Erasmus School of Economics

Master Thesis Financial Economics

The Timing of Share Repurchases to Achieve Private Benefits from Stock Options

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Abstract

This thesis investigates the strategic use and timing of share repurchases by CEOs for achieving private benefits. Specifically, it studies the relation between stock repurchases and stock option granting and exercise decision in different time periods. I find that share repurchases occur more three months after the stock option grant date and less three months before. Subsequently, I find that share repurchases occur less three months after the stock option exercise date and more three months before. The relation between the repurchase activity and stock option grants is stronger for larger stock option grants but weaker for vested stock options. Finally, I calculate cumulative abnormal returns within different individual periods and make comparisons to find the most valuable timing decision. My findings point out that it is more profitable to repurchase around the stock option grant date as I find higher cumulative abnormal returns compared to the period around the exercise date.

Keywords: Share repurchases, stock option grants, stock option exercises, opportunistic timing

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1. Introduction

There has been a huge controversy about the motives of repurchases and executive compensation in the form of stock option grants. Throughout the years, studies identified a link between those topics (Yermack 1997; Fenn and Liang, 1997; Chauvin and Shenoy, 2001; Babenko, 2009; Obernberger, Dittmann and Keusch, 2019). Those studies focus on the use of stock repurchases in affecting the value of stock options when are granted to executives. Kahle (2002) and Babenko (2009) also provide evidence that it is more likely to time share repurchases for when executives have higher stakes of stock options. Yermack (1997) and Chauvin and Shenoy (2001) find pattern when measuring abnormal returns around the stock option grant date from repurchase activity. These patterns need to be examined to determine whether share repurchases are used by executives to obtain private benefits from stock option grants

Similar to stock option grants, there is literature concerning the link between stock option repurchases and exercisable stock options (Carpenter and Remmers, 2001; Bens et al, 2002; Bartov and Mohanram, 2004; Edmans et al, 2008). Those studies examine a similar pattern to stock option grants but their main focus is around the exercise date. Taken together, those two individual patterns raise the question whether there is opportunistic timing behaviour of executives using share repurchases.

Yermack (1997) and Lie (2005) both have found evidence which supports the theory of grant date manipulation. Specifically, they find negative abnormal returns before the grant dates and positive afterwards from share repurchases which indicates timing around the grant date. Apart from the grant date manipulation theory there has been evidence of manipulation around the exercise date provided by Carpenter and Remmers (2001) and Bartov and Mohanram (2004). They find that firms generate positive abnormal returns in the period before executives decide to exercise and negative abnormal returns afterwards indicating an exercise manipulation theory similar to the grant date.

The most recent literature studying the timing between share repurchases and stock options is Obernberger, Dittmann and Keusch's (2019) paper. They provide evidence of CEO's opportunistically timing share repurchases around stock options grant. In line with

Obernberger, Dittmann and Keusch's (2019) I include the exercise dates of the stock option grants studied and observe the repurchase behaviour around different time periods and determine whether there is timing which measuring the abnormal returns around each period to understand if there is value for the CEOs.

To test whether there is timing of share repurchases by CEOs for achieving private benefits I develop 4 sets of hypotheses:

In my first hypothesis, I analyse relation between the decision to grant stock options and the repurchases decision. Since CEOs benefit if they are granted options at a low exercise price, I expect less to repurchases before the stock option grant date and more after the grant date as the stock prices increases after the share repurchase.

H1) Share repurchases occur more after the stock option grants and less before the grant

My second hypothesis tests whether there is link between the decision to exercise stock options and the repurchases decision. After the vesting period when the option can be exercised, there are no incentive to conduct share repurchases to increase the stock price but there are strong incentives in timing the share repurchases before the exercise date. Therefore, I expect more repurchases before the exercise date and less after the exercise date.

H2) Share repurchases occur more in the two quarters surrounding the stock option exercise (vesting) date and less in the following years.

My third hypothesis explores whether there is a connection between the size of the stock option (stock option grant and exercisable option) and repurchase activity. The existing literature supports that there is a strong relation between larger stock option grants. For already vested options (exercisable), a rational CEO would prefer to maximize the value of the stock option right before the exercise date and sell the option at the exercise date. As a result, I expect a expect a stronger relation for larger option grants and repurchase activity but a weaker relation for already vested options.

H3) The relation between CEO stock options and share repurchases activity is stronger for larger stock option grants but weaker for larger vested stock options.

The fourth and final hypothesis determines whether share repurchases can be used to obtain private benefits by calculating abnormal returns after share repurchases. Since prior literature associates repurchases with abnormal returns, cumulative abnormal returns would be a good

indicator to measure if there is indeed timing of stock option granting and exercising decision and more importantly distinguish which decision generates more value to the CEOs.

H4) There are abnormal returns surrounding the stock option grant date and the exercise date which derive from the share repurchase activity.

To test my hypotheses empirically, I construct my main dataset by combing repurchase data from Obernberger, Dittmann and Keusch's (2019) with ExecuComp data. My final data set consists of 8304 stock option grants and 2891 actual share repurchases between 2006 and 2010. To test the first three hypothesis, I will perform a difference in difference analysis using a treatment sample and a control sample. To be able create a control sample, I add Compustat data to my existing dataset. Compustat has accounting data which are essential in the matching procedure to create a control sample to perform my analysis. Lastly, for my final hypothesis I add CRSP data in order to measure abnormal returns.

I find that treatment firms increase repurchase activity more strongly after the stock option grant date and less before than control firms. Specifically, I find that the repurchases activity decreases 3 months before the stock option grant month and increases 3 months after. Before the 3-month period I find almost no repurchases activity which is explained since there are no incentives to repurchase. Adding to that, I find that treatment firms increase repurchase activity more strongly before the stock option exercise date and less after than control firms. In more detail I find increased repurchase activity in the 3 months before the stock option exercise month and less 3 months after the exercise period. Testing again, before the 3-month period results in almost none repurchase activity similar to stock option grants. Both these findings support the notion that CEOs time repurchase activity to profit from stock options.

I also find that the relation between repurchase CEO stock option grants and corporate share repurchase activity increase with value of the grant. I measure the value of stock option grant 3 months before the stock option grant date and 3 months after the stock option grant date. Contrary to stock option grants, I find that the value of the vested option though does not affect the relation between the larger vested stock options and repurchases activity.

Finally, I find that it is most profitable timing decision that gives the most private benefits to CEOs is to time the period around stock option grants. I do so, by calculating 3-month cumulative abnormal returns around the stock option grant date, the stock option exercise date and the normal period where there are no incentives to repurchase

This thesis contributes to the literature of share repurchases and stock option compensation supporting the notion that CEOs strategically use share repurchases to achieve private benefits. There has been already a research regarding the link between stock option grants and share repurchases. Obernberger, Dittmann and Keusch(2019) in their paper examine the relation between stock option granting decision and share repurchasing decision but only focus on the stock option grant date without taking into consideration that there might be timing around the exercise date. Therefore, my thesis adds to their research by linking the exercise dates with the grant dates of the stock options and studying their behaviour in other time periods other than around the stock option grant date. Additionally, abnormal returns that derive from share repurchases ,around each different time period used, are calculated to observe if there is timing and determine which decision provides the most private benefits to CEOs.

The rest of this thesis is structured in the following way : Chapter 2 provides a general overview of the related literature so far about share repurchases and stock option grants. I discuss both of them separately and explore the link between them. Also, I list the hypotheses tested in this research in a more detailed manner while providing more information about the literature from which are based. Chapter 3 focuses on the dataset and variables construction used in this research. Chapter 4 discusses the methodology used to conduct the empirical analysis. Chapter 5 highlights the findings and discusses their importance and significance. I also list any potential problems that can affect the interpretation of my findings Chapter 6 briefly summarizes my research and emphasizes on the key takeaways. I also make suggestions for future researches to extend my research. Chapter 7 contains all the references of the literature used in this thesis. Chapter 8 is the appendix which includes all the results presented in tables. **(see page 2, list of tables)**

2. Theoretical framework

This chapter focuses on the relevant literature so far regarding share repurchases and stock option grants. I begin with providing the key insights and literature, which presents stock option grants as an effective asset to exploit for private benefits. Following this, I will highlight the most essential to tool to exploit this asset into private benefits, which are stock repurchases. To do so, I will provide a theoretical background, which discusses motives for repurchases and relate them with options grants. Lastly, I will explain why stock option exercises can also serve as an effective asset for private benefits and relate them with repurchases.

2.1 Stock Option Grants

Stock options are usually granted to executives by their firms as a part of their total compensation to forge a strong form of alignment between their personal and the firm's interests. To determine the amount of stock option that are included in their compensation firms assign a compensation committee which is composed of non-executive and independent directors to avoid biases and guarantee a fair procedure. The committee makes changes to the compensation package to properly incentivize executives.

By holding those options, executives are given the right to purchase a specific amount of company's shares at a pre-determined exercise price in the future. After the stock option grant date follows a vesting period until options reach the maturity date. During the vesting period, options cannot be exercised. When the vesting period ends, the option holder may exercise the option until the maturity date of the option program. The executive may choose to exercise the stock option immediately after the end of the vesting period or can prolong the exercise.

This decision is based solely on the difference between the market stock price and the exercise on a given day. On the grant date, most stock options awarded at CEOs are "at the money", meaning that the exercise price is the same with the stock's closing price on that date. CEOs do not take any actions at this stage. In a future date, when the stock option price increases CEOs have the right to buy the same stock on the exercise price that it had at the grant date which is a lower price compared to the market price at that date profiting by the difference between the market price and the exercise price. In this situation we say that the option is valued "in the

money". However, the stock price could decrease and be lower than the exercise price on the grant date of the option, meaning that it is not very profitable for the CEO to exercise the option since the market price is lower than the exercise price. It is not a mandatory requirement to exercise the right to buy the stock and the decision depends solely on the CEO. For example, some CEOs may be confident that the stock price may rise even higher, so they decide to hold on to this option for a longer period. There is, however, a pre-determined period after grant where the stock options cannot be exercised called the vesting period. Vesting period is a pre-set number of years before shares in an employee stock option compensation plan are unconditionally owned by that employee. If the employee decides to terminate employment before the end of the vesting period, then the company can purchase its shares back at the original price granted which is the exercise price.

Most of the literature around stock option grants discuss the agency problems that arise from the structure of executive compensation plans in providing undesirable incentives. Since CEOs' compensation heavily depends on being granted options with a low exercise price, since they profit from the difference between an increased stock price and a low exercise price, they will manipulate stock prices prior to the stock option grant dates.

Yermack (1997) provides evidence of manipulation of grants dates by finding positive excess returns of 2-3% after stock option awards. He supports that CEOs are being granted stock options right before favorable corporate news and supports the notion that CEOs influence the compensation committee to opportunistically time grants.

Chauvin & Shenoy (2001) find abnormal decrease in stock prices prior to the grant date and abnormal increases after the grant date. Contrary to Yermack (1997) they provide a different explanation for this pattern. They argue that CEOs have the incentive and opportunity to manage the timing of their communications of inside information to the market during the period just prior to the date of their stock-option grant to reduce the exercise price of their options. Therefore, they attribute this abnormal decrease in stock prices to executives manipulating information and not in timing of stock option grant dates.

Following Yermack (1997) and Chauvin & Shenoy (2001), Aboody and Kasznik (2000) and Balsam et al. (2003) focuses on earnings management and provide evidence that stock price manipulation is attributed to the executive's decision to disclosure information to the market. They focus on earnings management before grant dates and prove that executives maximize the value of their stock option compensation. Balsam et al. (2003) also supports that earnings

management decreases the exercise price prior to the stock option grants leading to negative abnormal returns.

Lie (2005) extends Yermack's (1997) research by documenting the abnormal stock returns are negative before stock options grants and positive afterwards. He finds that predicted returns are abnormally low before the awards and abnormally high afterwards. He describes this pattern as retroactive timing of grant dates by executives to obtain a lower exercise price, which is known as "backdating." There were several scandals exposed due to backdating which made essential the need to regulate this effect. The SEC created a requirement under Sarbanes-Oxley law for companies to report the granting of options within two business days. Huang et al (2010) and Collins et al (2005) study the effect of Sarbanes-Oxley law on the timing manipulation of stock option grants. They find that under the new legislation the effect of inside information, disclosure information to the market and backdating are decreased. Heron and Lie (2007) study backdating after the implementation of the law and find that backdate persists on a smaller scale than before. They provide evidence of backdating as an explanation for the stock price pattern around executive stock option grants and in (2009) they estimate that a 13.6% of all option granted to executives from 1996 to 2005 were backdated or otherwise manipulated.

According to literature stock options are meant to align executive compensation with the firm's performance and provide proper incentives to executives to always have the firm's best interests in mind when they take decisions. However, it is found that when stock options affect a great percentage of their compensation, executives take decisions that focus on their own benefit neglecting the firm's performance. The executives try to influence the exercise price before the unscheduled stock option grant to benefit from the increase of stock price in the future. It has been proven that, one the strongest ways to apply pressure on the firm's stock price for personal benefits are share repurchases.

2.2 Share Repurchases

Over the years, there has been extensive literature about the motives behind share repurchases as well as their impact. Share repurchase or share buyback is a transaction used by the company to buy back its own shares by the market. The company decides whether to buy shares directly from the market or providing its shareholders with the opportunity of tendering their shares to the company at fixed price. This transaction reduces the number of shares outstanding, since

shares bought are canceled most of the times, so they no longer held publicly, which drastically affects the demand for share and their price.

The main reason that firms do share repurchases is that firms benefit from the perceived undervaluation by the market. This undervaluation is generated from the information asymmetry between managers and investors since managers have access to inside information not available to the public investors. Only managers can estimate firm's performance and understand if the firm is overvalued or undervalued. So, as a method to counter undervaluation to the market, the manager may decide to use share repurchase announcements to increase shareholder value since buying back shares increases the earnings per share. Stephens & Weisbach (1998), Vermaelen (1981) and Ikenberry et al (1995) study market reaction to share repurchases. They find that share repurchase announcements signal undervaluation to the market, which investors understand and correct by applying upward pressure to the stock price. Vermaelen & Peyer (2008) re-examine this buyback anomaly and find evidence consistent with previous literature.

Another reason for buying back shares is distributing excess capital to shareholders, like dividends. When a firm's capital exceeds its investment opportunities, the firm can either hold the excess or distribute it to shareholders (Jensen, 1986). Repurchases are preferred over dividends since when the firm announcement open market repurchases is not binding and the firm can choose not to repurchase and the distribution of excess capital using repurchases is not expected to happen regularly like dividends. If the firm decreases or stops paying dividends to its investors sends a signal of bad future performance to the market which affects the stock price and should be avoided at all costs (Dittmar, 2000). On the other hand, repurchases announcements give a good signal about the governance of the firms. It shows that the firm restrains managers from using the excess cash in non-profiting investments but channel them in more efficient ways. Also, distributing excess cash via repurchases can provide the firm with a tax benefit. Stock repurchases have a more favorable tax treatment than dividends since are considered capital gains.

The third motive, that we are dealing with in this thesis, is the use of repurchases to counter the dilution effects of employee and management stock options. There have been several studies focusing on the troubling link between repurchases and stock options. The first to observe the connection between share repurchases and stock option compensation were Fenn and Liang (1997) and Jolls (1996). They find that firms use repurchases to counter the dilution effects of

employee and management stock options. Since the repurchases do not dilute the employee and managements options and improve stock prices an opportunistic wealth-maximizing executive could manipulate them to increase his stock-based compensation. Kahle (2002) studies how stock options affect the decision to repurchase shares and finds that firms announce repurchases and finds that when executives have a high stake of exercisable stock options in their portfolios. Following Kahle (2002), Babenko (2009) shows that the likelihood of firms initiating share repurchases is higher when employees hold a large stake of the company. Additionally, she finds that firms make fewer stock option awards before repurchases and more after. This pattern was further investigated Obernberger, Dittmann and Keusch (2019) which is the benchmark paper for my thesis. In their paper they provide evidence that CEOs opportunistically time share repurchases around stock option grants. They find, in line with Babenko (2009), that firms decrease their repurchase activity in the quarter before the stock option grant and they document that the effect is stronger when the option grant constitutes a larger fraction of the CEO's salary.

There are several motives and consequences of conducting share repurchases. The ones we discussed and most prevalent are undervaluation, distributing excess cash to shareholders and countering the dilution effects of employee and management stock options. The latter has been broadly discussed as controversial topic across the literature. Since, share repurchases strongly affect stock prices this creates the incentive to CEOs to manipulate stock prices for personal benefits. For example, CEOs can hold back on repurchasing shares up until the option grant date to make sure they get a low exercise price and apply upward pressure to the prices afterwards. This opportunistic behaviour is not only happening around the stock option grant period but also around the exercise period.

2.3 Stock Option Exercises

After the vesting period, CEOs may exercise the right purchase firm's stocks for the pre-set exercised price at the date when the option was granted. The only profitable moment to exercise this right is only when the exercise price is lower than market price. Buying a firm's stock is not the only moment that requires timing though. CEOs must also monitor the market to find the perfect opportunity when the stock price will rise so that they can also profit from selling this option.

It is understandable that in order to lock in profits timing is important. A timing pattern similar to stock option grants (Chauvin & Shenoy, 2001; Yermack, 1997) has been also identified for stock option exercises. Carpenter and Remmers (2001) find negative abnormal returns in post

exercise period while Bartov and Mohanram (2004) further study this pattern and find positive abnormal returns before executives decide to exercise their options and negative after the exercise period thus extending Carpenter and Remmers (2001) research. Brooks (2012) studies the impact of the Sarbanes-Oxley law in stock option exercises and confirms the pattern. The common explanation across the literature for this behavior is private information inside the firm.

Like Brooks (2012) there were other authors also studying the effect of the legislative changes in executives exercise decision. Cicero (2007) similar to Heron and Lie (2005) studies the strategic timing and backdating of stock option exercises before and after the implementation of the SOX law and finds evidence of backdating even after the implementation of the law. He supports the notion private information being the key reason for manipulation and in 2009 he identifies three strategies executives use to manipulate option exercises. Dhaliwal et al (2009) in their research also identify backdating and it's use for tax savings.

One of the few attempts to link executives' stock option exercises with repurchases was done by Bens et al. (2002). They examine the real costs of executive stock options and find a positive relation between stock options exercises and share repurchases. Specifically, when executives hold many options that are exercisable firms decide to allocate cash towards share repurchases programs instead of investment opportunities (Jensen, 1986) and in 2003 they further study the dilution motive of repurchases to establish causality, but they do not find any evidence in supporting the relation of share repurchases and stock option exercises.

Edmans et al (2018) finally establish a link between share repurchases and stock option exercises. In 2017 they create a measure of CEO incentives called vesting equity which is the amount of stock and options scheduled to vest a given quarter and in 2018 they find that when vesting equity increases stock returns are more positive in the two quarters surrounding repurchases but more negative in the following two years. This supports the idea that firms increase their repurchase activity right after their stock option vest.

In summary, there are incentives to time stock option exercises similarly to stock option grants. Literature has provided evidence of manipulation and backdating before and after legislative changes resulting in a pattern around stock option exercises. There have been only a few papers studying the relation between share repurchases and stock option exercises so far.

2.4 Further Hypothesis Development

In this subsection, I provide more details regarding the hypotheses I am using to test whether CEOs time share repurchases around the stock option grant and exercise period to achieve private benefits. Using existing relevant literature my hypotheses provide insights to what motivates CEOs to postpone repurchases, the impact of the repurchases on the stock options and what drives the stock option granting and exercising decision.

CEOs prefer to obtain stock options at the lowest possible strike price and for a high stock price when the option is exercisable since they must wait for the vesting period to be able to sell their stocks. Since it has been shown that share repurchases have a positive effect on stock price, Vermaelen(1981), this provides a strong incentive to CEOs to time repurchases right after the stock option grant to maximize stock option value and as a result their compensation.

Chauvin and Shenoy(2001) find examine the abnormal stock price changes prior to executive stock option grants and find that executives have the incentive to opportunistically influence the market using private information during the period just prior to the date of their stock-option grant so as to reduce the exercise price of their options. They also show that executives benefit from temporary stock price decreases before the grant date and by stock price increases after the grant date. Kahle (2002) shows that firms announce repurchases when executives a high percentage of exercisable options in their portfolio. Moore (2018) studies the strategic use and timing of share repurchases by insiders for personal gain and finds a positive relation between CEO equity sales and share repurchases.

Regarding the first hypothesis, Obernberger, Dittmann and Keusch(2019) analyse relation between the decision to grant stock options and the repurchases decision and find that firms a decrease the stock option activity before the stock option grant date and increase their repurchase activity in the following period. My thesis uses their first hypothesis regarding the stock option granting decision and extends their research by studying the effects of the timing the stock option exercise decision. Therefore, my first hypothesis states that:

H1) Share repurchases occur more after the stock option grants and less before the grant

As in Obernberger, Dittmann and Keusch(2019)'s paper the first hypothesis can be divided into two:

H1a) Share repurchase activity is abnormally low before the stock option grant date

H1b) Share repurchase activity is abnormally high before the stock option grant date

Obernberger, Dittmann and Keusch(2019) in their paper find a pattern regarding the stock option granting decision and repurchases. Specifically, they find that firms decrease their repurchase activity in the quarter before the stock option grant to the CEO and increase it on the following period. Therefore, I predict less to none repurchases depending on the CEOs timing ability before the stock option grant date and more after the grant date as the stock prices increases. I expect a positive relation with stock prices and share repurchases after the stock option grant date.

My second hypothesis extends the hypothesis used by Obernberger, Dittmann and Keusch(2019) by exploring a similar pattern between the exercise decision and repurchase activity. After the exercise date when the option is already vested there is no incentive to conduct share repurchases to increase the stock price but there are strong incentives in timing the share repurchases before the exercise date. Edmans et al (2018) find that firms increase their repurchases activity right after executive's option's vest. They also find more positive stock returns in the two quarters surrounding the repurchases but more negative in the two years following the repurchases. Therefore, my second hypothesis states that:

H2) Share repurchases occur more in the two quarters surrounding the stock option exercise(vesting) date and less in the following years. Following Obernberger, Dittmann and Keusch(2019), hypothesis two can be also divided in two:

H2a) Share repurchases occur more in the quarter before and the quarter after the exercise date

H2b) Share repurchases occur less in the following years after the exercise date

According to Edmans et al(2018) I expect more repurchases in the period surrounding the exercise date and less in the following period after the exercise date. The first and second hypotheses main goal is to determine the timing of the decision to repurchase shares with stock option grant date and exercise date. Both hypotheses can be considered similar since they try to link repurchases with stock options but there is a need to separate them in order to establish causality between the stock option grant decision and exercise decision and repurchases.

Obernberger, Dittmann and Keusch(2019) in their paper find that the relation between stock option grants and share repurchase intensity gets stronger if the stock option granted to the CEO accounts for a larger percentage of his executive compensation. This theory agrees with Kahle (2002) which shows that firms announce repurchases when executives have large numbers of option outstanding and when employees have large numbers of options currently exercisable

so if a larger part of your compensation depends on the stock price you have stronger incentives to conduct share repurchases to maximize your compensation.

Therefore, the first part of my third hypotheses is to test the hypothesis of Obernberger, Dittmann and Keusch's (2019) paper. After so, the second part of my hypothesis would extend their hypothesis to test if the effect stands for already vested options.For already vested options(exercisable) a rational CEO would prefer to maximize the value of the stock option right before the exercise date and sell the option at the exercise date. Therefore, my third hypothesis stands as follows:

H3)The relation between CEO stock options and share repurchases activity is stronger for larger stock option grants but weaker for larger vested stock options.

I expect a stronger relation for larger option grants and repurchase activity as Obernberger, Dittmann and Keusch (2019) do find in their paper and a weaker relation for larger already vested options.

The fourth and final hypothesis determines whether share repurchases can be used to obtain private benefits by calculating abnormal returns after share repurchases. There has been prior literature suggesting that repurchases can generate abnormal returns. Ikeberry et al.(1995) and Peyer and Vermaelen (2008) find that there is a common pattern of long-run abnormal returns that is generated from share repurchases. Both papers agree to undervaluation as the common motive to initiate repurchases since they also find negative abnormal returns are generated before share repurchases. Therefore, I formulate my fourth hypothesis as follows:

H4) There are abnormal returns surrounding the stock option grant date and the exercise date which derive from the share repurchase activity.

Specifically:

H4a) There will be abnormally low returns before the stock option date and abnormally high in the following quarter after that date.

I expect that before stock option grants, I will find negative abnormal returns since the firm suspends share repurchases until the grant date and after the grant date, I expect positive abnormal returns following share repurchases.

H4b) There will be abnormally high returns before the stock option exercise date and abnormally low in the following quarter after that date.

I expect reverse behaviour of abnormal returns mainly because the repurchases activity increase until the exercise date to maximize the stock price and then since the stock will be sold the repurchase intensity will decrease. Therefore, I expect positive abnormal returns before the exercise date and negative abnormal returns after the exercise date following the share repurchases behaviour.

3. Data

In this chapter, I elaborate on how my final dataset used in this analysis is constructed. My dataset aims on share repurchases and CEOs stock options from United States firms only. I use data after 2004 and specifically between 2006 and 2010 for the initial analysis of the stock option grants. The reason why is that , after March 2004, SEC disclosure rules require firms that trade public in the US to publish monthly accounts on their share repurchases activity under items 2(e) of Form 10-Q and 5 (c) of Form 10-K, respectively. I expect that before 2004 since firms weren't obligated by the SEC to public monthly accounts of them repurchases activity there would be lack of data and insufficient information that will distort my results. I will use data from 2006 since at the start of 2006, the SEC required the disclosure of the dates on which stock option awards are made to the five executives. As part of the extension of my research I allow the stock options to vest thus extending the timeframe.

3.1 Sample Selection

To test my results empirically, I use four data sets. Since my hypotheses are based on Obernberger, Dittmann and Keusch's(2019) paper to begin testing my hypotheses regarding the link between CEO stock options and share repurchases I download CEO compensation date from ExecuComp(through WRDS). I obtain data from the plan-based awards database of ExecuComp from 2006 to 2010 about grant dates, fair value of the options exercised, number of options granted, and several variables used as control variables. Since this data is not sufficient for my research, I add data about executives' total compensation and the option's fair value from the annual compensation database of ExecuComp. Apart from stock option grant information I obtain information about CEO's age, tenure, gender, salary, if the CEO is chairman of the board and sensitivity of her equity portfolio to the firm's share price also known as CEO's delta. Following my benchmark paper, I download quarterly share repurchases after 2004 since from March 2004, SEC disclosure rules require firms that trade publicly in the US to publish monthly accounts on their share repurchases activity under items 2(e) of Form 10-Q and 5 (c) of Form 10-K, respectively. I expect that before 2004 since firms weren't obligated by the SEC to public monthly accounts of them repurchases activity there would be lack of data and insufficient information that will distort my results. I will obtain information about actual

share repurchases from ordinary shares (share code 10 or 11) traded on the NYSE, AMEX and NASDAQ between January 1,2006 and March 31,2011.

As a result, I use same criteria for my data in the same way as Obernberger, Keutch and Dittman do. Specifically, from ExecuComp I get information about stock option grants awarded to CEOs at the start of 2006, which is when SEC required the disclosure of the dates on which stock option awards are made to the five named executives. In only keep time-vesting grants and exclude all other types of grants. (e.g. grants that vest only when a certain threshold is accomplished, stock option repricings , grants with reloading provisions, grants that were not made at-the-money). Additionally, I extract firm financial variables from the Compustat Capital IQ databases(through WRDS). I choose to obtain yearly data because the yearly Compustat database are more complete than the quarterly and some of the variables on ExecuComp such a compensation is available annually. I exclude firms that have not available accounting data in Compustat data. Also, I drop repurchases without an announcement date and those that were announced after 2010. After that I drop share repurchases not done in the open market and those that have unlimited or variable volume. Lastly, I download share price information from CRSP and combine it with my initial data.

To combine all datasets, I must make sure that I also extract a common company identifier variable which should match datasets about the same firms. I use a PERMNO identifier to merge CRSP and Compustat and as well Repurchase datasets. I add ExecuComp's complete database using a CUSIP identifier. Another issue that I must address, is that the repurchases dataset contains calendar years while Compustat fiscal years. To fix this problem, I choose to get fiscal year-ending months only from Compustat and create a fiscal year variable in the repurchase dataset so that both can be now merged.

3.2 Variable Construction and Descriptive Statistics

As Obernberger, Keutch and Dittman(2019) do in their paper I construct 3 different measures of share repurchase activity around the stock options grant date. The first measure of share repurchase activity is total share repurchased scaled by total shares outstanding. As a second measure I use a dummy that takes the value of 1 in the months that there is an incidence of share repurchase. Finally, as third measure of share repurchase activity, I use the logarithm of one plus repurchase value. The repurchase date is obtained from actual share repurchases from ordinary shares (share code 10 or 11) traded on the NYSE, AMEX and NASDAQ between January 1,2006 and March 31,2011.

I extract stock option grant dates and measures for stock option grants from ExecuComp which are used later in my research as control variables for my model. Specifically, I download most of the data from Plan Based Awards section and I supplement the missing data from Annual-Based Compensation to create a conclusive dataset. I construct a dummy variable which takes the value of 1 in the months when stock options are granted, which results in 8304 grant dates. Since I need to measure the repurchase activity in different time horizons, I create one dummy variable, named "Pre", which is equal to 1 up to 3 months before the stock option grant date or 0 otherwise and one dummy variable, named Post, which is equal to 1 up to 3 months after the stock option grant date or zero otherwise. I use the same variables to measure months around the exercise date of those options.

Apart from the grant dates, I need to measure the stock option grants value. Therefore, I use the fair value of the option grant as reported by that firm on grant date scaled by CEO's annual total compensation. It is important to understand the relative effect of the option grants on the CEO's total compensation in order to observe if the size of the stock option affects the decision to repurchase.

I follow Edmans et al (2018) paper in calculating vesting equity of options to measure the stock option value at the exercise date. I extract a CEO's number of vesting shares in a given year from ExecuComp's Annual-Based Compensation variable "Shares Acquired on Vesting of Stock". This variable includes shares vested from restricted stock plans, restricted stock unit plans, and long-term incentive plans so it important to separate data regarding stock options. We do so, by separating the number of options that vest in a specific year, for each grant, from the remaining options that remain unvested at the beginning and end of this year and the new options that CEO's acquire in that year. Finally, it is essential to get the strike price and expiration date of the option grants from ExecuComp to calculate the vesting date of equity. We do not have to convert our vesting equity from annual to monthly basis as Edmans et al (2018) do in their paper because the exercise dates of stock options grants are available on monthly basis in ExecuComp.

The rest of the control variables used are obtained or constructed using Compustat and CRSP databases. The variable definitions used in this research can be found in (Appendix) The most important control variables work mentioning are the following:

Weisbenner (2000), Fenn and Liang (2001) and Moore (2017) use firm size as a control variable in their research and find a statistically positive effect on repurchases for firm size. The authors

argue that firm size affects the costs of financing and boosts asymmetric information which can play a crucial role in the decision to repurchase. The measure firm size as the logarithm of market capitalization and find an average value of 8,0. I decide to follow my benchmark paper's way of calculating firm size. I control for firm size by adding the natural logarithm of total assets and I find a I find an average of 6,8 in my sample. Obernberger, Keutch and Dittman(2019) have an average of 6,75 in their sample which is close my result.

Obernberger, Keutch and Dittman(2019) , Fenn and Liang (2001) and Moore (2017) have also added book-to-market ratio an indicator of firm's future growth opportunities. Book-to-Market rations above 1 mean that book value is higher the market value, pointing towards low growth opportunities. If the market ratio is higher than book value, it points towards overvaluation of the firms' value by the market. There are several studies which support the notion that firms which have high growth opportunities will use their internal cash to fund those opportunities instead of repurchasing shares. Therefore, according to those findings I expect to have a negative relation between high book-to-market ratio and repurchase behaviour. I construct book-to-market as the book value of equity divided by the market capitalization and find an average of 70% which is really high comparing to my benchmark paper Obernberger, Keutch and Dittman(2019) which find 55% indicating either low growth opportunities from the market or that the firm's equity value is less overvalued.

Obernberger, Keutch and Dittman(2019) also add as a control variable the sensitivity of the CEO's equity portfolio value to share price also known as the logarithm of the CEO portfolio delta which was first introduced by Core and Guay (1999). Following Core and Guay (1999) paper I calculate the sensitivity of the CEO's equity portfolio value to share price as the natural logarithm of the dollar change in value of the CEO's portfolio equity portfolio for a 1% change in share price and find an average of 4.3 which is close to the 4.8 found on my benchmark paper.

In accordance to my benchmark paper Obernberger, Keutch and Dittman(2019) I also add to my model yearly and monthly fixed effects and industry fixed effects. The fixed effects control for macro-economic events which can occur in a year or some specific events that can happen in a month and some unexpected industry-level focused trends which can affect the decision to repurchase and should be all accounted for individually. The summary statistics table **(Appendix 2)** of the variables I use in my research is similar to the statistics from my benchmark paper of Obernberger, Keutch and Dittman(2019) indicating that the dataset I use does not have

incorrect data or outliers which can generate biases or affect the credibility of my results and using this dataset I am able to resolve my hypotheses.

4. Methodology

In this section, I thoroughly explain the methodology I used in this thesis. I start with the propensity score matching methodology which is used to create the control sample of placebo months with similar firm and CEO characteristics to compare them with event months. Next, I discuss the difference-in-difference model I use to determine the relation between the repurchase behaviour and stock options grants and how is this relation affected by the size of the option. After this, I explain how I adjust this difference-in-difference model to study how vesting equity dates (CEO option exercises) studied by Edmans et al (2018) affect the repurchase decision and how the size of the option affects that relation. Lastly, I investigate whether CEO's gain private benefits around repurchases by calculating abnormal returns generated from repurchases around different time periods in search of the most profitable decision.

4.1 Propensity Score Matching

When I have already compiled my four datasets, I will conduct my empirical analysis. To test my first hypothesis, I will follow my benchmark paper's method. Obernberger, Dittmann and Keusch(2019) in their paper after matching the quarterly repurchase date with the incidence of stock option grants, they use a difference-in-difference analysis using a difference-in-difference model. Before they do so, they name every firm month that includes a stock option grant a treat firm month and they match it with a control firm month based on its propensity to grant a stock option on that same year-month and with the same fiscal year end month that is closed to predict the possibility of an stock option grant occurrence.

To construct the propensity score matching they use firm and CEO characteristics that have been identified by prior research (Smith Jr and Watts ,1992 and Core and Guay,1999) as explanatory variables for equity-compensation. The propensity score matching methodology estimates the probability or propensity to grant an option controlling for firm and CEO determinants.

To create the matched control sample, I run the following logit regression command in Stata:

$$Psmatch2 : treat + ln(assets) + BMratio + IndustryRet + SalesGrowth + ln(CEODelta), out\left(\frac{Total\ Repurchases}{Shares\ Outstanding}\right) \text{ n (1)}$$

where "psmatch2" is the command used in Stata, treat is a dummy variable with a value equal to 1 if there is an option grant in that month or 0 otherwise, then we have the natural logarithm of total assets, Book-to-Market ratio, industry-adjusted stock return performance, sale growth and the sensitivity of CEO's equity portfolio value to share price as firm and CEO controls, "out" indicates the outcome variable and since we want to study the relation between options and repurchases we use the repurchase intensity variable. Finally, "n(1)" defines an option called nearest neighbour matching, also used in Obernberger, Dittmann and Keusch(2019) and by choosing the number one what we do is get the closest control placebo month with similar characteristics as a stock option grant month so that we have an one-on-one matching. After we run this regression, we get our control sample that we are using in the difference-in-difference analysis.

The results of this logit regression are presented in **(Appendix 3)**. Consistent with Obernberger, Dittmann and Keusch (2019) I find a positive relation between firm's assets and the likelihood granting stock options. A firm's book-to-market ratio and industry-adjusted share price performance is negatively related to the probability of granting options. However, I find no significant relation between sales and I find a positive relation between the delta of CEO's equity portfolios with the likelihood of granting options.

4.2 Difference-in-Difference analysis Stock Option Grants

After treated firm-months are matched with control firm months, I perform a difference-in-difference analysis using a three-month pre-event period (months t - 3, t - 2, t - 1) and three-month post-event period (t + 1, t + 2, t + 3) relative to the option grant month or the matched control firms (t). Following my benchmark paper's method, I will use a panel that has 6 months for each treated month and for each control month.

First, I calculate a simple difference between the share repurchase activity in the 3 months prior to the stock option grant month with 3 months following the month only the treated firms sample(only the months where options have been granted) and then I add the matched control group sample to calculate using the following difference-in-difference model :

$$Share\ Repurchase\ Activity_{i,t} = a_i + a'_t + \beta_1 * Post_{i,t} + \beta_2 * treatment_{i,t} + \beta_3 * treatment * post_{i,t} + \gamma * Controls_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $Share\ Repurchase\ Activity_{i,t}$ is the repurchase measure in month t for firm i, $Post_{i,t}$ is a dummy variable equal to 1 in the 3 months after the stock option grant month or placebo month or equal to 0 otherwise, $treatment_{i,t}$ is a dummy variable equal to 1 for firms that granted stock options in a given month or equal to 0 otherwise and $Controls_{i,t}$ variables include firm and CEO characteristics.

I use three different measures of share repurchase activity as Obernberger, Dittmann and Keusch (2019) do in their paper as robustness checks. The first measure is the total share repurchased scaled by total shares outstanding. Then, I replace this measure with a dummy that takes the value of 1 in the months that there is an incidence of share repurchase. Finally, as a third measure of share repurchase activity, I use the logarithm of one plus repurchase value.

In line with Obernberger, Dittmann and Keusch(2019), I run this model initially without include any control variables other than year-month and firm fixed effects to avoid bad controls problem (Angrist and Pischke, 2009) and get a first view of the results. I run this model again controlling for firm characteristics including total assets, book-to-market-ratio, ROA, whether the firm is loss-making, cash holdings scaled by total assets, stock returns in the 3 previous months and dividend yield. Then, I control for CEO characteristics by adding when the CEO holds the title of chairman of the board, whether the CEO is new to the firm, the CEO's tenure, current age, a dummy variable equal to 1 if the CEO is in a retirement age or 0 otherwise, a dummy variable which takes the value of 1 if the CEO's gender is female and CEO's delta.

The first model provides information about the repurchases activity in the 3 months following the stock option grants but a conclusion cannot be drawn yet since it doesn't discuss repurchase activity in the months leading to the stock option grant month. As an additional robustness check I expand the model to detect repurchase activity in the 3 months before and the 3 months after stock option grants. Specifically, I compare repurchase activity between these months with repurchase activity of the same firms in the 'normal' months before the stock option grant date (t - 6, t - 5, t - 4) where there are no incentives to time share repurchases or stock option grants. I perform the difference-in-difference analysis between treatment firms and control firms in the 'normal' months with the following formula using months t-6 to t-1 and t+1 to t+3 :

$$Share\ Repurchase\ Activity_{i,t} = a_i + a'_t + \beta_1 * Pre_{i,t} + \beta_2 * Post_{i,t} + \beta_3 * treatment_{i,t} + \beta_4 * treatment * Pre_{i,t} + \beta_5 * treatment * Post_{i,t} + \gamma * Controls_{i,t} + \varepsilon_{i,t} \quad (2)$$

where $Share\ Repurchase\ Activity_{i,t}$ is the repurchase measure in month t for firm i, the coefficient of $Pre_{i,t}$, a variable which is equal to 1 in months t-3, t-2 and t-1 and equal to 0 otherwise, indicates the simple difference of control firms' repurchase activity between the period t-3 to t-1 and the period t-6 to t-4, the coefficient of $Post_{i,t}$, a variable which is equal to 1 in months t+1, t+2 and t+3 or equal to 0 otherwise, calculates the simple difference of control firms between the period t+1 to t+3 and the period t-6 to t-4. The coefficient of $treatment_{i,t}$, a variable that measures the simple difference in repurchase activity between treatment and control firms in period t-6 to t-4.

The coefficient of the first interaction term $treatment * Pre_{i,t}$ captures a difference-in-difference, which is whether the repurchases activity of treatment firms from period { t-6, t-5, t-4 } to period { t-3, t-2, t-1 } is different from the repurchase activity of control firms from period { t-6, t-5, t-4 } to period { t-3, t-2, t-1 }. In a similar manner, the coefficient of the second interaction term $treatment * Post_{i,t}$ measures whether repurchases activity of treatment firms from period { t-6, t-5, t-4 } to period { t+1, t+2, t+3 } is different from the repurchase activity of control firms from period { t-6, t-5, t-4 } to period { t+1, t+2, t+3 }.

Similarly, to formula (1) I use 3 measures of share repurchase activity and I run formula (2) 3 times, initially using only year-month and firm fixed effects and no controls, then controlling for firm characteristics and finally controlling for CEO characteristics.

To test the first part of my third hypothesis, I will adjust the difference-in-difference formula (1) according to the benchmark paper for periods t-3 to t+1 and t+1 to t+3. Since this hypothesis focuses on the relation between the size of the option and the repurchase activity, I replace the treatment variable with the measurement of size 'Option Grant Value divided by Salary'. The adjusted difference-in-difference formula is the following:

$$Share\ Repurchase\ Activity_{i,t} = a_i + a'_t + \beta_1 * Post_{i,t} + \beta_2 * \left(\frac{OptionGrantValue}{Salary}\right)_{i,t} + \beta 3 * \left(\frac{OptionGrantValue}{Salary}\right) * Post_{i,t} + \gamma * Controls_{i,t} + \varepsilon_{i,t} \quad (3)$$

where $Share\ Repurchase\ Activity_{i,t}$ is the repurchase measure in month t for firm i, $Post_{i,t}$ is a dummy variable equal to 1 in the 3 months after the stock option grant month or placebo month or equal to 0 otherwise, $\left(\frac{OptionGrantValue}{Salary}\right)_{i,t}$, the percentage of option grant value to total CEO compensation, is the indicator that we use to replace treatment which is always non zero for treatment firms and always zero for control firms in order work in the same way as treatment, $(\frac{OptionGrantValue}{Salary}) * Post_{i,t}$ is our interaction term which captures the difference-difference how the stock option grant size affects the change of the repurchase activity between the treatment firms from period {t-3, t-2, t-1} to period {t+1, t+2, t+3}and change of repurchase activity of control firms from period {t-3, t-2, t-1} to period {t+1, t+2, t+3}.

As in formula (1) and formula (2) I use 3 measures of share repurchase activity and I run formula (3) 3 times, initially using only year-month and firm fixed effects and no controls, then controlling for firm characteristics and finally controlling for CEO characteristics.

4.3 Difference-in-Difference analysis Stock Option Exercises

To test my second hypothesis and extend Obernberger, Dittmann and Keusch's(2019) research, first I must determine how to define whether a stock option is exercisable(vested). To do so, I will use the term vesting date of equity defined as "the amount of stocks and options scheduled to vest in a given quarter" first coined by Edmans, Fang and Lewellen(2017). In the working paper of Edmans, Fang and Huang (2018) they provide in their appendix the way to construct vesting date of equity.

After I construct vesting date of equity according to EFL I conduct the same difference-in-difference analysis to observe the link between repurchase intensity and the exercisable stock options. Specifically, I run the propensity score matching to estimate the likelihood of exercising a stock option using the same firm and CEO determinants as the stock option grants a created a matched control firm sample. Then I run formula (1) and formula (2) in a similar way as explained in subsection 4.2 with the only change being that I use the vesting date of stock options instead of using the stock option grant dates. I will use a pre-event period {t-3, t-2, t-1} before the option is vested and a post-event period {t+1, t+2, t+3} following the vested option.

To test the second part of my third hypothesis, I will adjust the difference-in-difference formula (1) accordingly for periods t-3 to t+1 and t+1 to t+3. Since this part of the hypothesis focuses on the relation between the size of the exercisable option and the repurchase activity, I replace

the treatment variable with the measurement of size of vested options 'Vested Option Value divided by Salary'. The adjusted difference-in-difference formula is the following:

$$Share\ Repurchase\ Activity_{i,t} = a_i + a'_t + \beta_1 * Post_{i,t} + \beta_2 * \left(\frac{VestedOptionValue}{Salary}\right)_{i,t} + \beta 3 * \left(\frac{VestedOptionValue}{Salary}\right) * Post_{i,t} + \gamma * Controls_{i,t} + \varepsilon_{i,t} \quad (4)$$

where $Share\ Repurchase\ Activity_{i,t}$ is the repurchase measure in month t for firm i, $Post_{i,t}$ is a dummy variable equal to 1 in the 3 months after the stock option exercise month or placebo month or equal to 0 otherwise, $\left(\frac{VestedOptionValue}{Salary}\right)_{i,t}$ is the percentage of vested option value to total CEO compensation, is the indicator that we use to replace treatment which is always non zero for treatment firms and always zero for control firms in order work in the same way as treatment, $\left(\frac{VestedOptionValue}{Salary}\right) * Post_{i,t}$ is our interaction term which captures the difference-difference how the already vested stock option size affects the change of the repurchase activity between the treatment firms from period {t-3, t-2, t-1} to period {t+1, t+2, t+3}and change of repurchase activity of control firms from period {t-3, t-2, t-1} to period {t+1, t+2, t+3}

4.4 Cumulative Abnormal Returns around repurchases

Finally, my fourth hypothesis and the last step of this research, is to find out which is the most profitable timing decision for CEOs to earn the most private benefits from repurchase activity. To be able to quantify the best decision, first I need to determine whether firms generate excess abnormal returns from share repurchases. Secondly, I must group those excess abnormal returns per individual period and measure the cumulative abnormal returns. Finally, depending on my results I will confirm which the timing decision that provides the most private benefits

The most known method to calculate abnormal returns is to focus on the excess returns around share repurchases (Vermaelen,1981; Stephens and Weisbach,1998; Zhang,2005 & Vermaelen and Peyer,2008). According to these studies there are excess returns in the market which are solely the result of actual share repurchases. They focus on excess returns since repurchases greatly impact the value of stocks because stock prices are affected from the market reaction of repurchase announcements.

I choose to follow Ikenberry, Lakonishok and Vermaelen's (1995) methodology since it is more fitting to my research. Ikenberry et al (1995) in their paper measure performance of

repurchases by calculating CAR relative to a benchmark. Their event study methodology focuses on repurchase dates which are considered as events and capture the excess returns that derive from those events on the price of stocks in a specific individual period.

The first step of every event study methodology is to identify the specific date or a period around this date called event window in which the event happens in order to capture the effect of this event. In my research I set as event date the repurchase announcements and I choose three individual time periods as event windows for stock option grants and vested stock options. I use 272 calendar days (Ikenberry et al ,1995) distributed in 3 event windows: the normal event window [-180,-120] starting from t-6 to t-4 , the pre-event window [-90,-30] from period t-3 to t-1 and the post-event window [30,90] from period t+1 to t+3.

For each event window, I estimate expected returns using an estimation window of 300 calendar days. The market model makes a comparison between the market index and the actual returns in the same period t using the estimation window as follows:

$$E(R_{i,t}) = a + b * (R_{market,t})$$

After calculating the expected returns $E(R_{i,t})$ for every repurchase date I calculated the difference from the actual returns to obtain the abnormal returns:

$$AR_{i,t} = R_{i,t} - E(R_{i,t})$$

where $AR_{i,t}$ is the abnormal return for each firm i at a given month t, $R_{i,t}$ is the actual return and $E(R_{i,t})$ is the expected return estimated with the market model.

The final step is to sum all the abnormal returns obtained for each event window and calculate the cumulative abnormal returns (CAR) to measure the impact for all repurchase on the stock price for every individual window of interest. I also conduct a t-test to check whether my results are significant.

5. Empirical Results

This chapter discusses the results relating the share repurchase activity and the private benefits from the timing of CEO stock options around the grant and the exercise date. In the first subsection, I provide results supporting the opportunistic timing of repurchases around the stock option grant date. I also find that the value of the stock option grant affects share repurchase intensity. In the second subsection, I provide evidence indicating that there is also timing around the stock option exercise date. However, I find no significant relation between the value of the already vested stock option and share repurchase activity. Finally, in the third subsection, I present the measurements of CARs for the three individual time periods (normal, pre-event, post event) around stock option grant and exercise date and discuss which is the most profitable timing decision to achieve private benefits.

5.1 Share Repurchases Activity around the stock option grant date results

In line with Obernberger, Dittmann and Keusch's (2019), I run model (1) to test my first hypothesis that firms repurchase more after the stock option grant than before. The results of this multi-regression can be found in **(Appendix table 4)**. I run the same model, using three different measures of share repurchase activity and run three individual panels with no controls, controlling for firm characteristics and controlling for firm and CEO characteristics.

For all panels and all measures of share repurchase activity the difference-in-difference estimates of the interaction term Treatment*Post is positive, and half of the results are significant. This indicates that treatment firms increase repurchase activity more after the stock option grant than before. Specifically, in Panel A, treatment firms are in average 1.5 percentage points more likely to conduct repurchases after the stock option grant than control firms. The results are robust controlling for firm and CEO characteristics and are consistent with my benchmark paper.

However, I find that the simple difference and the difference-in-difference estimates of the dummy variable Post is consistently negative and statistically significant in all panels which shows that the average likelihood of firms doing share repurchases is higher before the stock option grant month that after. Firms are in average 0.5 percentage points less likely to do share

repurchases after stock option grants. This result does not follow Obernberger, Dittmann and Keusch's(2019) since in their paper they find positive simple difference and the difference-in-difference estimates of the dummy variable Post across all panels.

Since my results on table 4 are controversial I need to apply more tests to draw any conclusion regarding my hypothesis. Following my benchmark paper, running model (2) I add a normal time period {t-6, t-5, t-4} where t is the stock option grant date and observe if there is any difference in share repurchase activity between this period and the three months before the stock option grant and between this period and the three months after.

I present the multi-regression simple difference and the difference-in-difference estimates of model (2) in **(Appendix table 5)**. In most of the panels of table 5, I find that the coefficient on Treatment is not statistically different from zero showing that during the normal period there is no difference in share repurchase activity between treatment and control firms. This confirms that are no incentives to time repurchases in these months in both treatment and control firms because there are no benefits to do so. In all panels of table 5, I find a negative interaction variable Treatment*Pre which implies that the share repurchase activity of treatment firms (relative to control firms) is greatly lower in the three months before the stock option grant compared to normal period. Also, the interaction term Treatment*Post shows that treatment firm's share repurchase activity is no different to the control firms between the three months after the grant and the normal period.

Those results support the notion that firms repurchase less before the CEO stock option grants and more after. The reason behind this, is that they want the lowest exercise price at the stock option grant date, and they want to avoid increasing the stock price. Taken together, the results from table 4 and 5 support that firms are more likely to conduct share repurchases after the stock option grant date than before.

Now that the relation between share repurchases and stock option grants has been established, I need to measure if that relation gets stronger for larger option grants as part of my third hypothesis. Obernberger, Dittmann and Keusch's (2019) support that CEO incentives to lower the stock option exercise price before the grant date should be stronger for more valuable grants. Therefore, I run model (3) and I present the results in **(Appendix table 6)**.

Consistent with my benchmark paper, for all three share repurchase activity measures across all panels the interaction variable (Option Grant Value/ Salary)*Post positive and statistically

significant confirming that the relation of CEO stock option grants and share repurchases is stronger for more valuable stocks. The variable Option Grant Value / Salary being negative and significant across all panels adds to the results of table 4 and 5 that firms do not repurchase shares prior to the stock option grant date.

5.2 Share Repurchases Activity around the stock option exercise date results

After testing Obernberger, Dittmann and Keusch's (2019) hypotheses I extend their research and using their methodology I explore the relation between share repurchases and stock option exercise date. I replace the stock option grant month as the event month with the vesting date of equity according to EFL (2018)(methodology 4.3). I expect to find I run model (1) and I show my results in **(Appendix table 7).**

For all panels and all measures of share repurchase activity the difference-in-difference estimates interaction term Treatment*Post is consistently negative with almost half of the results being significant. This indicates that treatment firms increase repurchase activity more before the stock option exercise date than after. In Table 7 Panel A, I find that treatment firms in average are 2.6 percentage points less likely to do share repurchases after the stock option exercise date. Adding to this finding, the dummy variable Post is also negative and in half of the panels statistically significant. In Panel A of table 7, I find that firms are in average 2.7 percentage points less likely to do share repurchases after stock option exercise date which confirms my second hypothesis.

Similar to the stock option grant analysis the analysis presented on table 7 only discusses what happens after the exercise date. To conclude, I need to explore what happens in the time period before the exercise date. To do so, I run model (2) I add a normal time period {t-6, t-5, t-4} where is t is the exercise date and test whether there is any difference in share repurchase activity between this period and the three months before the stock option exercise date and between this period and the three months after.

I present the multi-regression simple difference and the difference-in-difference estimates of model (2) in **(Appendix table 9)**. Around all the panels of table 9, I find that the coefficient on Treatment is not statistically different from zero showing that during the normal period there is no difference in share repurchase activity between treatment and control firms. Similarly, like stock option grants there are no incentives of opportunistic timing in this period. This is to be expected since during that period options are not yet exercisable. In all panels of table 9, I find a negative interaction variable Treatment*Pre which implies that the share repurchase activity

of treatment firms (relative to control firms) is greatly lower in the three months before the stock option exercise date compared to normal period. Also, the interaction term Treatment*Post shows that treatment firm's share repurchase activity is no different to the control firms between the three months after the grant and the normal period.

According the results from table 8 and 9 firms are more likely to conduct share repurchases only in the months before the exercise date and less after. For the second part of my third hypothesis, I test whether this relation grows stronger for more valuable vested stock options. I use the value of the stock option after it is vested and run model (3).

I present the results in **(Appendix table 10)**. For all three share repurchase activity measures across all panels the interaction variable (Vested Grant Value/ Salary)*Post is close to zero and not significant suggesting a weaker relation between the CEO vested stock options value and share repurchases. This is to be expected this variable measures the relation in the post event period {t+1,t+2,t+3} after the exercise date where there are less incentives to repurchase as supported by the results of table 8 and 9.

5.3 CARs of share repurchases

Finally, I present the calculations of CAR around the normal, the pre-event and the post-event period for share repurchases in **(Appendix 10)**. Regarding stock option grants, I find a CAR of -0.06 during the normal period which an acceptable finding since there are no incentives to conduct repurchases in that period. For the pre-event period, I find a CAR of -0.024 which is in line with our previous finds since we are approaching the stock option grant so CEOs want a low exercise price and hold back on repurchases and for the post-event period I find a CAR 0.132 indicating that are more share repurchases done in this period.

In regard to vested stock options the results I find a CAR 0.07 around the normal period implying that there is some repurchase activity. Since the normal period of vested stock options is after the stock option grant date this could be interpreted as an attempt of CEOs to apply upward pressure to the stock price. The most unexpected result I find is a CAR of -0.032 around the pre-event period. I expected that CEOs would time share repurchases to further increase the stock price before option is exercisable to benefit from the difference between from their pre-set low exercise price and market price. For the post-event period I also find a CAR of -0.037 indicating low repurchase activity after the date in which the option is exercisable. This is to be expected since a large groups of CEOs sell their stock once vested to realize profit.

5.4 Potential risks and limitations

This subsection discusses any potential risks that can affect the credibility and interpretation of my findings. The most important issue around the repurchase literature is to establish causality. There are many motives to conduct share repurchases and to align each motive with its consequence is a hard task. My research focuses in the timing of share repurchases around event dates, but it could be also that CEOs time stock option grants or exercise options around the share repurchase announcement dates so reverse causality issue is also a possibility. To address this issue, I use three different measures of share repurchase activity and run the model without controls, controlling for firm characteristics and controlling for both firm and CEO characteristics as robustness checks. I further use firm and year-monthly fixed effects to avoid the omitted variable bias issue. My results are also susceptible to measurement errors since most of the variables used in this research are not available to be download from the databases and must be constructed. Most of the variables used as control variables as constructed so I should take this potential bias into account when I interpret my results.

6. Conclusion

I investigate the strategic use and timing of share repurchases by CEOs for achieving private benefits. To do so, I explore the relation between stock repurchases and stock option granting and exercise decision and I measure the effect using cumulative abnormal returns around those periods. I hypothesize that CEOs conduct less repurchases before the stock option grant and more after and this relation is stronger for larger stock options. I also hypothesize a reverse behaviour for stock option exercises meaning that I expect that CEO repurchase more before the exercise date to apply upward pressure to the stock and less after and this relation should be weaker for larger vested stock option. In the end, using CARs I determined which is the most profitable timing decision

My results point towards the fact that there is indeed timing of share repurchases around the stock option grant and exercise dates. I find that share repurchases occur more frequently three months after the stock option grant date and less frequently three months before. These findings are in line with previous literature supporting that CEOs deter share repurchases before the stock option grant to obtain stock options with a low exercise price. I also find strong evidence that this relation gets stronger for more valuable stock options. Adding to that, I find that share repurchases occur less three months after the stock option exercise date and more three months before. My results are not able to confirm a similar relation between share repurchases and stock option exercises. My CAR results support that it is more profitable to repurchase around the stock option grant date as I find higher cumulative abnormal returns compared to the period around the exercise date.

To conclude, I provide evidence about the existence of a share repurchase pattern surrounding the stock option grant and exercise dates. This timing pattern is consistently used by CEOs to manipulate stock price and achieve private benefits. My results also indicate that the most profitable decision to manipulate stock price is around the stock option grant date since I find higher CAR from this time period than the other periods.

My research combines three sets of literature in a comprehensive way laying the groundwork for future researchers to extend this study in various ways. For instance, there are several

months between the stock option grant date and the exercise date. My research focuses specifically in the quarter before and after those dates but it would be interesting to explore if there is share repurchases in that period. To continue, my research uses executive data only from ExecuComp so another suggestion would be to extend my current dataset by including executive date from other databases such as Thomson Reuters. Adding to that, it is also important to study more recent time period than my research does to examine if the effect is still observable.

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8. Appendix

Table 1: Variable Definition

This tables lists all the variables used in this analysis accompanied by a brief description of each variable and the source that the variable was extracted.

	Description	Source
Book / Market	The book value of equity scaled by the market capitalization	CRSP/Compustat
Cash / Assets	Total cash including cash equivalents scaled by total assets	Compustat
CAR	Cumulative market-adjusted abnormal return surrounding a repurchase announcement (t=0) made by a firm calculated as the sum of the firm's daily abnormal returns over t periods [-6, -4] , [-3, -1] and [1, 3]	CRSP
CEO AGE > 62	A dummy variable equal to 1 when CEO's age is above 62	ExecuComp
Charman	A dummy variable equal to 1 when CEO holds the title Chairman of the board	ExecuComp
Divident Yield	Annual dividend per share scaled by closing share price	CRSP/Compustat
Female CEO	A dummy variable equal to when the gender of CEO is female	ExecuComp
Ln(Total Assets)	The natural logarithm of total assets	Compustat
Ln(CEO delta)	The natural logarithm of the dollar change in value of the CEO's equity portfolio for a 1% change in share price (Core and Guay, 1999)	ExecuComp/ CRSP
Ln(CEO tenure)	The natural logarithm of 1 plus the CEO's tenure	ExecuComp
Ln(Repurchase Value)	The natural logarithm of 1 plus the value of repurchased shares	SEC
Loss	A dummy variable equal to 1 if the firm made a loss in given year	Compustat
Monthly Stock Return	The firm's return in a given month	CRSP
New CEO	An dummy variable equal to 1 if the CEO is new in the firm	ExecuComp
Option Grant Value / Salary	The value of the stock option grants that are awarded to CEOs in a month scaled by the CEO's salary	ExecuComp
Option Grant Month	A dummy variable equal to 1 if an award was made to the CEO in a give month	ExecuComp
Post	A dummy variable equal to 1 in the 3 months after a stock option grant, stock option exercise or placebo month and 0 otherwise	ExecuComp
Pre	A dummy variable equal to 1 in the 3 months before a stock option grant, stock option exercise or placebo month and 0 otherwise	ExecuComp
Repurchase Dummy	A dummy variable equal to 1 in month when a repurchase takes place	SEC
ROA	EBITDA scaled by total assets	Compustat
Shares Repurchased / Shares Outstanding	The percentage of shares oustanding that is repurchases on the market	SEC/ CRSP
Treatment	A dummy variable equal 1 for firms that grant stock options to their CEO in a given month or firms that their CEOs is likely to exercise stock options in a given month and is equal to 0 for control firms	ExecuComp
Vesting Date of Equity Month	A dummy variable equal to 1 if the stock option has ended its vesting period and it is exercisable by the CEO in a give month (Edmans, 2018)	ExecuComp
Vested Option Value / Salary	The value of vested (exercisable) stock option of the CEO in a month scaled by the CEO's salary (Edmans, 2018)	ExecuComp

Table 2: Summary Statistics

This table lists the firm-month-level summary statistics of the main variables used in the multi-regression difference analysis of share repurchase activity around CEO stock option grants and exercisable stock options. The sample includes the three months before and the three months after the option grant month and the exercise option month in this research. The description of variables can be found in Table 1.

	Mean	StD	Min	25	Median	75	Max
Ln(Repurchase Value)	0.9200	2.7300	0.0000	0.0000	0.0000	0.0000	14.8700
Shares Repurchases / Shares Outstanding	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1200
Repurchase Dummy	0.1100	0.3200	0.0000	0.0000	0.0000	0.0000	1.0000
Option Grant Value / Salary	0.3567	0.2600	0.0000	0.0000	0.5800	0.2010	0.2300
Post	0.0000	0.0400	0.0000	0.0000	0.0000	0.0000	1.0000
Treatment	0.3900	0.4900	0.0000	0.0000	0.0000	1.0000	1.0000
Ln(Assets) $_{t-1}$	6.2800	2.1100	0.0000	4.8000	6.2700	7.6200	14.6300
Book / Market $_{t-1}$	0.7000	2.2400	0.0000	0.3000	0.5400	0.8600	0.9654
ROA$_{t-1}$	0.0100	0.6100	0.0000	0.0100	0.0800	0.1400	1.7000
Loss $_{t-1}$	0.0200	0.1400	0.0000	0.0000	0.0000	0.0000	1.0000
Cash / Assets $_{t-1}$	0.2100	0.2400	0.0000	0.0300	0.1000	0.3000	1.0000
Monthly Stock Return $_{t-1}$	0.0000	0.1800	-0.8600	-0.0800	-0.0100	0.0700	5.2500
Dividend Yield $_{t-1}$	0.2600	0.7100	0.0000	0.0000	0.0000	0.3000	30.8100
Chairman	0.0000	0.0600	0.0000	0.0000	0.0000	0.0000	1.0000
New CEO	0.0100	0.1000	0.0000	0.0000	0.0000	0.0000	1.0000
Ln(CEO Tenure)	0.5700	2.0500	0.0000	0.0000	0.0000	0.0000	9.7700
Ln(CEO Age)	1.5900	2.0000	0.0000	0.0000	0.0000	4.0800	4.5500
CEO AGE > 62	0.7800	0.4100	0.0000	1.0000	1.0000	1.0000	1.0000
Female CEO	0.0300	0.1800	0.0000	0.0000	0.0000	0.0000	1.0000
Ln(CEO Portfolio Delta) $_{t-1}$	4.3533	1.7537	3.6300	3.7340	4.1224	6.1236	6.6757

Table 3: Propensity Score Matching – Option Grant Likelihood

This table presents the results of the logit regression that we run to estimate the likelihood of a CEO stock option grant in a given firm-month using the propensity-score matching methodology. Standard errors are clustered by firm. T-statistics are show in parentheses below the coefficients *, **, *** indicate the significance at the 10, 5, 1% level. The description of variables can be found in Table 1.

Panel A: Predicting CEO Stock Option Grants for Propensity-Score Matching	
	CEO Stock Option Grant
Ln(Assets) $_{t-1}$	0.4241884
	[6.55]
Book / Market $_{t-1}$	-0.017719
	[-4.32]
Annual Industry - Adjusted Stock Return $_{t-1}$	-0.099572
	[-1.37]
Sales Growth $_{t-1}$	-0.0001094
	[-1.84]
Ln(Ceo Portfolio Delta) $_{t-1}$	0.0242633
	[8.38]
Industry FE	Yes
Year FE	Yes
Pseudo R-Squared	0.2484

Table 4: Share Repurchases Activity around the stock option grant date

This table shows the results of monthly share repurchase activity between the three months before and the three months after the period which firms grant at-the-money stock options to their respective CEOs. For this analysis I use three different dependent variables measuring share repurchase activity and run the regression without controls (Panel A), controlling for firm characteristics (Panel B), controlling for firm and CEO characteristics (Panel C) for robust results. In columns 1, 2 I use Shares Repurchased scaled by Shares Outstanding as share repurchase activity measure. In columns 3, 4 I replace it with a Repurchase Dummy as the dependent variable and in columns 5, 6 I replace the dependent with the natural logarithm of

the Repurchase Value. Columns 1, 3 and 5 present the results of the simple-difference analysis including only treated firms. Columns 2, 4 and 6 show the results of the difference-in-difference analysis including the matched control group. Standard errors are clustered by firm. T-statistics are show in parentheses below the coefficients *, **, *** indicate the significance at the 10, 5, 1% level. The description of variables can be found in Table 1.

Panel A. No Control Variables						
	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.000487	-0.0015776	-0.1673852**	-0.1355902*	-1.614913***	-1.0766*
	[-0.65]	[0.49]	[-3.24]	[-1.72]	[-3.49]	[-1.81]
Treatment		0.0000519*		0.015807*		0.1872389*
		[1.81]		[1.40]		[1.89]
Treatment * Post		0.0016862*		0.0631216		0.41866
		[1.61]		[0.75]		[0.63]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year - Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.024	0.0149	0.0268	0.0196	0.0321	0.0295

Table 4: Share Repurchases Activity around the stock option grant date (Continued)

Panel B. Controlling for Firm Characteristics						
	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.0003104	-0.0014684*	-0.1520658**	-0.0159099*	-1.442802**	-0.9956253*
	[-0.40]	[-1.65]	[-2.84]	[-1.58]	[-2.99]	[-1.63]
Treatment		0.0000507		0.0159099*		0.1896979*
		[0.48]		[1.39]		[1.91]
Treatment * Post		0.0016364*		0.0594581		0.3810014
		[1.54]		[0.69]		[0.57]
Ln(Assets) $_{t-1}$	-0.0001516	-0.0001134*	-0.0172662	-0.013148*	-0.1047852	-0.0843869
	[-0.82]	[-1.73]	[-1.03]	[-2.13]	[-0.69]	[0.89]
Book / Markets $_{t-1}$	-0.00000766	-0.00000629*	-0.0014819*	-0.001136*	-0.0148045*	-0.0090757*
	[-1.14]	[-1.52]	[-1.73]	[-2.24]	[-1.72]	[-2.30]
ROA $_{t-1}$	0.0020748***	0.0001045*	0.2295371***	0.0085524*	2.452061***	0.0769423*
	[3.79]	[2.03]	[4.87]	[2.01]	[5.50]	[1.95]
Loss $_{t-1}$	-0.0000674	0.0000751	-0.0259064	-0.0013587	-0.2365292	-0.0100568
	[-0.19]	[0.37]	[-0.93]	[-0.08]	[-0.88]	[-0.07]
Cash / Assets $_{t-1}$	-0.0019417**	-0.0008083**	-0.1583782**	-0.06481**	-1.419546**	-0.5735236***
	[-2.48]	[-3.21]	[-2.94]	[-3.17]	[-2.86]	[-3.54]
Ln(Stock Return) $_{t-1}$	-0.0000525*	-0.0000481**	-0.0034887	-0.0029614*	-0.0376145	-0.0291367*
	[-1.43]	[-2.68]	[-1.20]	[-1.91]	[-1.33]	[-2.20]
Ln(Stock Return) $_{t-2}$	-0.000045*	0.00000115	-0.0016361	0.0005137	-0.0156999	0.0027074
	[-1.42]	[0.07]	[-0.57]	[0.33]	[-0.56]	[0.21]
Ln(Stock Return) $_{t-3}$	-0.00000269	0.00000459	-0.0003624	0.0014771	0.0039642	0.0100107
	[-0.08]	[0.25]	[-0.14]	[1.02]	[0.16]	[0.81]
Dividend Yield $_{t-1}$	-0.0000316	-0.00000791	0.0091293*	0.0088202*	[0.0701072]	0.0465314
	[-0.73]	[-0.31]	[1.48]	[2.02]	[1.29]	[1.34]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.0212	0.0074	0.0181	0.0018	0.0296	0.0076

Table 4: Share Repurchases Activity around the stock option grant date (Continued)

Panel C. Controlling for Firm Characteristics and CEO Characteristics						
	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.0003659	-0.0014215*	-0.1572178**	-0.1322742*	-1.492388**	-1.029459*
	[-0.47]	[-1.54]	[-2.94]	[-1.60]	[-3.10]	[-1.63]
Treatment		0.0008368*		0.0054659		0.1892174
		[1.67]		[0.18]		[0.62]
Treatment * Post		0.0015864*		0.0654169*		0.4341076
		[1.45]		[0.75]		[0.63]
Ln(Assets) $_{t-1}$	-0.0001372*	-0.0001147*	-0.0163133	-0.0137473*	-0.0946074	-0.0898631*
	[-0.74]	[-1.75]	[-0.97]	[-2.23]	[-0.62]	[-1.82]
Book / Markets $_{t-1}$	-0.00000794*	-0.00000637*	-0.0015031*	-0.0011145*	-0.0151911*	-0.0088627*
	[-1.15]	[-1.57]	[-1.77]	[-2.26]	[-1.77]	[-2.31]
ROA $_{t-1}$	0.0021135***	0.0001047*	0.2291675***	0.0086691*	2.453104***	0.078014*
	[3.85]	[2.04]	[4.87]	[2.02]	[5.52]	[1.96]
Loss $_{t-1}$	-0.0000767	0.0000723	-0.0259047	-0.0019337	-0.2371639	-0.0161896
	[-0.21]	[0.35]	[-0.93]	[-0.11]	[0.37]	[-0.11]
Cash / Assets $_{t-1}$	-0.0019267**	-0.0008235**	-0.1561487**	-0.0655168**	-1.397696**	-0.5802743***
	[-2.46]	[-3.26]	[-2.89]	[-3.21]	[-2.80]	[-3.59]
Ln(Stock Return) $_{t-1}$	-0.0000536*	-0.0000486**	-0.0036298	-0.0029069*	-0.0392204*	-0.0286756*
	[-1.46]	[-2.71]	[-1.24]	[-1.88]	[-1.39]	[-2.17]
Ln(Stock Return) $_{t-2}$	-0.0000463*	0.00000114	-0.001864	0.000524	-0.0180797	0.0028342
	[-1.47]*	[0.07]	[-0.65]	[0.34]	[-0.65]	[0.22]
Ln(Stock Return) $_{t-3}$	-0.00000349	0.00000448	-0.0004241	0.0015686	0.0032489	0.0108376
	[-0.10]	[0.24]	[-0.16]	[1.09]	[0.13]	[0.88]
Dividend Yield $_{t-1}$	-0.0000302	-0.0000115	0.0091024*	0.008728*	0.070156*	0.045159
	[-0.74]	[-0.44]	[1.47]	[2.02]	[1.29]	[1.32]
Chairman	-0.0001564	0.0004208	-0.0303027	0.1236044**	-0.424384*	1.320054**
	[-0.24]	[0.83]	[-0.68]	[2.42]	[-1.01]	[2.45]
New CEO	0.00000502	0.0001668	0.0025159	-0.0216616*	-0.0277828	-0.1648531
	[0.02]	[0.54]	[0.09]	[-0.85]	[-0.10]	[-0.66]
Ln(CEO Tenure)	-0.0000231*	0.00000599	-0.0020891*	0.0001957	-0.0204601*	0.0071388
	[-1.46]	[0.27]	[-1.47]	[0.14]	[-1.49]	[0.53]
Ln(CEO Age)	-0.00008	-0.0002064*	-0.0081716	0.0024007	-0.0834702	-0.003169
	[-0.81]	[-1.70]	[-0.95]	[0.33]	[-1.05]	[-0.04]
CEO AGE > 62	-0.0000935	-0.0000903	0.0006419	0.0008944	-0.0007425	0.0116378
	[-0.89]	[-0.81]	[0.07]	[0.10]	[-0.01]	[0.14]
Female CEO	-0.0003848*	-0.0002692	-0.0316068*	0.0023315	-0.3244032*	-0.0002335
	[-1.79]	[-1.37]	[-1.77]	[0.15]	[-1.93]	[0.02]
Ln(CEO Delta) $_{t-1}$	0.00000257	0.00000974*	0.0017506*	0.001153*	0.0147615*	0.0111959*
	[0.18]	[1.63]	[1.58]	[2.10]	[1.40]	[2.33]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.0221	0.0072	0.0207	0.0020	0.033	0.0081

Table 5 : Share Repurchase Activity around the stock option grant date – Supplementary tests including the normal period. This table shows the results of regression analyses of share repurchasing activity in months { t-6 , t-5, t-4, t-3, t-2, t-1, t+1, t+2, t+3 } where t represents the stock option grant month in which firms award CEOs. The period { t-6 , t-5 , t-4 } is the normal period in which there are no incentives to conduct repurchase comparing to dummy variables Pre (equal to 1 in period t-3 to t-1 or equal to 0 otherwise) and Post (equal to 1 in period t+3 to t+1 or equal to 0 otherwise). For this analysis I use three different dependent variables measuring share repurchase activity and run the regression without controls (Panel A), controlling for firm characteristics (Panel B), controlling for firm and CEO characteristics (Panel C) for robust results. In columns 1, 2 I use Shares Repurchased scaled by Shares Outstanding as share repurchase activity measure. In columns 3, 4 I replace it with a Repurchase Dummy as the dependent variable and in columns 5, 6 I replace the dependent with the natural logarithm of the Repurchase Value. Columns 1, 3 and 5 present the results of the simple-difference analysis including only treated firms. Columns 2, 4 and 6 show the results of the difference-in-difference analysis including the matched control group. Standard errors are clustered by firm. T-statistics are show in parentheses below the coefficients *, **, *** indicate the significance at the 10, 5, 1% level. The description of variables can be found in Table 1.

Panel A. No Control Variables

	[1]	[2]	[3]
Sample	Treatment & Control Firms	Treatment & Control Firms	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding	Repurchase Dummy	Ln(Repurchase Value)
Pre	0.0002288	-0.0264634	0.0008219
	[1.04]	[-0.52]	[0.00]
Post	-0.0015492	-0.1285263*	-1.012377*
	[-1.76]*	[-1.62]	[-1.68]
Treatment	0.0000627	0.0162918*	0.1932265*
	[0.58]	[1.42]	[1.92]
Treatment * Pre	-0.0007232*	-0.0904407	-1.172935*
	[-1.66]	[-1.31]	[-2.13]
Treatment * Post	0.0014502*	0.0086082	-0.1268073
	[1.43]	[0.09]	[-0.18]
Firm FE	Yes	Yes	Yes
Year - Month FE	Yes	Yes	Yes
Adjusted R-Squared	0.0151	0.0197	0.0296

Table 5 : Share Repurchase Activity around the stock option grant date – Supplementary tests including the normal period (Continued)

Panel B. Controlling for Firm Characteristics			
	[1]	[2]	[3]
Sample	Treatment & Control Firms	Treatment & Control Firms	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding	Repurchase Dummy	Ln(Repurchase Value)
Pre	0.0002306	-0.0260945	0.0076661
	[1.04]	[-0.52]	[0.03]
Post	-0.0014443*	-0.1212366*	-0.9366855*
	[-1.61]	[-1.49]	[-1.52]
Treatment	0.0000599	0.0162891*	0.19478*
	[0.55]	[1.40]	[1.93]
Treatment * Pre	-0.0006918*	-0.0886993	-1.150493*
	[-1.60]	[-1.29]	[-2.09]
Treatment * Post	0.0014181*	0.006238	-0.1479605
	[1.38]	[0.07]	[-0.20]
Ln(Assets) $_{t-1}$	-0.0001151*	-0.0135487*	-0.0882169*
	[-1.75]	[-2.19]	[-1.78]
Book / Markets $_{t-1}$	-0.00000628*	-0.0011281*	-0.0090034*
	[-1.52]	[-2.24]	[-2.30]
ROA $_{t-1}$	0.0001046*	0.0085585*	0.0770592*
	[2.04]	[2.02]	[1.96]
Loss $_{t-1}$	0.0000751	-0.0013678	-0.0099668
	[0.37]	[-0.08]	[-0.07]
Cash / Assets $_{t-1}$	-0.0008086**	-0.0650867**	-0.5754519***
	[-3.21]	[-3.19]	[-3.56]
Ln(Stock Return) $_{t-1}$	-0.000048**	-0.0029102*	-0.0286388*
	[-2.67]	[-1.87]	[-2.16]
Ln(Stock Return) $_{t-2}$	0.000000998	0.0004763	0.0023419
	[0.06]	[0.31]	[0.18]
Ln(Stock Return) $_{t-3}$	0.00000443	0.0014317	0.0095772
	[0.24]	[0.99]	[0.78]
Dividend Yield $_{t-1}$	-0.0000079	0.0088033*	0.0464056
	[-0.31]	[2.02]	[1.33]
Firm FE	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Adjusted R-Squared	0.0074	0.0015	0.0069

Table 5 : Share Repurchase Activity around the stock option grant date – Supplementary tests including the normal period (Continued)

Panel C. Controlling for Firm Characteristics and CEO Characteristics			
	[1]	[2]	[3]
Sample	Treatment & Control Firms	Treatment & Control Firms	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding	Repurchase Dummy	Ln(Repurchase Value)
Pre	0.0002069	-0.0249977	0.0130938
	[0.92]	[-0.50]	[0.04]
Post	-0.0013601*	-0.1232112*	-0.9412474*
	[-1.45]	[-1.50]	[-1.49]
Treatment	0.0006189	0.0456913*	0.4246782*
	[1.13]	[1.46]	[1.47]
Treatment * Pre	-0.0006545*	-0.0889967	-1.147632*
	[-1.51]	[-1.30]	[-2.10]
Treatment * Post	0.0013137	0.0074817	-0.1522261
	[1.23]	[0.08]	[-0.20]
Ln(Assets) $_{t-1}$	-0.0001132*	-0.0136302*	-0.0890956*
	[-1.72]	[-2.20]	[-1.79]
Book / Markets $_{t-1}$	-0.0000061*	-0.0011251*	-0.0089658*
	[-1.46]	[-2.27]	[-2.33]
ROA $_{t-1}$	0.0001045*	0.0085462*	0.0769626*
	[2.03]	[2.02]	[1.96]
Loss $_{t-1}$	0.0000811	-0.0017574	-0.0122448
	[0.40]	[-0.10]	[-0.08]
Cash / Assets $_{t-1}$	-0.0008099**	-0.064462**	-0.5714136***
	[-3.21]	[-3.15]	[-3.53]
Ln(Stock Return) $_{t-1}$	-0.0000471**	-0.0028608*	-0.0280951*
	[-2.62]	[-1.84]	[-2.11]
Ln(Stock Return) $_{t-2}$	0.000000829	0.000441	0.0019609
	[0.05]	[0.28]	[0.15]
Ln(Stock Return) $_{t-3}$	0.00000409	0.0014703	0.0095699
	[0.22]	[1.02]	[0.78]
Dividend Yield $_{t-1}$	-0.00000736	0.0087195*	0.0456497
	[-0.29]	[2.00]	[1.32]
Chairman	-0.0000493	0.0459801	0.6975009
	[-0.10]	[0.97]	[1.37]
New CEO	0.0006768*	0.0091518	0.186952
	[1.48]	[0.35]	[0.72]
Ln(CEO Tenure)	-0.0000087	-0.002432*	-0.0229561*
	[-0.47]	[-1.83]	[-1.86]
Ln(CEO Age)	-0.0001364	-0.0069128	-0.053142
	[-1.02]	[-0.96]	[-0.80]
CEO AGE > 62	-0.00000104	0.0000319	0.0031675
	[-0.01]	[0.00]	[0.04]
Female CEO	-0.0002313	0.0180075	0.1177007
	[-1.16]	[1.12]	[0.76]
Ln(CEO Delta) $_{t-1}$	0.0000016	0.0005416	0.0051014
	[0.28]	[0.98]	[1.05]
Firm FE	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Adjusted R-Squared	0.0079	0.0019	0.0079

Table 6 : Relation between Share Repurchase Activity and the value of the option grant

This table explores whether the size in value of the option grant makes an impact in the relation between share repurchase activity and option grant. For this analysis I use three different dependent variables measuring share repurchase activity and run the regression without controls (Panel A), controlling for firm characteristics (Panel B), controlling for firm and CEO characteristics (Panel C) for robust results. In columns 1, 2 I use Shares Repurchased scaled by Shares Outstanding as share repurchase activity measure. In columns 3, 4 I replace it with a Repurchase Dummy as the dependent variable and in columns 5, 6 I replace the dependent with the natural logarithm of the Repurchase Value. Columns 1, 3 and 5 present the results of the simple-difference analysis including only treated firms. Columns 2, 4 and 6 show the results of the difference-in-difference analysis including the matched control group. Standard errors are clustered by firm. T-statistics are show in parentheses below the coefficients *, **, *** indicate the significance at the 10, 5, 1% level. The description of variables can be found in Table 1.

Panel A. No Control Variables						
	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.0006376	-0.0002553	-0.1872265***	-0.0966539**	-1.803977***	-0.856781**
	[-0.90]	[-0.48]	[-3.41]	[-2.69]	[-3.68]	[-2.70]
Option Grant Value / Salary	-0.000000000169***	-0.000000000189***	-0.00000000603***	-0.00000000845***	-0.0000000679***	-0.0000000907***
	[-8.57]	[-10.84]	[-8.92]	[-8.15]	[-17.75]	[-43.05]
Post * Option Grant Value / Salary	0.0001978*	0.0002294*	0.0259418*	0.0228514*	0.2472672*	0.1967673*
	[1.28]	[1.35]	[1.94]	[2.08]	[2.09]	[1.98]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year - Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.0239	0.0135	0.0267	0.0121	0.0321	0.0153

Table 6 : Relation between Share Repurchase Activity and the value of the option grant (Continued)

Panel B. Controlling for Firm Characteristics						
	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.0004806	-0.0002018	-0.1735031**	-0.092642**	-1.64749**	-0.8148569**
	[-0.66]	[-0.37]	[-3.06]	[-2.57]	[-3.24]	[-2.56]
Option Grant Value / Salary	-0.000000000175***	-0.00000000019***	-0.00000000677***	-0.0000000085***	-0.0000000745***	-0.0000000914***
	[-10.41]	[-11.53]	[-6.68]	[-7.46]	[-19.45]	[-30.48]
Post * Option Grant Value / Salary	0.0002245*	0.0002511*	0.0282252*	0.0240084*	0.2694861*	0.2087472*
	[1.42]	[1.46]	[2.00]	[2.18]	[2.16]	[2.10]
Ln(Assets) $_{t-1}$	-0.0001516	-0.0001116*	-0.0171873	-0.0126422*	-0.1040892	-0.0784757*
	[-0.82]	[-1.70]	[-1.03]	[-2.05]	[-0.69]	[-1.59
Book / Markets $_{t-1}$	-0.00000769	-0.00000619*	-0.0014842*	-0.0011037*	-0.0148273*	-0.0086894*
	[-1.14]	[-1.49]	[-1.73]	[-2.16]	[-1.72]	[-2.18]
ROA $_{t-1}$	0.0020815***	0.0001044*	0.2299207***	0.0085287*	2.456045***	0.0766802*
	[3.80]	[2.03]	[4.88]	[2.00]	[5.51]	[1.94]
Loss $_{t-1}$	-0.000067	0.0000763	-0.0258306	-0.0009346	-0.2357799	-0.0050078
	[-0.18]	[0.37]	[-0.93]	[-0.06]	[-0.87]	[-0.03]
Cash / Assets $_{t-1}$	-0.0019525**	-0.0008102**	-0.1591333**	-0.0649845**	-1.427192**	-0.5752232***
	[-2.50]	[-3.22]	[-2.95]	[-3.18]	[-2.88]	[-3.56]
Ln(Stock Return) $_{t-1}$	-0.0000527*	-0.0000483**	-0.0034779	-0.0029599*	-0.0375459	-0.0291246*
	[-1.43]	[-2.70]	[-1.19]	[-1.91]	[-1.33]	[-2.20]
Ln(Stock Return) $_{t-2}$	-0.0000447*	0.00000159	-0.0015845	0.0005658	-0.0152395	0.0032106
	[-1.41]	[0.09]	[-0.55]	[0.36]	[-0.55]	[0.24]
Ln(Stock Return) $_{t-3}$	-0.00000316	0.00000444	-0.0002723	0.0015103	0.0046439	0.0102343
	[-0.09]	[0.24]	[-0.10]	[1.05]	[0.18]	[0.83]
Dividend Yield $_{t-1}$	-0.0000318	-0.00000815	0.0091231*	0.0087578*	0.0700396	0.045797
	[-0.73]	[-0.32]	[1.48]	[2.00]	[1.29]	[1.31]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.0211	0.0066	0.0182	0.0004	0.0297	0.0022

Table 6 : Relation between Share Repurchase Activity and the value of the option grant (Continued)

Panel C. Controlling for Firm Characteristics and CEO Characteristics						
	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.0005227	-0.0002157	-0.1756498**	-0.0932339**	-1.671544**	-0.8113879**
	[-0.72]	[-0.40]	[-3.09]	[-2.56]	[-3.26]	[-2.53]
Option Grant Value / Salary	-0.000000000164***	-0.000000000019***	-0.00000000696***	-0.00000000825***	-0.0000000748***	-0.0000000891***
	[-9.14]	[-11.69]	[-5.70]	[-6.51]	[-11.43]	[-15.19]
Post * Option Grant Value / Salary	0.0002489*	0.0002514*	0.0291279*	0.0239369*	0.2822636*	0.206442*
	[1.56]	[1.47]	[2.06]	[2.19]	[2.24]	[2.10]
Ln(Assets) $_{t-1}$	-0.0001419	-0.0001099*	-0.0168374	-0.0130424*	-0.100884	-0.0833936*
	[-0.77]	[-1.67]	[-1.00]	[-2.11]	[-0.66]	[-1.68]
Book / Markets $_{t-1}$	-0.00000708	-0.0000062*	-0.0014876*	-0.0011252*	-0.0148237*	-0.0089249*
	[-1.08]	[-1.49]	[-1.73]	[-2.27]	[-1.72]	[-2.31]
ROA $_{t-1}$	0.002104***	0.000104*	0.2275735***	0.0085785*	2.429321***	0.0772557*
	[3.80]	[2.03]	[4.85]	[2.01]	[5.47]	[1.95]
Loss $_{t-1}$	-0.0000536	0.0000794	-0.0260378	-0.0014597	-0.2337919	-0.0103702
	[-0.15]	[0.39]	[-0.93]	[-0.09]	[-0.86]	[-0.07]
Cash / Assets $_{t-1}$	-0.001985**	-0.0008106**	-0.1564103**	-0.0653815**	-1.412297**	-0.5784433***
	[-2.53]	[-3.22]	[-2.89]	[-3.20]	[-2.83]	[-3.57]
Ln(Stock Return) $_{t-1}$	-0.000052*	-0.0000483*	-0.0034463	-0.0029364*	-0.0371769	-0.0289508*
	[-1.41]	[-2.70]	[-1.18]	[-1.89]	[-1.32]	[-2.18]
Ln(Stock Return) $_{t-2}$	-0.0000458*	0.00000146	-0.0016696	0.0005528	-0.0163569	0.0030529
	[-1.45]	[0.09]	[-0.58]	[0.35]	[-0.59]	[0.23]
Ln(Stock Return) $_{t-3}$	-0.00000416	0.00000462	-0.0002963	0.0014511	0.0038618	0.0097821
	[-0.12]	[0.25]	[-0.11]	[1.00]	[0.15]	[0.80]
Dividend Yield $_{t-1}$	-0.0000302	-0.00000806	0.0088537*	0.0087252*	0.067144	0.0457619
	[-0.70]	[-0.31]	[1.42]	[2.00]	[1.24]	[1.31]
Chairman	-0.00000703	-0.000012	0.0439604	-0.0043789	0.7008829	0.0056435
	[-0.01]	[-0.05]	[0.90]	[-0.09]	[1.33]	[0.01]
New CEO	0.0007346*	-0.0001447	0.0150417	-0.0258294	0.2435765	-0.1815198
	[1.51]	[-0.53]	[0.54]	[-1.02]	[0.89]	[-0.73]
Ln(CEO Tenure)	-0.00000651	-0.0000285*	-0.0023801*	0.0007256	-0.0210854*	0.0085447
	[-0.34]	[-1.74]	[-1.76]	[0.52]	[-1.67]	[0.63]
Ln(CEO Age)	-0.0001955	0.00000664	-0.0048878	0.0026326	-0.0550775	0.0296003
	[-1.26]	[0.22]	[-0.60]	[0.87]	[-0.72]	[1.12]
CEO AGE > 62	-0.0000474	0.00000475	-0.0072812	0.0104188	-0.0676608	0.0760887
	[-0.42]	[0.04]	[-0.75]	[1.21]	[-0.74]	[0.94]
Female CEO	-0.0003038*	-0.0000354	0.010983	0.0091278	0.0472884	0.0629561
	[-1.43]	[-0.16]	[0.65]	[0.62]	[0.29]	[0.45]
Ln(CEO Portfolio Delt	-0.00000805	-0.000000942	0.0007127	0.0004115	0.0074642	0.0038947
	[-0.72]	[-0.18]	[0.67]	[0.76]	[0.73]	[0.84]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.0223	0.0064	0.0196	0.0015	0.0318	0.0048

Table 7 : Share Repurchases Activity around the stock option exercise date

This table shows the results of monthly share repurchase activity between the three months before and the three months after the period which the options granted by firms to CEOs are exercisable. For this analysis I use three different dependent variables measuring share

repurchase activity and run the regression without controls (Panel A), controlling for firm characteristics (Panel B), controlling for firm and CEO characteristics (Panel C) for robust results. In columns 1, 2 I use Shares Repurchased scaled by Shares Outstanding as share repurchase activity measure. In columns 3, 4 I replace it with a Repurchase Dummy as the dependent variable and in columns 5, 6 I replace the dependent with the natural logarithm of the Repurchase Value. Columns 1, 3 and 5 present the results of the simple-difference analysis including only treated firms. Columns 2, 4 and 6 show the results of the difference-in-difference analysis including the matched control group. Standard errors are clustered by firm. T-statistics are show in parentheses below the coefficients *, **, *** indicate the significance at the 10, 5, 1% level. The description of variables can be found in Table 1.

Panel A. No Control Variables

	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.0006776	-0.00000647	-0.1359074**	-0.0015746	-0.0223543*	0.0047306
	[-1.10]	[-0.04]	[-3.36]	[-0.10]	[-2.28]	[1.13]
Treatment		0.0000418		0.0036176		0.0035442
		[0.28]		[0.24]		[0.85]
Treatment * Post		-0.0001337		-0.0694895*		-0.011315
		[-0.25]		[-2.16]		[-1.27]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year - Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.0224	0.0146	0.024	0.0138	0.0242	0.0193

Table 7 : Share Repurchases Activity around the stock option exercise date (Continued)

Panel B. Controlling for Firm Characteristics

	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.0005354	0.00024	-0.1259544**	0.0201725	-0.016674*	0.0083955*
	[-0.84]	[1.19]	[-3.00]	[1.11]	[-1.59]	[1.78]
Treatment		0.0000604		0.0064123		0.003654
		[0.39]		[0.42]		[0.87]
Treatment * Post		-0.0003235		-0.0874852**		-0.0132326*
		[-0.58]		[-2.61]		[-1.43]
Ln(Assets) $_{t-1}$	-0.0001882	-0.0001137*	-0.0228357*	-0.0128262*	-0.0023426	-0.001449
	[-1.15]	[-1.72]	[-1.49]	[-2.07]	[-0.62]	[-1.07]
Book / Markets $_{t-1}$	-0.00000651*	-0.00000614*	-0.0011384*	-0.0010967*	-0.0002313*	-0.0001392*
	[-1.74]	[-1.47]	[-2.14]	[-2.15]	[-2.19]	[-1.76]
ROA $_{t-1}$	0.0017402***	0.0001045*	0.2104057***	0.0085406*	0.0847391***	0.0025273*
	[3.65]	[2.03]	[4.95]	[2.01]	[3.85]	[1.88]
Loss $_{t-1}$	-0.0000226	0.0000747	-0.0225308	-0.0010984	-0.0040127	-0.0004029
	[-0.06]	[0.36]	[-0.83]	[-0.06]	[-0.53]	[-0.10]
Cash / Assets $_{t-1}$	-0.0018483**	-0.0008065**	-0.1422698**	-0.0648754**	-0.066333**	-0.0262463**
	[-2.62]	[-3.21]	[-2.87]	[-3.17]	[-2.43]	[-3.30]
Ln(Stock Return) $_{t-1}$	-0.000048	-0.0000482**	-0.0024393	-0.0029473*	-0.0015922*	-0.0013883**
	[-1.42]	[-2.69]	[-0.91]	[-1.90]	[-1.77]	[-3.08]
Ln(Stock Return) $_{t-2}$	-0.0000335	0.00000161	-0.0008617	0.0005868	-0.0009227	-0.0004468
	[-1.15]	[0.10]	[-0.33]	[0.38]	[-1.08]	[-1.03]
Ln(Stock Return) $_{t-3}$	0.00000278	0.00000442	-0.0003136	0.0015007	-0.0010651	-0.0004881
	[0.08]	[0.24]	[-0.13]	[1.04]	[-1.11]	[-1.11]
Dividend Yield $_{t-1}$	-0.0000446	-0.0000079	0.0079656	0.008791*	-0.00209	-0.000434
	[-0.92]	[-0.31]	[1.29]	[2.01]	[-0.88]	[-0.34]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.0166	0.0075	0.0076	0.0009	0.023	0.0133

Table 7 : Share Repurchases Activity around the stock option exercise date (Continued)

Panel C. Controlling for Firm Characteristics and CEO Characteristics						
	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.0005509	0.000245	-0.1252419**	0.0252062	-0.016757*	0.0100631*
	[-0.87]	[1.17]	[-2.99]	[1.32]	[-1.60]	[2.01]
Treatment		0.0001202		-0.0051258		0.0015114
		[0.52]		[-0.28]		[0.27]
Treatment * Post		-0.0003279		-0.0921682**		-0.0148307*
		[-0.59]		[-2.72]		[-1.59]
Ln(Assets) $_{t-1}$	-0.0001852	-0.0001125*	-0.0228367*	-0.0131433*	-0.0024054	-0.0015544
	[-1.14]	[-1.72]	[-1.48]	[-2.12]	[-0.64]	[-1.15]
Book / Markets $_{t-1}$	-0.00000561*	-0.00000575	-0.0011722*	-0.0011321*	-0.0002293*	-0.0001391*
	[-1.47]	[-1.35]	[-2.19]	[-2.26]	[-2.10]	[-1.73]
ROA $_{t-1}$	0.0017351***	0.0001042*	0.2084054***	0.0085347*	0.0844287***	0.0025373*
	[4.81]	[2.03]	[4.93]	[2.01]	[3.84]	[1.88]
Loss $_{t-1}$	-0.00000574	0.0000819	-0.0231713	-0.0016843	-0.0037373	-0.0003735
	[-0.02]	[0.40]	[-0.86]	[-0.10]	[-0.50]	[-0.10]
Cash / Assets $_{t-1}$	-0.001872**	-0.0008118**	-0.1382049**	-0.0638762**	-0.0661836**	-0.0262055**
	[-2.65]	[-3.22]	[-2.78]	[-3.12]	[-2.44]	[-3.30]
Ln(Stock Return) $_{t-1}$	-0.0000469	-0.0000476**	-0.0024284	-0.0029216*	-0.0015727*	-0.0013715**
	[-1.38]	[-2.65]	[-0.91]	[-1.88]	[-1.75]	[-3.04]
Ln(Stock Return) $_{t-2}$	-0.0000333	0.00000176	-0.000956	0.0005341	-0.000938	-0.0004526
	[-1.15]	[0.10]	[-0.37]	[0.34]	[-1.09]	[-1.04]
Ln(Stock Return) $_{t-3}$	0.00000171	0.00000384	-0.0003919	0.0014768	-0.001083	-0.0004958
	[0.05]	[0.21]	[-0.16]	[1.02]	[-1.14]	[-1.13]
Dividend Yield $_{t-1}$	-0.0000429	-0.00000671	0.0078153	0.0087518*	-0.0021284	-0.0004373
	[-0.89]	[-0.26]	[1.27]	[2.00]	[-0.90]	[-0.35]
Chairman	-0.000049	-0.0000614	0.0507667	0.0451542	0.0078472	0.006085
	[-0.10]	[-0.13]	[1.03]	[0.95]	[0.51]	[0.42]
New CEO	0.0007243*	0.0006942*	0.0103747	0.0099839	0.0108778	0.0105324
	[1.52]	[1.50]	[0.38]	[0.37]	[1.07]	[1.07]
Ln(CEO Tenure)	-0.00000432	-0.00000902	-0.0022102*	-0.0024574*	-0.0003172	-0.0004613
	[-0.23]	[-0.48]	[-1.65]	[-1.85]	[-0.75]	[-1.12]
Ln(CEO Age)	-0.0000341	-0.000018	0.0019567	0.0034582	0.0001214	0.0006183
	[-0.69]	[-0.39]	[0.54]	[1.01]	[0.11]	[0.57]
CEO AGE > 62	-0.0000798	-0.0000272	-0.0084702	-0.0022771	-0.0028282	-0.0011753
	[-0.75]	[-0.26]	[-0.91]	[-0.25]	[-1.01]	[-0.44]
Female CEO	-0.0002681	-0.0002199	0.013702	0.0189194	-0.0051999	-0.0037612
	[-1.30]	[-1.10]	[0.83]	[1.17]	[-1.09]	[-0.82]
Ln(CEO Delta) $_{t-1}$	-0.00000281	-0.00000149	0.0000253	0.0003129	0.0001939	0.0001382
	[-0.19]	[-0.21]	[0.02]	[0.55]	[0.48]	[0.72]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.017	0.0076	0.0083	0.0012	0.0241	0.0139

Table 8: Share Repurchase Activity around the stock option exercise date – Supplementary tests including the normal period

This table shows the results of regression analyses of share repurchasing activity in months { t-6 , t-5, t-4, t-3, t-2, t-1, t+1, t+2, t+3 } where t represents the month where CEOs can exercise the stock options granted by the firm. The period { t-6 , t-5 , t-4 } is the normal period in which there are no incentives to conduct repurchases comparing to dummy variables Pre (equal to 1 in period t-3 to t-1 or equal to 0 otherwise) and Post (equal to 1 in period t+3 to t+1 or equal to 0 otherwise). For this analysis I use three different dependent variables measuring share repurchase activity and run the regression without controls (Panel A), controlling for firm characteristics (Panel B), controlling for firm and CEO characteristics (Panel C) for robust results. In columns 1, 2 I use Shares Repurchased scaled by Shares Outstanding as share repurchase activity measure. In columns 3, 4 I replace it with a Repurchase Dummy as the dependent variable and in columns 5, 6 I replace the dependent with the natural logarithm of the Repurchase Value. Columns 1, 3 and 5 present the results of the simple-difference analysis including only treated firms. Columns 2, 4 and 6 show the results of the difference-in-difference analysis including the matched control group. Standard errors are clustered by firm. T-statistics are show in parentheses below the coefficients *, **, *** indicate the significance at the 10, 5, 1% level. The description of variables can be found in Table 1.

Panel A. No Control Variables

	[1]	[2]	[3]
Sample	Treatment & Control Firms	Treatment & Control Firms	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding	Repurchase Dummy	Ln(Repurchase Value)
Pre	0.0002408	-0.0746683	0.0035225
	[0.64]	[-1.25]	[0.47]
Post	0.0000104	-0.0017873	0.0049451
	[0.07]	[-0.11]	[1.15]
Treatment	0.0000587	0.0033986	0.0037592
	[0.38]	[0.22]	[0.88]
Treatment * Pre	-0.0009*	-0.0217434	-0.0178111*
	[-1.55]	[-0.29]	[-1.73]
Treatment * Post	-0.0004009	-0.1045531*	-0.0169383*
	[-0.79]	[-2.59]	[-2.07]
Firm FE	Yes	Yes	Yes
Year - Month FE	Yes	Yes	Yes
Adjusted R-Squared	0.015	0.0136	0.0197

Table 8: Share Repurchase Activity around the stock option exercise date – Supplementary tests including the normal period (continued)

Panel B. Controlling for Firm Characteristics			
	[1]	[2]	[3]
Sample	Treatment & Control Firms	Treatment & Control Firms	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding	Repurchase Dummy	Ln(Repurchase Value)
Pre	0.0002546	-0.0718633	0.0029923
	[0.68]	[-1.21]	[0.39]
Post	0.0002523	0.0193968	0.0084735*
	[1.23]	[1.05]	[1.77]
Treatment	0.0000755	0.0061088	0.0037965
	[0.48]	[0.39]	[0.89]
Treatment * Pre	-0.0008937*	-0.0235116	-0.0170359*
	[-1.54]	[-0.31]	[-1.66]
Treatment * Post	-0.0005791	-0.1216727**	-0.0186274*
	[-1.11]	[-2.94]	[-2.17]
Ln(Assets) $_{t-1}$	-0.0001159*	-0.0131696*	-0.0014913
	[-1.76]	[-2.13]	[-1.10]
Book / Markets $_{t-1}$	-0.00000608*	-0.0010881*	-0.0001378*
	[-1.46]	[-2.15]	[-1.75]
ROA $_{t-1}$	0.0001045*	0.0085253*	0.0025268*
	[2.04]	[2.01]	[1.88]
Loss $_{t-1}$	0.000075	-0.0011287	-0.0003946
	[0.37]	[-0.07]	[-0.10]
Cash / Assets $_{t-1}$	-0.0008088**	-0.0653368**	-0.0262833**
	[-3.21]	[-3.19]	[-3.30]
Ln(Stock Return) $_{t-1}$	-0.000048**	-0.0029058*	-0.0013819**
	[-2.67]	[-1.87]	[-3.06]
Ln(Stock Return) $_{t-2}$	0.00000146	0.0005517	-0.0004503
	[0.09]	[0.35]	[-1.04]
Ln(Stock Return) $_{t-3}$	0.00000423	0.0014645	-0.0004924
	[0.23]	[1.01]	[-1.12]
Dividend Yield $_{t-1}$	-0.00000779	0.0087753*	-0.0004327
	[-0.30]	[2.01]	[-0.34]
Firm FE	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Adjusted R-Squared	0.0076	0.0007	0.0132

Table 8: Share Repurchase Activity around the stock option exercise date – Supplementary tests including the normal period (continued)

Panel C. Controlling for Firm Characteristics and CEO Characteristics			
	[1]	[2]	[3]
Sample	Treatment & Control Firms	Treatment & Control Firms	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding	Repurchase Dummy	Ln(Repurchase Value)
Pre	0.0002802	-0.0765021	0.002468
	[0.75]	[-1.26]	[0.32]
Post	0.0002604	0.0250318	0.0101983*
	[1.23]	[1.28]	[2.01]
Treatment	0.0001447	-0.0050141	0.0016994
	[0.62]	[-0.27]	[0.30]
Treatment * Pre	-0.0009282*	-0.015131	-0.0159389*
	[-1.61]	[-0.20]	[-1.55]
Treatment * Post	-0.00059	-0.1255048**	-0.0200886*
	[-1.13]	[-3.00]	[-2.30]
Ln(Assets) $_{t-1}$	-0.0001163*	-0.0137291*	-0.0016163
	[-1.76]	[-2.21]	[-1.19]
Book / Markets $_{t-1}$	-0.00000559	-0.0011133*	-0.000137*
	[-1.33]	[-2.27]	[-1.72]
ROA $_{t-1}$	0.0001045*	0.0085546*	0.0025393*
	[2.04]	[2.02]	[1.89]
Loss $_{t-1}$	0.0000829	-0.001562	-0.000334
	[0.40]	[-0.09]	[-0.09]
Cash / Assets $_{t-1}$	-0.0008146**	-0.0647127**	-0.0263273**
	[-3.24]	[-3.16]	[-3.31]
Ln(Stock Return) $_{t-1}$	-0.0000472**	-0.002881*	-0.0013672**
	[-2.63]	[-1.86]	[-3.03]
Ln(Stock Return) $_{t-2}$	0.0000017	0.000536	-0.0004473
	[0.10]	[0.34]	[-1.03]
Ln(Stock Return) $_{t-3}$	0.00000377	0.0014539	-0.0004999
	[0.21]	[1.01]	[-1.14]
Dividend Yield $_{t-1}$	-0.00000667	0.0087335*	-0.0004333
	[-0.26]	[2.00]	[-0.35]
Chairman	-0.0000612	0.0450951	0.0060253
	[-0.13]	[0.95]	[0.41]
New CEO	0.0006935*	0.0097853	0.0104898
	[1.50]	[0.37]	[1.07]
Ln(CEO Tenure)	-0.00000897	-0.002451*	-0.0004607
	[-0.48]	[-1.85]	[-1.11]
Ln(CEO Age)	-0.0000205	0.0032934	0.0005982
	[-0.44]	[0.97]	[0.56]
CEO AGE > 62	-0.0000248	-0.0020595	-0.0011441
	[-0.24]	[-0.23]	[-0.42]
Female CEO	-0.0002218	0.0186587	-0.0038242
	[-1.11]	[1.16]	[-0.83]
Ln(CEO Delta) $_{t-1}$	0.00000221	0.0009253*	0.0002075
	[0.37]	[1.60]	[1.13]
Firm FE	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Adjusted R-Squared	0.0077	0.001	0.014

Table 9 : Relation between Share Repurchase Activity and the value of the vested option

This table explores whether the size in value of the vested (exercisable) option makes affects the relation between share repurchase activity and option exercise. For this analysis I use three different dependent variables measuring share repurchase activity and run the regression without controls (Panel A), controlling for firm characteristics (Panel B), controlling for firm and CEO characteristics (Panel C) for robust results. In columns 1, 2 I use Shares Repurchased scaled by Shares Outstanding as share repurchase activity measure. In columns 3, 4 I replace it with a Repurchase Dummy as the dependent variable and in columns 5, 6 I replace the dependent with the natural logarithm of the Repurchase Value. Columns 1, 3 and 5 present the results of the simple-difference analysis including only treated firms. Columns 2, 4 and 6 show the results of the difference-in-difference analysis including the matched control group. Standard errors are clustered by firm. T-statistics are show in parentheses below the coefficients *, **, *** indicate the significance at the 10, 5, 1% level. The description of variables can be found in Table 1.

Panel A. No Control Variables						
	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.0006927	-0.000154	-0.1420122**	-0.0759277**	-0.0223474*	-0.0066404
	[-1.12]	[-0.28]	[-3.28]	[-2.40]	[-2.28]	[-0.82]
Option Grant Value /	-0.0000000000103	-0.0000000000127	0.00000000511	0.00000000463	0.000000000109	-0.0000000000665
Salary	[-0.36]	[-0.48]	[1.24]	[1.17]	[0.23]	[-0.15]
Post * Option Grant	0.0000206	0.0000168	0.0082107	0.0067296	-0.0000107	0.0001265
Value / Salary	[0.19]	[0.19]	[0.95]	[0.88]	[-0.01]	[0.09]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year - Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.0224	0.0136	0.0241	0.0122	0.0242	0.013

Table 9: Relation between Share Repurchase Activity and the value of the vested option (continued)

Panel B. Controlling for Firm Characteristics						
	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.0005714	-0.0000964	-0.1334246**	-0.0717744*	-0.0175777*	-0.0051541
	[-0.89]	[-0.18]	[-2.99]	[-2.24]	[-1.68]	[-0.63]
Option Grant Value / Salary	-0.00000000000783	-0.0000000000108	0.00000000523	0.00000000499	-0.0000000000927	-0.00000000012
	[-0.38]	[-0.49]	[1.09]	[1.16]	[-0.24]	[-0.34]
Post * Option Grant Value / Salary	0.000049	0.0000186	0.0100291	0.006475	0.0012277	0.0004713
	[0.40]	[0.20]	[1.08]	[0.83]	[0.48]	[0.31]
Ln(Assets) $_{t-1}$	-0.0001877	-0.0001117*	-0.0231061*	-0.0127397*	-0.0023364	-0.0013399
	[-1.15]	[-1.70]	[-1.50]	[-2.07]	[-0.62]	[-1.00]
Book / Markets $_{t-1}$	-0.00000651*	-0.00000621*	-0.0011388*	-0.0011031*	-0.0002312*	-0.000143*
	[-1.74]	[-1.49]	[-2.15]	[-2.16]	[-2.19]	[-1.82]
ROA $_{t-1}$	0.0017408***	0.0001044*	0.2104239***	0.0085505*	0.0847534***	0.0025229*
	[3.65]	[2.03]	[4.95]	[2.00]	[3.85]	[1.87]
Loss $_{t-1}$	-0.0000221	0.0000753	-0.0224965	-0.0010383	-0.0040009	-0.0003684
	[-0.06]	[0.37]	[-0.83]	[-0.06]	[-0.53]	[-0.10]
Cash / Assets $_{t-1}$	-0.0018495**	-0.0008052**	-0.1422335**	-0.064684**	-0.0663586**	-0.0261531**
	[-2.62]	[-3.20]	[-2.87]	[-3.17]	[-2.43]	[-3.29]
Ln(Stock Return) $_{t-1}$	-0.000048*	-0.0000482**	-0.0024394	-0.0029404*	-0.0015921*	-0.0013865**
	[-1.42]	[-2.69]	[-0.91]	[-1.90]	[-1.77]	[-3.07]
Ln(Stock Return) $_{t-2}$	-0.0000335	0.0000016	-0.0008822	0.0005777	-0.0009236	-0.0004477
	[-1.15]	[0.09]	[-0.34]	[0.37]	[-1.08]	[-1.03]
Ln(Stock Return) $_{t-3}$	0.00000267	0.00000432	-0.0002688	0.0015113	-0.0010668	-0.000491
	[0.08]	[0.24]	[-0.11]	[1.05]	[-1.11]	[-1.11]
Dividend Yield $_{t-1}$	-0.0000446	-0.00000828	0.0079669	0.0087493*	-0.0020901	-0.000457
	[-0.92]	[-0.32]	[1.29]	[2.00]	[-0.88]	[-0.36]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.0166	0.0066	0.0074	0.0004	0.0231	0.0093

Table 9: Relation between Share Repurchase Activity and the value of the vested option (continued)

Panel C. Controlling for Firm Characteristics and CEO Characteristics						
	[1]	[2]	[3]	[4]	[5]	[6]
Sample	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms	Treatment Firms Only	Treatment & Control Firms
Dependent Variable	Shares Repurchased / Shares Outstanding		Repurchase Dummy		Ln(Repurchase Value)	
Post	-0.0005902	-0.0000903	-0.1326027**	-0.0707757*	-0.017661*	-0.0047724
	[-0.92]	[-0.17]	[-2.96]	[-2.22]	[-1.67]	[-0.58]
Option Grant Value / Salary	-0.00000000000964	-0.0000000000136	0.00000000518	0.00000000492	-0.00000000013	-0.000000000184
	[-0.42]	[-0.58]	[1.04]	[1.08]	[-0.33]	[-0.51]
Post * Option Grant Value / Salary	0.0000541	0.0000175	0.009789	0.0057717	0.0011723	0.0002329
	[0.45]	[0.19]	[1.02]	[0.73]	[0.45]	[0.15]
Ln(Assets) $_{t-1}$	-0.0001851	-0.0001092*	-0.023331*	-0.0132104*	-0.0024494	-0.0015585
	[-1.14]	[-1.66]	[-1.52]	[-2.13]	[-0.65]	[-1.16]
Book / Markets $_{t-1}$	-0.00000563*	-0.00000606*	-0.0011852*	-0.001125*	-0.0002325*	-0.0001405*
	[-1.47]	[-1.44]	[-2.21]	[-2.23]	[-2.12]	[-1.82]
ROA $_{t-1}$	0.001735***	0.0001038*	0.2076313***	0.008542*	0.84231***	0.0025467*
	[3.62]	[2.03]	[4.92]	[2.01]	[3.84]	[1.88]
Loss $_{t-1}$	-0.00000396	0.0000825	-0.0230571	-0.001703	-0.0037785	-0.0004166
	[-0.01]	[0.40]	[-0.85]	[-0.10]	[-0.50]	[-0.11]
Cash / Assets $_{t-1}$	-0.0018715**	-0.0008058**	-0.1387193**	-0.0641123**	-0.0665141**	-0.0263189**
	[-2.65]	[-3.20]	[-2.79]	[-3.13]	[-2.44]	[-3.30]
Ln(Stock Return) $_{t-1}$	-0.0000469	-0.0000476**	-0.0024018	-0.0029259*	-0.0015644*	-0.00137**
	[-1.38]	[-2.65]	[-0.90]	[-1.88]	[-1.74]	[-3.03]
Ln(Stock Return) $_{t-2}$	-0.0000333	0.00000162	-0.0009611	0.0005345	-0.0009322	-0.0004501
	[-1.15]	[0.10]	[-0.37]	[0.34]	[-1.08]	[1.04]
Ln(Stock Return) $_{t-3}$	0.00000168	0.00000372	-0.0003179	0.0014808	-0.001081	-0.0005005
	[0.05]	[0.20]	[-0.13]	[1.03]	[-1.13]	[-1.14]
Dividend Yield $_{t-1}$	-0.0000431	-0.00000716	0.0078052	0.0087819*	-0.0021236	-0.000442
	[-0.89]	[-0.28]	[1.26]	[2.01]	[-0.90]	[-0.35]
Chairman	-0.0000474	-0.0000603	0.0502247	0.0450141	0.0075751	0.0059386
	[-0.10]	[-0.13]	[1.03]	[0.95]	[0.49]	[0.41]
New CEO	0.000725*	0.0006958*	0.0103092	0.009899	0.010803	0.0104754
	[1.53]	[1.51]	[0.38]	[0.37]	[1.07]	[1.06]
Ln(CEO Tenure)	-0.00000431	-0.00000906	-0.0021843*	-0.0024584*	-0.0003078	-0.0004572
	[-0.23]	[-0.48]	[-1.63]	[-1.85]	[-0.73]	[-1.11]
Ln(CEO Age)	-0.0000342	-0.00000442	0.0018757	0.0028428	0.0001263	0.0007845
	[-0.69]	[-0.13]	[0.51]	[0.97]	[0.11]	[0.96]
CEO AGE > 62	-0.0000794	-0.0000297	-0.0083064	-0.0021355	-0.0028436	-0.0012261
	[-0.74]	[-0.29]	[-0.89]	[-0.24]	[-1.01]	[-0.45]
Female CEO	-0.0002684	-0.0002187	0.0138784	0.0189746	-0.0051814	-0.0037442
	[-1.30]	[-1.10]	[0.84]	[1.18]	[-1.09]	[-0.81]
Ln(CEO Delta) $_{t-1}$	-0.00000136	-0.00000444	0.0009896	0.0001399	0.0004315	0.0002041
	[-0.13]	[-0.82]	[0.99]	[0.25]	[1.19]	[1.16]
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-Squared	0.0171	0.0067	0.0084	0.0014	0.0245	0.0131

Table 10: Cumulative Abnormal Returns (CAR) from share repurchases around normal period, grant date & exercise date

This table presents cumulative abnormal returns (CAR) calculative from repurchases around the 3 different periods : the normal event window [-180,-120] starting from t-6 to t-4 , the pre-event window [-90,-30] from period t-3 to t-1 and the post-event window [30,90] from period t+1 to t+3. T-statistics are show in parentheses below the coefficients *, **, *** indicate the significance at the 10, 5, 1% level.

Table 10.CAR for all time periods

Full Sample	Base Period [-6,-4]	Pre Period [-3,-1]	Post Period [1,3]
Stock Option Grants	-0.0602523700	-0.0243029*	0.13214624*
	(1.37)	(2.06)	(1.91)
Vested Stock Options	0.07155371*	-0.03279184	-0.037393170
	(1.84)	(0.51)	(0.83)