b>	66.687%	67.746%	+1.059%	51	32.90%
<b>Dec 31, 2002</b>	66.325%	69.880%	+3.555%	38	34.55%
<b>Dec 31, 2003</b>	66.788%	67.289%	+0.502%	25	30.86%
<b>Dec 31, 2004</b>	65.126%	66.215%	+1.090%	20	37.74%

Only firms with initial ownership concentration (sum of all stakes above 10%) with at least 75%

<b>Time of the initial ownership structure</b>	<b>Initial ownership concentration</b>	<b>Next year ownership concentration</b>	<b>Change</b>	<b>Stocks</b>	<b>Out of all stocks</b>
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<b>Dec 31, 1996</b>	85.217%	85.278%	+0.061%	356	25.74%
<b>Dec 31, 1997</b>	85.795%	86.168%	+0.374%	447	32.87%
<b>Dec 31, 1998</b>	86.183%	86.240%	+0.057%	511	40.02%
<b>Dec 31, 1999</b>	86.901%	87.074%	+0.173%	401	40.22%
<b>Dec 31, 2000</b>	87.442%	87.850%	+0.408%	164	54.67%
<b>Dec 31, 2001</b>	88.415%	89.151%	+0.736%	86	55.48%
<b>Dec 31, 2002</b>	88.093%	88.587%	+0.494%	58	52.73%
<b>Dec 31, 2003</b>	89.181%	89.563%	+0.383%	44	54.32%
<b>Dec 31, 2004</b>	87.043%	87.146%	+0.103%	28	52.83%

### Number of changes per stock

The volatility of the number of changes per share is high. On one side, there were several stocks with less than 10 changes in the ownership structure. On the other side there were several

Number of ownership changes	Number of stocks
<b>≥ 100</b>	<b>110</b>
<b>100&gt;x≥ 50</b>	<b>233</b>
<b>49&gt;x≥ 25</b>	<b>317</b>
<b>24&gt;x≥ 10</b>	<b>412</b>
<b>10&gt;x</b>	<b>387</b>