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Компенсация CEO, избыточная самоуверенность и решения о выплатах собственникам

Диссертация
на соискание ученой степени
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Introduction

Chief Executive Officer (CEO) can be considered as one of the most powerful and influential decision-makers in a company. Although the corporate decisions should be approved by shareholders and by the board of directors, that represents shareholders' interests, the survey shows that companies' executives consider themselves as major decisions makers [Brav et al, 2005]. Thus, it is argued that corporate decisions are affected not only by firm-level characteristics, but also by some factors, which are attributed to top executives, especially to CEOs. These factors may have rational background in the form of compensation incentives [Fenn, Liang, 2001] or inherent risk-aversion [Graham et al., 2013]; or may be explained by personal characteristics and experiences, such as personal financial habits [Cronqvist et al., 2012], early life or career experiences [Dittmar, Duchin, 2016; Bernile et al., 2017] and moreover - by behavioral biases, such as overconfidence [Malmendier, Tate, 2005] and others. The interaction of rational compensation incentives, personal traits and irrational biases of a CEO may also influence corporate policies [Gervais, Heaton, Odean, 2011]. Corporate decisions that are affected by CEO-level characteristics include payout decisions among others.

The results of recent research in the area of payout policy have shown that CEO-level characteristics such as rational compensation incentives of a CEO and other top executives [Caliskan, Doukas, 2015; Burns et al., 2015; Geiler, Renneboog, 2016; Wu, Wu, 2020] and irrational biases, such as CEO's overconfidence [Ben-David et al., 2007; Deshmukh et al., 2013; Shu et al., 2013; Banerjee et al., 2018(a)] play important roles in shaping the payout policy.

First, authors show that different types of CEO's compensation (equity-based compensation, inside debt) affect payout decisions. Equity-based compensation leads to a decrease in the total payout [Fenn, Liang, 2001; Cuny, Martin, Puthenpurackal, 2009] and in the level of cash dividends [Burns et al., 2015; Geiler, Renneboog, 2016] if the incentives are not dividend protected, which

is true in the case of executive stock options. Equity-based compensation may provide incentives for an increase in the level of share repurchases [Fenn, Liang, 2001; Aboody, Kasznik, 2008], as repurchases do not reduce the value of executive's equity portfolio.

CEOs with compensation in the form of inside debt set higher levels of cash dividends [Caliskan, Doukas, 2015; Wu, Wu, 2020], while the effects of inside debt on share repurchases are unclear. Inside debt aligns CEO's interests to those of debtholders and provides incentives for risk-averse behaviour, which may lead to a smaller set of attractive investment opportunities and to higher levels of cash dividends.

Second, it has been shown by recent studies that overconfident CEOs tend to set and maintain lower levels of cash dividends [Ben-David et al., 2007; Deshmukh et al., 2013]. On the other hand, repurchases are higher in companies with overconfident CEOs [Shu et al., 2013; Banerjee et al., 2018(a)]. Such CEOs may consider the company's shares to be undervalued by investors and possess upwardly-biased estimates of a company's value. Moreover, as their compensation mostly consists of equity-based instruments [Humpherry-Jenner et al., 2016] they may be induced to repurchase shares to avoid the negative impact of cash dividends on the value of their portfolio.

Finally, since overconfident CEOs tend to set lower levels of payout in the form of cash dividends, the question has been raised as to the possibility of monitoring and utilizing the benefits of CEO's overconfidence in order to protect the interests of shareholders. It is argued that the adverse impact of biased CEOs on corporate decisions may be significant when corporate governance is weak and limited in its ability to provide enough monitoring to force such CEOs to make rational decisions [Baker, Wurgler, 2012]. The theory of corporate governance, which showed that boards of directors are a primary tool for protecting shareholders' interests, has been deepened recently by new evidence that boards of directors are capable of managing the CEO's overconfidence [Kolasinski, Li, 2013; Banerjee, Masulis, Upadhyay, 2018], leading to an increase in the level of

cash dividends in companies with overconfident CEOs [Banerjee et al., 2015]. The findings suggest that a corporate governance of higher quality is able to provide optimal incentives for a CEO through different remuneration options, accounting for his or her overconfidence, in order to increase shareholders' wealth.

Although researchers have already shown that CEO-level characteristics affect payout policy and that these effects can be mitigated by improvements in corporate governance, we have defined some areas of possible contribution. First, it has been shown that inside debt and its components do not affect the level of repurchases or the choice of payout channel [Wu, Wu, 2020; Borah et al., 2020]. Because of the growing importance of repurchases for payout policy, we believe that this question requires further investigation on a more recent time period.

Second, different components of inside debt (pension benefits and deferred compensation) may provide different incentives for payout decisions because pension benefits are a longer term compensation tool than deferred compensation. However, recent research has not shown the differences between the impact of pension benefits and deferred compensation on payout decisions.

Third, several approaches have been developed to measure CEO's overconfidence. Two of them have been proved to be the most reliable: the first uses data on the strike prices and holding periods of executive stock options to construct time-invariant variables [Deshmukh et al., 2013], while the second constructs continuous variables by using data on vested but unexercised options value and amount [Banerjee et al., 2018(a)]. It may be the case that the second approach may capture not only the effects of CEO's overconfidence, but also the compensation incentives, because this approach is based on the information about option-based compensation. Although these two approaches yield similar results when applied separately on different samples, it may be of interest to check the stability of these results on a single sample.

Fourth, to assess the ability of board's work to mitigate the impact of CEO's overconfidence on corporate decisions, including payout policy, previous research has used the implementation of Sarbanes-Oxley Act of 2002 to account for

corporate governance improvements [Banerjee et al., 2015]. Although the results support their hypothesis that improved corporate governance has led to increased payouts in companies with overconfident CEOs, this effect may as well be driven by the dividends tax cut of 2001. Thus, this result requires further verification and application of other methods to measure improvements in corporate governance.

Fifth, previous research studied the effects of compensation incentives and CEO's overconfidence on payout decisions separately, using different samples and time periods. Thus, it was not possible to test whether both rational incentives and irrational overconfidence affect CEO's decisions about payout and to compare these effects, which may be of interest to better understand the drivers of CEO's decisions.

Finally, previous research, especially for the relationship between CEO's compensation and payout policy, has been mostly conducted on the data from 1990-2010. It may be interesting to check whether the obtained results are still relevant using more recent dataset.

The analysis and investigation of these gaps **is the primary motivation behind this research**.

The aim of this research is to find evidence for the impact of a CEO's rational incentives and irrational bias such as overconfidence on payout decisions. For the purpose of our research, the term 'payout decisions' is defined as a set of financial decisions about the payout itself in the form of dividends and repurchases; about the level of payout in the form of cash dividends and share repurchases; and about the choice of payout channel.

The objectives of this research are the following:

1. To identify the impact of CEO's incentives on the probability of paying cash dividends and repurchasing shares, on their respective levels, and on the choice of payout channel;
2. To determine the differences between the impact of various compensation incentives (i.e. stocks, options, inside debt) on payout decisions;

3. To find out the impact of CEO's overconfidence on the probability of paying cash dividends and repurchasing shares, on their respective levels, and on the choice of payout channel;
4. To test whether corporate governance of higher quality is able to better monitor and mitigate the impact of CEO's overconfidence to benefit shareholders.

To achieve these objectives, we use a sample of 813 companies from the USA for the period of 2007-2019. To run empirical tests, we use open data from the Securities and Exchange Commission (SEC) and the commercial databases of S&P Capital IQ, Thomson Reuters Eikon, and Bloomberg as **the main sources** of financial data, data on CEO compensation, and data on the characteristics of board of directors.

Contribution. We contribute to three strands of literature: on the impact of CEO's compensation incentives on payout decisions; on the impact of CEO's overconfidence on payout decisions; and on the ability of high-quality corporate governance to effectively monitor CEO's overconfidence to benefit shareholders.

The impact of CEO's compensation incentives on payout decisions. First, to our knowledge, we are first to link inside debt and decisions about repurchases and to show that higher levels of inside debt may lead to higher probability and levels of share repurchases. Higher levels of inside debt also incentivize a CEO to choose repurchases as a main payout channel. This means that repurchases, along with cash dividends, are the channels through which inside debt alleviates agency problems.

Second, as far as we know, we are first to show that different components of inside debt may provide different incentives in terms of payout decisions and the choice of payout channel. Namely, deferred compensation provides incentives for higher levels and probabilities of repurchases, while pension benefits - for higher levels and probabilities of cash dividends. We argue that as pension benefits are providing longer-term incentives than deferred compensation, they may motivate a CEO to establish more stable and conservative payout policy, which is to pay cash

dividends, to avoid the deterioration of company's funds. On the other hand, deferred compensation is not so long-term and may provide incentives for less commitment-intensive payout policy, which is to repurchase shares.

Third, although we show that the probabilities of cash dividends and repurchases and their respective levels are higher in companies where the CEO's compensation in the form of company's stocks is higher, which is in line with previous findings [De Cesari, Ozkan, 2015], we are first to show that CEOs with higher option-based compensation are less likely to repurchase stocks and are less likely to choose repurchases as a main channel of payout. These findings contradict previous results that options lead to dividends being substituted for repurchases [Fenn, Liang, 2001; Geiler, Renneboog, 2016]. We assume that these results may be driven by the fact that such CEOs try to increase the value of their options portfolio by increasing the volatility of company's stocks. For this purpose they may take up high risk investment projects at the expense of share repurchases programs.

The impact of CEO's overconfidence on payout decisions. First, we contribute by showing that the probability of cash dividends is higher in companies with overconfident CEOs. Although previous research has found that the *level* of cash dividends is lower, when a CEO is overconfident [Deshmukh et al., 2013], we are first to show that the *probability* of cash dividends is higher in such companies. This means that overconfident CEOs may have different motivation behind the decision about paying cash dividends and the decision about the level of cash dividends.

Second, we show that the fraction of repurchases is higher in companies with overconfident CEO's. This may be a sign that such CEOs choose repurchases as a primary channel of payout. This result is novel, because previous researchers either have not found significant relationship between overconfidence and fraction of repurchases [Deshmukh et al., 2013], or have considered repurchases as a substitute for excess (unexpected) dividends, showing that overconfident CEOs repurchase stocks while reducing the excess dividends [Banerjee et al., 2018(a)].

Our approach does not control for unexpected dividend changes, instead we are interested in whether or not repurchases are the dominant payout channel in companies with overconfident CEOs.

Third, we contribute by testing hypotheses using two approaches to measurement of CEO's overconfidence. We provide evidence that different approaches yield qualitatively similar results for the probabilities and levels of repurchases. However, for the probabilities and levels of cash dividends the situation is different. The lower level of cash dividends in companies with overconfident CEO is true for continuous measures of overconfidence (which are based on the value of vested but unexercised executive stock options), while higher probability is true for time-invariant measures (which are based on the moneyness of option and exercise data). As continuous measures are based on the value of executive stock options, they may capture not only the effects of overconfidence, but also those of CEO's compensation (the detailed description of overconfidence measures is provided below).

The ability of high-quality corporate governance to effectively monitor CEO's overconfidence to benefit shareholders. First, using the index of corporate governance quality, developed in this dissertation, we show that corporate governance of higher quality may reduce the impact of CEO's overconfidence on payout decisions. More specifically, it reduces the negative effects of overconfidence on the level of cash dividends and positive effects of overconfidence on the level of repurchases. This means that the level of cash dividends will be higher and the level of repurchases will be lower in companies with overconfident CEOs, if the quality of corporate governance is higher. We argue that it may be the case that boards of directors consider cash dividends as a more preferable payout channel than repurchases, and they force overconfident CEOs to rebalance the payout mix. We contribute to the existing literature [Banerjee et al., 2015] by showing these effects using the index that captures company-level corporate governance quality more directly than the implementation of Sarbanes-Oxley Act in 2002, which was used in previous

studies, and isolating possible effects of dividend tax cut of 2001 by using the more recent dataset.

Second, we have shown that corporate governance of higher quality not only mitigates the effects of CEO's overconfidence on payout decisions, but also utilizes the benefits of overconfidence for the purposes of value creation. Both market and operating performance are higher in companies with overconfident CEOs, if the quality of corporate governance is higher. We contribute by providing evidence based on the company-level characteristics of boards of directors and not on the exogenous effects of implementation of Sarbanes-Oxley Act.

Third, we show that different components of corporate governance quality index have different impact on the relationship between overconfidence and payout decisions. For example, gender diversity and audit committee independence show better ability to reduce the impact of CEO's overconfidence on payout decisions than the size of the board, board of directors' independence, and CEO duality. Although previous researchers have used gender diversity of the board [Banerjee, Masulis, Upadhyay, 2018] and optimal size and board's independence [Kolasinski, Li, 2013] to check their ability to reduce the effects of overconfidence on corporate decisions, we are first to implement this approach to payout decisions.

Research methodology. To distinguish between different types of compensation incentives we use information on CEO's compensation in the form of salary and bonuses; stocks; restricted stock units; executive stock options; deferred compensation; and pension benefits [Geiler, Renneboog, 2016; Wu, Wu, 2020]. We use this information to construct the variables that capture various compensation incentives of CEOs.

To measure CEO's overconfidence we use two approaches. For the first approach we use data on the exercises of executive stock options from the Form 4 of SEC. We use these data to define the moneyness of each option tranche at the beginning of its expiration year, and whether it was exercised during the expiration year. Following this approach [Malmendier, Tate, 2005; 2008; 2015], we define a CEO as overconfident if he or she exercised an option during its expiration year,

even if it was at least 40% in the money at the beginning of the expiration year. This is a time-invariant measure of overconfidence.

For the second approach we use data on the value and amount of vested but not exercised options, provided by S&P Capital IQ. Following previous research, [Banerjee et al., 2018(a); Banerjee et al., 2020] we find the value per option by dividing the value by amount, and then divide it by the stock price at the corresponding year's end. The higher the measure is, the higher is the overconfidence. This measure is a continuous measure of CEO's overconfidence. We also develop an alternative continuous measure by dividing the value of vested but not exercised options over the value of all vested options. This measure may capture the effects of CEO's overconfidence, as it shows the fraction of unexercised options in total vested options holdings, which may show the CEO's willingness to postpone the option's exercise.

To assess the impact of a CEO's compensation and overconfidence on the choice of payout channel, and on the level of dividends and share repurchases, we use panel tobit regressions with robust standard errors clustered by firms. To account for endogeneity we include dummy variables for industries and years.

To check the robustness of results, we use the generalised method of moments (GMM), applying Arellano and Bond's estimator [Arellano, Bond, 1991] with adjustments by Roodman [Roodman, 2009]. This method is applicable to the present study as our sample has a large number of observations (companies) and a small number of years. This method also helps to solve some endogeneity issues concerning independent variables and also takes lags of dependent variables into consideration. To assess the models' quality, we use Hansen's specification test and Arellano-Bond's test on autocorrelation.

To assess the influence of a CEO's compensation and overconfidence on the probability of dividends and repurchases, we use a panel probit regression [Wooldridge, 2005] with dummies for industries and years.

To evaluate the ability of corporate governance of higher quality to reduce the influence of a CEO's overconfidence on payout decisions, we develop an index

of corporate governance quality. The following significant characteristics of boards of directors have been defined and included in our index: the size of the board of directors [Kolasinski, Li, 2013; Muravyev, Berezinets, Ilina, 2014]; the number of independent directors on the board [Kolasinski, Li, 2013]; the gender diversity of the board [Green, Homroy, 2018; Banerjee, Masulis, Upadhyay, 2018]; the independence of audit committee [Mande et al., 2012; Zhu, 2014]; and CEO duality – when a CEO serves simultaneously as board chairman [Al-Ahdal et al., 2020]. With the use of this set of characteristics, we apply the principal components method to construct the index. To check the robustness of obtained results, we develop another index using the equal weights for boards' characteristics, and investigate the impact of each characteristic on the relationship between overconfidence and payout decisions separately.

Theoretical implications. Our findings may be used to support existing theories in corporate finance. First, the findings may add to agency theory. As inside debt may lead to higher levels of not only dividends, but also repurchases, we believe that this type of compensation may align CEO's interests to those of bondholders *and* shareholders. Inside debt alleviates agency conflicts through dividends and repurchases, which supports agency theory.

Second, we add to the theory of corporate governance. We show that payout levels are higher in companies with overconfident CEOs, if the quality of corporate governance is higher. This supports the theoretical predictions that better governance leads to higher payouts.

Finally, this research provides models, metrics and frameworks that can be applied in further research. The econometric models applied in this dissertation can be used in future research on companies internationally, including those in emerging markets. Moreover, the methodology of calculation of the index of corporate governance quality that we developed may be used in future research on corporate governance in various topics. The role of the boards in mitigating behavioral biases that we introduced and studied in relation to payout policies can be further applied in the area of behavioural corporate finance.

Practical implications. First, relying on the results of this dissertation, shareholders may start the processes of improving corporate governance quality in their companies, in order to protect themselves from the effects of CEO's overconfidence. A system of corporate governance can be established and adjusted according to shareholders' interests and CEO's overconfidence in order to utilise the benefits of this bias for the purposes of increasing a company's performance indicators.

Second, based on the results obtained in this research, companies' shareholders and boards of directors, who are responsible for representing and protecting shareholders' interests, have the opportunity to develop and implement remuneration tools that would adjust CEO's behaviour optimally in terms of meeting the demands of shareholders. Measures and methods developed in this dissertation may be used in companies to determine CEO's overconfidence and to assess its impact on different strategic decisions (including payout policy), in order to be able to adjust company's remuneration and staff policy accordingly.

The results of this dissertation **are published in the following research papers:**

1. Anilov, A. (2017). "Behavioral Motives of the Payout Policy Choice: Literature Review", Journal of Corporate Finance Research, 11 (4), pp. 93-112;
2. Anilov, A.E., Ivashkovskaya, I.V. (2019). "Do Boards of Directors Affect CEO Behaviour? Evidence from Payout Decisions". Journal of Management and Governance 24 (4), pp. 989-1017, https://doi.org/10.1007/s10997-019-09491-z. (Scopus Q2);
3. Anilov, A. (2019). "Do Overconfident CEOs Pay More to Shareholders? Evidence from the US Market" // Journal of Corporate Finance Research, Vol. 13. No. 2. pp. 25-35.

The results of this dissertation **have been presented in the following conferences and workshops:**

1. Report on the 15th Workshop on Corporate Governance of European Institute of Advanced Studies in Management (EIASM) in November, 2018 in Brussels, Belgium with the study titled «Do Boards of Directors Affect the CEO's Behaviour? The Evidence from Payout Decisions». The paper received one of the four 'Best Paper' awards and was recommended for publication in the Journal of Management and Governance.
2. Report on the 4-th International GSOM Emerging Markets Conference 2017 in the Graduate School of Management (Saint-Petersburg State University) in October, 2017 with the research titled «CEO risk preferences and payout policy choice».
3. Report on the International PhD Workshop "Financial Markets and Corporate Strategies: Comparative Studies" as a part of the XIX April International Academic Conference of Higher School of Economics in April, 2018 with the research titled «Overconfident CEOs and payout policy choice».
4. Report on the international conference «Lomonosov-2018» in Moscow State University in April, 2018 with the study titled «Overconfident CEOs and payout policy choice». The award for 2nd place was received.
5. Report on the "EURAM – 2019" of European Academy of Management in June, 2019 in Lisboa, Portugal with the research paper «Do Boards of Directors Affect the CEO's Behaviour? The Evidence from Payout Decisions». The report was named one of the best among the special track "Special interest group in corporate governance".

The results of this dissertation have also been reported and discussed on several workshops and seminars, organized by the School of Finance and Doctoral School of Economics in the Higher School of Economics.

The text is organized as follows. In the first section, we analyse and discuss theoretical and empirical papers that investigate different motives behind payout decisions, including classic theories, and the behavioural approach. Based on this

analysis, we define several research questions that have not been discussed in previous research. The second section is devoted to the impact of CEO's compensation on payout decisions: we outline hypotheses, discuss and analyse the sample, develop econometric models, present and discuss results. In the third section we investigate the impact of CEO's overconfidence on payout decisions. In the fourth section we analyse the capability of high-quality corporate governance to reduce the impact of CEO's overconfidence on payout policy.

The dissertation contains 64 tables, 7 graphs and references on 214 research papers and books, 82 of which (40%) have been published in 2015-2020.

Section 1. Motives behind payout decisions: theoretical approaches

In this Section we analyse the theoretical and empirical research in the field of payout policy. By investigating the classical and behavioural theories of payout policy, we identify some blind spots in the current research in order to formulate and test hypotheses of the dissertation.

1.1 Classic theories of payout policy

Questions around the significance of payout policy in terms of company value creation and the factors that determine payout policy were first raised by Miller and Modigliani. The authors came to the conclusion that decisions about payouts to shareholders do not affect the company's value, under a certain set of assumptions about a perfect capital market [Miller, Modigliani, 1961]. These included: (i) investors and managers are fully rational; (ii) economic agents have equal access to information, i.e. information asymmetry is absent; (iii) the absence of transaction costs; (iv) tax rates are either zero or equal on both dividend income and capital gains income; (v) no agency costs; (vi) competitive product and financial markets.

Under these assumptions the shareholders' wealth is defined by the cash flows from investment projects that have been undertaken by a company previously, and not by the way this cash is distributed among shareholders. The authors demonstrated that if these assumptions do not hold, payout policy will start to affect the company's value. Subsequent research analysed market imperfections and their impact on payout decisions. In this subsection we discuss these theories, their assumptions, and the results of empirical tests on different markets.

Signalling Theory

It is clear that in the real market, economic agents do not have equal access to information. First of all, this is usually the case in relationships between CEOs and investors in the company's securities. CEOs usually possess more precise and

recent information on a company's financial and economic performance and its future prospects. Moreover, they may influence the information available to the investors and the quality of such information. Thus, the assumption of the absence of information asymmetry in the markets is not realistic, which is the point in question regarding the signalling theory.

The basics of signalling theory was developed by Ross, who proposed the model of signals that a company may send to the financial markets about its "quality" [Ross, 1977]. Ross demonstrates that this signal may be transferred to the market by a company's choice of capital structure: a company which has a level of debt above a certain threshold is considered to be of "high quality" by the markets. In contrast, a company of "low quality" cannot mimic such a signal because the CEO's wealth in this case will be severely damaged. Later the signalling argument has been also applied to payout decisions. The underlying concept of the signalling theory is that CEOs use payout policy to send a signal about the current earning power and its future capacity to generate earnings in order to mitigate the information asymmetry problem. Usually, an increase in the level of payout to shareholders may be a sign of the CEO's confidence in the future cash flows and, consequently, in the possibility of maintaining higher levels of payout in the future [Bhattacharya, 1979; Miller, Rock, 1985]. Researchers have proposed analytical models that show that CEOs use announcements about changes in payout policy to send signals to the markets about a company's anticipated *future earnings*. If a company's investment policy is held constant, then the increase in dividends level is a signal about the quality of *current earnings*. The markets usually react with an increase in the level of demand on a company's stocks and in their market price if the level of investment does not decrease.

Table 1 summarises the results of papers that have tested signalling theory empirically. The papers in Table 1 have been chosen to assess results from both developed and emerging markets, and from different time periods. We have also chosen these particular papers to discuss the theoretical aspects of signalling theory.

Table 1. Results of testing the signalling theory of payout policy[1].

Authors and year of publication	Sample	Model	Results
Signalling Theory: Cash Dividends			
Aharony, Swary, 1980	149 US companies, 1963-1976	Event-study method: the calculation of abnormal returns of companies' stocks after the dividend announcement.	Announcement about the upcoming changes in payout policy is a signal to the market and significantly affects the company's stock return.
Woolridge, 1983	225 US companies, 1970-1977	$r_{i,t} = \mu_{i,t} + \epsilon_{i,t}$, where $r_{i,t}$ – is an actual return on company i's stock; $\mu_{i,t}$ - is an expected return on company i's stock; $\epsilon_{i,t}$ – is a stochastic component, which defines the impact of new information on the stock return.	Announcement about the upcoming changes in payout policy is a signal to the market and significantly affects the company's stock return.
Bali, 2003	3022 US companies, 1965-1992	$\epsilon_{j,t} = r_{j,t} - 1/\mathrm{N} \sum_{i=1 \neq j}^{N} r_{i,t}$, where $\epsilon_{j,t}$ – is an abnormal return on company j's stock; $r_{j,t}$ - is an actual return on company j's stock after dividend announcement; $1/\mathrm{N} \sum_{i=1 \neq j}^{N} r_{i,t}$ - is an actual return on company i's stock, which is the same size as a company j, after the dividend announcement.	Announcement about the upcoming changes in payout policy is a signal to the market and significantly affects the company's stock return.

[1] We use green to highlight the articles that have found that the predictive extension of signaling theory corresponds with payout policy, and we use red if authors have found evidence that contradict the theory's predictions.

Michaely et al., 1995	US companies, 1964-1988	Event-study method: the calculation of abnormal returns of companies' stocks after dividend announcement.	Announcement about the upcoming changes in payout policy is a signal to the market and significantly affects the company's stock return.
Conroy et al., 2000	Companies from Japan, stocks of which trade on the Tokyo Stock Exchange, 1988-1993	Event-study method: the calculation of abnormal returns of companies' stocks after dividend announcement.	Announcement about the upcoming changes in payout policy is NOT a signal to the market and does NOT significantly affect the company's stock return.
Benartzi et al., 1997	1025 US companies, 1979-1991	Event-study method: the calculation of abnormal returns of companies' stocks after dividend announcement.	Announcement about the upcoming changes in payout policy is NOT a signal to the market about future levels of profitability.
Grullon et al., 2005	US companies, 1963-1997	Event-study method: the calculation of abnormal returns of companies' stocks after dividend announcement.	Announcement about the upcoming changes in payout policy is NOT a signal to the market about future levels of profitability.
DeAngelo et al., 1996	145 US companies, 1980-1987	Event-study method: the calculation of abnormal returns of companies' stocks after dividend announcement.	Announcement about the upcoming changes in payout policy is NOT a signal to the market about the future levels of profitability.
Bhattacharya, 1979	Without empirical tests	Analytical model development and comparative statics analysis.	Dividend announcement is a signal to the market about future levels of profitability.
Miller, Rock, 1985	Without empirical tests	Analytical model development and comparative static.	Dividend announcement is a signal to the market about future levels of

			profitability.
Brickley, 1983	US companies, 1969-1979	Event-study method: the calculation of abnormal returns of companies' stocks after dividend announcement.	Announcement about the upcoming changes in payout policy is a signal to the market and significantly affects the company's stock return.
Signalling Theory: Stock Repurchases			
Grullon, Michaely, 2002	US companies, 1972-2000	$CAR_i = \alpha_0 + \alpha_1 * Chng_i + \alpha_2 * Size_i + \varepsilon_i$, where CAR_i - is a cumulative abnormal return on company i's stock after repurchase announcement; $\alpha_{0,1,2}$ - const; $Chng_i$ – is a change in the level of payout to shareholders; $Size_i$ – is the level of repurchase; ε_i - is a normally distributed error term.	Announcements of repurchase initiation is a signal to the market that the company's shares are undervalued compared to their fundamental value.
Ikenberry et al., 1995	US companies, 1980-1990	Event-study method: the calculation of abnormal returns of companies' stocks after repurchase announcement.	Announcement about repurchase initiation is NOT a signal to the market about the future levels of profitability, because the market does not consider this information.
Ikenberry, Vermaelen, 1996	US companies, 1980-1990	$CAR_i = \alpha_0 + \alpha_1 * SD_i + \alpha_2 * Size_i + \varepsilon_i$, where CAR_i - is a cumulative abnormal return on company i's stock after repurchase announcement; $\alpha_{0,1,2}$ - const; SD_i – is a standard deviation of company i's stock return; $Size_i$ - is the level of repurchase; ε_i - is a normally distributed error term.	Announcements of repurchase initiation is a signal to the market that the company's shares are undervalued compared to their fundamental value.

Grullon, Michaely, 2004	US companies, 1980-1997	$\Delta OP_t = \alpha_0 + \alpha_1 * REP_t + \alpha_2 * X_t + \varepsilon_t$, where ΔOP – is a change in the level of company's operational efficiency; REP_t - the number of shares to be repurchased; X_t- the levels of different types of cash flows; $\alpha_{0,1,2}$ - const; ε_t - is a normally distributed error term.	Announcement about repurchase initiation is NOT a signal to the market about future levels of profitability.
Jagannathan, Stephens, Weisbach, 2000	US companies, 1985-1996	$Payers_i = \alpha_0 + \alpha_1 * X_i + \alpha_2 * SR_i + \varepsilon_i$, where $Payers_i$- is a binary variable defining the choice of payout channel; X_i- control variables; $\alpha_{0,1,2}$ - const; SR_i - is an actual return on company i's stock; ε_i - is a normally distributed error term.	Announcement about the upcoming changes in payout policy is a signal to the market and significantly affects the company's stock return; dividends signal about the sustainable growth in the level of cash flow, while repurchases signal about the temporary positive shock to the cash flow, which is hardly sustainable.
Guay, Harford, 2000	3612 US companies, 1981-1993	$CAR_i = \alpha_0 + \alpha_1 * Size_i + \alpha_2 * CFS_i + \alpha_3 * dummy_i + \varepsilon_i$, where CAR_i - is a cumulative abnormal return on company i's stock after payout announcement in any form; $\alpha_{0,1,2,3}$ - const; $Size_i$ – is the level of payout; CFS_i – is the level of external shock to the operational cash flow; $dummy_i$ - is a binary variable defining the choice of payout channel; ε_i - is a normally distributed error term.	Announcement about the upcoming changes in payout policy is a signal to the market and affects significantly the company's stock return; dividends signal about the sustainable growth in the level of cash flow, while repurchases signal about the temporary positive shock to the cash flow, which is hardly sustainable.

As can be seen from the first part of Table 1, the authors come to contradictory conclusions regarding the signals that are contained in the announcements about payout policy choice. Most research in the area of signalling theory is carried out using the event-study methodology (which is based on the calculation of cumulative abnormal return after some event or announcement) after information is released. Research based on US companies for the period of 1960-1970s has shown that a dividend announcement is a signal for the market about the *future profits* of the company [Aharony, Swary, 1980; Brickley, 1983; Michaely, Thaler, Womack, 1995]. Authors who have applied the regression analysis [Woolridge, 1983; Bali, 2003] have come up with the same conclusion. Nevertheless, later studies based on data from the period of the 1980s and 1990s have found no evidence in support of signalling theory in US companies [DeAngelo, DeAngelo, Skinner, 1996; Benartzi, Michaely, Thaler, 1997; Grullon et al., 2005], or in Japanese companies [Conroy, Eades, Harris, 2000]. More recent research has found that the market reaction to dividend announcements may depend on the company's industry [Rogova, Berdnikova, 2014].

The dynamics of empirical results may be considered as evidence that in the course of time the information component of the dividend payments has decreased. In such a situation, the market has stopped responding as actively to announcements about payout policy changes or to the initiation of payouts to shareholders. This trend coincided with a reduction in the proportion of dividends in the aggregate level of payout to shareholders, and with an increase in the share of stock repurchase [Fama, French, 2001]. For that reason, it has become necessary to check the signalling theory as regards stock repurchases as well. As can be seen from the second part of Table 1, researchers have come to the same conclusion - that stock repurchase does not carry the information to the market about a company's future profits [Ikenberry, Lakonishok, Vermaelen, 1995; Grullon, Michaely, 2004]. Unlike dividends, which may be a signal of sustainable profit growth that will be preserved into the future, the increase of payout through stock repurchases is mostly considered by the market as a signal about a temporary

positive shock in the level of current net income [Guay, Harford, 2000; Jagannathan, Stephens, Weisbach, 2000]. In this case, stock repurchase does not contain any signals about levels of future profits. Instead, the information carried by stock repurchases signals that the CEO considers the company's shares to be underestimated by the market in comparison with their fundamental value [Ikenberry, Vermaelen, 1996; Grullon, Michaely, 2002].

The markets react quite similarly on the information about payout in the form of so-called special dividends, or '*specials*' [DeAngelo, DeAngelo, Skinner, 2000]. Specials are distributed on an irregular basis, and only if the level of a company's net income is higher than the level of regular dividends or expected dividends. CEOs of companies who use specials do not show confidence in the sustainable increase in levels of future net income, thus securing themselves from negative market reactions if they will have to cut dividends in the future. As a result, the market reaction to a specials announcement is not as strong as that for a dividends payout.

Signalling theory assumes that companies use dividends to convey only positive signals to the market about positive future outlooks or about a strong current financial position. As a response to this issue, a theoretical model has been developed, according to which CEOs consider not only the benefits from payout increases today, but also possible costs from decreasing payout levels in the future [Baker, Wurgler, Yuan, 2012; Shapiro, Zhuang, 2015]. By increasing the levels of payout, CEOs set up the psychological reference points for future payout levels. If these reference points are not achieved, the market reacts negatively. This negative reaction is usually stronger than the positive reaction from previous payout increases. Thus, under equilibrium, the following situations would present themselves: if the level of net income is not enough to maintain the regular or expected payout level, a company will distribute all its net income among shareholders; if its net income has increased slightly, a company will maintain the regular or expected level of payout; and if net income has increased significantly, a

company will increase payout to the level which is likely to be maintained in the future.

Agency theory

Another unrealistic assumption in payout policy theories is the idea of the absence of so-called agency conflicts – the conflicts of interest between various groups of economic agents involved in company's activities (e.g. shareholders, managers, debt holders, employees, and other stakeholders). Suppose that a company has a significant amount of free cash in its accounts, while at the same time, the set of attractive investment projects that may be implemented is limited. In such circumstances, a CEO may be willing to use this free cash to finance some inefficient projects or to cover non-productive operational expenses. If this is the case, shareholders will prefer to withdraw the free cash from the CEO's management by distributing it as dividends or as stock repurchases.

Table 2 summarises the results of research papers that have tested the idea of the agency explanation for payout motives.

Table 2. Results of testing the agency theory of payout policy.

Authors and year of publication	Sample	Model	Results
Agency Theory			
Rozeff, 1982	1000 US companies, 1974-1980	$PR_i = \alpha_0 + \alpha_1 * G_i + \alpha_2 * \beta_i + \alpha_3 * LSH_i + \alpha_4 * IH_i + \varepsilon_i$, where PR_i - is the level of dividend payout; G_i- is the revenue growth rate; β_i – is the company's stocks beta coefficient; LSH_i – is the natural logarithm of shareholders number; $\alpha_{0,1,2,3,4}$ - const; IH – is the share of company's stocks owned by insiders; ε_i - is a normally distributed error term.	The results support agency theory: companies with fewer stocks owned by the insiders distribute more dividends among shareholders.
Dempsey, Laber, 1992	1000 US companies, 1981-1987	$PR_i = \alpha_0 + \alpha_1 * G_i + \alpha_2 * \beta_i + \alpha_3 * LSH_i + \alpha_4 * IH_i + \varepsilon_i$, where PR_i - is the level of dividend payout; G_i- is the revenue growth rate; β_i - is the company's stocks beta coefficient; LSH_i – is the natural logarithm of shareholders number; $\alpha_{0,1,2,3,4}$ - const; IH - is the share of company's stocks owned by insiders; ε_i - is a normally distributed error term.	The results support agency theory: companies with fewer stocks owned by the insiders distribute more dividends among shareholders.
Alli et al., 1993	105 US companies, 1983-1985	$PR_i = \alpha_0 + \alpha_1 * H_i + \alpha_2 * \beta_i + \alpha_3 * InstH_i + \alpha_4 * X_i + \varepsilon_i$, where PR_i - is the level of dividend payout; H_i- is the number of shareholders; β_i - is the company's stocks beta coefficient; $InstH_i$ – is the share of institutional investors; $\alpha_{0,1,2,3,4}$ - const; X_i - control variables; ε_i - is a normally distributed error term.	The results support agency theory: companies with more institutional investors distribute more dividends among shareholders.

Jensen et al., 1992	600 US companies, 1982, 1987	$PR_i = \alpha_0 + \alpha_1 * G_i + \alpha_2 * \beta_i + \alpha_3 * D_i + \alpha_4 * IH_i + \varepsilon_i$, where PR_i - is the level of dividend payout; G_i- is the revenue growth rate; β_i - is the company's stocks beta coefficient; D_i – is the level of company's debt; $\alpha_{0,1,2,3,4}$ - const; IH_i - is the share of company's stocks owned by insiders; ε_i - is a normally distributed error term.	The results support agency theory: companies with fewer stocks owned by the insiders distribute more dividends among shareholders.
Saxena, 1999	333 US companies, 1981-1990	$TPR_i = \alpha_0 + \alpha_1 * G_i + \alpha_2 * \beta_i + \alpha_3 * LSH_i + \alpha_4 * IH_i + \varepsilon_i$, where TPR_i - is the target level of dividend payout; G_i- is the revenue growth rate; β_i - is the company's stocks beta coefficient; LSH_i - – is the natural logarithm of shareholders number; $\alpha_{0,1,2,3,4}$ - const; IH_i - is the share of company's stocks owned by insiders; ε_i - is a normally distributed error term.	The results support agency theory: companies with fewer stocks owned by the insiders distribute more dividends among shareholders.
La Porta et al., 2000	4000 companies from 33 countries, 1994	$PR_i = \alpha_0 + \alpha_1 * G\_dec_i + \alpha_2 * Protect_i + \alpha_3 * Law_i + \varepsilon_i$, where PR_i - is the level of dividend payout; G_dec_i- is the decile of a revenue growth rate; $Protect_i$ – is the level of minor shareholders protection; Law_i – the type of legislative system: Civil Law or Common Law; $\alpha_{0,1,2,3}$ - const; ε_i is a normally distributed error term.	The results support agency theory: a more efficient system of shareholders protection increases the level of payout in companies.
Moh'd et al., 1995	341 US companies, 1972-1989	$PR_i = \alpha_0 + \alpha_1 * G_i + \alpha_2 * \beta_i + \alpha_3 * LSH_i + \alpha_4 * IH_i + \varepsilon_i$, where PR_i - is the level of dividend payout; G_i- is the revenue growth rate; β_i - is the company's stocks beta coefficient; LSH_i – is the natural logarithm of shareholders number; $\alpha_{0,1,2,3,4}$ - const; IH_i - is the share of company's stocks owned by insiders; ε_i - is a normally distributed error term.	The results support agency theory: companies with more shareholders and fewer stocks owned by the insiders distribute more dividends among shareholders.

Chen, Steiner, 1999	785 US companies, 1991-1993	$\ln(PR)_i = \alpha_0 + \alpha_1 * G_i + \alpha_2 * \ln(RISK)_i + \alpha_3 * \ln(D)_i + \alpha_4 * \ln(IH)_i + \varepsilon_i$, where PR_i - is the level of dividend payout; G_i- is the revenue growth rate; $RISK_i$ – is the standard deviation of stock returns; D_i – is the debt-to-equity ratio; $\alpha_{0,1,2,3,4}$ - const; IH_i - is the share of company's stocks owned by insiders; ε_i - is a normally distributed error term.	The results support agency theory: companies with fewer stocks owned by the insiders distribute more dividends among shareholders.
Gugler, 2003	214 companies from Austria, 1991-1999	$D_i = \alpha_0 + \alpha_1 * R\&D_i + \alpha_2 * INV_i + \alpha_3 * X_i + \alpha_4 * OWN_i + \varepsilon_i$, where D_i - is the level of dividend payout; $R\&D_i$ - is the level of research and development expenses; INV_i – is the level of capital investments; X_i - control variables; $\alpha_{0,1,2,3,4}$ - const; OWN_i – is the set of dummy variables which define the company's ownership structure; ε_i - is a normally distributed error term.	Companies with more efficient corporate governance and higher fraction of stocks owned by the government maintain higher levels of dividends and tend to smooth payout levels.
Samuel et al., 2015	114 companies from Malaysia, 2002-2008	$D_i = \alpha_0 + \alpha_1 * MEET_i + \alpha_2 * ID_i + \alpha_3 * X_i + \varepsilon_i$, where D_i- is the level of dividend payout; $MEET_i$ – is the number of board of director meetings for the period; ID_i – is the number of independent directors on the board; X_i - control variables; $\alpha_{0,1,2,3}$ - const; ε_i - is a normally distributed error term.	Companies with more efficient corporate governance maintain lower levels of dividends, because more efficient corporate governance is considered as substitution to high levels of dividends.
Easterbrook, 1984	Without empirical tests	Analytical approach to agency explanation of dividend policy	Companies that pay dividends to shareholders reduce agency costs as they decrease the levels of spare cash under the management of the CEO.

Jensen, 1986	Without empirical tests	Analytical approach to agency explanation of dividend policy	Companies that pay dividends to shareholders reduce agency costs as they decrease the levels of spare cash under the management of the CEO.
Farinha, 2002	600 companies from Great Britain, 1987-1996	$PR_i = \alpha_0 + \alpha_1 * X_i + \alpha_2 * IH_i + \varepsilon_i$, where PR_i - is the level of dividend payout; X_i- control variables; $\alpha_{0,1,2}$ - const; IH - is the share of company's stocks owned by insiders; ε_i - is a normally distributed error term.	The results support agency theory: companies with fewer stocks owned by the insiders distribute more dividends among shareholders.

As can be seen from Table 2, agency theory was first introduced as a set of theoretical models, in which payout to shareholders is considered as a way of exemption of free cash from the CEO's management [Easterbrook, 1984; Jensen, 1986]. As a result, a CEO faces a constant lack of free funds and needs to select projects to finance carefully. A CEO's behaviour gets adjusted to be more in line with shareholders' interests.

Agency theory has been supported empirically with the investigation of US companies for the period of the 1970s - 1980s. In these companies, the less the number of shares at the insiders', or CEO's, disposal, the higher the levels of payout [Rozeff, 1982; Dempsey, Laber, 1992; Alli, Khan, Ramirez, 1993; Jensen, Solberg, Zorn, 1992; Moh'd et al., 1995; Saxena, 1999]. Thus, the shareholders have sufficient power over the CEO to increase the level of payout. In the 1990s, these interrelations stayed stable [Chen, Steiner, 1999; La Porta et al., 2000; Farinha, 2002; Gugler, 2003], but in the 2000s, authors came to different conclusions concerning the influence of shareholders on payout policy. Research conducted on Australian companies confirmed that a more efficient corporate governance system resulted in an increase in the level of payout to shareholders [Yarram, Dollery, 2015], while an investigation of Malaysian companies showed that this dependence was inverse: more efficient corporate governance leads to decrease in the dividends level [Samuel, Mazlina, 2015]. Authors argue that more efficient corporate governance system is considered as a compensation for low dividends in these companies, i.e. corporate governance and dividends are substitutes.

This change in the sign of interrelation may be explained by the fact that in times of crisis (for example, during the financial crises of 2008-2009), CEOs tend to reduce the levels of payouts in order to increase the amount of free internal financial resources which are necessary for implementing investment projects due to the increased cost of borrowing [Bliss, Cheng, Denis, 2015; Bildik et al., 2015; Floyd, Li, Skinner, 2015].

The agency conflict can be presented as an unwillingness of CEOs to distribute cash among shareholders [Eckbo, 2008]. First, CEOs on average are unlikely to distribute large parts of residual income, to maintain some level of assets and to reduce the risk of financial distress. Second, most CEOs have executive stock options, and dividends may have negative effects on the price of both the underlying stocks and the value of the CEO's portfolio. The CEO's main goal here is to maximise the level of assets and cash under his or her management, and not to maximise shareholders' wealth. Boards of directors are created to resolve this issue, however, the shareholders protection may by itself be a difficult task, the successful solution to which may depend on the board's efficiency.

Another aspect of agency conflict is connected to the fact that holders of company's debts, in spite of a first-tier right to get their money back in case of bankruptcy, bear some risks [Jensen, Meckling, 1976; Myers, 1977]. Shareholders may further increase the risk levels by accepting investment projects with high risks and high return, in order to increase their gains. Shareholders may insist on increasing the level of payout, which can damage the company's financial position, increase the probability of financial distress, and damage bond holders' positions.

Clientele Theory

Various groups of investors, such as individuals, funds (including investment and pension funds), and other companies, invest their money in the shares of different companies in financial markets. The revenues of various groups of investors may be taxed at different tax rates. Moreover, income in the form of dividends and income in the form of capital gains are also taxed at different tax rates. Thus, including taxes in the analyses of payout policy has resulted in the emergence of the clientele theory, which introduces various groups of investors that benefit from receiving income from owning shares in one form (dividends) or another (capital gain and repurchases). The companies in turn try to satisfy the demands of these groups, depending on which group is predominant in the company's ownership structure. Table 3 summarises the results of research studies that have tested the clientele theory of payout policy.

Table 3. Results of testing the clientele theory of payout policy.

Authors and year of publication	Sample	Model	Results
Clientele Theory			
Dhaliwal et al., 1999	133 US companies, 1982-1995	$InstH_i = \alpha_0 + \alpha_1 * Div_i + \alpha_2 * RISK_i + \alpha_3 * G_i + \alpha_4 * X_i + \varepsilon_i$, where $InstH_i$ – is the share of institutional investors in a company; Div_i - is a binary variable that equals to "1" if a company initiates payout to shareholders, and "0" - otherwise; G_i- is a binary variable that equals to "1" if there is an increase in stock price for the period, and "0" - otherwise; $RISK_i$ – is the change in stock's beta coefficient; $\alpha_{0,1,2,3,4}$ - const; X_i – control variables; ε_i - is a normally distributed error term.	The results support the existence of tax clienteles with different tax preferences, which affect the choice and the size of dividend payout. Payout in the form of dividends attracts institutional investors.
Elton, Gruber, 1970	US companies, 1966-1967	Spearman Correlation Test between the level of dividend payout and change in stock price after the dividend announcement.	The results support the existence of tax clienteles with different tax preferences, which affect the choice and the size of dividend payout
Short et al., 2002	211 companies from Great Britain,	$\Delta Div_i = \alpha_0 + \alpha_1 * \Delta E_i + \alpha_2 * InstH_i + \alpha_3 * M_i + \varepsilon_i$, where ΔDiv_i - is the change in the level of payout to shareholders; ΔE_i- is the change in company's earnings; $InstH_i$ - is a binary variable that equals to "1" if a share of institutional investors in a company is greater than 5%, and "0" -	The results support the existence of tax clienteles with different tax preferences, which affect

	1988-1992	otherwise; $\alpha_{0,1,2,3}$ - const; M_i - is a binary variable that equals to "1" if a share of insiders in a company is greater than 5%, and "0" - otherwise; ε_i - is a normally distributed error term.	the choice and the size of dividend payout.
Pettit, 1977	Information on 914 portfolios of US investors, 1964-1970	$DY_i = \alpha_0 + \alpha_1 * \beta_i + \alpha_2 * AGE_i + \alpha_3 * INC_i + \alpha_4 * DTR_i + \varepsilon_i$, where DY_i - is a dividend yield of companies in portfolio i; AGE_i - is investor's age; INC_i – is investor's income; β_i – is the beta coefficient of investor's portfolio; $\alpha_{0,1,2,3,4}$ - const; DTR_i – is the difference between income tax rate on dividends and income tax rate on capital gain; ε_i - is a normally distributed error term.	The results support the existence of tax clienteles with different tax preferences, which affect the choice and the size of dividend payout.
Scholz, 1992	Questionnaires results of the US households, 1983	$Y_i = \alpha_0 + \alpha_1 * X_i + \alpha_2 * MTRD_i + \varepsilon_i$, where Y_i - is portfolio's return; X_i - control variables; $\alpha_{0,1,2}$ - const; $MTRD_i$ - is the difference between income tax rate on dividends and income tax rate on capital gain; ε_i - is a normally distributed error term.	The results support the existence of tax clienteles with different tax preferences, which affect the choice and the size of dividend payout.
Allen et al., 2000	Without empirical tests	Analytical model development and comparative static.	The results support the existence of tax clienteles with different tax preferences, which affect the choice and the size of dividend payout.
Ang et al., 1991	Investment trusts of Great Britain, 1969-1982	Authors compare stock prices and levels of dividends between periods with different tax legislation.	The results support the existence of tax clienteles with different tax preferences, which affect the choice and the size of dividend payout.

Denis et al., 1994	US companies, 1962-1988	$XR_i = \alpha_0 + \alpha_1 * CHNG_i + \alpha_2 * DY_i + \alpha_3 * CF_i + \varepsilon_i$, where XR_i - is abnormal return after dividend announcement; $CHNG_i$ - is the change in dividend levels; $\alpha_{0,1,2,3}$ - const; DY_i- is the dividend yield; CF_i – is the free cash flow to the firm; ε_i - is a normally distributed error term.	The change in stock price after the dividend announcement is affected by the company's dividend yield.
Geiler, Renneboog, 2015	1906 companies from Great Britain, 1997-2007	$\Delta \ln (D)_t = \alpha_0 + \alpha_1 * ln\theta_t + \alpha_2 * ln\theta_{t-1} + \alpha_3 * \ln(D)_{t-1} + \alpha_4 * ROA_t + \varepsilon_t$, where D – is the level of dividend payout; θ_t – is the relative tax advantage of dividend income over capital gain; ROA_t – is return on assets; $\alpha_{0,1,2,3,4}$ - const; ε_t - is a normally distributed error term.	The results support the existence of tax clienteles with different tax preferences. However, these clienteles do not affect the choice and the size of dividend payout.
Amromin et al., 2005	US companies, 2002-2003	Event-study method: the calculation of abnormal returns after tax reforms.	The results support the existence of tax clienteles with different tax preferences. However, these clienteles do not affect the choice and the size of dividend payout.
Desai, Jin, 2011	US companies, 1980-1997	$Y_t = \alpha_0 + \alpha_1 * \theta_t + \alpha_2 * X_t + \varepsilon_t$, where Y_t - is the dividend yield; θ_t- is a fraction of investors with high rates of tax on dividend income; $\alpha_{0,1,2,}$ - const; X_t - control variables; ε_t - is a normally distributed error term.	The results support the existence of tax clienteles with different tax preferences, which affect the choice and the size of dividend payout.

Graham, Kumar, 2006	US companies, 1991-1996	$Y_t = \alpha_0 + \alpha_1 * AGE_t + \alpha_2 * X_t + \alpha_3 * INCOME_t + \alpha_4 * \theta_t + \varepsilon_t$, where Y_t - is the dividend yield; AGE_t- is investor's age; $\alpha_{0,1,2,3,4}$ - const; X_t - control variables; $INCOME_t$ - is investor's income; θ_t - is a variable for tax preferences which are different for different types of investors; ε_t is a normally distributed error term.	The results support the existence of tax clienteles with different tax preferences, which affect the level of demand on the stocks of companies that do pay dividends.
Dahlquist et al., 2014	260 companies from Sweden, 2001-2005	$Y_t = \alpha_0 + \alpha_1 * \theta_t + \alpha_2 * X_t + \varepsilon_t$, where Y_t - is the dividend yield; θ_t- is a variable for tax preferences which are different for different types of investors; $\alpha_{0,1,2,}$ - const; X_t - control variables; ε_t - is a normally distributed error term.	The results support the existence of tax clienteles with different tax preferences, which affect the company's dividend yield.
Bartholdy, Brown, 1999	Companies from New Zealand, 1982-1985	$\Delta P_t = \alpha_0 + \alpha_1 * DT_t + \alpha_2 * DNT_t + \varepsilon_t$, where ΔP - is the change in stock price after dividend announcement; DT_t - is the level of dividends which are not tax exempt; DNT_t- is the level of dividends which are tax exempt; $\alpha_{0,1,2}$ - const; ε_t - is a normally distributed error term.	The results support the existence of tax clienteles with different tax preferences, which affect the choice and the size of dividend payout.

As can be seen from Table 3, the clientele theory of payout policy has not been rejected by recent research. Although the survey of companies' management suggests that tax considerations are not among the top concerns when deciding about payouts [Brav et al., 2005; 2008], research carried out on US companies for the period of 1960s–2000s confirms that the clienteles with different tax regimes may influence the level of dividend payments significantly. If a company's major shareholder is a legal entity with a more advantageous taxation of dividends, such a company will increase the level of payout to shareholders in the form of dividends and the shares' dividend yield will increase [Elton, Gruber, 1970; Pettit, 1977; Scholz, 1992; Denis, Denis, Sarin, 1994; Dhaliwal, Erickson, Trezevant, 1999; Desai, Jin, 2011]. This effect of tax clienteles is also confirmed for companies from other countries [Ang, Blackwell, Megginson, 1991; Bartholdy, Brown, 1999; Short, Zhang, Keasey, 2002; Rantapuska, 2008].

On the other hand, stock repurchases may become more beneficial for individual investors than dividend payments as long as the country's tax rate for dividends is higher than the tax rate for income in the form of capital gains [Allen, Bernardo, Welch, 2000; Graham, Kumar, 2006; Dahlquist, Robertsson, Rydqvist, 2014]. Thus, a company will increase payments to the shareholders in the form of stock repurchase, if the major shareholder's income is taxed at a lower rate.

Indeed, research has shown that the aggregate level of stock repurchase in the US has increased significantly in recent decades. The important question is why that did not happen sooner. The first possible explanation is that the SEC may have accused companies that repurchased stocks of stock price manipulation. The legislation was adjusted only in 1982, allowing companies to use repurchases [Grullon, Michaely, 2002]. The second explanation is that companies' characteristics have changed over time [Fama, French, 2001]. For example, public companies have become more similar to small companies that have never paid dividends: small size and profits, and high level of investments. Researchers also posit that the propensity to pay dividends itself has declined, as have the benefits of payout in the form of dividends.

However, the clientele theory for repurchases has not been confirmed subsequent to the 2000s for US companies [Amromin et al., 2005] or companies from Great Britain [Geiler, Renneboog, 2015]. That may probably be explained by the fact that by this time the sustainable tax clienteles, which do not readjust their portfolios given the stable payout policy in companies from their portfolios, have already been formed. It may be a sign of equilibrium between the demands of different investor types and companies' payout policies.

Catering Theory

Relaxing the assumption about the absence of taxes also resulted in the clientele theory being supplemented with the catering theory. The theory also relaxes the assumption about investors' rationality, as they may irrationally prefer dividends [Shefrin, Statman, 1984]. This theory was proposed by Baker and Wurgler and states that investors may have demand for the shares of the companies that pay dividends [Baker, Wurgler, 2004(a), 2004(b)]. Consequently, this demand should be reflected as a difference in the price of the shares of companies that pay dividends (dividend payers) and those that do not pay dividends (non-payers). This is how the "dividend premium" is formed – the difference in the prices of shares of dividend payers and non-payers. The authors defined the 'dividend premium' as the difference in the logarithms of the corresponding market-to-book ratios. CEOs, in turn, try to meet this increased demand for the dividend payers' shares by paying dividends when investors evaluate the dividend-paying companies as being more attractive, and by stopping the payment of dividends when investors show preference towards the shares of non-payer companies (or in other words, when the dividend premium is negative). Thus, the authors assume that the propensity to pay dividends depends on the dividend premium or discount that is embedded in the share price. This assumption is confirmed by empirical tests. However, the authors have not found an explanation for the changes in investor demand within the catering framework. It is worth noting, however, that the authors testing catering theory studied the issue of dividend payment itself rather than the level of dividend payments. Table 4 summarises the results of testing on the catering theory.

Table 4. Results of testing the catering theory of payout policy.

Authors and year of publication	Sample	Model	Results
Catering Theory: Cash Dividends			
Baker, Wurgler, 2004(a)	US companies, 1963-2000	$PTP_i = \alpha_0 + \alpha_1 * X_i + \alpha_2 * DP_i + \varepsilon_i$, where PTP_i – is the propensity to pay dividends by a company i, which is the difference between the actual level of payout and the level forecasted by logit-model; X_i- control variables; $\alpha_{0,1,2}$ - const; DP_i – is the dividend premium in a company's i stock price; ε_i - is a normally distributed error term.	The propensity to pay dividends increases with the increase in the level of dividend premium
Baker, Wurgler, 2004(b)	3797 US companies, 1963-2000	$PTP_i = \alpha_0 + \alpha_1 * X_i + \alpha_2 * DP_i + \varepsilon_i$, where PTP_i - is the propensity to pay dividends by a company i, which is the difference between the actual level of payout and the level forecasted by logit-model; X_i- control variables; $\alpha_{0,1,2}$ - const; DP_i - is the dividend premium in a company's i stock price; ε_i - is a normally distributed error term.	The propensity to pay dividends increases with the increase in the level of dividend premium
Li, Lie, 2006	US companies, 1963-2000	$\Delta D_i = \alpha_0 + \alpha_1 * X_i + \alpha_2 * DP_i + \varepsilon_i$, where ΔD_i- is the difference in dividend payout levels in 2 consecutive time periods in a company i; X_i- control variables; $\alpha_{0,1,2}$ - const; DP_i - is the dividend premium in a company's i stock price; ε_i - is a normally distributed error term.	The decisions about changes in dividend policy are directly affected by the level of dividend premium

Ferris et al., 2009	2700 companies from 23 countries, 1995-2004	$Payers_i = \alpha_0 + \alpha_1 * X_i + \alpha_2 * DP_i + \varepsilon_i$, where $Payers_i$- is a binary variable that equals to "1" if a company pays cash dividends, and "0" - otherwise; X_i- control variables; $\alpha_{0,1,2}$ - const; DP_i - is the dividend premium in a company's i stock price; ε_i - is a normally distributed error term.	The propensity to pay dividends increases with the increase in the level of dividend premium. However, this interrelation is only present for the companies from the Common Law countries
Kuo et al., 2013	About 4000 companies from 18 countries, 1989-2011	$\Delta PTP_{i,t} = \alpha_0 + \alpha_1 * FC_{i,t} + \alpha_2 * DP_{i,t-1} + \varepsilon_{i,t}$, where $\Delta PTP_{i,t}$ - is the difference in the propensity to pay dividends by a company i in 2 consecutive time periods, which is the difference between the actual level of payout and the level forecasted by logit-model; $FC_{i,t}$- is a dummy variable for global financial crisis; $\alpha_{0,1,2}$ - const; $DP_{i,t-1}$ - is the dividend premium in a company's i stock price in the previous period; $\varepsilon_{i,t}$ - is a normally distributed error term.	The propensity to pay dividends is not affected by the level of dividend premium
Julio, Ikenberry, 2004	US companies, 1984-2004	The measurement of cumulative abnormal returns for companies that initiate dividend payouts for the first time.	The propensity to pay dividends is not affected by the level of dividend premium
Hoberg, Prabhala, 2009	US companies, 1963-2004	$\Delta PTP_{i,t} = \alpha_0 + \alpha_1 * DP_{i,t} + \alpha_2 * X_i + \varepsilon_{i,t}$, where $\Delta PTP_{i,t}$ - is the difference in the propensity to pay dividends by a company i in 2 consecutive time periods, which is the difference between the actual level of payout and the level forecasted by logit-model; $\alpha_{0,1,2}$ - const; $DP_{i,t}$ - is the dividend premium in a company's i stock price; X_i- control variables; $\varepsilon_{i,t}$ - is a normally distributed error term.	The propensity to pay dividends is not affected by the level of dividend premium

Denis, Osobov, 2008	Companies from the USA, Canada, Europe and Japan, 1994-2002	$\Delta PTP_{i,t} = \alpha_0 + \alpha_1 * DP_{i,t} + \alpha_2 * X_i + \varepsilon_{i,t}$, where $\Delta PTP_{i,t}$ - is the difference in the propensity to pay dividends by a company i in 2 consecutive time periods, which is the difference between the actual level of payout and the level forecasted by logit-model; $\alpha_{0,1,2}$ - const; $DP_{i,t}$ - is the dividend premium in a company's i stock price; X_i- control variables; $\varepsilon_{i,t}$ - is a normally distributed error term.	The propensity to pay dividends is not affected by the level of dividend premium in companies outside the USA
Dong, Liu, 2016	Companies from China, 2009-2014	$PTP_i = \alpha_0 + \alpha_1 * DP_i + \varepsilon_i$, where PTP_i - is the propensity to pay dividends by a company i, which is the difference between the actual level of payout and the level forecasted by logit-model; $\alpha_{0,1}$ - const; DP_i - is the dividend premium in a company's i stock price; ε_i - is a normally distributed error term.	The propensity to pay dividends increases with the increase in the level of dividend premium
Anouar, Aubert, 2016	221 companies from France, 2001-2012	$Payers_i = \alpha_0 + \alpha_1 * X_i + \alpha_2 * DP_i + \varepsilon_i$, where $Payers_i$- is the binary variable that equals to "1" if a company repurchases its stocks, and "0" - otherwise; X_i- control variables; $\alpha_{0,1,2}$ - const; DP_i - is the dividend premium in a company's i stock price; ε_i - is a normally distributed error term.	The propensity to pay dividends increases with the increase in the level of dividend premium
Baker et al., 2013	1512 companies from Canada, 1988-2006	$Payers_t = \alpha_0 + \alpha_1 * X_t + \alpha_2 * DP_{t-1} + \varepsilon_t$, where $Payers_t$- is the binary variable that equals to "1" if a company repurchases its stocks, and "0" - otherwise; X_t- control variables; $\alpha_{0,1,2}$ - const; DP_{t-1} - is the dividend premium in a company's i stock price in the previous year; ε_t - is a normally distributed error term.	The propensity to pay dividends increases with the increase in the level of dividend premium

Zhan, 2016	1100 companies from China, 2008-2014	$\Delta PTP_{i,t} = \alpha_0 + \alpha_1 * DP_{i,t} + \varepsilon_{i,t}$, where $\Delta PTP_{i,t}$ is the difference in the propensity to pay dividends by a company i in 2 consecutive time periods, which is the difference between the actual level of payout and the level forecasted by logit-model; $\alpha_{0,1}$ - const; $DP_{i,t}$ - is the dividend premium in a company's i stock price; $\varepsilon_{i,t}$ - is a normally distributed error term.	The propensity to pay dividends is not affected by the level of dividend premium
Kim, Kim, 2013	Companies from South Korea, 1981-2010	$PTP_i = \alpha_0 + \alpha_1 * X_i + \alpha_2 * DP_i + \varepsilon_i$, where PTP_i - is the propensity to pay dividends by a company i, which is the difference between the actual level of payout and the level forecasted by logit-model; X_i- control variables (level of a company's risk, capital structure, Tobin's Q, size); $\alpha_{0,1,2}$ - const; DP_i - is the dividend premium in a company's i stock price; ε_i - is a normally distributed error term.	The propensity to pay dividends is not affected by the level of dividend premium
Wang et al., 2016	Companies from Taiwan, 1992-2011	$Payers_i = \alpha_0 + \alpha_1 * X_i + \alpha_2 * DP_i + \varepsilon_i$, where $Payers_i$- is the binary variable that equals to "1" if a company repurchases its stocks, and "0" - otherwise; X_i- control variables; $\alpha_{0,1,2}$ - const; DP_i - is a dividend premium in a company's i stock price; ε_i - is a normally distributed error term.	The propensity to pay dividends increases with the increase in the level of dividend premium
Tangjitprom, 2013	Companies from Thailand, 1992-2009	$\Delta PTP_{i,t} = \alpha_0 + \alpha_1 * DP_{i,t-1} + \varepsilon_{i,t}$, where $\Delta PTP_{i,t}$ - is the difference in the propensity to pay dividends by a company i in 2 consecutive time periods, which is the difference between the actual level of payout and the level forecasted by logit-model; $\alpha_{0,1}$ - const; $DP_{i,t-1}$ - is the dividend premium in a company's i stock price in the previous year; $\varepsilon_{i,t}$ - is	The propensity to pay dividends increases with the increase in the level of dividend premium

		a normally distributed error term.	
Catering Theory: Stock Repurchases			
Jiang et al., 2013	US companies, 1963-2010	$Payers_{i,t} = \alpha_0 + \alpha_1 * X_{i,t} + \alpha_2 * DP_{i,t-1} + \alpha_3 * RP_{i,t-1} + \varepsilon_{i,t}$, where $Payers_{i,t}$- is the binary variable that equals to "1" if a company repurchases its stocks, and "0" - otherwise; X_i- control variables; $\alpha_{0,1,2,3}$ - const; $DP_{i,t-1_i}$ - is the dividend premium in a company's i stock price; $RP_{i,t-1}$ is the repurchase premium in a company's i stock price; $\varepsilon_{i,t}$ - is a normally distributed error term.	The propensity to repurchase stocks increases with the increase in the level of repurchase premium
Kulchania, 2013	US companies, 1971-2010	$PTR_i = \alpha_0 + \alpha_1 * RP_i + \varepsilon_i$, where PTR_i - is the propensity to repurchase stocks by a company i, which is the difference between the actual level of repurchases and the level forecasted by logit-model; $\alpha_{0,1}$ - const; RP_i – is the difference between repurchase premium and dividend premium in a company's i stock price; ε_i - is a normally distributed error term.	Companies tend to distribute cash among shareholders through repurchases if the shares of companies that repurchase stocks trade with the premium to stocks of companies that only pay dividends.

As can be seen in Table 4, Baker and Wurgler's theory is confirmed for developed economies [Li, Lie, 2006; Ferris, Jayaraman, Sabherwal, 2009; Baker et al., 2013; Anouar, Aubert, 2016] as well as for emerging economies [Tangjitprom, 2013; Dong, Liu, 2016; Wang et al., 2016]. In fact, over the 1990s and 2000s, companies from both developed and emerging countries monitored the quantity of investor demand for the shares of dividend payers and adjusted their payout policy in accordance to the change in demand.

However, there is a group of research that does not find any evidence for support of this theory, using data from US companies [Julio, Ikenberry, 2004; Hoberg, Prabhala, 2009; Denis, Osobov, 2008; Kuo et al., 2013], from China [Zhan, 2016] and from the Republic of Korea [Kim, Kim, 2013]. Perhaps such a difference in results between these two groups of research is related to an imperfect methodology of verifying this theory.

As can be seen from the second part of Table 4, the catering theory was also tested later from the point of view of stock repurchasing [Jiang et al., 2013; Kulchania, 2013]. The authors calculate the repurchase premium in the price of the company's shares, assuming that the existence of the premium leads to a positive decision about repurchase initiation. Based on a sample of companies from the USA, the authors conclude that the existence of the repurchase premium indeed has a positive effect on the possibility of initiating the repurchase program, and on the extension of such programs. Moreover, it has been demonstrated that dividends and repurchases are substitutes, which means that the probability of repurchase initiation depends positively on the "repurchase premium" and negatively on the "dividend premium", while for the dividends initiation these interrelations have opposite signs. The level of repurchase also depends on these premiums.

In this subsection we have shown that relaxing the assumptions of Modigliani and Miller has led to the development of new theories that have shown the impact of payout policy on company value. This impact can be seen through signals to the market, through resolving agency conflicts, and through meeting the demands of different investor types. We have shown that each theory has its own

controversies and there is no universal theory which is able to explain every puzzle regarding payout policy. However, these theories have one common underlying assumption – that economic agents are fully rational in these theories. These economic agents are either involved in decision-making about payout policy (CEOs) or are directly affected by these decisions (investors). The one exception is catering theory, which implies that investors may irrationally prefer dividends. In the following subsections, we will discuss research papers that investigate the impact of CEO-level characteristics on payout decisions. The survey has shown that top executives consider themselves as major decisions makers, who determine corporate policies, including the payout policy [Brav et al, 2005]. Their power to determine payout policy is certainly not unlimited, as top executives will only propose a policy that would be most likely approved by shareholders or boards [Farre-Mensa et al., 2014]. However, as we will see, CEO-level characteristics do affect the payout decisions.

First, we will discuss the impact of CEO incentives on payout decisions. Second, we will focus on papers that investigated the impact of irrational behaviour forced by CEO's overconfidence on payout policy.

1.2 CEO incentives and payout decisions

Recent studies have shown that CEO's incentives may play an important role in defining the payout policy [Fenn, Liang, 2001; Geiler, Renneboog, 2016; Wu, Wu, 2020]. Boards of directors define the remuneration policy for a CEO in such a way as to incentivise him or her to behave optimally in terms of meeting the shareholders' demands. However, depending on the major component of his or her compensation, a CEO as a rational agent will define corporate policies, including payout decisions, in order to maximize the value of his or her compensation portfolio.

First, for example, if the CEOs compensation package consists of instruments that align his or her interests to those of debtholders, such a CEO will

have incentives to keep the company's risk profile low and to distribute more funds via cash dividends [Caliskan, Doukas, 2015; Wu, Wu, 2020]. This type of compensation is called inside debt and it may consist of pension plan benefits and deferred compensation that will be paid in the future conditional on the achievement of some specified goals. Inside debt incentivizes the CEO to decrease the default probability and minimize costs of financial distress. Based on research findings, companies run by CEOs, who have more inside debt, maintain higher levels of dividends [Caliskan, Doukas, 2015; Wu, Wu, 2020]. This is because CEOs bear fewer risks and accept a smaller number of investment projects, which leaves them with more funds available for distribution among shareholders. Aside from inside debt compensation, companies may also establish a payment of dividends for the shares, distributed on the basis of management incentive programs (restricted stocks units, or "RSU"). RSU belong to equity-based compensation because the payment is made using company's stocks, however, its impact on the CEOs incentives is more in line with inside debt compensation. This type of compensation also results in an increase in the levels of dividend payments to shareholders [Aboody, Kasznik, 2008; Minnick, Rosenthal, 2014; Burns et al., 2015] as a CEO also gets dividends on his or her RSU. However, when the payment of dividends on RSU is not provided for, the higher levels of compensation in the form of RSU leads to a decrease in the levels of dividends [Burns et al., 2015; Geiler, Renneboog, 2016].

Second, on the other hand, boards may introduce equity-based payments, particularly in the form of stocks or stock options. This type of compensation is thought to reduce agency problems [Jensen, Meckling, 1976] and to induce optimal risk-seeking behaviour that should benefit shareholders [Financial behaviour, 2017]. Stock options allow a CEO to make a profit in two ways. First, a CEO may want to increase the company's equity value to exercise options in order to get more profit. In this case, a CEO must combine profitable projects with a positive NPV while also concentrating on risk control. This is to keep the spread between return on capital and the required rate of return at a positive level for the

overall portfolio of projects. Second, he or she may want to increase the volatility of underlying shares to increase the value of related options. To do so, the CEO needs to invest more heavily in projects with higher risk. As the CEO's set of attractive investment opportunities increases, so does the company's risk [Caliskan, Doukas, 2015; Wu, Wu, 2020]. A higher level of risk results in higher volatility of the company's stocks, which leads to an increase in the value of executive stock options. This is why he or she would rather pursue investing in projects with a higher-than-average risk factor (from the company's perspective), hoping that it will boost the company's capitalisation, volatility and the CEO's pay [Low, 2009].

Hence, if a CEO's compensation is based on the market value of the company shares, and the payment of dividends on RSU is not provided for (stocks compensation, option programs), then such a CEO has little incentives to increase the level of cash dividends [Cuny, Martin, Puthenpurackal, 2009; Geiler, Renneboog, 2016]. The drop in share price after the ex-dividend date leads to a decrease in the value of CEO's portfolio if it is mainly consisted of stocks or executive stocks options. Instead, a CEO with high levels of equity-based compensation may distribute more in the form of stock repurchase [Dittmar, 2000; Aboody, Kasznik, 2008]. However, growth of payments in the form of stock buyback often does not cover a decrease in the level of cash dividends, and, for this reason, the aggregate payments in such companies may be smaller [Fenn, Liang, 2001; Cuny, Martin, Puthenpurackal, 2009; De Cesari, Ozkan, 2015].

Third, the greeks - delta and vega coefficients of executive stock options – also have significant influence on payout decisions [Caliskan, Doukas, 2015; De Cesari, Ozkan, 2015]. The delta coefficient of the options at the CEO's possession measures option's price sensitivity to the change in the price of an underlying asset. The option's vega represents the option's price sensitivity to the change in the volatility. The researchers agree that higher delta increases the risk aversion of the CEO [Feng, Rao, 2018], while higher vega increases the risk-seeking behaviour of the CEO [Grant et al., 2009; Black, 2018], as higher vega increases

the convexity of a CEO's remuneration policy. The studies which investigated the impact of delta and vega on payout decisions conclude that higher delta leads to higher levels of dividends, while higher vega leads to lower levels of dividends [Caliskan, Doukas, 2015]. However, European companies do not follow the same pattern as higher delta decreases the level of dividends, as in Europe dividend protection is less common than in the US companies [De Cesari, Ozkan, 2015].

Table 5 summarizes the main findings of research on the impact of CEO's compensation on payout policy.

Table 5. Academic research on the impact of CEO incentives on payout policy.

Papers	Type of compensation	Payout variables	Impact of equity-based compensation on payout policy	Impact of inside debt on payout policy	Sample
Wu, Wu, 2020	Equity-based compensation: RSU and options; Inside debt: pensions and deferred compensation	Level of dividends, repurchases and total payout scaled by stock price (dividend yield)	Higher options- fewer dividends and more repurchases; no impact on total payout	Higher inside debt - more dividends and total payout; and no impact on repurchases	US companies 2008-2015
Geiler, Renneboog, 2016	Equity-based compensation: RSU and options	Level of dividends; choice of payout channel	Higher options and RSU- fewer dividends; prefer repurchases over dividends	-	UK companies 1996-2007
De Cesari, Ozkan, 2015	Equity-based compensation: stocks and options deltas	Level (scaled by stock price) and likelihood of dividends and total payout; choice of payout channel	Higher options and deltas- fewer and less likely dividends and no impact on repurchases; More stock ownership - more dividends	-	EU companies 2002-2009
Burns et al., 2015	Equity-based compensation:	Level of dividends and	Higher options and RSU- fewer	-	EU companies

	RSU and options	repurchases	dividends and more repurchases		2003-2012
Caliskan, Doukas, 2015	Inside debt compensation; Options delta and vega	Propensity to pay dividends	Higher delta-higher propensity to pay dividends; higher vega - lower propensity to pay dividends	Higher inside debt - higher propensity to pay dividends	US companies 2006-2011
Cuny, Martin, Puthenpurackal, 2009	Equity-based compensation: stocks and options	Level of dividends, repurchases and total payout scaled by stock price	Higher options and stocks-fewer dividends and more repurchases, but lower total payout	-	US companies 1993-2005
Fenn, Liang, 2001	Equity-based compensation: stocks and options	Level of dividends, repurchases and total payout scaled by stock price	Higher options - fewer dividends and more repurchases, but lower total payout; Stocks ownership has no impact	-	US companies 1993-1997

We can see from Table 5 and from previous discussion that there are some limitations in the current research. First, although different papers investigate separately the impact of CEO incentives on different metrics of payout policy, i.e. dividend yield [Wu, Wu, 2020], the likelihood of payout [Caliskan, Doukas, 2015], the choice of payout channel [De Cesari, Ozkan, 2015; Geiler, Renneboog, 2016], there is a lack of results on the impact of CEO incentives on different payout decisions obtained from one sample of companies from the same country. Second, few studies provide the opportunity to compare effects of equity-based compensation and inside debt on dividends [Caliskan, Doukas, 2015; Wu, Wu, 2020], while differences in effects on repurchases are yet to be determined, as there is no evidence on the impact of inside debt on share repurchases. Finally, the most

recent research on the US companies is conducted using a sample prior to 2015 [Wu, Wu, 2020], which may require results validation on more recent datasets.

In the next subsection we move to the discussion of behavioural explanation of payout policy.

1.3 Behavioural explanation of payout policy motives

The assumption about the irrationality of economic agents has led to the development of a completely new approach to the explanation of variations in payout policy in different companies and different markets. This approach is now known as the *behavioural explanation*. The behaviour-based approach emerged with the paper by Kahneman and Tversky that was dedicated to finding and explaining various biases which may be possessed by various economic agents about the same time as the classic theories of payout policy (as discussed earlier) were being developed [Kahneman, Tversky, 1979]. This approach is focused on the behavioural biases of economic agents, including CEOs and investors. These biases can influence the decisions regarding strategic financial policies, including dividend policy, and result in irrational behaviour of economic agents.

The theories, discussed in subsection 1.1, focus almost solely on the financial characteristics of companies, and have recently become a thoroughly-studied field of expertise. Two explanations for the dominance of classic theories over the behavioural explanation may be distinguished. First, it is easier to measure, aggregate, and investigate financial indicators, while behavioural traits may be measured only indirectly by using proxy variables. Second, according to different surveys of CEOs [Kent Baker, Powell, 2012], the indicators of a company's current financial position are used by top management to present potential determinants of payout decisions.

Nevertheless, as can be seen in Figure 1, the number of research papers dedicated to behavioural finance has increased dramatically since the beginning of the 1990s. For example, in 1990 only 3 research papers were published on

behavioural finance, while in 2019 this number increased to 164. The exponential growth of the citations number of behavioural finance research papers also shows the increasing interest in this field of expertise.

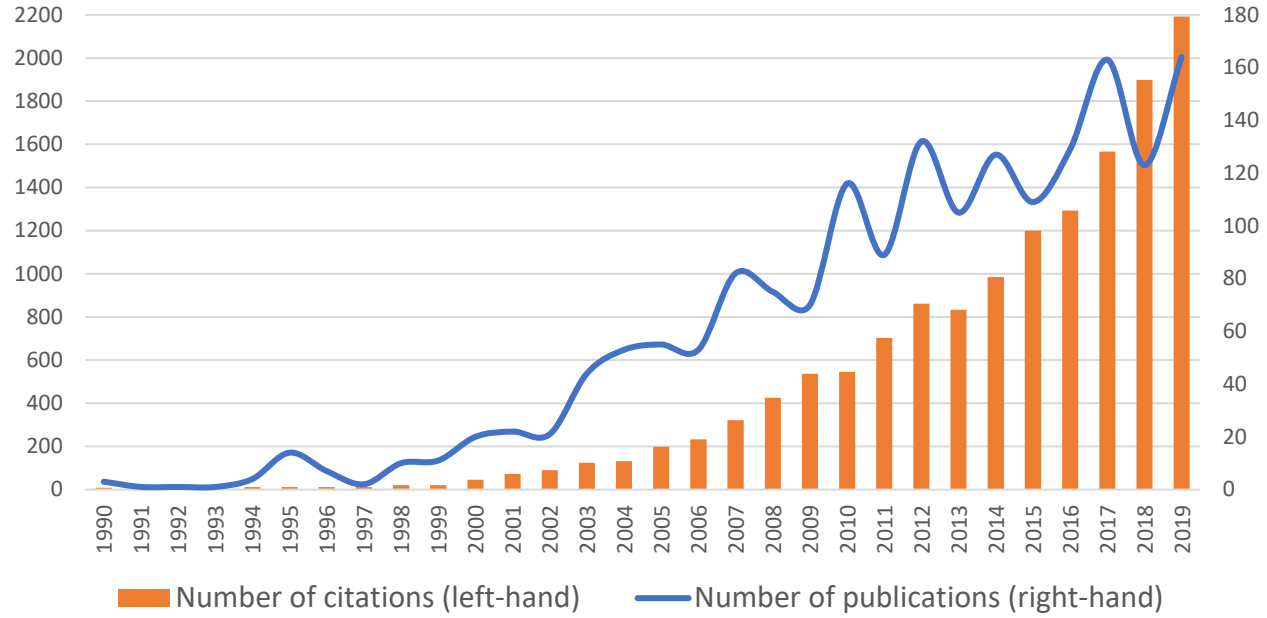

Figure 1. Number of publications and citations in behavioural corporate finance.[2]

The reason for the emergence and development of the behavioural branch in corporate finance was the increasing disagreement with the assumption of the complete rationality of economic agents. By the beginning of the 1990s, enough evidence had been accumulated proving that agents were not always fully rational, and behavioural economics had formed as a separate field of study [Belianin, 2017]. Experiments by Kahneman and Tversky showed that people may be subject to psychological biases including overconfidence, anchoring, conformism, etc. In financial markets and in the economy in general, it is expressed in the form of periodic bubbles, both positive and negative; in the everyday losses of investors (in the case of complete rationality, an investor gains income all the time); and in the constant failures of CEOs to accept projects that are profitable from the point of

[2] Sources: [Huang et al., 2016] and the author's calculations based on data from https://app.dimensions.ai, the articles were filtered by topics 14 "Economics" and 15 "Commerce, Management, Tourism and Services" using the keyword phrase "Behavioural Finance".

view of the shareholders, and so on. Such evidence resulted in the necessity *to include agents' irrationality in the analysis.*

Thus, the behavioural approach considers the influence of the traits and biases inherent in those CEOs who manage the companies on strategic decisions *vis-a-vis* payout policy, rather than the influence of the company's financial indicators as in the classic theories. In this dissertation we will focus on one such bias – CEO's overconfidence.

For the purpose of this study overconfidence can be defined as *a cognitive bias, under the influence of which CEOs tend to overestimate the mean outcomes and mean values of different variables, for example, the valuation in M&A deals* [Malmendier, 2018].

Different approaches to measurement of overconfidence.

The biggest challenge for the researchers in behavioural finance is the quantitative measurement of CEO's overconfidence. Nevertheless, for the several decades that the behavioural branch has been developing, several approaches to measurement of this behavioural bias have been laid out.

Table 6 summarises the approaches to the measurement of CEO's overconfidence.

Table 6. Different academic approaches to measuring the overconfidence of CEOs[3].

Authors and year of publication	Sample	Measure of overconfidence	Research question
Andreou et al, 2018	US companies, 1992-2009	Number of keywords (overconfident, optimistic) in press articles about CEO	How does a CEO's overconfidence affect stock returns after repurchases?

[3] Source: [Anilov, 2017].

Hirshleifer et al, 2012	US companies, 1993-2003	CEO is considered overconfident if he or she postpones options exercise, even if they are already in the money; alternative - number of keywords (overconfident, optimistic) in press articles about CEO	How does a CEO's overconfidence affect innovations?
Malmendier, Tate, Yan, 2011	US companies, 1980-1994	CEO is considered overconfident if he or she postpones options exercise, even if they are already in the money; alternative - number of keywords (overconfident, optimistic) in press articles about CEO	How does a CEO's overconfidence affect corporate financial policies?
Malmendier, Tate, 2005	US companies, 1980-1994	CEO is considered overconfident if he or she postpones options exercise, even if they are already in the money; alternative - number of keywords (overconfident, optimistic) in press articles about CEO	How does a CEO's overconfidence affect investment policy?
Deshmukh et al., 2013	US companies, 1980-1994	CEO is considered overconfident if he or she does not exercise executive options prior to their expiration date, even if they are already in the money; alternative - number of keywords (overconfident, optimistic) in press articles about CEO	How does a CEO's overconfidence affect payout policy?
Shu et al., 2013	Companies from Taiwan, 2000-2008	Number of keywords (overconfident, optimistic) in press articles about CEO	How does a CEO's overconfidence affect share repurchases?
Banerjee et al., 2018(a)	US companies, 1992-2011	CEO is considered overconfident if he or she does not exercise executive options	How does a CEO's overconfidence affect share repurchases?

		prior to their expiration date, even if they are already in the money; alternative - number of keywords (overconfident, optimistic) in press articles about CEO	

As can be seen from Table 6, CEO's overconfidence may be measured in several ways. The first way implies calculation of the period, during which a CEO owns an executive stock option for the shares of the company where he or she works and "moneyness" of each option tranche [Malmendier, Tate, 2005; Deshmukh et al., 2013; Banerjee et al., 2015; Banerjee et al., 2018(a)]. We need to point out here that there are two approaches to measuring the "moneyness" of an option. The first approach is to measure it directly, by subtracting the strike price from the share price. This approach was proposed by Malmendier and Tate [Malmendier, Tate, 2005] under assumptions proposed by Hall and Murphy [Hall, Murphy, 2002]. However, to implement this approach one has to know a strike price of an option, which may be unavailable in some databases or for some time periods, especially before 2006. That is why the second approach emerged. This approach implies calculating the value per option by dividing the value of all vested but unexercised options by their amount and then scaling it by the share price and using this measure as a proxy for "moneyness" [Campbell et al., 2011; Banerjee et al., 2018(a); Banerjee et al., 2020]. The drawback of this approach is that it does not take into account the actual strike price. It may be interesting to compare the results of both approaches for one sample.

If a CEO exercises the option within the year before the option's expiration date, despite the fact that for some time the option has been at least 40% (in some research 67% [Hirshleifer et al, 2012]) 'in-the-money' (the shares' value has been exceeding the exercise price of the option), such a CEO may be described as overconfident, or in some sources – as 'optimistic'. This logic is based on the fact that overconfident CEOs count on the steady growth of their company's share price, and for this reason they do not exercise the option until the last moment.

The second way to define CEO's overconfidence is to search for keywords such as "overconfident" or "optimistic" along with their synonyms and antonyms in interviews with CEOs or in mass media materials about the companies managed by them [Malmendier, Tate, Yan, 2011; Shu et al., 2013; Andreou et al., 2018]. This way of research may be more reliable than the one based on the options holding period, but it is more time-consuming, involves advanced techniques of linguistic analysis and may be subjected to possible biases in CEO's descriptions in mass media. Researchers who used both option-based and press-based measures of overconfidence point out that these two measures are highly correlated and yield similar results.

The third way to measure a CEO's overconfidence is to use the stock price volatility and daily trade volume volatility as proxies [Duxbury, 2015]. It is assumed that overconfident CEOs may attract the increased attention of short-term investors to the company's stocks, as such CEOs may take up more projects with high risks and signal markets about positive prospects of companies they run. These investors generally represent speculative capital and are ready to bear high levels of risk. Short-term investors may be attracted by some optimistic forecasts about a company's future, or about prospects for new investments, or by the increased risk profile of the company's investment opportunities set. The increase in number of short-term investors leads to the increase in volatility of company's stocks price and daily trade volume. Moreover, overconfident CEOs may trade company's stocks by themselves, influencing short-term fluctuations, and increasing volatility even more.

Those authors who have investigated overconfident CEOs have come to the conclusion that such CEOs tend to increase investments [Choi et al., 2018; He et al, 2019], especially high risk investments and those centred on research and development [Malmendier, Tate, 2005; Hirshleifer et al., 2012]. As a result, overconfident CEOs have fewer funds to distribute among shareholders during the relevant period, which leads to a decrease in dividend levels. At the same time, overconfident CEOs consider external financing as the more expensive option in

comparison with internal financing, and therefore they do not use debt financing to increase or maintain payout levels or to finance investment projects, leading to a decrease in cash dividends levels [Ben-David et al., 2007; Deshmukh et al., 2013]. In spite of the fact that - all else being equal - overconfident CEOs pay smaller cash dividends, they are more inclined to make stock repurchases because they think that current stock prices result in the company's shares being undervalued and leaving room for growth [Shu et al., 2013; Banerjee et al., 2018(a)]. This leads to an increase in the level of repurchases in companies run by overconfident CEOs. Thus, the influence of a CEO's overconfidence on the level of total payout may be positive or negative and demands further research.

However, the authors of previous research pay little attention to the tools that can be used to mitigate the impact of CEO's overconfidence on payout policy or to utilize the benefits of overconfidence to increase shareholders' wealth. Few studies that take this into consideration show that implementation of Sarbanes-Oxley Act of 2002 helped to overcome the effects of overconfidence on corporate policies [Banerjee et al., 2015; Humpherry-Jenner et al., 2018].

This limitation is considered to be of the utmost importance, since CEOs do not always act to meet shareholders' interests of increasing company's value under the influence of their behavioural biases. One way to resolve this issue is to use compensation with so-called dividend protection. This type of CEO compensation is constructed in such a way as to protect the value of a CEO's portfolio of either stocks or executive options from the negative effects of dividend announcements [Zhang, 2018].

The second way to solve this problem is via higher quality system of corporate governance. We assume that a high quality of corporate governance has an ability to reduce the effects of CEO's behavioural biases on the payout policy, because recent research has shown that the level of shareholders' payout is higher in those companies with corporate governance of a higher quality than in companies with a low quality of corporate governance [Jiraporn et al., 2011; Sharma, 2011]. We will return to this question in Section 4 of this dissertation.

1.4 Section 1 discussion and conclusions

Based on the analysis of the works dedicated to CEO incentives and overconfidence and their impact on payout policy, we can now draw some preliminary conclusions about their influence on the payout levels in different forms. These conclusions are presented in Table 7.

Table 7. The signs of impact of CEO incentives and overconfidence on payout policy.[4]

Behavioural trait	Effect on dividends	Effect on share repurchases
Overconfidence	-	+
Equity-based compensation	-	+
Inside debt	+	N/A

As can be seen from Table 7, authors of previous research papers agree that CEO's overconfidence, and equity-based compensation may decrease the level of dividends due to the fact that these types of CEO have a wider investment opportunity set and/or try to protect the value of their compensation portfolios from the negative effects of dividend payout.

In this Section we have shown that accounting for the compensation incentives and overconfidence of the CEO has led to the further development of dividends theory and provided new insights into CEOs' behaviour around payout decisions. Overconfident CEOs and those with equity-based compensation on average tend to distribute fewer funds among shareholders in the form of cash dividends, and more through stock repurchases.

In the following Sections we deepen these results by investigating the impact of CEO's compensation incentives and overconfidence on payout decisions and the ability of corporate governance to reduce this impact.

[4] Source: [Anilov, 2017].

Section 2. CEO compensation and payout decisions

In this Section we discuss the impact of different compensation incentives of a CEO on payout decisions: about the payment of cash dividends or repurchases in a given year; about the level of cash dividends and repurchases; about the choice of payout channel. First, we develop and discuss hypotheses. Second, we develop the appropriate econometric models to test the hypotheses and introduce variables. Third, we discuss results and the implications for theory and practice. Finally, we test the robustness of obtained results.

2.1 Hypotheses development

The empirical research on the impact of CEO's compensation incentives on the level of cash dividends and stock repurchases has yielded controversial results.

On the one hand, researchers have shown that if a CEO receives the most part of his or her compensation in the form of inside debt, his or her goal becomes to decrease the default probability [Sundaram, Yermack, 2007; White, 2013]. As dividend payments are a cash outflow from the company, such CEO may consider paying dividends as a threat to a company's stability, thus decreasing the dividends levels.

Moreover, CEOs whose compensation is based on the market value of equity (i.e. executive stock options, restricted stocks) also tend to decrease the level of cash dividends [Geiler, Renneboog, 2016]. First, equity-based compensation is more likely to be used to award risk-seeking CEOs, as it is cheaper to incentivize them than risk averse CEOs [Graham et al., 2013]. Risk tolerant CEOs in turn tend to pursue higher-risk investments and are left with fewer funds to be distributed among shareholders, thus decreasing payout to shareholders [Caliskan, Doukas, 2015].

Second, equity compensation may have no dividend protection and CEOs become reluctant to increase dividends to avoid negative effects of dividend

announcements on the value of their portfolio of stocks or options [Burns et al., 2015; De Cesari, Ozkan, 2015].

On the other hand, some researchers show that inside debt may induce a CEO to pay more dividends [Caliskan, Doukas, 2015; Wu, Wu, 2020]. As inside debt may induce more risk averse behaviour of a CEO, incentivizing him or her to increase hedging and diversification and to decrease high risk R&D projects and leverage [Cassell et al., 2012], authors argue that such a CEO has less investment opportunities that fit CEO's risk preferences. As a result, he or she chooses a conservative decision – to increase the level of cash dividends.

As more recent studies have shown that inside debt leads to an increase in the level of cash dividends, we formulate our first hypothesis as follows:

Hypothesis 1: The higher the level of inside debt owned by the CEO, the higher the level of cash dividends.

To deepen the understanding of the impact of inside debt on payout policy, we also assess its impact on the likelihood of dividend payments in a given year. As this type of compensation stimulates the higher levels of dividends and may increase the probability of dividends payout [Borah et al., 2020], we formulate the following hypothesis:

Hypothesis 1a: The higher the level of inside debt owned by the CEO, the higher the probability of cash dividends payout in a given year.

On the contrary, equity-based compensation may incentivize CEOs to invest in projects with high risks. Such investments may be associated with losses or with returns, which are lower than the returns demanded by shareholders. This type of compensation may lead to a decrease in the level of cash dividends [Anilov, Ivashkovskaya, 2019; Wu, Wu, 2020]. To address this issue, we formulate the second hypothesis:

Hypothesis 2: The higher the level of equity-based compensation of the CEO, the lower the level of cash dividends.

Hypothesis 2a: The higher the level of equity-based compensation of the CEO, the lower the probability of cash dividends payout in a given year.

The recent research has shown that equity-based compensation may have a significant impact on the level of share repurchases [Fenn, Liang, 2001; Wu, Wu, 2020]. However, at the same time inside debt may be insignificant in terms of the level of stock repurchases [Wu, Wu, 2020; Borah et al., 2020]. We hypothesize that as inside debt incentivizes a CEO to minimize the probability of company's default, such a CEO may be willing to sustain some base level of payout in the form of cash dividends, because a big cash outflow resulted from stock repurchases may be detrimental for the company's financial health. Based on this logic, we formulate our third hypothesis:

Hypothesis 3: The higher the level of inside debt owned by the CEO, the lower the level of stock repurchases.

To deepen the evidence on the impact of CEO's inside debt on payout policy, we also test whether it affects the decision about payout in the form of repurchases in a given year:

Hypothesis 3a: The higher the level of inside debt owned by the CEO, the lower the probability of stock repurchases in a given year.

Unlike inside debt, equity-based compensation can lead to an increase in the level of stock repurchases [Fenn, Liang, 2001; Wu, Wu, 2020]. Authors suggest that such CEOs may use repurchases more intensively as the value of their portfolios of equity-like securities is not protected against negative effects of cash dividends announcements. Thus, they replace dividends with repurchases; however, the effect on the level of total payout may be negative. Moreover, such CEOs use repurchases to signal markets about stocks undervaluation. This signal increases stock prices and the value of CEO's portfolio. These suggestions allow us to formulate the fourth hypothesis:

Hypothesis 4: The higher the level of equity-based compensation of the CEO, the higher the level of stock repurchases.

Hypothesis 4a: The higher the level of equity-based compensation of the CEO, the higher the probability of stock repurchases in a given year.

As previous research has shown that equity-based compensation, but not inside debt, provides incentives for an increase in the level of repurchases [Wu, Wu, 2020], we aim at testing whether the type of CEO compensation affects the choice of payout channel. We assume that CEOs with more inside debt, who are not encouraged to bear more risks by their compensation packages, tend to maintain some stable level of payout by distributing the base level of cash dividends and not using the repurchases to distribute some additional amount. In contrast, we believe that CEOs with more equity compensation are more willing to use repurchases as the main channel of payout to protect the value of their portfolio from negative effects of dividend payout [Geiler, Renneboog, 2016; Anilov, Ivashkovskaya, 2019]. We formulate the fifth and the sixth hypotheses as follows:

Hypothesis 5: The higher the level of inside debt owned by the CEO, the less likely a CEO chooses repurchases as a main payout channel.

Hypothesis 6: The higher the level of equity-based compensation of the CEO, the more likely a CEO chooses repurchases as a main payout channel.

Now we can move on to the development of econometric models to test our hypotheses.

2.2 Econometric models development

To test the hypotheses, introduced in the previous subsection, we use several econometric models that allow us to assess the above-mentioned relationships accurately and take data structure into account.

To test hypotheses 1, 2, 3, 4, 5 and 6 we use model 1:

$$Payout_{i,t} = \alpha + \beta_1 \bullet CEO\_compensation_{i,t} + \beta_2 \bullet Age_{i,t} + \sum_{k=3}^{12} \beta_k \bullet Control_{i,t,k} + \theta_i + \delta_t + \varepsilon_{i,t} \quad (1),$$

where $Payout_{i,t}$ – is one of the three "Payout" variables defined in Table 8 below; $CEO\_compensation_{i,t}$ – is either one of three measures of CEO's inside debt or one of four measures of CEO's equity-based compensation; $Age_{i,t}$– is the

age of the CEO; $Control_{i,t,k}$ – is the set of control variables; α, β_k- are coefficients for regressions; $\varepsilon_{i,t}$, – is a normally distributed error term; θ_i- are industry effects; δ_t – are the year's effects; i – is a company's index; t – is a year's index.

To test hypotheses 1a, 2a, 3a, and 4a we use model 2:

$$pr(DTP_{i,t} = 1) = \varphi\{\mu + \gamma_1 \bullet CEO\_compensation_{i,t} + \gamma_2 \bullet Age_{i,t} + \\ + \sum_{k=3}^{12} \gamma_k \bullet Control_{i,t,k} + \theta_i + \delta_t\} \quad (2),$$

where $pr(DTP_{i,t} = 1)$ is the probability that $DTP_{i,t}$=1; DTP – is a binary variable that equals to "1" if a company distributed cash among the shareholders through repurchases and/or dividends, and "0" – otherwise; $\varphi\{x\}$ – is the standard normal cumulative distribution function; $CEO\_compensation_{i,t}$ – is either one of three measures of CEO's inside debt or one of four measures of CEO's equity-based compensation; $Age_{i,t}$– is the age of the CEO; $Control_{i,t,k}$ – is the set of control variables; μ, γ_k- are coefficients for regressions; θ_i- are industry effects; δ_t – are the year's effects; i – is a company's index; t – is a year's index.

The variables that capture the impact of CEO's compensation incentives on payout decisions, are presented in Table 8.

Table 8. The variables.

Variable type	Variable name	Definition
Payout	Repurchase ratio (RR)	Repurchases to total assets
	Dividend ratio (DR)	Cash dividends on common and preferred stocks to total assets
	Fraction of repurchases (FR)	Repurchases to total payout
DTP	Decision to repurchase (DTR)	1 if repurchases took place, 0 otherwise
	Decision to pay dividends (DTPD)	1 if cash dividends took place, 0 otherwise
Equity-based compensation	Total CEO equity	The natural logarithm of sum of the values of company's stocks, restricted

		stocks and executive stock options owned by a CEO (all on year's end)
	Options compensation	The value of option awards to a CEO in a given year to the value of total compensation
	Stocks compensation	The value of stocks awards to a CEO in a given year to the value of total compensation
	Restricted stocks compensation	The value of restricted stocks awards to a CEO in a given year to the value of total compensation
Inside debt and other compensation	Total CEO inside debt	The natural logarithm of sum of CEO's deferred compensation on the year's end and present value of accumulated pension benefits
	CEO relative debt to equity	The natural logarithm of the ratio of CEO's total inside debt to total CEO equity to a company's debt to equity
	CEO high relative debt to equity	Dummy variable that equals to 1 if CEO's debt to equity ratio is higher than company's debt to equity ratio, and 0 - otherwise
	Cash compensation	Total cash compensation to total compensation
Age	Age	Age of the CEO
Control	Cash	Cash holdings to total assets
	Tobin's Q	Market value of equity to book value of equity
	Debt to equity	Book value of debt to equity
	Capital expenditures (CAPEX)	Capital expenditures to total assets
	Research and development (R&D)	R&D expenses to total assets
	Long-term debt (LTD)	Long-term debt to total debt
	Return on assets (ROA)	Net income to total assets

	Size	Natural logarithm of total assets
	Annual stock return	The annual return on a company's common stocks
	Annualized stock volatility	The annualized volatility of price of a company's common stocks

As can be seen from Table 8, we use three specifications of payout policy decisions for model 1 and two specifications for model 2. The first specification is based on the repurchases, and the second is based on the dividends. The distinction between these two specifications allows us to compare the impact of various compensation incentives of CEOs on the levels of different types of payout and on their probabilities. The third specification is based on the fraction of different payout components in total payout, namely the fraction of repurchases. This variable allows us to define the determinants of the choice of payout channel: cash dividends or share repurchases.

Now let us discuss more thoroughly the variables that measure compensation incentives of the CEO.

Equity-based compensation.

To assess the impact of equity-based compensation on payout decisions we have chosen four measures. The first measure is the natural logarithm of the sum of the value of CEO's stocks, received under the compensation policy, CEO's restricted stocks and CEO's executive stock options. This measure defines CEO's overall exposure to equity incentives. Studies that applied this measure have shown that it really leads to a decrease in dividends levels, as CEOs may be willing to protect their portfolio from the negative effects of dividend payouts [Caliskan, Doukas, 2015]. We define this variable as CEO's total equity and, unlike previous research, use the natural logarithm of this measure to bring it more in line with measurements of other variables.

To test whether different components of equity compensation provide different incentives we also use measures for each component. Thus, the second measure is the ratio of option awards to a CEO in a given year to the level of total

compensation (defined as a sum of cash, option, stock, and restricted stock compensation in a given year). As executive stock options are usually not dividend protected, CEOs with large compensation in the form of options decrease the level of dividends and total payout [Geiler, Renneboog, 2016], while increasing the level of repurchases [Fenn, Liang, 2001].

The third measure is the ratio of stock awards to a CEO in a given year to the level of total compensation. On the one hand, CEOs with high levels of stock holdings may be cautious in their investment decisions, because they may be afraid of a stock price collapse in the face of high-risk investments. Moreover, such compensation may align interests of a CEO to those of shareholders, thus, leading to an increase in payout [De Cesari, Ozkan, 2015]. On the other hand, recent research has shown that the relationship between CEO ownership and his or her risk tolerance may be concave: equity may be considered as a call on company's assets, which value increases with volatility [Colonnello et al., 2017]. Thus, such CEOs may increase the portfolio of high-risk projects, leading to a decrease in dividend payout.

Finally, we separate restricted stock units (RSU) from stocks awards. RSU provide a CEO with an incentive to achieve long-term goals. The payments from the RSU are made available for the CEO only after several years, when it becomes clear that achieved results are sustainable. Moreover, unlike stock-option grants RSUs are usually dividend protected [Aboody, Kasznik, 2008]. Although some researchers have not found significant relationship between RSU and payout [Geiler, Renneboog, 2016], we hypothesize that CEOs who have more RSU in their total compensation may distribute more funds to shareholders.

Inside debt.

Following previous research, we have chosen three specifications of inside debt.

The first variable is the amount of deferred compensation and present value of accumulated pension benefits. The deferred compensation is a type of compensation that has been earned but has not been paid. The payment of deferred

compensation may be conditional on the achievement of some goals in the future. The pension benefits are also a type of compensation that will be paid in the future when a CEO is retired. It is considered as more long-term incentive than the deferred compensation [Reid, 2018]. It is argued that these two types of compensation put a CEO in the position of a company's debtholder and are referred to as "inside debt" [Sundaram, Yermack, 2007; Reid, 2018; Wu, Wu, 2020]. As the result, CEO's goal becomes to decrease the default probability, which may reduce the investment opportunities set and lead to an increase in dividends payout [Caliskan, Doukas, 2015; Wu, Wu, 2020]. Again, we use natural logarithm of this measure.

The second measure is the ratio of CEO's inside debt to the CEO's total equity relative to a company's debt to equity ratio. This variable measures the CEO's leverage relative to a company's leverage. Following previous research, we use natural logarithm of this ratio [Cassell et al., 2012; Caliskan, Doukas, 2015; Freund et al., 2018]. The researchers show that higher relative CEO leverage leads to an increase in CEO's risk aversion and dividends payout [Caliskan, Doukas, 2015; Wu, Wu, 2020].

The third measure is a dummy variable that equals to 1 if CEO's debt to equity ratio is higher than the company's debt to equity ratio, and 0 - otherwise. This measure allows us to compare the CEO's leverage and company's leverage. Authors argue that this measure helps define the extent to which CEO's incentives are aligned to those of debtholders [Sundaram, Yermack, 2007; He, 2015; Caliskan, Doukas, 2015]. The higher this measure is, the stronger the incentive to act as a bondholder

Other types of compensation.

A CEO's salary is usually a fixed amount that does not depend on whether the CEO achieves some key performance indicators (KPI) or not. As this type of compensation does not induce a CEO to focus on long-term performance of the company, the fixed component of the total compensation does not stimulate a CEO

to invest and to bear more risks in order to achieve KPI [Caliskan, Doukas, 2015] leading to higher levels of payout to shareholders [Geiler, Renneboog, 2016].

In addition to these variables and based on previous research, we use a set of control variables. First, we use age of a CEO. As shown in previous research, older people, due to their huge experience and, perhaps, shorter expected remaining lifetime, are more cautious and less willing to take certain risks [Caliskan, Doukas, 2015], for example, they are less likely to initiate acquisitions [Yim, 2013], which may lead to an increase in dividend payout. In contrast, younger people are more associated with courage and risk. Second, we use variables representing the financial position of the company (see Table 8). Namely, we use variables that turned out to be significant in terms of their impact on payout decisions: Cash holdings, Research and Development expenditures, Size, and stock return [Banerjee et al., 2018(a)]; Tobin's Q, Leverage, and Return on Assets [Wu, Wu, 2020]; Capital expenditures and stock return volatility [Caliskan, Doukas, 2015]. By doing so, we are able to compare the impact of compensation incentives with the impact of fundamental financial factors.

Due to endogeneity issues, we also include industry dummies and year dummies to capture possible effects.

To assess model 1, following prior research [De Cesari, Ozkan, 2015; Burns et al., 2015] we use panel tobit regression with random effects as we have censored data. While investigating the impact of CEO compensation incentives on the level of cash dividends and stock repurchases, we specify the lower limit at 0, without upper limit; and for the fraction of repurchases we specify lower limit at 0 and upper limit at 1. In the following subsections we will also implement alternative econometric tools to account for endogeneity and to check the robustness of obtained results.

To address the panel structure of data and the initial conditions problem, for model 2 a population-averaged panel probit model regression has been applied [Wooldridge, 2005].

For all models, the robust standard errors at firm level have been used. We do not report R^2 or pseudo- R^2 for these models, because these econometric tools do not use the least squares procedure and there is no approach to calculate R^2 or pseudo- R^2. To assess the quality and reliability of the models we use Wald statistics.

All calculations have been made using Stata package.

In the following subsection we discuss the process of data collection and describe the sample.

2.3 Sample description

To conduct the research, we collected a sample of companies from the United States of America. We have chosen US companies because, first, some research on this topic has been conducted using samples of US companies [Cuny, Martin, Puthenpurackal, 2009; Caliskan, Doukas, 2015; Borah et al., 2020; Wu, Wu, 2020]. Using these companies will allow us to compare results with existing studies. Second, the reliable data on CEO's compensation components is available for the US companies. The reliable data will allow us to develop and to test research methodology of the dissertation and to apply it to further research on samples of companies from emerging markets and compare results across the world.

We collect a sample of non-financial and non-utility companies from the US for 2007 to 2019 from the S&P 1500 Index, which represents the largest and most stable companies in the US. We drop those companies, which do not report information about compensation of their CEOs, and those with more than 5 years of missing data. The rest of missing data were replaced with zeroes. After adjusting for outliers, we came up with a final sample of 813 companies. The data on company's financials and CEO's compensation was obtained from the S&P Capital IQ database.

The descriptive statistics for the sample are presented in Table 9.

Table 9. Descriptive Statistics.

Variable	Mean	St. dev.	Q1	Median	Q3	Min	Max
Dependent variables							
Repurchase ratio	0.04	0.07	0.00	0.01	0.04	0.00	0.97
Dividend ratio	0.01	0.02	0.00	0.01	0.02	0.00	0.31
Fraction of repurchases	0.51	0.41	0.00	0.57	1.00	0.00	1.00
Decision to repurchase	0.74	0.44	0.00	1.00	1.00	0.00	1.00
Decision to pay dividends	0.59	0.49	0.00	1.00	1.00	0.00	1.00
CEO equity-based compensation							
Ln total CEO equity	15.19	4.52	14.90	16.18	17.31	0.00	26.27
Options compensation	0.10	0.16	0.00	0.03	0.13	0.00	1.00
Stocks compensation	0.43	0.28	0.19	0.49	0.65	0.00	1.00
Restricted stocks compensation	0.14	0.12	0.04	0.13	0.20	0.00	0.99
CEO inside debt							
Ln total CEO inside debt	8.03	7.32	0.00	12.12	14.83	0.00	19.40
CEO relative leverage	0.39	0.78	0.00	0.01	0.50	0.00	8.51
High CEO relative leverage	0.22	0.42	0.00	0.00	0.00	0.00	1.00
Control variables							
CEO cash compensation	0.30	0.27	0.11	0.20	0.38	0.00	1.00
CEO age	53.80	7.40	49.00	54.00	58.00	23.00	96.00
Cash	0.11	0.11	0.03	0.08	0.16	0.00	0.91
Tobin's Q	2.15	2.24	0.92	1.55	2.62	0.00	41.26
Debt to equity	0.41	0.64	0.08	0.28	0.52	0.00	18.03
Capital expenditures	0.05	0.05	0.02	0.03	0.06	0.00	0.81
R&D expenses	0.02	0.05	0.00	0.00	0.03	0.00	0.58
Long-term debt	0.69	0.38	0.46	0.89	0.98	0.00	1.00
Return on assets	0.05	0.09	0.02	0.06	0.09	-0.85	0.90
Size	21.50	2.57	20.47	21.55	22.76	0.00	27.04
Stocks return	1.11	0.65	0.85	1.09	1.32	0.00	26.08
Standard deviation of stocks return	19.19	28.38	7.24	12.63	21.74	0.00	840.99

Table 9 shows that the companies in our sample differ in various respects: from companies with high payout ratios to those with no payouts; companies with very high levels of debt, and companies with no debt.

We can see that companies use both equity-based compensation and inside debt widely. Equity-based compensation seems to be more common, as a mean of

natural logarithm of CEO's total equity is 15.19, which is higher than a mean of natural logarithm of CEO's total inside debt. Among equity-based compensation, compensation with company's stocks seems to be more wide-spread. At the same time, there are companies that use only fixed cash compensation, which is not dependent on the company's market performance.

Within the sample, repurchases are, on average, more common than cash dividends - the arithmetic average repurchase ratio for our sample is 0.04 and the arithmetic average dividend ratio is 0.01. These are in line with previous findings [Fama, French, 2001; Fenn, Liang, 2001; Douglas, 2007; Geiler, Renneboog, 2016]. At the same time the total payout consists of approximately equal fractions of cash dividends and repurchases – repurchases account for 51% of total payout.

Given the changes in the fractional amount of repurchases relative to the total payout for the period, presented in Figure 2, the data suggests that repurchases have been becoming increasingly popular.

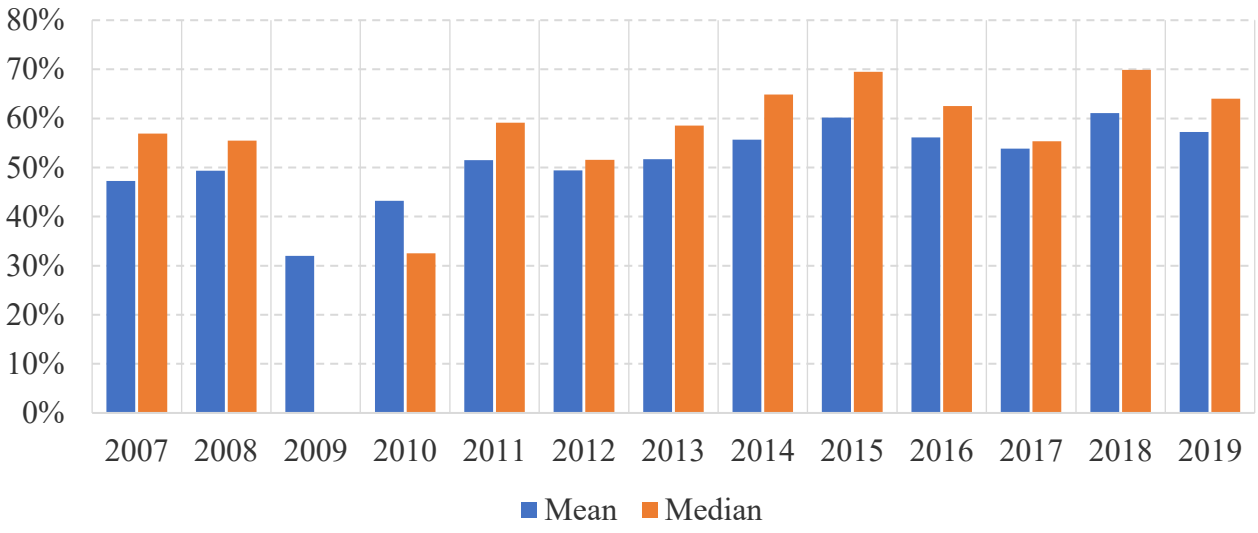

Figure 2. The dynamics of the fractional amount of repurchases relative to the total payout [Anilov, Ivashkovskaya, 2019].

We can see from Figure 2 that from 2009 to 2011 and from 2012 to 2015 both the mean and median fraction of repurchases in the total payout increased. The major shocks that happened in 2009 (the "Great Recession") and 2012 (tax reform and the tightening of monetary policy) reduced the overall fraction of repurchases, but the subsequent trends were upward, and in 2014 the fraction of

repurchases reached pre-recession levels. However, 2016 and 2017 has also faced the reduction in the fraction of repurchases, which has been alleviated in 2018 by an increase to the highest level during the sample period: 61% - for mean, and 70% - for median. To understand the data structure more deeply, as repurchases are the main channel of payout to shareholders, in Table 10 we investigate the differences between the companies which repurchase stocks, and those which do not.

Table 10. Average values for companies which repurchase their shares, and those which do not[5].

Variable	Companies which do not repurchase	Companies which do repurchase	t-test for differences in means
Equity-based compensation			
Ln total CEO equity	13.91	15.64	-17.46***
Options compensation	0.11	0.09	5.27***
Stocks compensation	0.34	0.46	-2.87***
Restricted stocks compensation	0.12	0.15	-11.35***
Inside debt			
Ln total CEO inside debt	6.28	8.65	-14.74***
CEO relative leverage	0.34	0.41	-4.40***
High CEO relative leverage	0.20	0.23	-3.69***
Control variables			
CEO cash compensation	0.37	0.27	17.90***
CEO age	53.56	53.89	-2.00**
Cash	0.11	0.11	1.64
Tobin's Q	1.87	2.25	-7.73***
Debt to equity	0.39	0.42	-2.42**
Capital expenditures	0.05	0.04	7.41***
R&D expenses	0.03	0.02	2.91***
Long-term debt	0.65	0.70	-5.41***
Return on assets	0.03	0.06	-18.12***
Size	20.52	21.85	-24.02***
Stocks return	1.12	1.11	0.49
Stand. dev. of stocks return	15.66	20.43	-7.59***

The data presented in Table 10 shows that companies which repurchase their shares are on average larger, more profitable and have higher values of Tobin's Q, meaning that they are valued more by the market, than companies which do not

[5] *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

repurchase. It means that investors value such companies more than companies that distribute cash among shareholders only through dividends or do not pay dividends at all.

We can see that CEOs in companies which repurchase stocks have more equity, specifically they have higher compensation in the form of company's stocks, which is in line with findings of previous research [Lee et al., 2019], while options compensation is lower. It means that in such companies, CEOs are compensated more through stocks, but not through stock options. As this observation is contrary to the findings of previous research, we will need to check the results of regression analysis to draw conclusions about the interrelations between repurchases and compensation in the form of stock options.

Table 10 shows that CEOs get significantly more compensation in the form of inside debt in companies which repurchase stocks, with higher values of CEO's relative leverage. Increased level of inside debt in these companies may be a sign of overall higher CEO's compensation package due to higher profitability and market value. At the same time, higher CEO's debt to equity ratio relative to company's leverage may signal about the fact that, contrary to our predictions, inside debt provides incentives for stock repurchases. The final conclusions, however, will be drawn after regression analysis.

We also investigate the dynamics of equity-based compensation and inside debt measures over the time frame of our sample in Figure 3. We do so to check, how CEO's compensation has evolved over time, and whether these dynamics are somehow connected with the dynamics of payout levels.

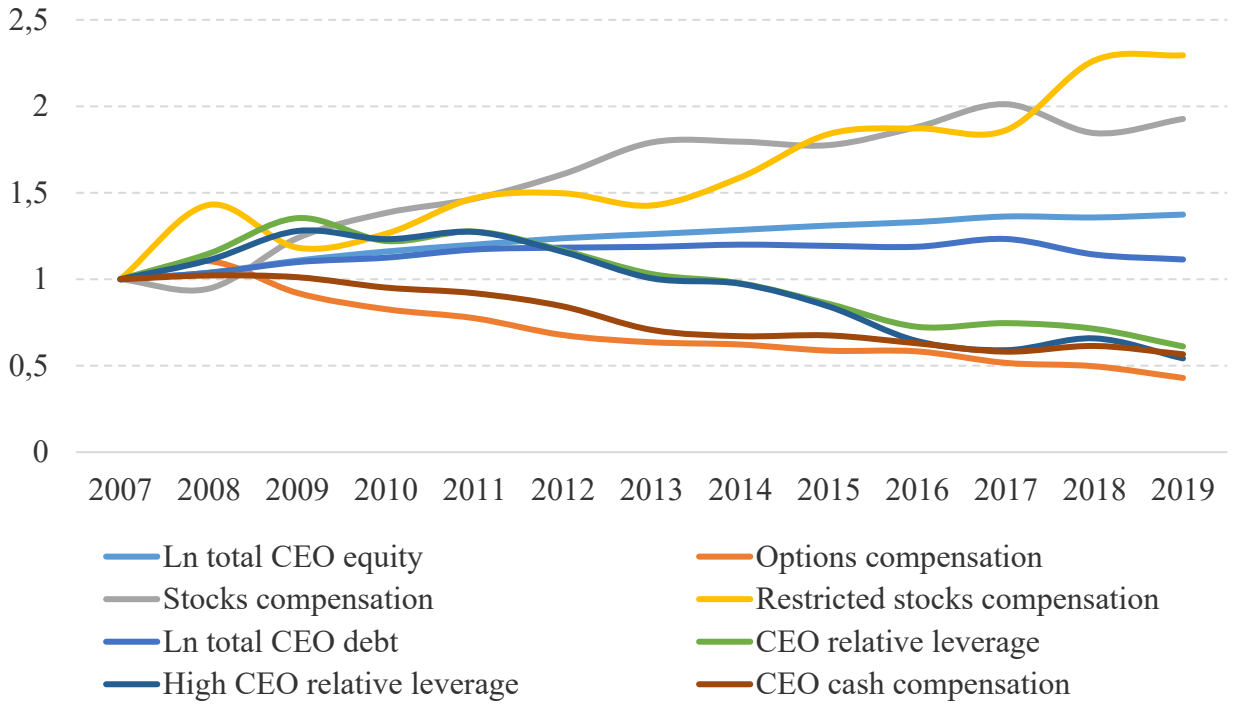

Figure 3. The dynamics of the mean values of equity-based compensation and inside debt. The values of 2007 are scaled to 1.

We can see from Figure 3 that different types of CEO's compensation show very different dynamics over the course of 2007-2019. First, the amount of equity compensation has increased. Surprisingly, this increase came from the higher levels of compensation in the form of stocks and restricted stocks, and not from the option compensation. Actually, the fraction of compensation in the form of executive stock options almost halved during the investigated period for our sample. As we can see, this type of compensation has been substituted with stocks compensation and restricted stocks compensation. This observation is contrary to the results of previous studies, which found that options compensation had become increasingly popular [Fenn, Liang, 2001]. Perhaps, stocks compensation is now considered more appropriate in terms of reducing agency conflicts between managers and shareholders, and the trend that was observable 20 years ago has now changed. Another explanation, is that compensation in the form of stock options is nowadays more common among younger CEOs in smaller companies [Malmendier, 2018], which are not widely represented in S&P1500, which is used to build sample for this study.

Second, the amount of inside debt, owned by CEOs has increased, though not as high as CEO's total equity. As inside debt aligns CEO's interests to those of debtholders, we believe that the goal of its increased usage is to balance the incentives of CEOs so that they act not only in the interests of shareholders under equity compensation, but also in the interests of debtholders. At the same time the measures of relative leverage both declined, which may be a sign that CEO's leverage grew not so rapidly as the company's leverage over the investigated time period (the mean company's leverage has increased from 0.35 to 0.65, while CEO's leverage has declined from 0.23 to 0.15).

Now we can look at the correlation matrix in Table 11.

Table 11. Correlation Matrix.

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Repurchase ratio	1.0																							
2	Dividend ratio	0.1	1.0																						
3	Fraction of repurchases	0.4	-0.2	1.0																					
4	Decision to repurchase	0.3	0.1	0.7	1.0																				
5	Decision to pay dividends	0.0	0.5	-0.3	0.1	1.0																			
6	Ln CEO's total equity	0.0	0.1	0.1	0.2	0.2	1.0																		
7	Options compensation	0.1	-0.1	0.0	-0.1	-0.1	0.0	1.0																	
8	Stocks compensation	0.0	0.1	0.1	0.2	0.2	0.4	-0.4	1.0																
9	Restricted stocks compensation	0.0	0.0	0.1	0.1	0.0	0.3	-0.2	0.2	1.0															
10	Ln CEO's total inside debt	0.0	0.1	0.0	0.1	0.3	0.3	0.0	0.3	0.1	1.0														
11	CEO relative leverage	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.0	0.5	1.0													
12	High CEO relative leverage	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.1	0.0	0.5	0.7	1.0												
13	CEO's cash compensation	-0.1	0.0	-0.1	-0.2	-0.1	-0.2	0.0	-0.7	-0.4	-0.2	0.0	0.0	1.0											
14	CEO's age	-0.1	0.0	0.0	0.0	0.1	0.2	-0.1	0.1	0.0	0.1	0.1	0.0	0.1	1.0										
15	Cash	0.1	0.0	0.1	0.0	-0.2	0.0	0.1	-0.1	-0.1	-0.3	-0.1	0.0	0.1	0.0	1.0									
16	Tobin's Q	0.3	0.3	0.1	0.1	-0.1	0.1	0.1	0.0	-0.1	-0.1	-0.1	-0.1	0.0	0.0	0.2	1.0								
17	Company's d/e	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-0.1	-0.2	0.0	0.0	-0.2	0.2	1.0							
18	Capital Expenditures	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	1.0						
19	R&D	0.2	0.0	0.1	0.0	-0.2	0.0	0.2	-0.1	0.0	-0.2	-0.1	-0.1	0.0	-0.1	0.4	0.2	-0.1	-0.1	1.0					
20	LTD	-0.1	0.0	0.0	0.1	0.2	0.1	-0.1	0.2	0.1	0.3	0.1	0.0	-0.1	0.1	-0.3	-0.1	0.2	0.1	-0.2	1.0				
21	ROA	0.3	0.3	0.1	0.2	0.1	0.1	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.3	-0.1	0.0	-0.1	-0.1	1.0			
22	Size	0.1	0.1	0.1	0.2	0.3	0.4	0.0	0.3	0.2	0.3	0.1	0.1	-0.1	0.1	-0.1	0.0	0.2	0.1	-0.1	0.4	0.1	1.0		
23	Stocks return	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	-0.1	0.0	0.0	0.1	0.1	1.0	
24	Standard deviation of stocks return	0.1	0.0	0.1	0.1	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.2	0.1	1.0

Table 11 provides the correlation matrix for the chosen variables. We can see that correlations are above 50% only for dependent variables and between cash compensation and stocks compensation, and CEO's relative leverage and high relative leverage. But it is not a concern, as we do not put these variables in one regression. For other variables pair correlations are below 50%, which alleviates the problem of multicollinearity.

Having discussed the sample, we can now move to the discussion of regression analysis of the impact of CEO's compensation incentives on payout decisions.

2.4 Results of regression analysis

We begin with the discussion of the impact of a CEO's incentives on the level of cash dividends. The results are presented in Table 12 below.

Table 12. The impact of a CEO's incentives on the level of cash dividends.[6]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Ln total CEO equity	0.000 (0.03)						
CEO cash compensation	0.0012 (1.04)						
Options compensation		-0.0047** (-2.31)					
Stocks compensation			0.0036*** (3.41)				
Restricted stocks compensation				-0.005*** (-2.91)			
Ln total CEO inside debt					0.0002*** (4.67)		
CEO relative leverage						0.0006* (1.93)	
High CEO							0.0017**

[6] This table presents results from the tobit regression with lower limit set at 0 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

relative leverage							(2.18)
CEO age	0.0001 (1.40)	0.0001 (1.53)	0.000 (1.54)	0.000 (1.4)	0.000 (0.88)	0.000 (1.23)	0.000 (1.21)
Cash	0.0153*** (4.53)	0.0156*** (4.59)	0.0159*** (4.69)	0.0156*** (4.61)	0.0159*** (4.71)	0.0155*** (4.57)	0.0154*** (4.55)
Tobin's Q	0.0025*** (15.62)	0.0025*** (15.71)	0.0025*** (15.38)	0.0025*** (15.5)	0.0025*** (15.43)	0.0025*** (15.65)	0.0025*** (15.64)
Debt to equity	-0.004*** (-7.57)	-0.004*** (-7.63)	-0.004*** (-7.48)	-0.004*** (-7.56)	-0.004*** (-7.47)	-0.004*** (-7.41)	-0.004*** (-7.38)
Capital expenditures	0.003 (0.38)	0.003 (0.41)	0.003 (0.34)	0.003 (0.4)	0.003 (0.38)	0.003 (0.39)	0.003 (0.43)
R&D expenses	-0.147*** (-8.34)	-0.145*** (-8.27)	-0.143*** (-8.12)	-0.144*** (-8.22)	-0.143*** (-8.15)	-0.146*** (-8.29)	-0.146*** (-8.30)
Long-term debt	-0.0006 (-0.65)	-0.0006 (-0.65)	-0.0006 (-0.68)	-0.0006 (-0.64)	-0.0006 (-0.68)	-0.0006 (-0.62)	-0.0004 (-0.46)
ROA	0.028*** (8.55)	0.0276*** (8.45)	0.0273*** (8.32)	0.0270*** (8.22)	0.028*** (8.60)	0.0279*** (8.52)	0.0277*** (8.47)
Size	0.0017*** (6.28)	0.0017*** (6.45)	0.0016*** (6.21)	0.0017*** (6.53)	0.0016*** (6.08)	0.0016*** (6.35)	0.0016*** (6.33)
Stocks return	-0.006*** (-10.76)	-0.006*** (-10.95)	-0.006*** (-11.14)	-0.006*** (-11.03)	-0.006*** (-10.77)	-0.006*** (-10.71)	-0.006*** (-10.67)
Stand. dev. of stocks return	0.000 (0.45)	0.0000 (0.50)	0.0000 (0.34)	0.0000 (0.34)	0.0000 (0.31)	0.0000 (0.39)	0.0000 (0.38)
Constant	-0.037*** (-4.64)	-0.037*** (-4.68)	-0.037*** (-4.73)	-0.036*** (-4.51)	-0.035*** (-4.46)	-0.036*** (-4.54)	-0.036*** (-4.55)
Year dummies	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES
Wald stat	1134.8 (0.00)	1138.7 (0.00)	1146.8 (0.00)	1144.2 (0.00)	1158.2 (0.00)	1137.8 (0.00)	1139 (0.00)

Table 12 shows that all the regressions are statistically significant, as Wald statistics are high enough. First, the results presented in Table 12 show that dividend ratio is significantly affected by all three measures of CEO's inside debt, used in this study. This means that inside debt provides incentives for a CEO to increase the level of cash dividends. We suppose that this type of compensation does not incentivize a CEO to increase a company's risk by taking up risky investment projects, so he or she distributes more funds among shareholders. This finding supports hypothesis 1 and is in line with results of previous research [Wu, Wu, 2020; Borah et al., 2020].

Second, in line with our predictions and results of previous research [Fenn, Liang, 2001; Geiler, Renneboog, 2016] we have found that the level of cash dividends is lower in companies where equity-based compensation of a CEO is higher. However, when we look at different components separately, we add some new insights to this result. We can see in Table 12 that both options and restricted stocks does not incentivize a CEO to increase dividends payout, as options are not dividend-protected, meaning that their value may decrease after dividend announcement [Burns et al., 2015]. At the same time, stocks awards do provide incentives for an increase in the level of cash dividends. Perhaps, this type of equity compensation better aligns CEO's interests to those of shareholders, as a CEO also becomes a recipient of dividends [De Cesari, Ozkan, 2015].

As can be seen in Table 12, the level of cash dividends is also affected positively by the level of cash holdings, Tobin's Q, return on assets, and company's size; and is affected negatively by the financial leverage, the level of R&D expenses and stock returns, which is in line with the results of previous research.

Now we move to the discussion of the impact of a CEO's incentives on the level of stock repurchases. The results are presented in Table 13.

Table 13. The impact of a CEO's incentives on the level of stock repurchases.[7]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Ln total CEO equity	-0.0002 (-0.85)						
CEO cash compensation	-0.011*** (-3.19)						
Options compensation		-0.0068 (-1.22)					
Stocks compensation			0.012*** (3.73)				

[7] This table presents results from the tobit regression with lower limit set at 0 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Restricted stocks compensation				0.005 (0.84)			
Ln total CEO inside debt					0.0005*** (3.04)		
CEO relative leverage						0.001 (1.17)	
High CEO relative leverage							0.005** (2.21)
CEO age	-0.001*** (-2.66)	-0.001*** (-3.08)	-0.001*** (-3.07)	-0.001*** (-3.04)	-0.001*** (-3.41)	-0.001*** (-3.20)	-0.001*** (-3.31)
Cash	0.0172* (1.78)	0.0162* (1.67)	0.0174* (1.8)	0.016* (1.65)	0.0179* (1.85)	0.0161* (1.66)	0.0161* (1.66)
Tobin's Q	0.004*** (9.00)	0.004*** (9.03)	0.004*** (8.8)	0.004*** (9.03)	0.004*** (9.02)	0.004*** (9.03)	0.004*** (9.03)
Debt to equity	-0.001 (-0.99)	-0.002 (-1.04)	-0.001 (-0.92)	-0.002 (-1.01)	-0.002 (-1.01)	-0.001 (-0.92)	-0.001 (-0.80)
Capital expenditures	0.0625*** (2.87)	0.0612*** (2.80)	0.0619*** (2.84)	0.0609*** (2.79)	0.0628*** (2.88)	0.0615*** (2.82)	0.0622*** (2.85)
R&D expenses	0.239*** (7.55)	0.241*** (7.57)	0.245*** (7.72)	0.238*** (7.51)	0.243*** (7.67)	0.239*** (7.54)	0.240*** (7.58)
Long-term debt	-0.001 (-0.44)	-0.001 (-0.47)	-0.001 (-0.52)	-0.001 (-0.45)	-0.002 (-0.61)	-0.001 (-0.46)	-0.001 (-0.31)
ROA	0.191*** (19.30)	0.190*** (19.22)	0.189*** (19.02)	0.191*** (19.27)	0.190*** (19.23)	0.190*** (19.24)	0.190*** (19.21)
Size	0.006*** (8.59)	0.006*** (8.58)	0.006*** (8.24)	0.006*** (8.49)	0.006*** (8.08)	0.006*** (8.48)	0.006*** (8.41)
Stocks return	-0.01*** (-7.18)	-0.01*** (-7.27)	-0.01*** (-7.46)	-0.01*** (-7.18)	-0.01*** (-7.22)	-0.01*** (-7.21)	-0.01*** (-7.14)
Stand. dev. of stocks return	0.0000 (-0.85)	0.0000 (-0.81)	0.0000 (-0.79)	0.0000 (-0.82)	0.0000 (-0.82)	0.0000 (-0.85)	0.0000 (-0.86)
Constant	-0.115*** (-6.28)	-0.118*** (-6.29)	-0.118*** (-6.37)	-0.118*** (-6.31)	-0.110*** (-5.93)	-0.116*** (-6.17)	-0.114*** (-6.11)
Year dummies	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES
Wald stat	1370.4 (0.00)	1352.8 (0.00)	1367.7 (0.00)	1353.1 (0.00)	1368.7 (0.00)	1354.6 (0.00)	1358.4 (0.00)

The results presented in Table 13 show that the level of repurchases is also affected by CEO incentives. First, the coefficients of natural logarithm of inside debt and of high CEO relative leverage are both positive and significant, meaning that inside debt and its high levels relative to company's leverage provide incentives for an increase in the level of share repurchases. Although this result

contradicts hypothesis 3, this research, to our knowledge, is the first to show a non-trivial relationship between inside debt and the level of share repurchases, as previous research has not found significant relationship between repurchases and inside debt [Wu, Wu, 2020; Borah et al., 2020]. This result may probably be explained by the fact that higher levels of inside debt align CEO's interests not only to those of debtholders, but also to shareholders' interests, and lead to an increase in both share repurchases and cash dividends.

Second, compensation in the form of stocks also incentivizes a CEO to increase the level of share repurchases which is in line with previous evidence [De Cesari, Ozkan, 2015]. This result supports hypothesis 4. Combining with previous findings that stocks compensation leads to an increase in dividend levels, this suggests that stocks compensation better aligns CEO's interests with shareholders' interests. However, options compensation and restricted stocks compensation does not affect the level of repurchases significantly, which contradicts results of previous research [Fenn, Liang, 2001; Burns et al., 2015; Wu, Wu, 2020].

The level of repurchases is also affected positively by the level of cash holdings, Tobin's Q, return on assets, company's size, capital expenditures, and R&D expenses; and is affected negatively by the level of CEO's cash compensation, his or her age, and stock returns.

Now we are going to discuss the impact of a CEO's incentives on the choice of payout channel. The results are presented in Table 14.

Table 14. The impact of a CEO's incentives on the choice of payout channel.[8]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Ln total CEO equity	0.006*** (2.95)						
CEO cash	-0.134***						

[8] This table presents results from the tobit regression with lower limit set at 0and upper limit set at 1 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

compensation	(-3.88)						
Options compensation		-0.176*** (-3.11)					
Stocks compensation			0.189*** (5.81)				
Restricted stocks compensation				0.198*** (3.26)			
Ln total CEO inside debt					0.002 (1.42)		
CEO relative leverage						0.020* (1.84)	
High CEO relative leverage							0.046** (2.24)
CEO age	-0.002 (-1.13)	-0.002 (-1.34)	-0.002 (-1.34)	-0.002 (-1.20)	-0.002 (-1.48)	-0.002 (-1.55)	-0.002 (-1.60)
Cash	0.144 (1.44)	0.137 (1.38)	0.155 (1.35)	0.134 (1.34)	0.142 (1.42)	0.136 (1.36)	0.134 (1.34)
Tobin's Q	-0.003 (-0.58)	-0.001 (-0.21)	-0.003 (-0.67)	-0.001 (-0.15)	-0.001 (-0.31)	-0.001 (-0.28)	-0.001 (-0.29)
Debt to equity	-0.035** (-2.27)	-0.041*** (-2.65)	-0.037** (-2.37)	-0.039** (-2.57)	-0.039*** (-2.56)	-0.038** (-2.42)	-0.037** (-2.38)
Capital expenditures	0.021 (0.09)	-0.026 (-0.12)	-0.010 (-0.05)	-0.023 (-0.10)	-0.014 (-0.07)	-0.016 (-0.07)	-0.011 (-0.05)
R&D expenses	0.750** (2.12)	0.714** (2.01)	0.771** (2.18)	0.659* (1.86)	0.689* (1.94)	0.673* (1.90)	0.677* (1.91)
Long-term debt	-0.030 (-1.14)	-0.0285 (-1.07)	-0.0308 (-1.15)	-0.0278 (-1.04)	-0.028 (-1.06)	-0.0273 (-1.02)	-0.0232 (-0.87)
ROA	1.04*** (11.21)	1.049*** (11.28)	1.020*** (10.96)	1.079*** (11.57)	1.055*** (11.35)	1.055*** (11.34)	1.051*** (11.3)
Size	0.047*** (9.39)	0.051*** (10.18)	0.047*** (9.53)	0.049*** (9.82)	0.049*** (9.82)	0.049*** (9.93)	0.049*** (9.89)
Stocks return	-0.029** (-2.29)	-0.028** (-2.26)	-0.032** (-2.53)	-0.025** (-1.98)	-0.027** (-2.15)	-0.027** (-2.14)	-0.026** (-2.08)
Stand. dev. of stocks return	-0.0003 (-0.74)	-0.0002 (-0.46)	-0.0002 (-0.59)	-0.0002 (-0.47)	-0.0002 (-0.59)	-0.0002 (-0.58)	-0.0002 (-0.59)
Constant	-0.547*** (-3.39)	-0.523*** (-3.22)	-0.553*** (-3.42)	-0.555*** (-3.40)	-0.498*** (-3.06)	-0.487*** (-2.99)	-0.485*** (-2.98)
Year dummies	YES	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES
Wald stat	934.0 (0.00)	914.7 (0.00)	939.2 (0.00)	915.3 (0.00)	908.4 (0.00)	909.4 (0.00)	911.1 (0.00)

We can see from Table 14 that contrary to hypothesis 5 and our predictions CEOs with more inside debt are more likely to choose share repurchases as a main

payout channel. Combining with results on equity-based compensation from previous research [Geiler, Renneboog, 2016], this means that share repurchases is a more preferable channel of payout under both equity-based incentives and inside debt. This supports the idea that inside debt aligns CEO's interests to both debtholders' and shareholders' interests [Borah et al., 2020].

The results in Table 14 support hypothesis 6, as equity-based compensation also incentivizes a CEO to choose repurchases as a main payout channel. At the same time this is only true for stocks and restricted stocks, while option-based compensation does not lead to the choice of repurchases as a main payout channel, which contradicts previous findings [De Cesari, Ozkan, 2015; Geiler, Renneboog, 2016]. This contradiction may be due to the fact that the latter paper investigated UK companies, the former – EU companies, while we focus on the companies from the US. We suppose that CEOs with high level of options awards may be willing to increase the value of their compensation portfolio by increasing the volatility of company's shares. As this can be achieved by taking up some high-risk investments projects, such a CEO is left with less funds to be distributed among shareholders leading to a decrease in both dividends level (Table 12) and fraction of repurchases (Table 14).

The choice of payout channel is also affected by financial variables, i.e. financial leverage, return on assets, company's size and stocks returns. Further discussion will be devoted only to compensation incentives and will not include the financial variables results.

Tables 15 and 16 present results of the research into the impact of a CEO's compensation incentives on the probability of payouts to shareholders in the form of cash dividends and repurchases.

Table 15. The impact of a CEO's incentives on the probability of cash dividends.[9]

[9] This table presents results from the panel probit regression estimation. All regressions include constant term and dummies for industries and years with robust standard errors clustered by firms. z-Statistics are reported in parentheses below each coefficient estimate. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Ln total CEO equity	0.019*** (2.88)						
CEO cash compensation	-0.066 (-0.55)						
Options compensation		-0.120 (-1.35)					
Stocks compensation			0.109* (1.71)				
Restricted stocks compensation				-0.0499 (-0.57)			
Ln total CEO inside debt					0.0117*** (3.31)		
CEO relative leverage						0.0389* (1.84)	
High CEO relative leverage							0.0918** (2.18)
CEO age	0.0055 (1.13)	0.00183 (0.52)	0.002 (0.52)	0.002 (0.52)	0.000 (0.14)	0.001 (0.31)	0.001 (0.27)
Cash	-0.690** (-2.02)	-0.143 (-0.85)	-0.132 (-0.78)	-0.147 (-0.87)	-0.124 (-0.74)	-0.144 (-0.86)	-0.144 (-0.86)
Tobin's Q	0.0067 (0.38)	0.00352 (0.40)	0.002 (0.27)	0.003 (0.37)	0.003 (0.32)	0.003 (0.4)	0.003 (0.38)
Debt to equity	-0.167** (-2.09)	-0.045 (-1.62)	-0.042 (-1.53)	-0.044 (-1.60)	-0.046* (-1.67)	-0.041 (-1.49)	-0.040 (-1.46)
Capital expenditures	-2.546* (-1.95)	-0.531 (-1.55)	-0.532 (-1.57)	-0.533 (-1.56)	-0.530 (-1.58)	-0.527 (-1.55)	-0.523 (-1.53)
R&D expenses	-3.121*** (-3.15)	-2.886*** (-4.07)	-2.826*** (-3.97)	-2.879*** (-4.11)	-2.871*** (-4.10)	-2.891*** (-4.14)	-2.904*** (-4.13)
Long-term debt	0.134 (1.42)	0.0616 (1.30)	0.0616 (1.30)	0.0625 (1.32)	0.055 (1.15)	0.0607 (1.28)	0.0699 (1.48)
ROA	1.982*** (6.09)	0.271* (1.94)	0.257* (1.85)	0.269* (1.93)	0.284** (2.04)	0.274** (1.97)	0.267* (1.91)
Size	0.211*** (5.38)	0.0312*** (4.50)	0.0299*** (4.32)	0.0307*** (4.38)	0.029*** (4.26)	0.0302*** (4.34)	0.0298*** (4.33)
Stocks return	-0.118*** (-3.25)	-0.063*** (-3.12)	-0.067*** (-3.25)	-0.063*** (-3.14)	-0.062*** (-3.07)	-0.061*** (-3.09)	-0.060*** (-3.03)
Stand. dev. of stocks return	-0.004** (-2.29)	-0.0002 (-0.36)	-0.0002 (-0.39)	-0.0002 (-0.42)	-0.0002 (-0.46)	-0.0002 (-0.44)	-0.0002 (-0.45)
Constant	-4.080*** (-4.52)	0.168 (0.54)	0.201 (0.65)	0.168 (0.54)	0.225 (0.71)	-0.630* (-2.07)	0.264 (0.86)
Wald stat	458.58 (0.00)	288.8 (0.00)	293.4 (0.00)	289.1 (0.00)	311.3 (0.00)	301.3 (0.00)	303.6 (0.00)

Table 16. The impact of a CEO's incentives on the probability of stock repurchases.[10]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Ln total CEO equity	0.0069 (1.55)						
CEO cash compensation	-0.255*** (-3.37)						
Options compensation		-0.280** (-2.43)					
Stocks compensation			0.401*** (4.99)				
Restricted stocks compensation				0.250* (1.90)			
Ln total CEO inside debt					0.020*** (5.58)		
CEO relative leverage						0.0708*** (2.66)	
High CEO relative leverage							0.137*** (2.86)
CEO age	-0.004 (-1.10)	-0.005 (-1.35)	-0.005 (-1.37)	-0.004 (-1.25)	-0.007** (-2.08)	-0.006* (-1.62)	-0.006* (-1.64)
Cash	0.183 (0.85)	0.167 (0.77)	0.202 (0.94)	0.165 (0.76)	0.255 (1.19)	0.176 (0.81)	0.18 (0.83)
Tobin's Q	-0.005 (-0.43)	-0.003 (-0.25)	-0.006 (-0.52)	-0.003 (-0.27)	-0.002 (-0.21)	-0.003 (-0.29)	-0.003 (-0.31)
Debt to equity	-0.027 (-0.95)	-0.037 (-1.27)	-0.030 (-1.06)	-0.033 (-1.16)	-0.036 (-1.22)	-0.025 (-0.83)	-0.024 (-0.80)
Capital expenditures	-0.602 (-1.30)	-0.671 (-1.46)	-0.649 (-1.41)	-0.671 (-1.45)	-0.604 (-1.31)	-0.649 (-1.40)	-0.642 (-1.39)
R&D expenses	0.215 (0.29)	0.185 (0.25)	0.342 (0.46)	0.0904 (0.12)	0.356 (0.47)	0.157 (0.21)	0.178 (0.24)
Long-term debt	-0.002 (-0.04)	-0.00158 (-0.03)	-0.00542 (-0.09)	0.00123 (0.02)	-0.019 (-0.33)	-0.00161 (-0.03)	0.00879 (0.15)
ROA	1.504*** (6.66)	1.491*** (6.67)	1.448*** (6.52)	1.534*** (6.75)	1.528*** (6.89)	1.513*** (6.72)	1.506*** (6.69)
Size	0.060*** (6.73)	0.0632*** (7.01)	0.0586*** (6.55)	0.0603*** (6.79)	0.056*** (6.30)	0.0601*** (6.79)	0.0600*** (6.74)
Stocks return	-0.057** (-2.42)	-0.056** (-2.43)	-0.065*** (-2.71)	-0.051** (-2.28)	-0.053** (-2.30)	-0.054** (-2.34)	-0.052** (-2.27)

[10] This table presents results from the panel probit regression estimation. All regressions include constant term and dummies for industries and years with robust standard errors clustered by firms. z-Statistics are reported in parentheses below each coefficient estimate. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Stand. dev. of stocks return	-0.001 (-0.85)	-0.001 (-0.69)	-0.001 (-0.70)	-0.001 (-0.72)	-0.001 (-0.76)	-0.001 (-0.77)	-0.001 (-0.77)
Constant	-0.255 (-0.88)	-0.788*** (-2.65)	-0.266 (-0.91)	-0.795*** (-2.70)	-0.734** (-2.51)	-0.895*** (-3.12)	-0.204 (-0.69)
Wald stat	649.8 (0.00)	641.0 (0.00)	656.6 (0.00)	642.2 (0.00)	694.3 (0.00)	654.8 (0.00)	648.7 (0.00)

Table 17 shows the marginal effects for equity-based compensation and inside debt of the CEO at means.

Table 17. Marginal effects for model 2, at means.[11]

Independent Variable	Decision to pay dividends	Decision to repurchase
Ln total CEO equity	0.008*** (2.88)	0.002 (1.55)
Options compensation	-0.046 (-1.35)	-0.087** (-2.43)
CEO stocks	0.042* (1.71)	0.124*** (4.98)
Stocks compensation	-0.019 (-0.57)	0.078* (1.89)
Ln total CEO inside debt	0.004*** (3.30)	0.006*** (5.54)
CEO debt to equity	0.015* (1.84)	0.022*** (2.65)
CEO relative leverage	0.035** (2.18)	0.042*** (2.85)
CEO cash compensation	-0.026 (-0.55)	-0.079*** (-3.35)

The results presented in Tables 15 and 17 show that the probabilities of dividend payout or repurchases are affected by CEO incentives. First, results suggest that inside debt incentivizes a CEO to pay dividends, increasing its probability. In line with hypothesis 1a and previous findings [Caliskan, Doukas, 2015; Borah et al., 2020] it means that inside debt may lead to an increase in the probability of dividends payout.

Second, the results show that compensation in the form of company's equity, more specifically – company's stocks, also provides incentives for an increase in

[11] This table presents results from assessment of marginal effects, at means, after the panel probit regression estimation. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

the probability of dividend payout, which means that hypothesis 2a may be rejected. As was the case with the level of dividends, we suppose that CEOs with large packages of stocks awards actually benefit from cash dividends, which results in higher payout likelihood [De Cesari, Ozkan, 2015].

Tables 16 and 17 show somewhat similar picture for the case of repurchases probability. The results show that inside debt (all three specifications) may significantly increase the probability of repurchases. This result contradicts with hypothesis 3a, but is in line with our previous results for the level of repurchases and the choice of payout channel (Tables 13 and 14).

The probability of repurchases is also affected by the equity incentives. However, the sign of interrelation depends on the type of compensation. Stocks and restricted stocks incentivize a CEO to repurchase stocks, which support hypothesis 4a and previous findings [De Cesari, Ozkan, 2015]. At the same time, CEOs with high levels of options compensation are less likely to repurchase stocks. We suppose that this may be a sign of limitations of spare funds under CEO's management, as such CEO may pursue high-risk investment projects.

In this subsection we have shown that both inside debt and equity incentives of a CEO affect payout decisions. We add to the existing literature on this topic by showing that, first, CEO's inside debt provides incentives for an increase in the levels of both cash dividends and share repurchases, as well as for an increase in the payout probabilities in both forms. Moreover, inside debt leads to an overall transition from cash dividends to share repurchases. We suppose that inside debt aligns CEO's interests not only to those of bondholders, but also to shareholders' interests, leading to an increase in the overall payout. Following previous research, we argue that dividends and repurchases are the channels through which inside debt mitigates agency problems [Jensen, 1986; Borah et al., 2020]. Second, compensation in the form of company's stocks provides somewhat similar incentives, leading to an increase in the levels of cash dividends and repurchases and their respective probabilities in line with previous findings [De Cesari, Ozkan, 2015]. We believe that CEOs with large packages of stocks awards benefit from

both dividends and repurchases (although stocks may not be dividend protected), as they receive them under such remuneration policy. Finally, we show that CEOs with high levels of compensation in the form of executive stock options are less likely to repurchase stocks and to use repurchases as a main payout channel and are less incentivized to increase cash dividends. The latter may be explained with the fact that executive stock options are not dividend protected and such CEOs are reluctant to increase dividends. The former results, which contradict previous findings [Fenn, Liang, 2001; Geiler, Renneboog, 2016], may be due to a fact that such CEOs try to increase the value of their options portfolio by increasing the volatility of company's stocks. For this purpose they may take up high risk investment projects at the expense of payouts to shareholders.

In the following subsection we aim at checking the robustness of obtained results.

2.5 Robustness check

2.5.1 Alternative measures of CEO's inside debt

To check the robustness of results obtained in previous subsections we use other measures of CEO's inside debt.

First, we split total inside debt in its components: the balance of deferred compensation and present value of accumulated pension benefits. For our sample, the fraction of deferred compensation in total inside debt is 49%, and the fraction of present value of accumulated pension benefits is 51%. It is argued that the latter component of total inside debt provides longer-term incentives for the CEO, while the former will be paid in not so distant future [Reid, 2018]. Thus, these two components may provide different incentives for a CEO, so in this subsection we aim at checking whether or not this is true.

Second, the previous research has shown that there may be a non-linear relationship between CEO's inside debt and payout decisions [Caliskan, Doukas,

2015]. Authors have shown that in line with signaling hypothesis, bond prices react positively to dividend announcements, meaning that debtholders do not consider dividends as a way of wealth transfer from them to shareholders. This view predicts that CEOs with significant inside debt will distribute more funds among shareholders. To test this notion, we create dummy variables for high levels of inside debt (equals to 1, if the CEO's level of inside debt is higher than 67% of other CEOs in our sample) and medium levels of inside debt (equals to 1, if the CEO's level of inside debt is higher than 33-rd percentile, but lower than 67-th percentile of our sample). We also create the corresponding dummies for high and medium levels of CEO's leverage relative to a company's leverage.

To test the robustness of results we use the same econometric tools as in the previous subsection.

Table 18 presents the results of testing the impact of inside debt components on the level of cash dividends.

Table 18. Robustness check: the impact of inside debt components on the level of cash dividends, and non-linearity.[12]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Ln of CEO's PV of acc. pension benefits	0.0003*** (5.56)				
Ln of CEO's balance of deferred compensation	0.000 (1.18)				
CEO's pens. benefits to CEO's equity to company's leverage		0.0018*** (3.54)			
CEO's deferred comp to CEO's equity to company's leverage		-0.0002 (-0.58)			
High CEO's relative leverage measured with pension benefits			0.0027*** (3.3)		
High CEO's relative leverage measured with deferred comp			-0.0006 (-0.74)		

[12] This table presents results from the tobit regression with lower limit set at 0 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Medium inside debt				0.002** (2.45)	
High inside debt				0.004*** (4.84)	
Medium CEO's relative leverage					0.0018** (2.16)
High CEO's relative leverage					0.0027*** (3.53)
CEO age	0.000 (0.42)	0.000 (0.87)	0.000 (1.03)	0.000 (0.67)	0.000 (1.2)
Cash	0.016*** (4.73)	0.015*** (4.53)	0.016*** (4.59)	0.016*** (4.73)	0.016*** (4.64)
Tobin's Q	0.003*** (15.56)	0.003*** (15.60)	0.003*** (15.63)	0.003*** (15.44)	0.003*** (15.57)
Debt to equity	-0.004*** (-7.61)	-0.004*** (-7.38)	-0.004*** (-7.38)	-0.004*** (-7.50)	-0.004*** (-7.41)
Capital expenditures	0.003 (0.44)	0.003 (0.45)	0.003 (0.43)	0.003 (0.4)	0.003 (0.38)
R&D expenses	-0.145*** (-8.26)	-0.145*** (-8.24)	-0.146*** (-8.29)	-0.144*** (-8.19)	-0.144*** (-8.20)
Long-term debt	-0.001 (-0.68)	-0.001 (-0.62)	-0.001 (-0.57)	-0.001 (-0.70)	-0.001 (-1.12)
ROA	0.028*** (8.53)	0.028*** (8.56)	0.028*** (8.47)	0.028*** (8.57)	0.028*** (8.59)
Size	0.002*** (5.98)	0.002*** (6.29)	0.002*** (6.33)	0.002*** (6.07)	0.002*** (6.25)
Stocks return	-0.006*** (-10.72)	-0.006*** (-10.68)	-0.006*** (-10.68)	-0.006*** (-10.75)	-0.006*** (-10.72)
Stand. dev. of stocks return	0.0000 (0.26)	0.0000 (0.30)	0.0000 (0.33)	0.0000 (0.27)	0.0000 (0.41)
Constant	-0.032*** (-4.12)	-0.035*** (-4.35)	-0.035*** (-4.45)	-0.034*** (-4.32)	-0.036*** (-4.58)
Wald stat	1179.7 (0.00)	1147.3 (0.00)	1145.1 (0.00)	1160.8 (0.00)	1148.1 (0.00)

The results presented in Table 18 show that balance of deferred compensation and present value (PV) of accumulated pension benefits indeed have different impact on the level of cash dividends. The measures based on the PV of accumulated pension benefits affect the level of cash dividends positively, while measures based on deferred compensation do not show any significant influence on the level of cash dividends. This means that of all inside debt, pension benefits drive incentives for an increase in cash dividends levels. As pension benefits are

longer-term incentives, they may better align CEO's interests with those of shareholders and debtholders than deferred compensation.

The results also support previous findings that there is a non-linear relationship between inside debt and levels of dividends [Caliskan, Doukas, 2015]. We can see that coefficients of both medium inside debt and high inside debt (as well as medium relative CEO's leverage and high relative CEO's leverage) are significant and positive. Moreover, coefficients of high inside debt are higher than those of medium inside debt. The results suggest that CEOs with high inside debt holdings have even more incentives to increase the level of cash dividends than CEOs with lower levels of inside debt. This finding supports the assumption that inside debt aligns CEO's interests with those of bondholders, who favor the payout of dividends.

We now move to the discussion of testing the impact of inside debt components on the level of share repurchases. Table 19 presents the results.

Table 19. Robustness check: the impact of inside debt components on the level of share repurchases, and non-linearity.[13]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Ln of CEO's PV of acc. pension benefits	-0.0001 (-0.44)				
Ln of CEO's balance of deferred compensation	0.001*** (4.24)				
CEO's pens. benefits to CEO's equity to company's leverage		-0.0013 (-0.71)			
CEO's deferred comp to CEO's equity to company's leverage		0.0024* (1.78)			
High CEO's relative leverage measured with pension benefits			-0.0036 (-1.21)		
High CEO's relative leverage measured with deferred comp			0.007*** (2.99)		

[13] This table presents results from the tobit regression with lower limit set at 0 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Medium inside debt				0.004* (1.72)	
High inside debt				0.008*** (3.29)	
Medium CEO's relative leverage					0.004* (1.70)
High CEO's relative leverage					0.004* (1.87)
CEO age	-0.001*** (-3.33)	-0.0004*** (-3.04)	-0.0004*** (-3.03)	-0.001*** (-3.49)	-0.001*** (-3.19)
Cash	0.018* (1.88)	0.016* (1.66)	0.0161* (1.66)	0.0181* (1.87)	0.017* (1.76)
Tobin's Q	0.004*** (9.02)	0.004*** (9.04)	0.004*** (9.01)	0.004*** (9.00)	0.004*** (9.04)
Debt to equity	-0.0015 (-0.98)	-0.0014 (-0.93)	-0.0013 (-0.86)	-0.0015 (-1.00)	-0.0015 (-1.02)
Capital expenditures	0.061*** (2.81)	0.060*** (2.76)	0.060*** (2.76)	0.063*** (2.90)	0.062*** (2.85)
R&D expenses	0.243*** (7.70)	0.238*** (7.52)	0.239*** (7.55)	0.242*** (7.64)	0.241*** (7.61)
Long-term debt	-0.002 (-0.69)	-0.001 (-0.47)	-0.001 (-0.26)	-0.001 (-0.61)	-0.002 (-0.80)
ROA	0.190*** (19.22)	0.191*** (19.26)	0.190*** (19.25)	0.190*** (19.21)	0.191*** (19.27)
Size	0.005*** (8.02)	0.006*** (8.52)	0.006*** (8.47)	0.006*** (8.04)	0.006*** (8.28)
Stocks return	-0.012*** (-7.23)	-0.012*** (-7.24)	-0.012*** (-7.19)	-0.012*** (-7.19)	-0.012*** (-7.25)
Stand. dev. of stocks return	0.0000 (-0.79)	0.0000 (-0.81)	0.0000 (-0.80)	0.0000 (-0.84)	0.0000 (-0.81)
Constant	-0.110*** (-5.92)	-0.118*** (-6.26)	-0.118*** (-6.26)	-0.108*** (-5.80)	-0.114*** (-6.11)
Wald stat	1381.0 (0.00)	1356.5 (0.00)	1363.1 (0.00)	1371.1 (0.00)	1360.5 (0.00)

The results presented in Table 19 differ from those shown in Table 13. The results show that the level of stock repurchases is higher when a CEO has more deferred compensation. Combined with previous results this means that different components of inside debt provide different incentives for a CEO, as they stimulate different ways of payout. We believe that as deferred compensation is a less long-term compensation than pension benefits, CEOs with higher deferred compensation may increase repurchases levels, as this type of compensation does not represent a long-term commitment and is not considered as a payout level that

will last for a long time. This finding adds to the existing literature on this topic, as previous research has not found significant relationship between different components of inside debt and repurchases [Wu, Wu, 2020].

The results in Table 19 also support previous findings and our assumption that there may be a non-linear relation between inside debt and payouts. As was the case with the level of dividends, the results show that higher levels of inside debt may lead to higher levels of repurchases than medium and low levels of inside debt.

Now we turn to the results of testing the impact of inside debt components on the choice of payout channel presented in Table 20.

Table 20. Robustness check: the impact of inside debt components on the choice of payout channel, and non-linearity.[14]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Ln of CEO's PV of acc. pension benefits	-0.001 (-0.90)				
Ln of CEO's balance of deferred compensation	0.004*** (3.89)				
CEO's pens. benefits to CEO's equity to company's leverage		-0.024 (-1.39)			
CEO's deferred comp to CEO's equity to company's leverage		0.041*** (3.09)			
High CEO's relative leverage measured with pension benefits			-0.063** (-2.23)		
High CEO's relative leverage measured with deferred comp			0.111*** (4.52)		
Medium inside debt				0.031 (1.23)	
High inside debt				0.046* (1.83)	
Medium CEO's relative leverage					-0.0017 (-0.06)

[14] This table presents results from the tobit regression with lower limit set at 0and upper limit set at 1 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

High CEO's relative leverage					0.023 (0.96)
CEO age	-0.002** (-2.15)	-0.002 (-1.24)	-0.002 (-1.21)	-0.002 (-1.52)	-0.002 (-1.44)
Cash	0.960 (1.55)	0.136 (1.36)	0.133 (1.33)	0.144 (1.44)	0.137 (1.36)
Tobin's Q	-0.002 (-0.62)	-0.001 (-0.27)	-0.002 (-0.33)	-0.002 (-0.32)	-0.001 (-0.27)
Debt to equity	-0.024** (-2.44)	-0.038** (-2.45)	-0.037** (-2.39)	-0.040** (-2.56)	-0.040** (-2.47)
Capital expenditures	-0.015 (-0.11)	-0.035 (-0.16)	-0.029 (-0.13)	-0.011 (-0.05)	-0.018 (-0.08)
R&D expenses	0.281 (1.31)	0.658* (1.85)	0.670* (1.89)	0.694* (1.95)	0.668* (1.88)
Long-term debt	-0.016 (-0.97)	-0.0275 (-1.03)	-0.0196 (-0.73)	-0.029 (-1.08)	-0.0293 (-1.08)
ROA	0.747*** (12.50)	1.055*** (11.35)	1.057*** (11.36)	1.055*** (11.34)	1.057*** (11.36)
Size	0.034*** (10.57)	0.049*** (9.99)	0.049*** (9.91)	0.049*** (9.77)	0.049*** (9.91)
Stocks return	-0.018** (-2.25)	-0.028** (-2.20)	-0.027** (-2.12)	-0.027** (-2.14)	-0.027** (-2.13)
Stand. dev. of stocks return	-0.0003 (-1.33)	-0.0002 (-0.51)	-0.0002 (-0.51)	-0.0002 (-0.60)	-0.0002 (-0.55)
Constant	-0.269*** (-2.67)	-0.521*** (-3.19)	-0.522*** (-3.21)	-0.491*** (-3.01)	-0.501*** (-3.08)
Wald stat	1127.3 (0.00)	915.1 (0.00)	927.7 (0.00)	909.7 (0.00)	907.8 (0.00)

The results presented in Table 20 support the results shown previously. We can see that different components of inside debt provide different incentives for the choice of payout channel. CEOs who have more pension benefits tend to choose cash dividends as a primary payout channel. On the contrary, CEOs with higher levels of deferred compensation may use share repurchases as a main channel of payout. The reason for that may be in different time horizons of incentives provided by these two components of inside debt, as discussed earlier.

We do not interpret the results on possible non-linearity, as the obtained results are not statistically significant.

Finally, we discuss the impact of deferred compensation and pension benefits on the probability of payouts and possible non-linearity between inside debt and payout probabilities. Tables 21 and 22 summarize the results.

Table 21. Robustness check: inside debt components impact on cash dividends probability and non-linearity.[15]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Ln of CEO's PV of acc. pension benefits	0.021*** (4.37)				
Ln of CEO's balance of deferred compensation	0.004 (1.13)				
CEO's pens. benefits to CEO's equity to company's leverage		0.139*** (3.4)			
CEO's deferred comp to CEO's equity to company's leverage		-0.010 (-0.41)			
High CEO's relative leverage measured with pension benefits			0.247*** (3.68)		
High CEO's relative leverage measured with deferred comp			-0.036 (-0.81)		
Medium inside debt				0.114** (2.11)	
High inside debt				0.196*** (3.42)	
Medium CEO's relative leverage					0.120** (2.25)
High CEO's relative leverage					0.139*** (2.88)
CEO age	-0.001 (-0.25)	0.000 (-0.05)	0.000 (-0.04)	0.000 (0.05)	0.001 (0.35)
Cash	-0.119 (-0.71)	-0.14 (-0.84)	-0.138 (-0.82)	-0.122 (-0.73)	-0.133 (-0.79)
Tobin's Q	0.004 (0.41)	0.003 (0.37)	0.003 (0.4)	0.003 (0.3)	0.003 (0.37)
Debt to equity	-0.048* (-1.72)	-0.039 (-1.46)	-0.040 (-1.48)	-0.046* (-1.67)	-0.044 (-1.62)
Capital expenditures	-0.472 (-1.42)	-0.491 (-1.45)	-0.513 (-1.49)	-0.527 (-1.57)	-0.53 (-1.59)
R&D expenses	-2.924*** (-4.26)	-2.829*** (-4.16)	-2.895*** (-4.20)	-2.884*** (-4.13)	-2.857*** (-4.06)
Long-term debt	0.056 (1.19)	0.060 (1.27)	0.067 (1.42)	0.054 (1.14)	0.036 (0.77)

[15] This table presents results from the panel probit regression estimation with robust standard errors clustered by firms. All regressions include constant term and dummies for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

ROA	0.270* (1.94)	0.272** (1.96)	0.252* (1.79)	0.281** (2.03)	0.289** (2.09)
Size	0.028*** (4.24)	0.029*** (4.23)	0.029*** (4.33)	0.029*** (4.25)	0.030*** (4.35)
Stocks return	-0.061*** (-2.98)	-0.060*** (-3.04)	-0.061*** (-3.03)	-0.061*** (-3.06)	-0.062*** (-3.14)
Stand. dev. of stocks return	-0.0002 (-0.48)	-0.0002 (-0.55)	-0.0002 (-0.51)	-0.0002 (-0.49)	-0.0002 (-0.39)
Constant	0.310 (1.02)	-0.512 (-1.70)	0.351 (1.12)	0.248 (0.79)	0.187 (0.59)
Wald stat	319.0 (0.00)	309.7 (0.00)	312.8 (0.00)	313.7 (0.00)	307.3 (0.00)

Table 22. Robustness check: inside debt components impact on share repurchases probability and non-linearity.[16]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Ln of CEO's PV of acc. pension benefits	0.005 (1.12)				
Ln of CEO's balance of deferred compensation	0.022*** (5.83)				
CEO's pens. benefits to CEO's equity to company's leverage		0.005 (0.13)			
CEO's deferred comp to CEO's equity to company's leverage		0.096*** (2.71)			
High CEO's relative leverage measured with pension benefits			0.0046 (0.07)		
High CEO's relative leverage measured with deferred comp			0.185*** (3.31)		
Medium inside debt				0.163*** (2.94)	
High inside debt				0.356*** (5.89)	
Medium CEO's relative leverage					0.149** (2.57)
High CEO's relative leverage					0.270*** (4.95)
CEO age	-0.007* (-2.09)	-0.005 (-1.47)	-0.005 (-1.44)	-0.008** (-2.32)	-0.006* (-1.82)

[16] This table presents results from the panel probit regression estimation with robust standard errors clustered by firms. All regressions include constant term and dummies for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Cash	0.263 (1.23)	0.175 (0.81)	0.181 (0.83)	0.262 (1.22)	0.22 (1.02)
Tobin's Q	-0.002 (-0.22)	-0.003 (-0.30)	-0.004 (-0.34)	-0.003 (-0.25)	-0.002 (-0.15)
Debt to equity	-0.036 (-1.24)	-0.026 (-0.87)	-0.024 (-0.82)	-0.036 (-1.21)	-0.027 (-0.93)
Capital expenditures	-0.624 (-1.35)	-0.677 (-1.46)	-0.667 (-1.44)	-0.571 (-1.24)	-0.614 (-1.33)
R&D expenses	0.364 (0.48)	0.146 (0.19)	0.166 (0.22)	0.331 (0.44)	0.258 (0.34)
Long-term debt	-0.022 (-0.39)	-0.003 (-0.04)	0.012 (0.21)	-0.019 (-0.34)	-0.043 (-0.73)
ROA	1.519*** (6.89)	1.515*** (6.74)	1.512*** (6.74)	1.520*** (6.86)	1.529*** (6.88)
Size	0.056*** (6.29)	0.061*** (6.84)	0.060*** (6.77)	0.055*** (6.26)	0.058*** (6.54)
Stocks return	-0.052** (-2.29)	-0.055** (-2.39)	-0.053** (-2.32)	-0.051** (-2.23)	-0.054** (-2.33)
Stand. dev. of stocks return	-0.001 (-0.79)	-0.001 (-0.75)	-0.001 (-0.76)	-0.001 (-0.81)	-0.001 (-0.71)
Constant	-0.195 (-0.68)	-0.399 (-1.42)	-0.234 (-0.80)	-0.665** (-2.28)	-0.768*** (-2.62)
Wald stat	720.7 (0.00)	659.2 (0.00)	653.2 (0.00)	689.2 (0.00)	691.5 (0.00)

Table 23 shows the marginal effects for the inside debt components (deferred compensation and pension benefits) of the CEO at means.

Table 23. Robustness check: marginal effects for inside debt components, at means.[17]

Independent Variables	Decision to pay dividends	Decision to repurchase
Ln of CEO's balance of deferred compensation	0.002 (1.13)	0.007** (5.82)
CEO's deferred comp to CEO's equity to company's leverage	-0.004 (-0.41)	0.030*** (2.71)
High CEO's relative leverage measured with deferred comp	-0.014 (-0.81)	0.057*** (3.31)
Ln of CEO's PV of acc. pension benefits	0.008*** (4.37)	0.002 (1.12)

[17] This table presents results from assessment of marginal effects, at means, after the panel probit regression estimation. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

CEO's pens. benefits to CEO's equity to company's leverage	0.053*** (3.39)	0.002 (0.13)
High CEO's relative leverage measured with pension benefits	0.095*** (3.68)	0.001 (0.07)
High Inside Debt	0.075*** (3.41)	0.110*** (5.85)
Medium Inside Debt	0.044** (2.11)	0.050*** (2.94)
High CEO's relative leverage	0.053*** (2.87)	0.083*** (4.92)
Medium CEO's relative leverage	0.046** (2.25)	0.046*** (2.57)

The results presented in Tables 21, 22, and 23 show that the measures based on deferred compensation increase the probability of repurchases, while PV of accumulated pension benefits increases the probability of cash dividends. These results support our previous discussion, because CEOs with short-term compensation are more likely to do repurchases, while CEO's with long-term compensation are more likely to pay cash dividends.

CEOs with high level of inside debt are more likely to pay dividends, and to do repurchases, than CEOs with low and medium levels of inside debt. This non-linearity holds for both specifications of inside debt.

In this subsection we obtained the results that add to the existing literature in the following ways. First, we have shown that two components of inside debt – deferred compensation and pension benefits - are not alike in terms of incentivizing payout decisions. We have shown that their impact on payout levels and probability of payouts may differ. More specifically, deferred compensation is associated with higher levels and probabilities of repurchases, while pension benefits may lead to higher levels and probabilities of cash dividends. Second, we have found support for the notion that there is a non-linear relationship between inside debt and payout levels and probabilities. We have shown that CEOs who possess larger amounts of inside debt pay out more than those with lower inside debt holdings.

2.5.2 Alternative estimation method

To check the robustness of obtained results and to account for possible endogeneity, to assess model 1, we also use the dynamic panel data method, namely the Arellano-Bond estimator [Arellano, Bond, 1991], with adjustments proposed by Roodman [Roodman, 2009]. We can apply this method because our sample has a large number of companies (813) and a small number of years (13). We use this method because endogeneity problems arise as CEO's remuneration may be affected by the payout policy. Except of using GMM estimator, to address these issues we also include industry and year dummies, as discussed in previous subsections, and use a two-step estimation. We include a lag of dependent variable to account for possible payout smoothing and to check robustness [Borah et al., 2020]. We also report Arellano-Bond tests for autocorrelation, and the Hansen test for specification. As we use a two-step estimation, the Hansen test is more appropriate than the Sargan test. We start with testing the results for the impact of CEO's incentives on the level of cash dividends. The results are presented in Table 24.

Table 24. Robustness check: estimation of the impact of a CEO's incentives on the level of cash dividends with GMM-estimator.[18]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Lag of dividend ratio	0.699*** (6.83)	0.680*** (7.03)	0.636*** (6.99)	0.671*** (6.65)	0.661*** (6.85)	0.665*** (6.76)	0.709*** (8.55)
Ln total CEO equity	-0.000 (-0.19)						
CEO cash compensation	0.001 (0.47)						
Options compensation		0.0022* (1.74)					
Stocks			0.0134*				

[18] This table presents results from the Arellano-Bond two-step GMM estimator for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics for Arellano-Bond are reported in parentheses below each coefficient estimate. P-values for Wald stat., Hansen test and the Arellano-Bond tests for autocorrelation are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

compensation			(1.74)				
Restricted stocks compensation				-0.0035** (-2.11)			
Ln total CEO inside debt					0.001 (0.76)		
CEO relative leverage						0.001** (2.05)	
High CEO relative leverage							0.001** (1.97)
Stand. dev. of stocks return	-0.000 (-1.19)	-0.000 (-1.00)	-0.000 (-0.70)	-0.000 (-0.54)	-0.000 (-0.73)	-0.000 (-0.60)	-0.000 (-1.90)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	9755	9755	9755	9755	9755	9755	9755
Wald statistic	698.8 (0.00)	1337.6 (0.00)	385.5 (0.00)	1376.4 (0.00)	559.5 (0.00)	1457.7 (0.00)	1641.5 (0.00)
Hansen test	22.75 (0.86)	30.23 (0.56)	27.00 (0.17)	10.10 (0.69)	8.89 (0.63)	9.38 (0.67)	23.78 (0.85)
Arellano-Bond autocorrelation test (AB-1)	-4.24 (0.00)	-4.12 (0.00)	-4.24 (0.00)	-4.60 (0.00)	-4.78 (0.00)	-4.65 (0.00)	-4.93 (0.00)
Arellano-Bond autocorrelation test (AB-2)	0.50 (0.62)	0.60 (0.55)	0.37 (0.71)	0.50 (0.62)	0.55 (0.58)	0.50 (0.62)	0.58 (0.56)

Table 24 shows that all the regressions are statistically significant, as Wald statistics are high enough. The results of Hansen test show that instruments used in all regressions are valid and there is no overidentification problem in our models. Finally, the tests of autocorrelation of order 1 and order 2 satisfy the assumptions of Arellano-Bond model, meaning that instruments are appropriate and selected models suit or sample.

The results correspond to those obtained from tobit regressions. Namely we can see that coefficients suggest that the level of company's stocks, CEO's leverage relative to company's leverage and high CEO's relative leverage affect the level of dividends positively, while the level of restricted stocks affects it negatively. Now we can look at the results of testing the impact of CEO's incentives on the level of repurchases. The results are presented in Table 25.

Table 25. Robustness check: estimation of the impact of a CEO's incentives on the level of repurchases with GMM-estimator.[19]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Lag of repurchases ratio	0.161*** (5.12)	0.162*** (5.21)	0.177*** (5.03)	0.171*** (5.57)	0.17*** (5.10)	0.16*** (4.98)	0.165*** (4.65)
Ln total CEO equity	-0.001 (-1.63)						
CEO cash compensation	0.0002 (0.02)						
Options compensation		0.0019 (0.13)					
Stocks compensation			0.0243* (1.64)				
Restricted stocks compensation				-0.0117 (-0.31)			
Ln total CEO inside debt					0.002 (1.22)		
CEO relative leverage						0.0106 (0.95)	
High CEO relative leverage							0.0232* (1.72)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	9755	9755	9755	9755	9755	9755	9755
Wald statistic	332.16 (0.00)	323.3 (0.00)	300.2 (0.00)	326.5 (0.00)	319.3 (0.00)	330.9 (0.00)	312.4 (0.00)
Hansen test	32.56 (0.39)	32.50 (0.39)	20.79 (0.24)	23.92 (0.12)	17.15 (0.25)	13.30 (0.43)	18.76 (0.23)
Arellano-Bond autocorrelation test (AB-1)	-7.85 (0.00)	-7.86 (0.00)	-6.43 (0.00)	-6.83 (0.00)	-8.15 (0.00)	-8.51 (0.00)	-7.78 (0.00)
Arellano-Bond autocorrelation test (AB-2)	-0.01 (0.99)	0.01 (0.99)	0.21 (0.83)	0.24 (0.81)	-0.21 (0.84)	-0.09 (0.93)	0.03 (0.98)

The results shown in Table 25 suggest that stocks compensation and inside debt (measured with CEO's leverage relative to company's leverage) may lead to

[19] This table presents results from the Arellano-Bond two-step GMM estimator for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics for Arellano-Bond are reported in parentheses below each coefficient estimate. P-values for Wald stat., Hansen test and the Arellano-Bond tests for autocorrelation are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

an increase in the levels of stock repurchases. These results correspond to those obtained in previous subsections, which supports their reliability. Finally, we can check the robustness of the impact of CEO's compensation on the choice of payout channel. The results are presented in Table 26.

Table 26. Robustness check: estimation of the impact of a CEO's incentives on the choice of payout channel with GMM-estimator.[20]

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Lag of fraction of repurchases	0.332*** (14.28)	0.354*** (11.92)	0.319*** (11.77)	0.321*** (11.4)	0.316*** (10.93)	0.280*** (6.93)	0.322*** (13.38)
Ln total CEO equity	-0.005 (-1.57)						
CEO cash compensation	-0.075* (-1.91)						
Options compensation		-1.08* (-1.80)					
Stocks compensation			0.426* (1.75)				
Restricted stocks compensation				0.537* (1.70)			
Ln total CEO inside debt					0.017 (0.67)		
CEO relative leverage						0.403* (1.70)	
High CEO relative leverage							0.0902* (1.66)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	9755	9755	9755	9755	9755	9755	9755
Wald statistic	3459.1 (0.00)	543.4 (0.00)	639.4 (0.00)	595.5 (0.00)	605.0 (0.00)	410.8 (0.00)	730.7 (0.00)
Hansen test	20.73 (0.60)	16.19 (0.64)	22.65 (0.36)	10.08 (0.69)	7.99 (0.71)	6.45 (0.84)	14.31 (0.50)
Arellano-Bond autocorrelation	-17.37 (0.00)	-8.60 (0.00)	-15.58 (0.00)	-14.57 (0.00)	-12.34 (0.00)	-8.68 (0.00)	-18.18 (0.00)

[20] This table presents results from the Arellano-Bond two-step GMM estimator for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics for Arellano-Bond are reported in parentheses below each coefficient estimate. P-values for Wald stat., Hansen test and the Arellano-Bond tests for autocorrelation are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

test (AB-1)							
Arellano-Bond autocorrelation test (AB-2)	0.69 (0.49)	1.60 (0.11)	0.07 (0.94)	0.53 (0.60)	0.07 (0.94)	-1.04 (0.30)	0.88 (0.38)

The results in Table 26 show the same pattern of impact of CEO's compensation on the choice of payout channel, as the results of tobit regression. We can see that inside debt and all components of equity-based compensation, except of option-based compensation, provide incentives for the choice of share repurchases as a main channel of payout to shareholder.

To sum up, in this subsection we have shown that main results obtained in previous subsections hold if we use different estimation method, namely Arellano-Bond estimator, which helps to account for possible endogeneity. We have also made sure that including a lagged dependent variable in regression does not change the main results.

2.6 Section 2 discussion and conclusions

In this Section we have investigated the impact of CEO's compensation on the level of cash dividends and repurchases; on the probability of paying dividends and making repurchases; and on the decisions about payout channel. We have added evidence to the existing literature in this topic by showing that, first, CEO's inside debt may incentivize a CEO for an increase in the levels of both cash dividends and share repurchases, as well as for an increase in the payout probabilities in both forms. We believe that inside debt may align CEO's interests not only to those of bondholders, but also to shareholders' interests. This in turn may lead to an increase in payouts in both forms.

Second, stocks-based compensation may provide somewhat similar incentives, because it may lead to an increase in the levels of cash dividends and repurchases and their respective probabilities. At the same time, we show that CEOs who are mostly compensated with stock options are less likely to repurchase stocks and to use repurchases as a main payout channel, which contradicts with

findings of previous research [Fenn, Liang, 2001], and are less incentivized to pay cash dividends.

Third, we have shown that deferred compensation and pension benefits, which represent two components of CEO's inside debt, differ in terms of inducing CEO's payout decisions. We argue that these two components provide CEOs with incentives of different terms, thus, resulting in the choice of different payout channels. Namely we show that deferred compensation (less long-term compensation) may incentivize a CEO for payout in the form of repurchases, while pension benefits (more long-term compensation) provide incentives for payouts in the form of cash dividends.

Fourth, our results provide support to the assumption that there is a non-linear relationship between CEO's inside debt, on the one side, and dividends and repurchase levels and their probabilities, on the other side.

Finally, we have shown that our results hold if we change estimation method and include a lag of dependent variable in regressions. This adds to the reliability of obtained results in the presence of endogeneity issues.

In the next Section we will discuss the impact of a behavioural bias of the CEOs – overconfidence – on payout decisions.

Section 3. CEO's overconfidence and payout decisions

In this Section we investigate the impact of CEO's overconfidence on payout decisions. As in the previous Section, these decisions include the decision about payout itself in the form of cash dividends or repurchases; the decision about the level of cash dividends and repurchases; and about the choice of payout channel. First, we develop and discuss hypotheses, based on the rationale of the previous research. Second, we briefly discuss appropriate econometric models introduced in previous Section to test our hypotheses and introduce variables that capture the effects of managerial overconfidence. Third, we discuss results and the implications for theory and practice.

3.1 Hypotheses development

The empirical evidence suggests that overconfident CEOs, especially excessively overconfident, may overestimate the returns of investment projects, which widens a possible set of attractive investment opportunities for such CEOs [Pikulina et al., 2017]. Moreover, overconfident CEOs consider external financing costly, so overinvestment arises when internal funds are abundant [Malmendier, Tate, 2015]. As a result, they tend to increase internal resources under their management by increasing the value of cash holdings [Aktas et al., 2019; Chen et al., 2020] and decreasing the level of cash dividends to be able to finance investments in the future [Ben-David et al., 2007; Deshmukh et al., 2013].

However, if an overconfident CEO overestimates the value of cash flows from future operations, he or she may make a commitment to increase the level of cash dividends [Wu, Liu, 2011].

As empirical studies have supported the prediction that overconfident CEOs tend to distribute less cash dividends among shareholders, we formulate our seventh hypothesis as follows:

Hypothesis 7: The level of cash dividends is lower in companies with overconfident CEOs.

To deepen the understanding of CEO's overconfidence effects on payout policy, we also assess its impact on the probability of paying dividends. As overconfidence does not stimulate paying higher dividends, we assume that it also may decrease the probability of dividend payments:

Hypothesis 7a: The probability of cash dividends is lower in companies with overconfident CEOs.

Recent research has also shown that CEO's overconfidence affects significantly the decision about the level of stock repurchases. First, the findings suggest that overconfident and optimistic CEOs consider the companies' stocks as undervalued, which may [Nguyen et al., 2018] or may not be the case [Andreou et al., 2018; Banerjee et al., 2018(a)], and tend to repurchase them at what they assume is a bargain price. Their estimates of a company's value are upwardly-biased, which leads to higher levels of payout in the form of repurchases [Shu et al., 2013; Banerjee et al., 2018(a); Anilov, 2019]. Second, authors have shown that alternative explanation for the increase in the repurchases level is that, as overconfident CEO's compensation is mostly equity-based, CEO's personal interest may be to buy back shares to increase the value of his or her portfolio [Lee et al., 2019].

However, previous research has also shown that overconfident CEOs are more willing to use internal resources to finance investment opportunities. Thus, the question may arise: why overconfident CEOs should choose repurchases over investments [Guenzel, Malmendier, 2019]? One of the possible answers to this question is that improved corporate governance has induced overconfident CEOs to switch from investments to repurchases [Banerjee et al., 2015]. We will discuss this issue in greater detail in the next Section, devoted to corporate governance.

Taking into account the results of previous research, we formulate the eighth hypothesis as follows:

Hypothesis 8: The level of repurchases is higher in companies with overconfident CEOs.

As it has been shown that overconfidence stimulates higher levels of stock repurchases, we assume that it also may lead to an increase in the repurchases probability, as shown in prior research [Ben-David et al., 2007; Banerjee et al., 2018(a)]:

Hypothesis 8a: The probability of repurchases is higher in companies with overconfident CEOs.

As previous research has shown that CEO's overconfidence leads to an increase in the level of repurchases, we aim at testing whether overconfidence affects the choice of payout channel. We assume that less overconfident CEOs tend to maintain some stable level of payout by distributing the base level of cash dividends and not using the repurchases to distribute some additional amount. Indeed, it has been shown that overconfident CEOs may use repurchases and not dividends to distribute some *excess* amount of cash among the shareholders [Banerjee et al., 2018(a)]. However, we aim at checking not the preferential channel to distribute *excessive* amount of cash, but the preferred channel of overall payout in general. Thus, we formulate the ninth hypothesis as follows:

Hypothesis 9: Overconfident CEOs are more likely to choose repurchases as a main payout channel.

Now we can move to the discussion of models and variables that can be used to test these hypotheses.

3.2 Econometric models development

We use two models to test hypotheses 7-9, which are similar to those that have been used in Section 2 to test the impact of compensation incentives of CEOs on payout decisions.

To test hypotheses 7, 8 and 9 we use model 3:

$$Payout_{i,t} = \alpha + \beta_1 \bullet Overconf_{i,t} + \beta_2 \bullet Age_{i,t} + \sum_{k=3}^{12} \beta_k \bullet Control_{i,t,k} + \theta_i + \delta_t + \varepsilon_{i,t} \quad (3),$$

where $Payout_{i,t}$ – is one of the three "Payout" variables; $Overconf_{i,t}$- is one of four variables, discussed below, that reflects overconfidence of the CEO; $Age_{i,t}$– is the age of the CEO; $Control_{i,t,k}$ – is the set of control variables; α, β_k- are coefficients for regressions; $\varepsilon_{i,t}$, – is a normally distributed error term; θ_i- are industry effects; δ_t – are the year's effects; i – is a company's index; t – is a year's index.

To test hypotheses 7a and 8a we use model 4:

$$pr(DTP_{i,t} = 1) = \varphi\{\mu + \gamma_1 \bullet Overconf_{i,t} + \gamma_2 \bullet Age_{i,t} + \sum_{k=3}^{12} \gamma_k \bullet Control_{i,t,k} + \theta_i + \delta_t\} \quad (4),$$

where $pr(DTP_{i,t} = 1)$is the probability that $DTP_{i,t}$=1; DTP – is a binary variable that equals to "1" if a company distributed cash among the shareholders through repurchases and/or dividends, and "0" – otherwise; $\varphi\{x\}$ – is the standard normal cumulative distribution function; $Overconf_{i,t}$- is one of four variables, discussed below, that reflects overconfidence of the CEO; $Age_{i,t}$– is the age of the CEO; $Control_{i,t,k}$ – is the set of control variables; μ, γ_k- are coefficients for regressions; θ_i- are industry effects; δ_t – are the year's effects; i – is a company's index; t – is a year's index.

To test the impact of CEO's overconfidence on payout decisions we use the same measures of payout, as have been used to investigate the impact of equity-based compensation and inside debt of the CEO, presented in Table 8: repurchase ratio, dividend ratio, fraction of repurchases in total payout and two binary variables, which capture the fact of cash dividends payout or stock repurchases.

Table 27 summarizes the variables that we use to measure CEO's overconfidence.

Table 27. The measures of CEO's overconfidence.

Variable type	Variable name	Definition

Overconf	Confidence	The ratio of average value per vested unexercised option to the stock price
	Vested-unexercised options	Value of vested unexercised options to the value of all vested executive options
	Longholder	Equals 1 in all years if a CEO at least once holds an option until expiration year even if it is at least 40% in-the-money in the beginning of this year
	Pre-Longholder	Equals 1 in all years prior to the year when a CEO is classified as "Longholder" for the first time
	Post-Longholder	Equals 1 in all years after the year when a CEO is classified as "Longholder" for the first time

As can be seen from Table 27, we use five measures of CEO's overconfidence, following approaches presented in recent academic studies. The choice of these measures is defined by the availability of data in S&P CapitalIQ database. Unlike S&P Execucomp database, Capital IQ does not have information on separate executive options tranches, their expiration dates, strike prices and number of underlying shares, which prevents us from using traditional option-based measures of overconfidence, used in previous research [Malmendier, Tate, 2005; 2008; 2015; Adam et al., 2019]. Instead, the data provided in Capital IQ include the aggregate value of all executive option tranches on the end of each year, including the breakdown of vested (exercisable) and non-vested (non-exercisable) options. Exercisable options are those for which the vesting period has already expired and that can be exercised at any time from now until the expiration date. These limitations are reflected in the process of variables construction.

The first measure of CEO's overconfidence used in this study follows the approach of several recent studies [Banerjee et al., 2018(a); Banerjee et al., 2020; Chen et al., 2020]. First, we divide the value of vested, but not exercised options over their amount to obtain the average value of vested but not exercised options.

Then we calculate their average “moneyness” by dividing their average value over the stock price on the year’s end. This measure, which we call “Confidence”, reflect CEO’s overconfidence, as its higher values mean that a CEO is unwilling to exercise his or her options, despite the fact that they are “in-the-money”.

The second measure takes a slightly different approach of measuring CEO’s willingness to exercise options and takes into account data limitations. Namely, we divide the value of vested but not exercised options over the value of all vested options. This measure reflects CEO’s overconfidence, as it shows the fraction of unexercised options in total vested options holdings. The higher fraction may be a sign that a CEO wants to postpone the exercise of already vested options, one of the reasons of which may be his or her beliefs in stocks undervaluation. However, we recognize that a possible limitation of this measure may be that it does not consider “moneyness” of options, as these data is unobservable to us.

Although these two measures are not among traditional in research, their advantage is that they vary in time, compared to time-invariant traditional option-based measures. This allows us capture the relative dynamics of overconfidence measures over time.

Although we do not have access to S&P Execucomp database, we can derive data on executive stock options, exercised by CEOs, from the Securities and Exchange Commission database. All insiders are obliged to file a so-called Form 4, when they buy or sell securities of the company they work for (the example of the Form can be found in Appendix A). In this Form, particularly in its table 2, there are data on transactions with different tranches of executive stock options, including strike prices, expiration date, transaction date, and amount of underlying shares. Although these data are organized in disaggregated form, i.e. the data can be retrieved only from separate Forms, each of which has data only for a certain transaction of a certain CEO – for our sample one would have to look through more than half a million filings -, we managed to build a database with accordance to our sample. This will allow us add traditional measures of overconfidence and compare results for different approaches to measuring overconfidence.

Thus, the third measure is constructed following the approach of Malmendier and Tate [Malmendier, Tate, 2005; 2008], and is referred to as "Longholder". This measure equals "1" if a CEO satisfies two criteria: (a) a CEO exercised stock option during the year of option's expiration at least once during observation period; and (b) this particular option tranche was at least 40% in-the-many in the beginning of the year. Such CEO is considered overconfident during the whole sample period, meaning that this measure is time-invariant.

Finally, as it has been shown that "Longholder" is a noisy measure of CEO's overconfidence and accounts for forward-looking information in CEO's classification [Deshmukh et al., 2013], we split "Longholder" in two variables. The first variable – "Post-Longholder" - equals "1" in all years after a CEO is classified as "Longholder" for the first time. The second variable – "Pre-Longholder" – equals "1" in all prior years.

We also considered the usage of overconfidence measure based on the gender of a CEO. Recent research has shown that male CEOs tend to show more risk-seeking and overconfident behaviour. For example, male CEOs are involved in more acquisitions and risky investments [Huang, Kisgen, 2013]. Researchers have also shown that gender-based measure of overconfidence correlates with more widely used option-based measures, suggesting that male CEO's are more overconfident in establishing corporate policies [Andreou et al., 2018; Aktas et al., 2019]. However, as gender may capture a great deal of differences beyond overconfidence, and for our sample this measure has almost now variations (more than 95% of all observations are males), we do not use this measure in analysis.

We use the same control variables as in Section 2 (Cash holdings, Tobin's Q, Debt-to-Equity ratio, Long-term Debt ratio, Capital and Research and Development expenditures, Return on Assets, Size, stocks return, and standard deviation of stocks return) representing the financial position of the company (see Table 8 in Section 2).

To assess model 3, we use random-effects tobit regressions, and for model 4 a population-averaged panel probit model regression has been applied

[Wooldridge, 2005]. For all models the robust standard errors at firm level have been used.

In the following subsection we describe the sample in terms of CEO's overconfidence.

3.3 Sample description

To test hypotheses developed in previous subsections, we use the same sample of 813 companies from the USA for the period of 2007-2019, as we used in Section 2. In this subsection we will only report descriptive statistics for the variables reflecting CEO's overconfidence, as descriptive statistics for dependent and control variables have already been discussed in Subsection 2.3.

Table 28 presents descriptive statistics for CEO's overconfidence measures.

Table 28. Descriptive Statistics.

Variable	Mean	St. dev.	Q1	Median	Q3	Min	Max
Confidence	0.21	0.35	0.00	0.02	0.36	0.00	6.94
Vested-unexercised options	0.42	0.44	0.00	0.18	0.98	0.00	1.00
Longholder	0.69	0.46	0.00	1.00	1.00	0.00	1.00
Pre-Longholder	0.18	0.38	0.00	0.00	0.00	0.00	1.00
Post-Longholder	0.52	0.50	0.00	1.00	1.00	0.00	1.00

Table 28 shows that around 42% of all vested stock options are not exercised, regardless of the fact that vesting period has expired, meaning that CEOs are willing to wait until the stock price rises further, which may be a sign of CEO's overconfidence. We can also see that the majority of CEOs -69% - are classified as Longholders, meaning that the majority of CEO's in our sample may be considered overconfident.

Table 29 reports average measures of overconfidence for the companies which repurchase stocks, and those which do not, and tests of their equality.

Table 29. Average values for companies which do repurchase their shares, and those which do not.

Variable	Companies which do not repurchase	Companies which do repurchase	t-test for differences in means
Confidence	0.16	0.23	-8.83***
Vested-unexercised options	0.36	0.44	-7.95***
Longholder	0.62	0.72	-9.05***
Pre-Longholder	0.23	0.16	8.70***
Post-Longholder	0.40	0.56	-15.08***

We can see from Table 29 that means of overconfidence measures in two different subsamples differ significantly. Namely, we can see that all measures of overconfidence (except of "Pre-Longholder") are higher in a subsample of companies, which repurchase stocks. Moreover, the differences in "Pre-Longholder" and "Post-Longholder" suggest that CEOs are classified as overconfident earlier in companies that repurchase stocks, than in companies that only pay dividends. These observations support the predictions that repurchases are more likely to take place in companies with overconfident CEOs. However, we have to check this notion using regression analysis.

The recent research claims that overconfident CEOs require less equity-based compensation to be incentivized to act in the interests of shareholders [Otto, 2014; Malmendier and Tate, 2015; Malmendier, 2018]. On the other hand, however, in the case of excessively overconfident CEOs, it may be beneficial for companies to increase the performance-based compensation [Gervais, Heaton, Odean, 2011]. As we have investigated the compensation incentives of CEOs in previous section, it may be of interest to check the differences in CEO's compensation between a subsample of Longholders and a subsample of non-Longholders. The comparison is presented in Table 30.

Table 30. Average values of CEO's compensation for companies with not overconfident and overconfident CEOs.

Variable	Companies with not overconfident CEOs	Companies with overconfident CEOs	t-test for differences in means
CEO's cash compensation	0.31	0.29	-7.46***
CEO's options-based compensation	0.07	0.11	16.57***

CEO's stocks-based compensation	0.41	0.44	9.05***
CEO's restricted stocks-based compensation	0.14	0.14	-0.20
CEO's leverage relative to company's leverage	0.39	0.39	0.22

From what we see in Table 30, we cannot conclude that overconfident CEOs in our sample have less equity-based compensation. On the contrary, they have more options and stocks and less cash in their remuneration packages, than not overconfident CEOs, which is more in line with another strand of literature [Gervais, Heaton, Odean, 2011; Humpherry-Jenner et al., 2016]. From the results we have obtained in previous section we know that stocks and options may provide different incentives in terms of payout policy.

To check whether the overconfidence measures are stable over time, as suggested by previous research [Banerjee et al., 2015], we construct the graph of overconfidence measures dynamics in Figure 4a. We do not report the dynamics of "Longholder" measure, as it is time invariant, as discussed previously. However, we present the dynamics of "Post-longolder" measure in Figure 4b, namely we present the number of CEO's classified as Longolders for each year.

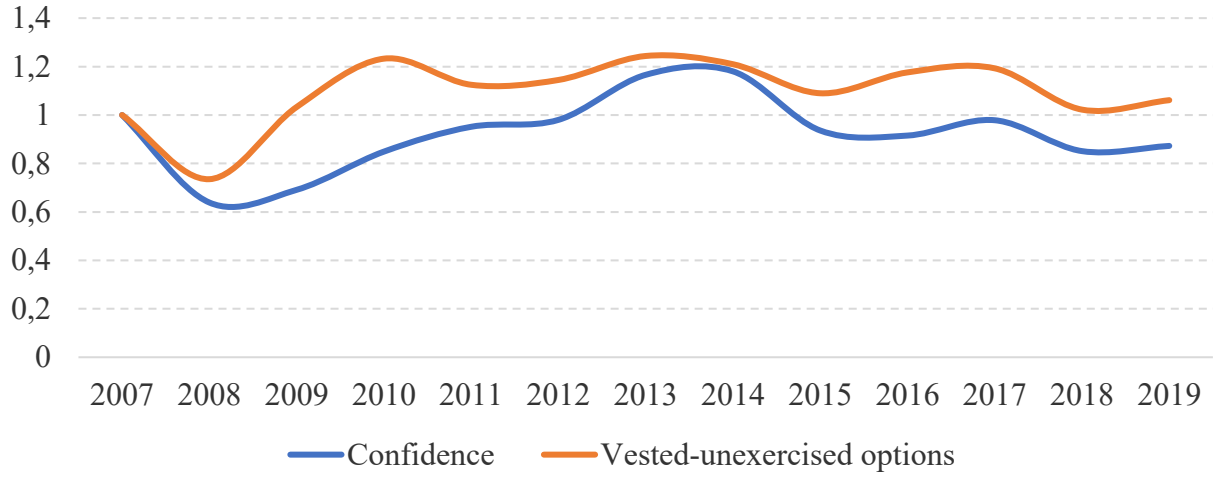

Figure 4a. The dynamics of the mean values of overconfidence measures. The values of 2007 are scaled to 1.

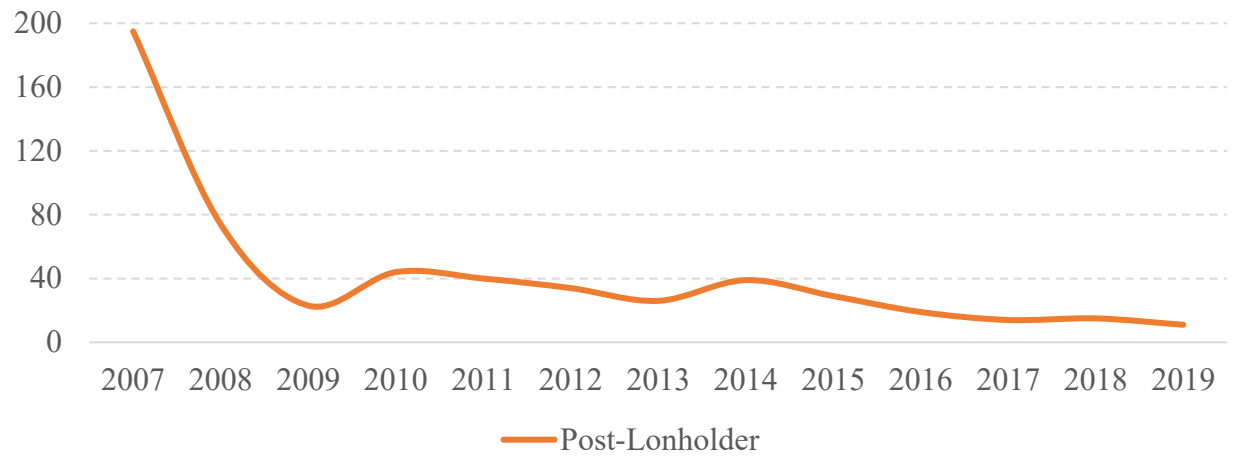

Figure 4b. The dynamics of the number of CEOs classified as Longholders for the first time.

As can be seen from Figure 4a, both measures are relatively stable after 2008, when they declined significantly following the decline of stocks and options value during the financial crises, which supports previous suggestions that overconfidence is "sticky" and does not fluctuate widely over time [Malmendier, Tate, 2005; Banerjee et al., 2015]. We see that the dynamics of two measures are pretty close to each other, suggesting that they may be highly correlated and capture the same effects of CEO's overconfidence. To check if this is true, we can look at the correlation matrix in Table 31. At the same time, we see on Figure 4b that the majority of CEOs in our sample are classified as overconfident in the very beginning of observation period and stay overconfident during the whole observation period. The limitation of this measure, however, is that we cannot check whether a CEO keeps acting overconfident (i.e. exercising in-the-money options of other tranches during the year of expiration) in the years following the first classification as "Longholder".

Table 31. Correlation Matrix.

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	Repurchase ratio	1.0																				
2	Dividend ratio	0.1	1.0																			
3	Fraction of repurchases	0.4	-0.2	1.0																		
4	Decision to repurchase	0.3	0.1	0.7	1.0																	
5	Decision to pay dividends	0.0	0.5	-0.3	0.1	1.0																
6	Confidence	0.1	0.0	0.1	0.1	0.0	1.0															
7	Vested-unexercised options	0.0	0.0	0.1	0.1	0.1	0.5	1.0														
8	Longholder	0.1	0.0	0.1	0.1	0.0	0.1	0.1	1.0													
9	Pre-Longholder	0.0	-0.1	0.0	-0.1	-0.1	0.1	0.1	0.3	1.0												
10	Post-Longholder	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.7	-0.5	1.0											
11	CEO’s age	-0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	-0.1	0.1	1.0										
12	Cash	0.1	0.0	0.1	0.0	-0.2	0.0	0.0	0.1	0.1	0.0	0.0	1.0									
13	Tobin's Q	0.3	0.3	0.1	0.1	-0.1	0.2	0.0	0.1	0.0	0.1	0.0	0.2	1.0								
14	Company's d/e	0.0	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.2	0.2	1.0							
15	Capital Expenditures	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.0	-0.1	0.0	0.0	1.0						
16	R&D	0.2	0.0	0.1	0.0	-0.2	0.0	0.1	0.1	0.1	0.0	-0.1	0.4	0.2	-0.1	-0.1	1.0					
17	LTD	-0.1	0.0	0.0	0.1	0.2	0.0	0.1	-0.1	-0.1	0.0	0.1	-0.3	-0.1	0.2	0.1	-0.2	1.0				
18	ROA	0.3	0.3	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.3	-0.1	0.0	-0.1	-0.1	1.0			
19	Size	0.1	0.1	0.1	0.2	0.3	0.1	0.1	0.1	-0.1	0.1	0.1	-0.1	0.0	0.2	0.1	-0.1	0.4	0.1	1.0		
20	Stocks return	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.2	0.0	-0.1	0.0	0.0	0.1	0.1	1.0	
21	Standard deviation of stocks return	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	-0.1	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.2	0.1	1.0

We can see from Table 31 that correlations are above 50% only for dependent variables and between "Confidence" measure and the ratio of vested unexercised options to all vested options, which supports our previous prediction, and between Longholder measures. We do not put these variables in one regression. For other variables pair correlations are below 50%, which alleviates the problem of multicollinearity.

Now we can turn to a discussion of regression analysis of the impact of CEO's overconfidence on payout policy decisions.

3.4 Results of regression analysis

Now we move to the discussion of the results of our hypotheses tests.

We begin with a discussion of the impact of a CEO's overconfidence on the levels of cash dividends. The results are presented in Table 32 below.

Table 32. The impact of a CEO's overconfidence on the level of cash dividends.[21]

Variable	Model 1	Model 2	Model 3	Model 4
Confidence	-0.003*** (-4.06)			
Vested but unexercised		-0.001** (-2.51)		
Longholder			0.003 (1.26)	
Pre-longholder				0.002 (0.58)
Post-longholder				0.004 (1.44)
CEO age	0.0001 (1.60)	0.0001* (1.63)	0.000 (1.53)	0.000 (1.55)
Cash	0.015*** (4.52)	0.015*** (4.53)	0.015*** (4.55)	0.015*** (4.57)

[21] This table presents results from the tobit regression with lower limit set at 0 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Tobin's Q	0.003*** (15.91)	0.003*** (15.70)	0.003*** (15.65)	0.003*** (15.64)
Debt to equity	-0.004*** (-7.70)	-0.004*** (-7.60)	-0.004*** (-7.54)	-0.004*** (-7.58)
Capital expenditures	0.004 (0.48)	0.003 (0.43)	0.003 (0.40)	0.004 (0.50)
R&D expenses	-0.148*** (-8.44)	-0.146*** (-8.33)	-0.147*** (-8.35)	-0.146*** (-8.30)
Long-term debt	-0,001 (-0.64)	-0,001 (-0.59)	-0.001 (-0.63)	-0.001 (-0.60)
ROA	0.029*** (8.91)	0.028*** (8.66)	0.028*** (8.55)	0.028*** (8.55)
Size	0.002*** (6.46)	0.002*** (6.46)	0.002*** (6.39)	0.002*** (6.42)
Stocks return	-0.006*** (-10.44)	-0.006*** (-10.67)	-0.006*** (-10.84)	-0.006*** (-10.71)
Stand. dev. of stocks return	0.000 (0.58)	0.000 (0.37)	0.000 (0.40)	0.000 (0.43)
Constant	-0.038*** (-4.73)	-0.037*** (-4.71)	-0.039*** (-4.83)	-0.040*** (-4.92)
Year dummies	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES
Wald stat	1151.7 (0.00)	1140.8 (0.00)	1135.6 (0.00)	1143.4 (0.00)

The results presented in Table 32 show that all regressions are significant with high Wald statistics.

In terms of our hypotheses, the results in Table 32 show that the level of cash dividends is lower in companies with overconfident CEOs. This result holds only for several specifications of CEO's overconfidence, namely for continuous variables. We believe that overconfident CEOs tend to use internal funds mostly to finance investments and acquisitions, as has been shown in previous studies [Malmendier, Tate, 2005; 2008]. As the result, fewer funds are left available to distribute among shareholders, which leads to lower levels of cash dividends. These support hypothesis 7.

However, time-invariant measures of overconfidence are not significant in regressions; thus, we cannot verify results, obtained in previous studies, which used these measures [Ben-David et al., 2007; Deshmukh et al., 2013]. Perhaps, differences may arise due to different sources of data and to different time periods,

as we use more recent data in this research. Still we can check the impact of these measures on other payout decisions.

Now we move to the discussion of the impact of CEO's overconfidence on the level of stock repurchases. Table 33 presents these results.

Table 33. The impact of a CEO's overconfidence on the level of stock repurchases.[22]

Variable	Model 1	Model 2	Model 3	Model 4
Confidence	0.003 (1.37)			
Vested but unexercised		0.003* (1.80)		
Longholder			0.013*** (3.91)	
Pre-longholder				0.010** (2.50)
Post-longholder				0.014*** (4.15)
CEO age	-0.0004*** (-3.08)	-0.0004*** (-3.10)	-0.001*** (-3.24)	-0.001*** (-3.25)
Cash	0.0161* (1.67)	0.016* (1.66)	0.015 (1.57)	0.015 (1.57)
Tobin's Q	0.004*** (8.89)	0.004*** (8.98)	0.004*** (8.97)	0.004*** (8.96)
Debt to equity	-0.001 (-0.98)	-0.001 (-0.97)	-0.001 (-0.87)	-0.001 (-0.86)
Capital expenditures	0.061*** (2.78)	0.061*** (2.79)	0.064*** (2.93)	0.065*** (2.98)
R&D expenses	0.239*** (7.55)	0.237*** (7.50)	0.229*** (7.24)	0.230*** (7.28)
Long-term debt	-0.001 (-0.47)	-0.001 (-0.49)	-0.001 (-0.40)	-0.001 (-0.44)
ROA	0.189*** (19.08)	0.190*** (19.17)	0.191*** (19.27)	0.190*** (19.26)
Size	0.006*** (8.50)	0.006*** (8.44)	0.006*** (8.47)	0.006*** (8.45)
Stocks return	-0.012*** (-7.29)	-0.012*** (-7.30)	-0.012*** (-7.30)	-0.012*** (-7.20)

[22] This table presents results from the tobit regression with lower limit set at 0 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Stand. dev. of stocks return	-0.000 (-0.86)	-0.000 (-0.80)	-0.000 (-0.84)	-0.000 (-0.84)
Constant	-0.117*** (-6.24)	-0.116*** (-6.22)	-0.123*** (-6.58)	-0.123*** (-6.60)
Year dummies	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES
Wald stat	1354.1 (0.00)	1356.1 (0.00)	1374.1 (0.00)	1379.0 (0.00)

Table 33 shows that in line with the assumption that overconfident CEOs may consider company's stocks undervalued and repurchase them at a price they consider low, the coefficients of overconfidence measures are positive and significant. We can see that all measures of overconfidence (except of "Confidence") yield qualitatively similar results. This supports our hypothesis that the levels of repurchases are higher in companies run by overconfident CEOs and is in line with findings of previous research [Ben-David et al., 2007; Shu et al., 2013; Banerjee et al., 2018(a)].

The results suggest that the impact of CEO's overconfidence on cash dividends and share repurchases is opposite. The previous research has shown that overconfident CEOs prefer to distribute *excessive* cash through repurchases and not through dividends [Banerjee et al., 2018(a)]. In this study we aim at checking whether overconfident CEOs generally substitute dividends with repurchases, not only when they have *excessive* cash. The results are presented in Table 34.

Table 34. The impact of a CEO's overconfidence on the choice of payout channel.[23]

Variable	Model 1	Model 2	Model 3	Model 4
Confidence	0.100*** (4.32)			
Vested but unexercised		0.043** (2.48)		
Longholder			0.108** (2.32)	

[23] This table presents results from the tobit regression with lower limit set at 0 and upper limit set at 1 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Pre-longholder				0.046 (0.90)
Post-longholder				0.128*** (2.71)
CEO age	-0.002 (-1.33)	-0.002 (-1.39)	-0.002 (-1.39)	-0.002 (-1.39)
Cash	0.135 (1.36)	0.136 (1.36)	0.131 (1.31)	0.132 (1.33)
Tobin's Q	-0.003 (-0.64)	-0.002 (-0.35)	-0.002 (-0.34)	-0.002 (-0.34)
Debt to equity	-0.037** (-2.41)	-0.039** (-2.51)	-0.038** (-2.48)	-0.039** (2.51)
Capital expenditures	-0.037 (-0.17)	-0.024 (-0.11)	-0.005 (-0.02)	0.017 (0.08)
R&D expenses	0.719** (2.03)	0,664* (1.87)	0.613* (1.73)	0.654* (1.84)
Long-term debt	-0.028 (-1.04)	-0.029 (-1.07)	-0.026 (-0.99)	-0.028 (-1.05)
ROA	1.016*** (10.87)	1.044*** (11.21)	1.055*** (11.33)	1.054*** (11.34)
Size	0.049*** (9.85)	0.049*** (9.86)	0.049*** (9.94)	0.049*** (9.94)
Stocks return	-0.030** (-2.37)	-0.028** (-2.25)	-0.027** (-2.19)	-0.025** (-2.03)
Stand. dev. of stocks return	-0.000 (-0.72)	-0.000 (-0.54)	-0.000 (-0.56)	-0.000 (-0.55)
Constant	-0.494*** (-3.05)	-0.499*** (-3.08)	-0.571*** (-3.47)	-0.584*** (-3.55)
Year dummies	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES
Wald stat	924.4 (0.00)	912.5 (0.00)	911.3 (0.00)	922.1 (0.00)

Although previous studies did not find the significant relationship between CEO's overconfidence and fraction of repurchases [Deshmukh et al., 2013], the results presented in Table 34 show that in line with our assumptions overconfident CEOs not only increase repurchases levels, but also tend to use share repurchases as a main payout channel instead of cash dividends. This result holds for different specifications of overconfidence and supports hypothesis 9. The one possible explanation for this result is that they use repurchases to distribute excessive cash. Another explanation is that overconfident CEOs may use repurchases to increase

the price of company's stocks before they exercise their executive stock options [Banerjee et al., 2018(a)].

Now we proceed to the discussion of impact of CEO's overconfidence on the probability of cash dividends and repurchases. The results are presented in Tables 35 and 36.

Table 35. The impact of a CEO's overconfidence on the probability of cash dividends.[24]

Variable	Model 1	Model 2	Model 3	Model 4
Confidence	-0.032 (-0.94)			
Vested but unexercised		-0.010 (-0.35)		
Longholder			0.182* (1.92)	
Pre-longholder				0.161* (1.61)
Post-longholder				0.193** (2.00)
CEO age	0.002 (0.53)	0.002 (0.54)	0.002 (0.53)	0.002 (0.52)
Cash	-0.151 (-0.90)	-0.148 (-0.88)	-0.155 (-0.92)	-0.155 (-0.92)
Tobin's Q	0.004 (0.44)	0.003 (0.40)	0.003 (0.37)	0.003 (0.38)
Debt to equity	-0.044 (-1.61)	-0.044 (-1.60)	-0.044 (-1.58)	-0.044 (-1.58)
Capital expenditures	-0.529 (-1.54)	-0.530 (-1.55)	-0.536 (-1.58)	-0.530 (-1.56)
R&D expenses	-2.910*** (-4.12)	-2.888*** (-4.10)	-2.913*** (-4.11)	-2.912*** (-4.10)
Long-term debt	0.063 (1.32)	0.063 (1.33)	0.060 (1.27)	-0.059 (1.24)
ROA	0.286** (2.04)	0.278** (1.99)	0.280** (2.01)	0.281** (2.01)
Size	0.031*** (4.40)	0.031*** (4.41)	0.032*** (4.54)	0.032*** (4.55)
Stocks return	-0.061***	-0.062***	-0.063***	-0.062***

[24] This table presents results from the panel probit regression estimation with robust standard errors clustered by firms. All regressions include constant term and dummies for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	(-3.08)	(-3.10)	(-3.16)	(-3.13)
Stand. dev. of stocks return	-0.000 (-0.38)	-0.000 (-0.42)	-0.000 (-0.47)	-0.000 (-0.47)
Constant	-0.656** (-2.17)	0.167 (0.53)	0.022 (0.07)	-0.753** (-2.47)
Wald stat	287.5 (0.00)	287.3 (0.00)	297.2 (0.00)	298.1 (0.00)

Table 36. The impact of a CEO's overconfidence on the probability of stock repurchases.[25]

Variable	Model 1	Model 2	Model 3	Model 4
Confidence	0.141*** (2.81)			
Vested but unexercised		0.054 (1.44)		
Longholder			0.255*** (3.76)	
Pre-longholder				0.141* (1.82)
Post-longholder				0.315*** (4.41)
CEO age	-0.005 (-1.29)	-0.005 (-1.34)	-0.005 (-1.35)	-0.005 (-1.35)
Cash	0.171 (0.78)	0.173 (0.79)	0.162 (0.73)	0.174 (0.79)
Tobin's Q	-0.006 (-0.57)	-0.004 (-0.36)	-0.004 (-0.35)	-0.004 (-0.37)
Debt to equity	-0.031 (-1.09)	-0.033 (-1.13)	-0.028 (-0.91)	-0.029 (-0.95)
Capital expenditures	-0.666 (-1.44)	-0.659 (-1.42)	-0.596 (-1.27)	-0.538 (-1.15)
R&D expenses	0.173 (0.23)	0.088 (0.12)	0.032 (0.04)	0.120 (0.16)
Long-term debt	0.002 (0.03)	0.001 (0.02)	0.008 (0.13)	0.005 (0.09)
ROA	1.459*** (6.53)	1.494*** (6.65)	1.538*** (6.86)	1.535*** (6.80)
Size	0.061*** (6.82)	0.061*** (6.86)	0.065*** (6.86)	0.065*** (6.90)
Stocks return	-0.058** (-2.51)	-0.056** (-2.44)	-0.056** (-2.42)	-0.051** (-2.25)
Stand. dev. of stocks return	-0.001	-0.001	-0.001	-0.001

[25] This table presents results from the panel probit regression estimation with robust standard errors clustered by firms. All regressions include constant term and dummies for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

	(-0.83)	(-0.73)	(-0.78)	(-0.80)
Constant	-0.936*** (-3.26)	-0.779*** (-2.63)	-1.025*** (-3.33)	-0.593** (-2.04)
Wald stat	638.2 (0.00)	638.6 (0.00)	661.0 (0.00)	663.1 (0.00)

Table 37 shows the marginal effects for overconfidence of the CEO at means.

Table 37. Marginal effects for model 4, at means.[26]

Independent Variable	Decision to pay dividends	Decision to repurchase
Confidence	-0.012 (-0.94)	0.044*** (2.81)
Vested but unexercised	-0.004 (-0.35)	0.017 (1.44)
Longholder	0.070* (1.91)	0.079*** (3.75)
Pre-longholder	0.062* (1.61)	0.044* (1.82)
Post-longholder	0.074** (2.00)	0.097*** (4.41)

The results presented in Tables 35, 36, and 37 are somewhat controversial. The results suggest that probability of cash dividends is affected by time-invariant overconfidence measures, which are based on the period of stock options holdings. However, contrary to hypothesis 7a and previous findings [Ben-David et al., 2007], the results show that probability of cash dividends is higher in companies run by overconfident CEOs. Taking into account results, discussed previously, this means that overconfident CEOs may decrease the level of cash dividends, but when it comes to the decision about paying dividends at all, they do not refuse paying dividends. Quite the opposite, they are more likely to pay dividends despite the fact that dividends may have negative effects on the value of their stock options. Perhaps, they pay dividends to convince the markets about the good future prospects of a company to increase the value of company's stocks. Or they may

[26] This table presents results from assessment of marginal effects, at means, after the panel probit regression estimation. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

overestimate the level of future cash flows and make a pre-commitment to distribute cash through the dividends [Wu, Liu, 2011].

At the same time overconfident CEOs are more likely to repurchase company's stocks. This supports hypotheses 9a and previous findings [Banerjee et al., 2018(a)]. We can see that this result holds for different specifications of CEO's overconfidence.

To sum up, the findings, presented in this subsection, provide some new insight into the relationship between payout decisions and CEO's overconfidence. First, the results support the notion that overconfident CEOs tend to increase the level of repurchases and their probability and are in line with findings of previous research [Shu et al., 2013; Banerjee et al., 2018(a)]. This may mean that overconfident CEOs treat company's shares as undervalued and have incentives to repurchase them at what they consider a low price. We provide evidence that different specifications of CEO's overconfidence yield similar results. Second, we show that the level of cash dividends is lower in companies with overconfident CEOs, while the probability of cash dividends is higher in these companies. This may be a sign that overconfident CEOs may have different motivation behind decisions about the level of cash dividends and about paying dividends at all. Moreover, these results are driven by different measures of overconfidence: the former is true for continuous measures based on value-per-option, and the latter is true for time-invariant longholder measures. Finally, we show that overconfident CEOs substitute cash dividends with repurchases not only when they have excessive cash, but also when generally considering different payout channels.

In the following subsection we aim at checking the robustness of results, discussed here.

3.5 Robustness check

3.5.1 Alternative measures of CEO's overconfidence

To check the robustness of results obtained in a previous subsection we use different measures of CEO's overconfidence.

First, it is argued that if vested but unexercised options are not economically important to a CEO, the measures based on these options will not capture the CEO's overconfidence appropriately [Banerjee et al., 2015]. To address this issue, we construct two overconfidence measures based on the value of the CEO's vested-but-unexercised options scaled, first, by his or her salary, and, second, by his or her total compensation. More specifically we use the natural logarithm of one plus the ratio of the value of vested but unexercised executive options over CEO's salary or total CEO's compensation.

Second, we reconstruct a Longholder measure of CEO's overconfidence, using 67% threshold of executive options' moneyness (instead of 40%), and refer to this measure as Holder67. This measure has also been used in previous research [Malmendier, Tate, Yan, 2011; Hirshleifer et al., 2012]. This measure will capture highly overconfident CEOs, as they postpone exercising of vested options that are highly in-the-money.

Finally, we use natural logarithm of the amount of vested but unexercised options [Banerjee et al., 2018(a)]. This measure is argued to be less subject to endogeneity issues [Banerjee et al., 2015]. We can see the dynamics of chosen variables, except of time-invariant Holder 67, on Figure 5.

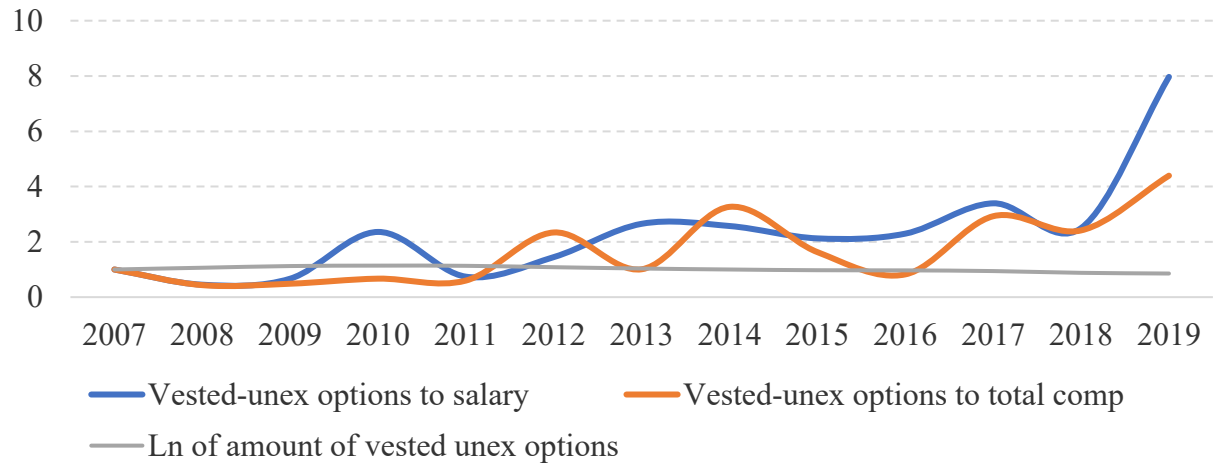

Figure 5. The dynamics of the mean values of alternative overconfidence measures. The values of 2007 are scaled to 1.

We can see from Figure 5 that dynamics of these measures differ from those used in a previous subsection. The measures based on the value of vested but not exercised options are more volatile, reflecting the volatility of CEO's compensation. Thus, these two measures may not capture CEO's overconfidence, but rather his or her compensation incentives.

We assume that using these measures will yield qualitatively similar results as in a previous subsection. To test the robustness of results we use the same econometric tools as in a previous subsection.

Table 38 presents the results of testing the impact of alternative measures of CEO's overconfidence on the level of cash dividends.

Table 38. Robustness check: the impact of alternative measures of a CEO's overconfidence on the level of cash dividends.[27]

Variable	Model 1	Model 2	Model 3	Model 4
Vested unexercised options to CEO's salary	-0.0001*** (-2.84)			
Vested unexercised options to CEO's total compensation		-0.001*** (-5.55)		
Holder 67			0.002 (0.91)	
Ln of vested unexercised options amount				-0.0001** (-2.28)
CEO age	0.0001* (1.67)	0.0001* (1.93)	0.000 (1.54)	0.0001* (1.68)
Cash	0.015*** (4.57)	0.016*** (4.65)	0.015*** (4.55)	0.015*** (4.51)
Tobin's Q	0.003*** (15.8)	0.003*** (16.14)	0.003*** (15.65)	0.003*** (15.68)
Debt to equity	-0.004*** (-7.61)	-0.004*** (-7.74)	-0.004*** (-7.55)	-0.004*** (-7.54)
Capital expenditures	0.003 (0.42)	0.003 (0.45)	0.003 (0.39)	0.003 (0.39)
R&D expenses	-0.148*** (-8.41)	-0.147*** (-8.39)	-0.146*** (-8.33)	-0.146*** (-8.32)

[27] This table presents results from the tobit regression with lower limit set at 0 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Long-term debt	-0.001 (-0.63)	-0.001 (-0.70)	-0.001 (-0.63)	-0.001 (-0.61)
ROA	0.028*** (8.59)	0.029*** (8.83)	0.028*** (8.55)	0.028*** (8.48)
Size	0.002*** (6.49)	0.002*** (6.51)	0.002*** (6.40)	0.002*** (6.52)
Stocks return	-0.006*** (-10.78)	-0.006*** (-10.69)	-0.006*** (-10.83)	-0.006*** (-10.78)
Stand. dev. of stocks return	0.000 (0.58)	0.000 (0.55)	0.000 (0.40)	0.000 (0.35)
Constant	-0.038*** (-4.81)	-0.039*** (-4.90)	-0.038 (-4.76)	-0.037*** (-4.72)
Year dummies	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES
Wald stat	1139.3 (0.00)	1166.1 (0.00)	1134.8 (0.00)	1138.9 (0.00)

The results presented in Table 38 are similar to those discussed in a previous subsection. We can see that alternative measures of CEO's overconfidence have statistically significant negative coefficients, except of Holder67. This provides further evidence for the notion that the level of cash dividends is lower in companies with overconfident CEOs. The results for Holder67 correspond to those of Longholder measures.

Table 39 below presents the results for the impact of CEO's overconfidence on the level of stock repurchases

Table 39. Robustness check: the impact of alternative measures of a CEO's overconfidence on the level of stock repurchases.[28]

Variable	Model 1	Model 2	Model 3	Model 4
Vested unexercised options to CEO's salary	-0.000 (-1.14)			
Vested unexercised options to CEO's total compensation		-0.0001** (-1.98)		
Holder 67			0.010*** (3.03)	
Ln of vested unexercised				0.001***

[28] This table presents results from the tobit regression with lower limit set at 0 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

options amount				(3,17)
CEO age	-0.0004*** (-3.08)	-0.0004*** (-3.08)	-0.001*** (-3.18)	-0.001** (-3.20)
Cash	0.016* (1.64)	0.016* (1.64)	0.015 (1.58)	0.016* (1.68)
Tobin's Q	0.004*** (9.02)	0.004*** (9.07)	0.004*** (8.96)	0.004*** (8.99)
Debt to equity	-0.002 (-1.02)	-0.002 (-1.04)	-0.001 (-0.91)	-0.002 (-1.03)
Capital expenditures	0.061*** (2.80)	0.063*** (2.87)	0.063*** (2.87)	0.062*** (2.83)
R&D expenses	0.239*** (7.55)	0.238*** (7.51)	0.234*** (7.39)	0.234*** (7.39)
Long-term debt	-0.001 (-0.46)	-0.001 (-0.43)	-0.001 (-0.40)	-0.001 (-0.51)
ROA	0.191*** (19.27)	0.191*** (19.28)	0.190*** (19.25)	0.191*** (19.31)
Size	0.006*** (8.55)	0.006*** (8.55)	0.006*** (8.51)	0.006*** (8.24)
Stocks return	-0.012*** (-7.23)	-0.012*** (-7.24)	-0.012*** (-7.28)	-0.012*** (-7.30)
Stand. dev. of stocks return	-0.000 (-0.83)	-0.000 (-0.82)	-0.000 (-0.84)	-0.000 (-0.70)
Constant	-0.118*** (-6.27)	-0.118*** (-6.28)	-0.122*** (-6.49)	-0.115*** (-6.15)
Year dummies	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES
Wald stat	1353.4 (0.00)	1356.2 (0.00)	1365.0 (0.00)	1364.3 (0.00)

The results presented in Table 39 show that although the ratios of vested but unexercised options to CEO's salary and total compensation do not affect the level of repurchases in a predicted way, Holder67 and number of vested unexercised options yield results that are similar to those obtained in a previous subsection. Thus, we move to the discussion of robustness of results obtained for the choice of payout channel. The results are presented in Table 40.

Table 40. Robustness check: the impact of alternative measures of a CEO's overconfidence on the choice of payout channel.[29]

[29] This table presents results from the tobit regression with lower limit set at 0 and upper limit set at 1 for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Variable	Model 1	Model 2	Model 3	Model 4
Vested unexercised options to CEO's salary	0.0003 (1.57)			
Vested unexercised options to CEO's total compensation		0.003 (1.24)		
Holder 67			0.087* (1.92)	
Ln of vested unexercised options amount				0.007*** (4.67)
CEO age	-0.002 (-1.33)	-0.002 (-1.35)	-0.002 (-1.37)	-0.002 (-1.55)
Cash	0.137 (1.37)	0.133 (1.33)	0.131 (1.31)	0.141 (1.41)
Tobin's Q	-0.002 (-0.27)	-0.002 (-0.35)	-0.002 (-0.34)	-0.002 (-0.35)
Debt to equity	-0.040** (-2.57)	-0.040*** (-2.58)	-0.039** (-2.50)	-0.040*** (-2.59)
Capital expenditures	-0.019 (-0.09)	-0.025 (-0.11)	-0.013 (-0.06)	-0.012 (-0.06)
R&D expenses	0.640* (1.80)	0.660* (1.86)	0.633* (1.79)	0.633* (1.78)
Long-term debt	-0.026 (-0.97)	-0.026 (-0.99)	-0.026 (-0.98)	-0.029 (-1.10)
ROA	1.053*** (11.31)	1.053*** (11.32)	1.055*** (11.34)	1.061*** (11.42)
Size	0.049*** (9.91)	0.049*** (9.92)	0.049*** (9.97)	0.047*** (9.47)
Stocks return	-0.027** (-2.20)	-0.027** (-2.16)	-0.027** (-2.19)	-0.028** (-2.26)
Stand. dev. of stocks return	-0.000 (-0.61)	-0.000 (-0.64)	-0.000 (-0.056)	-0.000 (-0.45)
Constant	-0.501*** (-3.09)	-0.499*** (-3.07)	-0.555*** (-3.38)	-0.483*** (-2.97)
Year dummies	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES
Wald stat	908.0 (0.00)	906.3 (0.00)	909.6 (0.00)	926.1 (0.00)

The results in Table 40 show that similar to previous table, the ratios of vested but unexercised options do not have significant impact on the choice of payout channel. At the same time, two other measures support the robustness of results obtained in previous subsection, i.e. the fraction of repurchases is higher in companies with overconfident CEOs. Now we can discuss the robustness of results

of the impact of CEO's overconfidence on the probability of cash dividends and repurchases. The results are presented in Tables 41 and 42.

Table 41. Robustness check: the impact of alternative measures of a CEO's overconfidence on the probability of cash dividends.[30]

Variable	Model 1	Model 2	Model 3	Model 4
Vested unexercised options to CEO's salary	-0.005** (-2.09)			
Vested unexercised options to CEO's total compensation		-0.050*** (-3.81)		
Holder 67			0.137 (1.51)	
Ln of vested unexercised options amount				-0.005* (-1.69)
CEO age	0.006 (1.34)	0.006 (1.34)	0.002 (0.53)	0.002 (0.60)
Cash	-0.651** (-1.96)	-0.654** (-1.98)	-0.152 (-0.90)	-0.154 (-0.92)
Tobin's Q	0.017 (1.07)	0.019 (1.22)	0.003 (0.36)	0.004 (0.43)
Debt to equity	-0.176** (-2.31)	-0.175** (-2.34)	-0.043 (-1.58)	-0.043 (-1.57)
Capital expenditures	-2.520* (-2.07)	-2.561* (-1.94)	-0.534 (-1.57)	-0.527 (-1.52)
R&D expenses	-3.058*** (-3.14)	-3.045*** (-3.14)	-2.906*** (-4.12)	-2.867*** (-4.06)
Long-term debt	0.171 (1.59)	0.166 (1.55)	0.0611 (1.29)	0.064 (1.35)
ROA	1.938*** (6.09)	1.898*** (6.02)	0.280** (2.01)	0.269* (1.93)
Size	0.212*** (4.41)	0.209*** (4.33)	0.032*** (4.50)	0.032*** (4.54)
Stocks return	-0.097*** (-3.02)	-0.092*** (-2.89)	-0.063*** (-3.14)	-0.061*** (-3.04)
Stand. dev. of stocks return	-0.003** (-2.05)	-0.003** (-1.97)	-0.000 (-0.45)	-0.000 (-0.48)
Constant	-4.614*** (-4.27)	-4.555*** (-4.20)	-0.760** (-2.46)	0.211 -0,69
Wald stat	437.2 (0.00)	443.1 (0.00)	293.5 (0.00)	285.4 (0.00)

[30] This table presents results from the panel probit regression estimation with robust standard errors clustered by firms. All regressions include constant term and dummies for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 42. Robustness check: the impact of alternative measures of a CEO's overconfidence on the probability of stock repurchases.[31]

Variable	Model 1	Model 2	Model 3	Model 4
Vested unexercised options to CEO's salary	0.000 (0.10)			
Vested unexercised options to CEO's total compensation		0.001 (1.03)		
Holder 67			0.168** (2.52)	
Ln of vested unexercised options amount				0.009*** (2.77)
CEO age	-0.005 (-1.30)	-0.005 (-1.29)	-0.005 (-1.32)	-0.005 (-1.41)
Cash	0.167 (0.77)	0.165 (0.76)	0.164 (0.75)	0.182 (0.83)
Tobin's Q	-0.004 (-0.34)	-0.004 (-0.35)	-0.004 (-0.36)	-0.004 (-0.33)
Debt to equity	-0.033 (-1.15)	-0.034 (-1.16)	-0.030 (-1.00)	-0.034 (-1.17)
Capital expenditures	-0.665 (-1.43)	-0.664 (-1.43)	-0.633 (-1.36)	-0.643 (-1.39)
R&D expenses	0.085 (0.11)	0.083 (0.11)	0.067 (0.09)	0.054 (0.07)
Long-term debt	0.002 (0.03)	0.002 (0.03)	0.007 (0.13)	0.001 (0.02)
ROA	1.507*** (6.69)	1.506*** (6.69)	1.524*** (6.79)	1.513*** (6.71)
Size	0.061*** (6.92)	0.061*** (6.91)	0.063*** (6.93)	0.059*** (6.55)
Stocks return	-0.055** (-2.39)	-0.054** (-2.38)	-0.056** (-2.42)	-0.056** (-2.43)
Stand. dev. of stocks return	-0.001 (-0.74)	-0.001 (-0.76)	-0.001 (-0.77)	-0.001 (-0.67)
Constant	-0.945*** (-3.30)	-0.953*** (-3.33)	-1.089*** (-3.74)	-0.248 (-0.85)
Wald stat	636.8 (0.00)	636.0 (0.00)	653.1 (0.00)	640.8 (0.00)

Table 43 shows the marginal effects for overconfidence of the CEO at means.

[31] This table presents results from the panel probit regression estimation with robust standard errors clustered by firms. All regressions include constant term and dummies for industries and years. z-Statistics are reported in parentheses below each coefficient estimate. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 43. Robustness check: marginal effects for model 4 with alternative measures of overconfidence, at means.[32]

Independent Variable	Decision to pay dividends	Decision to repurchase
Vested unexercised options to CEO's salary	-0.002** (-2.09)	0.000 (0.10)
Vested unexercised options to CEO's total compensation	-0.021*** (-3.80)	0.000 (1.03)
Holder67	0.052 (1.51)	0.052** (2.52)
Ln of vested unexercised options amount	-0.002* (-1.69)	0.003*** (2.77)

The results in Tables 41, 42, and 43 support the previous findings that overconfident CEOs are more likely to repurchase stocks. However, we obtain different results for the probability of cash dividends. In previous subsection we have shown that overconfident CEOs may increase the likelihood of cash dividends, but results in Tables 41 and 43 do not support this. The results suggest that the probability of cash dividends is lower in companies with overconfident CEOs. Perhaps these differences arise because of different approaches to measuring overconfidence, as here the variables are based on the value and number of executive stock options, which do not incentivize CEOs to pay dividends to protect the value of options portfolio from negative effects of dividend payout as shown in Section 2.

In this subsection we have shown that the results obtained previously are robust to different specifications of CEO's overconfidence. However, in terms of the impact of overconfidence on the probability of cash dividends, the results differ, because to check the robustness we use the measures based on the value of vested but unexercised options, and on their amount, which may measure compensation incentives of a CEO, but not his or her overconfidence.

[32] This table presents results from assessment of marginal effects, at means, after the panel probit regression estimation. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

3.5.2 Alternative estimation method

As an additional test of robustness we use an alternative estimation method, which has been used in Subsection 2.5.2. We start with checking the robustness for the impact of CEO's overconfidence on the level of cash dividends. The results are presented in Table 44.

Table 44. Robustness check: estimation of the impact of a CEO's overconfidence on the level of cash dividends with GMM-estimator.[33]

Variable	Model 1	Model 2	Model 3	Model 4
Lag of dividend ratio	0.710*** (9.55)	0.708*** (9.49)	0.742*** (8.93)	0.745*** (9.03)
Confidence	-0.001* (-1.83)			
Vested but unexercised		-0.001* (-1.86)		
Longholder			0.014 (1.56)	
Pre-longholder				0.018 (1.04)
Post-longholder				0.014 (1.59)
Constant	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Number of Observations	9755	9755	9755	9755
Wald statistic	373.7 (0.00)	350.2 (0.00)	352.8 (0.00)	356.11 (0.00)
Hansen test	17.65 (0.82)	17.41 (0.79)	10.25 (0.96)	10.26 (0.95)
Arellano-Bond autocorrelation test (AB-1)	-4.28 (0.00)	-4.24 (0.00)	-4.52 (0.00)	-4.48 (0.00)
Arellano-Bond autocorrelation test (AB-2)	0.43 (0.67)	0.46 (0.65)	0.42 (0.67)	0.45 (0.66)

[33] This table presents results from the Arellano-Bond two-step GMM estimator for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics for Arellano-Bond are reported in parentheses below each coefficient estimate. P-values for Wald stat., Hansen test and the Arellano-Bond tests for autocorrelation are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 44 shows that Wald statistics are high, meaning that regressions are statistically significant. The results of Hansen test show that instruments used in all regressions are valid and there is no overidentification problem in the models. Finally, the tests of autocorrelation satisfy the assumptions of Arellano-Bond model, meaning that instruments are appropriate.

The results are qualitatively similar to those obtained from tobit regressions. We can see that continuous measures of overconfidence have significant negative coefficients, while Longholder measures are not statistically significant. These results support the findings of previous subsections. Now we can look at the results of testing the impact of CEO's overconfidence on the level of repurchases. The results are presented in Table 45.

Table 45. Robustness check: estimation of the impact of a CEO's overconfidence on the level of repurchases with GMM-estimator.[34]

Variable	Model 1	Model 2	Model 3	Model 4
Lag of repurchases ratio	0.168** (2.19)	0.157* (1.62)	0.159*** (2.66)	0.161*** (2.77)
Confidence	0.012 (0.84)			
Vested but unexercised		0.027* (1.63)		
Longholder			-0.019 (-1.61)	
Pre-longholder				-0.035* (-1.88)
Post-longholder				-0.013 (-1.17)
Constant	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Number of Observations	9755	9755	9755	9755
Wald statistic	128.8 (0.00)	124.6 (0.00)	192.3 (0.00)	201.3 (0.00)

[34] This table presents results from the Arellano-Bond two-step GMM estimator for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics for Arellano-Bond are reported in parentheses below each coefficient estimate. P-values for Wald stat., Hansen test and the Arellano-Bond tests for autocorrelation are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Hansen test	12.84 (0.46)	7.61 (0.75)	11.81 (0.69)	14.84 (0.46)
Arellano-Bond autocorrelation test (AB-1)	-4.79 (0.00)	-3.87 (0.00)	-5.49 (0.00)	-5.93 (0.00)
Arellano-Bond autocorrelation test (AB-2)	0.67 (0.50)	0.07 (0.94)	-0.28 (0.78)	-0.60 (0.55)

The results shown in Table 45 suggest that results are robust for models 1 and 2, while Longholder measures are insignificant in models 3 and 4, which contradicts findings of previous subsections. Finally, we can check the robustness of the impact of CEO's overconfidence on the choice of payout channel. The results are presented in Table 46.

Table 46. Robustness check: estimation of the impact of a CEO's overconfidence on the choice of payout channel with GMM-estimator.[35]

Variable	Model 1	Model 2	Model 3	Model 4
Lag of fraction of repurchases	0.240*** (3.00)	0.267*** (3.75)	0.384*** (4.99)	0.383*** (5.00)
Confidence	0.0465* (1.75)			
Vested but unexercised		0.0682* (1.75)		
Longholder			0.109** (2.08)	
Pre-longholder				0.0965 (1.31)
Post-longholder				0.112** (2.12)
Constant	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Number of Observations	9755	9755	9755	9755
Wald statistic	2688.5 (0.00)	295.5 (0.00)	2482.6 (0.00)	324.6 (0.00)
Hansen test	21.11 (0.60)	20.86 (0.18)	16.28 (0.50)	16.07 (0.52)
Arellano-Bond autocorrelation test (AB-1)	-5.10 (0.00)	-5.68 (0.00)	-5.02 (0.00)	-5.10 (0.00)

[35] This table presents results from the Arellano-Bond two-step GMM estimator for the complete sample with robust standard errors clustered by firms. All regressions include intercept and dummy variables for industries and years. z-Statistics for Arellano-Bond are reported in parentheses below each coefficient estimate. P-values for Wald stat., Hansen test and the Arellano-Bond tests for autocorrelation are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Arellano-Bond autocorrelation test (AB-2)	-0.97 (0.33)	-0.71 (0.48)	0.79 (0.43)	0.82 (0.41)

From Table 46 one can see that results are robust across all models, suggesting that repurchases are a more common payout channel in companies run by overconfident CEOs, which supports the findings, discussed in previous subsections.

Thus, in this subsection we have shown that results are robust, when we use different estimation methods that account for possible endogeneity.

3.6 Section 3 discussion and conclusions

In this Section we have investigated the dependence of payout decisions on CEO's overconfidence. We have managed to add to the existing research in this field [Shu et al., 2013; Banerjee et al., 2018(a)] by showing that, first, both the probability and the level of repurchases are higher in companies with overconfident CEOs. This result holds for different approaches to measuring CEO's overconfidence. This finding supports our hypothesis that overconfident CEOs consider company's stocks as undervalued and tend to repurchase them.

Second, the probability of cash dividends is higher in companies run by overconfident CEOs, while the level of cash dividends is lower. The latter is consistent with previous findings, while the former is somewhat surprising. We argue that overconfident CEOs may be inclined to set lower levels of dividends, but they are not willing to refuse paying out at all.

Third, unlike previous research [Deshmukh et al., 2013], we show that the fraction of repurchases is higher in companies with overconfident CEOs, meaning that such CEOs prefer repurchases as a main payout channel.

Finally, we show that results are robust to various specifications of CEO's overconfidence and to different estimation methods.

Section 4. The role of corporate governance in mitigating the impact of CEO's overconfidence on payout decisions

In the previous Sections we have shown that CEO's compensation incentives and overconfidence significantly affect payout probabilities and decisions about payout levels, and about the choice of payout channel. It is arguable that if corporate policies are defined not only by financial state of a company, but also by the CEO's behavioural biases, such as overconfidence, it may have detrimental effects on shareholders' wealth. In this Section we aim at investigating whether the high-quality corporate governance is capable of mitigating the impact of CEO's overconfidence on payout decisions. First, we cover literature on corporate governance quality to gain deeper understanding of its ability to increase company's profitability and shareholders' wealth and to learn different approaches to measuring the corporate governance quality. Second, we formulate hypotheses based on the results and rationale of previous research. Third, we develop an index of corporate governance quality to test our hypotheses. Finally, we discuss main findings and their implications.

4.1 Corporate governance as a main tool of shareholders' interests protection

Corporate governance (CG) is a set of internal control and motivation tools that are developed and used by boards of directors to solve the conflicts of interests between shareholders, debtholders, CEO, employees, and other stakeholders [La Porta et al., 2000]. We assume that more efficient corporate governance procedures may be able to reduce the impact of a CEO's overconfidence on the strategic financial decisions, including decisions about payout policy.

The question of the vital importance in this particular field of research is how to define criteria of CG quality. Different authors use different approaches to answer this question in their research. Table 47 summarises the most reliable approaches to measuring the quality of CG.

Table 47. Different approaches to measuring corporate governance quality.

Approaches to measuring the quality of corporate governance	Authors and year of publication	Sample	Main conclusions
Indexes of corporate governance quality			
Authors developed an index of board of directors' diversity based on gender and age diversity, and information about directors' education and experience	Bernile et al., 2018	US companies, 1996-2014	More diverse boards affect profitability and company value positively, and affect company's shares volatility negatively
Authors developed an index of corporate governance quality based on the structure of board of directors, ownership structure, shareholder protection level, company's transparency and efficiency of internal procedures of the board	Ararat et al., 2017	Turkish companies, 2006-2012	Corporate governance quality affects profitability and company's value positively
Commercial corporate governance quality index - Globe&Mail	Adjaoud, Ben-Amar, 2010	Canadian companies, 2002-2005	Corporate governance quality affects the level of payout positively
Commercial corporate governance quality index - International Shareholder Services	Jiraporn et al., 2011	Companies from different countries, 2001-2004	Corporate governance quality affects the level of payout positively
Commercial corporate governance quality index - International Shareholder Services	Zhu, 2014	US companies, 2002-2005	High quality of corporate governance leads to a decrease in cost of capital
Separate measures of corporate governance			
Gender diversity of the board and its committees	Green, Homroy, 2018	European Union companies, 2004-2015	The presence of female directors, especially in a board's committees, leads to an increase in profitability
Fraction of independent directors, gender diversity, board's size, CEO duality	Alves et al., 2015	Companies from different countries, 2006-2010	The presence of female directors, and independent directors, combined with absence of CEO duality reduces information asymmetry between managers and shareholders
Fraction of independent directors,	Sharma,	US	Number of independent

their tenure, workload of directors	2011	companies, 2006	directors and their tenure affect the level of payout positively; director's workload affects the level of payout negatively
Fraction of independent directors, board's size, CEO duality	Yarram, Dollery, 2015	Australian companies, 2009	Number of independent directors, absence of CEO duality, and company's size affect the level of payout positively

Table 47 shows that several approaches have been developed to define the quality of corporate governance. The first approach is to develop and use an index of corporate governance quality that is based on several measures chosen by the authors. The elements of the index may include gender and age diversity of the board [Bernile et al., 2018; Cosma et al., 2018]; the size of the board of directors and its committees [Al-Ahdal et al., 2020]; the level of the company's transparency [Braga-Alves, Shastri, 2011; Black et al., 2014]; and the presence of independent directors on the board and in its committees [Mande et al., 2012; Kolasinski, Li, 2013; Al-Ahdal et al., 2020]. The researchers who use this approach conclude that high-quality corporate governance reduces the agency problem [Mande et al., 2012], increases the company's value and shareholder payouts [Hwang et al., 2013; Nazarova, Kolkina, 2016]. However, at the same time in some countries the large number of independent directors in the board leads to an increase in research and development expenses. It, in turn, may be a sign of the CEO's increasing risk-seeking behaviour, which may result in a decrease in shareholders' wealth [Stepanova, Tereshchenko, 2016].

The second approach is to use commercial indexes, which are provided by professional agencies for a fee, for example, RiskMetrics [Zagorchev, Gao, 2015], G-Index [Chang et al., 2014], Institutional Shareholder Services [Jiraporn et al., 2011; Zhu, 2014], and Globe&Mail [Adjaoud, Ben-Amar, 2010]. These authors conclude, as can be seen from Table 47, that high-quality CG increases operational efficiency, increases shareholder payouts, and reduces the cost of capital.

In spite of the fact that results show that indexes may be used to measure the quality of corporate governance, the use of the indexes is associated with some limitations that researchers should be aware of [Bozec, Bozec, 2012]. First, using a huge number of elements with equal weights in an index may increase measurement errors. Second, if using a large number of elements, it may turn out that some of them are not complimentary to each other, but rather are substitutes. This means that the same quality characteristic may be presented in an index more than once, which will increase the weight of this characteristic disproportionally. Third, a company may build its CG mechanism accordingly with some external threats, which are unobservable to researchers. This means that some elements of CG may be more efficient under one circumstance and less efficient under all other circumstances, which is hard to capture with an index that is constructed using a large number of components. Instead researchers should focus on one aspect of corporate governance (for example, board of directors) and measure its efficiency, without trying to develop an index of overall corporate governance quality.

To overcome the limitations stated above, it is recommended to use a small number of CG characteristics to build an index. We take into account these warnings and limitations while developing our index of corporate governance quality. We discuss the composition of corporate governance quality index in the following subsections.

To avoid the limitations of the index approach, some authors use separate characteristics of corporate governance to distinguish between corporate governance of high quality and that of low quality. The second part of Table 47 shows that these characteristics may include: the structure of the board and its committees [Ivashkovskaya et al., 2014; Teplova, Sokolova, 2019]; the gender diversity of the board and its committees [Alves et al., 2015; Muravyev, 2017; Green, Homroy, 2018; Ye et al., 2019]; the number of independent directors in the board and in its committees [Ivashkovskaya, Stepanova, 2011; Sharma, 2011]; CEO duality – the situation when the CEO is also a board's chairman [Alves et al., 2015; Ivashkovskaya, Evdokimov, 2018]. Researchers that use this approach have

shown that the presence of female directors, the presence of independent directors, and the absence of CEO duality, lead to an increase in profitability, operational efficiency and payout levels and to a decrease in the level of agency conflict in companies from both non-financial and financial sectors.

Irrespective of a chosen method, the authors have shown that corporate governance of high quality leads to an increase in the levels of payout to shareholders [Gugler, 2003; Sharma, 2011; Jiraporn et al., 2011; Yarram, Dollery, 2015]. This result supports the outcome hypothesis, which suggests that corporate governance of higher quality mitigates agency conflicts by forcing managers to distribute more cash among shareholders [La Porta et al., 2000; Grullon, Michaely, 2012]. However, a recent study has shown that this is true only when company's idiosyncratic risk is low [Bhattacharya et al., 2016]. Another view on the relationship between corporate governance and payout policy is that more efficient corporate governance may act as a substitute for lower dividends [John, Knyazeva, 2006; Officer, 2011]. At the same time, weak governance may be associated mostly with quarterly dividends rather than repurchases [John, Knyazeva, Knyazeva, 2015], meaning that dividends are considered as stronger commitment.

However, researchers show that even high-quality corporate governance may have its own limitations in its ability to protect shareholders' interests. First, an increase in corporate governance quality will not necessarily lead to an increase in payout levels, if a company is facing some constraints with borrowing and/or equity offerings on capital markets [Chae et al., 2009]. In spite of more efficient boards of directors, these companies are more likely to use free cash flow to cover their operational and investment needs, rather than to distribute it among shareholders.

Second, in those companies where the CEO is both the company's founder and a major shareholder, the board of directors may play just a nominal role to show the company's adherence to existing legislation or to corporate governance rules that may exist in a country. In most cases, shareholders in these companies

are less protected from the CEO's adverse behaviour [Libman, Dolgopyatova, Yakovlev, 2018].

Third, huge and more independent boards of directors tend to increase the option-based compensation of a CEO [Ozkan, 2007]. As has been shown in previous subsections this type of compensation may decrease the level of payout to shareholders through both dividends and repurchases.

In spite of limitations mentioned above, the authors agree that high-quality corporate governance is able to increase the level of protection of shareholders' interests and the level of payout. However, very few research deals with the issue of corporate governance ability to reduce the effects of CEO's overconfidence on payout decisions [Banerjee et al., 2015; Humpherry-Jenner et al., 2018]. In the following subsections we aim at filling this gap, starting with the discussion of hypotheses.

4.2 Hypotheses development

Researchers have developed two contradicting views regarding the impact of CEO's overconfidence on the shareholders' wealth.

On the one hand, it is argued that CEO's overconfidence may be beneficial in terms of shareholders' value creation as it may help to overcome conservatism and risk aversion [Guenzel, Malmendier, 2019]. First, such CEOs are more willing to participate in investment projects, especially in those with high risks. If these CEOs have enough expertise in finding value creating projects, or they work in innovative industries where risk-taking and bold actions are rewarded, it may lead to an increase in shareholders' wealth [Galasso, Simcoe, 2011; Hirshleifer et al., 2012]. Moreover, *moderately* overconfident CEOs do not need heavy stimulation to search for investment projects, meaning that their compensation is less incentive-intensive than the compensation demanded by less *and* more overconfident risk-averse CEOs [Gervais, Heaton, Odean, 2011].

Second, overconfident CEOs may exert more effort in searching relevant information about investment projects, as they may overestimate their impact on

the company [Gervais, Heaton, Odean, 2011]. Such CEOs help alleviate information asymmetry problem and reduce uncertainty regarding future cash flows from investment projects.

Third, overconfident CEOs exert more effort not only in searching relevant information, but also in achieving their own overoptimistic forecasts [Hilary et al., 2016]. It has been shown that such CEOs are more determined and use all available resources to achieve their goals, which may lead to an increase in companies' efficiency.

Finally, it has been shown that overconfidence may be a crucial determinant of promoting a person to CEO in the first place due to possible beneficial effects for company's value [Goel, Thakor, 2008]. However, this is true only if the person's overconfidence is evident before the appointment [Palomino, Sadrieh, 2011], which is not always a case. Moreover, it has been shown recently that appointment of overconfident CEOs may be due to inefficiencies of boards of directors if they are excessively busy [Banerjee et al., 2020]. The excessive business of boards, thus, results in selecting overconfident CEOs, who were lucky previously, instead of the talented CEOs.

On the other hand, the authors agree that *excessive* overconfidence of a CEO may lead to detrimental consequences for shareholders' wealth due to potential value-destroying projects [Goel, Thakor, 2008; Gervais, Heaton, Odean, 2011]. First, overconfident CEOs tend to overinvest [Malmendier, Tate, 2005], establish overly optimistic forecasts about company's prospects, even if they already know that previously their forecasts were wrong [Chen et al., 2015], or even be involved in manipulation of stock prices [Banerjee et al., 2018(b)].

Second, overconfident CEOs are more likely to be involved in value-destroying acquisitions, as they overestimate their ability of picking profitable targets [Malmendier, Tate, 2008; Kolasinski, Li, 2013].

Third, indirect evidence that excessively overconfident CEOs may destroy shareholders' value is the fact that such CEOs are more likely to be dismissed from their position than less overconfident and more risk-averse CEOs in companies

with independent boards of directors [Campbell et al., 2011]. Authors have shown that excessive overconfidence and risk-taking lead to higher CEO turnover.

To address these negative effects of CEO's overconfidence, several researchers have raised a question whether it is possible to utilize the benefits of CEO's behavioural traits, and at the same time to limit the detrimental effects of excessive overconfidence. One possible answer to this question is establishing more efficient corporate governance and increasing its quality. When the board of directors is strong, it may use incentive-intensive compensation to prevent an overconfident CEO from taking up a "bad" (from shareholders' point of view) investment project [Heaton, 2019]. Although the number of researches in this field is scarce, recent results suggest that improvements in corporate governance has resulted in attenuation of the impact of CEO's overconfidence on corporate policies and in an increase in shareholder's wealth [Kolasinski, Li, 2013; Banerjee et al., 2015]. More specifically, it has been shown that improved corporate governance has induced overconfident CEOs to reduce overinvestment and value-destroying acquisitions [Kolasinski, Li, 2013], to moderate companies' excessive exposures to risks and to increase the payout levels [Banerjee et al., 2015]. However, the impact of these developments is uncertain in terms of creating shareholders' value. To resolve this issue authors use measures of company's performance, for example, Tobin's Q and return on assets. Authors argue that improved corporate governance in presence of overconfident CEOs has benefited shareholders, as companies' performance and market value have both increased [Banerjee et al., 2015]. On the contrary, some research has shown that improved corporate governance has resulted in negative relationship between CEO's overconfidence and company's performance [Bharati, Doellman, Fu, 2016].

Based on these findings, we can formulate the following hypotheses:

Hypothesis 10: A high quality of corporate governance mitigates the impact of a CEO's overconfidence on payout decisions.

However, as have been argued above, the mitigation of CEO's overconfidence effects on payout decisions does not necessarily lead to an increase

in shareholder's wealth. To address this issue, we develop an additional hypothesis, following previous research [Banerjee et al., 2015]:

Hypothesis 11: A high quality of corporate governance in companies run by overconfident CEOs leads to an increase in the company's performance, compared to companies with low quality of corporate governance.

In the following subsection, we discuss the construction of corporate governance quality index, which will allow us to test these hypotheses.

4.3 Corporate governance quality index

Unlike previous researchers, who investigated the role of corporate governance improvements in mitigation of effects of CEO's overconfidence and other behavioural traits on corporate decisions [Banerjee et al., 2015; Humpherry-Jenner et al., 2018], we do not use exogenous shock of the Sarbanes-Oxley Act implementation in 2002, as our sample is restricted to a more recent time period of 2007-2019. Instead, to test hypotheses 10-11, we construct the corporate governance quality index (CGQI) which is based on the empirical evidence analyzed in previous subsections, as it has been shown that indices may be used to capture the effects of corporate governance quality [Ararat et al., 2017; Bernile et al., 2018; Cosma et al., 2018].

To take into account the limitations of index composition process, discussed in previous subsections, we limit our index to 5 components. The choice of a particular component is motivated, first, by the availability of data in Bloomberg and Thomson Reuters Eikon databases. As we do not have access to International Responsibility Research Center, we are not able to recreate indices used in previous research [Gompers et al., 2003; Bebchuk et al., 2009].

Second, we focus only on the quality of the board of directors as the main corporate governance body to capture its ability to attenuate the impact of CEO's overconfidence on payout decisions. Previous studies have shown that to capture the monitoring role of the board, its size, independence and audit committee

independence, may be used [Mande et al., 2012]. Commercial indexes also include these characteristics and CEO duality in composition when constructing board's quality subindex [Jiraporn et al., 2011; Zhu, 2014]. Thus, we use these four characteristics to build our index.

Finally, although gender diversity is rarely put into indexes [Alves et al., 2015], it has been shown that it may mitigate the effects of CEO's overconfidence [Banerjee, Masulis, Upadhyay, 2018] on corporate policies. We consider this to be important to use gender diversity in our index to capture possible effects of gender diversity on CEO's overconfidence. Thus, the index is comprised of the board characteristics discussed below [Anilov, Ivashkovskaya, 2019; Anilov, 2019].

The gender diversity of the board of directors.

Researchers have shown that female directors are on average more risk-averse and less overconfident than their male colleagues [Andreou et al., 2018; Aktas et al., 2019; Hoang et al., 2019]. Thus, it is argued that the presence of female directors may attenuate the impact of CEO's overconfidence on corporate decisions [Banerjee, Masulis, Upadhyay, 2018; Chen et al., 2019; El Kalak, Tosun, 2019]. Gender diversity may lead to better acquisition decisions, less aggressive investment policies, higher company's performance, lower stock's volatility [Bernile et al., 2018; Aggarwal et al., 2019] and higher payout ratios [Ye et al., 2019]. Moreover, authors posit that board's gender diversity leads to additional points of view, insights and expertise, which benefits the decision-making process [Cumming et al., 2015; Adams, Kirchmaier, 2016; El Kalak, Tosun, 2019].

Because the existing research states that the presence of female directors increases board monitoring and decision-making efficiency, we measure the gender diversity with a dummy variable, which equals "1", if there is at least 1 female director on the board, and "0" – otherwise [Green, Homroy, 2018; Banerjee, Masulis, Upadhyay, 2018; Chen et al., 2019; Ye et al., 2019].

The presence of independent directors.

Researchers show that presence of independent directors, i.e. those who are not affiliated with a company, improves the expertise of the board and its overall

efficiency. On the contrary, board's dependence affects the corporate performance negatively [Jermias, Gani, 2014] and may decrease the level of payout [Sharma, 2011]. Frequently, companies that experience decline in performance respond to that by increasing the independence of the board [Bhagat, Black, 2002; Black, Kim, 2012].

Moreover, researchers have shown that independent boards are able to mitigate the effects of CEO's excessive power and overconfidence on corporate decisions, which may be a sign that independent directors can mitigate the effects of CEO's behavioural biases [Kolasinski, Li, 2013; Schwizer et al., 2015; Jiraporn et al., 2016].

Researchers argue that a board of directors may be considered independent, if more than 50% of its members are outsiders, implying that the majority of the board is not affected by CEO's power and authority [Jiraporn et al., 2011; Black et al., 2012; Kolasinski, Li, 2013; Al-Ahdal et al., 2020]. That is why we create a dummy variable, which equals to 1, if at least 50% of board's members are independent, and equals to 0 – otherwise.

CEO duality.

CEO duality is the situation when the CEO also occupies the post of the board's chairman. It is argued that when a CEO is also a board's chairman, the board becomes less independent. It cannot execute its functions efficiently, as it is always controlled by the powerful CEO, who may be affected by some behavioural biases [Black et al., 2012; Yarram, Dollery, 2015]. On the contrary, if the roles of CEO and board's chairman are separated, the board has more monitoring and controlling power [Vafeas, Vlittis, 2019].

Thus, we create a dummy variable, which equals to 1, if the roles of CEO and board's chairman are separated, and equals to 0 – otherwise [Jiraporn et al., 2011; Al-Ahdal et al., 2020].

The independence of audit committee.

The previous research has shown that audit committees may play an important role in driving the quality of corporate governance. For example,

commercial indexes include audit committees as a separate subindex [Jiraporn et al., 2011; Zhu, 2014]. Moreover, it has been shown that audit committees may lead to an increase in company's performance [Black et al., 2012; Black, Kim, 2012; Al-Ahdal et al., 2020].

To capture these effects, we create a dummy variable, which equals to 1, if an audit committee comprises solely of independent directors, and equals to 0 – otherwise [Jiraporn et al., 2011; Mande et al., 2012; Zhu, 2014]

The size of the board.

To efficiently execute its functions, a board of directors has to have enough members [Mande et al., 2012]. It helps to acquire different expertise and points of view, as well as to diversify each member's strengths and weaknesses. However, when the board of directors is too big, inefficiencies may arise in the form of bureaucracy, longer decision-making, and communication failures [Yermack, 1996; Vafeas, Vlittis, 2019]. It means that a moderately-sized board contributes more to efficiency of monitoring and decision-making than a too big board [Zhu, 2014; Al-Ahdal et al., 2020]. For example, researchers have shown that moderately sized boards of directors are able to improve company's performance [Muravyev, Berezinets, Ilina, 2014] and to mitigate the effects of CEO's excessive overconfidence on corporate decisions [Kolasinski, Li, 2013].

As the researchers state that moderately sized boards show the maximum efficiency, we create a dummy variable, which equals to 1, if a board has between 4 and 12 members, and 0 – if a board has less than 4 and more than 12 members [Malmendier, Tate, 2008; Kolasinski, Li, 2013].

To aggregate these characteristics of board's efficiency and construct the index of corporate governance quality, we apply the principal components analysis with the use of a correlation matrix to derive the value of the index. This specific method of principal components analysis allows use of both continuous and categorical or dummy variables. The principal components analysis creates linear combinations of variables – principal components, or eigenvectors -, so that these combinations have a maximum variation, captured by each principal component

[Brown et al., 2011; Black et al., 2017]. The "quality" of each principal component is measured by eigenvalues. Commonly, principal components with eigenvalues higher than 1, are used for the index. The researchers have shown that this method can be applied for corporate governance quality indices construction, because it eliminates the problem of arbitrary weights assigned to different components [Black et al., 2017; Bernile et al., 2018].

To construct the index, we, first, implement the principal components analysis on corporate governance variables. Second, we use the first and the second components with the highest eigenvalues higher than 1 for the index construction. Finally, we calculate the sum of index components multiplied by the sum of squares of corresponding eigenvectors divided by the number of components (2). We present the obtained weights for index elements in Table 48. As we use dummy variables, the obtained index is measured between 0 and 1. As a robustness check, we will implement another approach to the index construction - equally-weighted index [Bernile et al., 2018]. Moreover, we will check the impact of index components separately. We will discuss this in the following subsections.

Table 48. Weights for the elements of corporate governance quality index.

	CEO Duality	Gender Diversity	Board Independence	Audit Committee Independence	Board Size
Weights	0.02	0.19	0.32	0.17	0.30

We can see from Table 48 that principal components analysis has resulted in applying higher weights to board independence and its size, and lower weights to CEO duality. Although it may be a sign of relative importance of this separate measures, we need to make a robustness check using these measures as proxies for corporate governance quality to make a conclusion about their abilities to mitigate the effects of CEO's overconfidence on payout decisions.

From Figure 6 we can see the breakdown of our sample in terms of companies' corporate governance quality.

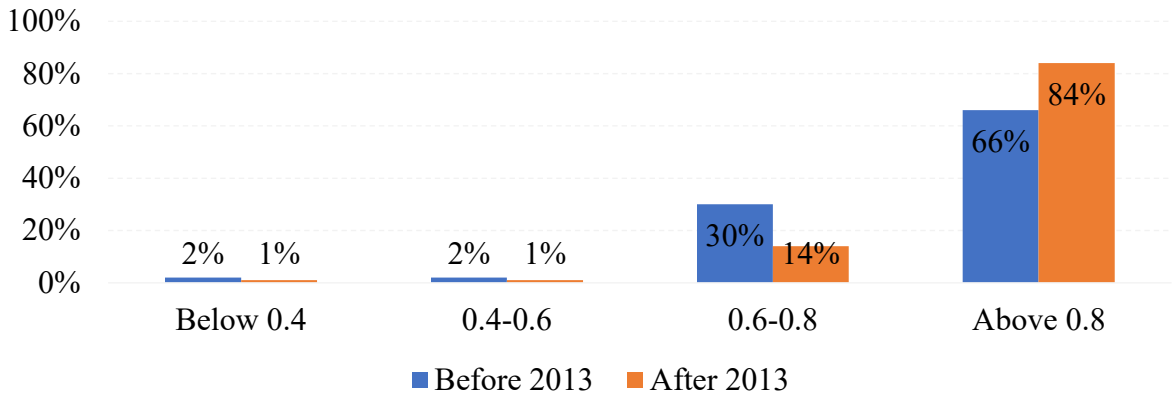

Figure 6. The fraction of observations with different levels of corporate governance quality.

We can see from Figure 6 that the vast majority (66% before 2013, and 84% after 2013) of observations in our sample are companies with high quality of corporate governance with the index value above 0.8. It is no surprise, as developments in legislature, including the Sarbanes-Oxley Act, have led to an increase in the corporate governance quality across companies in the USA. Figure 6 also shows a shift from lower levels of corporate governance quality to higher levels after 2013 (the median year for the sample). We can also look at Figure 7 to check if the mean value of the index has changed over time in companies from our sample.

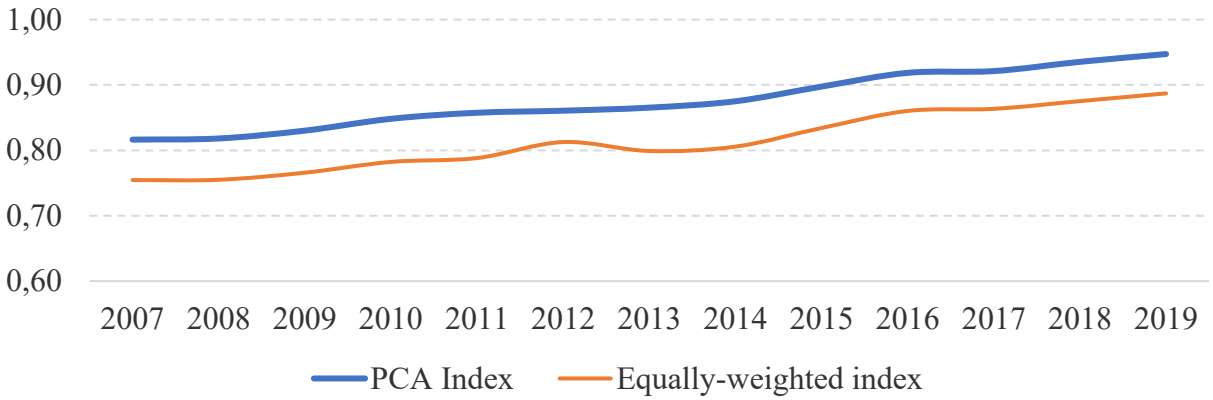

Figure 7. The dynamics of means of CG quality indexes.

The graph on Figure 7 shows that the quality of corporate governance has increased since 2007 in companies from our sample for both types of indexes: obtained with principal components and equally-weighted. The former index is smoother, than the latter, but their dynamics are quite similar. We can see that

major growth has occurred after 2009, which may reflect the legislative improvements and stricter rules after the financial crisis, and once again after 2011-2013, which may result from the acceptance of the Dodd-Frank Act in 2010, which forced improvements in corporate governance across the US companies.

Now we move to the discussion of econometric models to test hypotheses 10-11. To test hypothesis 10, we use models 5 and 6:

$$Payout_{i,t} = \alpha + \beta_1 \bullet CGQI_{i,t} + \beta_2 \bullet Overconf_{i,t} + \beta_3 \bullet Overconf_{i,t} \bullet CGQI_{i,t} + \beta_4 \bullet Age_{i,t} + \sum_{k=5}^{14} \beta_k \bullet Control_{i,t,k} + \theta_i + \delta_t + \varepsilon_{i,t} \quad (5)$$

$$pr(DTP_{i,t} = 1) = \varphi\{\mu + \gamma_1 \bullet CGQI_{i,t} + \gamma_2 \bullet Overconf_{i,t} + \gamma_3 \bullet Overconf_{i,t} \bullet CGQI_{i,t} + \gamma_4 \bullet Age_{i,t} + \sum_{k=5}^{14} \gamma_k \bullet Control_{i,t,k} + \theta_i + \delta_t\} \quad (6),$$

where $Payout_{i,t}$ – is one of the three "Payout" variables; $pr(DTP_{i,t} = 1)$ is the probability that $DTP_{i,t}$=1; DTP – is a binary variable that equals to "1" if a company distributed cash among the shareholders through repurchases and/or dividends, and "0" – otherwise; $\varphi\{x\}$ – is the standard normal cumulative distribution function; $CGQI_{i,t}$ – is the absolute value of corporate governance quality index; $Overconf_{i,t}$- is one of four variables, that reflects overconfidence of the CEO; $Age_{i,t}$– is the age of the CEO; $Control_{i,t,k}$ – is the set of control variables; $\alpha, \beta_k, \mu, \gamma_k$- are coefficients for regressions; $\varepsilon_{i,t}$, – is a normally distributed error term; θ_i- are industry effects; δ_t – are the year's effects; i – is a company's index; t – is a year's index.

To check hypothesis 10 we will look at two pairs of coefficients: β_2 and β_3, and γ_2 and γ_3. More specifically, we need these coefficients (a) to be statistically significant, and (b) to have the opposite signs. This will mean that corporate governance of higher quality attenuates the impact of CEO's overconfidence on payout decisions. If the coefficients have the same signs, this will mean that corporate governance of higher quality exacerbates the effects of overconfidence.

We will also look at signs and significance of $\beta_2 + \beta_3 * CGQI$ and $\gamma_2 + \gamma_3 * CGQI$ for given levels of CGQI (10-th quantile, median, and 90-th quantile). This

will allow us check the effects of CEO's overconfidence on payout decisions for different levels of corporate governance quality.

To test hypothesis 11, we use models 7 and 8, based on the previous studies [Banerjee et al., 2015; Banerjee, Masulis, Upadhyay, 2018]:

$$ROA_{i,t+1} = \alpha + \beta_1 \bullet CGQI_{i,t} + \beta_2 \bullet Overconf_{i,t} + \beta_3 \bullet Overconf_{i,t} \bullet CGQI_{i,t} + \sum_{k=4}^{10} \beta_k \bullet Control_{i,t,k} + \theta_i + \delta_t + \varepsilon_{i,t} \quad (7)$$

$$Tobin\ Q_{i,t+1} = \alpha + \beta_1 \bullet CGQI_{i,t} + \beta_2 \bullet Overconf_{i,t} + \beta_3 \bullet Overconf_{i,t} \bullet CGQI_{i,t} + \sum_{k=4}^{12} \beta_k \bullet Control_{i,t,k} + \theta_i + \delta_t + \varepsilon_{i,t} \quad (8),$$

where $ROA_{i,t+1}$- is return on assets in time t+1; $Tobin\ Q_{i,t+1}$ - is a market-to-book ratio in time t+1.

Using models 7 and 8 we need to check significance and signs of $\beta_2 + \beta_3 * CGQI$ for given levels of CGQI (10-th quantile, median, and 90-th quantile). This will allow us compare the effects of overconfidence on company's performance for different levels of corporate governance quality. To support hypothesis 9 we need to find that overconfidence contributes to company's performance more in companies with high quality of corporate governance than in companies with low quality.

To test hypotheses 10-11, we use the same sample of 813 US companies and the same econometric tools (tobit regressions and panel probit regressions) as were used in Sections 2 and 3. The data on the boards of directors' characteristics was obtained from the S&P Capital IQ, Bloomberg, and Thomson Reuters Eikon.

In the following subsection we report the results of testing hypotheses 10-11.

4.4 The ability of high-quality corporate governance to reduce the impact of CEO's overconfidence on payout decisions

Now we move to the research of the corporate governance ability – in our case, the ability of the board of directors – to reduce the effects of a CEO's overconfidence on payout decisions. The results are presented in Tables 49 and 50.

Table 49. The effects of corporate governance quality on the impact of CEO's overconfidence on payout decisions.[36]

	Dividend ratio				Repurchase ratio				Fraction of repurchases			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Panel A: Results of regression analysis												
Corporate governance quality index (CGQI)	0.005**	0.005**	-0.007**	-0.006*	0.011	0.011	0.033***	0.035***	0.047	0.022	0.366***	0.409***
	(2.43)	(2.22)	(-2.16)	(-1.91)	(1.59)	(1.44)	(3.15)	(3.32)	(0.71)	(0.29)	(3.56)	(3.96)
Confidence	0.0001				-0.004				-0.182*			
	(0.04)				(-0.33)				(-1.57)			
CGQI*Confidence	-0.004				0.008				0.330*			
	(-0.87)				(0.61)				(2.47)			
Vested Unexercised		0.0003				0.001				-0.152*		
		(0.10)				(0.05)				(-1.58)		
Vested Unex*CGQI		-0.002				0.003				0.219*		
		(-0.56)				(0.27)				(2.06)		
Longholder			-0.012***				0.039***				0.435***	
			(-2.72)				(3.51)				(3.75)	
Longholder*CGQI			0.017***				-0.031**				-0.376***	
			(4.46)				(-2.49)				(-3.09)	
Prelongholder				-0.012**				0.032**				0.547***
				(-2.37)				(2.35)				(3.90)
Postlongholder				-0.010**				0.046***				0.454***
				(-2.33)				(3.86)				(3.69)
Prelongholder*CGQI				0.016***				-0.027*				-0.591***
				(3.18)				(-1.71)				(-3.84)
Postlongholder*CGQI				0.016***				-0.037***				-0.374***
				(3.98)				(-2.83)				(-2.90)
Wald stat	1157.8	1146.8	1162.4	1167.4	1362.1	1363.6	1386.9	1393.8	934.6	919.9	923.3	939.0
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Panel B: Effects of CEO's overconfidence for a given level of corporate governance quality												
*b2+b3*CGQI(P10)*	-0.0023*	-0.0009	-0.0007	-0.0001	0.0013	0.0024	0.0200***	0.0227***	0.0288	-0.0110	0.1945***	0.2149***
	(-1.87)	(-0.91)	(-0.26)	(-0.03)	(0.37)	(0.74)	(4.55)	(4.93)	(0.79)	(-0.36)	(3.56)	(3.80)
*b2+b3*CGQI(P50)*	-0.0035***	-0.0015**	0.0050*	0.0053**	0.0040	0.0034*	0.0096***	0.0102***	0.1405***	0.0631***	0.0675	0.0887*
	(-3.81)	(-2.48)	(1.86)	(1.97)	(1.47)	(1.64)	(2.73)	(2.87)	(4.95)	(3.16)	(1.40)	(1.82)
*b2+b3*CGQI(P90)*	-0.0036***	-0.0016**	0.0053**	0.0056**	0.0042	0.0034*	0.0090**	0.0095***	0.1471***	0.0675***	0.0599	0.0812*
	(-3.68)	(-2.40)	(1.98)	(2.07)	(1.45)	(1.57)	(2.49)	(2.59)	(4.90)	(3.20)	(1.22)	(1.64)

[36] This table presents results from the tobit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4, 8 and 12 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 50. The effects of corporate governance quality on the impact of CEO's overconfidence on payout probabilities.[37]

	Decision to pay dividends				Decisions to repurchase			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Panel A: Results of regression analysis								
Corporate governance quality index (CGQI)	0.260* (1.91)	0.254* (1.71)	0.243 (1.02)	0.263 (1.10)	0.243* (1.60)	0.234 (1.34)	0.616*** (2.92)	0.692*** (3.31)
Confidence	-0.014 (-0.08)				-0.368* (-1.59)			
CGQI*Confidence	-0.022 (-0.12)				0.604** (2.18)			
Vested Unexercised		-0.014 (-0.09)				-0.214 (-1.08)		
Vested Unex*CGQI		0.003 (0.01)				0.307 (1.36)		
Longholder			0.176 (0.70)				0.599** (2.40)	
Longholder*CGQI			0.009 (0.03)				-0.418 (-1.52)	
Prelongholder				0.226 (0.77)				0.826*** (2.70)
Postlongholder				0.188 (0.71)				0.606** (2.28)
Prelongholder*CGQI				-0.075 (-0.23)				-0.832** (-2.41)
Postlongholder*CGQI				0.008 (0.03)				-0.357 (-1.23)
Wald stat	298.4 (0.00)	298.0 (0.00)	306.6 (0.00)	306.9 (0.00)	649.5 (0.00)	657.1 (0.00)	673.2 (0.00)	692.0 (0.00)
Panel B: Effects of CEO's overconfidence for a given level of corporate governance quality								
*b2+b3*CGQI(P10)*	-0.0278 (-0.51)	-0.0124 (-0.23)	0.1823* (1.62)	0.1929* (1.65)	0.0186 (0.26)	-0.0177 (-0.28)	0.3309*** (3.57)	0.3779*** (3.81)
*b2+b3*CGQI(P50)*	-0.0353 (-0.88)	-0.0115 (-0.34)	0.1855* (1.89)	0.1957** (1.98)	0.2234*** (3.23)	0.0859* (1.88)	0.1895*** (2.60)	0.2574*** (3.38)
*b2+b3*CGQI(P90)*	-0.0358 (-0.85)	-0.0115 (-0.32)	0.1857* (1.86)	0.1959** (1.95)	0.2355*** (3.23)	0.0920* (1.90)	0.1812** (2.41)	0.2502*** (3.19)

[37] This table presents results from the panel probit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4 and 8 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

We start with the discussion of results for corporate governance ability to reduce the impact of CEO's overconfidence on the level of payout and choice of payout channel, presented in Table 49. We can see that, first, the coefficients for interaction terms in models 1 and 2 are statistically insignificant. This means that corporate governance does not mitigate the negative effects of CEO's overconfidence (measured using continuous variables) on the level of cash dividends, as shown in Section 3. This result contradicts hypothesis 10.

Second, when we measure overconfidence with Longholder measures (models 3 and 4), we obtain different results. We can see that overconfidence measures and interaction terms are significant and have different signs. This supports hypothesis 10, as this means that corporate governance helps mitigate the negative impact of CEO's overconfidence on the level of cash dividends, which supports previous findings [Banerjee et al., 2015]. In Panel B of Table 49 we can see that with an increase in corporate governance quality, the effects of overconfidence on the level of cash dividends become positive.

Third, although we do not find support for hypothesis 9 in models 5 and 6, we can see that overconfidence measures and interaction terms are significant and have different signs in models 7 and 8. This result suggests that corporate governance quality reduces the positive impact of CEO's overconfidence on the level of repurchases. Results in Panel B provide further evidence that with an increase in quality of corporate governance, the positive impact of CEO's overconfidence on the level of stock repurchases decreases. This may be a sign that corporate governance of high quality forces overconfident CEOs to reduce the level of stock repurchases, and to increase the level of cash dividends.

Finally, although the results show that overconfidence measures and interaction terms are significant for models 9-12 and have opposite signs, there are differences in the impact of corporate governance quality on the relationship between CEO's overconfidence and the choice of payout channel between models 9-10 and models 11-12. Namely, we can see that when we measure overconfidence with continuous variables, the results show that corporate governance with higher

quality increases the positive impact of overconfidence on the fraction of repurchases, i.e. stimulates an overconfident CEO to choose repurchases as a main payout channel. However, when we measure overconfidence with Longholder measures, the results are the opposite: corporate governance with higher quality reduces the positive impact of CEO's overconfidence on fraction of repurchases, i.e. stimulates an overconfident CEO to choose cash dividends as a main payout channel. The latter is more consistent with results for models 3-4 and models 7-8. Perhaps, shareholders prefer dividends, as they are more stable and predictable than repurchases, and higher quality of corporate governance caters to these preferences by forcing overconfident CEOs to reduce the fraction of repurchases. However, from regressions used in this study, we cannot draw the reliable conclusions on the reasons of these interrelations.

Clearly, results are sensitive to the specification of overconfidence. Perhaps, continuous measures capture not only the effects of overconfidence, but also the relative importance of compensation in the form of stock options. As we show in Section 2, this type of compensation leads to a reduction in dividends level and does not stimulate a CEO to use repurchases as a main payout channel. Thus, a higher quality of corporate governance may incentivize such a CEO to pay out more, and in turn a CEO chooses repurchases as a main channel of payout, as dividends may decrease the value of his or her options portfolio.

Now we proceed to the discussion of results for the effects of corporate governance quality on the impact of CEO's overconfidence on payout probabilities, presented in Table 50. First, we can see that interaction terms are insignificant in models 1-4, meaning that higher quality of corporate governance does not attenuate the effects of CEO's overconfidence on the probability of cash dividends. Perhaps, this is due to the fact that in Section 3 we show that dividends probability is higher (and not lower) in companies run by overconfident CEOs.

Second, the higher quality of corporate governance strengthens the positive impact of CEO's overconfidence on the probability of stock repurchases only for model 5, while interaction terms in models 6-8 are insignificant. Again, this may

be due to the fact that probability of repurchases is higher in companies with overconfident CEOs irrespective of the level of corporate governance quality, as shown in Section 3.

So far we have shown that higher quality of corporate governance may reduce the negative effects of CEO's overconfidence on payout decisions and strengthen the positive effects. Now we turn to investigation whether this benefits shareholders. To do this we look at the corporate governance ability to stimulate overconfident CEOs to increase the company's performance. The results are presented in Table 51.

Table 51. The effects of corporate governance quality on the impact of CEO's overconfidence on company's performance.[38]

	Tobin Q				Return on Assets			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Panel A: Results of regression analysis								
Corporate governance quality index (CGQI)	-0.513* (-1.92)	-0.558* (-1.92)	-0.819*** (-2.59)	-0.847*** (1.10)	-0.019** (-1.98)	-0.027** (-2.49)	-0.015 (-1.06)	-0.017 (-1.20)
Confidence	-0.390 (-1.11)				-0.013 (-0.98)			
CGQI*Confidence	0.718* (1.65)				0.043*** (2.57)			
Vested Unexercised		-0.366 (-1.22)				-0.029* (-1.71)		
Vested Unex*CGQI		0.473 (1.41)				0.041** (2.22)		
Longholder			-0.000 (-0.01)				-0.000 (-0.01)	
Longholder*CGQI			0.659* (1.64)				0.007 (0.38)	
Prelongholder				0.150 (0.40)				0.019 (0.97)
Postlongholder				-0.000 (-0.01)				-0.000 (-0.01)
Prelongholder*CGQI				0.633 (1.29)				-0.001 (-0.04)
Postlongholder*CGQI				0.738* (1.71)				0.016 (0.88)
F stat	17.2 (0.00)	16.9 (0.00)	16.9 (0.00)	15.7 (0.00)	11.9 (0.00)	11.3 (0.00)	11.1 (0.00)	10.3 (0.00)
R-sq (overall)	23.9%	20.9%	22.0%	21.5%	3.8%	3.2%	3.1%	3.1%
Panel B: Effects of CEO's overconfidence for a given level of corporate governance quality								
*b2+b3*CGQI(P10)*	0.070 (0.67)	-0.063 (-0.66)	0.422* (1.64)	0.473* (1.71)	0.014*** (3.35)	-0.002 (-0.39)	0.004 (0.38)	0.010 (0.88)
*b2+b3*CGQI(P50)*	0.313*** (2.63)	0.097 (1.55)	0.645* (1.64)	0.723* (1.71)	0.028*** (5.96)	0.012*** (3.61)	0.007 (0.38)	0.015 (0.88)
*b2+b3*CGQI(P90)*	0.327*** (2.61)	0.106 (1.60)	0.659* (1.64)	0.737* (1.71)	0.029*** (5.86)	0.013*** (3.63)	0.007 (0.38)	0.016 (0.88)

[38] This table presents results from the regressions with firm-fixed effects for the complete sample with robust standard errors clustered by firms. All regressions include control variables, dummies for years and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4 and 8 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for F stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

We can see from Table 51 that corporate governance quality affects the impact of CEO's overconfidence on company's performance. First, the impact of CEO's overconfidence on the market performance of company's stocks gets more positive with an increase in the quality of corporate governance (Panel B of Table 51). This supports hypothesis 11, meaning that higher quality of corporate governance helps utilize the benefits of CEO's overconfidence for the purposes of value creation for shareholders.

Second, the impact of CEO's overconfidence on operational performance of a company also gets more positive with an increase in the value of corporate governance quality index. This also supports hypothesis 11. However, this result holds only for models 5 and 6.

Thus, the results in Table 51 suggest that higher corporate governance quality may limit the detrimental effects of CEO's overconfidence and direct it to the performance improvement and value creation, which is in line with previous findings in this field of study [Banerjee et al., 2015].

To sum up, in this subsection we have shown that, first, higher quality of corporate governance mitigates the negative impact of CEO's overconfidence on the level of cash dividends, as well as positive impact on the level of stock repurchases. Overconfident CEOs increase payout in the form of cash dividends and decrease payout in the form of stock repurchases more in companies with higher levels of corporate governance quality. However, the results are sensitive to the specifications of CEO's overconfidence. Second, overconfident CEOs contribute more to an increase in market performance of company's stocks and operational performance of the company in companies with higher levels of corporate governance quality. This suggests that higher quality of corporate governance helps mitigate possible negative effects of overconfident CEOs.

In the following subsection we check the robustness of obtained results.

4.5 Robustness check

4.5.1 Alternative measure of corporate governance quality

To check the robustness of results obtained in the previous subsection we implement an alternative approach to the construction of corporate governance quality index. In the previous subsection we used the index that was built using principal components analysis. This approach eliminates the problem of arbitrary weighs of different index constituents, but is difficult to interpret.

In this subsection, we use an approach based on the assignment of equal weights to each component [Black et al., 2017; Bernile et al., 2018]. We once again use the gender diversity of the board; the fraction of independent directors; the independence of audit committee; CEO-duality; and the size of the board. We use the absolute values of index. The results are provided in Tables 52 and 53.

Table 52. Robustness-check: equally-weighted index and payout decisions.[39]

	Dividend ratio				Repurchase ratio				Fraction of repurchases			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Panel A: Results of regression analysis												
Equally-weighted index (EW)	0.003*	0.003	-0.006**	-0.005*	0.010*	0.009	0.029***	0.031***	0.079	0.071	0.292***	0.323***
	(1.66)	(1.23)	(-2.02)	(-1.78)	(1.78)	(1.35)	(3.13)	(3.29)	(1.33)	(1.08)	(3.09)	(3.40)
Confidence	-0.003				-0.005				-0.043			
	(-0.78)				(-0.60)				(-0.46)			
Confidence*EW	-0.001				0.011				0.182			
	(-0.12)				(0.99)				(1.58)			
Vested Unexercised		-0.002				-0.004				-0.046		
		(-0.96)				(-0.52)				(-0.59)		
Vested Unex*EW		0.001				0.009				0.108		
		(0.43)				(0.94)				(1.17)		
Longholder			-0.007*				0.033***				0.314***	
			(-1.91)				(3.46)				(3.10)	
Longholder*EW			0.013***				-0.025**				-0.258**	
			(3.77)				(-2.28)				(-2.32)	
Prelongholder				-0.007				0.029**				0.258**
				(-1.57)				(2.43)				(2.12)
Postlongholder				-0.007*				0.037***				0.382***
				(-1.66)				(3.70)				(3.62)
Prelongholder*EW				0.011**				-0.024*				-0.272*
				(2.38)				(-1.72)				(-1.94)
Postlongholder*EW				0.013***				-0.029**				-0.315***
				(3.50)				(-2.49)				(-2.73)
Wald stat	1155,3	1144,6	1154,6	1160,7	1366,9	1368,7	1389,6	1395,8	932,4	918,9	921,0	933,8
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Panel B: Effects of CEO's overconfidence for a given level of corporate governance quality												
*b2+b3**EW*(P10)*	-0.0030***	-0.0016*	0.0005	0.0010	0.0011	0.0012	0.0179***	0.0198***	0.0657**	0.0188	0.1591***	0.1929***
	(-2.98)	(-1.91)	(0.17)	(0.35)	(0.38)	(0.44)	(4.44)	(4.75)	(2.11)	(0.71)	(3.05)	(3.61)
*b2+b3**EW*(P50)*	-0.0031***	-0.0014**	0.0031	0.0035	0.0033	0.0030*	0.0129***	0.0141***	0.1020***	0.0403**	0.1075**	0.1230***
	(-4.06)	(-2.55)	(1.16)	(1.32)	(1.45)	(1.68)	(3.91)	(4.21)	(4.44)	(2.34)	(2.30)	(2.74)
*b2+b3**EW*(P90)*	-0.0032***	-0.0011	0.0057**	0.0060**	0.0054*	0.0047*	0.0079**	0.0084**	0.1382***	0.0618***	0.0562	0.0671
	(-2.80)	(-1.55)	(2.09)	(2.20)	(1.67)	(1.93)	(2.02)	(2.13)	(4.09)	(2.60)	(1.10)	(1.29)

[39] This table presents results from the tobit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4, 8 and 12 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 53. Robustness-check: equally-weighted index and payout probabilities.[40]

	Decision to pay dividends				Decisions to repurchase			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Panel A: Results of regression analysis								
Equally-weighted index (EW)	0.170 (1.44)	0.127 (1.01)	0.209 (1.15)	0.229 (1.25)	0.208 (1.45)	0.223 (1.38)	0.486** (2.46)	0.543*** (2.77)
Confidence	-0.108 (-0.90)				-0.173 (-0.99)			
Confidence*EW	0.096 (0.66)				0.404* (1.78)			
Vested Unexercised		-0.134 (-1.02)				-0.073 (-0.44)		
Vested Unex*EW		0.152 (0.98)				0.157 (0.78)		
Longholder			0.210 (1.06)				0.490** (2.22)	
Longholder*EW			-0.035 (-0.16)				-0.315 (-1.21)	
Prelongholder				0.305 (1.33)				0.553** (2.15)
Postlongholder				0.203 (0.98)				0.558** (2.34)
Prelongholder*EW				-0.183 (-0.68)				-0.550* (-1.78)
Postlongholder*EW				-0.011 (-0.05)				-0.325 (-1.17)
Wald stat	298.1 (0.00)	297.7 (0.00)	308.2 (0.00)	307.6 (0.00)	644.3 (0.00)	644.7 (0.00)	670.6 (0.00)	681.5 (0.00)
Panel B: Effects of CEO's overconfidence for a given level of corporate governance quality								
*b2+b3**EW*(P10)*	-0.0509 (-1.14)	-0.0430 (-0.93)	0.1900* (1.82)	0.1964* (1.83)	0.0701 (1.19)	0.0213 (0.38)	0.3007*** (3.50)	0.3634*** (3.92)
*b2+b3**EW*(P50)*	-0.0317 (-0.93)	-0.0126 (-0.43)	0.1826* (1.95)	0.1943** (2.04)	0.1510*** (2.86)	0.0527 (1.39)	0.2376*** (3.54)	0.2985*** (4.21)
*b2+b3**EW*(P90)*	-0.0127 (-0.28)	0.0177 (0.46)	0.1757* (1.72)	0.1922* (1.87)	0.2315*** (2.93)	0.0838* (1.52)	0.1749** (2.09)	0.2338*** (2.68)

[40] This table presents results from the panel probitt regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4 and 8 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

We can see that the results presented in Tables 52 and 53 correspond to those presented in Tables 49 and 50. High-quality corporate governance is capable of reducing the impact of CEO's overconfidence on payout decisions. For example, higher levels of corporate governance quality reduce the negative impact of CEO's overconfidence on the level of cash dividends and reduce the positive effects – on the level of repurchases. This results in lower impact of CEO's overconfidence on the fraction of repurchases in companies with higher levels of corporate governance quality.

Overall, we can see that using the equally weighted index has yielded qualitatively similar results as using the index developed with principal components analysis. Based on these results, we can assume that characteristics of boards of directors that have been chosen for index construction purposes in this research really capture the quality of corporate governance for companies from our sample. However, to make sure that this is the case we need to look at different components of the index separately. The results are presented in the following subsections.

4.5.2 CEO duality

We start the discussion of the impact of different components of corporate governance quality index on the relationship between CEO's overconfidence and payout decisions with CEO duality. The results are presented in Tables 54 and 55.

Table 54. Robustness-check: CEO duality and payout decisions.[41]

	Dividend ratio				Repurchase ratio				Fraction of repurchases			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Panel A: Results of regression analysis												
CEO Duality	0.0001	-0.0002	0.002*	0.002*	0.001	0.0004	0.003	0.003	0.044**	0.044*	0.011	0.009
	(0.13)	(-0.30)	(1.89)	(1.85)	(0.64)	(0.20)	(0.76)	(0.74)	(2.08)	(1.88)	(0.33)	(0.28)
Confidence	-0.003***				0.002				0.143***			
	(-2.80)				(0.58)				(3.91)			
Confidence*Duality	0.0005				0.002				-0.070			
	(0.31)				(0.44)				(-1.57)			
Vested Unexercised		-0.002**				0.001				0.063**		
		(-2.16)				(0.45)				(2.34)		
Vested Unex*Duality		0.001				0.003				-0.032		
		(0.76)				(0.92)				(-0.97)		
Longholder			0.005*				0.014***				0.091*	
			(1.83)				(3.33)				(1.71)	
Longholder*Duality			-0.003**				-0.002				0.025	
			(-2.13)				(-0.39)				(0.61)	
Prelongholder				0.005*				0.011**				-0.049
				(1.62)				(2.23)				(-0.80)
Postlongholder				0.005*				0.014***				0.129**
				(1.85)				(3.40)				(2.39)
Prelongholder*Duality				-0.005***				-0.003				0.140***
				(-2.78)				(-0.58)				(2.62)
Postlongholder*Duality				-0.002*				-0.001				-0.003
				(-1.64)				(-0.22)				(-0.07)
Wald stat	1152.0	1141.5	1140.6	1152.3	1356.2	1359.3	1375.6	1381.0	928.7	915.8	913.8	933.3
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Panel B: Effects of CEO's overconfidence for a given level of CEO duality												
*b2+b3**Duality*(0)*	-0.0030***	-0.0020**	0.0050*	0.0050*	0.0020	0.0010	0.0140***	0.0140***	0.1430***	0.0630**	0.0910*	0.1290**
	(-2.80)	(-2.16)	(1.83)	(1.85)	(0.58)	(0.45)	(3.33)	(3.40)	(3.91)	(2.34)	(1.71)	(2.39)
*b2+b3**Duality*(1)*	-0.0029***	-0.0011*	0.0023	0.0030	0.0038	0.0044**	0.0122***	0.0134***	0.0733**	0.0310	0.1161**	0.1265**
	(-3.19)	(-1.64)	(0.86)	(1.10)	(1.37)	(2.00)	(3.34)	(3.61)	(2.59)	(1.47)	(2.35)	(2.52)

[41] This table presents results from the tobit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4, 8 and 12 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 55. Robustness-check: CEO duality and payout probabilities.[42]

	Decision to pay dividends				Decisions to repurchase			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Panel A: Results of regression analysis								
CEO Duality	-0.012 (-0.31)	-0.036 (-0.86)	0.247* (1.89)	0.242* (1.90)	0.036 (0.66)	0.044 (0.73)	0.045 (0.57)	0.042 (0.53)
Confidence	-0.044 (-0.90)				0.190** (2.21)			
Confidence*Duality	0.019 (0.33)				-0.074 (-0.74)			
Vested Unexercised		-0.052 (-1.08)				0.086 (1.42)		
Vested Unex*Duality		0.067 (1.18)				-0.051 (-0.67)		
Longholder			0.356*** (2.61)				0.279*** (3.02)	
Longholder*Duality			-0.281* (-1.87)				-0.039 (-0.39)	
Prelongholder				0.202 (1.28)				0.118 (1.08)
Postlongholder				0.388*** (2.79)				0.349*** (3.56)
Prelongholder*Duality				-0.361** (-2.04)				0.032 (0.25)
Postlongholder*Duality				-0.241 (-1.58)				-0.056 (-0.52)
Wald stat	288.5 (0.00)	288.6 (0.00)	455.8 (0.00)	463.5 (0.00)	638.9 (0.00)	639.6 (0.00)	661.5 (0.00)	667.1 (0.00)
Panel B: Effects of CEO's overconfidence for a given level of CEO duality								
*b2+b3**Duality*(0)*	-0.0440 (-0.90)	-0.0520 (-1.08)	0.3560*** (2.61)	0.3880*** (2.79)	0.1900** (2.21)	0.0860 (1.42)	0.2790*** (3.02)	0.3490*** (3.56)
*b2+b3**Duality*(1)*	-0.0247 (-0.60)	0.0148 (0.43)	0.0752 (0.70)	0.1468 (1.33)	0.1159* (1.95)	0.0357 (0.76)	0.2393*** (3.04)	0.2931*** (3.59)

[42] This table presents results from the panel probit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4 and 8 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

We can see from Tables 54 and 55 that the results are weaker than when we use indexes to measure the quality of corporate governance. This is not surprising, because, as has been shown in Table 48, CEO duality accounts for only 2% of the index. We can see that CEO duality itself does not attenuate the effects of CEO's overconfidence on payout decisions. This result holds for all specifications except of models 3 and 4.

It is interesting to note, however, that overconfident CEOs are more likely to pay dividends and distribute higher levels of dividends in companies where they are also chairmen of the boards, than in companies where these roles are separated, even though CEO duality is considered to worsen the quality of corporate governance. Perhaps, as overconfident CEOs in our sample are mostly compensated with stocks (Table 30), they may benefit from increasing the level of cash dividends. Thus, when such CEO also occupies the position of board's chairman, it becomes easier for him or her to adjust payout policy to whatever is more beneficial for CEO's personal wealth.

4.5.3 Gender diversity and board's independence

We proceed to the discussion of the ability of gender diversity of the board of directors to mitigate the impact of CEO's overconfidence on payout decisions. Then we discuss the influence of board independence on this impact. The results are presented in Tables 56 and 57 for gender diversity, and in Tables 58 and 59 for board independence.

Table 56. Robustness-check: gender diversity and payout decisions.[43]

	Dividend ratio				Repurchase ratio				Fraction of repurchases			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Panel A: Results of regression analysis												
Gender diversity dummy (GD)	0.003***	0.002**	-0.003**	-0.003*	0.002	0.003	0.009**	0.010**	-0.021	-0.007	0.036	0.053
	(2.99)	(2.57)	(-2.13)	(-1.92)	(0.88)	(0.90)	(2.38)	(2.57)	(-0.80)	(-0.24)	(0.90)	(1.30)
Confidence	-0.002				-0.003				0.045			
	(-1.53)				(-0.62)				(1.14)			
Confidence*GD	-0.001				0.008*				0.077*			
	(-0.89)				(1.71)				(1.66)			
Vested Unexercised		-0.001				0.0004				0.044		
		(-1.10)				(0.11)				(1.22)		
Vested Unex*GD		-0.00004				0.003				-0.002		
		(-0.04)				(0.85)				(-0.05)		
Longholder			-0.003				0.019***				0.160***	
			(-0.96)				(3.92)				(2.68)	
Longholder*GD			0.008***				-0.008*				-0.066	
			(4.99)				(-1.79)				(-1.38)	
Prelongholder				-0.005*				0.018***				0.133**
				(-1.72)				(3.20)				(2.05)
Postlongholder				-0.001				0.021***				0.186***
				(-0.47)				(3.96)				(2.98)
Prelongholder*GD				0.009***				-0.012**				-0.123**
				(4.76)				(-2.04)				(-2.13)
Postlongholder*GD				0.007***				-0.009*				-0.073
				(3.97)				(-1.73)				(-1.44)
Wald stat	1161.3	1150.4	1170.8	1177.7	1364.3	1363.9	1383.7	1390.1	927.5	912.4	912.7	925.9
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Panel B: Effects of CEO's overconfidence for a given level of gender diversity of the board of directors												
*b2+b3**GD*(0)*	-0.0020	-0.0010	-0.0030	-0.0010	-0.0030	0.0004	0.0190***	0.0210***	0.0450	0.0440	0.1600***	0.1860***
	(-1.53)	(-1.10)	(-0.96)	(-0.47)	(-0.62)	(0.11)	(3.92)	(3.96)	(1.14)	(1.22)	(2.68)	(2.98)
*b2+b3**GD*(1)*	-0.0034***	-0.0014**	0.0050*	0.0051*	0.0055**	0.0039**	0.0109***	0.0120***	0.1228***	0.0422**	0.0936*	0.1124**
	(-3.86)	(-2.34)	(1.85)	(1.91)	(2.09)	(1.98)	(3.15)	(3.42)	(4.54)	(2.23)	(1.95)	(2.32)

[43] This table presents results from the tobit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4, 8 and 12 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 57. Robustness-check: gender diversity and payout probabilities.[44]

	Decision to pay dividends				Decisions to repurchase			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Panel A: Results of regression analysis								
Gender diversity dummy (GD)	0.116**	0.122**	0.142*	0.147*	0.049	0.079	0.111	0.136*
	(2.36)	(2.30)	(1.82)	(1.89)	(0.86)	(1.22)	(1.32)	(1.63)
Confidence	-0.071				0.031			
	(-1.15)				(0.37)			
Confidence*GD	0.056				0.172*			
	(0.83)				(1.71)			
Vested Unexercised		-0.025				0.051		
		(-0.41)				(0.68)		
Vested Unex*GD		0.018				0.004		
		(0.28)				(0.04)		
Longholder			0.206*				0.288***	
			(1.81)				(2.74)	
Longholder*GD			-0.023				-0.052	
			(-0.25)				(-0.49)	
Prelongholder				0.165				0.270**
				(1.37)				(2.26)
Postlongholder				0.237**				0.331***
				(1.97)				(2.95)
Prelongholder*GD				0.005				-0.200
				(0.05)				(-1.57)
Postlongholder*GD				-0.051				-0.029
				(-0.52)				(-0.25)
Wald stat	301.8	302.4	311.7	313.7	645.1	645.7	669.4	692.3
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Panel B: Effects of CEO's overconfidence for a given level of gender diversity of the board of directors								
*b2+b3**GD*(0)*	-0.0710	-0.0250	0.2060*	0.2370**	0.0310	0.0510	0.2880***	0.3310***
	(-1.15)	(-0.41)	(1.81)	(1.97)	(0.37)	(0.68)	(2.74)	(2.95)
*b2+b3**GD*(1)*	-0.0141	-0.0074	0.1835*	0.1857*	0.2023***	0.0550	0.2357***	0.3019***
	(-0.38)	(-0.24)	(1.87)	(1.88)	(3.29)	(1.28)	(3.24)	(3.96)

[44] This table presents results from the panel probit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4 and 8 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 58. Robustness-check: independence of the board of directors and payout decisions.[45]

	Dividend ratio				Repurchase ratio				Fraction of repurchases			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Panel A: Results of regression analysis												
Board independence dummy (BI)	0.004*	0.003	0.004	0.004	0.009	0.010	0.008	0.009	0.110*	0.107	0.238**	0.248**
	(1.67)	(1.20)	(1.05)	(1.14)	(1.30)	(1.45)	(0.74)	(0.79)	(1.68)	(1.56)	(2.20)	(2.30)
Confidence	-0.002				0.018*				0.069			
	(-0.80)				(1.74)				(0.69)			
Confidence*BI	-0.001				-0.016				0.030			
	(-0.25)				(-1.48)				(0.29)			
Vested Unexercised		-0.004				0.020*				-0.0002		
		(-1.03)				(1.87)				(-0.00)		
Vested Unex*BI		0.002				-0.017*				0.043		
		(0.64)				(-1.60)				(0.41)		
Longholder			0.004				0.016				0.276**	
			(0.78)				(1.24)				(2.02)	
Longholder*BI			-0.001				-0.004				-0.172	
			(-0.14)				(-0.27)				(-1.30)	
Prelongholder				0.004				0.015				0.344**
				(0.69)				(1.05)				(2.35)
Postlongholder				0.004				0.018				0.187
				(0.77)				(1.20)				(1.24)
Prelongholder*BI				-0.002				-0.006				-0.310**
				(-0.45)				(-0.40)				(-2.17)
Postlongholder*BI				-0.0003				-0.004				-0.062
				(-0.07)				(-0.27)				(-0.42)
Wald stat	1155.3	1144.6	1138.8	1146.5	1357.5	1359.8	1375.5	1380.3	928.5	916.7	916.7	931.0
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Panel B: Effects of CEO's overconfidence for a given level of board independence												
*b2+b3**BI*(0)*	-0.0020	-0.0040	0.0040	0.0040	0.0180*	0.0200*	0.0160	0.0180	0.0690	-0.0002	0.2760**	0.1870
	(-0.80)	(-1.03)	(0.78)	(0.77)	(1.74)	(1.87)	(1.24)	(1.20)	(0.69)	(-0.00)	(2.02)	(1.24)
*b2+b3**BI*(1)*	-0.0032***	-0.0013**	0.0033	0.0038	0.0024	0.0027	0.0128***	0.0138***	0.0999***	0.0427**	0.1040**	0.1251***
	(-4.05)	(-2.43)	(1.26)	(1.43)	(1.06)	(1.52)	(3.87)	(4.11)	(4.25)	(2.47)	(2.22)	(2.65)

[45] This table presents results from the tobit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4, 8 and 12 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 59. Robustness-check: independence of the board of directors and payout probabilities.[46]

	Decision to pay dividends				Decisions to repurchase			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Panel A: Results of regression analysis								
Board independence dummy (BI)	0.140 (0.99)	0.110 (0.76)	0.196 (0.66)	0.202 (0.68)	0.298** (2.04)	0.268* (1.70)	0.600*** (2.72)	0.612*** (2.77)
Confidence	0.114 (0.76)				0.092 (0.45)			
Confidence*BI	-0.155 (-1.01)				0.051 (0.24)			
Vested Unexercised		-0.002 (-0.01)				-0.093 (-0.39)		
Vested Unex*BI		-0.009 (-0.05)				0.150 (0.63)		
Longholder			0.314 (0.97)				0.691** (2.40)	
Longholder*BI			-0.135 (-0.42)				-0.457 (-1.59)	
Prelongholder				0.328 (0.93)				0.719** (2.20)
Postlongholder				0.297 (0.84)				0.632** (1.99)
Prelongholder*BI				-0.173 (-0.49)				-0.606* (-1.83)
Postlongholder*BI				-0.106 (-0.31)				-0.337 (-1.06)
Wald stat	290.8 (0.00)	289.5 (0.00)	299.4 (0.00)	300.3 (0.00)	639.4 (0.00)	645.6 (0.00)	667.5 (0.00)	674.8 (0.00)
Panel B: Effects of CEO's overconfidence for a given level of board independence								
*b2+b3**BI*(0)*	0.1140 (0.76)	-0.0020 (-0.01)	0.3140 (0.97)	0.2970 (0.84)	0.0920 (0.45)	-0.0930 (-0.39)	0.6910** (2.40)	0.6320** (1.99)
*b2+b3**BI*(1)*	-0.0404 (-1.18)	-0.0112 (-0.38)	0.1796* (1.88)	0.1906** (1.97)	0.1429*** (2.74)	0.0573 (1.50)	0.2342*** (3.47)	0.2952*** (4.15)

[46] This table presents results from the panel probit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4 and 8 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

We can see from Tables 56 and 57 that the results are qualitatively similar to those obtained using the index of corporate governance quality. This supports the previous findings that presence of women in the board of directors increases the quality of corporate governance [Banerjee, Masulis, Upadhyay, 2018]. The results show that the impact of CEO's overconfidence on the level of repurchases is lower, and on the level of cash dividends is higher in companies with diverse boards than in companies where women are not presented on the board. However, gender diversity of the board does not affect the impact of CEO's overconfidence on payout probabilities.

At the same time we fail to find any robust evidence that independent directors mitigate the impact of CEO's overconfidence on payout decisions, although board independence accounts for 32% of corporate governance quality index. We can see in Tables 58 and 59 that the interaction terms are insignificant, meaning that the impact of CEO's overconfidence on payout decisions does not differ between companies with more or less than 50% of independent directors in the board, which contradicts previous findings [Kolasinski, Li, 2013]. This contradiction, perhaps, may be explained by the fact that in previous research the board's independence was investigated simultaneously with moderate size of the board, while we investigate board's independence and size separately.

4.5.4 Independence of audit committee and board's size

In the final set of robustness check we use the independence of audit committee and the size of the board of directors to check, whether they mitigate the impact of CEO's overconfidence on payout decisions. The results are presented in Tables 60 and 61 for audit committee independence, and in Table 62 and 63 – for the board's size.

Table 60. Robustness-check: independence of the audit committee and payout decisions.[47]

	Dividend ratio				Repurchase ratio				Fraction of repurchases			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Panel A: Results of regression analysis												
Audit committee independence dummy (ACI)	-0.001 (-1.45)	-0.001 (-1.57)	-0.008*** (-6.19)	-0.008*** (-5.95)	0.004 (1.57)	0.003 (1.15)	0.009** (2.08)	0.009** (2.21)	0.0008 (0.03)	-0.007 (-0.27)	0.114*** (2.71)	0.128*** (3.03)
Confidence	-0.005*** (-3.55)				0.001 (0.25)				0.007 (0.18)			
Confidence*ACI	0.003* (1.71)				0.003 (0.67)				0.129*** (2.76)			
Vested Unexercised		-0.003*** (-2.68)				0.0004 (0.10)				-0.029 (-0.84)		
Vested Unex*ACI		0.002* (1.70)				0.004 (0.88)				0.092** (2.36)		
Longholder			-0.005* (-1.70)				0.017*** (3.48)				0.201*** (3.36)	
Longholder*ACI			0.011*** (6.93)				-0.006 (-1.19)				-0.121** (-2.49)	
Prelongholder				-0.006* (-1.83)				0.011* (1.85)				0.142** (2.13)
Postlongholder				-0.004 (-1.52)				0.021*** (4.00)				0.239*** (3.88)
Prelongholder*ACI				0.010*** (4.95)				-0.001 (-0.22)				-0.133** (-2.19)
Postlongholder*ACI				0.011*** (6.57)				-0.009* (-1.72)				-0.143*** (-2.83)
Wald stat	1155.2 (0.00)	1143.9 (0.00)	1188.0 (0.00)	1192.4 (0.00)	1364.5 (0.00)	1366.9 (0.00)	1385.4 (0.00)	1393.2 (0.00)	934.3 (0.00)	919.8 (0.00)	919.2 (0.00)	932.1 (0.00)
Panel B: Effects of CEO's overconfidence for a given level of audit committee independence												
*b2+b3**ACI*(0)*	-0.0050*** (-3.55)	-0.0030*** (-2.68)	-0.0050* (-1.70)	-0.0040 (-1.52)	0.0010 (0.25)	0.0004 (0.10)	0.0170*** (3.48)	0.0210*** (4.00)	0.0070 (0.18)	-0.0290 (-0.84)	0.2010*** (3.36)	0.2390*** (3.88)
*b2+b3**ACI*(1)*	-0.0024*** (-2.84)	-0.0009 (-1.57)	0.0058** (2.16)	0.0061** (2.27)	0.0040 (1.51)	0.0039** (1.99)	0.0116*** (3.34)	0.0120*** (3.44)	0.1363*** (5.12)	0.0621*** (3.26)	0.0800* (1.67)	0.0967** (1.99)

[47] This table presents results from the tobit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4, 8 and 12 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 61. Robustness-check: independence of the audit committee and payout probabilities.[48]

	Decision to pay dividends				Decisions to repurchase			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Panel A: Results of regression analysis								
Audit committee independence dummy (ACI)	0.0199 (0.39)	-0.001 (-0.02)	-0.068 (-0.87)	-0.062 (-0.79)	0.045 -0.71	0.038 (0.54)	0.105 (1.14)	0.129 (1.41)
Confidence	-0.120** (-2.31)				-0.025 (-0.35)			
Confidence*ACI	0.118* (1.94)				0.248*** (2.72)			
Vested Unexercised		-0.101* (-1.76)				-0.061 (-0.87)		
Vested Unex*ACI		0.119* (1.84)				0.154* (1.90)		
Longholder			0.067 (0.56)				0.266** (2.32)	
Longholder*ACI			0.157* (1.66)				-0.019 (-0.16)	
Prelongholder				0.080 (0.61)				0.206 (1.58)
Postlongholder				0.070 (0.58)				0.333*** (2.72)
Prelongholder*ACI				0.115 (0.95)				-0.101 (-0.71)
Postlongholder*ACI				0.164* (1.72)				-0.028 (-0.22)
Wald stat	292.1 (0.00)	290.5 (0.00)	304.1 (0.00)	304.5 (0.00)	656.6 (0.00)	651.8 (0.00)	664.2 (0.00)	670.5 (0.00)
Panel B: Effects of CEO's overconfidence for a given level of audit committee independence								
*b2+b3**ACI*(0)*	-0.1200** (-2.31)	-0.1010* (-1.76)	0.0670 (0.56)	0.0700 (0.58)	-0.0250 (-0.35)	-0.0610 (-0.87)	0.2660** (2.32)	0.3330*** (2.72)
*b2+b3**ACI*(1)*	-0.0016 (-0.04)	0.0171 (0.53)	0.2237** (2.32)	0.2341** (2.39)	0.2237*** (3.34)	0.0925** (2.12)	0.2467*** (3.42)	0.3053*** (4.07)

[48] This table presents results from the panel probit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4 and 8 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 62. Robustness-check: board size and payout decisions.[49]

	Dividend ratio				Repurchase ratio				Fraction of repurchases			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Panel A: Results of regression analysis												
Board size dummy (BS)	0.002**	0.003**	0.002	0.002	0.0004	-0.0002	0.008	0.008	0.025	-0.012	0.113**	0.114**
	(2.19)	(2.50)	(1.30)	(1.34)	(0.11)	(-0.05)	(1.47)	(1.49)	(0.72)	(-0.31)	(2.19)	(2.22)
Confidence	0.002				0.006				0.057			
	(0.89)				(0.62)				(0.66)			
Confidence*BS	-0.006**				-0.003				0.045			
	(-2.21)				(-0.30)				(0.51)			
Vested Unexercised		0.002				0.003				-0.046		
		(1.39)				(0.56)				(-0.85)		
Vested Unex*BS		-0.004**				-0.0001				0.097*		
		(-2.40)				(-0.01)				(1.74)		
Longholder			0.005				0.024***				0.212***	
			(1.49)				(3.52)				(2.88)	
Longholder*BS			-0.001				-0.012*				-0.114*	
			(-0.79)				(-1.86)				(-1.83)	
Prelongholder				0.005				0.017*				0.215**
				(1.27)				(1.81)				(2.32)
Postlongholder				0.005				0.026***				0.216***
				(1.52)				(3.73)				(2.87)
Prelongholder*BS				-0.003				-0.008				-0.185**
				(-1.28)				(-0.87)				(-2.19)
Postlongholder*BS				-0.001				-0.013**				-0.097
				(-0.58)				(-1.97)				(-1.51)
Wald stat	1157.7	1147.9	1136.9	1145.7	1354.3	1356.2	1378.0	1383.5	925.5	915.8	915.4	927.6
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
anel B: Effects of CEO's overconfidence for a given level of board size												
*b2+b3**BS*(0)*	0.0020	0.0020	0.0050	0.0050	0.0060	0.0030	0.0240***	0.0260***	0.0570	-0.0460	0.2120***	0.2160***
	(0.89)	(1.39)	(1.49)	(1.52)	(0.62)	(0.56)	(3.52)	(3.73)	(0.66)	(-0.85)	(2.88)	(2.87)
*b2+b3**BS*(1)*	-0.0035***	-0.0018***	0.0032	0.0037	0.0030	0.0032*	0.0119***	0.0128***	0.1022***	0.0509***	0.0982**	0.1195**
	(-4.46)	(-3.11)	(1.21)	(1.40)	(1.29)	(1.73)	(3.55)	(3.77)	(4.32)	(2.86)	(2.09)	(2.51)

[49] This table presents results from the tobit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4, 8 and 12 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Table 63. Robustness-check: board size and payout probabilities.[50]

	Decision to pay dividends				Decisions to repurchase			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Panel A: Results of regression analysis								
Board size dummy (BS)	0.066 (1.04)	0.077 (1.14)	0.055 (0.52)	0.057 (0.54)	0.031 (0.43)	-0.050 (-0.58)	0.113 (1.20)	0.119 (1.27)
Confidence	0.300* (1.90)				0.313* (1.94)			
Confidence*BS	-0.346** (-2.22)				-0.178 (-1.09)			
Vested Unexercised		0.152* (1.96)				-0.045 (-0.43)		
Vested Unex*BS		-0.175** (-2.19)				0.106 (0.96)		
Longholder			0.262* (1.76)				0.423*** (3.35)	
Longholder*BS			-0.086 (-0.74)				-0.183* (-1.56)	
Prelongholder				0.305* (1.65)				0.346* (1.77)
Postlongholder				0.254* (1.69)				0.470*** (3.73)
Prelongholder*BS				-0.157 (-0.98)				-0.225 (-1.15)
Postlongholder*BS				-0.067 (-0.57)				-0.171 (-1.48)
Wald stat	292.1 (0.00)	288.8 (0.00)	301.7 (0.00)	303.8 (0.00)	642.9 (0.00)	639.5 (0.00)	660.2 (0.00)	665.7 (0.00)
Panel B: Effects of CEO's overconfidence for a given level of board size								
*b2+b3**BS*(0)*	0.3000* (1.90)	0.1520* (1.96)	0.2620* (1.76)	0.2540* (1.69)	0.3130* (1.94)	-0.0450 (-0.43)	0.4230*** (3.35)	0.4700*** (3.73)
*b2+b3**BS*(1)*	-0.0457 (-1.35)	-0.0226 (-0.75)	0.1760* (1.86)	0.1876* (1.95)	0.1352*** (2.66)	0.0616 (1.55)	0.2394*** (3.48)	0.2996*** (4.15)

[50] This table presents results from the panel probit regressions with robust standard errors clustered by firms. All regressions include control variables, dummies for years and industries and intercepts; coefficients are omitted for space considerations. The effects in Panel B for Models 4 and 8 are provided only for Postlongholder measures. z-Statistics are reported in parentheses below each coefficient estimate. P-values for Wald stat. are reported in the parentheses below each statistics value. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

The results in Tables 60 and 61 suggest that audit committee independence really mitigates the impact of CEO's overconfidence on payout decisions even better than the overall index of corporate governance quality, as interaction terms are significant in almost all models. More specifically, depending on the specification of overconfidence, it either reduces the negative impact of CEO's overconfidence on the level of cash dividends, or reverses it, so it becomes positive. We can also see that probabilities of cash dividends and repurchases are higher in companies with overconfident CEOs, if audit committee is independent. Other results are qualitatively similar to the results obtained using the index of corporate governance quality.

Finally, we can see from Tables 62 and 63 that the board's size also may affect the relationship between CEO's overconfidence and payout decisions. The results are mostly similar to those obtained with the index of corporate governance quality. However, we can see that for models 1 and 2 results differ. Namely, we can see that the level of cash dividends and probability of dividends are higher (lower) in companies with overconfident CEOs, if the size of the board is suboptimal (optimal) as defined in Section 4.3.

To sum up, in this subsection we have shown that, first, equally weighted index of corporate governance quality may be used as an alternative measure of corporate governance quality, as the approaches based on principal components and equal weights yield similar results.

Second, the results show that different components of corporate governance quality index have different impact on the relationship between overconfidence and payout decisions. For example, gender diversity and audit committee independence better mitigate the impact of overconfidence on payout decisions than board of directors' independence and CEO duality.

4.6 Section 4 discussion and conclusions

In this Section we have investigated the ability of corporate governance of high quality to reduce the impact of CEO's overconfidence on payout decisions. We contribute to the existing literature on this topic [Kolasinski, Li, 2013; Banerjee et al., 2015] by showing that, first, corporate governance of higher quality really reduces the impact of CEO's overconfidence on payout decisions. More specifically it reduces the negative effects of CEO's overconfidence on the level of cash dividends, as well as its positive effects on the level of repurchases. Second, the results have shown that high-quality corporate governance contributes to a company's performance: it has an ability to control CEO's overconfidence and to utilize its benefits for the purposes of value creation. Third, we have found that indices, based on principal components, and indices, based on the equal weights of components, may be used for the purposes of corporate governance quality measurement and yield similar results. Finally, we have shown that different components of corporate governance quality index have different impact on the relationship between overconfidence and payout decisions. Gender diversity and audit committee independence both show better ability to reduce the impact of CEO's overconfidence on payout decisions than the size of the board, board of directors' independence, and CEO duality.

Conclusion

Based on the academic literature analysis, in this dissertation we have recognized some areas of potential contribution. First, we have noticed that previous research investigated the impact of CEO's compensation and overconfidence on payout decisions separately, while it may interesting to look at these relationships in a single sample to be able to compare their effects.

Second, previous research has not found significant relationship between inside debt and its components and decisions about repurchases. We argue that this topic requires further investigation because of the importance of repurchases in payout policy and possible role of inside debt in determination of payout policy. Moreover, different components of inside debt may provide different incentives for a CEO, as they have different terms. This also requires further investigation to gain a deeper understanding of relationships between compensation and payout policy.

Third, in this dissertation we are able to compare different approaches to measuring CEO's overconfidence using a single dataset. Although these two approaches mostly yield similar results, it may be the case that the approach based on the continuous variables captures not only the effects of overconfidence, but also the effects of compensation.

Finally, the previous research has mostly focused on the investigation of influence of corporate governance quality on the level of payout. The studies that actually investigated the ability of corporate governance to mitigate the impact of CEO's overconfidence on payout decisions used the implementation of Sarbanes-Oxley Act of 2002 to account for corporate governance improvements. We argue that this approach may not capture the effects of higher quality of corporate governance on a company level and may not isolate the effects of 2001 dividends tax cut. Thus, in this research, we develop an index of corporate governance quality based on five characteristics of boards of directors, which allows us assess the level of board of directors' efficiency for each company in the sample. Using this index, as well as separate characteristics of the boards of directors, we analyse

the ability of high-quality corporate governance to reduce the impact of CEO's overconfidence on payout decisions. Moreover, we investigate the corporate governance ability to utilize the benefits of CEO's overconfidence for the purposes of increasing shareholders wealth.

Table 64 summarises the results of testing the hypotheses of this dissertation.

Table 64. Results of hypotheses testing.

Hypothesis	Results of testing
Compensation incentives	
1. The *higher the level of inside debt owned by the CEO*, the *higher the level of cash dividends*	Cannot be rej.
1a. The *higher the level of inside debt owned by the CEO*, the *higher the probability of cash dividends* payout in a given year	Cannot be rej.
2. The *higher the level of equity-based compensation* of the CEO, the *lower the level of cash dividends*	Mixed results
2a. The *higher the level of equity-based compensation* of the CEO, the *lower the probability of cash dividends* payout in a given year	Can be rej.
3. The *higher the level of inside debt owned by the CEO*, the *lower the level of stock repurchases*	Can be rej.
3a. The *higher the level of inside debt owned by the CEO*, the *lower the probability of stock repurchases* in a given year	Can be rej.
4. The *higher the level of equity-based compensation* of the CEO, the *higher the level of stock repurchases*	Cannot be rej.
4a. The *higher the level of equity-based compensation* of the CEO, the *higher the probability of stock repurchases* in a given year	Mixed results
5. The *higher the level of inside debt owned by the CEO*, the *less likely a CEO chooses repurchases as a main payout channel*	Can be rej.
6. The *higher the level of equity-based compensation* of the CEO, the *more likely a CEO chooses repurchases as a main payout channel*	Mixed results
Overconfidence	

7. *The level of cash dividends is lower in companies with overconfident CEOs*	Cannot be rej.
7a. *The probability of cash dividends is lower in companies with overconfident CEOs*	Can be rej.
8. *The level of repurchases is higher in companies with overconfident CEOs*	Cannot be rej.
8a. *The probability of repurchases is higher in companies with overconfident CEOs*	Cannot be rej.
9. *Overconfident CEOs are more likely to choose repurchases as a main payout channel*	Cannot be rej.
Corporate governance	
10. A high quality of corporate governance *mitigates the impact* of a CEO's overconfidence on payout decisions	Mixed results
11. A high quality of corporate governance in companies run by overconfident CEOs leads to *an increase in the company's performance,* compared to companies with low quality of corporate governance	Mixed results

As we can see from Table 64, we have found that, first, inside debt really affects payout decisions. The probabilities and levels of both cash dividends and share repurchases are higher in companies where a CEO has more inside debt. As well as this, such CEOs use repurchases as a main channel of payout. We believe that this type of compensation may benefit not only debtholders, but also shareholders. We have also shown that different components of inside debt may provide different incentives. For example, the results suggest that pension benefits provide a CEO with longer term incentives, stimulating payouts in the form of cash dividends, while the deferred compensation provides shorter term incentives, stimulating payouts in the form of share repurchases. Finally, we have shown that there is a non-linear relationship between inside debt and payout decisions. This means that CEOs with high inside debt holdings have more incentives to increase payout than CEOs with lower levels of inside debt.

Second, we have found that different components of equity-based compensation may provide different incentives for a CEO. For example, the compensation in the form of company's stocks provides similar incentives to those

of inside debt. The probabilities and levels of repurchases and cash dividends are higher when a CEO has higher stocks-based compensation. Stocks may incentivize a CEO to choose repurchases as a main payout channel. At the same time, options-based compensation provides very different incentives, as the level of cash dividends and repurchase probability are lower when a CEO receives more executive stock options. We believe that such CEOs may be inclined to increase the company's stocks volatility to increase the value of options holdings. To do this they may take up some high risk investment projects. This leaves them with fewer funds that can be distributed among shareholders.

Having investigated the effects of CEO's compensation, we proceed with the investigation of impact of CEO's overconfidence on payout decisions. First, we have found that CEO's overconfidence may lead to an increase in the repurchases level and probability. Overconfidence also incentivizes a CEO to choose share repurchases as a main payout channel. These results support the hypotheses that overconfident CEOs consider company's stocks as undervalued and tend to repurchase them.

Second, we have shown that CEO's overconfidence contributes to lower levels of cash dividends. This supports the assumption that overconfident CEOs may be more willing to use spare funds for capital investments than for distribution among shareholders. At the same time the results suggest that the probability of cash dividends is higher in companies with overconfident CEOs. We assume that overconfident CEOs may have different motivation behind the decisions about the level of payout and about the payout itself. On the other hand, these results are driven by different measures of overconfidence. The continuous measures of overconfidence, which are based on the value of executive stock options, may capture not only the effects of overconfidence but also the effects of compensation. As it has been shown that options-based compensation may lead to lower levels of cash dividends, it may be not surprising that measures of overconfidence based on the value of vested but unexercised options have negative correlations with the levels of cash dividends in our sample.

After investigating the impact of CEO's overconfidence on payout decisions, we continue with the analysis of the ability of corporate governance of higher quality to reduce this impact and to utilize the benefits of overconfidence for the purposes of value creation. The results have shown that corporate governance of higher quality really reduces the impact of CEO's overconfidence on payout decisions. Namely, high-quality corporate governance reduces the negative impact of CEO's overconfidence on the level of cash dividends, as well as positive impact on the level of share repurchases. This may mean that boards of directors consider dividends as more preferable for shareholders than share repurchases. Moreover, we have found that corporate governance of higher quality contributes to a company's performance: Tobin's Q and return on assets are higher in companies with overconfident CEOs, if the quality of corporate governance is higher. This may mean that corporate governance of higher quality has an ability to effectively monitor CEO's behavior and utilize it for the purposes of value creation.

Finally, the results suggest that different characteristics of the board of directors have different ability to reduce the impact of CEO's overconfidence on payout decisions. More specifically, we have found that audit committee independence and gender diversity of the board reduce the impact of overconfidence on payout decisions more efficiently, while the independence of the board and CEO duality have almost no impact on the relationship between CEO's overconfidence and payout decisions.

The results of this dissertation are robust to various estimation methods and different specifications of compensation and overconfidence measures.

Based on the results of this dissertation, we suggest that major shareholders should force the development of high-quality governance processes to protect themselves against the effects of the CEO's overconfidence on payout decisions and to utilize the benefits of these traits for the purposes of value creation. The appropriate level of corporate governance and board of directors' efficiency should

be set in accordance with the shareholders' interests and the peculiarities of the CEO's overconfidence.

The results of this dissertation may be used by shareholders of Russian companies. First, they should be aware of possible effects of CEO's overconfidence on payout decisions to be able to choose an optimal combination of compensation tools to manage CEO's behaviour. Second, companies in Russia should develop corporate governance of higher quality using the best practices of the US companies and keep the quality high as it helps to mitigate the effects of CEO's overconfidence on payout decisions.

The aspects of CEO's overconfidence studied in this research are only a part of the behavioural biases that predetermine different styles in developing corporate policies. First, we believe that further research should focus on a deeper understanding of the influence of the overall set of behavioural traits of CEOs (for example, optimism, education, and management style) on different strategic financial decisions. Second, future research on the interaction of CEO's behavioural biases, along with the biases of members of the board, might be a productive angle for understanding the future of corporate payout policies. Third, it may be important to consider the behavioural traits of the Chief Financial Officer – CFO – who plays a vital role in different financial decisions along with the CEO. Fourth, an important direction for research is to apply the methodology and tools of this dissertation towards an investigation of companies from Russia and other emerging markets. This will allow researchers to compare the impact of behavioural biases of actors and agents in companies from different countries.

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SEC Form 4

FORM 4

UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

STATEMENT OF CHANGES IN BENEFICIAL OWNERSHIP

Filed pursuant to Section 16(a) of the Securities Exchange Act of 1934
or Section 30(h) of the Investment Company Act of 1940

OMB APPROVAL	
OMB Number:	3235-0287
Estimated average burden hours per response:	0.5

[X] Check this box if no longer subject to Section 16. Form 4 or Form 5 obligations may continue. *See* Instruction 1(b).

1. Name and Address of Reporting Person*	2. Issuer Name **and** Ticker or Trading Symbol	5. Relationship of Reporting Person(s) to Issuer (Check all applicable)
BERKSHIRE HATHAWAY INC	DELTA AIR LINES, INC. [DAL]	Director X 10% Owner Officer (give title below) Other (specify below)
(Last) (First) (Middle) 3555 FARNAM STREET	3. Date of Earliest Transaction (Month/Day/Year) 04/01/2020	
(Street) OMAHA NE 68131	4. If Amendment, Date of Original Filed (Month/Day/Year)	6. Individual or Joint/Group Filing (Check Applicable Line) Form filed by One Reporting Person X Form filed by More than One Reporting Person
(City) (State) (Zip)		

Table I - Non-Derivative Securities Acquired, Disposed of, or Beneficially Owned

1. Title of Security (Instr. 3)	2. Transaction Date (Month/Day /Year)	2A. Deemed Execution Date, if any (Month/Day /Year)	3. Transaction Code (Instr. 8)		4. Securities Acquired (A) or Disposed Of (D) (Instr. 3, 4 and 5)			5. Amount of Securities Beneficially Owned Following Reported Transaction(s) (Instr. 3 and 4)	6. Ownership Form: Direct (D) or Indirect (I) (Instr. 4)	7. Nature of Indirect Beneficial Ownership (Instr. 4)
			Code	V	Amount	(A) or (D)	Price			
Common Stock	04/01/2020		S		3,834,559	D	$24.0428[1]	68,052,404	I	See Footnote[2]
Common Stock	04/01/2020		S		3,244,166	D	$25.2729[3]	64,808,238	I	See Footnote[2]
Common Stock	04/01/2020		S		669,041	D	$26.0368[4]	64,139,197	I	See Footnote[2]
Common Stock	04/02/2020		S		2,727,703	D	$22.9646[5]	61,411,494	I	See Footnote[2]
Common Stock	04/02/2020		S		2,461,432	D	$23.859[6]	58,950,062	I	See Footnote[2]
Common Stock	04/02/2020		S		49,303	D	$24.5315[7]	58,900,759	I	See Footnote[2]

Table II - Derivative Securities Acquired, Disposed of, or Beneficially Owned
(e.g., puts, calls, warrants, options, convertible securities)

1. Title of Derivative Security (Instr. 3)	2. Conversion or Exercise Price of Derivative Security	3. Transaction Date (Month/Day /Year)	3A. Deemed Execution Date, if any (Month/Day /Year)	4. Transaction Code (Instr. 8)		5. Number of Derivative Securities Acquired (A) or Disposed of (D) (Instr. 3, 4 and 5)		6. Date Exercisable and Expiration Date (Month/Day /Year)		7. Title and Amount of Securities Underlying Derivative Security (Instr. 3 and 4)		8. Price of Derivative Security (Instr. 5)	9. Number of derivative Securities Beneficially Owned Following Reported Transaction(s) (Instr. 4)	10. Ownership Form: Direct (D) or Indirect (I) (Instr. 4)	11. Nature of Indirect Beneficial Ownership (Instr. 4)
				Code	V	(A)	(D)	Date Exercisable	Expiration Date	Title	Amount or Number of Shares				

1. Name and Address of Reporting Person*
BERKSHIRE HATHAWAY INC