ERASMUS UNIVERSITY ROTTERDAM
Erasmus School of Economics
Bachelor Thesis Financial Economics

Managerial ownership on risk in the Netherlands

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Date final version:
9-7-2019

Abstract

This paper will research the relationship between managerial ownership and risk in the Dutch market. In the review two main opposing hypothesis are identified, regarding a negative and a positive relationship. The hypothesis for the Dutch markets states that the relationship is in accordance with the risk-aversion hypothesis, and a negative relationship between risk and managerial ownership is expected. This is analysed via Bloomberg data of relevant variables with the addition to control for option awards. The research outcomes are inconclusive with regards to the influence of option awards, no significant relationship between the ownership of executives and risk. However, a significant relationship is found between the ownership of all insiders and risk, which confirms the hypothesis.

Contents

1. Introduction

Agent-principal problems date back to mankind's first global entrepreneurial endeavours: Merchant Ships, e.g. the world's first public company the VOC. In these times the owners of the ship were usually ashore while their ships roamed the oceans to find different business opportunities to take along home to the western world (Leeson, 2007). While one might not think of this directly when thinking about said times, it is likely the first major point in history where owners stumbled upon agent-principal problems, as an owner you were not in control of the output of your assets. As Leeson showed in his 2007 studies, the captain and the owner of the ship had an agent-principal relation respectively. Owners of ships hired captains to monitor their ships in their behalf, therefore creating a classic agent-principal relationship with corresponding problems and costs. Because the owners can not properly monitor the captains because they are away for a few months they would have to align their interests to reduce moral hazard and other kinds of agency costs. While some of the tried solutions to the costs and problem were quite gruesome, one particular strategy to align the agent-principal interest was to let the captain share in the ownership of his ship (Leeson, 2007), alias managerial ownership.

Since the agent-principal is still not totally solved, studies into the problem and the according solutions continue to be conducted. For example in these major research fields on agency theory; Previous research has considered the agency problem both from a theoretical (e.g. Ross, 1973; Jensen & Meckling, 1976) and empirical (e.g. Ang et al., 2000), and has tried to provide solutions to the problem (e.g. Eisenhardt, 1989) Since in contemporary times managerial ownership and incentivizing the agents is still our best solution (Ang et al., 2000), it is important to further research the implications of the used solutions furthermore.

This research will focus on the influence of managerial ownership on the risk of companies in the Dutch markets. While there has been plenty of research into the effects of managerial ownership on risk (e.g. Chen & Steiner, 1999; Coles et al., 2006), empirical results and hypotheses of other studies do not seem to align (Capozza & Seguin, 2003;). Some empirical results support the 'wealth transfer hypothesis' (Chen et al., 2001), while other results support the 'risk-aversion hypothesis' (Chen et al., 1998; Capozza & Seguin, 2003). These hypotheses will be discussed in depth in the following chapter. Besides, research in the Dutch market is scarce and there is reason to believe that the US results might not be robust for the Dutch market, e.g. differences in market-based system in opposition to a bank-based system and a general difference in market risk.

The outcomes of the research are unable to conclude on the influence of option awards, the relationship for the ownership of executives on risk, but do conclude a negative relationship between all insider ownership and risk. Future research should aim to acquire a more complete dataset regarding the option awards and executive ownership, and analyse risk in a wider manner.

research will conclude with no sensible information about the influence of option awards, no significant relationship for the ownership of executives on risk and a negative significant relationship between all insider ownership and risk.

This research is structured as follows: First a review of the literature will provide an introduction into the basics of agency theory and proposed solutions in part 2.1-3, next discussion on the definition of managerial ownership and how it should reduce the agency problem is discussed in part 2.4, part 2.5 & 2.6 will discuss literature specifically relevant for this research and in 2.7 the hypothesis will be presented. In chapter 3 the data and methodology of this research will be presented and explained. Chapter 4 will continue displaying the results and discussing which might be best fitting for the data. Chapter 5 will conclude and evaluate the hypothesis regarding the data. Finally, chapter 6 will include some recommendations for following research in the topic.

2. Literature Review

2.1 Agency theory

Agency relations appear when there is a separation of control and ownership (Berle & Means, 1932; Ross, 1973). These problems tend to add additional costs referred to as agency costs (Jensen and Meckling, 1976). The agent-principal problem occurs when a manager has the opportunity to fulfil private interests at the expense of the owner. A modern example of this problem is the relationship between a chief executive officer (CEO) and shareholders of a publicly traded company. Both the CEO and shareholders might have different interests. The CEO would typically want to maximize his personal output through salary, bonuses or external personal benefits from chosen projects, while the shareholders would want to maximize the company's profits, share prices or dividends. Assuming both parties are rational economic agents they both would do anything in their power to maximize their output and thus their utilization. Without any regulations or contracts there would be a clear problem here. The owners would have no way into forcing the CEO to act in their interests and would act only in self-interest, this would create the situation in which the shareholders do not receive any returns at all. In this scenario no one would want to buy company shares since they are simply not beneficial.

The two main drivers in the principal-agent problem are moral hazard and information asymmetry. Moral hazard is the difference in behaviour when facing direct versus indirect risk. For example, the change in behaviour when handling an asset of your own versus handling asset of someone else, in the latter you do not have negative consequences with depletion of the asset or any other form of value reduction. One would be more willing to use the asset in a value reducing way for private gains when it is not one his own assets. Information asymmetry is when one party has better information than the other party. For example, an acting CEO has a better view of the company's internal workings than a shareholder. The CEO might use this to his advantage.

Agency costs arise as extra costs caused by the misalignment between owner and controller. Some examples of these costs as mentioned by Panda and Leepsa (2017) are among other costs, the search costs for finding a suitable agent, costs of collecting information on the performance of the agent, the costs of monitoring the agent via said information, the costs of bonding and aligning the agent in place and the residual loss (loss via inefficient behaviour of the agent). These costs are merged into 3 categories by Jensen and Meckling (1976) as

monitoring costs, bonding costs and residual loss. Together these 3 costs are all the possible agency costs according to Jensen and Meckling (1976).

2.2 Contracts

One of the first and foremost used device to improve the agency problem is the use of contracts. This basic need of contracts, stated by Coase (1937), Jensen and Meckling (1976), and Fama and Jensen (1983) (Shleifer and Vishny, 1997), is a primary solution to the agency problem. Contract theory dictates that to overcome different agent-principal problems the parties should write up contracts which are as complete as possible. Coase (1937) introduced modern economic research into the contractual view of the firm, he argued that firms rise because of transaction costs that come up in contracting. In this view firms are a way to reduce contracts and so the transaction costs. Although there is not a formal mention of agency costs, some of the transaction costs mentioned by Coase would be considered agency costs. Jensen and Meckling (1976) described an agency relationship as a contract in itself. Fama and Jensen (1983) described a firm as 'the nexus of contracts' with multiple agent-principal relations, with each contract specifying the rights and duties of each agent. Contracts solve the basics of the agent-principal problem, both parties sign a negotiated agreement in which they try to align their interests. The contract dictates how the agent should act in different situations, so he will not act out self-interest.

However, when making these agreements one cannot foresee all possible outcomes, which makes a complete contract impossible to draw up (Hart and Moore, 1988). One can draw up contracts which are as complete as possible, but this is costly. Grossman and Hart (1986) show that most contracts are likely to have residual rights, rights which were not mentioned in the contract. In theory, ownership means a direct claim to these residual rights. But in practice owners in these relationships tend to lack the professional knowledge to act in their own best interest (Shleifer and Vishny, 1997), this is of course why they hired a manager in the first place. This scenario would still require the owners to let the manager decide what is best for the company. With this process repeatedly occurring the manager would end up with all the 'residual control'. While the manager could decide to act in the owner's best interest, this is questionable because of the basics of agency theory stated earlier. So, there is need for solutions regarding the agency costs of this 'residual control'.

2.3 Incentive contracts

As argued in the previous section, with expensive and incomplete contracts, the managers will end up with quite a lot ‘residual control’. This induces more agency costs. To even further align the interests of the manager and the shareholder an incentive contract can be drawn up. An incentive contract is an agreement in which the reward of the manager is inevitably correlated to the performance of the company or the benefits of the principal, another possibility is other set specific goals (e.g. sustainability goals). As a result, it becomes feasible for a manager to use his residual control to increase the performance of the company since it will be beneficial for the manager as well. There is a vast amount of research into the optimal incentive contract from the point of view of the shareholders (Harris & Raviv, 1979; Demski & Sappington, 1984; Gibbons & Murphy, 1992; Baker, 2002). Based on this research we could predict what incentives an agent would be offered in an optimal situation; therefore, it is relevant to explore the implications of these optimal contracts.

There are multiple possibilities for the addition of incentives into manager contracts. Among other devices are; Managerial ownership, stock options, pay and dismissal incentives (Fama, 1980; Jensen and Murphy, 1990). In Jensen and Murphy their 1990 studies they have shown that CEO’s wealth changes by $3,25 for every $1000 change in shareholders wealth. They also concluded that incentives from managerial ownership are relatively large compared to other kinds of incentives.

2.4 Managerial ownership

In their 2000 research Ang et. al. showed empirically that managerial ownership has an inverse relationship with agency costs. So, besides the theoretical reasoning, the positive effects also have been observed. Since it would be beneficial for shareholders to let their managers share in the company, we should observe this phenomenon in the real markets. Which we observe, averaging at 12,23% in the US in 1991 (Knopf & Teall, 1996) and 4,86% in the Netherlands in 1996 (de Jong et al., 2001) for publicly traded companies.

Because of this implication, there have been studies regarding the effects of managerial ownership on other company measures such as value and performance (Morck et al., 1988; Fahlenbrach and Stulz, 2009). If there is an effect managerial ownership might proxy for or forecast a company's value and/or performance, which could be valuable information. So, if there is an effect of managerial ownership on the actions of top-management this might be a good indicator for investors and a way to acquire more information about said companies. Furthermore, some research on the effects of ownership on value and performance.

Theoretically the value of a firm should increase with managerial ownership. Since the ownership aligns the interest of the manager with the rest of the owners this should induce profit maximizing behaviour. But as Morck et al. (1988) argue, when such a manager gains enough equity in the company their voting power could increase to a level in which they can continue to act purely self-interested by voting in his own favour. In their further research (Morck et al., 1988) show empirically that market valuation of a company rises when shares of the managers rise from 0% to 5% but the valuation declines as the ownership share rises over 5%.

Fahlenbrach and Stulz (2009) show that the market valuation of the company is only affected by the changes in managerial ownership of the officers (Chief operating officer, financial officer etc.), but there is hardly a significant change with the managerial ownership of directors. Besides they have empirically proven how younger firms usually have more managerial ownership which decreases over time with good performance of the company.

2.5 Managerial ownership on risk

Since we know how to slightly predict managerial ownership of a company it is useful to further study the implications of that ownership. As suggested by prior research (Chen et al., 2001; Amihud & Lev, 1981) there might be a relationship between risk and managerial ownership. Two hypotheses regarding the risk of a company are drawn up over the years, one hypothesis arguing decreasing risk with increasing managerial ownership and the other one suggests an increase in risk with more managerial ownership.

When a manager has ownership in the company he is running, his wealth is directly connected to the performance and valuation of the company. Considering the difference with an option package or cash bonuses as reward for his services. With an option package there is no possible downside to increasing risk, since the expected pay-off of a call-option increases with volatility of the market price and there is no chance of a negative pay-off since one would simply not exercise. This could induce moral hazard. With cash bonuses the manager might be induced to take on any projects just to reach his target, possibly disregarding any project risk, since the only personal risk he is bearing is the risk of not receiving his bonus. However, when sharing ownership as a manager he directly bears all the risks of the valuation of the company, in both his wealth and human capital.

Effects can be caused by managerial risk aversion and bad diversification of the managers asset. Since he is highly exposed to the idiosyncratic risk of the company by human capital investment and his equity. Therefore, the manager might be incentivized to induce less

risk and consequently miss out on possible profitable investments, or even actively try to decrease idiosyncratic risk (Risk aversion hypothesis (Chen et al., 2001)) (1).

Next to the general theory of risk-aversion in support of this hypothesis (1), Holt & Laury (2002) show that risk aversion increases when the payoffs increase as well. This suggest that when increasing the managerial ownership in companies, managers become more risk averse and would try to reduce a company's risk or actively try to reduce their share in ownership. In the concept of standard risk aversion by Kimball (1993), it is shown that bearing one risk makes an economic agent less willing to bear another risk, even if both risks are independent. Or in this case this points in the direction that an acting agent is likely less willing to take risky decisions within the company because he is already exposed to idiosyncratic risk by the ownership.

In support of the risk aversion hypothesis Amihud and Lev (1981) found evidence that managers try to reduce companies' risk by engaging in mergers to 'diversify' their equity. This conclusion suggests that managerial ownership induces diversification of a company and therefore should be less risky. In his 1995 study, May finds a similar result in support of hypothesis (1), his findings suggest that highly invested CEO's tend to reduce companies' risk to reduce his personal risk as well. Besides he finds that specialised CEO's tend to invest in their speciality to induce less risk.

However, another hypothesis of how managerial ownership influences risk, as stated by Chen & Steiner (1999), states that, in regard to the view of Black and Scholes (1973), all equity can be considered as a call-option or real-options. In short, this hypothesis argues that the value of this 'call-option' increases with risk. Following this logic managerial ownership has a positive relationship to risk. I.e. the manager is more induced into risk-taking because this increases the value of his equity ('call-option'). (Wealth transfer hypothesis (Chen et al., 2001)) (2).

In the study of Cole et al. (2006) higher risk-taking is observed when a CEO wealth is heavily sensitive to stock volatility. In this study however, the reduced risk-taking effects of ownership or stock compensation is probably offset by call-option-based compensation (Cole et al., 2006). They conclude that a CEO is more induced to act risky because options do not have the possible negative outcome since they will be only executed when it is profitable. Because of this offset it is not possible to see the effects of managerial ownership on risk-taking, only the effects of managerial incentives on risk-taking. Besides not controlling for option-based compensation these results might point in the direction of the wealth transfer hypothesis (2).

In their 1999 studies Chen & Steiner took a broader perspective. Considering both hypothesis in their literature review and including all relevant research until that moment. In their research they find a simultaneous causality, managerial ownership influences risk but risk also influences managerial ownership. At low levels of risk, they find a positive relationship to managerial ownership for monitoring purposes and at higher levels they find managerial risk aversion. But they also find, in support of hypothesis (2) for managerial ownership to be a positive determinant of risk. Their findings into managerial risk aversion could also suggest hypothesis (1) to be true. Saunders, Stock and Travlos (1990) find not direct proof for hypothesis (2) but show that a managerial controlled bank exhibits less risk than a shareholder-controlled bank. So, in line with these findings risk-taking should decrease when the managers interests align with the shareholders'.

Finally, some empirical studies show contradictory results based on sector focus of the research. First, Chen et al. (1998) empirically support hypothesis (1) in US depository institutions. So managerial ownership shows a negative relationship with risk. Capozza and Seguin (2003) show a similar relationship for REITs (Real Estate Investment Trusts) in the US. And in another research by Chen et al. (2001) they find evidence for hypothesis (2) in the life insurance industry, thereby risk increases with managerial ownership. These researches point in the direction that industry might be a determinant of risk and ownership, as Chen et al. (1999) state this is in line with the arguments of Demsetz (1983) and Demsetz & Lehn (1985) that firms which operate in risky markets are harder to monitor and so will increase their managerial ownership, hence more risk leads to more managerial ownership. In summary, from previous research it is not clear which hypothesis to accept. It seems that there might be more factors in play than just managerial ownership. We should be careful when considering managerial ownership and at control for industry-risk and call-option compensations to observe a clearer relation.

2.6 Dutch markets

Since all prior major research is mainly focussed on US market it is relevant to expand research to other markets. There are clear differences between US and European markets e.g. differences in taxes (differs per country), differences in accounting standards (IFRS vs US GAAP), differences in stocks (dual class stocks in the EU vs single class in the US), differences in openness of the market (Open EU vs semi-closed US) and many more. Because of these clear differences one could expect the EU markets to behave differently than the US market. This research will attempt to fill a knowledge gap for the Dutch markets. In this section there will be

a literary analysis of the expected idiosyncrasies of the Dutch markets and her differences with the US market.

The first main relevant difference between US market and Dutch market is the fact that the US market is generally perceived as a market-based financial system and the Dutch (and other European markets) more as a bank-based system (European Central Bank, 2011; Demirguc-Kunt & Levine, 1999). In a bank-based system there is relatively less traded equity and fixed income and generally more lending via the banking system. However an increasing share in equity financing, (European Central Bank, 2018) there is still a big difference. This difference is relevant for this research because of the delegated monitor role of a bank (Diamond, 1984). When a bank assumes the role of delegated monitor this results in agency costs reduction because the manager is less inclined to purely in self-interest (Holmström & Tirole, 1997). Therefore, since the overall decreased agency costs in bank-based systems we might expect less managerial ownership. However, as de Jong et al. (2001), & Demirguc-Kunt & Levine (1999) show, the Netherlands is somewhere between a market-based and bank-based system. So, we would expect more managerial ownership than in a bank-based system, but less than in a market-based system.

This expectancy seems to be truthful, in 1991 managerial ownership in the US was at average 12,23% (Knopf & Teall, 1996) and in 1996 in the Netherlands the average was 4,86% (de Jong et al., 2001). For more contemporary data from 8-6-2019 there is an observable difference as well. On this date we compare all US stocks and all Dutch stocks, and we compare the biggest US indices and the biggest Dutch index. Insider ownership is on average of all US stock 7,2% where in the Netherlands this percentage is 5,5% (Bloomberg, 2019). While the S&P 500 and the Dow Jones also have a larger share of inside ownership than the average of the AEX (Amsterdam Exchange Index), which are respectively 1,81%, 2,93% and 0,77% (Bloomberg, 2019)

However not completely a banking-based system, these numbers show that the delegated monitoring by banks leads to a lesser desire by the shareholders to align their interests with the managers. This basic difference in solving the agency problems could induce other results in the Netherlands than in the US.

Another relevant difference is the difference in general market risk. It is likely that both markets have a difference in their general market risk, which influences the implications of the US research on Dutch markets. Van der Goorbergh and Vlaar (1999) show this difference through conducting a Value-at-Risk analysis of both the Dutch AEX index and the US Dow Jones. In their analysis they used multiple different methodologies to calculate the expected

violation rate of the Value-at-Risk estimator. Both indices had a higher violation rate than the estimator provided but the AEX had a 0,8% higher violation rate than the Dow Jones using a student-t distribution. The violation rate shows how many times the actual volatility was higher than the predicted volatility via de 95% VaR analysis. Even though both indices are not a complete representation for both markets, they are a precise proxy, so it is likely that the Dutch market has a higher systematic risk than the US market.

Another difference in risk, is the management of it. Bodnar et al. (2003) show two differences in the management. First, since Dutch markets are more internationally engaged in trade they are more exposed to currency risk, because Dutch companies tend to hedge more of their financial risk than US companies. Second, as mentioned before, Dutch companies tend to use Banking system more for their risk management, where US companies has a larger security market at its disposal. Therefore, US companies face a higher counter-party risk. They generally conclude that the institutional differences in the countries influence their risk management practices.

A final relevant finding, Donker et al. (2009), shows that in the Dutch market (Euronext Amsterdam listed companies) there is a negative relationship between managerial ownership and the likelihood of financial distress, this is different from the US results which found a non-linear relationship (Morck et al., 1988). This research gives us a great first insight in the way that Dutch managers act. The likelihood of financial distress is a risk, but it is not the only risk a company faces; this likelihood is a type of financial distress another example of this is currency risk among others. Other types of risk are operational risks, regulatory risks and systematic risks. This research does allow a first look in the risk aversion of the Dutch managers in which they reduce this likelihood. This even more points in the direction of hypothesis (1) being true for the Dutch markets. This research will in a way extend the research of Donker et al. (2009) by taking a more general point of view in risk and controlling for other variables extracted from prior research.

Because of these differences it is safe to assume that US conclusions might not be robust for Dutch market. That is why this research will focus on the Dutch market.

2.7 Hypothesis

Since in theory the CEO which owns shares and human capital is exposed to serious idiosyncratic risk of the company, he should be induced to take on less risk. But the wealth transference hypothesis and previous research (section 2.5) results show otherwise. The results generally point in different directions and the prior research will probably not be robust for the

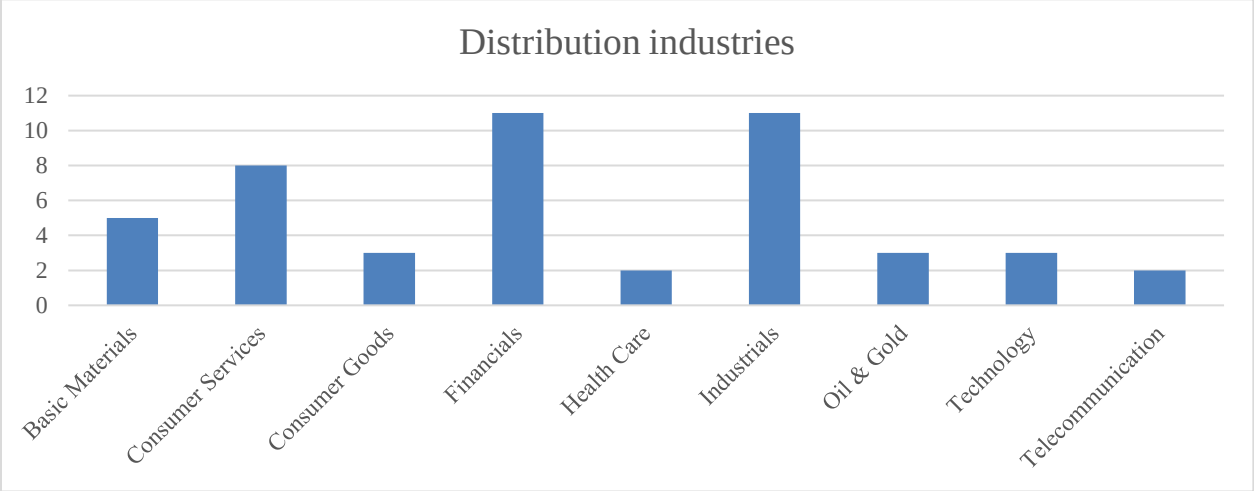
Dutch market because of the differences between US and Dutch markets (section 2.6). But since the research by Donker et al. (2009) point in the direction of the risk aversion hypothesis, there is reason to believe this hypothesis can be confirmed for the Dutch market. That is why this research will try to confirm this hypothesis:

H1: *Managerial ownership is negatively related to with risk in publicly traded companies in the Netherlands.*

3. Data

For this study data was retrieved from the Bloomberg databases on 1-6-2019. Data was retrieved from all companies listed in the AEX (Amsterdam Exchange Index) and AMX (Amsterdam Midkap Index). In this research companies actively traded in the AScX (Amsterdam Small cap Index) are excluded because of inconsistent and incomplete data in the Bloomberg databases and Adyen is omitted from the datasets since it would only contain 6 observations (IPO June 2018). The Panel-data retrieved from these companies has a time serial dimension from 31-1-2009 to 31-12-2018 (10 Years) with a frequency of one observation per month on the last day of each month, consisting of 48 companies cross-sectional. The use of monthly data in this research is to avoid unnecessary auto-correlation in the dependent variable and unnecessary noise. So, concluding, the initial sample consists of 5760 observations (48*10*12). All variables are retrieved from Bloomberg except when otherwise is stated.

Figure 1: The distribution of the observations between industries.



3.1 Dependent Variable: Risk

In pursuit of confirming either of the hypotheses, risk is the clear independent variable for constructing any model. However, what risk is and how to observe it might not be clear. Since one cannot measure risk exactly there is need for a proxy. In general, there are two common available possibilities as a risk proxy; First, one could use stock volatility, i.e. the price fluctuations of a stock price as measured by the standard deviations of the returns of a stock (as used by Chen & Steiner (1999)). A second possibility is the equity beta, i.e. a measurement of

how a stock price his fluctuation is correlated to the fluctuations in the open market (as used by Dolde & Knopf (2010)).

However, both suitable options to proxy risk in an analysis, stock volatility is preferred here. Since all used companies in this analysis are within the same market and since we use all, the market beta would simply be the correlation between their returns. Stock price volatility (from here on Volatility) has a more idiosyncratic nature and therefore more suitable for this research. The volatility used for this model is 30-day historical volatility since the other data is monthly as well and this volatility is the de facto standard in the field.

In the acquired data were some hefty outliers in the volatility, since these heavy volatility shocks increase the amount of errors in a possible model, they should be removed or changed. Since a spike in volatility is definitely a sign of a high momentary risk exposure, omission could also create a bias in the results. Because the model should try to explain the increases and decreases of the volatility, the data is winsorized on the 99th percentile, meaning all values in the top 1 percent are changed to the lowest value in said percentile. Any observations without a value for this variable will we discarded since this contains no information for this research. Table 1 displays the statistics of these variables with mutations mentioned above.

Table 1: Volatility variables statistics.

Variables	N	Mean	Std. Dev.	Min	Max	P1	P99
VOL30	4.806	29,71	16,14	6,93	209,90	10,20	87,94
VOL30WIN	4.806	29,47	14,91	6,93	87,94	10,20	87,94
LNVOL	4.806	3,26	0,46	1,94	4,48	2,32	4,48

With the 30-day trading price volatility denominated as VOL30, the 30-day trading price volatility winsorized on the 99th percentile denominated as VOL30WIN, and the natural logarithm of VOL30WIN denominated as LNVOL.

3.2 Main independent Variables: Managerial ownership

Since the model will measure the relationship between managerial ownership and volatility, the main independent variable should represent the ownership of the managers of the company. There are two main options, percentage of shares outstanding held by executives or percentage of shares outstanding held by insiders. The first option is consistent with Fahlenbrach and Stulz (2009) their results, stating that the valuation (and therefore the volatility of the market price) is only affected by the changes in managerial ownership of officers (executives) and not directors (other managers). However, option two might display a more complete image of managerial ownership, since all managerial ownership is included. Since both options are possibly viable, the dataset includes both. Percentages of shares outstanding

held by executives only accounts for a small part of the dataset, these observations may have a bias towards the latter part of the time series.

In the retrieved data is one clear outlier in the ownership, ArcelorMittal, the executive ownership of this company is around 80% since 7-2017 (by the CEO). This implies that most of the company is privately owned and there is no longer a Principal-Agent problem between the manager and shareholder. There probably is a Principal-Agent relationship between the CEO (80% owner) and the other owners, however this is not in the scope of this research so these observations are omitted. Other observations of executive ownership above 50% would be removed as well but are not observed.

Table 2 displays the statistics of the variables.

Table 2: Ownership variables statistics.

Variables	N	Mean	Std. Dev.	Min	Max	P1	P99
SHSEXECS	1.809	1,24	4,84	0	29,76	0	29,73
SHSINSIDERS	3.837	3,93	10,13	0	50,01	0	46,59

With % shares outstanding held by executives denominated as SHSEXECS, and % of shares outstanding held by insiders denominated as SHSINSIDERS.

3.3 Control Variables: Other causes of risk or price fluctuations.

Other variables are known to influence risk or price fluctuations. These variables are other factors that might increase the risk of a company. First of all, from the literature review it is clear that prior research did not control for option rewards as an incentive. Since, as stated in chapter 2.5, it is hypothesised that option rewards increase willingness to take risk by a manager, this could increase the risk and volatility of a company. Therefore, we include total option rewards to executives in the dataset. However, since many observations are missing from this variable and the available observations are not well diversified between companies, this limits the amount of usable observations from 1809 (SHSEXECS) and 3837 (SHSINSIDERS) to 954. Since total options awarded are likely heavily dependable on the size and valuation of the company (i.e. bigger firms tend to award bigger options packages and option packages tend to be more valuable when a firm is more valuable as well) an extra variable is created as the total options awarded to executives divided by the market capitalization.

Other possible causes of risk and volatility are retrieved from Fama & French (1993) who suggest book-to-market ratio and firm size are also factors of risk. Book-to-market ratio is retrieved as price-to-book ratio (i.e. market-to-book ratio) which correlates perfectly with book-to-market, so it contains the same information. Firm size is retrieved as market capitalization (Shares outstanding * market price) denominated in millions. As suggested in the literature

review (Chen et al., 1998; Chen et al., 2001; Capozza & Seguin, 2003) and Fama and French (1997) industry could also be an indicator of risk and therefore should be controlled for. The industries are retrieved from the website of Euronext (2019) which states the ICB industry for each company traded on the Euronext exchange. The price-to-book variable displays hefty outliers on the top 1%, ranging in value from 14,40 to 120,5. To correct for these outliers the variable is winsorized on the top 1%.

The final control variables are dummy variables for youth and year. As suggested by Fahlenbrach and Stulz (2009) young firms tend to have bigger stakes of managerial ownership which decreases over time with good performance. Since young firms also tend to be riskier and more vulnerable to fluctuations a dummy variable is created for firms which were not traded on the Euronext exchanged before January 2014 (11 of 47 companies). The year dummy is simply an indicator which only displays the year of the observation, since some years are likely to be more volatile than others (e.g. Mortgage crisis, 2009; Euro Crisis 2011), and allows to control for the impact of economic conditions and trends.

Table 3 and Figure 1 display the statistics of the control variables mentioned above.

Table 3: Continuous control variables statistics.

Variables	N	Mean	Std. Dev.	Min	Max	P1	P99
OPT_EXEC	954	699.535,8	1.247.505	-21000	7.153.000	-21000	5.830.000
OPTCAP	954	588,21	1.343,82	-14,08	7.958,85	-11,66	6.314,58
CAP	4.686	14.761,53	31.838,7	48,91	251.397,3	171,14	174.056,3
P_B	4.367	2,67	5,12	0,18	120,50	0,34	14,67
WP_B	4.367	2,42	2,11	0,18	14,67	0,34	14,67

With total options awarded to executives denominated as OPT_EXEC, total options awarded divided by market capitalization denominated as OPTCAP, market capitalization denominated as CAP, price-to-book ratio denominated as P_B, and price-to-book ratio winsorized on the 99th percentile denominated as WP_B.

3.4 Methodology

In order to analyse the data and create models Stata/MP 15.1 is used. The dataset is loaded as panel-data with a cross-sectional dimension of companies and a time-serial dimension of monthly data on the last day of each month from 31-1-2009 to 31-12-2018. To control for any residual autocorrelations and partial autocorrelations, correlograms are drawn up for each cross-sectional dimension, no residual autocorrelations or partial autocorrelations remains which can be used for modelling purposes.

To completely analyse the data correctly and find the best suiting regression to the data eight individual models will be created. Each model will be specified in a general to specific method, dropping out insignificant variables which do not improve the coefficient of determination (R-Squared). In table 4 is an overview of the models to be created.

As is shown models will be created for the winsorized volatility with the main dependent variable percentage shares outstanding held by executives or insiders, via a random or fixed effect estimator of the cross-sectional dimension (company). A Hausman test is conducted to confirm whether the fixed effects or random effects estimators are more consistent. All tests reject the null hypothesis that the difference between random and fixed effects are not systematic, so the within estimator (fixed effects) is the only consistent estimator. The within estimator estimates an unobservable time invariant effect for one single cross-sectional dimension (Company).

Another possibility is to conduct ordinary least squares regressions using the industry dummy as an extra control variable. This option might be suitable since this way there are more observations per group and might include more significant dummy effects than the company estimator does. A downside to this method is that all the companies are pooled in the regression. An analysis will follow on which type of models is more suitable for the data.

Initially the following models are created. Four models regarding the shares held by executives from which two are controlled for option awards. From those two models one is conducted using the fixed effects and one is conducted using OLS. Four more models in a similar fashion are conducted for the percentage of shares held by insiders.

Table 4: Overview the initially conducted regressions. No insignificant variables dropped yet.

Y	X1	X2	X3	X4	X5	X6	X7
VOL30WIN	SHSEXECS	CAP	WP_B	i.YEAR		YOUTH	Company groups (Within)
VOL30WIN	SHSEXECS	CAP	WP_B	i.YEAR		YOUTH	Industry dummy (OLS)
VOL30WIN	SHSEXECS	CAP	WP_B	i.YEAR	OPTCAP	YOUTH	Company groups (Within)
VOL30WIN	SHSEXECS	CAP	WP_B	i.YEAR	OPTCAP	YOUTH	Industry dummy (OLS)
VOL30WIN	SHSINSIDERS	CAP	WP_B	i.YEAR		YOUTH	Company groups (Within)
VOL30WIN	SHSINSIDERS	CAP	WP_B	i.YEAR		YOUTH	Industry dummy (OLS)
VOL30WIN	SHSINSIDERS	CAP	WP_B	i.YEAR	OPTCAP	YOUTH	Company groups (Within)
VOL30WIN	SHSINSIDERS	CAP	WP_B	i.YEAR	OPTCAP	YOUTH	Industry dummy (OLS)

With the 30 day trading price volatility winsorized on the 99th percentile denominated as VOL30WIN , % shares outstanding held by executives denominated as SHSEXECS, % of shares outstanding held by insiders denominated as SHSINSIDERS, market capitalization denominated as CAP, price-to-book ratio winsorized on the 99th percentile denominated as WP_B, the year dummy denominated as i.YEAR, total options awarded divided by market capitalization denominated as OPTCAP, and the final column stating the use of the random effects, within estimator or an industry dummy.

4. Results

Since the proposed models are separated into two obvious categories (percentage of shares held by executives and percentage of shares held by insiders), the results section will be structured in a similar fashion as well, but first will be analysed which regression method suits the data best, fixed effects estimations or OLS. Per model is explained and argued which variables are omitted from the regression. The year dummies in each regression starts at 2011, this is because the ownership data in Bloomberg was available from 2010 on. So, for 2009 there are no observations regarding the main independent variables and are therefore omitted from the model. 2010 is omitted to avoid the dummy variable trap. In all models the youth (YOUNG) dummy proved to be insignificant while not increasing model strength and is therefore omitted. Since the models are specified in a general to specific way any missing variables mentioned in the data section where not significant or model improving and therefore omitted from the discussed model.

4.1 Within estimator or ordinary least squares

Since both type of models shown different or inverse results (Appendix D) it is important to compare both manners of regressing in depth. The models best fitting to the data contains the most information and can therefore help to confirm the hypothesis or not. To analyse whether the company within estimator or the industry group dummies is the most efficient, appendix C is added. This table shows how the winsorized volatility differs between industry groups, between companies and within industry groups. Should the within estimator be more suiting to the data, the means and standard deviations should differ enough to justify adding an individual estimator for each company. The within estimator accounts for the typical level of volatility within the company over the time series of the dataset. This is followed by the model estimating the effects of the other control variables within a company. A downside to this modelling technique is the fact that some companies might have less observations than others and could create a bias in the estimations of the other independent variables. Should the industry dummies be more fitting to the data, the means and standard deviations inside industry should be comparable enough to bulk these observations and deviations into one industry dummy. This dummy in turn should account for the typical level of volatility within one industry. However, if these values differ significantly within industries the other variables might be biased, and a possibly valuable information within the company's individual characteristics might be missed.

Regarding these models and appendix C there are huge differences between the companies within the industries. Another check, which method is better suited for the data is comparing the R-Squared. Since models using a within estimator cannot be compared with OLS regressions in terms of R-Squared model 1 and model 5 are also estimated using industry dummies instead of the within estimator. Since this is in essence the same regression (estimating fixed effects per company group) we can compare this R-Squared to the models using solely the industry dummy. In appendix B the estimations of these models are shown. Model 1 is compared to model 5 and model 3 is compared to model 7 (see appendix D). Since the R-Squared values are higher of these regressions than of the industry dummy regressions (0,44 over 0,25 and 0,37 over 0,19, we can conclude that the within estimator also fits the data better in terms of R-Squared.

Therefore, the coefficients of the within models will better fit the data and help to confirm or reject the hypothesis. Since the within estimator is a better fit to the data the models using the industry dummies will be excluded from the following analysis and results section. The results of the models using the industry dummies are included in appendix D.

4.2 Percentage of shares held by executives (Model 1 & 2)

The first models are the models in which the percentage of shares outstanding held by executives is the primary independent variable. As concluded by Fahlenbrach and Stulz (2009) this independent variable should provide the clearest relationship to valuation and therefore price fluctuations. The first model does not control for option awards and the second model does. In both models constructed, the price-to-book ratio was not significant nor an improvement to the model and therefore omitted. A possibility is that, because of the high correlation between market capitalization, or options to market capitalization and price-to-book ratio (Appendix A), the effects of the price-to-book ratio is fully captured by the coefficient of market capitalization or option awards to market capitalization.

Model 1, using the within estimator with companies as the group variable does not seem to generate a significant influence of the percentage of shares outstanding held by executives on the 30-day volatility of the price. It does however give first insight into the other possible relationships. The influence of market capitalization on the 30-day price volatility is negative and the null hypothesis is rejected at a 5% confidence level. This relationship seems to be relatively small compared to the other coefficients, but mind that this coefficient is the coefficient determines the change in volatility for every 1 million euro change in market capitalization, with market capitalization values ranging from 48,9 billion to 251,3 billion.

A potential problem of this model is that the observations per group range between 8 and 106, so the panel data is not well balanced, and this might interfere with some of the results. This is likely because of missing observations in the percentage of shares outstanding held by executives variable. This could be the cause of the high standard errors (and high p-values).

Model 2 is essentially the same model as 1 but these models control for total option awards given to the executives relative to the size of the company. Since it is hypothesised in section 2.5 that option awards are likely to induce more risk-taking by the managers there is an expectancy that the relationship would show clearer in these models. This model does not show any significant relationship.

However, use of this variable drops the amount of observations to 435. Besides the observations are not well balanced and clustered in twelve of the forty-eight companies and four of the ten years. Therefore, this data is heavily biased towards these companies' years and could say less about general ideas and conclusions. Besides the observations are not well balances between the groups of the within estimator since there is one company with only one observation for the OPTCAP variable, whilst the average is 36,3 observations per group. In this model the control variable market capitalization is dropped because of insignificance.

Since both models do not show any significant relationship on either the SHSEXECS or OPTCAP variable to 30-day price volatility there is not much to interpret. Not even on a 10% significance level there is something to say about a possible relationship. This is likely because of the many missing observations. Since the only mapped relationships in these models are the dummies and within estimator it is not sensible to interpret the R-Squared values.

Table 5: Models using SHSEXECS as primary independent variable.

Variable	Coefficient (Model 1)	Coefficient (Model 2)
SHSINSIDERS	2,128120	0,395072
CAP	-0,000236**	OMITTED
OPTCAP		-0,002462
YEAR dummies	YES	YES
INDUSTRY Dummies	OMITTED	OMITTED
R-Squared	0,1768 / 0,1327	0,1448 / 0,3568
N	1.809	435
Model	Within estimator	Within estimator

With the 30 day top winsorized trading price volatility as dependent variable, % of shares held by executives denominated as SHSEXECS, total option awards given to executives divided by market capitalization denominated as OPTCAP, top winsorized price-to-book ratio denominated as WP_B, omitted dummy in years: 2010, omitted dummy in industries: Basic Materials, 99% confidence level noted as ***, 95% confidence level noted as **, 90% confidence level noted as *.

4.3 Percentage of shares held by insiders (Model 3 & 4)

The following models will be regarding the percentage of outstanding shares held by insiders as the main independent variable. The main difference between these models and the former is that all employer ownership is regarded and not just executives' ownership. This might create a more complete image of the workings. Since, particularly for bigger and segmented companies, managers and other officers tend to share in ownership also, and are likely to have at least some influence in the decision making and risk of the company. Another advantage of these models is that there is more data on this variable. Instead of the 1809 observations we now have 3837 without option control and for option control from 435 observations increased to 879. With almost double amounts of observations it is easier to observe clearer relationships and conclude them with a higher confidence level. Therefore, it is more likely that the following models will produce significant coefficients.

The third model, using the within estimator, features the same set up as the former models. However, besides the dropped winsorized price-to-book ratio, which was not significant or model improving, market capitalization is also not significant or model improving as well. The year dummies function the same as the following models. The main independent variable is the first with a relationship which aligns with the hypothesis. The influence of the percentage of outstanding shares held by insiders has a negative coefficient of -0,15 within a confidence level of 95%. This suggests that every 1% increase in insider ownership decreases the 30-day trading price volatility by 0,15. This result is in accordance with the hypothesis. The within R-Squared value is 0,12 which suggests that 12% of the proportion of the variation of the 30-day volatility is explained within the groups, in other words, the year and percentage of outstanding shares held by insiders account for 12% of the variance within a company.

The final model is an extension of model 3 including the control for option awards. This model suffers from the same downside as model 2, a lot of observations are missing which makes the modelling less precise and increases the standard errors significantly. The amount of observations used in these models is 879 which is little compared to the original sample size (5760). The observations are still not well balanced between the cross-sectional groups which could induce biases in the results and constricts the implications to only small local applicability. In model 3 the price-to-book variable is adopted instead of the market capitalization since market capitalization was non-significant and not model improving. It is likely that because of the correlations between option awards to market capitalization, price-to-book ratio, and market capitalization; that the effect of market capitalization is captured by the other mentioned variables. Model 7 seems to contradict the hypothesised idea that option

awards induce more risk-taking by a company because the coefficient is negative, and it is significant with a 99% confidence level.

This model does not seem to produce any significant relationship from percentage shares held by insiders to the 30-day price volatility. Therefore, we cannot interpret the coefficients as anything other than probably zero. This might again be induced due to the smaller sample size of these models.

Table 6: Models using SHSINSIDERS as primary independent variable.

Variable	Coefficient (Model 3)	Coefficient (Model 4)
SHSINSIDERS	-0,152298**	0,927932
CAP	OMITTED	OMITTED
OPTCAP		-0,002300***
WP_B	OMITTED	-3,832602**
YEAR dummies	YES	YES
INDUSTRY Dummies	OMITTED	OMITTED
R-Squared	0,1199 / 0,1234	0,1868 / 0,1788
N	3.837	879
Model	Within estimator	Within estimator

With the 30 day top winsorized trading price volatility as dependent variable, % of shares held by executives denominated as SHSEXECS, total option awards given to executives divided by market capitalization denominated as OPTCAP, top winsorized price-to-book ratio denominated as WP_B, omitted dummy in years: 2010, omitted dummy in industries: Basic Materials, 99% confidence level noted as ***, 95% confidence level noted as **, 90% confidence level noted as *.

5. Conclusion

For this research eight models are constructed using Bloomberg data to analyse the possible relationship between managerial ownership and risk of a company in the Netherlands. Regarding prior research the models tried to account for possible reasons of stock price volatility and causes of risk, one main novelty is the inclusion of stock option awards as a control variable to explain risk. In line with expectations based on prior research of the Dutch markets and managerial ownership in general, the hypothesis tried to confirm whether there is a negative relationship between risk and managerial ownership in publicly traded Dutch companies. This hypothesis aligns with the risk-aversion hypothesis, backed by theoretical economics (Kimball, 1993), empirics of general economics (Holt & Laury, 2002), US studies of managerial ownership (Amihud & Lev, 1981; May, 1995; Chen et al., 1998), and a similar study of the Dutch markets (Donker et al., 2009). Another well regarded hypothesis is the wealth transference hypothesis which states that the relationship is positive.

First of all, this research did not succeed in conducting a suiting model using option awards as a control variable. The main idea of adding this control variable is the hypothesised idea that stock call-option packages induce the manager to engage in more risk as explained in section 2. However, in the created models the data set proved to be insufficient to map the complete relationship. In the models using the total option awarded no significant relationships were found and the results seem distorted. This is likely because of the heavy bias in the dataset regarding these models. Only twelve of the total forty-eight companies in the complete dataset had observations regarding stock rewards, next to that the data was not well balanced over the groups of the regression (company or industry). Because of that it is not sensible to conclude anything regarding the influence of option awards on the volatility of stock prices and the effect of these awards on the shown relationship between managerial ownership and the volatility of the stock prices. In section 6 will be recommendations on how to test for this relationship properly in following research.

Whether to confirm or deny the hypothesis is not clear from an instance. What is clear that there is probably not a relationship between the shares held by executives and the influence on the risk of the company. In the first model using the within estimator no significant relationship was found. Since this model is the best fitting at hand we cannot draw a strong conclusion regarding this particular kind of managerial ownership. So, for now the conclusion regarding executive ownership, is that it does not influence risk in a significant way. In the discussion sector will be recommendations how to specify this relationship.

Model 3 does seem to confirm the hypothesis. Using the fixed effects of companies, the percentage of shares held by insiders has a negative coefficient of -0,15 with a significance level of 95%. This is in line with the hypothesis, but it might not be enough to confirm it. This model does fit de data well and generate a significant within R-Squared of 0,12. However, this model only features the year dummies and company within estimator, it seems highly unlikely that there is not another factor influencing both shares held by insiders and the volatility of stock prices.

Concluding this research, it was not able to control correctly for option awards to managers, since there were not enough observations. The research did not find a significant relationship from the percentage of shares outstanding held by executives to the volatility of the stock price and therefore the influence on risk. However, there was a significant influence of the percentage of shares outstanding held by insiders, this result was in line with the hypothesis. Since, these findings are in line with Donker et al. (2009) their findings, the data and previous research seems to confirm the hypothesis. It is therefore likely that the other models did not produce a significant relationship because of missing observations. That is why we confirm the hypothesis, and conclude that there is a negative relationship between managerial ownership and risk in the Netherlands. Since this relationship is concluded for insider ownership and not executive ownership, these findings are not in line with the conclusions of Fahlenbrach and Stulz (2009)

6. Limitations and recommendations

This research, like all research has some limitations. The dataset and incompletion of it did create some problems and variables might have been overlooked. This research tried to map the relationship of managerial ownership to risk of a company publicly traded in the Netherlands, however partly clear there is not yet a complete understanding of the inner workings.

First of all, the focus point and novelty of this research was the idea to control for option awards given to managers. Since, like hypothesised in 2.5, it is likely that the option awards correlate with managerial ownership and the risk a manager is willing to take it could have given a clearer insight into the direct relationship between ownership and risk itself. However, due to a lot of missing observations in the option awards, it is hard to conclude whether the relationship is unobservable because it is not there or simply because the data is to incomplete and biased to a few years and companies. Recommending for following research to complete the dataset with all option packages awarded to managers.

Another limitation of this research is the fact that the definition of risk is linked solely to the 30-day trading volatility. This is a good proxy for risk in general, however it is likely that other indicators of risk might be observable and available to analyse as well. Good examples of this might be to include variables as the investment in research and development, expansion or mergers and acquisitions. A manager's influence and actions trying to take or reduce risk might be observable over these other factors. Besides the 30-day trading price volatility might be influenced by completely other factors than an acting manager, like public opinion about a business or new legislation. Recommending for following research in the Netherlands is comparing this behaviour between largely managerial held companies and largely institutional held companies.

In the main independent variables is room for some improvement as well, since this research only included the ownership of all insiders or of the executives. In between are a lot of groups which could be analysed for the influence of their ownership on the risk of a company. For example, the ownership of segment-managers in multi-divisional companies might display a relationship of the risk of a company. The limitation of this research is the fact that it is focussed on just the top or all, nothing in between.

This research, like most research in finance, is focussed on a quantitative analysis. But, one way of researching whether managers feel induced to increase or decrease their risk with managerial ownership could be to simply ask. Interviews with managers might create a more

complete image of the risk-aversion or risk. This research, like most other, looks only at the output but not so much at the humane input.

Finally, there is the possibility that there are omitted variables biasing the results. For following research, one should always map out all possible relations again and gather the data.

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Appendix

Appendix A: Correlation matrix of the used continuous variables

	VOL30WIN	SHSEXECS	SHSINDERS	CAP	WP_B	OPTCAP
VOL30WIN	1					
SHSEXECS	-0,13***	1				
SHSINSIDERS	0,16***	0,61***	1			
CAP	-0,21***	-0,10***	-0,12***	1		
WP_B	-0,60***	-0,07***	-0,19***	0,13***	1	
OPTCAP	0,26***	0,15***	0,39***	-0,27***	-0,15***	1

With the 30-day trading price volatility winsorized on the 99th percentile denominated as VOL30WIN, % shares outstanding held by executives denominated as SHSEXECS, % of shares outstanding held by insiders denominated as SHSINSIDERS, market capitalization denominated as CAP, price-to-book ratio winsorized on the 99th percentile denominated as WP_B, and total options awarded divided by market capitalization denominated as OPTCAP. LNVOL excluded since it correlates the same as VOL30WIN, 99% confidence level noted as ***.

Appendix B: Model 1 and 5 estimated using Company dummies instead of the within estimator.

Variable	Coefficient (Model 1)	Coefficient (Model 5)
SHSEXECS	2,128120	-0,152298**
CAP	-0,000236**	
YEAR Dummies	YES	YES
COMNR Dummies	YES	YES
R-Squared	0,4464	0,3790
N	1.809	3.837
Model	Company dummy	Company dummy

With the 30-day top winsorized trading price volatility as dependent variable, % of shares held by executives denominated as SHSEXECS, market capitalization denominated as CAP, omitted dummy in years: 2010, omitted dummy in industries: Basic Materials, 99% confidence level noted as ***, 95% confidence level noted as **, 90% confidence level noted as *.

Appendix C: Winsorized 30-day volatility statistics sorted by industry and company

INDUSTRY	COMNR	Mean	Standard Deviation	Observations
1	6	27,78	10,14	120
1	8	38,60	15,70	94
1	19	23,63	8,91	120
1	26	22,11	7,30	53
1	Total	27,41	12,79	387
2	3	20,17	6,42	120
2	4	40,00	12,27	120
2	16	24,42	8,14	30
2	24	23,22	6,23	46
2	38	19,32	7,60	120
2	40	33,51	13,33	120
2	43	18,82	6,57	120
2	48	20,40	7,17	120
2	Total	24,10	11,39	702
3	18	26,74	10,66	120
3	25	19,85	6,45	120
3	41	44,74	20,05	120
3	Total	30,44	17,18	360
4	2	24,62	11,31	37
4	5	34,72	17,16	120
4	12	21,51	4,75	30
4	20	22,14	9,50	120
4	21	33,25	12,06	41
4	27	36,76	20,17	120
4	28	26,80	12,58	38
4	32	21,16	7,15	53
4	44	22,84	8,96	120
4	46	22,46	9,69	120
4	47	20,80	8,93	120
4	Total	26,36	13,95	919
5	23	36,35	17,00	120
5	34	26,80	10,12	120
5	Total	31,57	14,76	240
6	1	26,72	13,79	120
6	7	38,94	17,91	120
6	9	33,00	15,94	120
6	14	38,74	17,15	120
6	17	26,74	12,97	120
6	30	29,30	10,28	30
6	32	21,16	7,15	53
6	35	36,84	16,06	120
6	36	31,23	13,09	120
6	42	26,94	11,85	120
6	45	24,59	9,20	120
6	Total	31,97	14,76	1.180
7	22	37,12	16,57	120
7	37	20,13	7,80	120
7	39	35,58	13,33	120
7	Total	30,94	15,318	360
8	10	32,41	12,63	120
8	11	28,23	8,47	120
8	15	37,88	17,15	120
8	Total	32,84	13,69	360
9	13	45,13	21,64	58
9	29	26,31	11,35	120
9	Total	32,44	17,76	178

Appendix D: All initial models.

Models using only SHSEXECS as primary independent variable.

Variable	Coefficient (Model 1)	Coefficient (Model 2)
SHSEXECS	2,128120	0,377672**
CAP	-0,000236**	-0,000080***
YEAR dummies	YES	YES
INDUSTRY Dummies	NO	YES
R-Squared	0,1768 / 0,1327	0,2583
N	1.809	1.809
Model	Within estimator	Industry dummy

With the 30-day top winsorized trading price volatility as dependent variable, % of shares held by executives denominated as SHSEXECS, market capitalization denominated as CAP, omitted dummy in years: 2010, omitted dummy in industries: Basic Materials, 99% confidence level noted as ***, 95% confidence level noted as **, 90% confidence level noted as *.

Models using SHSEXECS and OPTCAP as primary independent variables.

Variable	Coefficient (Model 3)	Coefficient (Model 4)
SHSEXECS	0,395072	-2,814910
OPTCAP	-0,002462	-0,000904
YEAR dummies	YES	YES
INDUSTRY Dummies	NO	YES
R-Squared	0,1448 / 0,3568	0,4193
N	435	435
Model	Within estimator	Industry dummy

With the 30-day top winsorized trading price volatility as dependent variable, % of shares held by executives denominated as SHSEXECS, total option awards given to executives divided by market capitalization denominated as OPTCAP, omitted dummy in years: 2010, omitted dummy in industries: Basic Materials, 99% confidence level noted as ***, 95% confidence level noted as **, 90% confidence level noted as *.

Models using only SHSINSIDERS as primary independent variable.

Variable	Coefficient (Model 5)	Coefficient (Model 6)
SHSINSIDERS		0,210307***
CAP		-0,000103***
YEAR dummies	YES	YES
INDUSTRY Dummies	NO	YES
R-Squared	0,1199 / 0,1234	0,1965
N	3.837	3.837
Model	Within estimator	Industry dummy

With the 30-day top winsorized trading price volatility as dependent variable, % of shares held by executives denominated as SHSEXECS, market capitalization denominated as CAP, omitted dummy in years: 2010, omitted dummy in industries: Basic Materials, 99% confidence level noted as ***, 95% confidence level noted as **, 90% confidence level noted as *.

Models using SHSINSIDERS and OPTCAP as primary independent variables.

Variable	Coefficient (Model 7)	Coefficient (Model 8)
SHSINSIDERS	0,927932	-0,599557
OPTCAP	-0,002300***	-0,000294
WP_B	-3,832602**	-2,519270*
YEAR dummies	YES	YES
INDUSTRY Dummies	NO	YES
R-Squared	0,1868 / 0,1788	0,3032
N	879	879
Model	Within estimator	Industry Dummies