

# Cultural Distance in Family and Corporate Risk-taking

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## **Abstract**

We examine whether distance of Hofstede's cultural dimension, that is, the attitude toward uncertainty between CEOs and CEO spouses affects corporate risk-taking. We document that the high uncertainty avoidance of CEO spouses will influence CEOs' personal uncertainty avoidance, and then lead to less corporate risk-taking, reflected in standard deviation of return on assets and Research and Development (R&D) expenditure. Our study contributes to the research on how culture heritage and cultural transmission affect financial outcomes.

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## 1. Introduction

Do the inherited cultural values distance between husband and wife affect each other's decision-making? A growing literature documents how cultural heritage of chief executive officers (CEOs) shapes firm performance and how other family members affect CEOs corporate decisions, especially firm risk (Roussanov and Savor, 2014; Cronqvist and Yu, 2017; Pan, Siegel and Wang, 2017; Nguyen, Hagendorff and Eshraghi, 2017). However, this literature faces challenge when it neglects the cultural transmission between couples. Cultural distance in personalities, lifestyles, and beliefs affect couples personal concept imperceptible through cultural transmission. In this study, we examine whether cultural distance and cultural transmission between CEOs and CEO spouses influences corporate risk-taking.

To identify the cultural heritage of CEOs and CEO spouses, we hand-collect a novel data set to track ancestry information of CEOs in S&P 500 firms from 2000 to 2015 and their corresponding spouses. We obtain CEO names from ExecuComp and CEO spouse names from a set of various data sources. We use Ancestry.com to trace a person's ancestry immigrant information following Nguyen, Hagendorff and Eshraghi (2017). We then use a person's name to infer his or her cultural heritage distribution based on immigrant records if we cannot find exact information of this person's ancestors, following Pan, Siegel and Wang (2017). With the distribution of culture origin, we employ Hofstede's (2001) six country level cultural dimensions to capture culture values. Specifically, we focus on uncertain avoidance index (UAI) which reflects attitudes toward risk and uncertainty for unfamiliar situations in a society. We obtain UAI proxy for both CEOs and CEO spouses in the form of weighted-average UAI using the distribution of countries of origins. The cultural distance is measured by UAI of spouse minus UAI of CEO then scaled by UAI of CEO. Our hypothesis is that the UAI distance between CEO spouses and CEOs should be negatively associated with firm risk. We conjecture

that high uncertainty avoidance of CEO spouses will influence CEOs' personal uncertainty avoidance, and then lead to less corporate risk-taking.

We primarily measure firm risk with the quarterly standard deviation of firm operation return from industry average, i.e.  $\sigma(ROA)$ , following John, Litov, and Yeung (2008) and Leaven and Levine (2009). To distinguish the effect of culture, our models control CEO personal characteristics, firm characteristics, corporate governance, industry fixed effect and time fixed effect. Our baseline results show that UAI distance has negative and statistically significant coefficient firm operation risk. In economic terms, one standard deviation increase in UAI distance is associated with 0.11% decrease in  $\sigma(ROA)$ , which is corresponding to approximately 5% of one standard deviation of the  $\sigma(ROA)$ .

Our second measure is R&D investments, which is a typical measure of risky corporate policies because of its uncertain benefits (Bhagat and Welch, 1995; Barger et al., 2010). We construct R&D investments with R&D expenditure over total assets for each quarter<sup>1</sup>. We find UAI distance also has an economically sizable and statistically significant association with R&D expenditures. One standard deviation increase in UAI distance is associated with 10%, i.e. 8% of one standard deviation, decrease in R&D investments. Our results are robust when we use industry adjusted R&D investments.

We implement additional subsample tests to identify the effect of cultural distance for different CEOs. Our first subsample test is how education level deviate the effect of cultural distance because CEOs with high education level may be more cautious and less impacted by culture. We split our sample by whether CEOs have Master or higher degree, or not. We find UAI distance has stronger effect on corporate risk-taking if CEO has lower education level.

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<sup>1</sup> We treat firm-quarter observations with missing R&D expenditures as having zero expenditure.

Our second subsample test is whether CEO individualism culture, which is another Hofstede's culture dimension indicating the degree of people overvalue themselves in a society. We conjecture that people from high individualism culture may undervalue suggestions from others. We split our sample by whether the CEO individualism culture value is higher than the mean or not. UAI distance shows significant effect in low individualism sample. Cultural transmission between family members require contagion but also low individualism.

We examine changes of CEO and changes of corporate risk-taking with firm fixed effect to identify a casual effect in time-series variation. Besides, we also check the endogenous CEO-firm matching that is firms with high risk seeks a CEO with high uncertainty avoidance. We find we do not have reverse causality concerns. In our robustness check, we employ propensity score matching and Heckman two-stage model to address selection bias concerns, and our results of UAI distance still hold for corporate risk-taking and R&D investments. Our results are not driven by children in family, economic development, and institutional quality.

Our study contributes to the growing literature of impact of CEO on corporate outcomes. Various studies document the manager's physiology, life experiences, family members, or career experience explain heterogeneity of managerial styles among CEOs, which play a key role in a range of policy choices (Bertrand and Schoar, 2003; Custódio and Metzger, 2013; Adams, Keloharju, and Knupfer 2016; Bernile, Bhagwat, and Rau, 2017; Cronqvist and Yu, 2017). Our findings add to this literature, suggesting that cultural heritage across family members, especially the CEO's spouse, also shape CEO's managerial risk-taking styles. Most of CEOs got married before they became CEO and cultural heritage of CEO spouses is not a choice variable for the executive, which means that our results shed less endogeneity concerns.

Second, our study shed new light on the relation between culture and financial outcomes. Emerging literature documents how personal cultural heritage affect priory beliefs,

economic preferences, and political preferences (Guiso, Sapienza and Zingales, 2006). Cultural distance is related to trading volume (Chui, Titman, and Wei, 2010), bank loans (Giannetti and Yafeh, 2012), cross-border mergers (Ahern, Daminelli, and Fracassi, 2015), analyst forecast errors (Du, Yu and Yu, 2017), and corporate corruption (Liu, 2016). The findings of Nguyen, Hagendorff and Eshraghi (2017) imply that cultural heritage effects go beyond personal decisions to entire organization policies. Corporate leaders' personal cultural heritage cultivate corporate cultural heritage toward risk (Pan, Siegel and Wang, 2017). We extend these findings by indicating that not only CEO personal cultural heritage is related to corporate risk, cultural transmission between family members also shapes CEO preferences toward firm risk. Moreover, our findings include CEOs who are high generation immigrants, which contributes to the literature of persistence of individual cultural preferences and cultural transmission effect (e.g. Bisin and Verdier, 2000; Chen, 2013; Robalino and Robson, 2013).

Last but not least, we provide a novel explanation of how marriage affects risk-taking behavior of CEOs. Previous literature documents the marital statues directly impact preferences toward risk in married males, reflected in financial outcomes (e.g. Bertaut, 1998; Agnew, Balduzzi and Sunden, 2003; Bertocchi, Brunetti and Torricelli, 2011; Roussanov and Savor, 2014). To distinguish with different channels through which marriage can alter risk-tolerance of high-wealth individuals, we focus on the cultural transmission between married couples. Consistent with the sociology culture arguments that culture transmission affects personal traits, our findings suggest that personal risk avoidance increased when his or her spouse has lower risk-tolerance in cultural heritage.

The rest of paper is organized as follows. Section 2 discusses literature review in more detail and develop our hypothesis, section 3 describes the data and methodology, section 4 presents the results, section 5 shows robustness check, and section 6 concludes.

## 2. Literature review and hypothesis development

*“Culture is that complex whole which includes knowledge, beliefs, arts, morals, law, customs, and any other capabilities and habits acquired by [a human] as a member of society.”*

--Sir Edward B. Tylor (1871)

Culture is human nature and all people have a capacity to classify experiences, encode classifications symbolically, and teach such abstractions to others. Cultural variation among humans includes contemporary human cultures, their beliefs, myths, values, practices, technologies, economies and other domains of social and cognitive organization. Culture is the ways of thinking and describing, the ways of acting, and the material objects that together shape a people's way of life. Cultural proximity contributes to the formation of social ties and network (Pachucki and Breiger, 2010).

The improvement of techniques and increasing available data makes it possible to identify the differences in people's beliefs and to relate them to culture heritage, which introduce testable cultural explanations into economics (Guiso, Sapienza and Zingales, 2006). Some dimensions of culture, e.g. ethnic and religious, are inherited by an individual from previous generations affecting people's beliefs, values or preferences over several subsequent generations (Guiso, Sapienza and Zingales, 2006; Fernandez and Fogli, 2006, 2009; Giavazzi, Petkov and Schiantarelli, 2014). “Because of the difficulty of changing culture and its low depreciation rate, culture is largely a ‘given’ to individuals throughout their lifetimes.” (Becker, 1996). This identifies a causal effect from culture to economic outcomes and no need to worry about the reverse causality. Even though some religious practices respond to economic conditions, obvious modification occur over centuries or even millennia (Botticini and Eckstein, 2005).

## *2.1 Culture and economic outcomes*

The emerging literature has documented the significant impact of culture heritage on various economic exchanges and financial outcomes. In the survey of Guiso, Sapienza and Zingales (2006), culture heritage affect economic outcomes through three channels—prior beliefs, economic preferences, and political preferences. Guiso, Sapienza and Zingales (2003) using the World Values Survey look at the effect of religion on trust across individuals, finding that religious increases the trust of others especially for Catholic and Protestant. They also use General Social Survey to examine the effect of the ethnic origin on beliefs of people about trust in US, showing a significant different trusts across ethnic origins. Then Guiso, Sapienza and Zingales (2004 and 2009) find that bilateral trust between two countries matters for all trade in goods, financial assets, and direct foreign investment, i.e. trust more, engage more. Culture potentially affects economically relevant preferences, e.g. living arrangements (Giuliano, 2004), work and fertility choices (Fernández, Fogli and Olivetti, 2004), and shirking one the job (Ichino and Maggi, 2000), thriftiness and national saving rate (Guiso, Sapienza and Zingales, 2003, 2006). Finally, Guiso, Sapienza and Zingales (2006) find the underlying cultural determinants of preferences for redistribution seem to affect the amount of redistribution that occurs.

## *2.2 Cultural and Financial outcomes*

Besides economic outcomes, recent research shows that cultural also impact financial outcomes. Chui, Titman, and Wei (2010) find cross-country cultural differences measured by individualism index (Hofstede, 2001) is related to overconfidence and self-attribution bias, which is positively associated with trading volume and momentum profits. Giannetti and Yafeh (2012) investigate cultural differences between professional decision makers in international

syndicated bank loans, i.e. more cultural distant lead banks offer smaller loans, higher interest rate, and requirement of third-party guarantees. Ahern, Daminelli, and Fracassi (2015) find strong evidence that cross-country cultural distance in trust and individualism leads to less cross-border mergers and lower combined announcement returns. Du, Yu and Yu (2017) examine how cultural proximity affects information asymmetry in financial markets, documenting that Chinese analysts issue more accurate forecasts on Chinese firms than non-Chinese analysts.

Bisin and Verdier (2000) document the intergenerational transmission of ethnic and religious traits through marriage and socialization which influences preferences of next generation. Culture plays key role in the formation and persistence of an individual's characteristics, economic preferences, and risk attitude (Chen, 2013; Robalino and Robson, 2013; Becker, Dohmen, Enke, and Falk, 2015). The cultural heritage of CEO shapes corporate culture. Nguyen, Hagendorff and Eshraghi (2017) exploit the cultural heritage of US bank CEOs who are second- or third-generation immigrants are associated with higher profitability during competition intensifies but lower performance during stable environment because these CEOs emphasize safe, cost-efficiency and cautions acquisitions. The culture of a CEO's ancestors influence CEO's decision-making in the present time. Liu (2016) use cultural background of company insiders to measure the corporate corruption culture toward opportunistic behavior, e.g. earnings management, accounting fraud, option backdating. Most corporate investment decisions, e.g. R&D and M&A, are made under uncertainty (Knight, 1921; Dixit and Pindyck, 1994; Garlappi, Giammarino, and Lazrak, 2017). Pan, Siegel and Wang (2017) combine CEO cultural heritage and corporate risk culture documenting that the preferences toward risk and uncertainty by a firm's leaders' cultural heritage, which is measured by country-level UAL (Hofstede, 2001) has persistent effect on corporate risk culture, investment policies, and selection of leaders.



### *2.3 Hypothesis development*

Scholars have argued that marriage relationships can have a profound influence on the lives of individuals and their economic incentives. Married couples share a common future and offspring, and thus their interests tend to be well aligned (Luo and Klohn, 2005). Marital status may have a direct biological effect on preferences by leading to lower testosterone levels in married males correlated with risk taking (Burnham, 2007; Guiso and Rustichini, 2011). Married individuals invest more aggressively in personal portfolios (Bertaut, 1998), hold larger risky stock allocations (Bertocchi, Brunetti and Torricelli, 2011) and trade more frequently relative to singles (Agnew, Balduzzi and Sunden, 2003). Grable (2000) finds that married respondents are more risk tolerant than single respondents. Roussanov and Savor (2014) find that single CEO prefer more aggressive corporate policies in capital expenditures, R&D, advertising, and acquisitions, whereas Nicolosi and Yore (2015) find that these corporate activities and overall firm riskiness both increase significantly with CEO marriages. However, there is a research gap of the channels through which marriage can alter risk tolerance of CEOs.

We argue CEO cultural heritage, CEOs' spouse cultural heritage, and their cultural heritage distance jointly affect CEO risk-taking and corporate outcomes. Cultural sociology researchers believe culture changes with environment, inventions, and contacting with other cultures (Griswold, 2012). In social psychology studies, husband-wife interaction potentially change couples personality, perception, lifestyle and affect their decisions making (Kenkel, 1961). Cultural transmission through cross-cultural marriages have strong effect on personal traits and preferences, especially when families of origin differ greatly in their values and rituals (Falicov, 1995; McFadden, 2001; Remennick, 2009). Therefore, we conjecture that CEO's spouse cultural heritage could potentially affect CEO's personalities and preferences. Higher cultural distance in uncertain avoidance between CEO and CEO spouse is negatively correlated with corporate risk-taking.

### 3. Data and methodology

In this section, we describe the data source of CEO couples and how we identify their cultural heritage. Then, we explain the methodology of empirically examining the effect of CEO couples cultural distance on corporate risk-taking.

#### *3.1 Data source on CEOs and CEO spouses*

This paper studies how cultural heritage distance of CEOs and CEO spouses interactively shapes company strategies. Cultural heritage distance persists between individuals of different origins, even though their families might have been in the U.S. for several generations (Fernandez and Fogli (2006), (2009), Giavazzi et al. (2014)).

Our sample consists of Standard & Poor (S&P) 500 firms, i.e. the largest public firms in the U.S., from 2000 to 2015. We collect S&P 500 constituents from Compustat – Capital IQ and S&P ExecuComp database during the 16-years period. There are 849 firms have been in S&P 500 between 2000 and 2015. We exclude utility (Standard Industrial Classification (SIC) codes 4900-4999) firms and financial (SIC codes 6000-6999) firms, following Cronqvist and Yu (2017), because of regulatory requirements of some firm characteristics in these industries. Then we collect individual CEO characteristics of the remaining 646 firms, especially first and last name, from S&P ExecuComp database. For those firms always persist in S&P 500, we keep all CEOs during the sample period. For those firms left S&P 500, we only keep CEOs when their firms belong to S&P 500. This yield a sample of 1,465 CEOs.

However, there is no database with information related to CEO spouses. So, we manually collect data of CEO spouses' information, especially first and last name, from various public sources. We start by using The Complete *Marquis Who's Who* Biographies online resource through Lexis Nexis, which is the most comprehensive source of personal

biographical information. We also use Notable Names Database, Wikipedia, Google search, interviews or news about CEO couples, YouTube, and Ancestry.com, to obtain CEO couples' names and additional information as much as possible. To be precise, we require their year of marriage, how many children they have, divorce time if they do. If we cannot find exact marriage date of a couple, we will use the age of their oldest child plus one as their marriage year. This yield a sample of 1,128 couples whom we can obtain name of both.

### *3.2 Identification: ancestry information of CEOs and CEO spouses.*

People's surnames are widely used in identifying the ethnicity or country of ancestry. Kumar, Niessen-Ruenzi and Spalt (2015) find that US mutual fund managers with foreign-sounding name experience lower annual fund flows and lower appreciation. Liu (2016) use surnames to identify insiders' country of ancestry based on US Census records from 1850 to 1940. He matched the each unique surname from the Census records to its most frequently associated country of birth or father's country of birth. Nguyen, Hagendorff, and Eshraghi (2017) also use the Census records to check the immigrant generations of US banks' CEO, i.e. whether a CEO's father or grandfather immigrate from other country. Pan, Siegel and Wang (2017) use CEOs' name together with passenger lists of ships arriving in New York City from foreign ports between 1820 and 1957 through Ancestry.com. They assign each surname to the largest origin across 121 countries. Du, Yu and Yu (2017) pick the Chinese analysts out by searching the surnames of analysts.

To obtain data on the ancestry of CEO couples, we use the following steps. Firstly, we check the database in section 2.1, i.e. *Marquis Who's Who*, Notable Names Database, Wikipedia, Google search, interviews or news, YouTube, and Ancestry.com, to search direct immigrant information of the CEO couples and their families, especially those foreign born

CEOs or CEO spouses. There are 176 foreign-born CEOs and 136 foreign-born CEO spouses in our sample. Second step, following Nguyen, Hagendorff and Eshraghi (2017), we use the Census Bureau records accessed via Ancestry.com, which is the largest genealogy database in the world, to trace the exact country level origin of U.S. born CEO couples' ancestors<sup>2</sup>. The latest publicly available Census Bureau records are 1940 census, we can obtain ancestry information for those born before 1940. Census records contain demographic information of household members, e.g. birth years, birth places, parents' birth places. We map out their family tree and locate their country level origin. If CEO couples are born after 1940 and we can find their parents' names, birth place, and other necessary information through data collection, we will search their parents' Census records. Then we map out their parents' ancestry. We identify personal cultural heritage mainly based on father's country of origin since the change of surname reduce the information accuracy of mother's ancestry. If their parents are also born in the U.S., we continue our search of their grandparents or earlier ancestors using earlier census records as far back as possible until we find their foreign born ancestors. We find 94 CEOs and 58 CEO spouses are second immigrant generations, while 98 CEOs and 49 CEO spouses are third immigrant generations. 320 CEOs and 197 CEO spouses are forth or higher immigrant generations.

In third step, we will follow Nguyen, Hagendorff and Eshraghi (2017) approach to infer ancestry information of those CEOs or CEO spouses we cannot find enough information about their parents. We search the families with same surname as the CEO (spouse) and lived in the birth or adjacent county of CEO (spouse) around CEO (spouse) birth year. If all of these families emigrated from same country, we assume ancestors of this CEO or CEO spouse also emigrated from this country. For example, we search the ancestry of a CEO whose surname is

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<sup>2</sup> For women who change their surnames after marriage, we will search their maiden name first and then use their maiden name to trace ancestry.

Jandernoa born in 1950, Detroit, Wayne County, Michigan. We search the families with surname Jandernoa lived in Wayne County and adjacent county around 1950. We find there are two families with surname Jandernoa and both have German origin. So we can reasonably assume this CEO is of German ancestry. After above steps, we can obtain exact ancestry information for 691 CEOs and 444 CEO spouses. 319 couples have exact ancestry information of both. If the families with same surname and lived in the birth or adjacent county of CEO (spouse) come from different countries, we will calculate the frequency distribution across these countries of origin.

In the final step, for the rest persons who we cannot trace their ancestry information using their birthplace, we estimate the likelihood that an individual's ancestors emigrated from using the individual's surname and passenger lists, especially arriving in New York City between 1820 and 1957, following Pan, Siegel, and Wang (2017). The passenger lists are also available in Ancestry.com, which provides passengers' name, age, ethnicity, birth place, etc. Then we search the surname of this individual and use the ethnicity of passengers with this surname to calculate the frequency distribution across countries of origin. For example, among passengers with last name Deromedi, 51% have Italian origin, 33% come from Austrian origin, 11% have German origin and remaining 5% have Croatian origin. For some female CEO spouses who we cannot find their surname or maiden name because of changing surname after marriage, we search their first name in the passenger lists. If this first name is popular in a few countries only, usually less than three, we also calculate the origin distribution based on it. Otherwise we drop it from our sample. We have ancestry distribution of 1,066 couples in our final sample<sup>3</sup>, where 147 couples have exactly same ethnicity origin.

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<sup>3</sup> The ancestry distribution of individuals with exact ancestry information is 100%.

Table 1 shows descriptive statistics of CEOs' and CEO spouses' basic information, immigrant generations, and cultural backgrounds in our sample.

[Insert Table 1 here]

### 3.3 Cultural values: Hofstede six dimensions

The six country level cultural dimensions of Hofstede (1980, 2001, and 2010) has been widely applied across many disciplines. Some papers only focus on one dimension (e.g. Pan, Siegel and Wang (2017) only use UAI) while some papers use aggregate proxy (e.g. Aggarwal, Kearney and Lucey, 2012). In this paper we focus on the uncertainty avoidance index (UAI) which indicates to what extent members in a society's tolerance for ambiguity and uncomfortable situations. Hofstede (1980) constructed this index with surveys of IBM employees in 50 countries. Then this survey has been done several times with non-IBM participants in more countries. We calculate the UAI value for both CEOs and CEOs' spouses<sup>4</sup>. We use CEO spouses' UAI value minus CEO UAI value then scaled by CEO UAI value as the cultural distance between CEO couples, i.e. *UAI\_DISTANCE*. This proxy reflects the cultural distance between CEO couples relative to CEO personal cultural heritage.

### 3.4 Corporate risk-taking

Corporate risk-taking is essential to firm performance and survival. Literature document that corporate risk-taking is influenced by country-level factors (e.g. La Porta et al., 1997; John, Litov, and Yeung, 2008; Acharya, Amihud, and Litov, 2011; Li et al., 2013), firm-

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<sup>4</sup> We group historical origins to their modern larger groups following Pan, Siegel and Wang (2017). For example we group all Arab countries under Arab and African countries under west Africa or east Africa because Hofstede cultural dimensions do not have data of specific countries under these countries group. We associate Jewish with data for Israel when necessary.

level factors (e.g. Jensen and Meckling, 1976; Tosi and Greckhamer, 2004; Bryan et al., 2012), and individual-level factors (e.g. Kreiser et al., 2010; Cain and McKeon 2016).

The primary measure of corporate risk-taking in firms' operations is the volatility of ROA,  $\sigma(ROA)$ , defined as the standard deviation of firm's EBITDA over total assets at the beginning of the quarter from industry average (two-digit SIC code) over 5 years (20 quarters) overlapping leading windows. It is a standard proxy for corporate risk in literature (e.g. John, Litov, and Yeung, 2008; Leaven and Levine, 2009; Faccio, Marchica, and Mura, 2011, 2016; Li et al., 2013). This variable captures risk to investment decisions.

Besides the volatility of asset returns, Research and Development expenditures (*R&D*) are investments under uncertainty because they have a low probability of success and uncertain benefits (Bargeron et al., 2010; Acharya, Amihud, and Litov, 2011; Pan, Siegel, and Wang, 2017). R&D expenditure is the quarterly R&D expense over total assets from Compustat.

To examine how cultural difference between CEO couples affect the corporate risk-taking, we run the following model:

$$\text{Corporate risk}_{it} = \beta_0 + \beta_1 \cdot \text{UAI distance}_{i,t-1} + \text{Controls} + \text{Fixed effects} + \varepsilon_{it} \quad (1)$$

where  $i$  is firm and  $t$  is quarter. The dependent variable is corporate risk-taking which is  $\sigma(ROA)$  or R&D. The main independent variable is the UAI distance between CEO spouse and CEO.

### 3.5 Other controls

We include several factors from three dimensions that have been shown to influence corporate risk-taking following Cain and McKeon (2016) and Pan, Siegel, and Wang (2017), discussed below and variable definitions shown in Appendix A:

CEO characteristics: we control CEO age ( $\ln(1+AGE)$ ), CEO gender (*FEMALE*), CEO education (*EDUCATION*), CEO cultural background (*UAI\_CEO*), how many years of marriage ( $\ln(1+MARRIAGE\_YEAR)$ ), whether the couple has different cultural heritage (*DIFF\_CULTURE*), and CEO tenure ( $\ln(1+TENURE)$ ) from *Marquis Who's Who*, Notable Names Database, Wikipedia, interviews or news about CEO couples through Google search and YouTube, Ancestry.com., and ExecuComp.

Firm characteristics: we control firm size ( $\ln(ASSETS)$ ), market-to-book ratio (*MB*), whether it has loss (*LOSS*), and Tobin's Q (*Q*) from Compustat.

Corporate governance: we control board size (*BOARD\_SIZE*), board ownership (*BOARD\_OWNERSHIP*), and board independence (*BOARD\_INDEPENDENCE*) from Institutional Shareholder Services (ISS).

Table 2 shows descriptive statistics of our variables. Variable descriptive statistics of annual data is reported in Appendix Table A1.

[Insert Table 2 here]

#### **4. Empirical results**

In this section, we report empirical evidence on the relation between CEO couples' cultural distance and risk-taking in the firm that the CEO manages.

##### *4.1 Cultural distance and firm risk-taking*

Table 3 reports our baseline results of UAI distance between CEO and spouse on firm risk-taking. The dependent variable is  $\sigma(ROA) \times 100$ , which presents operating risk of the firm



managed by a specific CEO. Our key explanatory variable is the UAI index distance between CEO and this CEO's spouse. In Column (1) we only control CEO personal characteristics. In Column (2) we control firm characteristics and corporate governance. We put in all control variables in columns (3) to (6). Standard errors are double clustered at firm and quarter level. We control industry fixed effects (two-digit SIC code) in Column (3) only and control both industry and quarter fixed effects in columns (1), (2), and (5). In Column (4) we include industry-quarter fixed effect. The point estimate on UAI distance range from -0.172 to -0.206 and statistically significant at the 10%-level across all the model specifications. The estimate of UAI distance is higher when we only control CEO personality or firm-level observations. After incorporating all control variables, the estimate of UAI distance decreases. This estimate is consistent and the significant level dose not alleviates dramatically when we change controls. One standard deviation increase in UAI distance is associated with 9% ( $= -0.172 \times 0.54$ ) to 11.12% ( $= -0.206 \times 0.54$ ) decrease in  $\sigma(ROA) \times 100$ , which is corresponding to approximately 5% of one standard deviation of the  $\sigma(ROA)$ . There is less firm risk-taking when CEO spouse has higher uncertainty avoidance than CEO self.

In terms of control variables, firms run by female CEOs have less volatility in operating income than firms run by male CEOs. This result is consistent with findings in Faccio, Marchica, and Mura (2016). CEOs with longer tenure will take less risk, while larger size firms are also associated with less volatility. This finding correspond to Cain and Mckeon (2016). However, firms which have higher Tobin's Q or make a loss confront with more future volatility. It seems that CEOs with more cash payments will also take more risk. Corporate governance has little influence in our models.

[Insert Table 3 here]

#### 4.2 Cultural distance and R&D expenditure

We show UAI distance has significant effect on firm operation risk in section 4.1. An alternative way to quantify firm risk is to consider risk-related corporate policy. We test whether CEOs whose CEO spouses have higher UAI exhibit meaningful deviations in R&D expenditure. R&D investments are risky because their low probability of success and uncertainty benefits. We hypothesize that risk-tolerance CEO would like to adopt more R&D expenditure but high uncertainty avoidance of CEO spouse tend to intervene CEO's choice of R&D investments.

Estimates of UAI distance on corporate R&D expenditure are shown in Table 4. The dependent variable in column (1) to (5) is R&D expenditure over total asset. We use industry adjusted R&D expenditure in Column 6, which is the average R&D expenditure minus industry average R&D expenditure over next 20 quarters. The main explanatory variable is UAI distance between CEO spouse and CEO. Only CEO personality variables are included in Column (1). Only firm characteristics and corporate governance variables are included in Column (2). All control variables are included in Column (3) to (6). We find UAI distance still has significant and negative coefficient in all columns, with estimates ranging from -0.172 to -0.192. One standard deviation increase in UAI distance leads to 9% ( $= -0.172 \times 0.54$ ) to 10.37% ( $= -0.206 \times 0.54$ ) decrease in R&D  $\times 100$ , which is corresponding to approximately 6% of one standard deviation of the R&D. Thus, CEO may cut down expenditure on R&D investments if this CEO has a spouse with higher uncertainty avoidance culture.

We also find CEO with higher education degree prefer to increase R&D investments because they understand the importance of technic development. Firms with high Q will also increase R&D expenditure.

[Insert Table 4 here]

#### 4.3 Cultural distance, firm risk, and CEO education

CEO education which has effect on corporate R&D investments may mitigate the influence of cultural distance in CEO families. CEOs with higher education could be more cogitative when making corporate policies, and they are less impacted by cultural distance. To examine whether cultural distance of UAI has weaker influence on firm risk and R&D investments for better educated CEO, we split our sample by CEO education, which is whether CEO has a Master or higher degree.

Results are shown in Table 5. In Panel A of Table 5, we report the OLS results of UAI distance on corporate risk taking in each sub-sample. UAI distance still has negative and significant coefficients in the sample of low education degree sample, and these coefficients are lower than those in our baseline model, -0.361 compared to -0.192. However, UAI distance shows weak effect in the sub-sample of high education degree. We also find the different coefficients between high education degree sample and low education degree sample are statistically significant at 10% level. Better educated CEOs are less influenced by UAI distance while cultural distance in UAI has stronger effect on corporate risk-taking for CEOs who has lower education degree.

Results of UAI distance on R&D investments in each sub-sample are reported in Panel B. Different from corporate risk-taking, UAI distance shows no significant difference between high education degree sample and low education degree sample. The point estimates of UAI distance in each sub-sample are close to the results of our baseline model. CEO education level does deviate UAI distance effect on corporate risk-taking but not interplays for corporate R&D investments.

[Insert Table 5 here]

#### 4.4 UAI distance, firm risk, and CEO Individualism culture

Individualism vs. Collectivism (IDV) is another cultural dimension of Hofstede's (2001) six cultural dimensions. It reflects the degree to which people in a society are integrated into groups. Higher IDV value means people in this society are expected to take care of only themselves and pursue their own interests. Managers from high individualism culture countries are more likely to make decisions by themselves and pay less attention on others' suggestions. We do not want to predict cultural distance in IDV and corporate risk-taking in this paper because the link between CEO spouse's individualism and corporate risk is not very clear. However, we are interested in clarifying CEO personal individualism and the influence of UAI distance. Managers with high individualism tend to neglect suggestions from others and they are less likely to be affected by other people. Therefore, we conjecture that UAI distance between CEO and CEO spouse is less effective for managers with high individualism culture.

We split our sample by the mean of CEO individualism culture heritage at 70. The dependent variable is  $\sigma(ROA) \times 100$  in Panel A of Table 6 and  $R\&D \times 100$  in Panel B of Table 6. The negative effect of UAI distance is significant in low individualism sample with IDV\_CEO smaller than 70 but insignificant in high individualism sample with IDV\_CEO larger than 70 for both corporate risk-taking and R&D investments. The difference of coefficients between the two samples are statistically significant at 1% level. The point estimates of UAI distance in low individualism sample are -0.964 for corporate risk-taking and -0.446 for R&D expenditure, much lower than estimates in baseline model. CEOs with low individualism culture are more likely to be affected by their spouses' uncertainty avoidance, which is reflected in less corporate risk-taking and less R&D investments.

[Insert Table 6 here]

#### *4.5 Children, Economic Development and Institutional Quality*

Focusing on S&P 500 firms allows us to hold similar economic and institutional factors that all CEOs face. However, there are two more potential concerns. First, CEOs who have children may become more risk-averse. Second, CEOs with wives that come from countries with weak institutions and economic states may be more likely to manage earnings. To rule this out, we collect data of children in a CEO's family from *Marquis Who's Who*, GDP per capita, market capitalization, and rule of law at a CEO spouse's ancestral country of origin from World Bank.

As shown in Table 7, our results of UAI distance remain robust to the inclusion of these controls. The number of children does not significantly lead less firm risk-taking. Better economic factors, capital market development, and legal quality in spouse's origin does not assure less risk-taking neither. Our results are unlikely to be driven by these factors.

[Insert Table 7 here]

#### *4.6 CEO turnover and CEO appointment*

We examine a causal effect of UAI distance on firm risk-taking, which is changes in UAI distance over time should be associated with changes in corporate risk-taking and R&D investments. However, it is challenging to identify exogenous shocks to UAI distance in the time-series dimension because culture is predetermined and changes slowly. But, the changes in UAI distance are associated with CEO turnovers. We employ a firm fixed effect specification in a sub-sample of firms with at least one CEO turnover. Firm fixed effect absorb the effect of unobservable firm-specific characteristics. It also reveals how much effect operates through time-varying changes in UAI distance. In Column (1) and Column (2) of Table 8, we redo our baseline model of UAI distance on corporate risk-taking and R&D investments but controlling

firm fixed effect and industry-quarter fixed effect. We find the results still hold for  $\sigma(ROA)$ , even though weaker. This specification suggests that decreasing corporate risk-taking in a firm is associated with increasing in UAI distance in CEO family.

Furthermore, CEOs and firms do not match randomly. Our results could be biased by endogenous matching if CEO cultural backgrounds or CEO spouse cultural backgrounds are criterion of CEO appointment by the board. The board of a firm with high corporate risk in prior quarters may prefer to appoint a CEO with high uncertainty avoidance or a CEO who has high UAI distance in family. Column (3) and Column 4 in Table 8 reports results related to CEO-firm endogenous matching. We firstly identify all CEO turnover in our data set and regress the new CEO UAI distance on prior  $\sigma(ROA) \times 100$  which is the standard deviation of abnormal ROA from 20 prior quarter to 1 prior quarter in Column (3). Then we regress new CEO UAI distance on R&D expenditure in prior quarter in Column (4). We find prior corporate risk-taking and R&D expenditure do not significantly predict UAI distance in the new CEO's family. It is difficult to completely rule out endogenous matching scheme, so we conclude that there is no obvious reverse causality between UAI distance and corporate risk-taking at least.

[Insert Table 8 here]

## **5. Robustness check**

One concern we may have is the accuracy of cultural backgrounds. We cannot find exact cultural background of some persons and we calculate the distribution of potential cultural backgrounds for them. The inaccurate cultural backgrounds may make our results biased. To alleviate this concern, we conduct a subsample test where we only keep CEO spouse with exact cultural backgrounds information in our sample. Results are reported in Column (1) and

Column (2) in Table 9. We find UAI distance still has significant and negative effect on corporate risk-taking and R&D investments. Especially, the estimates decrease to -0.249 for R&D investments. The driving force of CEO spouse's uncertainty avoidance on CEO personal uncertainty avoidance of firm risk-taking is robust.

To further address potential sample selection bias, we report evidence from propensity score matching and Heckman two-stage test. First we match firm-quarter observation without exact data on CEO spouses to one for which we have exact data on CEO spouses, based on year, industry, and firm size. We require five matched neighbors. For each firm, we calculate the average ROA and R&D expenditure of matched firms. We re-estimate our baseline model on this matched data set in Column (3) and Column (4). The coefficient of *UAI\_DISTANCE* for the matched sample is close to our baseline model results. Then we use Heckman two-stage test following Nguyen, Hagendorff and Eshraghi (2017). We conjecture that the individual surname length will affect the accuracy and availability of cultural heritage data because of less duplications. We report Heckman two-stage test results in Column (5) and Column (6), where UAI distance has significant and negative coefficient. The Lambda of Heckman two-stage is significantly different from zero. The surname length, particularly spouse surname length indeed influences our results.

[Insert Table 9 here]

## **6. Conclusion**

This paper combines the culture distance between family members, CEOs and CEO spouses, with corporate risk-taking and R&D investments. We focus on CEOs of large US firms (S&P 500) because US citizens has larger variation of immigrant backgrounds comparing to other countries. To reveal the culture heritage of couples, we collect the names and family

ancestry backgrounds of CEOs and corresponding spouses. We identify cultural heritage distribution of a person through surname if we cannot find the exact immigrant information. To measure cultural distance between couples, we matched their cultural heritage with Hofstede's cultural dimensions value of uncertainty avoidance.

We find the cultural distance between CEOs and CEO spouses in uncertainty avoidance is negatively associated with firm operation risk and R&D investments. The higher uncertainty avoidance of CEO spouses drives CEOs individually more avoidance of firm future risk. The effect of uncertainty avoidance distance is stronger if CEO has lower education level and lower individualism cultural backgrounds.

The findings suggest an importance link between CEO family life and career life. In this paper, we only focus on the relation between the couple's cultural distance and corporate risk-taking policies. Other corporate policies, such as CSR, may be considered in future research.



## References

- Acharya, V.V., Amihud, Y. and Litov, L., 2011. Creditor rights and corporate risk-taking. *Journal of Financial Economics*, 102, 150-166.
- Adams, R., Keloharju, M. and Knüpfer, S., 2018. Are CEOs born leaders? Lessons from traits of a million individuals. *Journal of Financial Economics*, 130, 392-408.
- Ahern, K.R., Daminelli, D. and Fracassi, C., 2015. Lost in translation? The effect of cultural values on mergers around the world. *Journal of Financial Economics*, 117, 165-189.
- Aggarwal, R., Kearney, C. and Lucey, B., 2012. Gravity and culture in foreign portfolio investment. *Journal of Banking and Finance*, 36, 525-538.
- Agnew, J., Balduzzi, P. and Sunden, A., 2003. Portfolio choice and trading in a large 401 (k) plan. *American Economic Review*, 93,193-215.
- Bhagat, S. and Welch, I., 1995. Corporate research & development investments international comparisons. *Journal of Accounting and Economics*, 19(2-3), pp.443-470.
- Bargeron, L.L., Lehn, K.M. and Zutter, C.J., 2010. Sarbanes-Oxley and corporate risk-taking. *Journal of Accounting and Economics*, 49, 34-52.
- Bean, F.D. and Kerckhoff, A.C., 1971. Personality and perception in husband-wife conflicts. *Journal of Marriage and the Family*, 351-359.
- Becker, G.S., 1996. *Accounting for tastes*. Harvard University Press.
- Becker, A., Dohmen, T., Enke, B. and Falk, A., 2014. The ancient origins of the cross-country heterogeneity in risk preferences. Working Paper, University of Stanford.
- Bernile, G., Bhagwat, V. and Rau, P.R., 2017. What doesn't kill you will only make you more risk-loving: Early-life disasters and CEO behavior. *Journal of Finance*, 72, 167-206.
- Bertaut, C.C., 1998. Stockholding behavior of US households: evidence from the 1983–1989 survey of consumer finances. *Review of Economics and Statistics*, 80, 263-275.
- Bertrand, M. and Schoar, A., 2003. Managing with style: The effect of managers on firm policies. *Quarterly journal of economics*, 118, 1169-1208.
- Bertocchi, G., Brunetti, M. and Torricelli, C., 2011. Marriage and other risky assets: a portfolio approach. *Journal of Banking and Finance*, 35, 2902-2915.
- Bisin, A. and Verdier, T., 2000. “Beyond the melting pot”: cultural transmission, marriage, and the evolution of ethnic and religious traits. *Quarterly Journal of Economics*, 115, 955-988.
- Botticini, M. and Eckstein, Z., 2005. Jewish occupational selection: education, restrictions, or minorities?. *Journal of Economic History*, 65, 922-948.
- Bryan, S., Nash, R. and Patel, A., 2012. Culture and CEO compensation. Working Paper, Fordham University.
- Burnham, T.C., 2007. High-testosterone men reject low ultimatum game offers. *Proceedings of the Royal Society B: Biological Sciences*, 274, 2327-2330.

- Cain, M.D. and McKeon, S.B., 2016. CEO personal risk-taking and corporate policies. *Journal of Financial and Quantitative Analysis*, 51, 139-164.
- Chen, M.K., 2013. The effect of language on economic behavior: Evidence from savings rates, health behaviors, and retirement assets. *American Economic Review*, 103, 690-731.
- Chui, A.C., Titman, S. and Wei, K.J., 2010. Individualism and momentum around the world. *Journal of Finance*, 65, 361-392
- Cronqvist, H. and Yu, F., 2017. Shaped by their daughters: Executives, female socialization, and corporate social responsibility. *Journal of Financial Economics*, 126, 543-562.
- Custódio, C. and Metzger, D., 2013. How do CEOs matter? The effect of industry expertise on acquisition returns. *Review of Financial Studies*, 26, 2008-2047.
- Dixit, A.K., Dixit, R.K., Pindyck, R.S. and Pindyck, R., 1994. *Investment under uncertainty*. Princeton university press.
- Du, Q., Yu, F. and Yu, X., 2017. Cultural proximity and the processing of financial information. *Journal of Financial and Quantitative Analysis*, 52, 2703-2726.
- Faccio, M., Marchica, M.T. and Mura, R., 2011. Large shareholder diversification and corporate risk-taking. *Review of Financial Studies*, 24, 3601-3641.
- Faccio, M., Marchica, M.T. and Mura, R., 2016. CEO gender, corporate risk-taking, and the efficiency of capital allocation. *Journal of Corporate Finance*, 39, 193-209.
- Falicov, C.J., 1995. Cross-cultural marriages. *Clinical handbook of couple therapy*, 231-246.
- Fernández, R., Fogli, A. and Olivetti, C., 2004. Mothers and sons: Preference formation and female labor force dynamics. *Quarterly Journal of Economics*, 119, 1249-1299.
- Fernández, R. and Fogli, A., 2006. Fertility: The role of culture and family experience. *Journal of the European Economic Association*, 4, 552-561.
- Fernández, R. and Fogli, A., 2009. Culture: An empirical investigation of beliefs, work, and fertility. *American Economic Journal: Macroeconomics*, 1, 146-77.
- Garlappi, L., Giammarino, R. and Lazrak, A., 2017. Ambiguity and the corporation: Group disagreement and underinvestment. *Journal of Financial Economics*, 125(3), pp.417-433.
- Giannetti, M. and Yafeh, Y., 2012. Do cultural differences between contracting parties matter? Evidence from syndicated bank loans. *Management Science*, 58, 365-383.
- Giavazzi, F., Petkov, I. and Schiantarelli, F., 2014. Culture: Persistence and evolution. NBER Working paper.
- Giuliano, P., 2004. On the Determinants of Living Arrangements in Western Europe: Does Cultural Origin Matter?. Working paper, UC Berkeley.
- Grable, J.E., 2000. Financial risk tolerance and additional factors that affect risk taking in everyday money matters. *Journal of Business and Psychology*, 14, 625-630.
- Griswold, W., 2012. *Cultures and societies in a changing world*. Sage.

- Guiso, L., Sapienza, P. and Zingales, L., 2003. People's opium? Religion and economic attitudes. *Journal of monetary economics*, 50, 225-282.
- Guiso, L., Sapienza, P. and Zingales, L., 2004. The role of social capital in financial development. *American economic review*, 94, 526-556.
- Guiso, L., Sapienza, P. and Zingales, L., 2006. Does culture affect economic outcomes?. *Journal of Economic perspectives*, 20, 23-48.
- Guiso, L., Sapienza, P. and Zingales, L., 2009. Cultural biases in economic exchange?. *Quarterly Journal of Economics*, 124, 1095-1131.
- Guiso, L. and Rustichini, A., 2011. Understanding the size and profitability of firms: The role of a biological factor. CEPR Working Paper
- Hofstede, G., 1980. Motivation, leadership, and organization: do American theories apply abroad?. *Organizational dynamics*, 9, 42-63.
- Hofstede, G., 2001. *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*. Sage publications.
- Hofstede, G., Hofstede, G.J. and Minkov, M., 2010. *Cultures and organizations: software of the mind*. 3<sup>rd</sup> ed. New York, NY: McGraw-Hill.
- Ichino, A. and Maggi, G., 2000. Work environment and individual background: Explaining regional shirking differentials in a large Italian firm. *Quarterly Journal of Economics*, 115, 1057-1090.
- Jensen, M.C. and Meckling, W.H., 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3, 305-360.
- John, K., Litov, L. and Yeung, B., 2008. Corporate governance and risk-taking. *Journal of Finance*, 63, 1679-1728.
- Kenkel, W.F., 1961. Husband-wife interaction in decision making and decision choices. *Journal of Social Psychology*, 54(2), pp.255-262.
- Knight, F.H., 1921. Cost of production and price over long and short periods. *Journal of Political Economy*, 29, 304-335.
- Kreiser, P.M., Marino, L.D., Dickson, P. and Weaver, K.M., 2010. Cultural influences on entrepreneurial orientation: The impact of national culture on risk taking and proactiveness in SMEs. *Entrepreneurship theory and practice*, 34, 959-984.
- Kumar, A., Niessen-Ruenzi, A. and Spalt, O.G., 2015. What's in a name? Mutual fund flows when managers have foreign-sounding names. *Review of Financial Studies*, 28, 2281-2321.
- La Porta, R., Lopez-de-Silanes, F., Shleifer, A. and Vishny, R.W., 1997. Legal determinants of external finance. *Journal of finance*, 52, 1131-1150.
- Laeven, L. and Levine, R., 2009. Bank governance, regulation and risk taking. *Journal of financial economics*, 93, 259-275.

- Li, K., Griffin, D., Yue, H. and Zhao, L., 2013. How does culture influence corporate risk-taking?. *Journal of Corporate Finance*, 23, 1-22.
- Liu, X., 2016. Corruption culture and corporate misconduct. *Journal of Financial Economics*, 122, 307-327.
- Luo, S. and Klohnen, E.C., 2005. Assortative mating and marital quality in newlyweds: a couple-centered approach. *Journal of personality and social psychology*, 88, 304-326.
- McFadden, J., 2001. Intercultural marriage and family: Beyond the racial divide. *Family Journal*, 9, 39-42.
- Nguyen, D.D., Hagendorff, J. and Eshraghi, A., 2017. Does a CEO's cultural heritage affect performance under competitive pressure?. *Review of Financial Studies*, 31, 97-141.
- Nicolosi, G. and Yore, A.S., 2015. "I do": does marital status affect how much CEOs "do"?. *Financial Review*, 50, 57-88.
- Pachucki, M.A. and Breiger, R.L., 2010. Cultural holes: Beyond relationality in social networks and culture. *Annual review of sociology*, 36, 205-219.
- Pan, Y., Siegel, S. and Wang, T.Y., 2017. Corporate risk culture. *Journal of Financial and Quantitative Analysis*, 52, 2327-2367.
- Remennick, L., 2009. Exploring intercultural relationships: A study of Russian immigrants married to native Israelis. *Journal of Comparative Family Studies*, 40, 719-749.
- Robalino, N. and Robson, A.J., 2013. Genes, culture, and preferences. *Biological Theory*, 8, 151-157.
- Roussanov, N. and Savor, P., 2014. Marriage and managers' attitudes to risk. *Management Science*, 60, 2496-2508.
- Sedikides, C., Gaertner, L. and Toguchi, Y., 2003. Pancultural self-enhancement. *Journal of personality and social psychology*, 84, 60-79.
- Tosi, H.L. and Greckhamer, T., 2004. Culture and CEO compensation. *Organization Science*, 15, 657-670.
- Tylor, E.B., 1871. *Primitive culture: researches into the development of mythology, philosophy, religion, art, and custom* (Vol. 2). J. Murray.
- Yamaguchi, S., Gelfand, M., Ohashi, M.M. and Zemba, Y., 2005. The cultural psychology of control: Illusions of personal versus collective control in the United States and Japan. *Journal of Cross-Cultural Psychology*, 36, 750-761.

**Table 1: Descriptive Statistics of CEO and CEO spouse**

<i>Panel A: CEO's and CEO spouse's basic information</i>					
	N		Share of total CEOs		
CEOs with more than one marriage	72		4.91%		
Female CEO	40		2.73%		
CEOs with exact ancestry	688		46.96%		
CEO spouses with exact ancestry	440		30.03%		
CEO couples both with exact ancestry	318		21.71%		
CEO couples with same ancestry distribution	147		10.03%		
CEO couples both with ancestry distribution	1,066		72.76%		
Total CEO couples	1,128		76.70%		
Total CEOs	1,465		100%		
<i>Panel B: CEO's and CEO spouse's immigrant generation</i>					
	N of CEO	Share of Total CEOs	N of CEO spouses	Share of Total CEO spouses	
Gen 1	176	12.01%	136	12.76%	
Gen 2	94	6.42%	58	5.44%	
Gen 3	98	6.69%	49	4.60%	
Gen 4+	320	21.84%	197	18.48%	
Unknown	777	53.04%	626	58.72%	
Total	1,465	100%	1,066	100%	
<i>Panel C: CEO's and CEO spouse's cultural backgrounds</i>					
Country	N of CEO	N of CEO spouse	Country	N of CEO	N of CEO spouse
Arab	5	4	Latvia	0	1(0.42)
Argentina	1	2(0.16)	Lebanon	3	1(0.5)
Armenia	(0.8)	0	Lithuania	2(0.53)	1
Australia	17(20)	9(0.09)	Macedonia	(0.13)	0
Austria	10(4.37)	6(2.21)	Malaysia	2	0
Bangladesh	1	1	Mexico	3	5(1.11)
Belgium	5(0.29)	4(0.73)	Monaco	1	1
Bosnia	0	1	Native American	12	14
Brazil	6(0.36)	5(0.55)	Netherlands	21(13.59)	9(4.44)
Bulgaria	(0.09)	0	Norway	12(3.17)	5(9.775)

Canada	31(6.7)	23(8.53)	Pakistan	2(0.125)	1
Chile	1	1	Philippines	0	2
China	4	8(0.31)	Poland	15(4.42)	11(5.28)
Colombia	(0.05)	1	Portugal	1(0.52)	4(0.5)
Costa Rica	1	0	Puerto Rico	1	1(0.215)
Croatia	4(0.94)	(0.71)	Romania	3(1.16)	0.5(0.5)
Cuba	4(1.82)	1(0.88)	Russia	11(12.66)	5(5)
Czech Republic	8(1.04)	6(0.29)	Serbia	2	0
Denmark	4(2.08)	5(4.17)	Singapore	0	1
Dominica	(0.19)	0	Slovak Republic	(1.82)	1(0.4)
Egypt	2	1	Slovenia	(1.44)	2(0.25)
Estonia	0	(0.075)	South Africa	3	1
Finland	2(0.15)	2(1.76)	Spain	18(3.03)	12(3.93)
France	27(16.69)	26(17.41)	Sri Lanka	1	0
Germany	104(91.39)	56(64.835)	Sweden	17(13.79)	15(13.33)
Greece	12(2.86)	6(1.42)	Switzerland	7(3.3)	3(4.75)
Hungary	6(5.99)	3(2)	Syria	2(0.44)	1
India	29	14	Taiwan	6	4
Iran	4	1	Turkey	4(0.615)	2
Ireland	54(145.73)	26(91.79)	UK	175 (267.19)	182(197.72)
Israel	5	3(0.25)	Ukraine	2	0
Italy	80(21.74)	41(22.665)	Venezuela	0	(0.11)
Japan	3	2	Yugoslavia	0	1
Jewish	80(7.39)	44(5.79)	Zambia	0	1

Panel A reports descriptive statistics of CEOs and CEO spouses ancestry information. Panel B classifies CEOs and CEO spouses as first immigrant generation (foreign-born), Gen 2 (parents are foreign-born), Gen 3 (grandparents are foreign-born), or Gen 4+ (forth or higher immigrant generations), and Unknown (without generation information). Panel C reports the number of CEOs and CEO spouses from each country-level cultural backgrounds. The number outside parentheses is the amount of CEOs or CEO spouses with this specific country ancestry exactly. The number inside parentheses is the sum of distribution of CEOs or CEO spouses with this specific country ancestry not exactly.

**Table 2: Variable Descriptive Statistics**

	N	Mean	Std. Dev	Q1	Median	Q3
<i>Panel A: CEO Characteristics</i>						
UAI_CEO	22,454	55.12	20.98	35.00	50.00	75.00
IDV_CEO	22,454	69.91	16.44	60.84	73.78	82.16
UAI_DISTANCE	22,134	0.06	0.54	-0.32	0.00	0.20
EDUCATION	22,537	1.67	0.74	1	2	2
FEMALE	22,537	0.03	0.18	0	0	0
ln(1+ MARRIAGE_YEAR)	22,537	3.24	0.54	3.09	3.37	3.58
ln(1+AGE)	22,537	4.04	0.13	3.97	4.04	4.13
DIFF_CULTURE	22,217	0.87	0.33	1	1	1
ln(1+TENURE)	22,537	1.76	0.86	1.10	1.79	2.40
<i>Panel B: Firm Characteristics</i>						
$\sigma(\text{ROA}) \times 100$	12,578	2.23	2.03	1.06	1.62	2.62
R&D $\times 100$	22,537	0.80	1.67	0.00	0.01	1.12
MB	22,501	3.97	5.27	1.82	2.90	4.60
ln(ASSETS)	22,523	9.00	1.33	8.05	8.91	9.90
Q	22,503	2.21	1.36	1.35	1.79	2.55
LOSS	22,537	0.13	0.34	0	0	0
<i>Panel C: Corporate Governance</i>						
BOARD_SIZE	18,999	10.37	2.14	9	10	12
BOARD_OWNERSHIP	18,909	0.04	0.07	0.01	0.01	0.04
BOARD_INDEPENDENCE	18,991	0.76	0.14	0.69	0.80	0.89

Panel A reports descriptive statistics for the variables of CEO characteristics. Panel B reports descriptive statistics of firm level variables, while Panel C shows corporate governance variables. All variables are defined in the Appendix A.

**Table 3: Cultural Distance and Firm Risk**

This table reports the panel regression results of CEO and CEO spouse risk cultural distance on firm risk. The dependent variable is the volatility of the firm's operating return on assets ( $\sigma(ROA) \times 100$ ). The main explanatory variable is the UAI distance between CEO spouse and CEO (*UAI\_DISTANCE*). Definitions of the variables are provided in Appendix A. Industry fixed effects are based on two-digit SIC codes. All regressions include a constant term. Standard errors are double clustered at firm and quarter level. \*, \*\*, and \*\*\*, indicate significant at the 10%, 5%, and 1% level, respectively.

VARIABLES	(1) $\sigma(ROA)$	(2) $\sigma(ROA)$	(3) $\sigma(ROA)$	(4) $\sigma(ROA)$	(5) $\sigma(ROA)$
UAI_DISTANCE	-0.172* (0.102)	-0.185* (0.099)	-0.191** (0.095)	-0.206** (0.093)	-0.192** (0.095)
<b><u>Panel A: CEO Characteristics</u></b>					
EDUCATION	0.168** (0.083)		0.095 (0.078)	0.089 (0.074)	0.105 (0.078)
FEMALE	-0.535*** (0.188)		-0.473** (0.193)	-0.486*** (0.169)	-0.419** (0.191)
ln(1+ MARRIAGE_YEAR)	-0.261** (0.116)		-0.108 (0.091)	-0.017 (0.093)	-0.118 (0.089)
ln(1+AGE)	-0.331 (0.615)		-0.323 (0.599)	-0.267 (0.611)	-0.301 (0.605)
DIFF_CULTURE	0.250 (0.156)		0.197 (0.155)	0.166 (0.154)	0.193 (0.153)
ln(1+TENURE)	-0.114 (0.071)		-0.168** (0.067)	-0.148** (0.068)	-0.147** (0.067)
<b><u>Panel B: Firm Characteristics</u></b>					
MB		-0.013 (0.009)	-0.011 (0.008)	-0.018* (0.010)	-0.012 (0.008)
ln(ASSETS)		-0.133*** (0.046)	-0.135*** (0.048)	-0.130*** (0.048)	-0.122*** (0.046)
Q		0.164* (0.090)	0.199** (0.086)	0.202** (0.098)	0.158* (0.088)
LOSS		1.154*** (0.156)	1.094*** (0.147)	1.390*** (0.151)	1.096*** (0.147)
<b><u>Panel C: Corporate Governance</u></b>					
BOARD_SIZE		-0.033 (0.026)	-0.027 (0.028)	-0.039 (0.027)	-0.034 (0.027)
BOARD_OWNERSHIP		1.003 (0.741)	1.297* (0.778)	1.358 (0.830)	1.282* (0.761)
BOARD_INDEPENDENCE		0.643 (0.407)	0.223 (0.344)	0.390 (0.391)	0.631 (0.404)
Industry fixed effect	Yes	Yes	Yes	No	Yes
Quarter fixed effect	Yes	Yes	No	No	Yes
Industry-quarter fixed effect	No	No	No	Yes	No
Observations	12,353	10,612	10,612	10,320	10,612
R-squared	0.273	0.333	0.323	0.352	0.341



**Table 4: Cultural Distance and R&D Expenditure**

This table reports the panel regression results of CEO and CEO spouse risk cultural distance on firm R&D expenditure. The dependent variable is R&D expenditure over assets ( $R\&D \times 100$ ) in Column (1) to (5). In Column (6), the dependent variable is average industry adjusted R&D expenditure over assets in future 20 quarters. The main explanatory variable is the UAI distance between CEO spouse and CEO ( $UAI\_DISTANCE$ ). Definitions of the variables are provided in Appendix A. Industry fixed effects are based on two-digit SIC codes. All regressions include a constant term. Standard errors are double clustered at firm and quarter level. \*, \*\*, and \*\*\*, indicate significant at the 10%, 5%, and 1% level, respectively.

VARIABLES	(1) R&D	(2) R&D	(3) R&D	(4) R&D	(5) R&D	(6) Adj. R&D
UAI_DISTANCE	-0.192** (0.080)	-0.172** (0.076)	-0.185** (0.073)	-0.180** (0.075)	-0.182** (0.073)	-0.182** (0.072)
<b><u>Panel A: CEO Characteristics</u></b>						
EDUCATION	0.234*** (0.070)		0.206*** (0.065)	0.215*** (0.066)	0.209*** (0.065)	0.209*** (0.061)
FEMALE	-0.073 (0.223)		-0.034 (0.257)	-0.041 (0.276)	-0.027 (0.261)	-0.053 (0.229)
ln(1+ MARRIAGE_YEAR)	0.067 (0.071)		0.094 (0.071)	0.112 (0.077)	0.099 (0.070)	0.067 (0.066)
ln(1+AGE)	-1.073*** (0.412)		-0.599 (0.371)	-0.484 (0.382)	-0.571 (0.378)	-0.471 (0.364)
DIFF_CULTURE	0.045 (0.115)		0.112 (0.102)	0.096 (0.110)	0.108 (0.103)	0.090 (0.100)
ln(1+TENURE)	0.099 (0.067)		0.059 (0.061)	0.068 (0.064)	0.061 (0.060)	0.047 (0.056)
<b><u>Panel B: Firm Characteristics</u></b>						
MB		-0.003 (0.006)	-0.003 (0.006)	-0.003 (0.008)	-0.002 (0.006)	-0.006 (0.005)
ln(ASSETS)		-0.066 (0.057)	-0.062 (0.050)	-0.070 (0.056)	-0.069 (0.055)	-0.082 (0.052)
Q		0.340*** (0.051)	0.314*** (0.045)	0.369*** (0.052)	0.329*** (0.048)	0.304*** (0.041)
LOSS		0.916*** (0.190)	0.894*** (0.173)	1.059*** (0.213)	0.887*** (0.180)	0.659*** (0.153)
<b><u>Panel C: Corporate Governance</u></b>						
BOARD_SIZE		-0.031 (0.020)	-0.028 (0.019)	-0.025 (0.021)	-0.026 (0.020)	-0.023 (0.018)
BOARD_OWNERSHIP		0.451 (0.624)	0.614 (0.630)	0.429 (0.664)	0.523 (0.619)	0.553 (0.571)
BOARD_INDEPENDENCE		0.364 (0.252)	0.493** (0.217)	0.354 (0.269)	0.317 (0.250)	0.388 (0.241)
Industry fixed effect	Yes	Yes	Yes	No	Yes	Yes
Quarter fixed effect	Yes	Yes	No	No	Yes	Yes
Industry-quarter fixed effect	No	No	No	Yes	No	No
Observations	22,134	18,559	18,559	17,757	18,559	18,492
R-squared	0.268	0.349	0.344	0.392	0.358	0.664

**Table 5: Cultural Distance, Firm Risk, and CEO Education**

This table reports the panel regression results of CEO and CEO spouse risk cultural distance on firm risk and R&D expenditure based on CEO education. The dependent variable in Panel A is the volatility of the firm's operating return on assets ( $\sigma(ROA) \times 100$ ). The dependent variable in Panel B is R&D expenditure over assets ( $R\&D \times 100$ ). The main explanatory variable is the UAI distance between CEO spouse and CEO (*UAI\_DISTANCE*). Sample is split by CEO education level, which is whether CEO has a Master or higher degree ( $Edu \geq 2$ ) or not ( $Edu < 2$ ). Definitions of the variables are provided in Appendix A. Industry fixed effects are based on two-digit SIC codes. Industry-quarter fixed effect is included in Column (1) and Column (2). All regressions include a constant term. Standard errors are double clustered at firm and quarter level. \*, \*\*, and \*\*\*, indicate significant at the 10%, 5%, and 1% level, respectively.

VARIABLES	(1) Low	(2) High	(3) High - Low	(4) Low	(5) High	(6) High -
<b>Panel A: Firm Risk</b>						
UAI_DISTANCE	-0.314** (0.164)	-0.123 (0.114)	0.191*	-0.361** (0.145)	-0.183 (0.123)	0.178*
CEO characteristics	Yes	Yes		Yes	Yes	
Firm characteristics	Yes	Yes		Yes	Yes	
Corporate governance	Yes	Yes		Yes	Yes	
Industry fixed effect	No	No		Yes	Yes	
Quarter fixed effect	No	No		Yes	Yes	
Industry-quarter fixed effect	Yes	Yes		No	No	
Observations	4,319	6,293		3,448	5,486	
R-squared	0.329	0.401		0.407	0.421	
<b>Panel B: R&amp;D Expenditure</b>						
UAI_DISTANCE	-0.151 (0.120)	-0.143* (0.084)	0.008	-0.137 (0.134)	-0.151* (0.089)	-0.014
CEO characteristics	Yes	Yes		Yes	Yes	
Firm characteristics	Yes	Yes		Yes	Yes	
Corporate governance	Yes	Yes		Yes	Yes	
Industry fixed effect	No	No		Yes	Yes	
Quarter fixed effect	No	No		Yes	Yes	
Industry-quarter fixed effect	Yes	Yes		No	No	
Observations	7,345	11,214		6,347	10,077	
R-squared	0.320	0.395		0.211	0.323	

**Table 6: UAI Distance, Firm Risk, and CEO Individualism Culture**

This table reports the panel regression results of CEO and CEO spouse risk cultural distance on firm risk and R&D expenditure based on CEO education. The dependent variable in Panel A is the volatility of the firm's operating return on assets ( $\sigma(ROA) \times 100$ ). The dependent variable in Panel B is R&D expenditure over assets ( $R\&D \times 100$ ). The main explanatory variable is the UAI distance between CEO spouse and CEO ( $UAI\_DISTANCE$ ). Sample is split by CEO education level, which is whether CEO individualism is higher than average ( $IDV\_CEO > 70$ ) or not ( $IDV\_CEO \leq 70$ ). Definitions of the variables are provided in Appendix A. Industry fixed effects are based on two-digit SIC codes. Industry-quarter fixed effect is included in Column (1) and Column (2). All regressions include a constant term. Standard errors are double clustered at firm and quarter level. \*, \*\*, and \*\*\*, indicate significant at the 10%, 5%, and 1% level, respectively.

VARIABLES	(1) Low	(2) High	(3) High - Low	(4) Low	(5) High	(6) High -
<b>Panel A: Firm Risk</b>						
UAI_DISTANCE	-0.830*** (0.299)	-0.160* (0.095)	0.670***	-0.964** (0.263)	-0.061 (0.088)	0.903***
CEO characteristics	Yes	Yes		Yes	Yes	
Firm characteristics	Yes	Yes		Yes	Yes	
Corporate governance	Yes	Yes		Yes	Yes	
Industry fixed effect	No	No		Yes	Yes	
Quarter fixed effect	No	No		Yes	Yes	
Industry-quarter fixed effect	Yes	Yes		No	No	
Observations	4,439	6,173		3,750	5,325	
R-squared	0.318	0.415		0.384	0.452	
<b>Panel B: R&amp;D Expenditure</b>						
UAI_DISTANCE	-0.434** (0.217)	-0.080 (0.082)	0.354**	-0.446* (0.233)	-0.080 (0.081)	0.366**
CEO characteristics	Yes	Yes		Yes	Yes	
Firm characteristics	Yes	Yes		Yes	Yes	
Corporate governance	Yes	Yes		Yes	Yes	
Industry fixed effect	No	No		Yes	Yes	
Quarter fixed effect	No	No		Yes	Yes	
Industry-quarter fixed effect	Yes	Yes		No	No	
Observations	7,973	10,586		7,100	9,570	
R-squared	0.394	0.359		0.290	0.278	

**Table 7: Children, Economic Development and Institutional Quality**

This table reports the panel regression results of CEO and CEO spouse risk cultural distance on firm risk and R&D expenditure. The dependent variable in Panel A is the volatility of the firm's operating return on assets ( $\sigma(ROA) \times 100$ ). The dependent variable in Panel B is R&D expenditure over assets ( $R\&D \times 100$ ). The main explanatory variable is the UAI distance between CEO spouse and CEO ( $UAI\_DISTANCE$ ). The additional control is number of children in the family, GDP per capita in spouse's origin, market capitalization in spouse's origin, and rule of law in spouse's origin. Definitions of the variables are provided in Appendix A. Industry fixed effects are based on two-digit SIC codes. All regressions include a constant term. Standard errors are double clustered at firm and quarter level. \*, \*\*, and \*\*\*, indicate significant at the 10%, 5%, and 1% level, respectively.

VARIABLES	(1)	(2)	(3)	(4)	(5)
<b><u>Panel A: Firm Risk</u></b>					
UAI_DISTANCE	-0.261** (0.110)	-0.249** (0.114)	-0.233* (0.133)	-0.175* (0.112)	-0.211* (0.128)
Children	-0.045 (0.046)	-0.420 (0.045)	-0.058 (0.051)	-0.039 (0.043)	-0.047 (0.046)
GDP per capita		0.037 (0.055)			-0.179 (0.172)
Market capitalization			0.095* (0.049)		0.207 (0.142)
Rule of law				0.226 (0.124)	-0.020 (0.175)
CEO characteristics	Yes	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes	Yes
Corporate governance	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	No	No	Yes	Yes	Yes
Quarter fixed effect	No	No	Yes	Yes	Yes
Observations	8,746	8,621	6,871	8,094	6,350
R-squared	0.357	0.359	0.389	0.368	0.397
<b><u>Panel B: R&amp;D Expenditure</u></b>					
UAI_DISTANCE	-0.188** (0.088)	-0.179** (0.091)	-0.257** (0.107)	-0.232** (0.101)	-0.278** (0.110)
Children	-0.018 (0.033)	-0.017 (0.033)	-0.016 (0.040)	-0.008 (0.032)	-0.019 (0.043)
GDP per capita		-0.076 (0.048)			-0.086 (0.152)
Market capitalization			-0.057* (0.034)		0.024 (0.105)
Rule of law				-0.142 (0.103)	-0.182 (0.151)
CEO characteristics	Yes	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes	Yes
Corporate governance	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	No	No	Yes	Yes	Yes
Quarter fixed effect	No	No	Yes	Yes	Yes
Observations	14,887	14,703	11,400	13,782	10,505
R-squared	0.373	0.376	0.365	0.371	0.361

**Table 8: CEO Turnover and CEO Appointment**

This table reports the panel regressions results of CEO turnover and CEO seeking. The dependent variable in Column (1) is the volatility of the firm's operating return on assets ( $\sigma(ROA) \times 100$ ). The dependent variable in Column (2) is R&D expenditure over assets ( $R\&D \times 100$ ). The main explanatory variable is the UAI distance between CEO spouse and CEO ( $UAI\_DISTANCE$ ) in Column (1) and Column (2). The dependent variable in Column (1) is UAI distance between new CEO spouse and new CEO ( $UAI\_DISTANCE$ ). The main explanatory variable is  $\sigma(ROA) \times 100$  in prior quarter  $R\&D \times 100$  in prior quarter in Column (3) and Column (4). Definitions of the variables are provided in Appendix A. Firm fixed effect and industry-quarter fixed effect are included in column (1) and (2). Industry and quarter fixed effect are included in Column (3) and (4). All regressions include a constant term. Standard errors are double clustered at firm and quarter level. \*, \*\*, and \*\*\*, indicate significant at the 10%, 5%, and 1% level, respectively.

VARIABLES	(1) $\sigma(ROA)$	(2) R&D	(3) UAI_DIFF	(4) UAI_DIFF
UAI_DISTANCE	-0.293* (0.156)	-0.026 (0.035)		
$\sigma(ROA)$ in prior quarter			-2.251 (3.409)	
R&D in prior quarter				-0.040 (0.033)
CEO characteristics	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes
Corporate governance	Yes	Yes	Yes	Yes
Firm fixed effect	Yes	Yes	No	No
Industry fixed effect	No	No	Yes	Yes
Quarter fixed effect	No	No	Yes	Yes
Industry-quarter fixed effect	Yes	Yes	No	No
Observations	9,991	17,754	229	320
R-squared	0.765	0.594	0.516	0.388

**Table 9: Robustness Check**

This table reports the panel regressions results of robustness check. In Column 1 and Column 2, we require CEO spouses should have exact cultural backgrounds information. In Column 3 and Column 4, we use propensity score matching based on our year, industry, and other controls. We check selection bias in Column 5 and Column 6 with Heckman two-stage test. The main explanatory variable is the UAI distance between CEO spouse and CEO (*UAI\_DISTANCE*). Definitions of the variables are provided in Appendix A. Industry fixed effects are based on two-digit SIC codes. All regressions include a constant term. Standard errors are double clustered at firm and quarter level. \*, \*\*, and \*\*\*, indicate significant at the 10%, 5%, and 1% level, respectively.

VARIABLES	(1) $\sigma(\text{ROA})$	(2) R&D	(3) $\sigma(\text{ROA})$	(4) R&D	(5) $\sigma(\text{ROA})$	(6) R&D
<b><u>Panel A: CEO and CEO spouse risk cultural distance</u></b>						
UAI_DISTANCE	-0.181* (0.107)	-0.249** (0.119)	-0.217*** (0.078)	-0.134* (0.076)	-0.209** (0.104)	-0.139* (0.072)
<b><u>Panel B: First-stage results of Heckman two-stage test</u></b>						
CEO surname length					-0.080 (0.058)	-0.048* (0.029)
CEO spouse surname length					0.628*** (0.036)	0.509*** (0.036)
Lambda					-0.296*** (0.015)	1.388*** (0.159)
CEO characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Corporate governance	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Quarter fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,121	7,328	12,632	18,559	10,601	18,553
R-squared	0.319	0.391	0.245	0.228		

## Appendix A: Variable Definitions

### *CEO Characteristics:*

UAI\_CEO: Uncertainty avoidance index for the CEO. *Source:* Hofstede et al. (2010).

IDV\_CEO: Individualism vs. collectivism index for the CEO. *Source:* Hofstede et al. (2010).

UAI\_DISTANCE: The difference between the CEO spouse's UAI and CEO's UAI scaled by CEO's UAI. *Source:* Hofstede et al. (2010).

EDUCATION: The level of the CEO's education. It is equal to 3 if the CEO holds a doctorate degree, equal to 2 if the highest degree is a master's degree, and equal to 1 if the highest degree is undergraduate, and 0 otherwise. *Source:* Marquis Who's Who, Notable Names Database, Wikipedia.

FEMALE: An indicator equal to 1 if the CEO is a female, and 0 otherwise. *Source:* Execucomp item GENDER.

$\ln(1+\text{MARRIAGE\_YEAR})$ : Nature logarithm of years since the couple's wedding, updated annually. *Source:* Marquis Who's Who, Notable Names Database, Wikipedia, interviews or news about CEO couples through Google search and YouTube, and Ancestry.com. If we cannot find exact marriage date of a couple through these ways, we will use the age of their oldest child plus one as their marriage year.

$\ln(1+\text{AGE})$ : Nature logarithm of CEO's age plus one, updated annually. *Source:* Execucomp item AGE.

DIFF\_CULTURE: An indicator variable equal to 1 the CEO has different cultural heritage with his or her spouse.

$\ln(1+\text{TENURE})$ : Nature logarithm of years of service as CEO at given firm. *Source:* Execucomp item YEAR minus BECAMECEO.

### *Firm Characteristics:*

$\sigma(\text{ROA})$ : For each firm with available earnings and total assets for at least 5 years (20 quarters) over the 2001 to 2015 period, the standard deviation of the firm's ROA from the industry average ROA for the corresponding year (John et al. (2008)).  
 $\text{ROA}=(\text{NIQ}+\text{DPQ}+\text{TXTQ}+\text{XINTQ})/\text{ATQ}_{t-1}$  in Compustat.

R&D: R&D expenditure.  $\text{XRDQ}/\text{ATQ}$  in Compustat.

MB: Market to Book ratio.  $(\text{PRCC\_Q} \times \text{CSHOQ})/\text{SEQQ}$  in Compustat.

$\ln(\text{ASSETS})$ : Nature logarithm of total assets.  $\ln(\text{ATQ})$  in Compustat.

Q: Tobin's Q.  $[\text{ATQ} - \text{SEQQ} + (\text{PRCC\_Q} \times \text{CSHOQ})]/\text{ATQ}$  in Compustat

LOSS: An indicator equal to 1 if negative net income (NIQ) in given year, and 0 otherwise. NIQ in Compustat.

*Corporate Governance:*

BOARD\_SIZE: The number of directors sitting on the board. *Source:* BoardEx

BOARD\_OWNERSHIP: The number of shares hold by board member over board member shares plus outstanding shares.  $\text{NUM\_OF\_SHARE}/(\text{NUM\_OF\_SHARE} + \text{CSHO})$   
*Source:* Institutional Shareholder Services (ISS) item NUM\_OF\_SHARE and Compustat item CSHO

BOARD\_INDEPENDENCE: The fraction of independent directors on the board. *Source:* Institutional Shareholder Services (ISS) item CLASSIFICATION