The Effects of CEO's Divorce on Firm's Performance: An Empirical Research of US Firms

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Abstract

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To empirically examine the effects of CEOs' private lives on firms' performance, I use CEOs' divorce events as a proxy and collect all CEO divorce cases in the U.S. market from 1980 to 2013. I predict that divorce stress negatively affects CEOs' ability to make benign strategic decisions, thereby negatively influencing firms' performance. I find that divorced firms have worse performance than their counterparties before divorce events end and such events motivate CEOs to re-devote themselves to their job post-divorce. The boards of shareholders also use equity-based compensation as a valuable method to incentivize divorced CEOs due to their substantial loss of outside wealth. Furthermore, divorced CEOs reduce their risk tolerance and become more risk averse as they lose wealth and become less diversified in their portfolios.

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1. Introduction

In this study, I test the relationship between CEOs' divorces and corporate performance in the U.S. Prior studies have focused on a wide variety of topics related to CEOs' work lives, such as CEOs' power, compensation, and work relationships, to name a few. However, it is noteworthy that researchers have artificially separated CEOs' work and private lives. Their private lives have been left explained by the press.

Divorce which is an extreme life transition has negative effects on an individual's private life: such as the loss of emotional support and the lower level of wealth. When an individual has encountered a divorce, this will distract him and take a considerable part of attention. Existing evidence shows that divorce can lead to a huge loss of individuals' wealth in divorce settlements, especially for the rich. For example, Harold Hamm paid nearly $1 billion to his ex-wife Sue Ann Hamm, which made this bitter divorce one of the most expensive divorce cases in history.

It is clear that prior studies have devoted little attention to CEOs' divorces and their impact on corporate performance. As a human being, CEO also need to balance his or her private life and work life. When a CEO suffers divorce, he or she will face the same trouble like other people. However, besides a dejected husband or wife, CEO who is the chief decision maker also plays a very important role in the workplace. Divorced CEOs might be forced to transfer or sell their stocks or options to pay for such large "bills", which may result in the firms' loss of control and shape the corporate governance in the future. This significant shock to CEOs may have influence on firms in at least three ways. First, this negative private event can reduce a CEO's influence or control of his/her firm due to his/her loss of wealth and transfer of stocks in the divorce settlement. Moreover, the CEO's attitude toward risk changes. Second, when a CEO suffers such a painful experience, his or her productivity and concentration on the work is certainly affected. Third, the CEO's incentives are also influenced by the divorce event. Prior evidence indicates that shareholders often react positively to adjust the CEO's compensation. Our study fills in the gap of the existing literature on the effects of CEOs' private lives, which extends the branches of behavior finance.

To validate the aforementioned conjectures, I plan to create a unique database. There are no available databases containing all information relevant to divorces. Therefore, I must hand-collect data and merge them among several databases. 1) I obtain cases of divorced CEOs from Factiva and Forbes. 2) I use the Westlaw and Lexis Nexis databases to find court files with the exact divorce dates 3) I locate each individual's work information through Bloomberg and Google

and determine whether their divorces happen during their CEO tenures. 4) For the qualified cases, I search the companies' information, such as financial data and stock returns through Compustat, CRSP and Execucomp. 5) I match each case using the propensity score matching (PSM) method based on the firm's performance and characteristics. The propensity score matching method estimates the impact of the treatment by providing a propensity score based on the firm's observed characteristics, which can taper off the selection bias by equating treatment and control groups based on observed covariates. Difference-in-difference (DID) estimations test the effect of a treatment on the outcome (dependent variable) by comparing the average change over time between the two groups, reducing the selection bias and extraneous factors' effects. In this study, I use the one-to-one nearest-neighbor matching method, similar to Hellman et al. (2008), and univariate and multivariate DID estimation.

I find that divorced CEOs experience challenges from the time when they file their divorce documents to when they receive the final court judgment. Such a shock to their private lives prevents them from becoming immersed in their job and has a negative impact on their firms' performance. After their divorce cases end, the CEOs can fully focus on their work and they are apt to perform better to make up for the loss from the divorce event. Therefore, such firms have better performance in the following three years after CEOs' divorces.

To test the relationship between a CEO's divorce and compensation changes, I employ similar steps in univariate and multivariate DID estimation for a CEO's salary, bonus, stock grants and option grants based on the Black-Scholes value. I match sample firms and non-divorced firms with PSM using a compensation package and a list of firm-level characteristics. The regression results show that there is no abnormal compensation in the year before a divorce and in the divorce year. The stock grants are significantly higher one year and two years after a divorce, supporting our hypothesis that the boards of shareholders take equity-based compensation as a valuable method to incentivize divorced CEOs. Restricted stock grants in particular enjoy much more popularity among the boards as a valuable indemnifying measure for CEOs who have experienced a loss of wealth.

Previous research demonstrates considerable evidence on CEOs' risk management. Overconfidence, military experience, age, education and political affiliation have been analyzed by previous researchers (Malmendier and Tate, 2005; Malmendier and Tate, 2005, 2008; Hutton

et al., 2010). However, there is no evidence proving the impact of a CEO's divorce on risk management changes.

I demonstrate that divorced CEOs prefer lower firm-level risks in their divorce year and remain risk averse for at least two subsequent years. The log stock return volatility and idiosyncratic volatility are lower after the divorce year, especially two years post-divorce, which is significantly negatively related to stock volatility and idiosyncratic volatility.

The analysis of CEOs relates to several branches in the behavioral finance literature. As noted, previous studies focus invariably on CEOs' work lives, and academic research has devoted little attention to events in their private lives. My study combines the two branches and accentuates the effects of a CEO's divorce experience on his/her firm's performance. I contribute to the existing evidence of CEOs' individual power. To my knowledge, this study is the first testing the impact of a CEO's divorce on his/her company's performance using the difference-in-difference estimation method. Alternatively, I also showcase the change in CEOs' risk tolerance after such a painful experience and examine the influence of their private wealth on their incentives.

The remainder of this paper is organized as follows: Section 2 sheds light on the previous related rationales and the three hypotheses. The data selection process, sample description and methodologies are highlighted in section 3. Section 4 discusses the primary results of this paper and several robustness tests. Section 5 lists limitations to the study. Section 6 presents the key findings of the study.

2. Literature Review and Hypotheses

The study of top executives has drawn considerable attention in the behavior finance press. The general consensus is that the CEO, who is the company's chief decision maker, is ultimately responsible for his/her firm's organization and has a prominent effect on firm performance (Finkelstein et al., 2009; Hansen et al., 2010). The analysis of CEOs' individual characteristics and power can be classified into several branches. Evidence shows that top managers' personalities and experiences influence organizational outcomes (Miller and Droge, 1986). It is generally acknowledged that firms' policies and performance are swayed by CEOs' decisions (Adams, Almeida, and Ferreira, 2005). Executives' decision making plays an important role in developing an effective management team, optimizing firms' performance, and engaging in many other

prominent functions. Managers' traits, such as overconfidence, have been described in prior academic research (Malmendier, Tate, and Yan, 2011).

However, scholars tend to focus on CEO' personal characteristics rather than delving into the relationship between their private lives and daily work. It is a common struggle for managers to balance family and work. Simon (1956) argued that decision makers like CEOs are not one-hundred percent rational. Executives are faced with an influx of information every day (Finkelstein, et al., 2009). Such high demands often divert top managers from optimal decision making. When they are under great pressure in their personal lives, it is not easy for CEOs to devote their full effort to their work (Adams et al., 2005). According to a survey done by Lex Fridman[1], the divorce rate of chief executives is around 9.89%. Based on survey and anecdotal evidence, managers' wealth lost in a divorce event could range from 25 percent to 50 percent. In a nutshell, the cost of a divorce for chief executives is not only the loss of affection, but also the loss of substantial wealth, which is a double blow. In the light of the findings with respect to the consequences of divorce, there is no doubt that stress stemming from a divorce will divert the CEO's attention and consume much of his/her mind, which limits his/her job-related capacity. I thus posit the following hypothesis:

Hypothesis 1: Divorce stress negatively affects CEOs' ability to make benign strategic decisions, thereby negatively influencing firms' performance.

Agency theory has enjoyed considerable popularity in the past several decades. Due to the dilemma of the principle-agent problem, it is not easy for board members to determine an appropriate way to compensate CEOs that incentivizes top managers to immerse themselves in their work that is also in line with shareholders' profits (Core and Guay, 1999). The general consensus is that companies are apt to use incentive-based bonuses in which CEOs are rewarded by related performance bonuses, like stocks and options, in addition to their base salary (Tufano, P., 1996; Brick et al., 2006). Academic researchers have discussed a feasible and comprehensive framework to help scholars gauge the current state of CEO compensation research. There are three determinants of executive compensation: criteria, governance and contingencies (Barkema and Gomez-Mejia, 1998). Basically, criteria can be considered, such as firm size, CEO characteristics,

[1] Lex Fridman, "Divorce Rates by Profession", https://www.scribd.com/document/265583476/Divorce-Rates-by-Profession-Lex-Fridman-Blog, (May 17, 2015).

peer compensation and firm performance, to name a few. Governance refers to a firm's ownership structure, remuneration committee, market control and governance (Jensen, 1993). A handful of previous papers on executive compensation rest on the first two criteria; however, the press offers little guidance in the third one. Contingencies include possible internal and external determinants that have impacts on performance, such as a firm's strategy, industry regulation, national tax system and so on (Barkema and Gomez-Mejia, 1998). CEOs' divorce events can be classified according to this situation as divorces of CEOs have impacts on firms. This paper is an attempt to fill the void by checking board directors' reactions to CEO's significant private life changes and ascertains the impact of divorce events on CEOs' compensation.

The empirical evidence on shareholders' reactions to CEOs' compensation incentives is mixed. Dittmann and Maug (2007) found that different wealth does not lead to the same prediction results: salary has a negative relationship with CEOs' wealth, and stock grants should be more favored than options grants. From an information asymmetry perspective, numerous researchers assume that CEOs hold more information than the boards on the value of investment opportunities, which makes it more difficult for boards to evaluate CEOs' success (Smith and Watts, 1992; Yermack, 1994). Therefore, to improve monitoring, firms whose growth opportunities are greater should provide more stock-based compensation to managers instead of cash-based compensation. Guay (1999) delved into the evidence that shareholders are apt to use options and stocks to manage CEOs' performance, as portfolio sensitivities diverge from normal conditions, which means when CEOs' wealth decreases, the boards award more equity-based compensation. Corporations usually face high idiosyncratic risky projects with a positive net present value. Risk-averse CEOs may not be willing to undertake such projects. Boards often employ convex payoffs to induce CEOs to take risks (Edmans and Gabaix, 2011). Murphy's (1990a) research ascertains that equity-based compensation for managers is conducive to firms' value maximization. Mehran (1995) provided insight into a positive relation between firms' performance and the percentage of shares held by CEOs. In Hall and Murphy's (2002) study, the loss of top managers' wealth will increase compensation burden to firm. As a divorce event negatively impacts a CEO's ability and wealth as well as a firm's profits, I posit that shareholders award more equity-based incentives to compensate for CEOs' wealth loss through divorces so that CEOs can concentrate their attention on their work and maintain their firms' optimal performance.

Hypothesis 2: CEOs' equity-based compensation increases after their divorce event.

The rationale of agency theory is that CEOs are apt to be less risk aggressive than shareholders due to their "under-diversified", which means that managers tend to avoid undertaking great risks, while shareholders tend to seek to maximize returns with great risks (Yermack, 1995). Thus, the granting of stocks and options becomes the most direct way to solve this agency problem by aligning the interests of shareholders and managers (Coles et al., 2006.). As the use of equity-based compensation has grown quite rapidly over the past three decades, research on the relationship between equity-based compensation, in the form of stocks and options, and risk management decisions has gained attention.

The prior research remains unclear about whether equity-based compensation provides CEOs with incentives to take risks or limit risky projects. The evidence is varied, and a theoretical method for how the boards adjust CEOs' incentives remains unknown. Smith and Watts (1992) suggested that CEOs will gain from the options' convex payoffs and thus incentivize them to take on risky projects. Smith and Stulz (1985) proved that equity-based compensation is a favorable reward for CEOs to encourage optimal risk-taking behavior. The general knowledge is that the increase in volatility makes options more valuable (Smith and Watts, 1982). However, a burgeoning amount of evidence indicates that it may not be legal for CEOs to sell their stock in short-term transactions; they are also forbidden from trading their stock options because they are typically allowed to exercise them after a specified time period, which is as least two to three years following grants. Gormley, Matsa and Milbourn (2013) argued that although shareholders can react quickly to modify executives' incentives to increase risk, it takes at least three to five years for managers to shift the sensitivity of their wealth to firm risk. Thus, the CEOs' sensitivity of new incentive portfolio to firm-level risk is not easy to change quickly. Lambert et al. (1991) found that options amplify CEOs' exposure to firm risks and induce managers to become more risk averse. This is due to the market imperfections that diverge the valuation of compensation schemes between CEOs and shareholders. Moral hazard and adverse selection make managers have more restraints in diversifying risk to a certain extent as shareholders (Jensen, 1993).

Some researchers have found a negative relationship between CEO incentives and return variance (Samwick and Aggarwal, 1999). Prior studies demonstrate that a left-tail event, like employment loss or bankruptcy, which can induce huge personal losses, affects managers' risk-taking behaviors (Coles, Daniel and Naveen, 2006). Managers limit their financial exposure to firm risks due to the loss of private wealth and reputation. CEOs can also change firm risks by modifying

corporate investments directly (Gormley and Matsa, 2011). Although the board of shareholders increase equity-based compensation to change divorced managers' portfolios, as managers sell unrestricted stocks or exercise options to pay substantial amounts of money following the divorce settlement to their spouses, and the new incentives cannot be exercised in the short term, divorced CEOs' exposure to firm risk is limited, and they are more risk averse and reduce their risk tolerance.

Hypothesis 3: Divorced CEOs will be more risk averse and firms will show lower stock return volatility in the year following divorce.

3. Data Source and Description

3.1. Data source

The information on CEOs' divorces is hand-collected from myriad datasets and websites. I employ the name list with 3444 CEOs from Execucomp (1960–2014) and type keywords like "divorce", "ex-wife" and "remarried" to search for the related divorce news on the Factiva database. I also use the Forbes 400 richest Americans lists, which contains the marital status for the top wealthiest men/women in America during 1997–2013. I collect the richest divorce cases on the Forbes 400 lists and double check to ensure they are CEOs and the divorces happened during their tenures. The third method of data collection I use is SEC filings. For some CEOs who are divorced from their wives, they must file form 4 on Edgar to showcase the transaction of stocks and options. The files provide the names of the executives and the firms. However, Edgar provides data dating back only about 5 years prior to 2016; the filing dates are the dates that the transactions happened, but not the exact divorce dates. Nevertheless, this database still underpins the sources for cross-checked divorce events.

The main concern is that the precise divorce dates are not easy to find. One reason is that it is illegal to publicize divorce information in some American states and counties. For other cases, that lack available information is due to technological limitations—there are no electronic records for divorce cases dating many years back. Moreover, some celebrities use assumed names in court records, which becomes another problem that hinders the collection process.

To obtain accurate information on the divorce dates, I search the Westlaw US database, LexisNexis database and several public websites, like Vitalchek.com, which provide divorce filing information with exact file dates or court judgment dates. In addition to records databases, some state governments also supply online sources for the public to check court documents. Texas'

official website offers downloadable files for all counties of the state, which contain related information on the divorced parties, such as the parties' names and ages, the date of the court filing, the history of the marriage and the related judicial decision.

For CEOs who do not have public court files for their divorces, I match their divorce events in accordance with names and other pertaining information. Due to the common name repetition and lack of a unique identifier, I match CEOs' names with their birthday, spouse's name, company occupation and their location and the firm's headquarter location. Then, I use several biographical websites like Ancestry.com, marriage-divorce-records.mooseroots.com to find the divorce dates.

Finally, I gather 131 CEOs with 147 divorce cases (as some have been divorced more than once or during their divorce they acted as a CEO in more than one company). However, there are 64 CEOs (67 cases) who have positions in private firms. I fail to find such private data through Compustat. The exact divorce year for 29 of the cases cannot be found through each database nor online websites. I have to drop them due to missing information. For the other cases, there are 7 firms for which financial data are not available during the divorce period due to being delisted, or a merger and acquisition. I drop firms with missing data for the period starting from the three years before the divorce year(t-3) to three years after the divorce year (t+3). Overall, I collect a sample group of 44 divorced CEOs with available fundamental data. For the financial information on the sample group and stock related data, I collect the data from Compustat and CRSP. For information on CEOs' compensation, I download the panel data from Execucomp and use Datastream as the supplement.

3.2. Data description

Table 1 showcases the distribution of divorce cases by year and the two-digit SIC industry. Panel A reports the year distribution. I collect divorce cases from 1980 to 2013. I exclude cases that happened in 2014 because of the lack information for year 2016. In Panel A, the summary displays the fact that the divorce rate increases from 2009 to 2012, during which nearly 50% of the total number of divorces happened. Panel B shows the industry distribution for all 44 divorced firms. I use the two-digit SIC industry rather than Fama-French 48 industry, as the latter one cannot obtain a matched sample using the propensity score matching method. From Panel B, we can see that divorces that happened in the oil & gas extraction, transportation equipment, communications,

holding & other investment offices and business services industries represented half of the total cases.

Panel C showcases the summary statistics for both divorced firms and non-divorced firms. The observations return on assets (ROA) and return on equity (ROE), log assets, leverage ratio and market capitalization (MC) are 604, while there are 596 observations for the market-to-book ratio (MTB) due to missing data. I winsorize all non-dummy variables at the 1st and 99th percentiles.

Table 1 Summary of divorce cases

This table shows the number of CEO divorces from period 1980-2013. Divorced firms are listed by two-digits SIC industry.

Panel A The number of divorce cases by year

Year	Number of divorce cases
1980	1
1983	1
1987	3
1991	1
1994	2
1995	1
1996	1
1997	1
1999	2
2001	2
2002	2
2003	3
2006	1
2007	1
2008	1
2009	5
2010	6
2011	3
2012	6
2013	1
Sum	44

Panel B The number of divorce cases by industry

2-Digit SIC Codes	Description	Number of cases
01	Agricultural Production - Crops	1
13	Oil & Gas Extraction	4
20	Food & Kindred Products	1
28	Chemical & Allied Products	2
35	Industrial Machinery & Equipment	1
36	Electronic & Other Electric Equipment	1
37	Transportation Equipment	4
38	Instruments & Related Products	3
39	Miscellaneous Manufacturing Industries	1
45	Transportation by Air	1
48	Communications	4
49	Electric, Gas, & Sanitary Services	1
57	Furniture & Homefurnishings Stores	1
58	Eating & Drinking Places	2
60	Depository Institutions	1
61	Nondepository Institutions	3
63	Insurance Carriers	1
67	Holding & Other Investment Offices	4
73	Business Services	5
79	Amusement & Recreation Services	1
99	Non-Classifiable Establishments	2
Total		44

Panel C Summary of Firm Characteristic

Variable	Obs	Mean	Std. Dev.	Min	Max
Log assets	604	3.58	1.18	-0.70	5.88
ROA	604	-0.01	0.29	-4.61	0.34
ROE	604	0.01	0.72	-5.72	4.95
Leverage ratio	604	0.44	0.38	0	4.77
MC	604	16401.18	48449.61	0	476115.5
MTB	596	2.19	3.83	-14.97	28.67

4. Methodology and Results

4.1 CEO divorce and firm performance

To gauge the long-term value effects for public firms after the announcement of CEOs' divorces, I employ a DID estimation based on the comparison companies identified using the PSM method. The PSM method estimates the impact of the treatment by providing a propensity score based on a firm's observed characteristics. This statistical matching method attempts to taper off the selection bias by equating treatment and control groups based on observed covariates. DID estimations test the effects of a treatment on the outcome (dependent variable) by doing the comparison between treatment and control groups, which reduce the selection bias and extraneous factors' effects. In this study, I use the one-to-one nearest-neighbor matching method, similar to Hellman et al. (2008), and univariate and multivariate DID estimation. Divorce is viewed as the treatment, and the divorce year is the event year shown as t_0. I match firms from the whole sample pool of the Compustat database based on the two-digit SIC code, year, firm size (I use both log total assets and MC), firm growth opportunity (which is MTB) and leverage ratio, ROA and ROE. I employ the year t_0-3 as the matching year because there are an average of two or three years for the divorce cases from filing the divorce document to the final court judgment. Because usually the couple has divergences and contradictions on the division of property and it takes time to make judgements by the court. I use year t_0-2 to try to do the multivariate DID estimation, but the results are not significant and thus not reported here. To determine the quality of the matching results, I employ univariate tests and probit regressions on the unbalanced whole sample pool (labeled as "Prematch") and PSM-matched pairs that combined divorced and non-divorced firms obtained from PSM (labeled as "Postmatch). The balance tests' results shown in Table 2 suggest that all the coefficients of independent variables in the post-match estimation are insignificant, which means we cannot reject the null hypotheses that there is no difference between the mean of the treatment group and that of the matched group in firm characteristics. The univariate comparisons highlight that the divorced firms and non-divorced firms have similar firm characteristics in year t_0-3 and the matching results are appropriate. Panel B of Table 2 is the probit regression in which the dependent variable equals one if the firm has a divorce case and zero otherwise. The results for multivariate test of post match are insignificant which means the impacts of all variables on the treatment variable are removed successfully. The treatment group and matching group are matched well.

Table 2: Balancing tests for Propensity Score Matching

This table showcases the diagnostics of Difference-in-Difference tests on the effects of divorce on firm's performance. We use one-to-one nearest neighbor method for propensity score matching with firm-level characteristics matching variables. Panel A presents the balance tests for the treatment firms and control group before and after matching. The "Prematch" column reports the estimates of whole sample data prior to matching. The "Postmatch" column contains the information of treatment and control groups after matching, which treatment groups are firms with divorced cases and control groups are the non-divorced firms matched form propensity score matching. Panel B shows the parameter estimates of multivariate probit models using in propensity score matching. The standard errors in parentheses are reported at 1%(***), 5% (**) and 10% (*) levels, respectively.

Panel A: Univariate tests

	Prematch			Postmatch		
	Divorced	Non-divorced	Diff	Divorced	Non-divorced	Diff
	Mean	Mean		Mean	Mean	
ROA	0.00	-1.11	-0.11	-0.03	0.01	0.03
ROE	0.04	0.01	-0.03	-0.06	0.01	-0.07
Log assets	3.63	2.10	-1.53***	3.57	3.37	-0.20
Leverage ratio	0.47	0.41	0.06	0.39	0.51	0.12
MC	19725.56	1504.58	-18220.99***	21728.98	7797.67	-13931.31
MTB	2.87	1.90	-0.97	2.13	1.73	-0.40
N		384,480			88	

Panel B: Multivariate tests

	Dependent Variable: Divorce					
	Prematch			Postmatch		
	Coeff	S.E	P-Value	Coeff	S.E	P-Value
ROA	-0.57	0.09	0.53	-1.03	0.92	0.26
ROE	-0.02	0.02	0.27	0.02	0.23	0.95
Log assets	0.33***	0.04	0.00	0.04	0.15	0.80
Leverage ratio	0.10	0.09	0.28	-0.34	0.30	0.25
MC	9.77e-07	6.16e-07	0.11	4.46e-06	3.85e-06	0.25
MTB	0.15*	0.01	0.07	0.01	0.05	0.82
Constant	-4.77***	0.21	0.00	0.14	0.70	0.84
Industry FE	Yes			Yes		
Year FE	Yes			Yes		
N	384,480			88		

To complement the multivariate DID estimation based on the firms' performance, I conduct two panel regressions to examine the pre-divorce and post-divorce periods as follows:

$$ROA_{it} = \beta_0 + \beta_1 * DivorceFirm_i + \beta_2 * DivorceFirm_i \times PreDivorce_{it} + b * X_{it} + \mathcal{E}_{it}$$

$$ROA_{it} = \beta_0 + \beta_1 * DivorceFirm_i + \beta_2 * DivorceFirm_i \times PostDivorce_{it} + b * X_{it} + \mathcal{E}_{it}$$

Where ROA_{it} represents the return on assets for each firm from the divorce group and matched group at time t. $DivorceFirm_i$ is a dummy variable that equals one if the firm has a divorce case and zero if not. $PreDivorce_{it}$ is a dummy variable equal to one for years t-3, t-2, t-1 and zero otherwise. $PostDivorce_{it}$ is a dummy variable equal to one for years t+1, t+2, t+3 and zero if not. X_{it} represents a vector of control variables based on the firm level, such as firm size (log assets and market capitalization), MTB, leverage ratio, industry and year. I use six-year data around the divorce year, three years before and three years after, and seven years in total for each firm. The year fixed effect and the industry fixed effect are under consideration to exclude the unobservable fact that could be correlated to the divorce event and be turbulent to the results. In accordance with the previous research and rationale, I posit that the divorced firms will show worse performance than matched firms before the divorce year and the DID coefficients β_2 will be positive after a divorce, as divorced CEOs have totally released from the divorce and can re-devote every effort to work.

Table 3 illuminates the aforementioned hypothesis. Panel A sheds light on the divorce impact on firms' performance for years before divorce. The coefficient of the interaction term $DivorceFirm_i \times PreDivorce_{it}$ is negative and statistically significant, which is congruent with our deduction that divorced CEOs are thrown into trouble during the period starting from when they file divorce documents to when they receive the final court judgment, and such private life prevents them from being fully immersed in their job. The dummy variable $DivorceFirm_i$ is highly significant at the 5% level, which means that firms' performance is impacted by divorce events. Panel B of Table 3 suggests that the coefficient of interaction term $DivorceFirm_i \times PostDivorce_{it}$ is positive and statistically significant, consistent with our hypothesis that after divorce cases end, the CEOs can fully focus on their work and they are apt to perform better to make up for the loss from the divorce event. In both regressions, the log assets, market-to-book ratio and leverage ratio also have a strong influence on ROA. The correlation coefficients are statistically significant at the 99% level.

Table 3 CEO Divorce and Firm Performance

Table 3 illuminates two panel regressions to examine impacts of divorce event during pre divorce period and post divorce period. Where ROA represents the return on assets for each firm from divorce group and matched group at time t. *Divorce* is a dummy variable which equals to one if the firm has divorce case and zero if not. *PreDivorce* is a dummy variable equals to one for years t-3, t-2, t-1 and zero otherwise. *PostDivorce* is a dummy variable equals to one for years t+1, t+2, t+3 and zero otherwise. Control variables are based on firm level, such as firm size (log assets and MC), MTB, leverage ratio, industry and year. We use six-years data around the divorce year which three years before and three years afterward and seven years in total for each firm. Year fixed effect and industry fixed effect are under consideration to exclude the unobservable fact that could be correlated to the divorce event and turbulent to the results. Standard errors are in parentheses, which *, **, and *** indicate statistical significance at the .10, .05, and .01 levels, respectively.

Panel A- CEO Divorce and Firm Performance before Divorce Year

Variables	ROA	ROA	ROA	ROA	ROA	ROA
Divorce	0.05*	0.07**	0.04	0.04	0.06**	0.06**
	(1.85)	(2.35)	(1.29)	(1.59)	(1.98)	(2.49)
Divorce*PreDivorce		-0.05	-0.04	-0.04	-0.05	-0.06**
		(-1.45)	(-1.13)	(-1.22)	(-1.41)	(-1.98)
Log assets			0.10***	0.11***	0.10***	0.04***
			(9.32)	(9.67)	(8.78)	(9.71)
MC				-7.2e-07***	-6.4e-07**	-2.95e-07
				(-2.70)	(-2.35)	(-1.18)
MTB					-0.01**	-0.01***
					(-2.19)	(-4.91)
Leverage ratio						-0.34***
						(-10.73)
Constant	-0.03**	-0.03**	-0.36***	-0.40***	-0.37***	0.00
	(-1.98)	(-1.98)	(-9.37)	(-9.79)	(-8.36)	(0.02)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	604	604	604	604	596	596
R-squared	0.03	0.04	0.17	0.18	0.19	0.33

Panel B- CEO Divorce and Firm Performance after Divorce Year

Variables	ROA	ROA	ROA	ROA	ROA	ROA
Divorce	0.05*	0.02	0.00	0.01	0.02	0.01
	(1.85)	(0.83)	(0.13)	(0.35)	(0.56)	(0.49)
Divorce*Postdivorce		0.05	0.04	0.04	0.04	0.06*
		(1.32)	(1.00)	(1.05)	(1.22)	(1.71)
Log assets			0.10***	0.11***	0.10***	0.04***
			(9.33)	(9.67)	(8.78)	(3.69)
MTB				-7.16e-07***	-6.35e-7**	-2.90e-7
				(-2.68)	(-2.33)	(-1.16)
MC					-0.01**	-0.01***
					(-2.17)	(-4.88)
Leverage ratio						-0.34***
						(-10.70)
Constant	-0.03**	-0.03**	-0.36***	-0.40***	-0.37***	-0.00
	(-1.98)	(-1.98)	(-9.37)	(-9.79)	(-8.36)	(-0.00)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	604	604	604	604	596	596
R-squared	0.03	0.04	0.17	0.18	0.19	0.33

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Overall, the results of both univariate and multivariate estimations underpin that divorced firms have worse performance than their counterparts before divorce events end and such events motivate CEOs to re-devote themselves to their job after their divorces have been settled.

4.2 CEO divorce and compensation

To test the relationship between CEOs' divorces and their compensation changes, I employ similar steps to the univariate and multivariate DID estimation for CEOs' salary, stock grants and option grants based on the Black-Scholes value. Because Execucomp only contains the compensation data from 1992 and some of the firms' information are missing, I only obtain information on 22 divorced CEOs' compensation. I use nearest-neighbor propensity score matching to match divorced CEOs and non-divorced CEOs based on their compensation packages, containing their salary, bonuses, stock grants and option grants, and a list of firm-level characteristics, such as the two-digit SIC industry, year, log assets, ROA and leverage ratio. The matching year is one year before the divorce year to ensure the treatment group and the control

group are at the same level before the divorce court judgment happens. Thus, I can verify whether this huge private life change has an influence on CEOs' compensation. Because I use the court judgment date as the divorce date, not the announcement dates or filing divorce documents dates, which happened earlier, it is not surprising that wealth shock may affect compensation during the divorce year. However, as the judgment files proclaim the final disposition of property, I expect that compensation changes should be significant one year after the divorce year. According to Boschen and Smith (1995), there are average 5 years following changes that encompass the important performance event on CEO's compensation. Thus, I also test the incentive variations two years after the divorce year.

As the previous paper researched (Finkelstein and Boyd, 1998), the factors influencing compensation can be classified into four parts: the CEO's personal characteristics, firm size factors, firm performance and discretion. I run the OLS regressions on cash compensation and equity compensation separately.

$$\begin{aligned}\text{Salary}_{it} = {} & \beta_0 + \beta_1 * \text{Divorce}_i + \beta_2 * 1\text{ybefore}_i + \beta_3 * \text{Divorceyear}_i + \beta_4 * 1\text{yafter}_i + \beta_5 \\ & * 2\text{yafter}_i + \beta_6 * \text{Age}_{it} + \beta_7 * \text{Tenure}_{it} + \beta_8 * \text{Laglogassets}_{it} + \beta_9 * \text{LagROA}_{it} \\ & + \beta_{10} * \text{LagROE}_{it} + \beta_{11} * \text{LagMTB}_{it} + \beta_{12} * \text{Lagleverageratio}_{it} + \varepsilon_{it}\end{aligned}$$

$$\begin{aligned}\text{Bonus}_{it} = {} & \beta_0 + \beta_1 * \text{Divorce}_i + \beta_2 * 1\text{ybefore}_i + \beta_3 * \text{Divorceyear}_i + \beta_4 * 1\text{yafter}_i + \beta_5 \\ & * 2\text{yafter}_i + \beta_6 * \text{Age}_{it} + \beta_7 * \text{Tenure}_{it} + \beta_8 * \text{Laglogassets}_{it} + \beta_9 * \text{LagROA}_{it} \\ & + \beta_{10} * \text{LagROE}_{it} + \beta_{11} * \text{LagMTB}_{it} + \beta_{12} * \text{Lagleverageratio}_{it} + \varepsilon_{it}\end{aligned}$$

$$\begin{aligned}\text{Stock}_{it} = {} & \beta_0 + \beta_1 * \text{Divorce}_i + \beta_2 * 1\text{ybefore}_i + \beta_3 * \text{Divorceyear}_i + \beta_4 * 1\text{yafter}_i + \beta_5 \\ & * 2\text{yafter}_i + \beta_6 * \text{Age}_{it} + \beta_7 * \text{Tenure}_{it} + \beta_8 * \text{Laglogassets}_{it} + \beta_9 * \text{LagROA}_{it} \\ & + \beta_{10} * \text{LagROE}_{it} + \beta_{11} * \text{LagMTB}_{it} + \beta_{12} * \text{Lagleverageratio}_{it} + \varepsilon_{it}\end{aligned}$$

$$\begin{aligned}\text{Option}_{it} = {} & \beta_0 + \beta_1 * \text{Divorce}_i + \beta_2 * 1\text{ybefore}_i + \beta_3 * \text{Divorceyear}_i + \beta_4 * 1\text{yafter}_i + \beta_5 \\ & * 2\text{yafter}_i + \beta_6 * \text{Age}_{it} + \beta_7 * \text{Tenure}_{it} + \beta_8 * \text{Laglogassets}_{it} + \beta_9 * \text{LagROA}_{it} \\ & + \beta_{10} * \text{LagROE}_{it} + \beta_{11} * \text{LagMTB}_{it} + \beta_{12} * \text{Lagleverageratio}_{it} + \varepsilon_{it}\end{aligned}$$

The four dependent variables are salary, bonus, stock grants and option grants. Stock grants are the annual restricted stock grants paid to CEOs, and option grants are the Black-Scholes values of options that managers gain. The compensation data are reported in thousands. All the compensation information can be obtained directly from Execucomp. The firm-level variables are

one-year lag variables to reduce potential endogeneity (Brick, Palmon and Wald, 2005). Generally, shareholders determine CEOs' incentives based on the previous year's firm characteristics and performance (Neyland, 2012). Those control variables are taken from Compustat. I also included CEOs' age and tenure in the regression based on the usual compensation research (Yermack, 1994). Table 4 illustrates the compensation summary of divorced CEOs and non-divorced CEOs and the differences between the divorced and non-divorced groups.

Panel A reports the summary of compensation variables and control variables. The mean salary is $1041,362 and the mean bonus is $959,271. Stock grants and option grants have a similar mean, around $3300,000. For personal characteristics, CEOs in our whole sample are around 55 years old, and the average tenure is 8 years. Panel B showcases the differences in the mean and median between the sample and matched groups. Because the sample size is small, I use both t- and Wilcoxon signed-rank tests. The Wilcoxon signed-rank test is an alternative to a paired t-test when the assumptions of the t-test are not met. This nonparametric method is more powerful than a t-test for a small sample size (Klotz, 1963). For the pre-divorce year, we can see that all the coefficients of variables are statistically insignificant under both t- and signed rank z-tests, which means that there are no differences between the treatment group and the matched group. This proves that our matching results go well for all the divorce cases. In terms of one year post-divorce, all the compensation variables for the sample group are larger than the matched group. The mean of stock grants for divorced firms is $6885,610 higher than non-divorced firms. The option grants value for divorced firms is $1729,780 higher than the matched group. In particular, for the salary and stock grants and other compensation, the coefficients of these three variables are statistically significant under both the t- and z-tests. The option grant value is not significant at the 95% level. Divorced CEOs' owner shares of stock reduce post-divorce. The initial comparisons are consistent with our hypothesis that boards increase incentives for divorced CEOs and the stock grants are much more preferred as the incentive method. For the ownership variables and firm-level control variables, there are no obvious differences between the treatment and matched groups under the univariate tests.

Table 5 reports the multivariate regression for examining the impact of CEOs' divorces on their compensation. The independent variable divorce is the dummy variable that equals one if the firm has divorce cases and zero if not. The following four variables are also binary, which is one when the year is one year before the divorce, during the divorce year and one or two years post-

divorce. I also include the CEOs' age and tenure into the regression. The results indicate that the divorce event has a prominent impact on CEOs' salary and bonus. The coefficients of divorce in both salary regression and bonus regression are quite significant. There is no abnormal compensation before the divorce year and during the divorce year. The stock grants are significantly higher one and two years post-divorce, supporting our hypothesis that the boards of shareholders take equity-based compensation as a valuable method to incentivize divorced CEOs. CEOs' age also has significant negative relationship with equity-based compensation and a positive relationship with bonus. In terms of tenure, CEOs who work longer have a lower percentage of cash-based compensation and a higher amount of stock grants and option grants. The larger the firm, the larger the compensation for both cash- and equity-based compensation.

Table 4 CEO divorce and compensation

This table showcases the summary of characteristics for firm and CEO in panel A and difference of mean and median between divorced group and matched group in panel B. Salary and bonus are the cash compensation paid to CEO annually. Stock grants is the annual restricted stock grants paid to CEOs and option grants is the Black-Scholes values of options that managers gain. The compensation data are reported in thousands. All the compensation can be obtained directly from Execucomp. The firm level variables are one-year lag variables. Those control variables are taken form Compustat.

Panel A Summary of Firm and CEO Characteristics

Variable	Obs	Mean	Std. Dev.	Min	Max
Salary	339	1041.36	809.86	0	5806.65
Bonus	339	959.27	2367.40	0	16500
Stock grants	339	3341.86	8990.53	0	94555.28
Option grants	339	3259.94	11232.66	0	90693.40
Age	339	55.38	10.14	35	87
Tenure	339	8.66	8.11	1	48
Lag log assets	338	3.78	0.76	1.71	5.16
Lag ROA	338	0.04	0.08	-0.67	0.34
Lag ROE	338	0.12	0.56	-5.72	4.95
Lag MTB	338	2.76	7.09	-106.52	20.22
Lag leverage ratio	338	0.41	0.22	0	1.09

Panel B Differences between two groups

Variable	One Year Before Divorce				One Year After Divorce			
	Sample CEO	Matched CEO	T-stat	Signed-Rank Z	Sample CEO	Matched CEO	T-stat	Signed-Rank Z
Compensation variable								
Salary	808.53	935.03	-1.11	-0.94	1027.52	808.53	1.94	2.46
Bonus	930.36	737.84	0.74	0.60	1717.84	944.89	1.04	0.82
Stock grants value	1446.27	2256.50	-0.97	-0.41	7852.94	976.33	2.05	3.93
Option grants value	5865.39	2027.96	0.71	0.28	4929.09	3199.31	1.29	1.52
Other compensation	252.59	251.93	0.01	0.09	915.29	252.59	1.37	2.71
Ownership variable								
Shares owned	1162.67	1673.30	-1.01	-0.35	993.75	1585.30	-1.01	-0.88
Unexercisable option number	2190.47	569.17	1.29	1.25	1832.15	1746.42	0.36	0.59
Unexercisable option value	5924.86	1915.71	0.75	0.47	3177.77	2190.47	1.23	1.53
Exercisable option number	787.71	301.69	0.98	0.34	693.23	787.71	-2.08	-2.42
Exercisable option value	1171.15	4119.65	-1.25	-0.31	2571.05	1243.15	0.64	0.03
Restricted stock number	110.88	110.36	0.01	0.46	119.92	110.88	0.33	0.49
Restricted stock value	4381.24	3556.85	0.28	0.74	5577.43	4381.24	1.29	1.19
Control variable								
Lag log assets	3.51	3.65	-1.14	-1.41	3.58	3.56	0.16	0.99
Lag MTB	1.98	2.98	-1.98	-1.26	3.25	2.79	0.57	0.05
Lag ROA	0.01	0.02	-0.37	-1.13	0.04	0.03	0.59	0.05
Lag ROE	0.03	0.12	-0.88	-1.75	0.11	0.09	0.20	0.73
Lag leverage ratio	0.42	0.41	0.25	0.15	0.38	0.39	-0.36	-0.02
N	44				44			

Table 5 Multivariate Regression for CEO Compensation

This table reports the results of OLS regression of CEO compensation. The dependent variables are CEO's salary, bonus, stock awards and option awards separately. For the main independent variables, the divorce is the dummy variables which equals to one if the firm has divorce case or zero if not. The following four variables are also dummy which equal to one in the one year before divorce year, the year of divorce, one and two-year after divorce case. Salary and Bonus which get from Execucomp are the cash compensation paid to CEO.

	Salary	Bonus	Stock grants	Option grants
Divorce	195.2**	957.5***	1076.30	550.20
	(2.35)	(3.80)	(0.95)	(0.41)
1y before	-124.5	-234.1	-642.6	921.2
	(-1.14)	(-0.71)	(-0.43)	(0.53)
Divorce year	-70.82	-365.5	1760.0	706.9
	(-0.65)	(-1.10)	(1.18)	(0.40)
1y after	30.12	-92.11	3620.9 **	737.2
	(0.28)	(-0.28)	(2.44)	(0.42)
2y after	105.8	-205.3	3469.7 **	139.3
	(0.93)	(-0.60)	(2.26)	(0.08)
Age	-1.02	93.04 ***	-369.1***	-273.1 ***
	(-0.17)	(5.24)	(-4.64)	(-2.91)
Tenure	-7.55	-83.18 ***	302.8 ***	652.0 ***
	(-1.34)	(-4.87)	(3.95)	(7.22)
Lag log assets	349.8 ***	954.3 ***	2233.7 **	2635.7 **
	(5.16)	(4.65)	(2.43)	(2.43)
Lag ROA	- 737.2	-2988.7**	6652.4	12667.5*
	(-1.57)	(-2.10)	(1.04)	(1.69)
Lag MTB	-1.90	-7.72	-16.88	85.33
	(-0.37)	(-0.50)	(-0.24)	(1.04)
Lag leverage ratio	-617.8***	-2258.4***	-1785.9	-2351.3
	(-2.71)	(-3.27)	(-0.58)	(-0.65)
Constant	61.37	-6271.4***	11788.1**	2440.4
	(0.16)	(-5.55)	(2.33)	(0.41)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	338	338	338	338

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01

In sum, the univariate and multivariate tests on compensation both provide evidence that although cash compensation may be a method to diversify divorced CEOs' incentive packages, equity-based compensation, especially restricted stock grants, is much more popular among the boards as a valuable indemnifying measure for CEOs who have lost wealth.

4.3 CEO divorce and corporate risk

I also aim to gauge the effects of divorce events on firms' equity risk. CEOs who are less diversified because of divorce and wealth loss are apt to be more risk averse and tend to reduce firm-level risk. The matched sample is still the sample group in 4.1. However, the permno of some divorced firms and non-divorced firms cannot be found in CRSP, which means the stock-related information is not available for those firms. After excluding those pairs, I finally get 25 pairs that have complete data for both sample and matched firms. In this part, I include all the years' information with the stock return volatility and idiosyncratic volatility in the regression. I use two methods to measure the firm risk. The idiosyncratic risk is the shock or impact caused at the firm level, which has little correlation with market risk. It is calculated by the standard deviation of residuals counted from the four-factor Carhart model (1997). The data are the monthly returns to avoid microstructure noise. The return data are at least six months for each firm year.

$$R_{it} - R_{ft} = \hat{\alpha}_i + \beta_{1,i}\mathrm{R_{mt}} + \beta_{2,i}\mathrm{SMB_t} + \beta_{3,i}\mathrm{HML_t} + \beta_{4,i}\mathrm{UMD_t} + \mathcal{E}_i$$

Where R_{it} is the stock return for firm i at time t and R_{mt} is the return of the value-weighted market index. R_{ft} is the risk-free rate in the market. In the regression, $\hat{\alpha}_i$ is the estimate of the constant and β is the slope, where $\beta_{1,i}$ is the coefficient for the return of the value-weighted index, $\beta_{2,i}$ and $\beta_{3,i}$ represents the coefficients of Fama-French's "Small-Minus-Big" and "High-Minus-Low" factors, and $\beta_{4,i}$ denotes the Momentum factor form Carhart's four-factor regression model. R_{mt}, R_{ft}, SMB, HML and UMD are obtained from CRSP. For the Carhart four-factor model, I directly downloaded the information from the risk-free rate, value-weighted market index, SMB, HML and UMD from CRSP.

$$\begin{aligned}\mathrm{LogStockVolatility_{it}} = {} & \beta_0 + \beta_1 * \mathrm{Divorce_i} + \beta_2 * \mathrm{1ybefore_i} + \beta_3 * \mathrm{Divorceyear_i} + \\ & \beta_4 * \mathrm{1yafter_i} + \beta_5 * \mathrm{2yafter_i} + \beta_6 * \mathrm{Logassets_{it}} + \\ & \beta_7 * \mathrm{Leverageratio_{it}} + \beta_8 * \mathrm{MTB_{it}} + \beta_9 * \mathrm{Cashratio_{it}} + \\ & \beta_{10} * \mathrm{DividendsDummy_{it}} + \mathcal{E}_{it}\end{aligned}$$

$$\begin{aligned}\mathrm{IdiosyncraticVolatility_{it}} = {} & \beta_0 + \beta_1 * \mathrm{Divorce_i} + \beta_2 * \mathrm{1ybefore_i} + \beta_3 * \mathrm{Divorceyear_i} + \\ & \beta_4 * \mathrm{1yafter_i} + \beta_5 * \mathrm{2yafter_i} + \beta_6 * \mathrm{Logassets_{it}} + \\ & \beta_7 * \mathrm{Leverageratio_{it}} + \beta_8 * \mathrm{MTB_{it}} + \beta_9 * \mathrm{Cashratio_{it}} + \\ & \beta_{10} * \mathrm{DividendsDummy_{it}} + \mathcal{E}_{it}\end{aligned}$$

I also use the traditional stock volatility proxy for the firm risk, which is the standard deviation of the annualized return. For the independent variables, except the divorce dummy, I add the four dummy variables mentioned previously to test whether the years before and after the divorce year affect the stock volatility. Firm size, measured by the log total assets and the MTB, are controlled. I also include the cash ratio (cash divided by total assets) and leverage, which are the two major determinants when it comes to leverage effects (Brown and Kapadia, 2005). The dividends indicator equals one if the firm paid dividends in that year. The industry fixed effects and year fixed effects are controlled.

Table 6 presents the results of multivariate regressions. Divorce events have a significant influence on stock return volatility and idiosyncratic volatility. Firms with CEOs undergoing divorces have lower volatility than their non-divorced counterparts. The firm risks are lower in the divorce year and one and two years post-divorce. In particular, the coefficient two years post-divorce is significant at the 95% level for return volatility and 90% for idiosyncratic volatility. These results are consistent with our hypothesis that the loss of wealth and less diversification of portfolios reduce CEOs' risk tolerance and make them more risk averse. Log assets also have a strong negative relation with two kinds of volatilities and the leverage ratio positively impacts a firm's risk. The cash ratio has a positive significantly effect on the stock returns volatility and idiosyncratic volatility because of the reduction in total assets.

In sum, the results are identical with our third hypothesis that divorce managers are not risk aggressive following a divorce event and their risk preference is conservative due to their less-diversified personal portfolio. This is also consistent with the results indicating lower stock risk and idiosyncratic risk demonstrated by Neyland (2012).

Table 6 Multivariate Regression for Firm Risk

This table reports the results of OLS regression of firm risk. The dependent variables are log stock return volatility and idiosyncratic volatility separately. For the main independent variables, the divorce is the dummy variables which equals to one if the firm has divorce case or zero if not. The following four variables are also dummy which equal to one in the one year before divorce year, the year of divorce, one and two-year after divorce case. Other variables controlled are firm's leverage ratio, MTB, cash ratio which equals to cash divided by total assets. Dividend dummy equals to one if firm pays dividend in the year. Year fixed effects and industry fixed effects are included.

	Log stock return volatility	Idiosyncratic volatility
Divorce	-0.06**	-0.01**
	(-2.02)	(-1.97)
1y before	0.08	0.00
	(1.40)	(0.02)
Divorce year	-0.03	-0.00
	(-0.55)	(-0.16)
1y after	-0.08	-0.02
	(-1.51)	(-1.17)
2y after	-0.14**	-0.02*
	(-2.31)	(-1.73)
Log assets	-0.15***	-0.04***
	(-7.08)	(-7.81)
Leverage ratio	0.31***	0.09***
	(3.76)	(4.83)
MTB	0.00	0.00
	(1.13)	(0.65)
Cash ratio	1.177***	0.113***
	(7.14)	(2.87)
Dividends dummy	-0.09	0.00
	(-0.92)	(0.14)
Constant	0.86***	0.36***
	(6.78)	(11.94)
Year FE	Yes	Yes
Industry FE	Yes	Yes
N	793	793

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5. Limitations

One limitation of this study is the rather small sample size. Due to missing of data and limited information of court files, many collected cases cannot be analyzed in this study. If more information can be obtained, there are some directions for future research. In this study, I only use a dummy variable to measure divorce event homogenously. It will be interesting to use a different measurement to test divorce effects. In accordance with future theoretical analysis, it will be conceivable to divide the divorced CEO in difference groups by considering the number of kids and the number of previous divorce. For CEOs who have more kids, their firm performance may not become better following the divorce. This may be explained by that without the support of their spouse, they need more time to take care of the kids and their private lives. This may take a considerable part of their attention so that they cannot fully focus on their work after the divorce. Besides, in my sample, there are some CEOs have more than once divorce. If the CEOs have gone through divorce before, it is possible that their risk attitudes may not be changed or they will become more risk aggressive after the divorce ends. Furthermore, I only use stock return volatility and idiosyncratic volatility to measure the risk firm. Cash flow volatility could be another way to gauge firm-level risk, which represents the cash flow risk only based on the inside firm management. The volatility of firm's cash flow will present the thoughts of CEOs about their risk attitude. The related the predictions and analysis can also be extended to firm risk management and CEO compensation utility.

6. Summary and Conclusions

It is the common knowledge that CEOs are embedded in both their private and work lives. No one can entirely separate his or her work life from his or her private life. As the top executive officer, a CEO is usually empowered to make prominent decisions in the light of corporate policies and investments. Previous researchers have explored a wide variety of topics, such as CEOs' compensation, age and overconfidence. However, there is little evidence devoted to revisiting the relationship between CEOs' two kinds of lives. Thereby researchers rarely focus on managers' private lives and whether personal factors can influence their firm performance. Therefore, it is meaningful to discuss how much the "costs" of divorce, which can be considered an extremely stressful life transition, impact chief decision makers and their firms' performance.

In this paper, I study three divorce-related topics. First, I aim to test how CEO divorce events affect firms' performance. The results present that divorced firms behave worse than matched firms before the divorce year and the DID coefficient β_2 is positive following the divorce year, as divorced CEOs have completely released from divorce and can re-devote every effort to their work.

Second, I test the compensation changes around the divorce year. As divorce cases result in the loss of CEOs' personal wealth, the shareholders should modify managers' incentive portfolios as soon as possible. The boards increase the incentives for divorced CEOs, and shareholders use equity-based compensation as a valuable method to incentivize divorced CEOs. The stock grants are significantly higher one year and two years post-divorce, which suggest that stock grants are strongly preferred as the incentive method.

Third, I discuss the correlation between a divorce event and a CEO's risk tolerance. Although shareholders increase equity-based compensation to enhance CEOs' exposure to firm risk, our results show that firms with CEOs who have undergone divorces have lower volatility than their non-divorced counterparties. The firm risks are lower in the divorce year and one and two years after the divorce. In particular, the coefficient two years post-divorce is significantly strong at the 95% level for return volatility and 90% for idiosyncratic volatility. This may be explained by the less-diversified divorce managers who sell stocks and exercise options to pay for their spouses are more risk averse.

Overall, this paper demonstrates a general framework for valuing the effect of CEOs' divorces on their firms' performance. Because there is little evidence in the press, this is an attempt to discuss the basic topics related to CEOs' divorces.

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Appendices

Table 1 Variable definitions

Variable's name	Data source	Description
1y after		Dummy variable which equals to one if the year is one year after divorce.
1y before		Dummy variable which equals to one if the year is one year before divorce.
2y after		Dummy variable which equals to one if the year is two-year after divorce.
Age	Execucomp	CEO's age.
Bonus	Execucomp	The value of bonus each year paid to CEO
Cash ratio	Compustat	Cash divided by total assets.
Dividends dummy		Dividends indicator equals one if the firm pay dividends in that year.
Divorce		An indicator which equals to one if the firm has divorce cases.
Divorce year		Dummy variable which equals to one if the firm has divorce case.
Exercisable options number	Execucomp	The number of CEO's unexercised exercisable options.
Exercisable options value	Execucomp	The value of CEO's unexercised exercisable options.
Idiosyncratic volatility	CRSP	The standard deviation of errors from four factor Carhart model.
Leverage ratio	Compustat	Total debt divided by total equity, where total debt equals current liabilities plus long-term debt).
Log assets	Compustat	Log of total assets.
Log stock return volatility	CRSP	The standard deviation of annualized log returns.

Market capitalization	Compustat	Market capitalization is calculated by timing the firm's shares outstanding by market price.
Market to book ratio	Compustat	Market to book ratio is the ratio of firm's market value divided by assets' book value.
Options grants	Excucomp	The Black-Scholes values of options that managers gain.
Other compensation	Excucomp	The value of other compensation paid to CEO
PostDivorce		PostDivorce is a dummy variable equals to one for years t+1, t+2, t+3 and zero otherwise.
PreDivorce		PreDivorce is a dummy variable equals to one for years t-3, t-2, t-1 and zero otherwise.
Restricted stock number	Excucomp	The number of restricted stock.
Restricted stock value	Excucomp	The value of restricted stock.
Return on assets	Compustat	EBIT divided by total assets.
Return on equity	Compustat	EBIT divided by common stock.
Salary	Excucomp	The value of salary paid to CEO.
Share owned	Excucomp	The number of shares owned by CEO
Stock grants	Excucomp	The annual restricted stock grants paid to CEOs.
Tenure	Excucomp	The number of years that CEO is at his post.
Unexercisable option number	Excucomp	The number of CEO's unexercisable options
Unexercisable option value	Excucomp	The value of CEO's unexercisable options

Table 2 List of abbreviations

Abbreviations	
CEO	Chief executive officer
DID	Difference-in-difference estimations
MC	Market capitalization
MTB	Market-to-book ratio
PSM	Propensity score matching
ROA	Return on assets
ROE	Return on equity