Journal of Banking and Finance 125 (2021) 106070

Contents lists available at ScienceDirect

Journal of Banking and Finance

journal homepage: www.elsevier.com/locate/jbf

Top executive gender, board gender diversity, and financing decisions: Evidence from debt structure choice

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ARTICLE INFO

Article history:
Received 8 September 2020
Accepted 29 January 2021
Available online 4 February 2021

JEL classification:
G32
G41

Keywords:
Debt maturity structure
Top executive gender
Gender-based financial decision-making

ABSTRACT

Gender diversity in the C-suite and the boardroom have taken on greater importance in recent years. We establish a gender-based behavioral dimension to corporate debt maturity choice. Female executives choose a significantly shorter debt maturity structure compared to their male counterparts. However, their influence on debt maturity is inversely related to the proportion of their incentive compensation. Additionally, we find a substitution effect that moderates the relationship between executive gender and debt maturity structure as board gender diversity increases. Further, we find that firms led by females benefit from higher corporate credit ratings thus showing that the greater ethical sensitivities of female top executives compensate for the refinancing risk commonly associated with shorter-term debt. Transitions from male-to-female executive(s) result in shortening of debt maturity over the post-transition period. Our results survive a battery of robustness tests, including endogeneity, and contribute at the confluence of gender-based governance and corporate financial decision-making literatures.

1. Introduction

Financing decisions occupy an important place in the corporate finance literature. Specifically, identifying capital structure determinants is central to this body of research, which encompasses not only firms' choice of leverage but also their debt maturity structure. However, despite significant research on the determinants of debt maturity choice, as well as the growing focus on gender-based behavioral differences on financial decision-making, the influence of female top executives, chief executive officer (CEO) and chief financial officer (CFO), on corporate debt maturity choice remains unaddressed. Further, given the increasing importance of socially-conscious corporate decision-making, such as gender diversity, both in the C-suite and the boardroom, it is important to understand how such policies interact to affect corporate financing decisions. This study attempts to fill the gap and adds a new dimension to the corporate financing choice literature.

Early debt maturity structure research focuses on the impact of industry- and firm-level determinants on the trade-off between short-term and long-term debt (e.g., Myers, 1977; Flannery, 1986; Barclay and Smith, 1995; Stohs and Mauer, 1996; Johnson, 2003). More recent studies examine the role debt maturity structure plays in reducing agency conflicts by linking it to financial and behavioral characteristics of managers, such as ownership (Datta et al., 2005), compensation (Brockman et al., 2010), and overconfidence (Huang et al., 2016).

The growing presence of women in the U.S. corporate upper echelon has prompted another emerging body of research on how gender-based differences influence corporate decision-making.[3] Graham et al. (2013) present evidence using survey data that CEOs' behavioral traits, such as risk-tolerance and optimism, have a significant effect on corporate decisions by specifically focusing on capital structure and acquisition decisions. Because gender is a major observable characteristic of top managers with certain documented behavioral differences, it is expected to influence corporate debt maturity choice. Prior research documents that executive gender influences investment decisions

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[1] This paper was started while Datta was a Visiting Scholar (Finance) at Stephen M. Ross School of Business, University of Michigan.

[2] We thank Mara Faccio, Mai Iskandar-Datta, Anna Maria Cristina Menichini, Marco Pagano, and Toni Whited for helpful comments and discussions.

[3] According to the recently published white paper by *McKinsey and Company* and *Lean In* titled "Women in the workplace 2019," the presence of women in the C-suite has increased 24% between 2015 and 2019. Hence, it is ever more important to explore the effect of gender-based financial decision-making in U.S. corporations.

https://doi.org/10.1016/j.jbankfin.2021.106070
0378-4266/

(Huang and Kisgen, 2013), corporate risk-taking and capital allocation (Faccio et al., 2016), firm performance (Amore et al., 2014; Doan and Iskandar-Datta, 2018), financial reporting quality (Barua et al., 2010; Francis et al., 2015; Ho et al., 2015), and bank loan contracting (Francis et al., 2013). Given these gender-based behavioral/psychological differences in terms of overconfidence, risk-tolerance, and/or ethical sensitivities, we expect that top executive gender should play a significant role in determining corporate debt maturity structures. Further, we anticipate the relationship between female top executives and use of short-term debt to vary in the cross-section, when incentive compensation mechanisms that align shareholders' with managers' interests become available (i.e., equity-based compensation plans) or when other competing forms of monitoring are in place (i.e., board gender diversity). Finally, given their innate characteristics, we hypothesize that female executives may play a fundamental role on firms' access to capital markets.

Following the above considerations, in this paper, we seek to address the following questions: What is the influence of top executive gender on corporate debt maturity choice? Do female executives choose shorter (or longer) debt maturity than their male counterparts? What is the impact of a male-to-female executive transition on corporate debt maturity structure? What role does incentive compensation play in the relation between gender and debt maturity choice? What is the role of board gender diversity on the relation between top executive gender and debt maturity choice? Is the pricing of securities, as proxied by corporate credit ratings, affected by top executive gender?

Using a sample of 14,461 firm-year observations during the period 1992–2014, we study the causal link between executive gender and corporate debt maturity. To address the simultaneous choice of leverage and debt maturity, we adopt the two-stage least squares regression method (Barclay et al., 2003; Johnson, 2003; Datta et al., 2005). Our analysis shows that female executives are more aligned with shareholders' interest and choose a larger proportion of short-maturity debt after controlling for other established determinants of debt maturity structure. The economic implication of this result is that firms with female executives increase the proportion of debt maturing within three or five years by 3.64% and 4.53%, respectively. Given that the average proportions of debt maturing within three or five years in our sample are 26.29% and 47.04%, our results suggest that firms with female executives increase the use of short-maturity debt by 13.85% and 9.63%, respectively, relative to the average.

Our cross-sectional tests further deepen the analysis of the relationship between top executive gender and debt maturity structure choice by showing that female executives tend to choose debt of even shorter maturity as the proportion of incentive compensation in their pay packages increases. Further, we find evidence of a substitution effect as the influence of top female executives on the use of shorter term-debt dampens with increasing board gender diversity (i.e., a higher fraction of female directors on the board). Finally, we find that firms led by females benefit from higher corporate credit ratings thus showing that the greater ethical sensitivities of female top executives positively affect the pricing of securities and compensate for the refinancing risk commonly associated with shorter-term debt.

The relation between female executive gender and short-term debt may be endogenous. We address the endogeneity concerns by performing three different robustness tests. First, following Faccio et al. (2016), we apply Heckman's (1979) two-stage model to deal with the potential selection bias. Second, we report results for the propensity score matching approach to compare the maturity structure of debt across pairs of female firm-years and matched male firm-years with almost identical observables. Finally, we conduct a placebo analysis by randomly assigning the gender of the top executives and then examining the effect on debt maturity. Our results are robust to all these identification strategies.

Our study makes three primary contributions to the literature. First, it contributes to the growing literature on gender-based differences in accounting and financial decision-making and corresponding outcomes in U.S. firms. Second, it extends the literatures on debt maturity structure at the individual decision-maker level and bridges the gap in this area between behavioral and traditional finance literatures. Third, we add a new dimension to the capital structure literature by establishing the causal effect of top executive gender on debt maturity choice in the presence of socially responsible policies, such as gender diversity in the boardroom.

The remainder of the paper is organized as follows. We discuss the main hypotheses in Section 2. In Section 3, we detail the sample selection process. In Section 4, we describe our baseline and cross-sectional results. In Section 5, we test the robustness of our findings with alternate identification strategies. Section 6 concludes.

2. Theory and hypothesis development

2.1. Theory

Traditional finance theory postulates that firms attempt to achieve an optimal debt maturity structure by trading-off between a number of factors, such as the liquidity/refinancing risk, mispricing risk, as well as the underinvestment and overinvestment problems. However, the choice between long-term and short-term debt is not only one of the key devices of corporate financial policy but also a powerful monitoring mechanism to alleviate manager–shareholder agency conflicts. Particularly, as short-maturity debt comes up for frequent renewal, it has the benefit of reducing the agency costs arising from managerial discretion by subjecting managers to more frequent external market monitoring (Rajan and Winton, 1995; Stulz, 2001). However, given the separation of ownership and control, Datta et al. (2005) argue that it is not realistic to expect managers to voluntarily choose the optimal debt maturity structure and self-impose monitoring. Therefore, self-serving managers would have an incentive to insulate themselves from more frequent monitoring by choosing longer-term debt, thereby deviating from the optimal debt maturity choice at the expense of shareholders.

The gender-ethics framework posits that women are more concerned about ethical issues, such as disclosure, integrity, and conflict of interest, and pursue higher moral standards compared to men (Larkin, 2000; Ho et al., 2015). Accordingly, female executives are expected to extract less in private benefits than their male counterparts. Hence, in the context of debt maturity structure decisions, female executives are expected to have a lower preference for sub-optimal longer maturity debt to avoid market scrutiny than male executives. Therefore, female executives are expected to be associated with less debt-related agency problems and choose shorter-maturity debt than their male counterparts.

However, providing tension to the above line of reasoning is the argument that managerial risk-aversion and overconfidence would also impact debt maturity choice. Particularly, Brockman et al. (2010) posit that short-maturity debt is more costly to risk-averse executives for two reasons. First, the costs of liquidity/refinancing risk are higher for short-term debt. Second, risk-averse executives should have a preference for less monitoring but short-term debt is subject to more frequent external monitoring via refinancing. Since the risk-aversion perspective posits that female executives are likely to exhibit greater risk-avoidance and make safer financial and investment decisions than their male counterparts (Levin et al., 1988; Bajtelsmit and Van Derhei, 1997; Hinz et al., 1997; Jianakoplos and Bernasek, 1998; Sunden and

Surette, 1998), female executives will choose longer debt maturity structure than male executives.

On the other hand, overconfidence is expected to have a positive relation to short-term debt for two reasons. First, overconfident managers overestimate the probability of future success of their firms and have a strong belief that their securities are underpriced (Malmendier and Tate, 2008; Hirshleifer et al., 2012; Ben-David et al., 2013). Since long-term debt can potentially be more mispriced than short-term debt because its price is more sensitive to changes in firm value than that of short-term debt (Flannery, 1986; Kale and Noe, 1990), overconfident managers would prefer shorter-term debt. It could also be their way to signal their true quality to the market. Second, overconfident managers overestimate their ability to refinance short-term debt with lower costs and avoid inefficient liquidation of the firm (e.g., Sharpe, 1991; Diamond, 1991; Diamond, 1993) or the sale of important assets at fire-sale prices (Brunnermeier and Yogo, 2009; Choi et al., 2017). Landier and Thesmar (2009) examine French start-up firms and document that overconfident (optimistic) entrepreneurs make more use of short-term debt. Consistent with this notion, Huang et al. (2016), using a sample of public U.S. firms, find that firms with overconfident CEOs tend to adopt a shorter debt maturity structure.

Prior literature documents that while both women and men exhibit overconfidence, men are likely to be more overconfident than women (Barber and Odean, 2001a), and this gender-based difference still holds for people at the managerial level (Huang and Kisgen, 2013; Doan and Iskandar-Datta, 2018). Based on this argument, female managers will also be expected to use relatively more long-term debt than their male counterparts.[4]

2.2. Executive gender, ethical sensitivities, and debt maturity structure

Women typically exhibit ethical character traits, such as interpersonal strengths (Linley et al., 2007), score better on fairness issues (Peterson and Seligman, 2003), empathy and integrity (Chun, 2005), and tend to be more trustworthy and more compliant with rules and regulations (Baldry, 1987; Barnett et al., 1994; Fallan, 1999; Beu et al., 2003). It is further argued that women do not only adopt higher ethical standards but also apply a different moral reasoning process than men (French and Weis, 2000).

There is ample evidence to suggest that, in general, women demonstrate greater moral and ethical sensitivities. Survey studies of auditors also reveal that female auditors are at a significantly higher average level of moral development (Bernardi and Arnold, 1997), are more conservative in their ethical view-points (Larkin, 2000), and exert more effort in analytical procedures than male auditors (O'Donnell and Johnson, 2001). These results are corroborated by studies examining other professions, such as sales people (Dawson, 1997) and accountants (Pierce and Sweeney, 2010), as well by other related works investigating the ethical attitude of male versus female students (Albaum and Peterson, 2006). If females are indeed generally more ethical than males, then we expect the top female executives to be associated with intrinsically greater interest alignment with shareholders in terms of debt maturity choice.

Top managers have discretion not only over their firm's leverage choice but also over debt maturity when issuing debt (Datta et al., 2005). Given the separation of ownership and control, the self-interested manager's debt maturity choice could differ from what is optimal for the shareholder. Particularly, since long-term debt protects managers from external market monitoring for a longer period of time than short-term debt, self-interested managers with inherent affinity for greater autonomy may have incentives to lengthen the firm's debt maturity and thus can potentially make suboptimal debt maturity structure choices (Datta et al., 2005; Brockman et al., 2010). If female executives' decisions are more in line with shareholders' interests because of their inherent gender-based proclivities, then they should have lower preference for longer maturity debt to avoid frequent refinancing and thereby, monitoring. Based on the above reasoning, we expect firms with female executives to have relatively shorter debt maturity structure compared to their male counterparts.

Hence, we propose the following hypothesis:

H1A *Female executives will adopt a shorter debt maturity structure, relative to their male counterparts, if female ethical proclivities prevail in better aligning the interests of shareholders.*

2.3. Executive gender, risk-aversion, overconfidence, and debt maturity choice

Risk tolerance is another crucial difference between men and women that has also been emphasized in the literature. Research indicates that males and females are biologically and psychologically different which can influence their risk preferences. A large stream of academic work shows that females are more risk-averse than males, both in general settings (Hersch, 1996; Pacula, 1997) and financial settings (Levin et al., 1988; Bajtelsmit and Van Derhei, 1997; Hinz et al., 1997; Jianakoplos and Bernasek, 1998; Sunden and Surette, 1998). For example, prior studies have found that female executives and investors are more risk-averse than their male counterparts. Particularly, female executives adopt safer corporate policies (see, e.g., Francis et al., 2015; Faccio et al., 2016) and female investors tend to invest more conservatively (see, e.g., Hudgens and Fatkin, 1985; Johnson and Powell, 1994; Sunden and Surette, 1998; Bernasek and Shwiff, 2001).

Diamond (1991) predicts that, when confronted with debt maturity choices, firms balance the costs of liquidity risk against the gains achieved from short-term debt. A risk-averse manager thus would have a tendency to avoid short-term debt as he/she is expected to overweight the costs of liquidity/refinancing risk. Brockman et al. (2010) also argue that short-maturity debt is more costly to risk-averse managers for two reasons. First, the cost of rolling over short-term debt is greater than the cost of issuing long-term debt. Second, the self-serving managers would be subject to more frequent external monitoring via refinancing. Based on this argument, firms with female executives are more likely to adopt a longer debt maturity structure.

Besides risk-tolerance, managerial overconfidence is another behavioral characteristic of managers that has gained attention in the literature. Overconfidence refers to the cognitive bias of individuals to overestimate the accuracy of their knowledge and judgments (Griffin and Tversky, 1992), as well as the belief that outcomes will be favorable (Malmendier and Tate, 2008). Prior studies show that overconfidence has a substantial impact on corporate decision-making such as acquisitions (Billett and Qian, 2008; Malmendier and Tate, 2008), investments (Goel and Thakor, 2008), capital structure (Ben-David et al., 2013), debt issuance (Huang and Kisgen, 2013), debt maturity (Huang et al., 2016), and firm performance (Doan and Iskandar-Datta, 2018). Overconfidence may reduce or increase firm value depending on the firm's characteristics and prospects. For example, as high growth firms want to reduce the underinvestment problem while low growth firms are more

[4] A recent paper by La Rocca et al. (2020) examine data from European countries to show that in a prescriptive or regulated environment, in which there is a gender quota that firms have to satisfy for female managers, debt maturity structure is related to a macro-level masculinity index. Our study provides evidence on how CEO gender influences debt maturity choice in an unregulated environment, which, as argued by Binder et al. (2020), is best suited to analyze corporate financing policies.

likely to suffer from overinvestment, overconfidence confers benefits in dynamic environments but could lead to diminishing benefits in more stable settings.

Accordingly, overconfident executives will have a greater tendency to adopt more short-term debt for two reasons. First, overconfident executives tend to overestimate their firms' future returns, leading them to believe their securities are underpriced. Because long-term debt can potentially be more mispriced than short-term debt (Flannery, 1986; Kale and Noe, 1990), overconfident executives' inclination to avoid long-term debt would be stronger. Second, overconfident executives' overestimate their ability to refinance short-term debt with lower costs.

On the other hand, previous finance and psychology literatures document that while both women and men exhibit overconfidence, men are likely to be more overconfident than women (Barber and Odean, 2001b). Particularly, women exhibit less overconfidence in decision-making (e.g., Estes and Hosseini, 1988; Huang and Kisgen, 2013; Doan and Iskandar-Datta, 2018) and less hubris about their abilities (e.g., Furnham et al., 2002). Taken together, the above arguments also lead us to conclude that firms with female executives are more likely to adopt a longer debt maturity structure. Hence, providing tension to our hypothesis **H1A**, we propose the following alternative hypothesis **H1B**:

H1B *To the extent that women are more risk-averse and/or less overconfident than men, female executives are more likely to adopt a longer debt maturity structure.*

2.4. Does incentive compensation influence the relation between executive gender and debt maturity structure?

Prior literature has shown that equity-based compensation is designed to not only better align manager-shareholder interests, but it can also encourage managerial risk-taking to the detriment of the bondholders (see, e.g., Brockman et al., 2010). Since creditors may potentially face a loss as a result of enhanced managerial risk-taking and increase in cash flow volatility, they will have greater preference to lend short term to subject the firm to more frequent external monitoring via refinancing. Hence, we expect the relationship between executive gender and debt maturity to be more pronounced as executives' equity-based (incentive) compensation increases. Hence, we propose the following hypothesis:

H2 *The effect of executive gender on debt maturity structure will be more pronounced with greater proportion of equity-based compensation.*

2.5. The role of board gender diversity

Researchers have examined the role of female directors in corporate decisions, such as dividend payout policy (Chen et al., 2017), executive compensation (Carter et al., 2017), and mergers and acquisitions (Levi et al., 2014). Recent work by Li and Zhang (2018) investigates whether there are systematic differences in the choice of debt maturity in the presence of female directors. They conclude that female directors care more about monitoring and are more likely to use short-term debt to align managers' interests to those of shareholders.[5] Given this finding, we hypothesize that the effect of female executives on debt maturity would be weaker in firms with a larger fraction of female directors given the ability of those directors to reduce conflicts of interest. In other words, we expect a substitution effect of monitoring to reduce manager-shareholder agency conflicts in the presence of female directors and female top executives. Further, examining the effect of top executive gender on corporate decisions, such as financing or investment decisions, is a more direct, first order effect and should be stronger than the board gender diversity effect because the top executives are more directly responsible in making such choices. The above discussion leads us to propose the following hypothesis:

H3A *The effect of female top executives on debt maturity structure will be inversely related to the proportion of female outsiders on the board (gender diversity), due to the substitution effect of the two sources of gender-based monitoring through debt structure choice.*

Alternatively, it can be argued that increasing the proportion of female outside board members will facilitate female executives to be bolder in their decision-making, in this case debt maturity decisions. By this logic, we should expect the effect of female executives' on debt structure choice to be more pronounced.[6]

H3B *The effect of female top executives on debt maturity structure will be directly related to the proportion of female outsiders on the board (gender diversity), due to the complementary effect of the two sources of gender-based monitoring on debt structure choice.*

3. Data and sample selection process

In this paper, we define a firm as run by a female executive if either the CEO and/or the CFO is a woman. We include both CEOs and CFOs in our analysis because there are relatively fewer female CEOs compared to female CFOs in the U.S. sample and using a sample of only CEOs would be too small to draw statistical inference. In addition, prior work has shown that CFOs play an important role in making corporate financial and accounting decisions (see, e.g., Mian, 2001; Graham et al., 2005; Geiger and North, 2006; Chava and Purnanandam, 2010; Frank and Goyal, 2010; Jiang et al., 2010). Data on executives are collected from ExecuComp.

A manager is classified as a CEO if his/her title is composed of phrases such as "chief executive officer," "chief exec," "CEO", and other similar titles. Similarly, a manager is classified as a CFO if his/her title is composed of phrases such as "chief financial officer," "chief finance officer," "CFO", and other similar titles. All our observations have executive gender information. We find 253 firms with female executives and 1,623 firms with male executives over a sample period that spans from 1992 to 2014. Our sample covers 147 male-to-female top executive transitions and 2,283 male-to-male transitions.

Firm-level data are extracted from the COMPUSTAT and the Center for Research in Security Prices (CRSP) databases. Following (Barclay and Smith, 1995), we restrict our sample to firms with Standard Industrial Classification (SIC) codes from 2000 to 5999 (industrial firms).[7] Since our goal is to study the relationship between executive gender and debt maturity structure, we require COMPUSTAT to have available data for fiscal year-end long-term debt due in three and/or five years. Further, we discard firm-year observations where the total debt maturity is less than 0 or more than 100%. Firm-specific controls are matched to the executive information using the GVKEY and CUSIP identifiers as well as the fis-

[5] The positive correlation between female directors and monitoring has been explored also in Adams and Ferreira (2009), who observe that female directors are more likely to undertake increased monitoring, attend more board meetings, and demand greater accountability for poor performance from managers.

[6] We thank an anonymous referee for suggesting to look at *outside* female directors to better understand the moderating role of gender diversity on the relationship between female top executive and debt maturity structure.

[7] A similar approach is used in Barclay et al. (2003), Datta et al. (2005), Brockman et al. (2010), Huang et al. (2016), Li and Zhang (2018), Huang and Shang (2019).

Table 1
Summary statistics for the full sample, and for subsamples of firms with female and male top executives.

Variables	Full sample			Female	Male	*P*-value
	Mean	Median	SD	(Mean)	(Mean)	of diff.
No. obs. Female Exec	990					
No. obs. Female CEO	230					
No. obs. Female CFO	781					
ST3 (%)	26.29	18.77	26.43	28.57	26.12	0.01
ST5 (%)	47.04	42.12	31.06	50.16	46.81	0.00
StockOwn (%)	1.70	0.00	5.40	1.29	1.73	0.01
Size ($millions)	13,438.38	3,211.80	35,557.03	18,380.47	13,075.18	<.0001
MTB	1.78	1.46	1.11	1.80	1.78	0.54
Leverage (%)	16.70	14.52	12.73	16.60	16.71	0.80
ABN_Earn	0.12	0.01	8.23	0.04	0.12	0.29
AssetMat (years)	12.11	8.43	11.04	11.74	12.14	0.24
Term (%)	1.56	1.61	1.24	1.77	1.54	<.0001
RET_STD	0.06	0.05	0.04	0.06	0.06	0.01
Fixed Assets (%)	34.58	29.39	22.28	32.52	34.73	0.00
Profitability (%)	13.71	13.39	9.63	14.53	13.65	0.00
% of firms with TLCF	36.18			46.26	35.44	<.0001
% of firms with ITC	16.96			16.67	16.98	0.80
% of rated firms	62.06			70.71	61.43	<.0001
% investment grade firms	42.54			44.55	42.39	0.19

This table reports the summary statistics for variables constructed based on the sample of U.S. public firms from 1992 until 2014. Definitions of variables are listed in Appendix A.

cal year-end. The final number of firm-year observations is 14,461 for the sample period spanning from 1992 to 2014.

3.1. Summary statistics

We report summary statistics for salient variables in Table 1. Comparing the sample of firms run by female and male executives, we note that male executives have significantly greater stock ownership than their female counterparts (1.73% vs. 1.29%). Female executives also head significantly larger firms, ($18b vs. $13b) on average. There are also significant differences in firm characteristics, in terms of profitability (14.53% for females vs. 13.65% for males) and debt maturity with female executives being associated with a significantly greater proportion of short-term debt whether maturing in 3 or 5 years.

As argued by Huang and Kisgen (2013), the difference in size is likely to be attributed to the greater market attention that larger firms attract. Specifically, larger firms are more careful in avoiding gender discrimination in hiring and promotion as they are more visible. Females are also more likely to be hired by bond-rated firms and in those with a lower proportion of collateralizable (fixed) assets.

Table 2 reports the Pearson correlations between the firm's maturity, the executive gender, and salient firm-specific characteristics. Interestingly, we observe that having a female executive is positively correlated with the fraction of debt due in three (or five) years or less. The correlation signs for all the other observables are consistent with prior work (see, e.g., Datta et al., 2005).

4. Empirical findings

This section presents the main empirical tests of gender differences on the maturity structure of debt. Our baseline empirical strategy relies on a two-stage least squares regression model where leverage and debt maturity are endogenously determined, with leverage as the dependent variable in the first stage and debt maturity as the dependent variable in the second stage.

4.1. Baseline empirical methodology and findings

We use a two-stage least squares regression analysis to examine the role of top executive gender on corporate debt maturity structure. Following the approach of Johnson (2003) and Datta et al. (2005), we model leverage and debt maturity as simultaneously determined, with the endogenous variable, leverage, as the dependent variable in the first-stage and maturity as the dependent variable in the second stage.

In the first-stage, we measure the dependent variable as the ratio of long-term debt to the market value of total assets (multiplied by 100) and we control for variables that prior literature (see, e. g., Johnson, 2003; Barclay and Smith, 1995) has shown to have an impact on corporate leverage. More in detail, we estimate Eq. (1) described as follows:

$$\begin{aligned} Leverage_{it} = {} & \alpha + \gamma_s + \tau_t + \beta_1 Size_{it} + \beta_2 MTB_{it} + \beta_3 Fixed\ Assets_{it} \\ & + \beta_4 Profitability_{it} + \beta_5 ABN\_Earn_{it} + \beta_6 REG_{it} \\ & + \beta_7 RET\_STD_{it} + \beta_8 TLCF_{it} + \beta_9 ITC_{it} \\ & + \beta_{10} StockOwn_{it} + \beta_{11} Female\ Executives_{it} \\ & + \varepsilon_{it}, \end{aligned} \tag{1}$$

To determine leverage (*Leverage*), we include *Size*, to control for scale issues, *MTB*, to account for the firm's growth opportunities, *Fixed Assets*, capturing the firm's collateral value, *Profitability*, measuring the creditworthiness of firms and their potential access to capital markets, *ABN_Earn*, to control for firm quality, *StockOwn*, to control for the alignment of interests between shareholders and managers, and *RET_STD*, which proxies for the firm's risk profile. Finally, we add dummy variables taking a value equal to one if the firm is regulated (*REG*), has operating loss carryforwards (*TLCF*), is run by a female executive (*Female Executives*), and has investment tax credits (*ITC*), and zero otherwise. *Fixed Assets, Profitability, TLCF*, and *ITC* are instruments in the first-stage (see, e.g., Datta et al., 2005; Huang et al., 2016). We control for year and industry fixed effects by including τ_t and γ_s, respectively. Standard errrors are clustered at the firm level. All variables are defined in Appendix A.

In the second-stage, following Datta et al. (2005), we measure the dependent variable as the percentage of debt maturing within three years as a percent of total debt, multiplied by 100. We further validate our results by considering the percentage of debt maturing within five years as a percent of total debt. The model we estimate is the following:

$$ST3_{it+1}\ (ST5_{it+1}) = \alpha + \gamma_s + \tau_t + \beta_1 Female\ Executives_{it}$$

Table 2
Pearson correlations between debt maturity, female top executives, and salient firm-specific characteristics.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1. ST3	**1**															
2. ST5	**0.65**	**1**														
3. Female Exec	**0.02**	**0.03**	**1**													
4. StockOwn	**0.06**	**0.07**	**−0.02**	**1**												
5. Size	**−0.05**	**−0.10**	**0.04**	**−0.09**	**1**											
6. MTB	**0.06**	**0.05**	0.00	**0.03**	**0.13**	**1**										
7. Leverage	**−0.17**	**−0.09**	0.00	**−0.03**	**−0.10**	**−0.41**	**1**									
8. ABN_Earn	0.01	0.01	0.00	0.00	0.00	−0.01	0.00	**1**								
9. AssetMat	**−0.13**	**−0.20**	−0.01	**−0.10**	**0.03**	**−0.18**	**0.26**	0.00	**1**							
10. Rat	**−0.23**	**−0.27**	**0.05**	**−0.16**	**0.24**	**−0.10**	**0.25**	0.01	**0.15**	**1**						
11. INVG	**−0.16**	**−0.25**	−0.01	**−0.16**	**0.32**	0.00	**−0.04**	−0.01	**0.20**	**0.67**	**1**					
12. Term	**0.05**	**0.05**	**0.05**	**−0.04**	**0.04**	**−0.06**	**0.04**	0.01	0.02	**0.04**	0.00	**1**				
13. RET_STD	**0.19**	**0.20**	**−0.02**	**0.10**	**−0.12**	**0.33**	**−0.39**	**−0.02**	**−0.31**	**−0.35**	**−0.31**	−0.01	**1**			
14. Profitability	−0.01	−0.01	**0.02**	**0.05**	**0.09**	**0.19**	**−0.24**	**−0.02**	**−0.06**	**0.02**	**0.11**	**−0.05**	**−0.04**	**1**		
15. Fixed Assets	**0.11**	**−0.16**	**−0.03**	**−0.04**	**0.03**	**−0.18**	**0.29**	0.00	**0.81**	**0.13**	**0.18**	**−0.03**	**−0.29**	**0.04**	**1**	
16. TLCF	**0.03**	**0.08**	**0.06**	−0.02	**−0.04**	0.01	0.01	0.01	**−0.20**	**−0.02**	**−0.11**	**0.10**	**0.06**	**−0.08**	**−0.26**	**1**
17. ITC	**−0.02**	**−0.02**	0.00	**−0.05**	**0.04**	**0.05**	**−0.07**	0.00	0.01	**−0.02**	0.00	**0.04**	**0.02**	**0.02**	**−0.03**	**0.05**

This table reports Pearson correlations of salient focus-relevant characteristics of our sample. See Appendix A for variable definitions. Bolded values are significant at 0.05 level or better.

$$
\begin{aligned}
&+\beta_2 StockOwn_{it} + \beta_3 Size_{it} + \beta_4 Size_{it}^2 \\
&+\beta_5 MTB_{it} + \beta_6 \widehat{Leverage}_{it} \\
&+\beta_7 ABN\_Earn_{it} + \beta_8 AssetMat_{it} \\
&+\beta_9 Rat_{it} + \beta_{10} INVG_{it} + \beta_{11} Term_{it} \\
&+\beta_{12} RET\_STD_{it} + \varepsilon_{it}, \qquad (2)
\end{aligned}
$$

As shown in Eq. (2), the decision variables of interest (e.g., percentage of debt maturing in three/five years or less as a percent of total debt) are defined at time *t+1*. Our variable of interest, defined at time *t*, is *Female Executives*, a dummy variable that takes a value equal to one if the firm has a female CEO or a female CFO (or both), and zero otherwise. All control variables are defined at time *t*. The inclusion of these variables is justified by prior theoretical and empirical literature.

There is a large consensus supporting the idea that managerial stock ownership can help reduce the conflicts of interest between managers and shareholders. With increased ownership, managerial interests are better aligned with that of shareholders. Therefore, greater managerial ownership will lead to shorter debt maturity structure because managers will be less concerned about exposing the firm to more frequent monitoring through debt refinancing (Datta et al., 2005). Hence, based on the findings in Datta et al. (2005), we control for the managerial stock ownership (*StockOwn*) and we expect the coefficient β_2 to be positive.

As suggested by Barclay et al. (2003) and Johnson (2003), we add firm size (*Size*) and its square ($Size^2$). Diamond (1991) finds that larger firms have a better credit quality and can access to long-term debt more easily. We thus expect the coefficient β_3 to be negative. However, Diamond (1991) also predicts a non-linear relationship between firm size and debt maturity which brings us to expect a positive sign for β_4.

According to Myers (1977), market-to-book (MTB) should be positively correlated with short-term debt to minimize the underinvestment problems that come with high-growth opportunity firms ($\beta_5 > 0$). $\widehat{Leverage}$ represents the predicted values from the first stage regression model described in Eq. (1). We expect the coefficient β_6 to be positive. We include asset maturity (*AssetMat*) among the determinants of debt maturity since firms tend to match the maturity of their assets and liabilities (Myers, 1977). Since our focus is on short-term debt, we expect the coefficient (β_8) to be negative.

To proxy for the quality of firms, in the second-stage regression model, we also include abnormal earnings (*ABN_Earn*) and a dummy variable for S&P investment grade credit ratings (*INVG*). Both *ABN_Earn* and *INVG* are proxies for firm quality, where high quality firms are expected to issue debt with short maturity. We thus expect the signs for β_7 and β_{10} to be positive. Along with the investment grade dummy, we control for whether firms have been rated at all from a credit rating agency (*Rat*). Firms with a credit rating are being monitored and scrutinized by a credit rating agency. Therefore, these firms are associated with relatively more information availability to outside investors, and may benefit these firms with easier access to longer-maturity debt. Following this argument, we would expect the coefficient β_9 to be negative.

Based on the tax hypothesis proposed by Barclay and Smith (1995), we expect the coefficient β_{11} on the term structure variable (*Term*) to be negative. Finally, we include the firms' standard deviation of asset returns (*RET_STD*) to control for return volatility. Since riskier borrowers are more likely to be prevented from accessing long-term debt, we expect the coefficient β_{12} to be positive. The construction of all our control variables is explained in Appendix A. We include industry fixed effects, γ_s, to control for time-invariant industry-specific factors that may be correlated with omitted variables.[8] Year fixed effects, τ_t, are included as well. We use White's heteroskedasticity-corrected standard errors, clustered at the firm level, to draw statistical inference. We present our results for the second stage regressions in Table 3.

Models (1) and (3) present the results for the dependent variable *ST3*, the next period fraction of debt maturing in three years or less, while models (2) and (4) show the results for the dependent variable, *ST5*, the next period fraction of debt due in five years or less. The focus explanatory variable, *Female Executives*, is highly significant in all four regressions, regardless of whether we control for year and industry fixed effects (models 3 and 4) or not (models 1 and 2). These results support our hypothesis **H1A**, suggesting that firms headed by female top executives are associated with a greater proportion of short-term debt compared to those run by male executives.

These results are not just statistically significant but also highly significant economically. Focusing, for example, on the *Female Executives* coefficients in models 3 and 4, controlling for several determinants of the debt maturity structure, firms run by female executives have a 3.64% higher proportion of debt maturing within three years than those run by male executives. This is a sizeable differ-

[8] We also replicate our tests adding firm-fixed effects instead of industry fixed effects. Our results are robust to this alternative specification. Results (un-tabulated) are available upon request.

Table 3
Relation between top executive gender and debt maturity: 2SLS regression results.

Variables	(1) ST3	(2) ST5	(3) ST3	(4) ST5
Female Executives	**3.350*** **	**5.174*** **	**3.639*** **	**4.525*** **
	(0.00)	**(0.00)**	**(0.00)**	**(0.00)**
StockOwn	0.070	−0.012	0.069	0.000
	(0.33)	(0.89)	(0.32)	(1.00)
Size	−12.836***	−4.227*	−13.992***	−4.859*
	(<.0001)	(0.10)	(<.0001)	(0.07)
$Size^2$	0.692***	0.165	0.756***	0.200
	(<.0001)	(0.25)	(<.0001)	(0.21)
MTB	0.006	−0.204	0.589	0.980
	(0.99)	(0.73)	(0.36)	(0.13)
$\widehat{Leverage}$	0.075	−0.004	0.137	0.408 *
	(0.24)	(0.97)	(0.50)	(0.06)
ABN_Earn	0.073***	0.040***	0.080***	0.059***
	(<.0001)	(0.01)	(<.0001)	(0.00)
AssetMat	−0.217***	−0.395***	−0.092***	−0.205 ***
	(<.0001)	(<.0001)	(0.01)	(<.0001)
Rat	−9.098***	−7.540***	−10.027***	−11.787 ***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)
INVG	2.003**	−6.341***	3.171	−0.652
	(0.05)	(<.0001)	(0.12)	(0.78)
Term	1.081***	1.131***	−0.473	0.528
	(<.0001)	(<.0001)	(0.44)	(0.43)
RET_STD	56.089***	38.801***	37.297*	54.282**
	(<.0001)	(0.01)	(0.09)	(0.03)
Year F.E.	No	No	Yes	Yes
Industry F.E.	No	No	Yes	Yes
Adjusted R^2	0.080	0.110	0.118	0.183
N	14,461	14,461	14,461	14,461

This table shows the second stage regressions from 2SLS regression models where leverage and debt maturity are simultaneously determined. In the first stage, the endogenous variable, *Leverage*, is regressed on *Size, MTB, Fixed Assets, Profitability, ABN_Earn, RET_STD, REG, TLCF, ITC, StockOwn,* and *Female Executives*. In the second stage, we use the percentage of debt maturing in three (*ST3*) and five years (*ST5*) or less as a percent of total debt as dependent variables and regress those variables on the leverage predicted values obtained from the first stage, $\widehat{Leverage}$, *Female Executives*, and a set of control variables affecting the debt maturity structure of firms (*StockOwn, Size,* $Size^2$, *MTB, ABN_Earn, AssetMat, Rat, INVG, Term*, and *RET_STD*). See Appendix A for variable definitions. Numbers in parentheses are *p*-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

ence given that the mean (median) sample value for *ST3* is 26.29 (18.77) percent. Similarly, in model 4, we find that firms with female top executives have 4.53% greater proportion of debt maturing within five years than those run by male executives. Overall, our findings support the gender-ethics hypothesis (**H1A**) in which female executives are likely to choose more shorter-term debt than their male counterparts.

4.2. Separating the effects of female CEOs and CFOs

Although we combine female CEOs and CFOs in the rest of our analyses, in this section we separate the two to examine the individual effects of female CEOs and female CFOs on debt maturity by using two distinct dummy variables, *Female CEO* and *Female CFO*, taking values equal to one if the CEO, or the CFO, is a female, and zero otherwise.

Confirming our baseline findings, the results, presented in Table 4, show that both female CEOs and CFOs, separately, also significantly shorten the debt maturity structure of firms. The coefficient estimates show that firms run by female CEOs are associated with significantly higher percentage of short-term debt due in three (five) years, about 5.22 (5.94) percentage points, relative to their male CEO counterparts. Similarly, the effect on debt maturity structure when we consider female CFOs is also highly significant for both dependent variables, *ST3* and *ST5*.

Table 4
Separating the effects of female CEOs and female CFOs on debt maturity.

Variables	(1) ST3	(2) ST5	(3) ST3	(4) ST5
Female CEO	5.224**	5.941**		
	(0.03)	(0.05)		
Female CFO			3.091**	3.794 **
			(0.02)	(0.03)
Year F.E.	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes
Adjusted R^2	0.118	0.183	0.113	0.183
N	14,451	14,451	11,694	11,694

This table shows results for the baseline regression model (Eq. (2)) when the variable of interest, *Female Executives*, is divided into *Female CEO*and *Female CFO*, two dummy variables taking a value equal to one if the CEO or the CFO (or both) is a female and zero otherwise. We control for the leverage predicted values (obtained from the first stage regression model), $\widehat{Leverage}$, and a set of control variables affecting the debt maturity structure of firms (*StockOwn, Size,* $Size^2$, *MTB, ABN_Earn, AssetMat, Rat, INVG, Term*, and *RET_STD*). See Appendix A for variable definitions. Numbers in parentheses are *p*-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

4.3. Controlling for additional firm-specific variables

We augment model (2) with additional control variables that are less often used in the debt maturity literature. Table 5 (Panel A) tests the relationship between executive gender and the fraction of debt maturing in three or less years by including some additional firm-specific controls such as *ROA, Taxes, Cash, Dividend dummy*, and *Fixed Assets*. These variables are also defined in Appendix A. Our results show that the amount of short-term debt due in three years or less is negatively (and significantly) correlated with the firm's tax amount (*Taxes*) and liquidity (*Cash*), and positively correlated to the firm's collateral value (*Fixed Assets*). Most important, our primary variable of interest, *Female*, remains positive and highly significant. We conduct the same analysis with *ST5* and document similar results. This is another check for the robustness of our primary finding.

4.4. Controlling for additional macroeconomic variables

Panels B of Table 5 show the effect of top executive gender on the fraction of debt maturing within 3 years (*ST3*) and 5 years (*ST5*) when we include some relevant macro-economic variables, such as *GDP growth, Yields spread, Macro uncertainty, Short-term rate*, and *Recession dummy* in our model (Eq. (2)). Again, these variables are defined in Appendix A. Our results indicate that the use of short-term debt increases during periods of financial crises. As before, the primary relationship between female executives and debt maturity structure remains robust.

4.5. Controlling for inside debt

Prior literature has shown that there are two different views of why the executive inside debt holdings might affect the maturity structure of firms. The first hypothesis relies on the notion that there is a strong alignment of interests between executives with inside debt and creditors so that the first are more reluctant to risky corporate policies (Jensen and Meckling, 1976; Edmans and Liu, 2011; Rajan and Winton, 1995; Stulz, 2001). Since short-term debt is riskier than long-term debt from an executive's perspective (i.e., higher refinancing risk), it is less preferred by executives with inside debt. Consequently, the first view supports a negative relationship between executive inside debt and debt maturity.

Conversely, the alternative view argues that inside debt alleviates the disadvantages of short-term debt for two main reasons.

Table 5
Robustness test: including additional firm-specific and macroeconomic controls with dependent variables ST3 and ST5.

Panel A: Additional firm-specific characteristics										
Variables	ST3	ST5	ST3	ST5	ST3	ST5	ST3	ST5	ST3	ST5
Female Executives	**3.808*** (0.00)**	**4.755*** (0.00)**	**3.638*** (0.00)**	**4.525*** (0.00)**	**3.620*** (0.00)**	**4.517*** (0.00)**	**3.641*** (0.00)**	**4.532*** (0.00)**	**3.609*** (0.00)**	**4.464*** (0.00)**
ROA	9.460 (0.22)	13.737 (0.15)								
Taxes			−0.032** (0.04)	0.014 (0.54)						
Cash					4.598 (0.31)	−12.838** (0.02)				
Dividend dummy							−0.308 (0.79)	−1.460 (0.30)		
Fixed Assets									3.885 (0.27)	7.930* (0.09)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year and Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.118	0.184	0.118	0.183	0.118	0.185	0.118	0.184	0.118	0.184
N	14,461	14,461	14,461	14,461	14,461	14,461	14,461	14,461	14,461	14,461
Panel B: Macro-specific characteristics										
Female Executives	**3.640*** (0.00)**	**4.525*** (0.00)**	**3.636*** (0.00)**	**4.521*** (0.00)**	**3.641*** (0.00)**	**4.526*** (0.00)**	**3.639*** (0.00)**	**4.525*** (0.00)**	**3.639*** (0.00)**	**4.525*** (0.00)**
GDP growth	−0.205 (0.45)	0.011 (0.97)								
Yield spread			0.925 (0.44)	1.130 (0.37)						
Macro uncertainty					10.720 (0.34)	2.767 (0.80)				
Short-term rate							−0.360 (0.74)	−0.379 (0.71)		
Recession dummy									7.550*** (0.00)	−1.381 (0.53)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.118	0.183	0.118	0.183	0.118	0.183	0.118	0.183	0.118	0.183
N	14,461	14,461	14,461	14,461	14,461	14,461	14,461	14,461	14,461	14,461
Panel C: Inclusion of executive leverage										
Female Executives	**2.573* (0.08)**	**4.383** (0.03)**	**2.964** (0.05)**	**4.243** (0.03)**						
Executive leverage	0.267 (0.57)	−0.981* (0.08)	0.112 (0.82)	−0.712 (0.25)						
Controls	Yes	Yes	Yes	Yes						
Year and Industry F.E.	No	No	Yes	Yes						
Adjusted R^2	0.093	0.151	0.148	0.242						
N	5,784	5,784	5,784	5,784						

This table shows robustness tests for our baseline regression model (Eq. (2)). Our variable of interest is *Female Executives*, a dummy variable that takes a value equal to one for firms headed by a female. Panel A studies the effect of executive gender on short-term debt with the inclusion of additional firm-specific characteristics (*ROA, Taxes, Cash, Dividend dummy*, and *Fixed Assets*). Panel B tests the relationship between executive gender and short-term debt with the inclusion of macro-factors (*GDP growth, Yield spread, Macro uncertainty, Short-term rate,* and *Recession dummy*). Panel C includes *Executive Leverage* as an addition control variable. In all our specification models, we control for the leverage predicted values (obtained from the first stage regression model), $\widehat{Leverage}$, and a set of control variables affecting the debt maturity structure of firms (*StockOwn, Size, Size*^{2}, *MTB, ABN_Earn, AssetMat, Rat, INVG, Term*, and *RET_STD*). See Appendix A for variable definitions. Numbers in parentheses are *p*-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

First, inside debt can help reduce the refinancing risk of short-term debt. Particularly, executives with inside debt tend to have lower leverage (Cassell et al., 2012) and larger cash reserves (Liu et al., 2014), therefore lowering the aforementioned refinancing risk. Second, executives with inside debt should be less concerned about the monitoring of short-term debt as inside debt strengthens the manager-debtholder interest alignment. Consistent with this line of argument, Dang and Phan (2016) document a positive relation between inside debt and short-maturity debt. We include, *Inside Debt*, as the sum of the present value of accumulated pension benefits and deferred compensation as an additional control variable in model 2 in Table 5 (Panel C).[9] The *Female* coefficient continues to emerge as significant and robust to the inclusion of this control variable.

4.6. Comparing the effects of male-to-male and male-to-female executive transitions on debt maturity structure

Another way to examine the effect of gender on debt maturity is to partition the effect of top executive transitions based on the gender and compare the debt maturity structures of the two groups. Specifically, we apply the difference-in-differences approach to compare the debt maturity structure before and after

[9] Note that the number of observation when we include *Inside Debt* as an additional control is drastically reduced to 5,784. This happens because firms have had to report the value of executive pensions and deferred compensation, the two components of inside debt, in all proxy statements after the introduction of the disclosure requirement by the Securities and Exchange Commission (SEC) on December 15, 2006.

Table 6
Top executive transitions from male to female and debt maturity structure: difference-in-differences approach.

Variables	(1) ST3	(2) ST4	(3) ST5
Post*Female Transition	**1.397**	**5.243*** **	**3.475***
	(0.46)	**(0.01)**	**(0.08)**
Post	1.407***	0.590	0.315
	(0.01)	(0.34)	(0.60)
StockOwn	0.108	0.046	0.024
	(0.23)	(0.64)	(0.80)
Size	−16.009***	−9.715***	−4.929
	(<.0001)	(0.01)	(0.17)
$Size^2$	0.849***	0.453**	0.267
	(<.0001)	(0.04)	(0.21)
MTB	−0.275	−1.263*	−0.606
	(0.66)	(0.06)	(0.35)
$\widehat{Leverage}$	−0.341**	−0.499***	−0.168
	(0.05)	(0.01)	(0.35)
ABN_Earn	0.037	0.017	0.020
	(0.12)	(0.50)	(0.41)
AssetMat	0.009	−0.035	−0.031
	(0.90)	(0.66)	(0.69)
Rat	−3.511**	0.724	−1.390
	(0.05)	(0.71)	(0.46)
INVG	0.663	−0.960	−1.975
	(0.63)	(0.52)	(0.17)
Term	−0.867	0.381	0.269
	(0.23)	(0.63)	(0.73)
RET_STD	22.846	1.943	21.808
	(0.16)	(0.91)	(0.21)
Year F.E.	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes
Adjusted R^2	0.301	0.345	0.444
N	7,996	7,996	7,996

This table shows results for the difference-in-differences approach. Our variable of interest is the interaction between *Post* and *Female Transition*. *Female Transition* is a dummy variable that takes a value equal to one for firms facing a male-to-female transition. *Post* is a dummy variable for the after-transition period. Further, we include control variables affecting the debt maturity structure of firms (*StockOwn*, $\widehat{Leverage}$, *Size*, $Size^2$, *MTB*, *ABN_Earn*, *AssetMat*, *Rat*, *INVG*, *Term*, and *RET_STD*). See appendix A for variable definitions. Following the approach by Huang and Kisgen (2013), year and firm fixed effects are added in all specifications. Numbers in parentheses are *p*-values. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

transitions from a male to a female executive with a control sample of male-to-male transition (Huang and Kisgen, 2013). We further restrict our sample to three years before and after the transition, with the exclusion of the transition year. Our regression model is described as follows:

$$ST3_{it+1}\ (ST4_{it+1}, ST5_{it+1}) = \alpha + \gamma_s + \tau_t + \beta_1 Female\ Transition_{it} \times Post_{it} + \beta_2 Post_{it} + \theta X_{it} + \varepsilon_{it}, \quad (3)$$

In this test, we use three dependent variables; i.e., the percentage of debt maturing in three, four, and five years or less as a percent of total debt. We conjecture that when women are appointed to the role of CEO or CFO, we expect their gender-based proclivities will be manifested in the debt maturity structures of the firms. Following this intuition, we test the relationship between female executives and debt maturity using not only the fraction of debt due in three (*ST3*) and five (*ST5*) years but also in the intermediate four years (*ST4*), so as to capture the debt choice dynamically as we recognize that it takes time for the new executive to have an effect on the debt maturity structure of the firm.

In Eq. (3), *Post* is a dummy variable taking a value equal to one if year *t* is after the appointment, and zero otherwise. *FemaleTransition* is a dummy variable that takes a value equal to one for firms facing a male-to-female transition. The test interaction variable, *Female Transition* × *Post*, reflects the impact of female executives on the post-hiring short-term debt choice. *X* is the same set of control variables included in our base model (2) and described in Appendix A. As in Huang and Kisgen (2013), we omit the dummy variable *Female Transition* and include year and firm fixed effects.

The results using difference-in-differences model are reported in Table 6. Our coefficient of interest is β_1 illustrating the use of short-term debt for firms facing a transition from a male to a female executive. As shown in the table, the interaction term is always positive suggesting that female executives do rely more on short-term debt. Interestingly, it is statistically significant only when the dependent variable is *ST4* with the coefficient 5.243 (*p*-value of 0.01) and *ST5* having a coefficient of 3.475 (*p*-value of 0.08). Note that the coefficient of this variable, while being positive, is insignificant in model (1) for *ST3* because, as we recognize earlier, it takes time to have an effect on the debt maturity structure after the executive transition happens. Our results from this analysis again confirm that female executives lean significantly more to shorter debt maturity compared to male executives.[10]

4.7. The role of equity-based compensation

Brockman et al. (2010) examine the relationship between executive compensation and debt maturity and find that creditors

[10] A potential criticism of our results is that male-to-female executive transitions may not be random but are motivated by certain fundamental changes in the firms, such as deterioration in health of the company, that can lead to supply side factors driving the shortening of the debt maturity structure. However, our analysis in Table 6 controls for factors that capture the health/profitability and other relevant factors that determine debt maturity. Further, female led firms have higher ratings and are significantly more profitable than male led firms, so we should not expect any supply-side related debt maturity reduction. Finally, given that these are all public firms with arm's-length debt outstanding, we do not expect any supply side factors, such as bias against women top executives, that may lead to shortening of debt maturity. Hence, our result of debt maturity shortening reflects conscious demand side decision-making by female executives when they transition in by replacing a male executive.

Table 7
Relation between top executive gender and debt maturity: the role of executive equity-based compensation.

Variables	(1) ST3	(2) ST5	(3) ST3	(4) ST5
Female Executives	**3.458*** **	**3.838** **	**3.377 *** **	**3.850** **
	(0.01)	**(0.03)**	**(0.01)**	**(0.04)**
Female Executives*Exec_EBC	**0.112***	**0.136** **		
	(0.07)	**(0.03)**		
Exec_EBC	0.015	0.017		
	(0.43)	(0.43)		
Female Executives*High_Exec_EBC			**6.03** **	**6.879 ** **
			(0.05)	**(0.03)**
High_Exec_EBC			−0.460	0.287
			(0.60)	(0.77)
StockOwn	0.110	0.016	0.106	0.013
	(0.16)	(0.87)	(0.18)	(0.89)
Size	−13.894***	−4.410	−13.820 ***	−4.361
	(<.0001)	(0.14)	(<.0001)	(0.14)
$Size^2$	0.745***	0.170	0.743 ***	0.170
	(<.0001)	(0.33)	(<.0001)	(0.33)
MTB	0.805	1.230	0.851	1.271*
	(0.30)	(0.12)	(0.27)	(0.10)
$\widehat{Leverage}$	0.143	0.412	0.151	0.419*
	(0.56)	(0.11)	(0.53)	(0.10)
ABN_Earn	0.080***	0.058***	0.080***	0.059***
	(<.0001)	(0.00)	(<.0001)	(0.00)
AssetMat	−0.093***	−0.206***	−0.094***	−0.207 ***
	(0.01)	(0.00)	(0.01)	(<.0001)
Rat	−10.106***	−12.404***	−10.145***	−12.431 ***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)
INVG	2.611	−1.391	2.665	−1.355
	(0.26)	(0.59)	(0.25)	(0.60)
Term	−0.375	0.592	−0.414	0.577
	(0.60)	(0.38)	(0.51)	(0.39)
RET_STD	26.215	42.643	29.018	44.774
	(0.32)	(0.13)	(0.26)	(0.11)
Year F.E.	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes
Adjusted R^2	0.117	0.185	0.116	0.185
N	11,596	11,596	11,596	11,596

This table reports results of the baseline regression model of debt maturity on executive gender (*Female Executives*), the executive equity-based compensation (*Exec_EBC*), and their interaction. For robustness, we also replicate our results using a dummy variable for the *Exec_EBC* variable (*High_Exec_EBC*). See Appendix A for variable definitions. Each regression includes year and industry fixed effects. Numbers in parentheses are *p*-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

may decide to shorten the maturity of debt when the managerial risk taking attitude increases, a phenomenon that is likely to increase with the level of executives' equity-based compensation. Datta et al. (2005) document that managers with higher stock ownership choose a larger proportion of short-maturity debt. Their rationale is that managerial stock ownership is an effective disciplining mechanism, able to align shareholders' and managers' interests (see, e.g., Jensen and Meckling, 1976). As such, managers with a larger stock ownership are less concerned about escaping from frequent monitoring and more likely to use short-term maturity debt relative to managers whose compensation is less sensitive to the firm's equity capital. Based on these findings, we expect the positive effect of female executive gender on debt maturity to be more pronounced for firms where executives (i.e., CEOs or CFOs, or both) can benefit from a larger stock option compensation.

To test this conjecture, we first calculate the stock option compensation granted to CEOs and CFOs. We follow the approach in Datta et al. (2001) and construct the variable *Exec_EBC* as the ratio of the total options granted to the CEO and CFO to the total compensation they receive. Our baseline regression model is as follows:

$$ST3_{it+1}\ (ST5_{it+1}) = \alpha + \gamma_s + \tau_t + \beta_1 Female\ Executives_{it} + \beta_2 Female\ Executives_{it} \times Exec\_EBC_{it} + \beta_3 Exec\_EBC_{it} + \theta X_{it} + \varepsilon_{it}, \quad (4)$$

As in previous model, we use the fraction of debt due in three (five) years or less as our dependent variables. The interaction term between *Female Executives* and *Exec_EBC* is the key variable of interest capturing how and whether the equity compensation packet of executives alters the marginal effect of executive gender on firms' debt maturity structure. To check the robustness of our results, we estimate a modified version of model (4) when we replace the continuous variable *Exec_EBC* with the dummy variable *High_Exec_EBC* that takes a value equal to one if the stock option compensation package offered by the firm to executives is larger than the sample median.[11]

Our results for Eq. (4) are presented in Table 7. The coefficient estimates for *Female Executives* are positive and statistically significant, consistent with our earlier findings. The coefficient estimates of the interaction terms are positive and statistically significant in all columns, suggesting that the firms' debt maturity structure is even more sensitive to executive gender when firms reward executives via stock options. For example, based on the coefficient estimates reported in column (3), when *ST3* is the dependent variable and the variable of interest is a dummy, while the marginal effect of having a female executive on short-term debt is 3.377, the

[11] Our results hold when we define the dummy variable*High_Exec_EBC* to take a value equal to one if the stock option compensation package offered by the firm to executives is larger than the industry median.

Table 8
Relation between top executive gender and debt maturity: the role of board gender diversity.

Variables	(1) ST1	(2) ST2	(3) ST3	(4) ST4	(5) ST5
Female Executives	**2.586**	**3.483***	**6.254*****	**9.674*****	**10.812*****
	(0.12)	**(0.07)**	**(0.01)**	**(0.00)**	**(0.00)**
Female Executives*OutsideFemDir	**−7.063**	**−6.490**	**−15.367**	**−31.099****	**−40.572*****
	(0.39)	**(0.52)**	**(0.20)**	**(0.02)**	**(0.01)**
OutsideFemDir	10.966***	12.600 ***	10.603**	10.500 *	8.935
	(0.00)	(0.00)	(0.04)	(0.09)	(0.20)
Boardsize	−1.212	−2.082*	−1.600	−1.397	−0.171
	(0.18)	(0.10)	(0.31)	(0.45)	(0.93)
StockOwn	0.096*	0.102	0.069	0.157	0.131
	(0.06)	(0.18)	(0.44)	(0.12)	(0.23)
Size	−4.813***	−11.021***	−16.025***	−12.778***	−7.394*
	(0.01)	(<.0001)	(<.0001)	(0.00)	(0.06)
$Size^2$	0.264***	0.612***	0.865***	0.686***	0.343
	(0.01)	(<.0001)	(<.0001)	(0.00)	(0.12)
MTB	−0.335	−0.025	0.407	0.855	1.278**
	(0.32)	(0.96)	(0.54)	(0.17)	(0.04)
$\widehat{Leverage}$	−0.211	−0.024	0.190	0.472*	0.545*
	(0.15)	(0.90)	(0.45)	(0.08)	(0.06)
ABN_Earn	0.075***	0.077***	0.078***	0.077***	0.061***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.00)
AssetMat	−0.037	−0.072**	−0.112 ***	−0.170***	−0.221***
	(0.15)	(0.02)	(0.00)	(0.00)	(0.00)
Rat	−1.355	−5.937***	−10.086 ***	−13.308***	−11.439***
	(0.35)	(0.00)	(<.0001)	(<.0001)	(0.00)
INVG	−1.091	1.566	3.641	3.470	−1.042
	(0.40)	(0.36)	(0.11)	(0.16)	(0.70)
Term	−1.292***	−1.246**	−0.255	0.521	0.723
	(0.00)	(0.02)	(0.70)	(0.45)	(0.31)
RET_STD	−12.899	15.876	24.973	47.681	59.298 *
	(0.46)	(0.48)	(0.41)	(0.16)	(0.10)
Year F.E.	Yes	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.060	0.088	0.122	0.153	0.204
N	8,382	8,382	8,382	8,382	8,382

This table reports results of the baseline regression model of debt maturity on executive gender (*Female Executives*), the fraction of outside female directors that are not CEO or CFO (*OutsideFemDir*), and their interaction. See Appendix A for variable definitions. Each regression includes year and industry fixed effects. Numbers in parentheses are *p*-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

marginal effect increases to 9.407 when the stock option plan of executives is accounted for. These results support hypothesis **H2**.

4.8. The role of board gender diversity

To test our hypothesis H3, we collect director information from BoardEx. Due to data availability, the sample in this section is restricted to 1,113 firms from 1999 to 2014.

We identify female directors that are not CEO or CFO and distinguish between insider and outsider female directors. We construct the variable of interest, *OutsideFemDir*, as the total number of outside female directors divided by the total number of directors on the board.[12] Then, following the approach by Li and Zhang (2018), we estimate the effect of top executive gender on debt maturing within one, two, three, four, and five years, or less, for increasing ratios of outside female directors to total directors using the model specified below:

$$ST1_{it+1}\ (ST2_{it+1}, ST3_{it+1}, ST4_{it+1}, ST5_{it+1}) = \alpha + \gamma_s + \tau_t + \beta_1 Female\ Executives_{it} + \beta_2 Female\ Executives_{it} \times OutsideFemDir_{it} + \beta_3 OutsideFemDir_{it} + \theta X_{it} + \varepsilon_{it}. \quad (5)$$

The key variable of interest in model (5) is the interaction between *Female Executives* and *OutsideFemDir* showing the marginal effect of executive gender on debt maturity for firms with outside female directors.

The model estimates are presented in Table 8. The coefficient on *Female Executives* remains positive and statistically significant. Supporting our hypothesis **H3A**, the interaction coefficient is negative, but statistically significant only when the dependent variables are *ST4*, and *ST5*, but not less, thereby showing that the presence of female outside directors moderates the effect of female executives on short-term debt but not immediately. This moderating effect of board diversity is proportional to the fraction of outside females on the board.

4.9. Female executives and corporate credit ratings

In the previous sections, we have shown that, being more ethical, female executives tend to choose more short-term debt relative to their male counterparts. In this section, we investigate whether debt maturity decisions by female top executives (CEO or CFO) play any role on the pricing of securities by looking at the firm's corporate credit rating, a forward-looking, composite measure that determines the cost of debt for the firm.[13]

The net effect of the presence of female top executives on credit ratings remains unexamined. On the one hand, the greater ethi-

[12] In untabulated results, we test the relationship between outside female directors and debt maturing within one, two, three, four, and five years, or less. Our results (available upon request) show that outside female directors positively and significantly affect firms' short-term debt maturing within one, two, and three years.

[13] We thank an anonymous referee for suggesting the analysis of the effect of female executives on credit ratings.

Table 9
Relation between top executive gender and corporate credit ratings.

Variables	(1) CR(t)	(2) CR(t+1)	(3) CR(t)	(4) CR(t+1)
Female Executives	**−0.735*** **	**−0.628** **	**−0.100*** **	**−0.070***
	(0.01)	**(0.03)**	**(0.01)**	**(0.07)**
StockOwn	0.080***	0.080***	0.025***	0.025***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)
Size	−2.847***	−2.862***	−0.739***	−0.758***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)
EBIT	3.589***	2.668***	0.001	−0.436***
	(0.00)	(0.00)	(1.00)	(0.01)
Leverage	−0.039***	−0.038***	−0.002**	0.000
	(<.0001)	(<.0001)	(0.05)	(0.79)
R&D Intensity	5.606***	5.561***	2.218***	2.444 ***
	(0.00)	(0.01)	(<.0001)	(<.0001)
Advertising Intensity	−2.295	−1.423	−0.529	−0.240
	(0.41)	(0.60)	(0.15)	(0.51)
Dividends	−0.091**	−0.072*	−0.032***	−0.029***
	(0.02)	(0.07)	(<.0001)	(<.0001)
Capex	6.822***	5.455**	1.926***	1.619***
	(0.00)	(0.02)	(<.0001)	(<.0001)
Fixed Assets	−2.234**	−1.766*	−0.934***	−0.883***
	(0.02)	(0.06)	(<.0001)	(<.0001)
OLS	Yes	Yes	No	No
Ordered Logit	No	No	No	No
Year F.E.	Yes	Yes	Yes	Yes
Industry F.E.	Yes	Yes	Yes	Yes
Adjusted R^2	0.548	0.561	0.590	0.605
N	14,192	14,192	14,192	14,192

This table shows regression results studying the relationship between corporate credit ratings (*CR*) and female executives (*Female Executives*). Columns (1) and (2) ((3) and (4)) report results for ordinary least squares regression models (ordered logistic regressions). In columns (1) and (3) ((2) and 4)) all the variables are defined at time t (the dependent variable is defined at time *t+1* while all other variables are defined at time t). In all the regressions, we control for firm-specific characteristics that are likely to affect the credit rating levels of firms (*StockOwn, Size, EBIT, Leverage, R&D Intensity, Advertising Intensity, Dividends/Assets, Capex, Fixed Assets*), industry, and year fixed effects. See Appendix A for variable definitions. Numbers in parentheses are p-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

cal sensitivity of females, which prior literature has shown to be linked with lower leverage, less volatile earnings, and a higher chance of firm's survival (e.g., Faccio et al., 2016, among others), may generate higher credit ratings. However, on the other hand, short-term debt is also associated with a rollover risk that may induce credit rating agencies to assign lower ratings to these firms. We assess the relationship between female executives and firms' credit ratings using the model specified below:

$$CR_{it}\ (CR_{it+1}) = \alpha + \gamma_s + \tau_t + \beta_1 Female\ Executives_{it} + \theta X_{it} + \varepsilon_{it}. \quad (6)$$

To constuct the firm's credit rating, we collect Standard and Poor (S&P, thereafter) Domestic Long-Term Issuer Credit Rating from Compustat Ratings. Following prior literature, (e.g., Klock et al., 2005; Jiraporn et al., 2014, among others), we convert credit ratings to a numerical scale were AAA-rated firms are assigned a value of 22, while D-rated firms are assigned a value of 1. The results for this test are presented in Table 9.

We use an ordinary least squares regression model in columns (1) and (2) and an ordered logit model in columns (3) and (4). In columns (1) and (3) all the variables are measured at time (t). In columns (2) and (4), the dependent variable is measured at time (t+1) to alleviate possible endogeneity concerns. In all our models, we control for firm-specific characteristics that are likely to explain firms' credit ratings. Additionally, we control for time-invariant industry factors by including year and industry fixed effects. We draw statistical inference by clustering standard errors at the firm level. Our results suggest that firms led by female CEOs and/or CFOs have significantly better credit ratings (i.e., our coefficient of interest, β_1, is negative and statistically significant). Looking at column (1), we observe that firms with female executives can benefit from credit ratings that are (.735) notches higher compared to firms managed by their male counterparts, thus showing that these firms benefit from a better reputation and, consequently, are better situated to access the debt markets more frequently when they choose shorter term debt. Our result is confirmed when we evaluate credit ratings one year ahead.[14]

5. Robustness tests: addressing endogeneity and self-selection with alternate empirical methods

We use a battery of robustness tests to address the potential endogeneity issue that may arise in the relationship between executive gender and debt maturity. First, following Faccio et al. (2016), we apply Heckman's 1979 two-stage model in combination with an instrumental variable to deal with the potential selection bias. Second, we report results for the propensity score matching approach to compare the maturity structure of debt across pairs of female firm-years and matched male firm-years with almost identical observables. Finally, we conduct a placebo analysis by randomly assigning the gender of the top executives and then examining the effect on debt maturity.

5.1. Heckman two-stage model

The baseline model that we test (in Table 3) has some limitations as it is likely to be affected by endogeneity issues that we need to address. One potential problem that may bias our results is the "self-selection" issue, which means that female executives may self-select into firms with specific characteristics. To address

[14] In untabulated test, we also estimate the relationship between female executives and cost of borrowing debt. Our findings suggest that firms led by female CEOs/CFOs are not exposed to a significantly larger cost of capital. Our results are available upon request.

Table 10
Relation between top executive gender and debt maturity: treatment effects model.

Variables	(1) ST3	(2) ST5	(3) ST3	(4) ST5
Female Executives	**3.268*** **	**5.252*** **	**3.473*** **	**4.358*** **
	(0.01)	**(0.00)**	**(0.00)**	**(0.00)**
StockOwn	0.072	−0.017	0.073	0.003
	(0.31)	(0.85)	(0.28)	(0.97)
Size	−14.956	67.261	−29.793	79.293
	(0.82)	(0.50)	(0.92)	(0.81)
$Size^2$	0.979	−9.416	2.886	−11.055
	(0.91)	(0.48)	(0.94)	(0.81)
MTB	−0.847	17.102	−3.709	20.318
	(0.96)	(0.47)	(0.96)	(0.80)
$\widehat{Leverage}$	−0.169	4.211	−1.007	4.954
	(0.97)	(0.46)	(0.95)	(0.80)
ABN_Earn	−0.021	3.001	−0.598	3.506
	(0.99)	(0.46)	(0.96)	(0.80)
AssetMat	−0.260	1.688	−0.571	2.245
	(0.89)	(0.56)	(0.95)	(0.82)
Rat	2.283	−335.824	66.148	−391.725
	(0.99)	(0.46)	(0.96)	(0.80)
INVG	−9.129	317.779	−71.928	374.723
	(0.98)	(0.48)	(0.96)	(0.81)
Term	1.096***	1.094***	−0.313	0.782
	(<.0001)	(<.0001)	(0.60)	(0.23)
RET_STD	32.337	513.345	−88.150	579.695
	(0.94)	(0.43)	(0.96)	(0.79)
Inverse Mills Ratio	20.444	−659.546	149.283	−770.897
	(0.97)	(0.47)	(0.96)	(0.80)
Year F.E.	No	No	Yes	Yes
Industry F.E.	No	No	Yes	Yes
Adjusted R^2	0.080	0.111	0.118	0.184
N	14,461	14,461	14,461	14,461

This table shows results for the second stage treatment effects model. In the first-stage, we use a conditional logistic regression to estimate the probability that the firm will hire a female CEO as a function of firm-specific characteristics. In the second-stage, we estimate the effect of the dummy variable *Female Executives* on the fraction of debt due in three years (*ST3*) and five years (*ST5*) or less by including the Mills Ratio (derived from the first stage) and a set of control variables (*StockOwn, $\widehat{Leverage}$, Size, $Size^2$, MTB, ABN_Earn, AssetMat, Rat, INVG, Term*, and *RET_STD*). See Appendix A for variable definitions. Numbers in parentheses are *p*-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

this issue, we follow Heckman (1979) and use the treatment effects model. In the first-stage, we use a conditional logistic regression model to estimate the probability that the firm will hire a female executive as a function of firm-specific characteristics (*Size, Profitability, MTB, Lev, ABN_Earn, AssetMat, Rat, INVG, RET_STD*).[15] In the second-stage, we test the relationship between executive gender and debt maturity including the inverse Mills ratio (derived from the first stage) and the same set of control variables used in Eq. (2). Specifically, the first- and second-stages can be described as follows:

First Stage:

$$Female\ Executives_{it} = \alpha + \gamma_s + \tau_t + \beta_1 Gender\ Equality_i + \theta X_{it} + \varepsilon_{it}, \quad (7)$$

Second Stage:

$$ST3_{it+1}\ (or\ ST5_{it+1}) = \alpha + \gamma_s + \tau_t + \beta_1 Female\ Executives_{it} + \theta X_{it} + \varepsilon_{it}, \quad (8)$$

Female Executives is our variable of interest, measured by a dummy variable taking a value equal to one for a female CEO or CFO (or both). *X* is the same set of control variables included in model (2) and described in Appendix A. As in previous models, we include year and industry fixed effects and cluster standard errors at the firm level.

Our results for the second-stage of the treatment effects model are presented in Table 10. In each of the second-stage regression models, the coefficient on executive gender is positive and statistically significant at the 1% level, regardless the dependent variable used and the inclusion of fixed effects. Our results, thus, confirm previous findings in support of hypothesis **H1A**, and document that executive gender is an important trait affecting corporate decisions.

5.2. Propensity score matching

To further address the problem of non-random selection, we employ a propensity score matching approach (Rosenbaum and Rubin, 1983). We begin with a conditional logistic regression similar to the one in the first-stage of the Heckman two-stage model. We then use the propensity scores from the first-stage and perform a nearest neighbor matching without replacement to other firms.[16] This procedure guarantees that firms run by a female executive (treated sample) are paired with firms run by a male executive (control sample) with statistically the same size, profitability, market-to-book, leverage, abnormal earnings, asset maturing,

[15] We thank an anonymous referee for suggesting an alternative technique to address the incidental paramenter problem commonly associated to probit models with fixed effects. We have verified that our results hold using a probit model in the first stage (results available upon request). When the probit model is employed, to facilitate identification, we include a state's level of gender status equality (Sugarman and Straus, 1988; Huang and Kisgen, 2013), *Gender Equality*, as an instrument. It is argued that firms headquartered in a state that is friendlier to women's equality are more likely to hire female executives. The state's gender equality value for each firm is based on the firm's headquarters location. Higher values for *Gender Equality* indicate firms in states with greater attention toward gender equality.

[16] We use the nearest neighbor matching approach without replacement to avoid the potential issue that replaced observations with extreme propensity scores are matched many times and, thus, are heavily weighted (Lawrence et al., 2011).

Table 11
Relationship between executive gender and debt maturity: propensity score matching.

Panel A: Comparison between treated and control samples			
Firm characteristics	Female Exec ($N = 972$)	Male Exec ($N = 972$)	*P*-value of diff.
Size ($millions)	18,900	19,195	0.88
MTB	1.80	1.80	0.92
Leverage (%)	17.07	16.96	0.84
ABN_Earn	0.05	0.02	0.34
AssetMat (years)	11.87	11.64	0.64
RET_STD	0.05	0.06	0.51
Profitability (%)	14.58	14.38	0.60
% of rated firms	72.03	70.69	0.52
% investment grade firms	45.41	43.81	0.48

Panel B: Propensity score matching

	(1)	**(2)**	**(3)**	**(4)**
Variables	**ST3**	**ST5**	**ST3**	**ST5**
Female Executives	**4.526*****	**8.711*****	**3.005***	**7.160*****
	(0.00)	**(<.0001)**	**(0.07)**	**(0.00)**
StockOwn	0.341**	0.227	0.422 ***	0.300*
	(0.02)	(0.15)	(0.01)	(0.07)
Size	−11.447**	1.925	−8.648	2.400
	(0.02)	(0.70)	(0.18)	(0.70)
$Size^2$	0.629**	−0.121	−0.403	−0.198
	(0.02)	(0.65)	(0.29)	(0.61)
MTB	−0.651	−2.479	−2.974	−4.061
	(0.59)	(0.11)	(0.40)	(0.31)
$\widehat{Leverage}$	0.034	−0.022	−0.802	−0.400
	(0.78)	(0.89)	(0.38)	(0.70)
ABN_Earn	0.044	0.672	0.825	0.811
	(0.98)	(0.62)	(0.66)	(0.70)
AssetMat	−0.258***	−0.426***	−0.179**	−0.248 **
	(<.0001)	(<.0001)	(0.03)	(0.02)
Rat	−15.147***	−18.137***	−9.474	−13.640*
	(<.0001)	(<.0001)	(0.14)	(0.06)
INVG	2.304	−4.705*	−3.797	−6.631
	(0.22)	(0.07)	(0.59)	(0.42)
Term	1.557***	0.671	0.830	−0.305
	(0.00)	(0.24)	(0.61)	(0.86)
RET_STD	37.394	53.729*	−96.990	−39.560
	(0.16)	(0.08)	(0.34)	(0.73)
Year F.E.	No	No	Yes	Yes
Industry F.E.	No	No	Yes	Yes
Adjusted R^2	0.110	0.170	0.137	0.243
N	1,944	1,944	1,944	1,944

This table shows results for the propensity score matching approach. We run a conditional logistic regression to pair female-year observations with male-year observations based on *Size, Profitability, MTB, Leverage, ABN_Earn, AssetMat, Rat, INVG, RET_STD*, year, and industry dummies. Panel A shows the comparison of firm-specific characteristics between the treated sample (i.e., firms run by a female executive) and the control sample (i.e., firms run by a male executive). Then, we run a regression of the decision variables of interest (*ST3* or *ST5*) on the *Female Executives* dummy and a set of control variables (*StockOwn*, $\widehat{Leverage}$, *Size*, $Size^2$, *MTB, ABN_Earn, AssetMat, Rat, INVG, Term*, and *RET_STD*). See appendix A for variable definitions. Results for the propensity score matching methodology are presented in Panel B. Numbers in parentheses are *p*-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

and rating status. We then run model (2) on the matched sample to examine the relationship between gender differences and debt maturity choices.

Our results for the propensity score matching approach are illustrated in Table 11. Panel A compares firm-characteristics for the treated and control samples and shows that the matching is closely performed (i.e., the differences between the mean values of all the matching variables for the treated and the control samples are not statistically significant). Panel B shows the regression results for the matched sample. Our results confirm our previous findings. The sign and magnitude of the *Female Executives* coefficient is positive and statistically significant in all the specifications, with and without the inclusion of fixed effects, when the dependent variable is the fraction of debt maturing in three years, as well as the fraction of debt maturing in five years. Overall, the evidence of this subsection shows that female executives are more likely to have short-term debt as their decisions are more in line with the shareholders' interests compared to their male counterparts.

5.3. Placebo test

We further assess the robustness of our results using a placebo test that randomly assigns female executives to firms. This approach, which is widely used in psychology, ensures that each CEO or CFO has the same chance of being hired in any company and thus guarantees that any difference between and within firms is not systematic. If we believe that the effect on the debt maturity structure can be attributed to the executive gender (and is causally related to it), then we should *not* observe a positive and significant relation between debt maturity and the randomly (and artificially) assigned female executive.

The placebo test results are presented in Table 12. This table shows that randomly assigned female executives exhibit no shortening of their debt maturity structure. More precisely, the coefficient on *Female Executives* is insignificant for both the dependent variables, *ST3* or *ST5*. Overall, our placebo test confirms our previous findings.

Table 12
Relation between top executive gender and debt maturity: placebo test.

Variables	(1) ST3	(2) ST5	(3) ST3	(4) ST5
Female Executives	**−0.116**	**1.005**	**−0.252**	**0.545**
	(0.90)	**(0.31)**	**(0.77)**	**(0.56)**
StockOwn	0.068	−0.015	0.067	−0.002
	(0.34)	(0.87)	(0.33)	(0.98)
Size	−12.901***	−4.316*	−14.030***	−4.895*
	(<.0001)	(0.10)	(<.0001)	(0.07)
$Size^2$	0.698***	0.173	0.757 ***	0.200
	(<.0001)	(0.23)	(<.0001)	(0.21)
MTB	0.004	−0.217	0.571	0.951
	(0.99)	(0.71)	(0.38)	(0.14)
$\widehat{Leverage}$	0.073	−0.008	0.126	0.393*
	(0.25)	(0.93)	(0.54)	(0.07)
ABN_Earn	0.073***	0.039***	0.078***	0.058***
	(<.0001)	(0.01)	(<.0001)	(0.00)
AssetMat	−0.218***	−0.396***	−0.094***	−0.207 ***
	(<.0001)	(<.0001)	(0.01)	(<.0001)
Rat	−8.977***	−7.349***	−9.782***	−11.478***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)
INVG	1.880*	−6.540***	3.020	−0.849
	(0.06)	(<.0001)	(0.14)	(0.71)
Term	1.108***	1.172***	−0.391	0.631
	(<.0001)	(<.0001)	(0.52)	(0.34)
RET_STD	55.886***	35.346***	36.022*	52.555**
	(<.0001)	(0.01)	(0.10)	(0.03)
Year F.E.	No	No	Yes	Yes
Industry F.E.	No	No	Yes	Yes
Adjusted R^2	0.079	0.109	0.117	0.182
N	14,461	14,461	14,461	14,461

This table shows results for the placebo test where female executives are randomly assigned to firms. In all the specifications we include a set of control variables (*StockOwn*, $\widehat{Leverage}$, *Size*, $Size^2$, *MTB*, *ABN_Earn*, *AssetMat*, *Rat*, *INVG*, *Term*, and *RET_STD*). See Appendix A for variable definitions. Numbers in parentheses are *p*-values, adjusted for heteroskedasticity and clustering at the firm level. ***, **, and * denote significance at 1%, 5%, and 10%, respectively.

6. Conclusions

Understanding how executive gender affects corporate decisions has gained in importance with the increasing number of female executives in the C-suites. It is also essential to learn how socially conscious corporate policies, such as gender diversity, interact to influence major corporate decisions. With the choice of corporate debt maturity structure, the executives determine not only the firms financing decision but also the extent of external monitoring by the financial markets based on the frequency of debt refinancing. The effect of female executives on debt structure choice is expected to be different relative to that of male executives because of inherent differences in psychology (confidence and risk-tolerance), and ethics (transparency and extraction of private benefits). This study examines how corporate debt structure decisions are influenced by top executives' gender, while accounting for board gender diversity and executive compensation structure.

Based on a sample of 14,461 firm-year observations during the period 1992–2014, we establish a causal link between executive gender and corporate debt maturity. We document that female executives choose significantly shorter debt maturity structures relative to their male counterparts. This result holds separately for female CEOs and CFOs and in conjunction. Our analysis indicates that female executives are more aligned with shareholders' interest as they choose a greater proportion of short-maturity debt after controlling for other established determinants of debt maturity structure. The economic implication of this result is that firms with female executives increase the proportion of debt maturing within three or five years by 3.64% and 4.53%, respectively. Given that the average proportions of debt maturing within three or five years in our sample are 26.29% and 47.04%, our results represent an increase in the use of short-maturity debt by 13.85% and 9.63% respectively, relative to the average. The study thus adds another dimension to the debt maturity choice literature by documenting the impact of top executive gender.

Cross-sectional analysis shows that the influence of female executives on debt maturity is inversely related to the proportion of their incentive compensation. In other words, female executive with greater proportion of equity-based compensation choose even shorter debt maturity structures as their incentives are even more aligned with the shareholders, beyond what is dictated by the gender-based differences.

Further, we find a substitution effect as the relation between female executives and debt maturity dampens with increasing board gender diversity (or with higher fraction of female outside directors on the board). The substitution effect of monitoring via debt maturity choice becomes less important in the presence of female board members who pick up some of the monitoring.

An analysis of the effect of top executive gender on corporate credit ratings shows that firms run by females have better ratings. This result further strenghtens the argument that women are more ethical-oriented and this tendency translates into a more favorable access to capital markets as proxied by higher credit ratings.

Applying difference-in-differences methodology, we find that transitions from male-to-female executive(s) result in debt maturity shortening over the post-transition period. We contend that when a female CEO or CFO replaces a male executive, her gender-based proclivities will manifest over the post-transition period in shorter debt maturity structures.

Finally, to validate our findings we perform a battery of robustness checks, including controlling for additional firm-specific and macroeconomic variables, accounting for executives' inside debt, and addressing potential endogeneity and sample selection issues with alternate empirical methods to facilitate identification, such as the Heckman two-stage model, propensity score matching method, and placebo test. Overall, our study contributes at

the confluence of capital structure (more specifically, debt maturity structure) literature, emerging research on gender-based socially-conscious financial decision-making, and the body of work on behavioral finance.

Credit Author Statement

We thank Mara Faccio, Anna Maria Cristina Menichini and Marco Pagano for helpful comments and discussions.

Appendix A

Definitions of Variables:

This section provides the variable definitions used in the analysis. Compustat item codes are provided in parentheses.

ST3: Percentage of debt maturing in three years or less divided by total debt.

ST5: Percentage of debt maturing in five years or less divided by total debt.

Female Executives: Equal to one if the firm has a female CEO or a female CFO, and zero otherwise.

StockOwn: Self-interested managers prefer less monitoring associated with long-term debt. Therefore, without stock ownership to align executives' interests with stockholders, managers can issue long-term debt to avoid frequent monitoring. This variable is proxied by the number of shares (excluding options) owned by both the CEO and CFO divided by common shares outstanding at the end of the fiscal year.

Executive Leverage: The ratio of an executive's inside debt to his/her inside equity.

Inside Debt: The sum of the present value of accumulated pension benefits and deferred compensation.

Exec_EBC: Executive equity-based compensation. The sum of the value of new stock options (using modified Black–Scholes method) granted to the firm's CEO and CFO as a percentage of total compensation paid to them.

High_Exec_EBC: Equals one if a firm's Exec_EBC is higher than the sample median, and zero otherwise.

Inside Equity: The sum of the value of stock and stock options held by the CEO.

MTB: Market value of total assets/book value of total assets. We measure the market value of total assets with *Size*.

REG: Equal to one for regulated firms, and zero for non-regulated firms.

Rat: Equal to one for rated firms, and zero for non-rated firms.

INVG: Equal to one if a firm's credit rating is BBB- or higher by Standard & Poor's, and zero otherwise.

Size: The share price (data item 199) × outstanding shares (data item 54) + book value of total assets (data item 6) - book value of equity (data item 60).

ABN_Earn: (Earnings in year *t+1* (data item 20) - earnings in year *t*)/(share price (data item 199) × outstanding shares (data item 54)) in year *t*)

AssetMat: (Gross property, plant, and equipment (data item 7)/total assets (data item 6)) × (gross property, plant, and equipment (data item 7)/depreciation expense (data item 14)) + (current assets (data item 4)/total assets (data item 6)) × (current assets (data item 4)/cost of goods sold (data item 41)).

ITC: Equal to one for firms with investment tax credits, and 0 otherwise.

Leverage: Long-term debt (data item 9)/market value of total assets × 100.

Profitability: The ratio of operating income before depreciation (data item 13) to total assets (data item 6).

RET_STD: The standard deviation of the natural logarithm of stock return during the fiscal year [standard deviation of (ln(return)) × (market value of equity/market value of assets)].

Term: The difference between the month-end yield on 10-year government bonds and the month-end yield on 6-month treasury constant maturity date.

TLCF: Equal to 1 for firms with operating loss carryforwards, and 0 otherwise.

Gender Equality: An exclusion variable (for first stage regression in Heckman's method) based on the friendliness to women equality of the state in which the firm is headquartered.

Post: Equal to one if year *t* is after the executive transition, and zero otherwise.

Female Transition: is a dummy variable that takes a value equal to one for firms facing a male-to-female transition

ROA: Ratio of earnings before interest, taxes, depreciation, and amortization (EBITDA) to total assets (AT).

Taxes: Ratio of total income taxes (TXT) to pretax income (PI).

Cash: Ratio of cash and short-term investments (CHE) to total assets (AT).

Dividend dummy: Dummy variable that takes the value of one if the firm pays dividends (DVC).

Fixed Assets: Ratio of net property, plant, and equipment (PPENT) to total assets (AT).

GDP growth: The growth in gross domestic product.

Yield Spread: The difference between the five-year Treasury rate and the one-year Treasury rate.

Macro Uncertainty: Measure of the level of macroeconomic uncertainty, which is three-month ahead macroeconomic uncertainty obtained from Jurado's website.

Short-term rate: Yield on 1-year government bonds (Federal Reserve).

Recession dummy: Dummy variable that takes the value of one if there are at least 1 month in a year designated as recession by the NBER.

OutsideFemDir: Number of outside female directors (that are not CEO or CFO) on the board divided by board size.

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