Finance Research Letters 65 (2024) 105520

Contents lists available at ScienceDirect

Finance Research Letters

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

Executive gender and capital structure: New evidence from rebalancing events

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ARTICLE INFO

JEL codes:
G41
G32
J16

Keywords:
Gender diversity
Risk aversion
Female CFO
Female CEO
Capital structure
Leverage

ABSTRACT

Existing literature shows that female-led companies exhibit lower leverage compared to their male-led counterparts, a trend frequently attributed to the traditional view of higher risk aversion among women. We explore firms with female CFOs at or close to their optimal leverage and find that their capital structure is no different than that of firms with male CFOs. We argue that female CFOs reveal their true preferences and risk appetite during significant capital structure adjustments and find that their tolerance for risk aligns closely with that of their male counterparts. Our study challenges the conventional narrative by demonstrating that the financing decisions of top executives are likely not influenced by gender-based psychological differences.

1. Introduction

Extensive literature builds upon upper echelons theory (Hambrick and Mason, 1984) and relates various executive traits, such as gender, ethnicity, age, R&D background, and legal and financial expertise, to corporate policies and outcomes (Custódio and Metzger, 2014; Serfling, 2014; Cline and Yore, 2016; Doan and Iskandar-Datta, 2021; Li and Xiang, 2022; Huang et al., 2023; Liao, Ouyang, and Tang, 2023; among others). The evidence suggests that the identity of the people at the helm of the company plays a role in shaping firm strategies, including the choice of capital structure.[1] One factor that has been advanced as contributing to the link between executive identity and leverage is the varying degrees of risk aversion that firm leaders might have.

Numerous studies in business and psychology show that gender is related to risk preferences, with females exhibiting higher levels of risk aversion, and lower overconfidence and competitiveness than males (Barber and Odean, 2001; Croson and Gneezy, 2009; Bertrand, 2011; Charness and Gneezy, 2012; Chen, Leung, Song, and Goergen, 2019; Wang and Fung, 2022; Perrin, Bertrand, and Klein, 2023). Within the corporate finance field, extant literature finds evidence that the gender of the members of the top management team affects the capital structure of the firm. Female CEOs and CFOs are associated with lower leverage and less debt issuance (Huang and Kisgen, 2013; Faccio, Marchica and Mura, 2016; Schopohl, Urquhart, and Zhang, 2021), shorter debt maturity (Datta, Doan, and Toscano, 2021), higher cash holdings and lower cash flow volatility (Elsaid and Ursel, 2011).

On the other hand, empirical studies on board gender diversity demonstrate that female directors are equally, or even more,

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[1] See, among others, Bertrand and Shoar (2003), Malmendier, Tate, and Yan (2011), Cronqvist, Makhija, and Yonker (2012), Staneva (2024).

https://doi.org/10.1016/j.frl.2024.105520
Received 9 February 2024; Received in revised form 3 May 2024; Accepted 9 May 2024
Available online 11 May 2024

inclined towards risk-taking and competitive behaviors as male directors (Adams and Funk, 2012; Adams and Ragunathan, 2018; Berger, Kick and Schaeck, 2014; Sila, Gonzalez and Hagendorff, 2016). Matsa and Miller (2013) observe no significant change in firm leverage following the implementation of a board gender quota. Furthermore, studies employing economic experiments show that gender differences in financial risk aversion are less pronounced among managers and professionals than in the general population (Croson and Gneezy, 2009) and that prior findings on gender differences in risk aversion may arise from context and varying opportunity sets rather than risk attitudes (Schubert, Brown, Gysler and Brachinger, 1999).

Given the conflicting evidence on the level of risk aversion of female executives and its impact on capital structure, this remains an important empirical question. In this study, we provide new evidence on the effect that CFO and CEO gender has on the capital structure of the firm by focusing on situations where personal preferences and biases are most likely to be revealed – after leverage rebalancing. We find no significant effect of gender on the target leverage, which implies that psychological factors such as the level of risk aversion or overconfidence are likely not responsible for the lower leverage associated with female CFOs during off-target years. That conclusion is based on the premise that psychological factors would be constant at the level of the executive and manifest persistently across time. In fact, we argue that, if psychological biases indeed account for the observed gender differences in leverage, then their effect should be particularly pronounced during active refinancing events, which involve significant changes to the capital structure of the firm. These refinancing actions are directly influenced by executive decisions and should capture differences in risk aversion more clearly than any passive changes in leverage during periods of inactivity.

Key to our empirical approach is being able to identify specific years during which the leverage ratio is expected to closely match the optimal leverage determined by the company's executives. Hovakimian, Hovakimian, and Tehranian (2004) argue that firms issuing significant amounts of both debt and equity in the same year are likely to use that opportunity to optimize the capital structure of the firm. This is consistent with dynamic trade-off models where managers allow leverage to diverge from the target for extended periods when adjustment costs exceed the benefits of achieving the optimal capital structure (Fischer, Heinkel and Zechner, 1989; Leland, 1994; Goldstein, Ju and Leland, 2001; Strebulaev, 2007; and Morellec, Nikolov and Schürhoff, 2012). In a similar vein, Danis, Rettl and Whited (2014), examine periods when firms simultaneously undertake debt issuance and equity distribution to shareholders in large quantities and argue that the leverage resulting from these refinancing decisions is close to the optimal debt ratio.

In this study, we contrast the effect of CFO gender on leverage during times of adjustment to target to the effect during times of inaction, which allows us to gain insight into the mechanisms behind it. We show that, although firms with female CFOs typically maintain lower debt ratios, if we focus on the years of deliberate leverage rebalancing, we find no significant difference in the optimal leverage across firms with male and female CFOs. This finding is important as it implies that, when it comes to the choice of capital structure, female executives' preferences and risk appetites are comparable to those of their male counterparts. It also suggests that researchers should focus on exploring the underlying causes of gender disparities in adjustment costs to understand the factors responsible for the lower leverage associated with female executives during off-target years.

Our study contributes to the literature showing that women in leadership positions do not exhibit stereotypically female traits when making important corporate decisions. Using the framework of a dynamic inaction model, where the company leaves its capital structure off-target for long periods due to the presence of adjustment costs, we can reconcile the conflicting evidence regarding the impact of gender on leverage. We hope to enrich the dialogue around gender diversity in corporate leadership by highlighting the potential for overestimating the influence of stereotypical gender traits on executive behavior.

The rest of the paper proceeds as follows. Section 2 describes the data and methodology. Section 3 presents our main empirical analysis. Section 4 discusses the robustness of our findings. Section 5 examines differences in the speed of adjustment across female and male CFOs, and Section 6 concludes.

2. Data and methodology

Our dataset is derived from the Standard and Poor's *ExecuComp* database, which provides information on the top executives of S&P500, S&P MidCap400, and S&P SmallCap 600 firms, starting in 1992.We identify the CFO each year using the *cfoann* variable provided by *Execucomp* starting in 2006. For earlier observations or those with missing values for *cfoann*, we rely on the *titleann* variable to identify the CFO.[2] We also gather annual firm-level financial data from *Compustat* and stock price information from *CRSP*. We trim all variables to mitigate the effect of outliers and drop all financial firms (primary one digit SIC code of 6) as well as those with values of total assets or sales less than one million dollars from the sample. The final dataset consists of 26,722 firm-years, representing 2559 firms and encompassing the period from 1992 to 2022.

Within this sample, 557 firms (21.8% of firms) report having at least one female CFO during the sample period, while only 193 (7.5%) have been run by a female CEO over the same period. We rely on the firm's book leverage to assess the capital structure choices of CFOs as it is free of the effect of stock market reactions or any spurious correlations with explanatory variables (Barclay, Morellec, and Smith, 2006). Furthermore, Graham and Harvey (2001) report that executives focus on book values when determining the capital structure of the firm.

As postulated by the dynamic trade-off theory, the observed debt ratio at any point in time is comprised of two components – the target leverage ratio and the deviation from that target that has not been offset due to the presence of adjustment costs. The goal of this

[2] We focus on the CFO, as our goal is to examine the effect of gender on the firm's capital structure choice and that choice is directly under the purview of the CFO. This is consistent with prior studies (see Francis et al., 2013; Gupta, Mortal, Chakrabarty, Guo and Turban, 2020; Schopohl et al., 2021). Nevertheless, in the robustness section, we examine the effect of the CEO as well.

study is to examine the choices of female CFOs when it comes to the determination of an optimal capital structure for their companies. To arrive at a proxy for the target, we follow prior literature and identify years within the history of the firm where it is most likely to be at or near its target capital structure.[3] Specifically, Hovakimian et. al. (2004) argue that firms issuing large quantities of both debt and equity will choose the issuance amounts of new debt and equity such that any significant deviation from the target capital structure is offset. Furthermore, Danis et al. (2014) argue that firms that issue significant amounts of debt and use the proceeds to retire equity are doing so to bring the debt ratio up to its target level. In both situations (dual issuers or issuers of debt that repurchase equity), the leverage ratio observed at the end of the year when the rebalancing occurred should be very close to the optimal leverage. Following prior literature, we set a threshold of 5% of total assets to define "large" events. We identify 1499 such events in our sample and we call those "rebalancing years".

Table 1 reports summary statistics of the main variables of interest used in this study. In columns 1 to 4 of Panel A and column 1 of Panel B, the statistics are computed over the full sample, while the rest of the columns present the statistics during rebalancing events only. Female CFOs comprise around 9.2% of the full sample and similar proportion (9.8%) of the rebalancing subsample. Leverage is significantly higher during rebalancing events, which is consistent with our definition of those events, and with the idea that firms are generally more likely to be underlevered rather than overlevered and would thus bring leverage up to the higher target at points of adjustment. In Panel B, we compare leverage changes across the two samples and find that the events that we identify as rebalancing do indeed represent significant modifications to the capital structure of firms. During rebalancing years, the median firm changes its leverage ratio (in absolute terms) by almost 30%, which is twice as high as in the full sample.[4]

3. Empirical results

Our main research question is whether the gender of Chief Financial Officers influences the capital structure choice through the channel of differing levels of risk aversion. Prior studies have established that female executives tend to have lower leverage ratios, a difference largely attributed to a higher level of risk aversion exhibited by females compared to males. We begin the empirical analysis by confirming this result in our sample, in both a univariate and multivariate setting.

In Table 2, we split the full sample into observations where the CFO is female and firm-years where the CFO is male. In columns 1 to 4, we report the average values of all financial variables in each subsample and test the difference of those means for statistical significance.[5] We find that firms with female CFOs have on average around 6% lower leverage than those with a male CFO. We also observe that firms run by female CFOs have higher market-to-book ratio, profitability, size, and slightly lower R&D expense. As size, profitability, and market-to-book are among the established determinants of capital structure, we examine next the effect of CFO gender on leverage in a multivariate setting, where we can control for those factors explicitly.

We estimate the traditional leverage regression in the full sample and report the coefficients in column 1 of Table 3. Our main variable of interest is the indicator variable *Female CFO*, which equals 1 if *ExecuComp* has recorded the gender of the CFO as female, and zero if it has been recorded as male. The choice of the control variables included in the model is informed by the extensive capital structure literature, which has identified those factors as important determinants of the firm's leverage. Consistent with prior studies, we find a strong negative association between the presence of a female CFO and the debt ratio of the firm.

If this difference in leverage is largely due to gender-based psychological differences, we would expect female CFOs to exhibit such preference for lower leverage consistently throughout their tenure. In fact, any differences in the levels of risk aversion should be especially pronounced during active capital structure management events that would reveal the managers' choice of an optimal leverage ratio. Therefore, if we focus on the leverage ratio resulting from rebalancing actions, we are likely to capture the CFO's optimal capital structure choice, and expect to find similar, or even stronger, negative correlation between the gender of the CFO and the target leverage if indeed differing levels of risk aversion affect the capital structure choices of those executives. In columns 5 to 8 of Table 2, we perform the univariate analysis in the subsample representing rebalancing events only. We find no statistically significant difference in the optimal leverage chosen by female and male CFOs. In fact, female CFOs exhibit an average target of 0.338, while the target for male CFOs is 0.326. In column 2 of Table 3, we confirm this result with multivariate regression analysis. The coefficient on the *Female CFO* indicator variable is positive and insignificant when we limit the sample to the rebalancing years. The target leverage, measured as the debt ratio resulting from the issuance decisions during rebalancing years, of firms under the control of female CFOs is no different from the target leverage of firms with male CFOs.[6] This finding casts doubt on the notion that female Chief Financial Officers choose lower levels of leverage due to higher levels of risk aversion. In fact, when CFOs make significant financing decisions

[3] An alternative way to determine the target leverage that is frequently employed in the literature is to estimate the target as the predicted value from a regression of leverage on lagged firm characteristics assumed to proxy for the costs and benefits of debt. We do not rely on this approach as the predicted value cannot capture differences in risk aversion of the CFO, it would only reflect the differences in the firm characteristics across female and male CFOs, which we report in Table 2 and control for in all specifications. However, by identifying situations where firms adjust to their target, we can observe the influence of CFO risk preferences on their capital structure decisions. This is why we focus on specific events likely to identify the observed target debt ratios, rather than the estimated ones.

[4] We thank the anonymous referee for suggesting this additional analysis.

[5] The exact definition of all variables used in the empirical analysis is presented in Appendix A.

[6] Our main results focus on the most representative rebalancing events as identified by Hovakimian et. al. (2004) and Danis et al. (2014), using 5% of total assets as a definition of "large" issuance/repurchase. Our results remain consistent if we expand the rebalancing sample with years when the firm issues equity to retire debt and when we lower the threshold from 5% to 3%.

Table 1
Summary statistics.

Panel A

	1	2	3	4	5	6	7	8
Sample:	All years				Rebalancing years			
Statistic:	Obs.	Mean	Median	St. Dev.	Obs.	Mean	Median	St. Dev.
Leverage	26,722	0.24	0.22	0.19	1,499	0.33	0.31	0.17
Female CFO	26,722	0.09	0.00	0.29	1,499	0.10	0.00	0.30
MB	26,722	1.98	1.60	1.24	1,499	2.45	2.05	1.41
Return	26,722	0.15	0.10	0.46	1,499	0.26	0.19	0.45
ROA	26,722	0.15	0.14	0.11	1,499	0.18	0.18	0.12
Size	26,722	6.55	6.46	1.58	1,499	6.79	6.75	1.57
Tangibility	26,722	0.27	0.20	0.22	1,499	0.28	0.19	0.24
Expense	26,722	0.25	0.21	0.18	1,499	0.25	0.21	0.19
R&D	26,722	0.04	0.00	0.08	1,499	0.04	0.00	0.09
R&D dummy	26,722	0.68	1.00	0.47	1,499	0.68	1.00	0.47
Industry Leverage	26,722	0.21	0.22	0.11	1,499	0.21	0.22	0.11

Panel B

	1	2
Sample:	All Years	Rebalancing Years
Statistic:	Median	Median
Δ Leverage	−0.004	0.064
Δ Leverage (as a% of lagged leverage)	−2.87%	28.84%
Δ Leverage - absolute value	0.030	0.068
Δ Leverage - absolute value (as a% of lagged leverage)	14.29%	29.74%

The table in Panel A presents summary statistics of the key variables employed in this study, including averages, medians, and standard deviations. Summary statistics for the full sample, consisting of an unbalanced panel of 26,722 observations from 2,559 firms for the period 1992 - 2022, are displayed in columns 1 to 4. Columns 5 to 8 present these statistics for the rebalancing subsample. Panel B compares the magnitude of leverage changes in the full sample and in the subsample of rebalancing years. Variable definitions are provided in Appendix A.

Table 2
Univariate analysis.

Sample:	1 All years	2	3	4	5 Rebalancing years	6	7	8
	Female CFO firms	Male CFO firms	Difference	p-value	Female CFO firms	Male CFO firms	Difference	p-value
Leverage	0.223	0.237	−0.014***	0.000	0.338	0.326	0.012	0.406
MB	2.084	1.968	0.116***	0.000	2.671	2.427	0.244**	0.046
Return	0.148	0.149	−0.002	0.855	0.229	0.264	−0.036	0.358
ROA	0.156	0.151	0.005**	0.047	0.195	0.181	0.014	0.163
Size	6.719	6.535	0.184***	0.000	7.275	6.736	0.54***	0.000
Tangibility	0.260	0.268	−0.007	0.108	0.260	0.282	−0.023	0.280
Expense	0.251	0.250	0.001	0.895	0.251	0.254	−0.003	0.849
R&D	0.039	0.042	−0.003*	0.064	0.046	0.042	0.004	0.591
R&D dummy	0.691	0.680	0.012	0.240	0.701	0.678	0.023	0.568
Industry Leverage	0.204	0.206	−0.002	0.310	0.202	0.211	−0.008	0.365
Obs	2466	24,256			147	1352		

The table shows comparisons of means of financial characteristics for firm-years with a female CFO to firm-years with a male CFO. Comparisons within the full sample are presented in columns 1 to 4, while the sample is limited to only rebalancing years in columns 5 to 8. Variable definitions are provided in Appendix A. Significance at the 10%, 5%, and 1% level is identified with *, **, and ***, respectively.

that are most likely to reveal their preferences, we find that gender does not play a role. In the following section, we perform additional tests to rule out alternative explanations and establish the robustness of this result.

4. Robustness

A critique of our focus on rebalancing events in Table 3 is that it reduces the sample size considerably, which decreases the likelihood of detecting a significant effect even if the true relation between CFO gender and target leverage is negative. To alleviate this concern and demonstrate the statistical power of our tests, we perform a bootstrap procedure of the leverage regression from column 2 of Table 3. Out of the full sample of 26,722 observations, we randomly select a subsample of 1499 observations (to match the size of the rebalancing events sample) and estimate the leverage model in this sample. We repeat this process 5000 times and create a probability distribution for the coefficient on Female CFO, which is reported in Fig. 1. We find that, if the rebalancing subsample were chosen at

Table 3
Female CFOs and optimal leverage choice.

	1	2
Sample:	All years	Rebalancing years
Dependent variable:	$Leverage_{(t+1)}$	$Leverage_{(t+1)}$
Female CFO	−0.021***	0.006
	[−2.96]	[0.38]
MB	−0.015***	−0.005
	[−6.17]	[−1.27]
Return	−0.007**	0.01
	[−2.36]	[0.96]
ROA	−0.091***	−0.016
	[−3.51]	[−0.32]
Size	0.023***	0.009***
	[11.20]	[2.73]
Tangibility	0.092***	0.035
	[5.73]	[1.36]
Expense	0.036	0.059
	[1.63]	[1.44]
R&D	−0.022	−0.086
	[−0.53]	[−1.15]
R&D dummy	−0.015**	−0.008
	[−2.23]	[−0.70]
Industry Leverage	0.457***	0.419***
	[12.85]	[6.91]
Year Fixed Effects	**Yes**	**Yes**
Obs.	26,722	1499
Adjusted R-squared	24.7%	15.9%

The table presents the results of firm-level panel regressions of book leverage ($Leverage_{t+1}$) on an indicator variable identifying female CFOs (*Female CFO*) and control variables. In column 1, the model is estimated in the full sample, consisting of an unbalanced panel of 26,722 observations over the 1992 - 2022 period. In column 2, the sample is limited to rebalancing years. Variable definitions are provided in Appendix A. All specifications account for calendar year fixed effects. The standard errors used to compute t-statistics (reported in brackets) are robust to heteroskedasticity and clustering at the firm level. Coefficient estimates significantly different from zero at the 10%, 5%, and 1% level are identified with *, **, and ***, respectively.

random, the probability of getting the actual coefficient on the Female CFO variable, as reported in Table 3, is less than 5%.

While endogeneity is a concern in most corporate finance studies, the empirical setting that is employed in this paper helps alleviate such concerns somewhat as the focus is on the difference between coefficients across different subsamples of the same set of firms. Nevertheless, we perform additional robustness tests to address potential alternative interpretations of the results reported in the previous section.

One possible reason for finding no significant effect of the CFO gender variable on leverage during capital restructuring events is that CFOs simply do not have a say in the decision-making process. If such significant decisions are solely at the discretion of the CEO, then that could potentially explain the lack of significant differences between the optimal capital structure choices of male and female CFOs, even if female CFOs have higher levels of risk aversion than their male counterparts. To test this alternative explanation, we add an indicator variable for the gender of the CEO to the leverage regression. If CEOs are the decision makers when it comes to capital structure rebalancing, and if there are gender-based psychological differences influencing the behavior of top executives, then we expect to find a significant CEO gender effect. The results reported in column 1 of Table 4 indicate that this is not the case. Furthermore, in column 2 we add a variable capturing the instances where both the CEO and the CFO are female and find that none of the three gender variables has any significant effect on the optimal leverage ratio.

Next, to rule out the possibility that the differential effect of CFO gender on leverage during rebalancing years is due to firms and/or CFOs that rebalance being systematically different from those that do not, we perform a difference-in-difference analysis. Since not every firm or executive in our sample goes through a rebalancing event, our results could arise if female CFOs (or firms led by female CFOs) that rebalance more frequently are similar to male CFOs (or firms led by male CFOs) when it comes to setting the capital structure policy of the firm, while gender differences among CFOs that do not rebalance are more pronounced. We can test this theory by comparing the effect of CFO gender on leverage in the years leading up to rebalancing to that effect in the rebalancing year itself.

Specifically, we focus only on the year of rebalancing and the two years prior and add to the traditional leverage regression an interaction term between the Female CFO dummy and an indicator variable that equals 1 for the capital structure adjustment year and zero for the two prior years. We also include the individual components of the interaction term in the specification. The resulting coefficients are reported in column 3 of Table 4. We find that leverage is significantly lower for firms with female CFOs during the two years prior to rebalancing (coefficient of – 0.029) but that those firms more than make up for this difference during the year of capital structure adjustment. The coefficient on the interaction term is 0.034 and significant at the 5% level. This test implies that, to the extent that any unobserved factors are responsible for the negative association between CFO gender and leverage, such factors cannot be

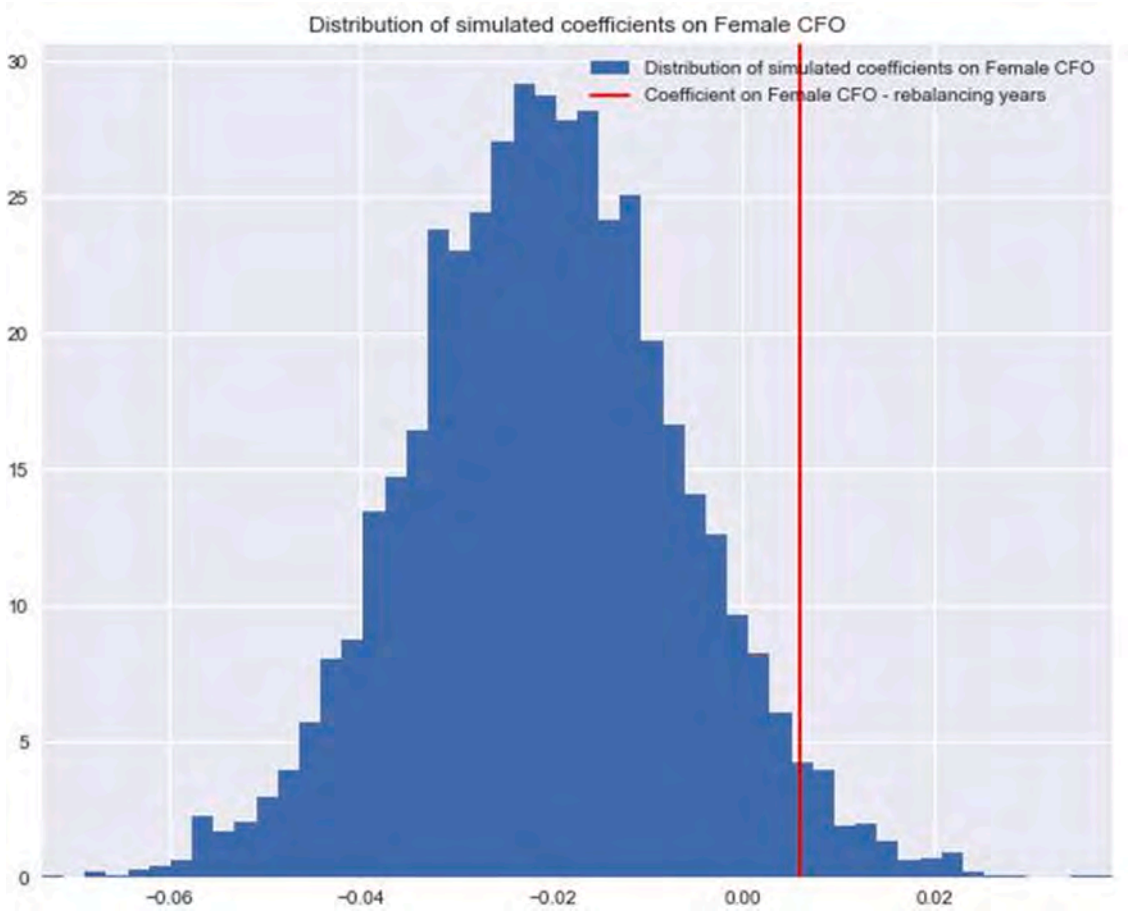

Fig. 1. Distribution of simulated coefficients on Female CFO.
The figure depicts the probability distribution of 5000 coefficients resulting from performing a bootstrap procedure of the leverage regression from Table 3. We randomly select a subsample of 1499 observations out of the full sample of 26,722 observations and estimate the leverage model in this subsample. We repeat this process 5000 times to create a probability distribution for the coefficient on the Female CFO variable. The red line designates the value of the actual coefficient on the Female CFO variable reported in column 2 of Table 3.

constant at the firm level nor at the level of the executive.

We also estimate the leverage regression in the full sample, including the interaction term between the female CFO dummy and the rebalancing event indicator and report the coefficients of interest in column 4 of Table 4. In column 5, we add firm fixed effects to this specification to address potential endogeneity concerns related to time-invariant omitted variables. In columns 6 and 7, we employ an instrumental variable approach and estimate 2-Stage Least Squares (2SLS) regressions, where we treat both the female CFO variable and the interaction term between female CFO and the rebalancing event indicator variable as endogenous. Following Schopohl et al. (2021), we use the average percentage of female directors per year (excluding the focal firm) as an instrument for the presence of a female CFO and augment the model with additional control variables including the number of directors, fraction of independent directors, fraction of independent directors who serve on outside boards, fraction of female directors, the age of the CFO, CFO total compensation, and if the CEO is also the chairman of the board. All board characteristics are collected from the ISS database.[7] We estimate the 2SLS specification with and without firm fixed effects and report the second stage results in columns 6 and 7 of Table 4. In all alternative specifications, we continue to find evidence that the negative association between female CFOs and leverage is reversed during years of rebalancing as indicated by the positive and significant coefficient on the interaction term in all regressions.

Lastly, we utilize a propensity score matching procedure to mitigate potential selection concerns. Using a logistic regression, we estimate the propensity to have a female CFO as a function of all variables used in the model except for the leverage ratio. Using the nearest-neighbor method and a caliper of 0.01 in absolute value, we match each observation with a female CFO to an observation with a male CFO based on the propensity score. We perform the matching separately in the full sample and in the rebalancing subsample to account for the possibility that the independent variables have differential effect on the probability of having a female CFO in those

[7] The board level data covers the period from 1996 to 2016, which reduces the sample size.

Table 4
Robustness tests.

	1	2	3	4	5	6	7
Model:	OLS	OLS	OLS	OLS	OLS with Firm FE	2SLS	2SLS with Firm FE
Sample:	Rebal. years	Rebal. years	Rebal. + two prior years	Full Sample	Full Sample	Full Sample	Full Sample
Dependent variable:	$Leverage_{(t+1)}$	$Leverage_{(t+1)}$	$Leverage_{(t+1)}$	$Leverage_{(t+1)}$	$Leverage_{(t+1)}$	$Leverage_{(t+1)}$	$Leverage_{(t+1)}$
Female CFO * Rebalance year			0.034**	0.026*	0.018*	0.484*	0.611**
			[2.27]	[1.65]	[1.70]	[1.68]	[2.32]
Female CFO	0.006	0.005	−0.029*	−0.022***	−0.007**	−0.781**	−0.415
	[0.38]	[0.34]	[−1.89]	[−3.16]	[−1.98]	[−1.96]	[−1.26]
Female CEO	−0.005	−0.007					
	[−0.19]	[−0.24]					
Both Female		0.022					
		[0.20]					
Rebalance year			0.080***	0.092***	0.057***	0.030	−0.015
			[19.11]	[18.18]	[17.05]	[0.92]	[−0.50]
Controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Year FE	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Firm FE					**Yes**		**Yes**
Obs.	1498	1498	3242	26,722	26,722	12,875	12,678
Adj. R-sq.	15.80%	15.70%	23.20%	26.00%	70.10%		
Kleibergen-Paap rk LM stat						4.344	2.861
Kleibergen-Paap rk LM p-value						0.037	0.091

The table presents the results of different robustness tests. In column 1, we estimate a firm-level panel regression of book leverage ($Leverage_{t+1}$) on an indicator variable identifying female CFOs (*Female CFO*) and an indicator variable identifying female CEOs (*Female CEO*) as well as control variables. In column 2, we add an interaction term between the CEO and CFO gender variables (*Both Female*). In columns 1 and 2, the sample is limited to rebalancing years. In columns 3, the sample consists of the rebalancing year as well as the two years prior to it, while columns 4–7 examine the full sample. The model in columns 3–7 includes an interaction term between the *Female CFO* variable and a dummy variable, which is 1 for the rebalancing year and zero otherwise. Columns 1 - 5 are estimated with an OLS regression. In columns 6 and 7, we employ the 2-stage Least Squares (2SLS) approach, treating both the *Female CFO* variable and the *Female CFO * Rebalance Year* interaction term as endogenous and using the average percentage of female directors per year (excluding the focal firm) as an instrument for the presence of a female CFO. We only report the second stage results of the 2SLS estimation in columns 6 and 7 and augment the model with additional control variables - the number of directors, fraction of independent directors, fraction of independent directors who serve on outside boards, fraction of female directors, the age of the CFO, CFO total compensation, and if the CEO is also the chairman of the board. Variable definitions are provided in Appendix A. All specifications account for calendar year fixed effects. The specification in column 5 also includes firm fixed effects. The standard errors used to compute t-statistics (reported in brackets) are robust to heteroskedasticity and clustering at the firm level. Coefficient estimates significantly different from zero at the 10%, 5%, and 1% level are identified with *, **, and ***, respectively.

different circumstances. Table 5 shows that we have achieved balance of the covariates in both matched samples. It also asserts our finding of a significantly lower leverage associated with female CFOs in the full sample and no significant difference in leverage in the rebalancing subsample. Those conclusions continue to hold in Table 6, which reports the regression results of the propensity score matching analysis.

5. Speed of adjustment tests

In this section we perform an additional test of the risk aversion explanation for the observed difference in leverage across male and female CFOs by examining differences in the speed of adjustment (SOA) towards the target leverage for those two groups.[8] This test is based on the observation that female CFOs, if more risk-averse or less overconfident, would likely adjust leverage slower from below and faster from above due to having a lower personal target leverage compared to their male counterparts. If, however, the lower leverage associated with female CFOs during off-target years is due to other factors (such as facing more difficulty in issuing debt, for example), then we could still find that female CFOs adjust leverage slower from below, but we should not observe any difference in the SOA from above.

We conduct the SOA regression analysis following the empirical approach from Hovakimian and Li (2011), who investigate multiple versions of the partial adjustment model, in both one-step and two-step form, with the goal of identifying the least biased way of estimating the SOA. We use three different proxies for the target leverage in the first stage of the two-stage partial adjustment model and report the differences in the average target across the firms with and without female CFOs in Table 7. Specifically, we estimate leverage regressions on lagged firm characteristics and the industry median leverage and measure the target in each year as the predicted value from these regressions. The three alternative specifications include: 1) cross sectional regressions; 2) regressions based

[8] We thank the anonymous referee for suggesting this additional analysis.

Table 5
Propensity score matching - univariate results.

Sample:	1 All years	2	3	4	5 Rebalancing years	6	7	8
	Female CFO firms	Male CFO firms	Difference	p-value	Female CFO firms	Male CFO firms	Difference	p-value
Leverage	0.222	0.242	−0.02***	0.000	0.338	0.321	0.017	0.398
MB	2.082	2.069	0.013	0.721	2.573	2.523	0.050	0.781
Return	0.148	0.164	−0.016	0.212	0.224	0.176	0.047	0.297
ROA	0.155	0.153	0.003	0.376	0.193	0.189	0.005	0.680
Size	6.717	6.688	0.029	0.527	7.077	7.139	−0.063	0.723
Tangibility	0.260	0.253	0.007	0.222	0.269	0.236	0.033	0.241
Expense	0.251	0.254	−0.003	0.502	0.243	0.235	0.008	0.704
R&D	0.039	0.040	−0.001	0.554	0.040	0.036	0.004	0.660
R&D dummy	0.691	0.679	0.013	0.342	0.669	0.654	0.015	0.796
Industry Leverage	0.204	0.206	−0.002	0.528	0.209	0.212	−0.003	0.850
Obs	2465	2465			133	133		

The table shows comparisons of means of financial characteristics for firm-years with a female CFO to firm-years with a male CFO in the propensity score matched samples. In columns 1–4, we use the full sample and match each firm-year with a female CFO with a firm-year with a male CFO. The matched sample consists of 2465 treated and 2465 control observations. In columns 5–8, we perform the propensity score matching only within the subsample of rebalancing years, which results in 133 treated and 133 control observations. Variable definitions are provided in Appendix A. Significance at the 10%, 5%, and 1% level is identified with *, **, and ***, respectively.

Table 6
Propensity score matching - regression results.

Sample: Dependent variable:	1 All years $Leverage_{(t+1)}$	2 Rebalancing years $Leverage_{(t+1)}$
Female CFO	−0.019**	0.020
	[−2.55]	[0.99]
MB	−0.011***	−0.006
	[−2.91]	[−0.75]
Return	−0.003	−0.001
	[−0.46]	[−0.02]
ROA	−0.061	0.265**
	[−1.43]	[2.12]
Size	0.022***	−0.002
	[7.75]	[−0.23]
Tangibility	0.089***	−0.064
	[3.72]	[−1.24]
Expense	0.043	−0.005
	[1.27]	[−0.06]
R&D	−0.019	−0.026
	[−0.23]	[−0.12]
R&D dummy	−0.012	0.014
	[−1.20]	[0.59]
Industry Leverage	0.415***	0.682***
	[7.72]	[4.99]
Year Fixed Effects	**Yes**	**Yes**
Obs.	4930	266
Adjusted R-squared	23.1%	21.5%

The table presents the results of estimating firm-level panel regressions of book leverage ($Leverage_{t+1}$) on an indicator variable identifying female CFOs (*Female CFO*) and control variables in the propensity score matched samples. In column 1, we use the full sample and match each firm-year with a female CFO with a firm-year with a male CFO. The matched sample consists of 2465 treated and 2465 control observations. In column 2, we perform the propensity score matching only within the subsample of rebalancing years, which results in 133 treated and 133 control observations. Variable definitions are provided in Appendix A. All specifications account for calendar year fixed effects. The standard errors used to compute t-statistics (reported in brackets) are robust to heteroskedasticity and clustering at the firm level. Coefficient estimates significantly different from zero at the 10%, 5%, and 1% level are identified with *, **, and ***, respectively.

on historical data only; and 3) regressions with firm fixed effects but using historical data only. Comparing the targets across the two samples - those with and without a female CFO – reveals conflicting results. Target 1 is slightly higher for female CFOs, the difference in Target 2 is insignificant, and Target 3 is significantly lower for female CFOs, which is expected as the firm fixed effects will capture the lower leverage associated with female CFOs during off-target years and would lower the predicted target for this group. As explained

above, any differences in the target predicted from a leverage regression would not be able to capture the influence of CFO risk preferences on the optimal leverage as that would only be revealed in actual, observed targets, which we aim to capture through our focus on rebalancing events in Sections 3 and 4.

Once we have the estimate of the target for each firm each year, we separate the deviation from the target into two variables – *Deviation_under* and *Deviation_over* to indicate whether the firm is underlevered or overlevered, respectively. Next, we interact these two variables with the Female CFO dummy and report the speed of adjustment estimates resulting from estimating the second stage of the 2-stage partial adjustment model:

$$\begin{aligned} Leverage_{i,t+1} - Leverage_{i,t} = {} & \left(Target_{i,t+1} - Leverage_{i,t}\right)^{Over} * Female\ CFO_{i,t+1} + \left(Target_{i,t+1} - Leverage_{i,t}\right)^{Under} \\ & * Female\ CFO_{i,t+1} + \left(Target_{i,t+1} - Leverage_{i,t}\right)^{Over} + \left(Target_{i,t+1} - Leverage_{i,t}\right)^{Under} \\ & + Female\ CFO_{i,t+1} + \varepsilon_{i,\ t+1} \end{aligned} \quad (1)$$

Table 7 reveals that, in two out of the three models, there are no significant differences in the SOA across female and male CFOs. In model 3, where we estimate the target using only historical data with firm fixed effects (the model recommended by the analysis in Hovakimian and Li, 2011), we find some evidence that female executives indeed adjust slower from below but do not exhibit any differences in adjustment speed from above. This outcome, combined with our finding of no significant differences in leverage during times of rebalancing from Table 3, is consistent with an explanation that female CFOs do not exhibit higher risk aversion (or lower overconfidence) than their male counterparts but, instead, are facing higher costs of adjusting leverage up. Since most firms tend to be below rather than above their target leverage, our results imply that the observed differences in the capital structure of firms with male and female CFOs during off-target years are likely due to higher adjustment costs faced by female CFOs, rather than any inherent difference in risk preferences.

We recognize that the precise speed of adjustment is inherently difficult to measure and that the results reported in Table 7 cannot conclusively differentiate between alternative potential explanations. Estimating the partial adjustment model assumes that we can correctly capture the unobserved target as the predicted value from a regression model and the exact specification of that regression model has been subject to debate in the literature. For example, discrepancies arise regarding whether profitability should be included as a determinant of the target leverage due to this variable's negative coefficient, which contradicts the expectations of tradeoff theory upon which the partial adjustment model rests (Hovakimian, Opler, Titman, 2001). Furthermore, Chang and Dasgupta (2009) show that the partial adjustment model produces biased estimates of the SOA in simulated samples due to mechanical mean reversion. Hovakimian and Li (2011) confirm the existence of significant bias in the estimates of the SOA by looking at simulated datasets generated with no target adjustment. The authors show that, in addition to mean reversion, another source of bias is using ex-post information to estimate the target. Although we have attempted to address some of these issues in our empirical analysis, we recommend interpreting the results presented in Table 7 with caution.

6. Conclusion

Our investigation into the capital structure decisions of firms led by female CFOs during leverage rebalancing events presents compelling evidence that challenges the conventional narrative linking gender to risk aversion in corporate finance. Our analysis reveals no significant gender-based differences in the optimal leverage ratios set by CFOs. This finding calls for a reevaluation of the impact of executive gender on corporate financial strategies, suggesting that factors beyond gender stereotypes are at play in shaping these decisions.

Like most studies in empirical corporate finance, we acknowledge that we can never fully address endogeneity concerns in the absence of a natural experiment despite employing several empirical strategies designed to address omitted variable bias and reverse causality. We do point out, however, that if there is an omitted factor that simultaneously influences the likelihood of having female CFOs and the level of leverage, then for this factor to account for our findings, it should have a differential effect across the year immediately before and the year of rebalancing.

Future research should explore potential causes for the observed capital structure differences during off-target years, such as gender-specific adjustment costs or lender biases against women. The growing discussion on the gender capital gap and the financial marginalization of female founders and executives suggests systemic biases may view women as less capable financial leaders. By challenging existing stereotypes and opening new avenues for inquiry, this study contributes to a more informed and nuanced dialogue on gender diversity in corporate leadership.

CRediT authorship contribution statement

Karolina Krystyniak: Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Conceptualization. **Viktoriya Staneva:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to

Table 7
Speed of adjustment tests.

	1	2	3
	First stage of partial adjustment model		
	Target 1	Target 2	Target 3
Male CFO firms	0.247	0.238	0.229
Female CFO firms	0.251	0.239	0.211
Difference	0.004*	0.000	−0.018***
p-value	0.062	0.961	0.000
	Second stage of partial adjustment model		
	Δ Leverage	Δ Leverage	Δ Leverage
Female CFO * Deviation_under	0.022	0.012	−0.053*
	[1.06]	[0.55]	[−1.70]
Female CFO * Deviation_over	−0.007	−0.003	0.006
	[−0.26]	[−0.12]	[0.20]
Female CFO	−0.004	−0.002	0.003
	[−1.33]	[−0.80]	[1.39]
Deviation_under	0.106***	0.103***	0.087***
	[15.27]	[14.40]	[7.97]
Deviation_over	0.089***	0.082***	0.109***
	[12.58]	[11.99]	[10.73]
N	26,576	26,255	25,042
adj. R-sq	4.4%	4.0%	2.0%

The table presents the results of estimating SOA using the 2-step partial adjustment model. In the first stage we estimate leverage regressions on lagged firm characteristics and the industry median leverage and then measure the target in each year as the predicted value from these regressions. The table reports the differences in the average target across the firms with and without female CFOs. Target 1 is estimated as the predicted value from annual cross-sectional regressions, Target 2 is the predicted value from regressions based on historical data only and Target 3 from regressions based on historical data with fixed effects included in the specification. In the second stage, we estimate the speed of adjustment to that target across female and male CFOs with the following model:..

$$Leverage_{i,t+1} - Leverage_{i,t} = \left(Target_{i,t+1} - Leverage_{i,t}\right)^{Over} * Female\ CFO_{i,t+1} + \left(Target_{i,t+1} - Leverage_{i,t}\right)^{Under} * Female\ CFO_{i,t+1} + \left(Target_{i,t+1} - Leverage_{i,t}\right)^{Over} + \left(Target_{i,t+1} - Leverage_{i,t}\right)^{Under} + Female\ CFO_{i,t+1} + \varepsilon_{i,\ t+1}$$

where the deviation from the target is separated into two variables – *Deviation_under* and *Deviation_over* to indicate whether the firm is underlevered or overlevered, respectively, and then interacted with the *Female CFO* dummy variable. Variable definitions are provided in Appendix A. The standard errors used to compute t-statistics (reported in brackets) are robust to heteroskedasticity and clustering at the firm level. Coefficient estimates significantly different from zero at the 10%, 5%, and 1% level are identified with *, **, and ***, respectively.

influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Appendix A. Variable definitions

Variable definitions	
Female CFO	1 if the firm's Chief Financial Officer is female, 0 otherwise.
Female CEO	1 if the firm's Chief Executive Officer is female, 0 otherwise.
Leverage	The sum of long-term debt (dltt) plus short-term debt (dlc), divided by total assets (at).
MB	The ratio of (total assets (at) – book value of equity + market value of equity) to total assests (at). Book value of equity is obtained as total assets (at) – long-term debt (dltt) – preferred stock (pstkl) + deferred taxes and investment tax credit (txditc). Market value of equity is (prcc_f)*(csho).
Return	Split- and dividend-adjusted stock return over the fiscal year.
ROA	Operating income before depreciation (oibdp) to total assets (at).
Size	The natural logarithm of sales (sale), adjusted for inflation (in 1983 dollars). CPI data gathered from the U.S. Bureau of Labor Statistics.
Tangibility	Property, plant, and equipment (ppent) to total assets (at).
Expense	Selling, general and administrative expense divided by sales (sale)
R&D	Research and development expense (xrd) divided by sales (sale). Set to zero if data is missing.
R&D dummy	1 if research and development expense (xrd) is nonmissing, 0 otherwise.
Industry Leverage	the median book leverage of each industry each year. Industry is defined by Fama-French 49 industry classification

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