Corporate Innovation and CEO Marital Status

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Abstract:

We analyze how CEO marital status and corporate innovation might interact. Firms with married CEOs are associated with higher levels of innovation, measured by patents and patent citations. Firms with married CEOs also tend to head firms with better employee relations and a better corporate culture. Results suggest married CEOs foster a positive work environment that is more conducive to innovation, consistent with other studies in the areas of marriage, pro-social behaviors, and innovation. Our findings extend the literature on CEO personal characteristics and corporate outcomes.

1. Introduction

In this study, we examine CEO marital status and its relationship with corporate innovation. A substantial body of literature shows that manager personal characteristics explain variation in firm outcomes—Shen (2021) reviews over 500 articles on CEO characteristics and firm performance. CEO personal characteristics are also associated with different attitudes toward risk, although this literature is not entirely accordant. For example, Roussanov and Savor (2014) finds that married CEOs are associated with reduced firm risk-taking in the form of lower stock return volatility and less intense capital expenditure, R&D, and acquisition activity. In contrast, Nicolosi and Yore (2015) report that a CEO getting married is associated with greater firm risk-taking. Studies on CEO marriage and firm performance measures also provide mixed results. Our study focuses on the intersection of risk-taking and performance, particularly among firms where innovation is key to their success.

At first, the link between marriage and innovation may seem tenuous. However, CEO marital status may impact innovation in different ways. One line of intuition following Roussanov and Savor (2014) is that unmarried CEOs are more apt to take risks at their firms, and if successful this would manifest itself in more innovation. Alternatively, marriage is associated

with pro-social behaviors such as care for others and valuing the common good (Irwin 2009), and we hypothesize that these values may translate to a corporate culture that is more conducive to innovation, consistent with the findings of Chen et al. (2016), who find that firms with better work environments are associated with more innovation.

We compile a panel dataset of CEO marital status, measures of innovation, and other related variables. We measure corporate innovation using the number of patents a firm obtains, and how frequently their patents are cited. We find that firms with married CEOs tend to generate more patents—and those patents are cited more frequently—than firms with non-married CEOs. These results suggest a positive relationship between CEO marriage and corporate innovation, and the results hold even after controlling for robust innovation determinants such as R&D activity, acquisitions, and capital intensity. Next, we take a closer look at why exactly CEO marital status might be associated with corporate innovation, and we find evidence consistent with the hypothesis that married CEOs promote a work environment that is conducive to innovation; find that firms with married CEOs are more likely to be ranked among the best work environments, and such firms also have more highly rated employee relations. Taken together, these results suggest that married CEOs promote innovation through pro-social behavioral tendencies, such as fostering a more positive, welcoming work environment.

We also look at how the relation between CEO marriage and corporate innovation may interact with social capital, or the concept of shared common beliefs, community trust, and norm-consistent behaviors. Higher levels of social capital may encourage innovation by the same mechanism we posit above, through the encouragement of a more welcoming work environment. Conversely, higher social capital may constrain norm-deviant behavior and risk-taking that might

be a source of creativity, disruption, and innovation. We find that the association between CEO marriage and innovation holds when we include social capital, which manifests itself as trust in others or shared common beliefs and likely affects employee relations. Similarly, the main result holds for firms in industries that are more sensitive to consumer perceptions, where employee treatment is likely better. So CEO marital status appears to explain corporate innovation much more richly than just a proxy for social capital or employee relations.

We also evaluate alternative explanations of the link between CEO marriage and corporate innovation. It is possible that innovative firms are more likely to have married CEOs for other reasons that are unobserved and unrelated to a CEO helping to foster innovation. Therefore, we conduct additional tests to evaluate robustness. We find that highly innovative firms are not more or less likely to hire married CEOs—self-selection does not seem to drive our results. In addition, in a sub-sample of firms that transition from having a single CEO to one who is married, patent generation and citation are both positive following the transition; moreover, the change in patent productivity and citation is positive and significant, further evidence of the link between CEO marital status and innovation. We also pair firms with married CEOs to those with non-married CEOs along relevant dimensions via propensity score matching. In the sub-sample of matched firms, those with married CEOs are still associated with greater innovation. Overall, this robustness evidence suggests that our results are not driven by endogeneity between firm innovation and CEO marital status.

Our study builds on the literature in three key areas. First, we provide new analysis of CEO characteristics associated with corporate innovation. To our knowledge, our study is the first in the growing body of literature on CEO characteristics that finds a link between CEO marital status and corporate innovation, which we argue drives a work environment that

encourages innovation. More broadly, our results help expand the understanding of how top executives imprint their personal characteristics upon the firms they manage. Second, we show how this imprinting likely manifests itself in more intense innovation. Married CEOs seem to build positive, more highly-rated work environments that are conducive to innovation. Finally, our results provide additional detail on how innovation and employee relations may interact. Specifically, we show that CEO marital status is important even when a work environment is likely more welcoming, either due to higher social capital or more sensitive consumer perceptions of employee treatment.

The rest of this paper is organized as follows. Section 2 reviews relevant literature. Section 3 describes the data and summary statistics. Section 4 presents main results on CEO marital status and innovation. Section 5 addresses robustness, and Section 6 concludes.

2. Literature review

Extant literature relevant to our study fits into three key areas: (i) marital status, for CEOs and also its financial associations more generally; (ii) other CEO personal characteristics and their association with firm activities; and (iii) the relation between corporate culture and innovation.

a. Marital status

Researchers have paid increasing attention to manager marital status and firm outcomes. Roussanov and Savor (2014) look at CEO marital status and risk attitudes. They find that married CEOs manage firms with lower levels of investment, such as capital expenditures, acquisitions, and R&D, and their firms also exhibit lower stock return volatility. The authors mention several possible explanations for this effect, including personal financial preferences due to different family situations, social standing issues related to marital status, and even

biological effects of marriage on how CEOs work. Hegde and Mishra (2019) study CEO marriage and corporate social responsibility (CSR). They report that firms with married CEOs score higher in the CSR areas of diversity and employee relations, arguing that a CEO valuing a commitment to a stable marriage encourages prosocial behavior at the firms they manage. Hilary, Huang, and Xu (2017) find that firms with married CEOs engage in less earnings management, arguing that married CEOs are more risk averse when it comes to financial reporting. Nicolosi (2013) examines a broad scope of CEO demographic information. Most pertinent to our study, she shows that firms with married CEOs pay more dividends and are more likely to make big dividend increases. Nicolosi and Yore (2015) study CEOs transitioning from single to married. The authors find that a CEO getting married is associated with more risk-taking broadly, in the form of mergers, joint ventures, corporate restructuring, increased capital expenditures, and higher beta and cost of equity. Their results suggest that a CEO's transition from single to married is associated with greater firm risk taking, in contrast with Roussanov and Savor (2014).

Other studies of marital status and finance are worth noting. Bertocchi, Brunetti, and Torricelli (2011) find that married individuals are more likely to invest in riskier assets. They argue that due to diversification of income sources and other social benefits, marriage represents a relatively safe asset, allowing for greater risk tolerance in other investments. Love (2010) also finds that life events such as marriage impact household investment portfolio allocations. Lu, Ray, and Teo (2016) look at marital status of hedge fund managers and find funds have significantly lower fund returns in the six months preceding and two years following a fund manager's marriage (or divorce), suggesting that marriage may consume limited attention resources.

b. CEO characteristics and firm/financial outcomes

The literature on manager characteristics besides marriage also informs our work. The importance of these personal characteristics goes back at least as far as Bertrand and Schoar (2003), who look at top managers working at multiple firms over time and find significant "manager fixed effects"—that is, adding manager fixed effects improves the explanatory power for models of investment policy, financial policy, and performance. The authors show that these effects are important for explaining firm leverage, R&D spending, and acquisition decisions—corporate decisions that seem particularly relevant to risk-taking and innovation. Chevalier and Ellison (1999) also find manager fixed effects among mutual fund managers.

Other studies examine CEO characteristics and personal experiences, and how those relate to their propensity for risk-taking. Malmendier, Tate, and Yan (2011) report significant associations between firm leverage and three CEO characteristics—overconfidence, growing up during the Great Depression, and having served in the military. They report that CEOs that are overconfident or served in World War II tend to pursue higher leverage, while CEOs growing up during the Great Depression tend to avoid debt and rely more in internal financing. Dittmar and Duchin (2016) find that CEOs who previously worked for firms that had financial troubles tended to have lower leverage, more cash, and lower levels of investment. Cain and McKeon (2016) find that CEOs with aircraft pilot licenses (their proxy for risk-taking) are associated with higher stock return volatility, more acquisitions, and higher leverage. Bernile, Bhagwat, and Rau (2017) look at CEO risk-taking and their exposure to local natural disasters during their youth. They find that CEOs who grew up experiencing high-fatality natural disasters have lower leverage and hold more cash at their firms, whereas CEOs experiencing low-fatality natural disasters tend to run firms with higher leverage and less cash. The authors argue that CEOs risk

attitudes are shaped by whether they experience the negative consequences of risk in the form of higher fatalities from the natural disasters they experienced. In contrast, CEOs may have been desensitized to risk if they experienced a natural disaster without high fatality rates.

Family relationships outside of marriage are also relevant. Cronqvist and Yu (2017) argue that CEO family environment has a systematic effect on firm outcomes and build a theoretical model where CEOs internalize the utility of their children. They find that a firm's corporate social responsibility rating is over 9% higher when a CEO has a daughter, supporting their argument that family relationships affect firm policies. Along similar lines, Dasgupta et al. (2018) find that a CEO with a daughter is more likely to have women newly join the firm's board.

Separate from family relationships, other prosocial behavioral tendencies seem to impact firm performance. Chatterjee and Hambrick (2007) find that firms with more narcissistic CEOs have more volatile (but not higher) operating performance and make more acquisitions. In contrast, Peterson, Galvin, and Lange (2012) show that when a CEOs are rated by CFOs as valuing the firm's success over their own, firms have higher operating performance. The literature on CEO family relationships and prosocial behaviors accords strongly with Wally and Baum (1994), who argue that CEOs project their own values onto the firms they manage. Taken together, all these studies support the view that CEO relationships and personal experiences are likely to manifest themselves in corporate outcomes.

c. Corporate policies and innovation

Many studies explore factors associated with corporate innovation. He and Tian (2018) review the literature on finance and innovation. Most relevant to our study, Chen et al. (2016) find firms treating their employees better are more innovative, producing more patents as well as

more valuable patents. Bostan and Mian (2019) and Islam and Zein (2020) report that CEOs with their own personal innovation experience tend to run firms that are more innovative. Both studies find that CEOs with patents in their own names are associated with more (and more valuable) patents at the firms they manage. Arena, Michelon, and Trojanowski (2018) find a positive relation between CEO hubris and environmental innovation.

Scholars have also explored manager compensation and its relationship with innovation. Baranchuk, Kieschnick, and Moussawi (2014) find that innovation is more pronounced when CEOs have more incentive compensation, more deferred compensation, and a higher "tolerance for failure" in the form of enhanced antitakeover provisions. The authors conclude that these factors allow CEOs to take short-term risks that may lead to greater future innovations. Lin et al. (2011) also find a positive relation between CEO incentive compensation and innovation. Mao and Zhang (2018) find a positive relationship between innovation and the sensitivity of manager compensation to firm risk (vega). They argue that higher vega incentivizes managers to take more risks that lead to greater innovation.

3. Data, sample, and summary statistics

The sample period for this study covers 1992 to 2020. We obtain CEO marital information following Roussanov and Savor (2014). We first get CEO information from the Execucomp database and use various databases to establish marital status, including the U.S. Securities & Exchange Commission EDGAR database and news searches. Following existing literature, we define our marriage variable according to legal marital status. It is certainly conceivable (and we argue likely) that non-traditional cohabitation arrangements involving committed relationships could follow similar associations with corporate innovation. The data does not provide the level of detail to distinguish among single, married, and other committed

relationship statuses, which is a limitation of our sample. However, we argue that this limitation would bias against finding a significant effect of CEO marital status on innovation, as a CEO in a committed long-term relationship not legally defined as marriage would be coded as single, and any enhanced association with innovation at that firm would be attributed to the non-married sub-sample.

Firm financial information comes from COMPUSTAT. Patent and citation data follow Kogan et al. (2017) and are taken from Noah Stoffman's website.[1] We use Fortune magazine's list of Top 100 Companies to Work For in each year of our sample. We also measure employee relations using the Kinder, Lydenberg, and Domini Research and Analytics, Inc. Social Investment Database (KLD). KLD contains six categories of company CSR ratings, including an index of employee relations. Social capital data are taken from Pennsylvania State University's Northeast Regional Center for Rural Development.

Table 1 presents summary statistics. It is clear that most CEOs are married: firms have married CEOs in 83% of firm-year observations, roughly in line with U.S. marriage rate of around 70% for individuals near the mean age in our sample (about 55 years). In addition, we also see the relative paucity of patents and citations among firm-year observations. The median number of patents and citations in a given firm-year is zero. However, the sample is also punctuated with pockets of intense innovation. At the 95th percentile, we see one in twenty firm-years have at least 38 patents and over 400 citations.

4. CEO marital status and firm innovation

In the previous section, we saw that the majority of CEOs appear to be married and also that the majority of firm-year observations showed no new patents or citations. We analyze this

[1] https://host.kelley.iu.edu/nstoffma/.

further in a multivariate setting, building our model around the literature on corporate innovation. We estimate linear regressions where the dependent variable is either new patents or patent citations. Because patents and citations take time and resources to develop, the dependent variables are measured in the one, two, and three years subsequent to the explanatory variables. All variables are defined in detail in the Appendix. The main variable of interest is an indicator for whether a firm's CEO is married. We also include variables measuring other CEO characteristics employed in the literature. We include the sensitivity of CEO compensation to stock price changes (delta), sensitivity to stock return volatility (vega), as well as CEO age and the tenure of their employment. We also include firm-level control variables shown in the literature to be associated with corporate innovation. Control variables include firm size, firm age, and leverage. We also include firm ROA, market-to-book ratio, asset tangibility (net property & equipment scaled by total assets), and advertising intensity. Finally, we control for institutional holdings. All model specifications include year and industry fixed effects to control for unobserved heterogeneity along those dimensions.

Table 2 presents these main regression results and shows that CEO marriage is associated with more innovation. The coefficient on the marriage indicator is positive and significant in all model specifications where the dependent variable is new patents or patent citations. This statistical significance also appears to be meaningful in terms of measurable innovation. For new patents, the coefficient on the marriage indicator is around 0.10, which (exponentiating the dependent variable) translates to an increase in innovation of 25% for a given firm-year at the 75th percentile.

Although these preliminary results are compelling, other corporate policies directly impact innovation, including R&D, acquisition activity, and the nature of the assets used in a

firm's operations (e.g., Hirshleifer, Low, and Teoh 2012, Hall and Ziedonis 2001). Consequently we add to our model R&D expense, acquisition expense, and capital expenditures, all scaled by total assets. Results are presented in Table 3 and are consistent with previous results. The coefficient on the indicator for CEO marriage is positive and significant in all models. In addition, the magnitude of the coefficient is largely unchanged after adding these controls. Coefficients on control variables are also in line with expectations. Again, it is unlikely that the legal institution of marriage imparts any innovative benefits to the firm. Instead, it is possible that a CEO committed to long-term family relationships values the development of a positive work environment that fosters innovation.

Our main hypothesis is that the positive association between CEO marriage and innovation stems from marriage being a proxy for CEO values and beliefs that are imparted onto the firms they manage. If marriage represents a person more likely to value consideration for others and pursuit of the common good, then we would expect firms run by married CEOs to be more welcoming, positive places to work. Measuring how welcoming or positive a workplace is inherently difficult, but utilize two proxies to estimate this. First, we use Fortune magazine's list of Top 100 Companies to Work For in each year of our sample, with an indicator variable that equals one if a firm makes the list in a given year. Second, we use the KLD CSR index, as described in Section 3 above. We estimate regressions with these two measures as the dependent variable. The main explanatory variable of interest is the CEO marriage indicator. We also include control variables associated with employee treatment and relations, following Cronqvist and Yu (2017). Results are presented in Table 4 and show that firms with married CEOs tend to have more positive work environments. In Column 1, the coefficient on the CEO marriage indicator is positive and significant at the 5% level, meaning that a firm with a married CEO is

significantly more likely to make the list of 100 best companies to work for in a given year. In Column 2 we see that firms with married CEOs have significantly higher values of the KLD Employee Relations index.

Our main argument is that marriage may represent a CEO's valuing stable relationships and consideration for others, which leads to a work environment more conducive to corporate innovation. Other factors may drive innovation via a similar mechanism, and we analyze two of these here. The first is social capital, or the effects conveyed by social networks, trust, and shared common beliefs that facilitate a well-functioning society. Extant literature has found a positive relationship between the level of social capital and measures CSR, including employee relations (e.g., Hoi, Wu, and Zhang 2018). It is intuitive that high levels of social capital in a community would translate to better employee relations within a firm, which could facilitate corporate innovation. However, Hoi, Wu, and Zhang (2018) summarize another possible effect of social capital explored in the literature, contending that it "facilitates norm-consistent and constrains norm-deviant behaviors of individuals and organizations." From this perspective, forces that guide individuals toward following established norms could hamper innovation. Thus, we add social capital to our model to see if the relation between CEO marriage and innovation holds. We measure social capital following Hasan et al. (2017), using county-level data from Pennsylvania State University's Northeast Regional Center for Rural Development. Column 1 of Table 5 presents these results. The coefficient on social capital is negative and significant, suggesting that the norm-consistent influence of social capital is associated with lower levels of innovation. However, the interaction term between the CEO marriage indicator and social capital is positive and significant, which shows that the effect of social capital is moderated by CEO marriage.

Furthermore, the indicator for CEO marriage remains positive and significant, consistent with earlier results.

Another factor that may influence innovation by way of a positive work environment could occur in industries that are more responsive to consumer perceptions. Lev, Petrovits, and Radhakrishnan (2010) identify industries that are particularly sensitive to consumer perceptions, where individual consumers are the main customers. These industries include consumer goods and finance. Although their study focuses on charitable giving, the authors also argue that firms in these industries may have incentives to engage in higher levels of CSR and have better employee relations in light of enhanced consumer attention to these policies. As a result, we include an indicator variable "B2C industry" for firms that operate in these consumer-sensitive industries, and we test whether the association between CEO marriage and innovation remains even in industries where a more welcoming work environment is more likely. Column 2 of Table 5 shows these results. The B2C industry indicator is not statistically significant, showing no association with corporate innovation. However, the interaction between the CEO marriage indicator and the B2C industry indicator is positive and significant, suggesting that even among firms operating in consumer-sensitive industries, CEO marriage is associated with higher levels of new patents and citations.

5. Robustness

It is possible that the evidence presented above can be explained by other factors besides our discussion of CEO marital status. In order to evaluate these possible alternative explanations, we conduct various robustness tests. First, may be that our results are driven by the distribution of CEO marital status across high- and low-innovative firms. If unobserved factors drive married CEOs to select into more innovative firms, we should see a higher proportion of married CEOs

in highly innovative firms. We investigate this on a univariate basis by splitting the sample in to firms with above and below median patent activity. We consider only firms with at least one patent. Panel A of Table 6 shows that self-selection of married CEOs into more innovative firms does not appear to be driving the results. Firms in the high- and low-innovative sub-samples do not have a significantly different proportion of married CEOs.

Firms with CEO turnover provide another opportunity to evaluate robustness. We look at the sub-sample of firms that change CEOs and create an indicator variable for firms that replace a single CEO with one who is married. We then run our main regression with this indicator. Results are in Panel B of Table 6 and show that if a firm replaces a single CEO with one who is married during year *t*, then the firm has higher levels of innovation measured by patents and citations in year *t+1*. Furthermore, the change in patents and citations in year *t+1* is also positive and significant—this result is further support for the argument that married CEOs are associated with increased levels of corporate innovation.

It is also possible that the relation between CEO marriage and firm innovation is endogenously determined. In other words, unobserved factors associated with a firm having a married CEO could also be associated with greater corporate innovation. In order to examine this possibility, we use propensity scoring to match firms with married CEOs to those whose CEOs are not married. Our methodology has been broadly employed in existing literature to address potential endogeneity (e.g., Drucker and Puri 2005, Aggarwal et al. 2009, Minton, Taillard, and Williamson 2014). Panel C of Table 6 summarizes the dimensions used to match firms, which include the main explanatory variables shown in the literature to influence corporate innovation. As shown in the table, the matched sample shows no significant differences between firms with married CEOs and their matched non-married counterparts. We then run our main regression

models using the matched sample. Results are presented in Panel D of Table 6 and are consistent with the full-sample results. The positive relationship between the CEO marriage indicator and both patents and citations remains statistically significant. These propensity score matching results suggest that endogeneity is not behind this positive relation.

6. Conclusion

The literature on how CEO characteristics affect corporate outcomes is far from complete. We attempt to contribute by examining CEO marital status and corporate innovation. Firms with married CEOs tend to generate both more patents and more patent citations than firms with single CEOs. Such firms also are more likely to have welcoming work environments and better employee relations. To be sure, the legal institution of marriage alone does not cause these results. Rather, the evidence is consistent with marriage representing a CEO's commitment to prosocial behavior, which manifests itself in a better work environment more conducive to innovation. Results are consistent for firms that transition from a single CEO to one who is married, and further tests show no evidence that endogeneity is driving our main findings.

Still, there is much more left to explore in the area of CEO marriage. A binary indicator for legal marital status is an inexact proxy for innovation-encouraging behavior. Richer data on CEO attitudes toward family structures, employee relations, and risk-taking could provide further insight into why some firms innovate more than others and shed more light on what role the CEO has in guiding this innovation. Surely there are personal characteristics beyond marriage influencing firm innovation. Finally, our results open avenues for ethical discussion about firm hiring practices. We unequivocally oppose all forms of illegal hiring discrimination, including that based on marital status. Nevertheless, the robustness of the results raises

challenging issues for firms in industries that benefit from patents and citations. It is because of these issues that more research in this strand of literature is needed.

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Table 1. Summary statistics

This table presents summary statistics for various firm-year-level variables. All continuous variables are winsorized at the 1% and 99% levels. All variables are described in Appendix.

	N	*Mean*	*Std. Dev*	*Q5*	*Q25*	*Median*	*Q75*	*Q95*
Log Patent	17,659	0.627	1.279	0	0	0	0.693	3.664
Log Citation	17,659	1.105	2.104	0	0	0	1.099	6.038
Married CEO	17,659	0.834	0.372	0	1	1	1	1
Log Assets	17,659	7.117	1.558	4.809	5.985	6.953	8.117	9.995
Leverage	17,659	0.232	0.197	0	0.061	0.224	0.350	0.545
ROA	17,659	0.137	0.130	-0.006	0.093	0.137	0.192	0.298
Market-to-Book	17,659	1.724	1.732	0.555	0.849	1.238	1.977	4.524
Advertising Intensity	17,659	0.013	0.233	0	0	0	0.006	0.056
Tangibility	17,659	0.327	0.234	0.041	0.137	0.265	0.490	0.787
Log Firm Age	17,659	3.079	0.693	1.946	2.565	3.135	3.738	4.007
Log Delta_CEO	17,659	5.001	1.623	2.315	3.966	5.016	6.037	7.614
Log Vega_CEO	17,659	3.515	1.655	0	2.545	3.648	4.642	6.039
Log CEO Age	17,659	4.026	0.135	3.784	3.951	4.043	4.111	4.234
Log CEO Tenure	17,659	1.588	0.539	0.693	1.099	1.609	1.946	2.485
Inst. Holdings	17,659	0.501	2.132	0	0	0.561	0.766	0.960
R&D Intensity	16,492	0.032	0.074	0	0	0	0.035	0.147
Acquisitions	16,492	0.029	0.068	0	0	0	0.025	0.165
Capital Intensity	16,492	0.064	0.058	0.010	0.027	0.047	0.080	0.179
Top 100 Firm for Working	11,900	0.019	0.139	0	0	0	0	0
KLD_Employee Relations	9,930	-0.069	0.970	-2	-1	0	0	2
Social Capital	8,929	-0.399	0.889	-1.937	-1.034	-0.351	0.157	0.964
B2C Industry	17,631	0.263	0.440	0	0	0	1	1

Table 2. CEO marital status and innovation

This table presents results from a regression analysis of proxies for corporate innovation on the marital status of the CEO. *Log Patent* is the natural logarithm of one plus the firm's total number of patents filed for the fiscal year. *Log Citation* is the natural logarithm of one plus the firm's total number of citations for the fiscal year. *Married CEO* is an Indicator variable that equals one if the CEO is legally married, zero otherwise. All models include industry (SIC 2) and year fixed effects, and all control variables are described in Appendix. Standard errors are robust and clustered by firm and *t*-statistics are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

Variables	*Dependent Variable*					
	Log Patent$_{t+1}$	*Log Patent$_{t+2}$*	*Log Patent$_{t+3}$*	*Log Citation$_{t+1}$*	*Log Citation$_{t+2}$*	*Log Citation$_{t+3}$*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Married CEO	0.093**	0.101***	0.110***	0.148**	0.167***	0.178***
	(2.55)	(2.81)	(3.23)	(2.52)	(2.96)	(3.31)
Log Assets	0.335***	0.307***	0.272***	0.474***	0.431***	0.376***
	(15.09)	(14.52)	(13.60)	(15.52)	(14.86)	(13.81)
Leverage	-0.593***	-0.561***	-0.505***	-1.005***	-0.924***	-0.817***
	(-7.21)	(-6.97)	(-6.36)	(-7.73)	(-7.41)	(-6.69)
ROA	-0.107	0.016	0.177	-0.143	0.101	0.384**
	(-1.00)	(0.15)	(1.61)	(-0.75)	(0.56)	(2.11)
Market-to-Book	0.097***	0.092***	0.084***	0.172***	0.153***	0.132***
	(9.18)	(8.29)	(8.13)	(10.63)	(8.86)	(8.32)
Advertising Intensity	0.026	0.030	0.047*	0.031	0.042	0.085**
	(0.84)	(1.01)	(1.80)	(0.63)	(0.92)	(2.13)
Tangibility	0.012	0.020	0.014	-0.103	-0.092	-0.100
	(0.08)	(0.14)	(0.10)	(-0.43)	(-0.40)	(-0.47)
Log Firm Age	0.065**	0.056*	0.052*	0.075	0.067	0.067
	(1.97)	(1.80)	(1.77)	(1.49)	(1.43)	(1.51)
Log Delta_CEO	-0.032***	-0.028**	-0.023**	-0.047**	-0.044**	-0.036**
	(-2.78)	(-2.45)	(-2.06)	(-2.47)	(-2.34)	(-1.98)
Log Vega_CEO	0.031**	0.025**	0.021*	0.055***	0.046**	0.038**
	(2.53)	(2.05)	(1.69)	(2.76)	(2.36)	(1.99)
Log CEO Age	-0.165	-0.137	-0.140	-0.285	-0.234	-0.254
	(-1.28)	(-1.07)	(-1.12)	(-1.42)	(-1.20)	(-1.34)
Log CEO Tenure	-0.019	-0.006	-0.004	-0.017	0.005	0.008
	(-0.74)	(-0.25)	(-0.17)	(-0.43)	(0.14)	(0.21)
Inst. Holdings	0.004	0.004	0.004	0.007	0.007	0.007
	(1.26)	(1.28)	(1.25)	(1.20)	(1.21)	(1.19)
Constant	-1.147*	-2.423***	-2.242***	-0.625	-3.232***	-2.946***
	(-1.87)	(-4.40)	(-4.26)	(-0.60)	(-3.66)	(-3.62)
Industry F.E.	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year F.E.	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	17,659	16,783	15,955	17,659	16,783	15,955
R-squared	0.4244	0.4093	0.3940	0.4329	0.4217	0.4102

Table 3. CEO marriage and other policies associated with innovation

This table presents results from a regression analysis of proxies for corporate innovation on the marital status of the CEO. *Log Patent* is the natural logarithm of one plus the firm's total number of patents filed for the fiscal year. *Log Citation* is the natural logarithm of one plus the firm's total number of citations for the fiscal year. *Married CEO* is an Indicator variable that equals one if the CEO is legally married, zero otherwise. All models include industry (SIC 2) and year fixed effects, and all control variables are described in Appendix. Standard errors are robust and clustered by firm and t-statistics are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

Variables	*Dependent Variable*							
	Log Patent$_{t+1}$	*Log Patent$_{t+1}$*	*Log Patent$_{t+1}$*	*Log Patent$_{t+1}$*	*Log Citation$_{t+1}$*	*Log Citation$_{t+1}$*	*Log Citation$_{t+1}$*	*Log Citation$_{t+1}$*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Married CEO	0.088**	0.091**	0.095***	0.086**	0.140**	0.145**	0.151***	0.135**
	(2.49)	(2.49)	(2.61)	(2.41)	(2.46)	(2.48)	(2.60)	(2.38)
R&D Intensity	3.032***			2.824***	5.110***			4.769***
	(7.77)			(7.29)	(7.83)			(7.40)
Acquisitions		-0.468***		-0.390***		-0.803***		-0.670***
		(-3.46)		(-2.90)		(-3.68)		(-3.09)
Capital Intensity			1.753***	1.380***			2.862***	2.285***
			(5.54)	(4.59)			(5.64)	(4.68)
Log Assets	0.353***	0.322***	0.341***	0.343***	0.504***	0.456***	0.485***	0.493***
	(15.82)	(14.43)	(15.14)	(15.11)	(16.50)	(14.82)	(15.70)	(15.83)
Leverage	-0.477***	-0.548***	-0.560***	-0.416***	-0.809***	-0.925***	-0.951***	-0.705***
	(-5.52)	(-6.65)	(-6.91)	(-4.91)	(-5.93)	(-7.11)	(-7.38)	(-5.26)
ROA	0.764***	-0.111	-0.140	0.697***	1.325***	-0.141	-0.197	1.224***
	(5.16)	(-1.04)	(-1.33)	(4.85)	(5.48)	(-0.75)	(-1.06)	(5.21)
Market-to-Book	0.065***	0.092***	0.094***	0.059***	0.118***	0.162***	0.167***	0.106***
	(6.34)	(8.60)	(8.93)	(5.87)	(7.35)	(10.05)	(10.36)	(6.87)
Advertising Intensity	0.052	0.024	0.024	0.046	0.074	0.027	0.028	0.065
	(1.57)	(0.80)	(0.80)	(1.51)	(1.40)	(0.59)	(0.58)	(1.36)
Tangibility	-0.002	-0.020	-0.310**	-0.284*	-0.126	-0.183	-0.627***	-0.620**
	(-0.01)	(-0.13)	(-2.04)	(-1.88)	(-0.54)	(-0.75)	(-2.58)	(-2.55)
Log Firm Age	0.073**	0.049	0.074**	0.067**	0.090*	0.053	0.091*	0.081
	(2.28)	(1.51)	(2.25)	(2.05)	(1.82)	(1.04)	(1.80)	(1.62)
Log Delta_CEO	-0.030***	-0.032***	-0.037***	-0.035***	-0.043**	-0.045**	-0.055***	-0.050***

	(-2.64)	(-2.81)	(-3.21)	(-3.09)	(-2.33)	(-2.39)	(-2.90)	(-2.67)
Log Vega_CEO	0.015	0.035***	0.030**	0.020*	0.029	0.061***	0.053***	0.035*
	(1.28)	(2.91)	(2.43)	(1.66)	(1.46)	(3.08)	(2.66)	(1.79)
Log CEO Age	-0.126	-0.132	-0.140	-0.078	-0.220	-0.225	-0.249	-0.139
	(-1.00)	(-1.06)	(-1.09)	(-0.65)	(-1.12)	(-1.15)	(-1.24)	(-0.73)
Log CEO Tenure	-0.030	-0.022	-0.017	-0.028	-0.034	-0.022	-0.014	-0.034
	(-1.16)	(-0.84)	(-0.67)	(-1.11)	(-0.89)	(-0.56)	(-0.36)	(-0.87)
Inst. Holdings	0.004	0.004	0.004	0.004*	0.008	0.007	0.007	0.008
	(1.62)	(1.43)	(1.28)	(1.77)	(1.49)	(1.36)	(1.21)	(1.65)
Constant	-1.630***	-1.179**	-2.469***	-2.756***	-1.440	-0.703	-3.204***	-3.754***
	(-2.74)	(-2.03)	(-4.26)	(-5.13)	(-1.44)	(-0.70)	(-3.27)	(-4.13)
Industry F.E.	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year F.E.	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	17,659	16,600	17,529	16,492	17,659	16,600	17,529	16,492
R-squared	0.4374	0.4129	0.4261	0.4261	0.4467	0.4221	0.4348	0.4363

Table 4. Quality of work environment and employee relations

This table presents results from a regression analysis. *Top 100 Firm for Working* is an indicator variable that equals one if the firm's name is appeared in the list of the "100 Best Companies to Work for in America" published in Fortune magazine each year. *KLD_Employee Relations* is a KLD CSR index on employee relations. *Married CEO* is an Indicator variable that equals one if the CEO is legally married, zero otherwise. All models include industry (SIC 2) and year fixed effects, and all control variables are described in Appendix. Standard errors are robust and clustered by firm and *t*-statistics are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

	Dependent Variable	
	Top 100 Firm for Working	*KLD_Employee Relations*
Variables	*(1)*	*(2)*
Married CEO	0.852**	0.051**
	(2.09)	(1.98)
Other Controls	*Yes*	*Yes*
Industry F.E.	*Yes*	*Yes*
Year F.E.	*Yes*	*Yes*
Observations	11,900	9,930
R-squared	0.2610	0.1425

Panel B	*Dependent Variable*				
	Log Vega_CEO	*Log Vega_Rank2*	*Log Vega_Rank3*	*Log Vega_Rank4*	*Log Vega_Rank5*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Married CEO	0.172***	0.057*	0.077*	0.072*	0.050*
	(3.42)	(1.73)	(1.92)	(1.85)	(1.91)
Other Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Industry F.E.	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Year F.E.	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Observations	18,399	18,203	18,143	17,731	16,669
R-squared	0.4057	0.3985	0.4325	0.4449	0.4401

Table 5. Social capital & B2C industry

This table presents results from a regression analysis of proxies for corporate innovation on the marital status of the CEO. *Log Patent* is the natural logarithm of one plus the firm's total number of patents filed for the fiscal year. *Log Citation* is the natural logarithm of one plus the firm's total number of citations for the fiscal year. *Married CEO* is an Indicator variable that equals one if the CEO is legally married, zero otherwise. *Social Capital* is constructed following Hasan, Hoi, Wu, and Zhang (2017) and measures social capital at the county level. *B2C Industry* is an Indicator variable that equals one if the firm is in the following four-digit SIC groups: 2000-2399, 2500-2599, 2700-2799, 2830-2869, 3000-3219, 3420-3429, 3523, 3600-3669, 3700-3719, 3751, 3850-3879, 3880-3999, and zero otherwise. All models include industry (SIC 2) and year fixed effects, and all control variables are described in Appendix. Standard errors are robust and clustered by firm and *t*-statistics are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively.

Variables	*Dependent Variable*			
	Log Patent$_{t+1}$ (1)	*Log Citation$_{t+1}$* (2)	*Log Patent$_{t+1}$* (3)	*Log Citation$_{t+1}$* (4)
Social Capital	-0.041**	-0.095***		
	(-2.06)	(-2.63)		
Married CEO X Social Capital	0.071***	0.130***		
	(3.05)	(3.17)		
B2C Industry			-0.171	-0.213
			(-1.31)	(-1.08)
Married CEO X B2C Industry			0.280***	0.407***
			(2.84)	(2.73)
Married CEO	0.169***	0.269***	0.017	0.037
	(6.82)	(6.16)	(0.45)	(0.58)
Other Controls	*Yes*	*Yes*	*Yes*	*Yes*
Industry F.E.	*Yes*	*Yes*	*Yes*	*Yes*
Year F.E.	*Yes*	*Yes*	*Yes*	*Yes*
Observations	8,929	8,929	17,631	17,631
R-squared	0.4105	0.4222	0.4258	0.4340

Table 6. Endogeneity tests

This table presents results from various endogeneity tests. Panel A shows the results of univariate analysis of marital status of newly hired CEOs of firms that actively engage in corporate innovation (Log Patent > Median) relative to firms that do not (Log Patent < Median). We only consider sample firms that have number of patents greater than zero. *Log Patent* is the natural logarithm of one plus the firm's total number of patents filed for the fiscal year. *Log Citation* is the natural logarithm of one plus the firm's total number of citations for the fiscal year. *Married CEO* is an Indicator variable that equals one if the CEO is legally married, zero otherwise. Panel B shows the effect of CEO transition on corporate innovation. *Single CEO to Married CEO* is an indicator variable that equals one if newly hired CEO is married and the former CEO is single, and zero if both newly hired CEO and former CEO are both single. Panel D reports OLS regression results using the PSM sample. We first estimate a logit model where the dependent variable is *Single CEO* (i.e., *Married CEO* = 0) and control variables are the same as those in Table 2. We also include the percent of outside directors. We then calculate a propensity score for the likelihood of each firm having a single CEO and create a nearest-neighbor matched group from firms with married CEOs by employing 0.2 caliper width. The test of mean difference in key variables used to estimate propensity scores between these matched groups are reported in Panel C. In Panel B and D, all models include industry (SIC 2) and year fixed effects, and

Panel A: Marital Status of Newly Hired CEOs

Variable	*High Innovative Firms (Log Patent > Median)*	*Low Innovative Firms (Log Patent < Median)*	*Diff (t-stat)*
Married CEO	0.828	0.784	0.044 (1.23)

Panel B: Transition

Variables	*Log Patent$_{t+1}$* *(1)*	*Log Citation$_{t+1}$* *(2)*	*ΔLog Patent$_{t\ to\ t+1}$* *(3)*	*ΔLog Citation$_{t\ to\ t+1}$* *(4)*
Single CEO to Married CEO	0.107**	0.152**	0.032**	0.063*
	(2.03)	(1.96)	(1.99)	(1.87)
Other Controls	*Yes*	*Yes*	*Yes*	*Yes*
Industry F.E.	*Yes*	*Yes*	*Yes*	*Yes*
Year F.E.	*Yes*	*Yes*	*Yes*	*Yes*
Observations	2,441	2,441	2,441	2,441
R-squared	0.3510	0.3644	0.0689	0.0681

Panel C: Covariate Test (Post PSM match)			
Variables	*Married CEO*	*Single CEO*	*Diff (t-stat)*
Log Assets	6.683	6.678	0.005 (0.11)
Leverage	0.201	0.203	-0.002 (-0.38)
ROA	0.131	0.130	0.001 (-0.02)
Market-to-Book	1.831	1.825	0.006 (0.11)
Advertising Intensity	0.009	0.011	-0.002 (-1.29)
Tangibility	0.273	0.278	-0.005 (-0.71)
Log Firm Age	2.938	2.948	-0.010 (-0.46)
Inst. Holdings	0.592	0.585	0.007 (0.58)
Outside Directors	0.653	0.649	0.004 (0.59)

Panel D: PSM Marched Sample		
Variables	*Log Patent$_{t+1}$ (1)*	*Log Citation$_{t+1}$ (2)*
Married CEO	0.125***	0.159**
	(2.98)	(2.50)
Other Controls	*Yes*	*Yes*
Industry F.E.	*Yes*	*Yes*
Year F.E.	*Yes*	*Yes*
Observations	3,113	3,113
R-squared	0.3362	0.3564

Appendix

Married CEO	Indicator variable that equals one if the CEO is legally married, zero otherwise.
Log Patent	Log (1+firm's total number of patents filed for the fiscal year)
Log Citation	Log (1+firm's total number of citations for the fiscal year)
Log Delta_CEO	Log (1+Change in the value of the CEO's option grant in a year and any accumulated option holdings for a 0.01 change of standard deviation of the stock return)
Log Delta_Rank2	Log (1+Change in the value of the second highest paid (tdc1) non-CEO executives 's option grant in a year and any accumulated option holdings for a 0.01 change of standard deviation of the stock return)
Log Delta_Rank3	Log (1+Change in the value of the third highest paid (tdc1) non-CEO executive's option grant in a year and any accumulated option holdings for a 0.01 change of standard deviation of the stock return)
Log Delta_Rank4	Log (1+Change in the value of the fourth highest paid (tdc1) non-CEO executive's option grant in a year and any accumulated option holdings for a 0.01 change of standard deviation of the stock return)
Log Delta_Rank5	Log (1+Change in the value of the fifth highest paid (tdc1) non-CEO executive's option grant in a year and any accumulated option holdings for a 0.01 change of standard deviation of the stock return)
Log Vega_CEO	Log (1+Change in the CEO's wealth in a year for 0.01 change of standard deviation of the stock return)
Log Vega_Rank2	Log (1+Change in the second highest paid (tdc1) non-CEO executive's wealth in a year for 0.01 change of standard deviation of the stock return)
Log Vega_Rank3	Log (1+Change in the third highest paid (tdc1) non-CEO executive's wealth in a year for 0.01 change of standard deviation of the stock return)
Log Vega_Rank4	Log (1+Change in the fourth highest paid (tdc1) non-CEO executive's wealth in a year for 0.01 change of standard deviation of the stock return)
Log Vega_Rank5	Log (1+Change in the fifth highest paid (tdc1) non-CEO executive's wealth in a year for 0.01 change of standard deviation of the stock return)
Log CEO Age	Log (1+Log CEO Age)
Log CEO Tenure	Log (1+Number of years a CEO has served in the firm)
Log Assets	Log (Firm's total assets)
ROA	Ratio of earnings before interests, taxes, and depreciation to the firm's total assets
Leverage	Ratio of long-term debt plus debt in current liabilities to total Log Assets
Market to Book	Ratio of total Log Assets plus market value of equity minus book value of equity to the firm's total assets
Log Firm Age	Log (1+Number of years the firm appears in Compustat database)
R&D Intensity	Ratio of R&D expenses to total assets

Acquisitions	Ratio of Acquisition expenses to total assets
Capital Intensity	Ratio of capital expenses to total assets
Advertising Intensity	Ratio of advertising expenses to total assets
Tangibility	Ratio of net property, plant, and investment to total assets
Institutional Holdings	Percent ownership from institutions
Top 100 Firm for Working	Indicator variable that equals one if the firm's name is appeared in the list of the "100 Best Companies to Work for in America" published in Fortune magazine each year.
KLD_Employee Relations	KLD CSR index on employee relations
Social Capital	The construction of the variable follows Hasan, Hoi, Wu, and Zhang (2017) and measures social capital at the county level
B2C Industry	Indicator variable that equals one if the firm is in the following four-digit SIC groups: 2000-2399, 2500-2599, 2700-2799, 2830-2869, 3000-3219, 3420-3429, 3523, 3600-3669, 3700-3719, 3751, 3850-3879, 3880-3999, and zero otherwise.