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The impact of CEO power on corporate capital structure: New evidence from dynamic panel threshold analysis

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Abstract
This study examines the non-linearity between CEO power and corporate capital structure. Many previous studies show that firm leverage responds differently to CEO power changes. In order to capture this non-linear relationship, we employ an innovative dynamic panel threshold model, this novel method allows the estimation of threshold effects with panel data even in case of endogenous regressors. Using a panel-dataset of Chinese SMEs from 2009 to 2013, we show that CEO power has a strong positive influence on leverage in "low-CEO power" firms, but a negative impact on leverage in "high-CEO power" firms. The results are robust to alternative measures of leverage and CEO power, as well as additional explanatory variables.

Keywords: Capital structure, CEO power, nonlinear relationship, dynamic panel threshold
JEL Classification G32 G34

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The impact of CEO power on corporate capital structure: New evidence from dynamic panel threshold analysis

Abstract This study examines the non-linearity between CEO power and corporate capital structure. Previous studies show that firm leverage responds differently to CEO power changes. In order to capture this non-linear relationship, we employ an innovative dynamic panel threshold model, this novel method allows the estimation of threshold effects with panel data even in case of endogenous regressors. Using a panel-dataset of Chinese SMEs from 2009 to 2013, we find that a CEO power threshold exists in the CEO power-firm leverage association. CEO power has a strong positive and statistically significant determinant of firm leverage, in the “low-CEO power” firms. However, at "high-CEO" regime, the impact is negative but insignificant determinant of leverage. The results are robust to alternative measures of leverage and CEO power, as well as additional explanatory variables.

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1. Introduction

The determinants of corporate capital structure have been extensively investigated in the literature. Among them, the majority of existing evidence shows that the corporate capital structure is not only be affected by firm-, industry-, and market-level characteristics, but also by the personal traits of top managers. Recently, studies have started to pay particular to how decision making power of Chief Executive Officer (CEO) shapes capital structure decisions (Jiraporn, Chintrakarn, & Liu, 2012; Chintrakarn, Jiraporn, & Singh, 2014). However, the empirical research on this topic still remains scarce and there is no consistent conclusion about the relationship between CEO power and firm leverage. In addition, although we have learned much from those of prior studies, most models in the literature are static, making it difficult to develop tests of the association between CEO power and capital structure dynamics. The purpose of our study is to investigate the CEO power-firm leverage nexus taking account for capital structure dynamics.

The start of modern capital structure research can be traced back to Modigliani and Miller (1958). In this study, they show that subject to certain conditions, the value of a firm is independent of its capital structure choice. Since then, financial economists have devoted significant effort to studying the determinants of capital structure and several theories have been developed to show that market frictions and imperfections do matter in shaping capital structure. One theory that has been broadly employed to interpret the relationship between manager behaviour and firm leverage is agency theory. The central theme of agency theory is that corporate capital structure is determined by agency costs which arise from the divergence of ownership and control (Berle & Means, 1932) and the imperfect alignment of interests between managers and owners (Jensen & Meckling, 1976). Due to this, the prevalent view presents that self-serving managers do not make capital structure decisions that maximise owner wealth (Morellec, Nikolov, & Schürhoff, 2012).

Yet, although the agency theory predicts that agency costs can lead to firm leverage deviate from the optimal level for owners, it is still unclear whether agency costs can result in too much or too little leverage (Jiraporn et al., 2012). On the one hand, managers might voluntarily use more than the optimal amount of debt to consolidate their equity voting power and avoid takeover threats (Harris & Raviv, 1990). On the other hand, managers may pursue lower levels of leverage to avoid the disciplining role of debt. For instance, Grossman and Hart (1980) and Jensen (1986) argue that debt is a disciplining instrument that can be applied to mitigate agency problems by reducing the

free cash flow availability of managers. Moreover, the use of high leverage can increase the probability of bankruptcy and job loss (Jensen, 1986; Friend & Lang, 1988). In this case, managers have incentives to protect their under-diversified human capital, thus prefer less debt than the optimal level.

Likewise, building on the abovementioned predictions and extensive management literature on managerial discretion (see, Bertrand & Schoar, 2003; Adams, Almeida, & Ferreira, 2005; Cronqvist, Makhija, & Yonker, 2012), previous studies document that CEO power has a significant impact on capital structure. More specifically, earlier study by Jiraporn et al. (2012) show that as CEO power increases, firms use significantly lower level of leverage. However, this finding is challenged by Chintrakarn et al. (2014), who argue that the effect of CEO power on leverage is complex and the simple linear relation is spurious. They also suggest that to investigate the reliable relationship between CEO power and leverage, researchers should use non-linear models. Through testing ad hoc non-linear models, they find that the relationship between CEO power and firm leverage is hump-shaped. They argue that firms with relatively weak CEOs, that is CEOs that hold less decision-making power, appear to be in favour of higher leverage. This is because corporate capital structure choices are more influenced by other stakeholders, such as board of directors (BOD). As a result, firm tends to use more debt to reduce the agency costs arising from conflicts between CEO and owners. However, as CEO continues to have higher power and grows beyond a certain threshold, he/she is more likely to manipulate corporate leverage in order to pursue their own benefits. In this case, CEO tends to pursue lower debt levels to avoid the disciplining role of debt.

This paper provides new evidence that sheds light on the impact of CEO power on firm leverage. Specifically, we explore whether there exist threshold levels of CEO power in the power–leverage relationship. One of the most interesting forms of nonlinear regression models with wide applications in economics is the threshold regression model. The importance of this model stems from the fact that it treats the sample split value (threshold parameter) as unknown. Tong (1983) first proposes threshold regression models for time series data. Hansen (1999) extends the threshold regression to static panel data structure and derives the corresponding asymptotic theory for threshold parameters and regression slopes. Therefore, a natural starting point for the empirical analysis of CEO power thresholds is the panel threshold model suggested by Hansen (1999). However, the application of the Hansen (1999) threshold model to the empirical analysis of a CEO

power–firm leverage relationship is not without problems. The most important limitations of this method are that the model is a static setup and all regressors are required to be exogenous. In reality, a firm's capital structure decisions are inherently dynamic and the past financing decisions may proxy for some unobservable firm characteristics that influence the current decisions (Florackis & Ozkan, 2009; Guney, Li, & Fairchild, 2011; Morellec et al., 2012). Therefore, to account for the dynamic process in corporate capital structure, it is essential to employ a more advanced technique. The Caner and Hansen (2004) threshold model is able to deal with the dynamic issue, but this technique is based on cross-section analysis (Law & Singh, 2014). Since the data we employed in this study is panel data, which can provide more information and mitigate multicollinearity as well as control for cross firm heterogeneity, it is therefore more appropriate to use other estimation methods. To this end, we apply the dynamic panel threshold model proposed by Kremer, Bick, and Nautz. (2013), building on Hansen (1999) and Caner and Hansen (2004). In the dynamic model, the endogeneity of important regressors is no longer an issue, thus it provides robust results.

To the best of our knowledge, this technique has not been employed before in analysing a CEO power–firm leverage nexus. In comparison with those of ad hoc non-linear methods employed in prior studies on CEO power–leverage relationship, the Kremer et al. (2013) methodology has three distinctive advantages which are summarised as follows: 1) the threshold model does not require any specified functional form of nonlinearity, such as previous research by Chintrakarn et al. (2014) that add a quadratic term in the regression; 2) the number and location of thresholds are (endogenously) determined by the data, that is, it internally sorts the data, on the basis of some threshold determinant, into groups of observations each of which obeys the same model; 3) asymptotic theory applied in the threshold model can be used to construct appropriate confidence intervals and a bootstrap method can be employed to determine the statistical significance of the thresholds. Therefore, this methodology allows us to examine the threshold effects of the CEO power–leverage link in a more adequate and flexible way than prior studies.

To large extent, this paper extends the existing literature in respect of this research method. Moreover, our study also contributes to the understanding of determinants of capital structure by investigating the impact of personal characteristics of the firm's top executive, the CEO. Since the seminar work by Modigliani and Miller (1958), economists have devoted significant effort to studying the determinants of capital structure. The focus of most empirical work has been on firm,

industry, and market characteristics. Nevertheless, the findings show that firms that are similar in terms of these fundamentals often choose very different corporate leverage. Thus, this has emphasized the importance of studying the impact of the personal traits of a CEO (Cronqvist et al. 2012). In particular, this study investigates the impact of CEO power on capital structure in Chinese SMEs based on agency theory, managerial power theory and corporate governance theory.

Furthermore, although there are many prior empirical studies on financing decisions, much less attention is paid to the small and medium sized enterprises (SMEs), especially in emerging markets, given that their growth and prosperity is subjected to different contingencies and constraints (Mateev, Poutziouris, & Ivanov, 2013). This paper, therefore, adds to the existing empirical literature by employing a sample of SMEs in transition economies, specifically China. Finally, the findings from the present study provide an important implication for the growth of the firm, thus furthering Chinese economic development. China has become the largest emerging market and the second largest economy in the world. The great success of the economic development is driven primarily by SMEs which make up the vast majority of firms and contribute more GPD, jobs and production than those of large companies (Huang, Boateng, & Newman, 2016; Li, Karim, & Munir, 2016). Understanding the specific determinants of financing policy decisions might be vitally important for SMEs' shareholders as well as policymakers to further improve firm performance, thus promoting China's economic growth. For instance, Chinese SMEs may optimize and improve corporate governance furtherly, thereby reducing the CEOs' improper behaviours that can harm owners' benefits.

The remainder of this paper proceeds as follows: Section 2 describes our empirical methodology and Section 3 presents the dataset and all the variables used in the econometric model. In Section 4 we present the main results of the paper. Some concluding remarks are offered in the last section.

2. Empirical model and methodology

To investigate the relationship between CEO power and capital structure, we start with the traditional linear regression model which can be briefly described as follows:

$$y_{it} = \beta POWER_{it} + \lambda X_{it} + \varepsilon_{it} \quad (1)$$

where, y_{it} represents our proxy for corporate capital structure, $POWER_{it}$ is the CEO's decision-making power in the firm, X is a set of other explanatory regressors (control variables) while ε_{it} is an error term, $i = 1, \dots, N$ represents the firm and $t = 1, \dots, T$ represents the time. In order to examine whether there is a threshold effect between CEO power and corporate capital structure, Eq. (1), according to Hansen (1999), can be set up as the following single threshold model:

$$y_{it} = \mu_i + \beta_1 x_{it} I(POWER_{it} \leq \gamma) + \beta_2 x_{it} I(POWER_{it} > \gamma) + \varepsilon_{it} \qquad (2)$$

where μ_i is the fixed effect that represents the firm heterogeneity under different operating conditions, x_{it} denotes the vector of explanatory regressors, the CEO's decision-making power ($POWER$) is the threshold variable used to split the sample into different regimes, while β_1 and β_2 are the two regression slopes assuming that there are two regimes with ??(·) as an indicator function taking on a quantity of 1 if the value of the threshold series $POWER$ is below a specific threshold value γ and 0 otherwise.

Using the two-step ordinary least squares (OLS) method and minimizing the sum of squared errors for any given γ, the estimators of the threshold value can be obtained. To test the threshold effect, Hansen (1999) provides the first-order asymptotic distribution and points out that a model-based bootstrap is an appropriate approach. However, the estimation methods proposed in Hansen (1999) are restricted to regression models, with all right-hand side variables being exogenous. As is well known in capital structure literature, the right-side variables are very likely to be endogenous rather than exogenous and a firm's financing decisions are inherently dynamic. Thus, not all explanatory variables in the vector x_{it} are uncorrelated with the error term. As a result, the conclusions reached by using the Hansen (1999) static model might be misleading and spurious. To deal with the endogeneity problem and account for the non-linearity, Caner and Hansen (2004) developed a threshold model for dynamic models, where generalised methods of moments (GMM) type estimators are used to allow for endogeneity. Nevertheless, their model is based on cross-section data. In order to test the threshold effect in the regression taking into account panel-data considerations, the Caner and Hansen (2004) model has to be extended to a panel framework. The extension we employ here is based on Kremer et al. (2013) that is firstly introduced for analysis of the non-linear relationship between inflation and economic growth.

The starting point for the Kremer et al. (2013) threshold analysis is the specification of a linear dynamic model which is a balanced panel of the form in the present study described as follows:

$$y_{it} = \mu_i + \phi y_{i,t-1} + \beta POWER_{it} + \lambda X_{it} + \varepsilon_{it} \quad (3)$$

where $y_{i,t-1}$ is the endogenous regressor that is the lagged dependent variable (proxy for corporate capital structure) in this study. Then the above dynamic model based on threshold regression, can be represented with the following:

$$\begin{aligned} y_{it} = \mu_i &+ \beta_1 POWER_{it} I(POWER_{it} \leq \gamma) + \delta_1 I(POWER_{it} \leq \gamma) \\ &+ \beta_2 POWER_{it} I(POWER_{it} > \gamma) + \lambda X_{it} + \varepsilon_{it} \end{aligned} \quad (4)$$

In this formula, $POWER_{it}$ is both the threshold variable and the regime-dependent variable, X_{it} denotes vectors of explanatory regressors that contain lagged values of the dependent variable, partly endogenous variables and exogenous variables, for which the slope coefficients are assumed to be regime independent. In our application, we also allow for differences in the regime intercepts (δ_1). Ignoring the regime intercepts might lead to inconsistent estimators for both the threshold value and the coefficient magnitude of the regimes (Bick, 2007). The initial dependent variable is considered as an endogenous variable, in which $X_{2it} = initial_{it} = y_{it-1}$, where X_{1it} contains the remaining control variables.

In the first step of the estimation procedure, we have to eliminate the firm-specific effects (μ_i) via a fixed-effects transformation. However, the standard within transformation and first differencing approaches to eliminate the firm-specific effects in the dynamic panels are not appropriate, because both can violate the distributional assumption underlying Hansen (1999) and Caner and Hansen (2004) (Kremer et al., 2013). In order to address these issues, Kremer et al. (2013) choose the forward orthogonal deviations transformation suggested by Arellano and Bover (1995). The distinguishing feature of this transformation is that it circumvents serial correlation of the transformed error terms and maintains the uncorrelatedness of the error terms. According to Hansen (2000), this transformation ensures that the estimation procedure derived by Caner and Hansen

(2004) for a cross-sectional model can be applied to a dynamic panel specification, such as Eq. (4) in the present study.

Following Caner and Hansen (2004), we first run a reduced form regression of the endogenous variable, X_{2it}, on a set of instruments using the OLS approach and obtain the predicted value of $\widehat{X_{2it}}$. The endogenous variables, X_{2it}, are then replaced by the predicted values $\widehat{X_{2it}}$ in Eq. (4). In step two, Eq. (4) is estimated by employing OLS for a fixed threshold γ where the endogenous variables are replaced by their predicted values obtained in the first step. Denote the resulting sum of squared residuals by $S(\gamma)$. This step is repeated for a strict subset of the support of the threshold value $POWER$. In the final step, the estimator of the threshold value γ is selected as the one associated with the minimization of the sum of squared residuals that is $\hat{\gamma} = \arg\min_{\gamma} S_n(\gamma)$ (Hansen, 2000). The critical values for determining the 95% confidence interval of the threshold value are given by $\Gamma = \{\gamma: LR(\gamma) \leq C(\alpha)\}$, where $C(\alpha)$ represents the asymptotic distribution of the likelihood ratio $LR(\gamma)$ statistic at the 95% level (Hansen, 1999; Canner & Hansen, 2004). The above likelihood ratio has been adjusted to account for the number of time periods used for each cross section (Hansen, 1999). Once the threshold value $\hat{\gamma}$ is determined, the slope coefficients β_1 and β_2 can be estimated using the GMM for the previously used instruments and the previous estimated threshold $\hat{\gamma}$ (Caner & Hansen, 2004; Kremer et al., 2013).

3. Data and variables

3.1. Sample selection

In this study, we choose to focus on China's SMEs. There are several reasons why we do so. First, as aforementioned, the great success of Chinese economic development is driven primarily by SMEs which account for the majority of all firms and contribute to the growth of GDP, employment opportunities and fiscal revenues more heavily than large-size firms. Second, private owned firms account for most of Chinese SMEs, which prefer to appoint top executives based on their ability and performance rather than political connections (Ruan, Tian, & Ma, 2011). Moreover, these enterprises also tend to adopt managerial-ownership governance system. Hence, the managers in these firms may be afforded more discretion over funding (Firth, Fung, & Rui, 2006). Third, in order to address the issue of lacking appropriate financing channels for SMEs and improve the

Chinese financial market, both the practitioners and academics have asked to understand more about SMEs (Huang et al., 2016; Li et al. 2016). Following the existing studies with respects to Chinese SMEs (Liu and Tian 2009; Ren, Eisingerich, & Tsai, 2015; Li et al., 2016), we collect the data from Shenzhen Stock Exchange (SZSE) SMEs Board.

The initial sample consists of annual observations from 2009 to 2013 for all firms listed on the SMEs Board. The CEO variables and financial variables are manually collected from annual reports. We obtain the stock prices from SINA Finance[1]. Following the convention in the literature, we apply the following standard restrictions on our data. First, we eliminate state-owned enterprises and financial companies, assuming that the relations between fundamental characteristics and the role of CEOs differ for these firms due to regulatory constraints. Second, we remove firms classified by the China Securities Regulatory Commission (CSRC) as "particular transfer" (PT) or "special treatment" (ST) firms, since they have financial or operational problems which may contaminate the results given the financial or operational trouble[2]. Third, we eliminate firms that have fewer than five years of observations so that we can use the GMM estimators that require the use of lagged instruments (Arellano & Bover, 1995). Finally, we remove companies for which the CEO power measures or other variables are not available. This process generates a final sample consisting of 231 firms and 1,155 firm-year observations.

3.2. Measurement of variables

3.2.1 Capital structure

Previous research has introduced several definitions to capital structure but they can mainly be categorized as book-value based leverage (book leverage) and market-value based leverage (market leverage). Although they are conceptually different, many empirical studies have used both interchangeably (Florackis & Ozkan, 2009; Jiaraporn et al., 2012). However, this paper emphasizes on book leverage for the following reasons. First, an earlier survey by Graham and Harvey (2001) suggests that executives pay more attention to book values when setting financial policies. Second, book values are less volatile than market values and hence provide better guidance regarding capital

[1] http://vip.stock.finance.sina.com.cn/mkt/

[2] We also show that our conclusions do not alter when we expanding our sample to those of trouble firms in the robustness check.

structure (Graham & Harvey, 2001). Third, market values create a substantial quantity of irrelevant noise to capital structure decisions since the Chinese stock market is inefficient (Chang, Chen, & Liao, 2014). The detailed definition of book leverage employed in the present study is provided in Table 1.

[Insert Table 1 here]

3.2.2. CEO power

There are several different definitions of CEO power in organisations. To demonstrate its influence and control, most definitions of power include the idea of overcoming resistance (Pfeffer, 1997). No definition lends itself to naturally and unequivocally capture CEO power (measure) and is likely to capture every possible dimension of CEO power (Adams et al., 2005; Veprauskaitė & Adams, 2013). Therefore, in order to capture the CEO ability to exercise decision-making power to the fullest extent possible, following Liu and Jiraporn (2010), Jiraporn et al. (2012), Ting (2013), and Veprauskaitė and Adams (2013), we construct a power index using four normalised CEO power-related variables. To combine these variables into a one-dimensional index, we extract components using the data reduction technique Principle Component Analysis (PCA). Our CEO power-related measurements include CEO duality, CEO's founder status, ownership and CEO pay slice. Table 1 provides definitions for all variables.

One of the ways of increasing CEO power is for the CEO to also serve as the board chairperson (Hermalin & Weisbach, 1998). CEO duality can restrict the information flow to other board directors and hence reduces a board's independent oversight of executives (Jensen, 1993). Prior research finds that a CEO who is the founder tends to be more influential in the financing decision-making process in China. For example, Pour (2015) shows that a Chinese founder-CEO seems to have the most robust influence on the survivability of IPOs, suggesting IPOs are more likely to survive if their CEOs are one of the founders. A CEO with significant shareholdings in the company is more able to define the firm's direction. Pathan (2009) argues that the CEOs who hold high proportions of the shares are more powerful. CEO pay slice is a more direct way to gauge CEO power (Bebchuket, Cremers, & Peyer, 2011). Previous empirical study by Chintrakarn et al. (2014)

has shown an inverted-U relationship between CEO pay slice and firm leverage for a sample of US firms.

Table 2 presents the results from the PCA. In Panel A, we report the summary statistics of the four CEO power variables used as attributes of the POWER. As the table shows, nearly 52% of CEOs are one of the founders and 37.8% of CEOs also chair the board. The percentage of CEO duality is much greater than those of findings from developed countries (Adams et al., 2005; Veprauskaitė & Adams, 2013). The average CEO ownership (dummy variable in the present study) is 45.5% in our sample, suggesting that Chinese private SMEs' CEOs tend to hold high proportions of the corporate shares. The mean value of CEO pay slice is 26.5%, much lower than that reported in Chintrakarn et al. (2014), who find that the average CEO pay slice is 33.8% for US firms.

Panel B of Table 2 reports principal component weights (loads) for CEO power index. The results (untabled) show that the first component is the only one with an eigenvalue exceeding 1, which accounts for the highest percentage of variation (53.4%) of CEO power. In this study, we use the first principal component, hereafter called *PINDEX*, as our CEO power indicator. *PINDEX* is mainly characterised by CEO duality, Founder-CEO, and CEO ownership, as the absolute values of their loadings that exceed 0.5. Like Hermalin and Weisbach (1998) and Veprauskaitė and Adams (2013), we expect CEO duality, Founder-CEO, and CEO ownership to indicate a higher degree of CEO ability to executive decision-making power. The signs of the component weights are consistent with what we expected and therefore, a positive *PINDEX* implies higher CEO decision-making power; likewise, a negative *PINDEX* reflects lower CEO power.

[Insert Table 2 here]

Moreover, to ensure the use of PCA, we perform three tests including the Bartlett test of Sphericity (Bartlett, 1954), the Kaiser-Meyer-Olkin test of appropriateness (Kaiser, 1974) and the Cronbach's alpha test of consistency (Cronbach, 1951). The null hypothesis of Bartlett test is that the variables are not intercorrelated. Rejecting it indicates that the PCA is acceptable. However, excessive intercorrelations might induce a multicollinearity problem. To guard against this, we then computed Kaiser-Meyer-Olkin statistics. The overall Kaiser-Meyer-Olkin value of our result is 0.703 being above the recommended 0.600 (Kaiser, 1974) indicating that it is appropriate to carry out the

principal component analysis. The Cronbach's alpha is calculated to measure the reliability of the components developed through PCA. In our study, a Cronbach alpha of 0.703, which is considered to be well above the lower limits of normal acceptability (Nunnally, 1978), revealing the high internal consistency.

3.2.3. Control variables

The earlier empirical studies in China have revealed that corporate capital structure decisions are affected significantly by a series of firm-specific characteristics (Chen, 2004; Huang & Song 2006; Chang et al., 2014; Chen, Jiang, & Lin, 2014; Huang et al., 2016). Consequently, we use the following firm characteristics as control variables in the subsequent empirical analysis: firm size, growth opportunity, operating risk, profitability and tax rate. The detailed measures of these variables are provided in Table 1.

4. Empirical results

4.1. Descriptive statistics and correlation matrix

Table 3 summarises the key descriptive statistics over the sample period. We observe that the average book leverage for Chinese listed SMEs is 36.8% over the period 2009 to 2013, which is similar to that of the Chinese companies reported in Huang and Song (2006). As the indicators obtained from PCA are normalized, the mean value of CEO Power is 0. Table 3 further presents the descriptive statistics of firm-level control variables. The reported results are comparable to those described in prior studies related to capital structure for Chinese firms (Chen, 2004; Huang & Song 2006; Chang et al., 2014).

[Insert Table 3 here]

The correlation coefficients between variables are provided in Table 4. Correlations are generally low, except for the correlations between profitability, risk and our book value-based measure of leverage. To check whether these variables are collinear, we perform a variance inflation factor

(VIF) test. The average VIF of 2.71 and the maximum VIF of 5.68 are lower than 10, suggesting that multicollinearity should not constitute a problem (O'Brien 2007).

[Insert Table 4 here]

4.2. Threshold analysis

Our empirical estimations for threshold effects are based on a balanced dataset of 1,155 observations including 231 Chinese listed SMEs for the period 2009 to 2013. Table 5 presents results of estimating the dynamic panel threshold model in which the threshold variable is the CEO power obtained from the first component of standard PCA. The threshold test statistics of 25.2626 (untabled) along with the *p*-values (= 0.0000) suggest a significant presence of a threshold effect on the nexus between CEO power and firm leverage. Specifically, as shown in Panel A of Table 5, the point estimate of the threshold value is -0.4314 with a corresponding 95% confidence interval [-1.5760, -0.3966]. Fig. 1 displays the computed likelihood ratio statistics as a function of the threshold variable for the dynamic threshold model, confirming the estimate for the threshold. This threshold value splits our sample into two regimes: the first regime consists of 361 observations with a relatively less powerful CEO; the second regime consists of 563 observations with high CEO power.

Once the threshold is obtained, we turn now to investigate how CEO power affects the level of firm leverage. To this end, we estimate the coefficients as well as the statistical significance of the CEO power in the two regime-dependent regressions. As can be seen in Panel B of Table 5, CEO power is positively related with firm book leverage at the 5% significant level in the first regime regression in which CEO power index is smaller than the threshold value (-0.4314). While the index increases and goes beyond the threshold value, the original positive relationship vanishes and the impact of CEO power on firm leverage becomes negative ($\widehat{\beta_2} = -0.0025$). However, the negative impact above the threshold value is insignificant.

Nonetheless, the empirical findings are in line with a non-linear relationship between CEO power and firm capital structure that is reported in the study of Chintrakarn et al. (2014). Specifically, firms with less powerful CEOs tend to apply higher levels of leverage. However, when the CEOs are afforded with high decision-making powers that go beyond a certain threshold, they are more

likely to adopt lower leverage. Moreover, our results are also consistent with those of studies, such as Brailsford, Oliver & Pua (2002), Florackis & Ozkan (2009) and Sun et al. (2015), that only examine the relationship between CEO ownership power and firm leverage. To sum up, our empirical results confirm an inverse U-shaped relationship between CEO power and corporate capital structure. Therefore, the impact of CEO power on firm leverage is more complex than the simple monotonic association documented in some of the previous literature (Zwiebel, 1994; Berger, Ofek, & Yermack, 1997; Jiraporn et al. 2012).

In order to understand this non-monotonic relationship deeply, we provide the following possible explanations. Our results suggest that CEO personal characteristics do impact corporate leverage decisions, corresponding to prior prediction (Parsons & Titman, 2008). However, the magnitude of this effect might depend on decision-making power they afforded. When CEO power is below the threshold value, that is lower degrees of decision-making power is afforded to CEOs, they would have less ability to manipulate corporate capital structure. Cronqvist et al. (2012) also argue that CEOs might be difficult to impose significant influence on firm decisions, if governance constrains them from imprinting their personal preferences on the firms they manage. Under this scenario, a CEO tends to act according to the interests of firm owners or he/she is more likely to obey decisions made by the owners (represent for board of directors) of the firm (Adams et al., 2005). Traditionally, with the purpose of mitigating agency costs that arise from the conflicts between managers and owners, a firm tends to make a decision of applying high leverage ex ante because debt serves as an effective disciplining device can limit managerial flexibility (Jensen, 1986).

However, as CEOs are afforded more power beyond a certain threshold, they will become more entrenched and have enough ability to affect firm decisions. As a result, CEOs tend to manipulate corporate capital structure to pursue their own interests. To avoid the discipline of debt, they appear to be in favour of lower leverage that is below optimal. Therefore, in this case, a CEO might no longer obey decisions made by the group. Hence, the conflicts between firm owners and a CEO become more severe.

Table 5 also reports the estimated results for those of control variables. In both of the two regime-dependent regressions, firm size and growth opportunities are positively and significantly related to firm leverage, consistent with the previous findings in China (Chen, 2004; Chang et al., 2014). We use Altman's Z-score to measure firm operating risk which appears negatively related to firm

leverage. While profitability is positively associated with leverage. However, their relationships with leverage are insignificant in the second regime.

Firms with a large size tend to have higher leverage compared to small firms, consistent with the trade-off theory. This is because larger firms are often more diversified and have a more stable cash flow, thus their probability of bankruptcy is usually lower than smaller firms. Likewise, the positive coefficient of profitability is also in line with trade-off theory, which suggests that profitable firms should use more debt because they have greater needs to shield income from taxation. A higher Z-score indicates lower operating risks. The negative relationship between Z-score and firm leverage suggests that Chinese SMEs rely heavily on borrowing, consistent with pecking-order theory (Chang et al., 2014). Finally, the positive coefficient of growth opportunity suggests that rapidly growing Chinese SMEs are more likely to use debt, supporting the previous findings by Chen (2004) and Chang et al. (2014). They argue that Chinese firms with high growth opportunities might not be able to obtain adequate funds through the Chinese equity market due to its strict constraints on equity issues. As a result, the firms have to resort to financing themselves through borrowing.

[Insert Table 5 and Figure 1 here]

4.3. Robustness tests

Several tests are preformed to check the robustness of the above findings in this section. In particular, we carry out different robustness checks to examine the sensitivity of the results to alternative measurements and additional explanatory variables. Our results are robust to alternative measurements and controlling for the additional explanatory variables by estimating the quadratic cross-sectional regressions. The OLS regression results are provided in Appendix 1. We have also expanded our sample to include those PT and ST firms and the final sample size increase to 1,180 firm-year observations after restricted to other conditions such as state-owned and financial companies, firms that missing value and firms that have fewer than 5 years of observations. We analyse whether the influence of CEO power on firm leverage differs across their financial or operational situations. We conducted univariate analysis to test whether there are significant differences between the main variables. There is no serious difference between normal firms and ST

(or PT) firms in terms of CEO power level[3]. To further examine the relationship between CEO power and leverage in those trouble firms, we therefore set a dummy variable- ST_dummy, which equal to one if the firm is denoted as ST (or PT), and add it into our threshold models. Appendices 2-4 show the empirical results of using different leverage, additional control variables and alternative CEO power measurement. As indicated, ST-dummy is not significantly related with leverage and our results are robust.

4.3.1. Alternative measure of capital structure

As aforementioned, although book value-based leverage and market value-based leverage are conceptually different and there is no consensus on the preferred definition, both of them are often used interchangeably in empirical studies (Florackis & Ozkan, 2009). In this section, we use market leverage as an alternative measure of capital structure. Table 1 provides the definition for market leverage. The empirical results of estimating the dynamic panel threshold model are shown in Table 6. The results are almost similar to those obtained from the book leverage model (see Table 5). Nonetheless, there are two differences that should be emphasised here. The first one is that we obtain a threshold value (-0.4233), which is slightly higher than the previous one (-0.4314), with a much narrower 95% confidence interval ([-0.4233, -0.4231]). As a result, more observations are placed into the first regime and fewer observations are assigned to the second regime.

Second, we find that the coefficient of the CEO power is much more statistically significant than the one above (see Table 5) in the "low-power" regime, while there are still statistically insignificant determinants of leverage in the "high-power" regime. However, these differences do not affect our final conclusion that the relationship between CEO power and capital structure is non-monotonic.

[Insert Table 6 here]

4.3.2. Additional control variables

[3] For the sake of brevity, we do not tabulate the results in the paper. However, they are available upon request.

We also check for the robustness of our empirical findings by adding a set of additional leverage determinant variables including CEO tenure, age and education. Previous literature on corporate capital structure has analysed these characteristics but provides ambiguous evidence (Cronqvist et al., 2012). The detailed definitions of the three variables are provided in the Table 1. We hand-collected data on CEO characteristics from annual reports of the selected firms. The empirical results are presented in Model A and Model B of Table 7. For Model A, the dependent variable is book leverage. In Model B, we use market leverage as the dependent variable. As indicated, the results are quantitatively similar to those reported in Table 5 and Table 6, thus confirming the robustness of our previous findings.

Moreover, we find that CEO tenure is positively and significantly associated with firm leverage. The reason for this relationship might be that long-standing CEOs tend to mitigate the agency costs through high leverage, thereby extending the term of a CEO position in the firm. The positive relationship between CEO age and leverage suggests that older CEOs take on more debt, which is in line with Malmendier et al. (2010), but this is in contrast to Bertrand and Schoar (2003). The result provides empirical evidence for the "risk-taking behaviour hypothesis" of Hirshleifer and Thakor (1992), which argues that because younger CEOs face greater career concerns, they display more risk-aversion, which might lead to excessive conservatism in financial decisions. In addition, we find that CEO education background also plays a significant role in determining the level of leverage. However, the contradictory signs of coefficient in book leverage regression and market leverage regression identify that the impact of CEO education is rather inconclusive.

[Insert Table 7 here]

4.3.3. Alternative measure of CEO power

In order to capture the CEO ability to exercise decision-making power most efficiently, we construct a power index using four CEO power-related variables including CEO duality dummy, CEO's founder dummy, ownership dummy and CEO pay slice. The method to combine the measurements into a one-dimensional index employed in the previous section (see section 3.2.2) is Principle Component Analysis, or more precisely the standard PCA. However, applying the

standard PCA to dummy variables may bias the estimates (Kolenikov and Angeles, 2004). To address this issue, they propose a discrete PCA. The use of a discrete PCA to derive CEO power components can correct for bias in the correlation matrix when both continuous and indicator variables are included. Accordingly, in this section we construct an alternative measurement of CEO power through exacting the first component of discrete PCA.

Table 8 reports the empirical results of estimating the dynamic panel threshold model in which the dependent variable is book leverage. Interestingly, our findings show that the threshold value is lower than the one reported in Table 5. The potential explanation is that the discrete PCA involves modifying the correlation matrix to take into account the nature of the underlying variables. However, the main results remain largely intact. In particular, Table 8 shows that the first regime contains 361 observations and 563 observations within the second regime. These figures are quantitatively similar to those reported in Table 5. In addition, we find that CEO power is always positively and significantly related to firm leverage if it is less than the threshold value, but turns negative if it is greater than the threshold value.

[Insert Table 8 here]

5. Conclusion

The main objective of this paper is to re-examine the non-linear relationship between CEO power and firm leverage using 231 Chinese SMEs with 1,155 firm-year observations over the period of 2009 to 2013. Previously Chintrakarn et al. (2014) suggest that the effect of CEO power on firm leverage varies across firms with different levels of CEO power. To this end, in the present study we apply the Kremer et al. (2013) dynamic panel threshold model. The main advantages of this methodology can be summarised as follow: 1) the panel threshold model provides endogenous identification of threshold levels and evaluates the effects of the interest variables on outcome variable under different regimes. Thus, it allows us to assess the threshold effects of the CEO power on CEO power-leverage link in a more adequate and flexible way than prior studies which employ the ad hoc methods of linear interaction or sample-splitting specification; 2) the dynamic panel threshold estimator applied in this study provides robust results since it takes account for the

dynamic process in corporate capital structure. In this dynamic model, the endogeneity of important regressors is no longer an issue.

Our results show that a CEO power threshold does indeed exist in the CEO power–firm leverage nexus. In addition, the results provide new evidence on the non-linear relationship between CEO power and firm leverage. In particular, we find that CEO power positively effects firm leverage if it is less than the threshold value. On the contrary, if it exceeds the threshold value, the relationship between CEO power and leverage becomes negative. However, the negative impact above the threshold level is statistically insignificant.

The empirical findings are robust to additional explanatory variables and alternative specifications of firm leverage and CEO power index. Thus, they provide strong support for the importance of CEO power in determining corporate capital structure. A firm might be able to maintain its leverage at the optimal level when CEO power is below the threshold value, because he/she has less ability to manipulate corporate capital structure. However, when a CEO is afforded more power that goes beyond a certain threshold, he/she is keen to manipulate corporate capital structure to pursue their own interests. To avoid the discipline of debt, a CEO could appear to be in favour of lower leverage below optimal. In this case, a firm may not be able to maintain its leverage at the optimal level. Accordingly, it is important to restrict CEO power, thus alleviating agency problems. Policymakers and firm owners might use our findings as evidence for doing so.

Our study is based on data obtained from Chinese listed SMEs. It might not necessarily represent all SMEs, especially since the sample contains only a small fraction of all SMEs in China. Therefore, further study could be possible on the CEO power–firm leverage nexus by applying more abundant data, particularly collecting data from unlisted companies, would be desirable. Moreover, the empirical results indicate that CEO power is insignificantly associated with leverage in the “high-power” regime which contains more observations than the “low-power” one. This gives rise to two new questions that are: 1) is there a second threshold that exists? 2) is the CEO power significantly and negatively related to firm leverage in the third regime in which CEO power is greater than the second threshold? We likewise leave these issues for future research topics. As the method we employed in this study can only test one threshold, future studies could extend this methodology to multiple thresholds in order to test the number of regimes.

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Table 1 Variable Definitions

Variables	Definition
Book leverage	Ratio of the financial debt to sum of financial debt and book value of equity.
Market leverage	Ratio of the financial debt to sum of financial debt and market value of equity.
CEO duality	A dummy equals to 1 if the CEO serves as board Chair and 0 otherwise.
CEO-Founder	A dummy equals to 1 if the CEO is one of the firm's founders and 0 otherwise.
CEO ownership	A dummy equals to 1 if the percentage of equity ownership held by CEO greater than or equal to 10% in the firm and 0 otherwise.
CEO pay slice	Total compensation the CEO received divided by the combined total compensation of the top five executives (including the CEO) in a given company.
CEO power index	First factor of using standard or discrete PCA of four CEO power-related variables: CEO duality, CEO-Founder, CEO ownership, and CEO pay slice.
Firm Size	Natural logarithm of total assets.
Tax Rate	Firm's practical income tax rate which is compulsory to report in annual reports.
Profitability	Ratio of the operating profit to total assets.
Growth Opportunity	Ratio of the sum of book value of total liabilities and market value of equity divided by total assets.
Operating Risk	$Z - Score\ =$ $0.517 - 0.460 * total\ liabilities/total\ assets + 0.388 *$ $working\ capital/total\ assets + 1.158 * retained\ earnings/total\ assets + 9.320 *$ $net\ profit/total\ assets$ (Altman et al. 2007).
Tenure	Natural logarithm of the number of years the CEO held the CEO position.
Age	Natural logarithm of the age of the CEO.
Graduate	A dummy equals to 1 if the CEO has a postgraduate degree and 0 otherwise.

Table 2 Principle Component Analysis

This table presents: a) the summary statistics for the four CEO power-related variables used as attributes of the power index proxy; b) principal components weights.

Panel A: Summary statistics				
Variable	Mean	Std. dev	Min	Max
CEO duality	0.378	0.485	0	1
Founder-CEO	0.520	0.500	0	1
CEO ownership	0.455	0.498	0	1
CEO pay slice	0.265	0.079	0.017	0.644

Panel B: Index weights				
Index	CEO duality	Founder-CEO	CEO ownership	CEO pay slice
PINDEX	0.565	0.579	0.588	-0.003

Table 3 Descriptive Statistics

This table presents descriptive statistics for the key variables. The sample consists of 231 unique firms from 2009 to 2013. Power is the CEO power index (*PINDEX*) obtained from standard PCA.

Variable	Mean	Std. dev	Min	25%	Median	75%	Max
Leverage	0.368	0.186	0.018	0.219	0.361	0.505	0.895
Power	0.00	1.461	-1.594	-1.579	-0.416	1.919	1.931
Size	21.284	0.854	19.243	20.704	21.203	21.787	25.133
Growth	2.169	1.259	0.895	1.426	1.774	2.422	11.681
Risk	1.236	0.688	-3.183	0.814	1.177	1.579	6.491
Profitability	0.061	0.060	-0.256	0.024	0.054	0.090	0.382
Tax	0.164	0.043	0.000	0.150	0.150	0.150	0.250

Table 4 Correlation Coefficients between Variables and VIF

This table presents the correlations matrix of the key variables used in our econometric analyses and VIF tests between dependent variables. Power is the CEO power index (*PINDEX*) obtained from standard PCA.

	Leverage	POWER	Size	Growth	Risk	Profitability	VIF
Leverage							(2.71)
Power	-0.08						1.02
Size	0.49	-0.06					1.34
Growth	-0.33	0.05	-0.31				1.46
Risk	-0.64	0.11	-0.13	0.49			5.68
Profitability	-0.42	0.06	0.04	0.45	0.88		5.58
Tax	0.23	-0.01	0.30	-0.18	-0.18	-0.04	1.16

Table 5 Dynamic Panel Threshold Estimation with Book Leverage

This table reports results for the dynamic panel threshold estimation. Each regime has at least 5% of all observations (Hansen, 1999). We denote book leverage as dependent variable. The threshold and the regime dependent variable is CEO power index (*PINDEX*) obtained from standard PCA. Following Bick (2007), the model accounts for regime dependent intercepts ($\widehat{\delta_1}$). Standard errors are reported in parentheses. ***, **, * indicate statistical significant at the 1%, 5% and 10% level, respectively.

Panel A: Threshold estimates		
$\hat{\gamma}$	-0.4314	
95% confidence interval	[-1.5760, -0.3966]	
Panel B: Impact of CEO power		
$\widehat{\beta_1}$	0.2040**	(0.0890)
$\widehat{\beta_2}$	-0.0025	(0.0032)

Panel C: Impact of covariates

	Regime I ($POWER_{it} \leq -0.4314$)		Regime II ($POWER_{it} > -0.4314$)	
	Coeff.	Std. Error	Coeff.	Std. Error
$Leverage_{it-1}$	0.5142***	(0.1992)	0.7702***	(0.0927)
$Size_{it}$	0.0421***	(0.0153)	0.0185**	(0.0083)
$Growth_{it}$	0.0121**	(0.0050)	0.0065**	(0.0028)
$Risk_{it}$	-0.2217***	(0.0788)	-0.0608	(0.0374)
$Profitability_{it}$	1.3427**	(0.5261)	0.1189	(0.3474)
Tax_{it}	-0.2080	(0.1329)	0.1257	(0.0923)
$\widehat{\delta_1}$	-0.2016	(0.1429)	-0.2655*	(0.1390)
Observations	361		563	

Table 6 Dynamic Panel Threshold Estimation with Market Leverage

This table reports the results for the dynamic panel threshold estimation. Each regime has at least 5% of all observations (Hansen, 1999). We denote market leverage as a dependent variable. The threshold and the regime dependent variable is the CEO power index (*PINDEX*) obtained from standard PCA. Following Bick (2007), the model accounts for regime dependent intercepts ($\widehat{\delta_1}$). Standard errors are reported in parentheses. ***, **, * indicate statistical significant at the 1%, 5% and 10% level, respectively.

Panel A: Threshold estimates		
$\hat{\gamma}$	-0.4233	
95% confidence interval	[-0.4233,-0.4231]	
Panel B: Impact of CEO power		
$\widehat{\beta_1}$	0.0594***	(0.0165)
$\widehat{\beta_2}$	-0.0011	(0.0029)

Panel C: Impact of covariates

	Regime I ($POWER_{it} \leq -0.4233$)		Regime II ($POWER_{it} > -0.4233$)	
	Coeff.	Std. Error	Coeff.	Std. Error
$Leverage_{it-1}$	0.4876***	(0.0797)	0.6556***	(0.0589)
$Size_{it}$	0.0528***	(0.0074)	0.0302***	(0.0055)
$Growth_{it}$	-0.0122***	(0.0030)	-0.0148***	(0.0035)
$Risk_{it}$	-0.1009***	(0.0196)	-0.0306	(0.0193)
$Profitability_{it}$	0.3010**	(0.1494)	-0.0229	(0.1920)
Tax_{it}	<0.0001	(0.0892)	0.1043	(0.0820)
$\widehat{\delta_1}$	-0.7956***	(0.1299)	-0.5067***	(0.1091)
Observations	377		547	

Table 7 Dynamic Panel Threshold Estimation with Additional Variables

This table reports results for the dynamic panel threshold estimation. Each regime has at least 5% of all observations (Hansen, 1999). For Model A, we denote book leverage as a dependent variable. For Model B, the dependent variable is market leverage. The threshold and the regime dependent variable is the CEO power index (*PINDX*) obtained from standard PCA. Following Bick (2007), all the models account for regime dependent intercepts ($\widehat{\delta_1}$). Standard errors are reported in parentheses. Standard errors are reported in parentheses. ***, **, * indicate statistical significant at the 1%, 5% and 10% level, respectively.

	Model A		Model B	
Panel A: Threshold estimates				
$\hat{\gamma}$	-0.4314		-0.4234	
95% confidence interval	[-1.5766, 1.9236]		[-0.4233, -0.4231]	
Panel B: Impact of CEO power				
$\widehat{\beta_1}$	0.2271**	(0.0924)	0.0548***	(0.0164)
$\widehat{\beta_2}$	-0.0013	(0.0033)	-0.0035	(0.0031)

Panel C: Impact of covariates

	Regime I ($POWER_{it} \leq -0.4314$)		Regime II ($POWER_{it} > -0.4314$)		Regime I ($POWER_{it} \leq -0.4233$)		Regime II ($POWER_{it} > -0.4233$)	
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
$Leverage_{it-1}$	0.5155***	(0.1968)	0.7543***	(0.0944)	0.4715***	(0.0820)	0.6430***	(0.0588)
$Size_{it}$	0.0420***	(0.0150)	0.0192**	(0.0087)	0.0530***	(0.0074)	0.0315***	(0.0056)
$Growth_{it}$	0.0112**	(0.0049)	0.0064**	(0.0029)	-0.0119***	(0.0030)	-0.0149***	(0.0035)
$Risk_{it}$	-0.2278***	(0.0794)	-0.0639*	(0.0384)	-0.1013	(0.0190)	-0.0316*	(0.0195)
$Profitability_{it}$	1.4092***	(0.5329)	0.1289	(0.3590)	0.2785**	(0.1385)	-0.0229	(0.1941)
Tax_{it}	-0.2076	(0.1347)	0.1305	(0.0931)	-0.0007	(0.0900)	0.1089	(0.0835)
Tenure	< 0.0001	(0.0052)	0.0657***	(0.0066)	0.0050	(0.0045)	0.0237***	(0.0057)
Age	-0.0132	(0.0294)	0.0951***	(0.0201)	0.0235	(0.0249)	0.0441**	(0.0210)
Graduate	0.0161**	(0.0084)	0.0034	(0.0067)	-0.0417***	(0.0065)	0.0028	(0.0057)
$\widehat{\delta_1}$	-0.1141	(0.1787)	-0.3273**	(0.1614)	-0.9010***	(0.1608)	-0.7097***	(0.1397)
Observations	361		563		377		547	

Table 8 Dynamic Panel Threshold Estimation with Alternative Variables

This table reports results for the dynamic panel threshold estimation. Each regime has at least 5% of all observations (Hansen, 1999). The dependent variable is book leverage. The threshold and the regime dependent variable is the CEO power index obtained from discrete PCA. Following Bick (2007), all the models account for regime dependent intercepts ($\widehat{\delta_1}$). Standard errors are reported in parentheses. ***, **, * indicate statistical significant at the 1%, 5% and 10% level, respectively.

Panel A: Threshold estimates				
$\hat{\gamma}$	-0.3385			
95% confidence interval	[-1.2500,-0.3208]			
Panel B: Impact of CEO power				
$\widehat{\beta_1}$	0.2551***	(0.1118)		
$\widehat{\beta_2}$	-0.0032	(0.0041)		
Panel C: Impact of covariates				
	Regime I ($POWER_{it} \leq -0.3385$)		Regime II ($POWER_{it} > -0.3385$)	
	Coeff.	Std. Error	Coeff.	Std. Error
$Leverage_{it-1}$	0.5138***	(0.1994)	0.7702***	(0.0927)
$Size_{it}$	0.0422***	(0.0153)	0.0185**	(0.0083)
$Growth_{it}$	0.0121**	(0.0050)	0.0065**	(0.0083)
$Risk_{it}$	-0.2218***	(0.0789)	-0.0682*	(0.0374)
$Profitability_{it}$	1.3431**	(0.5264)	0.1189	(0.3475)
Tax_{it}	-0.2081	(0.1330)	0.1257	(0.0923)
$\widehat{\delta_1}$	-0.2048	(0.1430)	-0.2656*	(0.1390)
Observations	361		563	

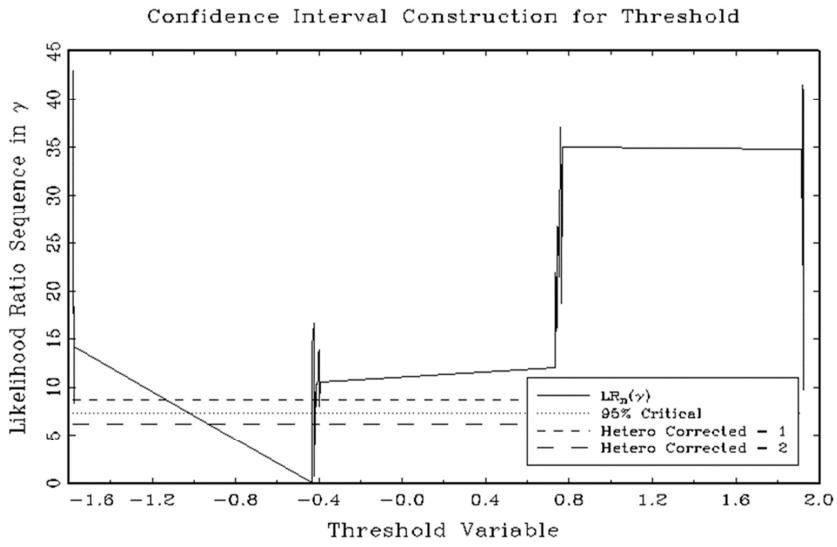

Fig. 1. Confidence Interval Construction for Book Leverage

Appendix 1 Regression Results of Leverage on CEO Power and Control Variables

This table reports the panel regression results of firm leverage using ordinary lease squares (OLS). Robust standard errors are clustered at the firm level and reported in parentheses. Power is the CEO power index variable that is derived after using standard PCA for Model (1)-(4) and discrete PCA for Model (5)-(8). The definitions of other variables are provided in Table 1. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Book leverage (1)	Market leverage (2)	Book leverage (3)	Market leverage (4)	Book leverage (5)	Market leverage (6)	Book leverage (7)	Market leverage (8)
Power	0.0085*	0.0050*	0.0080*	0.0049*	0.0110*	0.0083*	0.0103*	-0.0081*
	(0.0046)	(0.0032)	(0.0046)	(0.0029)	(0.0058)	(0.0046)	(0.0059)	(0.0047)
$Power^2$	-0.0055	0.0028	-0.0053	-0.0021	-0.0090	-0.0062	-0.0089	0.0028
	(0.0037)	(0.0036)	(0.0038)	(0.0039)	(0.0061)	(0.0042)	(0.0062)	(0.0050)
Size	0.0715***	0.0666***	0.0712***	0.0670***	0.0715***	0.0666***	0.0712***	0.0670***
	(0.0083)	(0.0064)	(0.0084)	(0.0063)	(0.0083)	(0.0064)	(0.0084)	(0.0063)
Growth	0.0244***	-0.0118***	0.0242***	-0.0113***	0.0244***	-0.0118***	0.0242***	-0.0113***
	(0.0056)	(0.0039)	(0.0057)	(0.0039)	(0.0056)	(0.0039)	(0.0057)	(0.0039)
Risk	-0.3993***	-0.1964***	-0.3999***	-0.1936***	-0.3993***	-0.1964***	-0.3999***	-0.1936***
	(0.0312)	(0.0170)	(0.0315)	(0.0164)	(0.0312)	(0.0169)	(0.0586)	(0.0163)
Profitability	2.2588***	0.8010***	2.2629***	0.7719***	2.2591***	0.8012***	2.2518***	0.7723***
	(0.3286)	(0.1781)	(0.3303)	(0.1721)	(0.3284)	(0.1781)	(0.6602)	(0.1720)
Tax	-0.3446**	-0.0804	-0.3346**	-0.1031	-0.3445**	-0.0803	0.0865**	-0.1029
	(0.1403)	(0.1072)	(0.1395)	(0.1031)	(0.1404)	(0.1073)	(0.2667)	(0.1031)
Tenure			0.0047	0.0066			0.0046	0.0066
			(0.0074)	(0.0053)			(0.0074)	(0.0053)
Age			0.0087	0.0467*			0.0088	0.0469*
			(0.0311)	(0.0263)			(0.0312)	(0.0263)
Graduate			0.0064	-0.0083			0.0064	-0.0083
			(0.0102)	(0.0071)			(0.0102)	(0.0071)
Intercept	-0.8606***	-1.2944***	-0.8907***	-1.3042***	-0.8600***	-1.0970***	-0.8903***	-1.3042
	(0.1921)	(0.1826)	(0.2321)	(0.1738)	(0.1920)	(0.1433)	(0.2321)	(0.1737)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.7180	0.7399	0.7185	0.7444	0.7180	0.7399	0.7186	0.7445
Observations	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155

Appendix 2 Dynamic Panel Threshold Estimation with ST (or PT) Firms

This table reports results for the dynamic panel threshold estimation. Each regime has at least 5% of all observations (Hansen, 1999). For Model A, we denote book leverage as a dependent variable. For Model B, the dependent variable is market leverage. The threshold and the regime dependent variable is the CEO power index (*PINDX*) obtained from standard PCA. Following Bick (2007), all the models account for regime dependent intercepts ($\widehat{\delta_1}$). Standard errors are reported in parentheses. ***, **, * indicate statistical significant at the 1%, 5% and 10% level, respectively.

	Model A		Model B	
Panel A: Threshold estimates				
$\hat{\gamma}$	-0.4692		-0.4300	
95% confidence interval	[-1.5630, -0.3966]		[-0.4300, -0.4289]	
Panel B: Impact of CEO power				
$\widehat{\beta_1}$	0.1478*	(0.0849)	0.0345**	(0.0138)
$\widehat{\beta_2}$	-0.0029	(0.0032)	-0.0004	(0.0029)

Panel C: Impact of covariates

	Regime I ($POWER_{it} \leq -0.4692$)		Regime II ($POWER_{it} > -0.4692$)		Regime I ($POWER_{it} \leq -0.4300$)		Regime II ($POWER_{it} > -0.4300$)	
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
$Leverage_{it-1}$	0.5302***	(0.1963)	0.7476***	(0.0816)	0.5128***	(0.0791)	0.6450***	(0.0563)
$Size_{it}$	0.0431***	(0.0159)	0.0203***	(0.0074)	0.0509***	(0.0074)	0.0315***	(0.0053)
$Growth_{it}$	0.0120**	(0.0050)	0.0062**	(0.0028)	-0.0120***	(0.0030)	-0.0156***	(0.0036)
$Risk_{it}$	-0.1994***	(0.0714)	-0.0676*	(0.0375)	-0.0918***	(0.0191)	-0.0319*	(0.0186)
$Profitability_{it}$	1.1709**	(0.4668)	0.1774	(0.3571)	0.2547*	(0.1491)	-0.0189	(0.1866)
Tax_{it}	-0.1850	(0.1226)	0.1337	(0.0918)	0.0324	(0.0870)	0.1092	(0.0814)
ST-$dummy_{it}$	-0.0275	(0.0528)	0.0023	(0.0240)	-0.0089	(0.0384)	-0.0074	(0.0212)
$\widehat{\delta_1}$	-0.3359	(0.1745)	-0.2916**	(0.1283)	-0.8119***	(0.1345)	-0.5309***	(0.1067)
Observations	365		579		390		554	

Appendix 3 Dynamic Panel Threshold, ST (or PT) Firms and Additional Variables

This table reports results for the dynamic panel threshold estimation. Each regime has at least 5% of all observations (Hansen, 1999). For Model A, we denote book leverage as a dependent variable. For Model B, the dependent variable is market leverage. The threshold and the regime dependent variable is the CEO power index (*PINDX*) obtained from standard PCA. Following Bick (2007), all the models account for regime dependent intercepts ($\widehat{\delta_1}$). Standard errors are reported in parentheses. ***, **, * indicate statistical significant at the 1%, 5% and 10% level, respectively.

	Model A		Model B	
Panel A: Threshold estimates				
$\hat{\gamma}$	-0.4692		-0.4233	
95% confidence interval	[-1.5713, 1.9281]		[-0.4233, -0.4231]	
Panel B: Impact of CEO power				
$\widehat{\beta_1}$	0.1680*	(0.0880)	0.0546***	(0.0157)
$\widehat{\beta_2}$	-0.0017	(0.0033)	-0.0023	(0.0031)

Panel C: Impact of covariates

	Regime I ($POWER_{it} \leq -0.4692$)		Regime II ($POWER_{it} > -0.4692$)		Regime I ($POWER_{it} \leq -0.4233$)		Regime II ($POWER_{it} > -0.4233$)	
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
$Leverage_{it-1}$	0.5272***	(0.1967)	0.7338***	(0.0839)	0.4790***	(0.0814)	0.6370***	(0.0561)
$Size_{it}$	0.0432***	(0.0157)	0.0210***	(0.0077)	0.0533***	(0.0075)	0.0327***	(0.0054)
$Growth_{it}$	0.0113**	(0.0049)	0.0061**	(0.0029)	-0.0120***	(0.0030)	-0.0156***	(0.0035)
$Risk_{it}$	-0.2058***	(0.0726)	-0.0704*	(0.0385)	-0.0934***	(0.0182)	-0.0327*	(0.0187)
$Profitability_{it}$	1.2345***	(0.4753)	0.1896	(0.3668)	0.2281*	(0.1316)	-0.0142	(0.1876)
Tax_{it}	-0.1850	(0.1226)	0.1337	(0.0918)	0.0044	(0.0879)	0.1181	(0.0818)
$ST\text{-}dummy_{it}$	-0.0349	(0.0548)	0.0071	(0.0255)	-0.0083	(0.0306)	-0.0101	(0.0232)
$Tenure_{it}$	0.0004	(0.0053)	0.0055	(0.0063)	0.0049	(0.0045)	0.0009	(0.0054)
Age_{it}	-0.0099	(0.0295)	0.0118	(0.0196)	0.0248	(0.0247)	0.0421**	(0.0206)
$Graduate_{it}$	0.0147*	(0.0081)	0.0031	(0.0067)	-0.0044	(0.0065)	0.0026	(0.0057)
$\widehat{\delta_1}$	-0.2705	(0.2017)	-0.3597**	(0.1497)	-0.9202***	(0.1620)	-0.5309***	(0.1067)
Observations	365		579		382		562	

Appendix 4 Dynamic Panel Threshold, ST (or PT) Firms and Alternative Variable

This table reports results for the dynamic panel threshold estimation. Each regime has at least 5% of all observations (Hansen, 1999). For Model A, we denote book leverage as a dependent variable. For Model B, the dependent variable is market leverage. The threshold and the regime dependent variable is the CEO power index (*PINDX*) obtained from standard PCA. Following Bick (2007), all the models account for regime dependent intercepts ($\widehat{\delta_1}$). Standard errors are reported in parentheses. ***, **, * indicate statistical significant at the 1%, 5% and 10% level, respectively.

	Model A		Model B	
Panel A: Threshold estimates				
$\hat{\gamma}$	-0.3719		-0.3363	
95% confidence interval	[-1.2377, -0.3027]		[-1.2467, 1.5231]	
Panel B: Impact of CEO power				
$\widehat{\beta_1}$	0.1886*	()0.1092	0.0546***	()0.0157
$\widehat{\beta_2}$	-0.0037	()0.0040	-0.0023	()0.0031

Panel C: Impact of covariates

	Regime I ($POWER_{it} \leq -0.3719$)		Regime II ($POWER_{it} > -0.3719$)		Regime I ($POWER_{it} \leq -0.3363$)		Regime II ($POWER_{it} > -0.3363$)	
	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error	Coeff.	Std. Error
$Leverage_{it-1}$	0.5285***	(0.1969)	0.7476***	(0.0816)	0.5201***	(0.0799)	0.6504***	(0.0557)
$Size_{it}$	0.0433***	(0.0159)	0.0203***	(0.0074)	0.0477***	(0.0075)	0.0319***	(0.0054)
$Growth_{it}$	0.0121**	(0.0050)	0.0062**	(0.0028)	-0.0124***	(0.0031)	-0.0154***	(0.0036)
$Risk_{it}$	-0.1994***	(0.0714)	-0.0676*	(0.0375)	-0.0949***	(0.0203)	-0.0293*	(0.0177)
$Profitability_{it}$	1.1687**	(0.4668)	0.1774	(0.3571)	0.2941*	(0.1612)	-0.0389	(0.1780)
Tax_{it}	-0.1849	(0.1227)	0.1337	(0.0918)	0.0231	(0.0865)	0.1091	(0.0819)
$ST\text{-}dummy_{it}$	-0.0272	(0.0529)	0.0023	(0.0240)	-0.0092	(0.0395)	-0.0082	(0.0200)
$\widehat{\delta_1}$	-0.3495*	(0.1788)	-0.2917**	(0.1283)	-0.7635***	(0.1413)	-0.5433***	(0.1094)
Observations	365		579		404		540	

Highlights

- This study examines the non-linearity between CEO power and corporate capital structure.
- We employ an innovative dynamic panel threshold model, which allows estimation of threshold effects in case of endogenous regressors.
- We find that CEO power has a strong positive influence on leverage in “low-CEO power” firms, but a negative impact on leverage in “high-CEO power” firms.
- The results are robust to alternative measures of leverage and CEO power.