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Nonlinear relationship between CEO power and capital structure: Evidence from China's listed SMEs

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ABSTRACT

This paper investigates the relationship between decision making power of chief executive officers (CEOs) and corporate capital structure in the context of emerging market characterized by deep collectivism and less prescriptive regulatory and legislative environment. Using a sample of 297 firms listed on Shenzhen Stock Exchange SMEs Board from 2009 to 2013, it finds a hump-shaped association between CEO power and leverage suggesting a strong nonlinearity between these two variables. Furthermore, the results show that the entrenchment effect of CEO power on firm leverage becomes more fiercely in state-owned firms. Our findings are robust to alternative calculation procedures for the CEO power index and to alternative estimation techniques. The shareholders and policy makers might leverage our findings to improve the performance of CEOs in the Chinese small and medium-sized enterprises.

1. Introduction

Previous literature has intensively explored the relationship between corporate capital structure and diversified characteristics from industry and firm-level. Yet, firms that are similar in terms of these fundamentals often choose different corporate leverage (Cronqvist, Makhija, & Yonker, 2012). This has led researchers to recently study the impact of personal characteristics of the firms' top executives, because top executives are seemed to be typically important factors with regard to financial decisions (Bertrand & Schoar, 2003; Liu & Jiraporn, 2010; Cronqvist et al., 2012) and other strategic choices (Finkelstein, 1992). However, the studies on this topic remain scarce (Jiraporn, Chintrakarn, & Liu, 2012). The present study extends this work, but we focus on the decision-making power of chief executives officers (CEOs).

Adams, Almeida, and Ferreira (2005) argue that in some companies, the CEO makes all the major decisions; while in other companies, decisions are more clearly the product of census among top executives. If different individuals have different opinions, then the distribution of decision-making power within companies might affect which decisions are made. Building on these ideas, prior studies have developed a hypothesis about how CEO dominance among top executives will affect corporate capital structure choices. Specifically, they attempted to explain corporate capital structure based on what degree of decision-making power a CEO holds. The theoretical basis for this hypothesis is the “agency theory” which is firstly proposed by Jensen and Meckling (1976).

The earliest capital structure theory can be traced back to 1958 when Modigliani and Miller argued that capital structure is irrelevant under the assumption of perfect capital markets. Since then, different theories have been developed to explain that market imperfections and frictions do matter in deciding corporate capital structure choices. One theory that has received strong empirical support is agency theory (Jiraporn et al., 2012). The main thrust of agency theory is that capital structure is determined by agency costs that arise from the imperfect alignment of interests between two parties within firms. For example, executives such as the CEO

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may not adopt optimal capital structure that maximizes shareholder's wealth. Rather, these executives may choose capital structure that enhances their own benefits.

Theoretically, it is inconclusive whether agency costs result in too high or too low leverage (Chintrakarn, Jiraporn, & Singh, 2014). On the one hand, firms may adopt high leverage because fixed claims such as debt serve as an alternative governance mechanism to reduce agency costs by decreasing the free cash flow availability of executives (Mehran, Taggart, & Yermack, 1999). In addition, by increasing the levels of debt ratio the equity base can shrink, hence increasing the percentage of equity owned by executives (Jiraporn et al., 2012). As a result, the agency conflicts between managers and shareholders can be reduced (Jensen & Meckling, 1976). On the contrary, executives may pursue little leverage to achieve self-interests, such as preserving managerial opportunism and freely using cash flow. Such contradictory arguments induce the hypothesis that CEO power plays a significant role in influencing capital structure and can both positively and negatively relate to firm leverage. In other words, firms with less powerful CEOs tend to use large amounts of debt to reduce agency costs. However, as CEOs amass more power that grows beyond a certain threshold, firms may adopt leverage below optimal, because the entrenched CEOs can manipulate capital structure to pursue their own benefits.

Aligning with the hypothesis, recent studies have started to focus on possible nonlinearity within the CEO power and capital structure nexus. Nonetheless, the literature on this topic remains scarce and it relates predominantly to studies in Western countries. For example, using a sample of non-financial US firms, Chintrakarn et al. (2014) find a hump-shaped relationship between CEO power and leverage. Although the findings in Western countries are relevant in countries of a non-Western context, the distinct cultural, market and institutional features may lead to significant differences. Indeed, there is a gap in literature on whether the classic theory and empirical findings derived from Western countries also work in developing countries characterized by deep collectivism and less prescriptive regulatory and legislative environments. This paper attempts to fill in this gap by employing the data obtained from the representative market. In particular, we aim to investigate how the decision-making power of CEOs affect capital structure in Chinese small and medium-sized enterprises (SMEs).

To empirically examine the association between CEO power and capital structure, we firstly follow Veprauskaitė and Adams (2013) to create a CEO power index by applying a principle components analysis (PCA). In the prior studies, most of the researchers either use a single variable to gauge the levels of CEO decision-making power (e.g., Chintrakarn et al., 2014; Jiraporn et al., 2012; Liu & Jiraporn, 2010; Pathan, 2009) or simply establish a CEO power ranking variables count on the strong assumption that all the decision-making power attributes contribute equally to the CEO power index (e.g., Luo, 2015; Ting, 2013). In comparison with these traditional measurement cases, PCA can combine the original variables of CEO power into a one-dimensional index and afford loadings to each of the variables according to variance contribution in the data. Therefore, to a certain extent, it mitigates the problem of measurement errors arising from manually allocated factor weights. In addition, it helps to avoid problems that may arise from the potential interdependence between decision-making power and control variables (e.g., multicollinearity).

We then employ pooled ordinary least squares (OLS), fixed effects (FE), and random effects (RE) techniques to estimate the regressions.[1] The empirical results indicate that the relationship between CEO power and leverage is hump-shaped, consistent with Chintrakarn et al. (2014). We also split our sample into privately owned firms (POEs) and state-owned firms (SOEs) based on their ultimate ownership. The findings show that the nonlinear relations remain stable in the regressions for both subsamples, but the statistical significance becomes weaker in SOEs. Finally, we re-estimate the tests using two alternative approaches: piecewise linear regression and system generalized method of moments (SYS-GMM) as well as alternative measurements of CEO power and control variables. The above-mentioned results are robust to the different specifications.

Our study makes the following contributions. First, by using a new dataset, our study contributes to the relatively small body of literature on assessing the impact of executives on firm financing decisions. In particular, our evidence strongly complements Chintrakarn et al. (2014), implying that the nonlinear relationship between CEO power and firm leverage also exists in developing countries. Second, this paper enriches the growing collection of research on the determinants of capital structure. Existing studies have broadly explored the behavior and performance of capital structure by employing firm and industry-level characteristics, particularly in developed countries. Yet, firms that are similar in terms of these fundamentals often choose very different capital structures (Cronqvist et al., 2012). Thus, this has led researchers to recently investigate the role of the top executives of firms in affecting the financing decisions and firm outcomes. However, the research remains scarce. In this study, we demonstrate that CEO power plays a significant role in shaping capital structure decisions of Chinese SMEs. Third, since our study focuses on the Chinese market, which has a unique cultural environment where managers tend to act according to the interest of the group as the exhibition of self-effacement in the interest of the group is a normal expectation (Pour, 2015), we also contribute to the literature on the role of CEO power within collectivism cultures.

The remainder of this paper is structured as follows. Section 2 provides the institutional background to the study. Section 3 discusses the literature and develops the hypotheses. Section 4 describes the data and methodology. Section 5 discusses the empirical results and Section 6 concludes the paper.

2. Institutional background

2.1. Background of Chinese SMEs

China has experienced remarkable institutional change since 1978—its economy has been practically undergoing a historic transformation. Prior to that, China maintained a planned economy; capitalists were treated as class enemies and the government

[1] The choice between fixed effects and random effects models is decided by performing the Hausman specification test.

prohibited the development of private (or civilian) enterprises and foreign invested firms. As a consequence, most production was produced by the SOEs. This planned economic form has made Chinese living standards lower than other countries. In 1978, the Chinese government decided to gradually reform the economy toward a market-oriented style based on to two ways, namely the “Open Door Policy” and free market principles. Its economic reform has proven to be effective in promoting economic growth and enhancing living standards. Currently, China has become the second largest economy and the largest emerging market in the world.

Although China has moved towards a market-oriented economy, the central and local governments still own a large number of enterprises which are generally managed by the State-owned Assets Supervision and Administration Commission (SASAC). Therefore, the Chinese economy has been driven primarily by both the SOEs and POEs. Bai, Lu, and Tao (2006) argue that private firms in particular have grown from an extremely restricted and ignored sector into a powerful growth engine for China's economy. Among the SOEs and POEs, most firms are SMEs, which account for more than 42 million and for 98% of registered firms.[2] These enterprises also contribute to more than 60% of the annual GDP, 50% of tax revenues, and 75% of the industrial value-added output. Moreover, Chinese SMEs provide for 75% of China's employment opportunities and absorb a large amount of the employees laid off from the SOEs.

However, despite the significant contribution, SMEs in China are facing serious challenges in obtaining external financing (Shen, Shen, Xu, & Bai, 2009), especially for private SMEs. It is also argued that the lack of appropriate financing channels has become a serious impediment for the development of SMEs. Therefore, the government of China has launched various schemes in order to address this issue. In May 2004, the Shenzhen Stock Exchange (SZSE) established the SMEs Board to allow firms which cannot fulfil the requirements for being listed on the main board to access equity financing. At the end of 2015, there were a total of 776 companies listed on the SZSE SMEs Board.

2.2. CEO roles in Chinese listed firms

After the founding of the Shanghai Stock Exchange (SHSE) and the SZSE, China introduced its Company Law in December 1993 to regulate the listed firms. One of the major provisions in the Company Law mandates a two-tier board governance system—a board of directors (BOD) and supervisory board (SB) for the firms. In this system, the BOD is responsible for managing the firm, such as making strategic decisions, while the SB serves as a monitoring function. Since the BOD is also charged with managing the firm, generally the chairman/president of the BOD and the CEO are recognised as the top two executives of a Chinese firm (Wu, Wu, & Rui, 2012). The CEOs typically function more as operational decision makers.

Moreover, Chinese corporate law does not rule that the two positions (i.e., chairman and CEO) are occupied by different individuals. As a consequence in some cases, the same person might simultaneously hold CEO and Chair positions in Chinese firms. Even though the two positions are held by different person, for SOEs in China, the active controller of the company is the BOD chair in almost all cases, however for non-SOEs (most of which are SMEs), this is less often the case (Jiang & Kim, 2015). Compared to SOEs, private firms have more autonomy and profit retention, and CEOs are more often appointed based on their ability, rather than political connections (Ruan, Tian, & Ma, 2011). They also argue that the majority of non-SOEs adopt a managerial-ownership governance approach, thus the CEOs may have more power to make financial decisions. Firth, Fung, and Rui (2006) claim that the managerial-ownership governance affords CEOs more discretion over funding.

Nevertheless, Jiang and Kim (2015) argue that scholars might make an incorrect assumption if they simply assume the firm's CEO is the active decision-maker when studying top managers in China. In this study, we assume that the CEO is a primary decision-maker when financing Chinese SMEs, however the decision-making magnitude depends critically on how much power he or she commands in a firm.

3. Literature review and hypotheses development

Since Modigliani and Miller first proposed the MM theory that capital structure is irrelevant in determining corporate value in a non-friction (perfect) market in 1958, the issue of capital structure has generated great interest among financial economists. In the past several decades, a series of theoretical models have been developed explaining firms' financing decisions, including the trader-off theory (Miller, 1977), the agency cost theory (Jensen & Meckling, 1976), the pecking order theoretical framework (Myers & Majluf, 1984), and the equity market timing theory (Baker & Wurlger, 2002). In this section, we use agency theory to illustrate how CEO power affects capital structure in Chinese SMEs.

It is argued that agency costs arise from conflicts between two parties, namely the principle and the agent (e.g., the owners and managers) within firms. Traditional assumption suggests that managers might take actions that enhance their own utility but maximize the owners' benefits. These actions cause tremendous damage to firm value. Two prescriptions have been proposed to mitigate such an agency problem. The first one is to closely align the interests of owners and managers through several effective ways, such as increasing managers' ownership, and making executive remuneration closely related to owners' wealth. The second way is to reinforce the monitoring of managers through a BOD or SB.

Leverage has been deemed as an instrument of the first perception to reduce agency costs, based on the following reasons. First, the use of debt can effectively displace equity capital, and shrink the equity base, hence increasing the percentage of equity owned by management (Jiraporn et al., 2012). Second, remain borrowing at higher levels might increase the probability of bankruptcy and job

[2] See: http://finance.sina.com.cn/hy/20120426/100211929864.shtml.

loss, and resolve the free cash flow problem (Jensen, 1986). Grossman and Hart (1983) suggest that the additional risk is helpful in reducing misfeasance and increasing managers' efficiency. According to the above arguments, firm leverage should always be maintained at a higher level. Furthermore, managers may voluntarily use more debt in some cases. For example, entrenched managers may adopt higher than optimal levels of debt to satisfy empire-building desires and to prevent control challenges (Zwiebel, 1996). On the contrary, however, managers have great incentives to use less debt to pursue self-interests such as lower personnel risk, preserving managerial opportunism, and freely using cash flow, consistent with prior findings that firms with stronger managerial control power are more likely to use less debt (Berger, Ofek, & Yermack, 1997).

Indeed, in alignment with the contradictory arguments, prior empirical studies have shown a non-monotonic association between firm leverage and managerial ownership power. For instance, Florackis and Ozkan (2009) and Sun, Ding, Guo, and Li (2015) find that the relation between managerial share ownership (MSO) and firm leverage is hump-shaped in UK firms. That is to say the relation is positive at lower degrees of MSO and negative at higher degrees. Ruan et al. (2011) show that in Chinese POEs, a negative relationship exists between MSO and leverage ratios when MSO is at both lower and higher levels; within the mediate levels, the leverage ratio increases as MSO increases. These studies that investigate the impact of managerial incentive on firm debt levels concentrate on all of the executives in the firm and only consider ownership power.

However, in some firms, decisions are the product of census among the top executives; while in other companies, the CEO makes all the major decisions (Adams et al., 2005). They also argue that if different individuals (executives) have different opinions, then the distribution of decision-making power within firms might affect which decisions are made. In addition, managerial power not only comes from ownership power, but may stem from other formal and informal sources, such as structural power and prestige power (Finkelstein, 1992; Pfeffer, 1992). Using the underlying agency theory and following the aforementioned arguments, Chintrakarn et al. (2014) report an inverted U relationship between firm leverage and CEO power in the United States. That is when the CEO commands less power, a firm uses more debt to align the interests of shareholders and executives, and to alleviate the agency costs of free cash flow. However, when CEOs with higher power exceed a threshold point, they have more discretion to manipulate companies' debt levels. This negative relation suggests that they tend to use lower leverage to reduce bankruptcy risks and to avoid the discipline and monitoring associated with debt financing.

Our study aims to explore the relationship between CEO power and capital structure in China. On the basis of the theoretical arguments and following the empirical findings to date, we therefore expect that the relationship between CEO power and firms' capital structure is nonlinear in Chinese SMEs.

4. Data and methodology

4.1. Sample selection

In the present study, we choose to focus on SMEs. We do so for several important reasons. First, as previously mentioned, SMEs play an important role in the Chinese economy and may even act as the engine of economic development. Second, SMEs have been noted to face growth constraints and have less access to formal sources of external finance (Shen et al., 2009). Recent needs for maintaining a relatively rapid speed for the economic development of China and alleviating the above-mentioned issue of obtaining external finances, have asked to understand more about Chinese SMEs. Finally, unlike large firms, Chinese SMEs which are accounted mostly by the POEs prefer to appoint CEOs based on their ability rather than political connections and tend to adopt managerial-ownership governance (Ruan et al., 2011). As a consequence, the CEOs in the SMEs may be afforded more discretion over funding (Firth et al., 2006).

Our initial sample contains all companies listed on the SZSE SMEs board. At the end of 2009, there were 327 firms listed on the SME Board. In order to obtain enough firm-level data, we focus on the sample of firms with an IPO prior to 2010. The year end of our sample data is December 31, 2013. We omit firms with special treatment (flagged as ST and *ST) status as well as companies in the financial industries. ST and *ST firms are those that have financial or operational trouble which may contaminate the results given the financial or operational problems. The companies in the financial industries such as banks, trusts, insurance companies and financial management firms in general have an extremely different balance sheet structure in comparison to non-financial firms. We also exclude the companies with any missing variables during the period of 2009 to 2013.

The data are sourced in two ways. Stock prices are collected from SINA Finance (http://vip.stock.finance.sina.com.cn/mkt/). Data for financial items, CEO and corporate governance characteristics are obtained from the annual reports of listed companies, and the SZSE website. As a result, the final sample includes a panel of 1485 firm-year observations, representing 297 firms.

4.2. Variable description and proxies

4.2.1. Dependent variables

Our dependent variable is capital structure, which can be defined in various ways according to the objective of research (Rajan & Zingales, 1995). In this paper, we rely on prior literature (e.g., Berger et al., 1997; Jiraporn et al., 2012) to define capital structure in the following two ways: book value-based leverage (BLVE) is calculated as the book value of total debt divided by the book value of total assets; and market value-based leverage (MLVE) is computed as the book value of total liabilities divided by the book value of total debt and the market value of equity, where the market value of equity is the number of shares times the stock price.

Although these two types of leverage are conceptually different, researchers have broadly used them interchangeably in empirical studies (Florackis & Ozkan, 2009). Nevertheless, the findings from the book value-based leverage analysis might be more reliable than from the market value-based leverage given the following reasons. First, prior findings suggest that managers pay more attention to book values when making financial decisions (Graham & Harvey, 2001). Second, book value-based leverage is less volatile than market value-based leverage, thus it is better suited to guide financial structure (Graham & Harvey, 2001; Florackis & Ozkan, 2009). In addition, market value may create a substantial quantity of irrelevant noise to capital structure decisions since the Chinese stock market is inefficient (Chang, Chen, & Liao, 2014). Consequently in this study, our analysis mainly relies on the results from book value-based leverage. However, we also report the findings for market value-based leverage as a comparison.

4.2.2. Independent variables

Previous studies broadly employ four sources of CEO power identified by Finkelstein (1992): structural power, ownership power, expert power and prestige power. However, this definition does not lend itself to natural and unequivocally captured CEO dominance (Luo, 2015). In addition, CEO power is not directly observable and might come from many formal and informal sources (Pfeffer, 1992). In this study, we define the powerful CEOs as those who can consistently influence corporate financing decisions in their firms. Therefore, not all of the measures of CEO power used in the prior studies are a suitable proxy for the CEO's financing decision power. It is necessary to construct a variable that can empirically capture CEO dominance. Following prior studies (e.g., Liu & Jiraporn, 2010; Luo, 2015; Jiraporn et al., 2012; Veprauskaitė & Adams, 2013; Ting, 2013), we construct a power index (PINDX) by comprising four CEO power-related variables – founder, title, ownership, and compensation pay slice.

Founder is a dummy variable that indicates whether the CEO is also one of the firm's founders (FNDR). Previous studies find that a CEO who is the founder tends to be more influential in the financing decision-making process. For example, 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 (Pour, 2015). Furthermore, agency costs might be lower for firms with founder-CEOs since they have more ability to guide a firm as the founder status reduces the conflict within the firm (Fischer & Pollock, 2004).

The second measure of CEO power is an indicator variable that takes the value of one if the CEO also serves as the board chairperson and zero otherwise (TITLE). CEO-Chair duality restricts the information flow to other board directors and hence reduces a board's independent oversight of a manager (Jensen, 1993). Hermalin and Weisbach (1998) argue that a CEO who also holds the chair position tends to have more decision-making power.

CEO ownership (CEOWNP) is another proxy of CEO power. CEO shareholding can add to the decision-making power but it is also likely to mitigate the conflicts between CEOs and shareholders since CEOs represents both owner and manager (Pathan, 2009). However, CEOs with significant ownership might also be more likely to pursue self-interests. A prior study by Ruan et al. (2011) has shown a negative relationship between managerial ownership and capital structure in Chinese POEs, suggesting executives with a higher proportion of shareholdings tend to manipulate leverage. Following Luo (2015), we use a dummy variable to gauge CEO ownership power, which takes the value of one if a CEO owns more than 10% of the firm's shares and zero otherwise.

The fourth measure is denoted as CPS which is deemed as a more direct way to gauge CEO power (Bebchuk, Cremers, & Peyer, 2011) and has been used by a great number of existing empirical studies (e.g., Bebchuk et al., 2011; Chintrakarn et al., 2014; Jiraporn et al., 2012). In particular, Chintrakarn et al. (2014) report a hump-shaped association between CPS and leverage. However, recent evidence shows that the pay gap between a CEO and other executives as well as CPS for Chinese listed firms is much lower than the figure reported by Bebchuk et al. (2011) for US companies (Hu, Pan, & Tian, 2013). Thus, this perhaps leads to the CPS becoming a weak indicator of CEO power for Chinese firms. Following the previous literature, we calculate the CPS as the percentage of the total compensation of the top-five executives that goes to the CEO. China's listed companies disclose only cash compensation without breaking it into base salary, bonus, and commissions.

4.2.3. Control variables

In addition to CEO power, other factors that affect firms' capital structure can be grouped by firm-specific characteristics. In this study, we control for firm size, income tax rate, tangibility, profitability, financial distress, growth opportunity, and corporate governance. The effect of each of these control variables on leverage ratios are well documented in the context of Chinese firms (e.g., Chen, 2004; Chen & Al-Najjar, 2012; Chang et al., 2014; Guney et al., 2011; Huang & Song, 2006; Huang & Wang, 2015; Liu & Tian, 2009).

Large firms have the advantages of diversification and stable cash flow, so they are less likely to default on their debt obligations. Trade-off theory suggests that large firms can use more debt. However, the pecking order theory posits that large firms tend to have lower leverage since they face fewer information asymmetric problems which can result in more issuing of informational sensitive securities. Empirical studies, such as Chen (2004), Huang and Song (2006), Guney et al. (2011), and Chang et al. (2014), generally find that large Chinese companies are more likely to have high leverage. On the contrary, Liu and Tian (2009) show a significantly negative relationship between firm size and leverage for Chinese SMEs. In this paper, the firm size (SIZE) is measured by the natural logarithm of book values of total assets.

The impact of tax on corporate financing is the main theme of previous studies. Modigliani and Miller (1958) assert that the capital structure is irrelevant in determining the firm value in a perfect market without taxes. However, the trade-off theory suggests that firms with high tax rates should use more debt because they can obtain the interest tax shields gain. Existing studies of capital structure in Chinese companies have reported a negative relation between non-debt tax shields and leverage (Chang et al., 2014; Liu & Tian, 2009). The official tax rate (TAX) is used to measure tax effect on leverage in this study.

Tangible assets can be used as collateral to diminish the lender's risk of suffering agency costs of debt because overinvestment can transfer the wealth from the creditors to shareholders. Hence, firm leverage is expected to increase with tangibility of assets. Moreover, in the case of bankruptcy, the value of tangible assets might be higher than intangible assets. However, Chang et al. (2014)

argue that firms with a high fraction of tangible assets can also have low leverage because they tend to have less informational asymmetric issues. Prior Chinese studies have revealed a mixed result for the relation between tangibility and leverage. The tangibility (TANG) is expressed as fixed assets scaled by total assets.

Several theoretical models have been employed to explain the relationship between profitability and external financing in prior literature. However, there are no consistent predictions that have been obtained. On one hand, trade-off theory suggests that profitable firms should use more debt because they have greater needs to shield income from corporate taxation. Agency-based models also give similar predictions. Fixed claims financing, such as debt, is considered as a discipline mechanism to ensure that managers maintain aligned interests with shareholders, thus reducing the agency costs of equity. So, profitable firms which also tend to have free cash flow should retain a high fraction of the fixed claims in capital structure to restrain management discretion. On the other hand, the pecking order theory asserts that debt is a financing source of a secondary resort (after retained earnings) attractive for firms. In contrast to theoretical studies, the majority of empirical studies of capital structure show that fixed claims financing is negatively related to profitability. For example, Chen (2004), Huang and Song (2006), and Chang et al. (2014) find that the relationship between profitability and leverage is negative in the context of Chinese firms. We use the ratio of operating profits to total assets to assess the firm's profitability (PROF).

Financial distress in general is used to measure the level of firms' operation or financial risk. Trade-off theory suggests that firms with higher risk should use less debt, because higher leverage ratio can increase the volatility of the profit, which might lead to higher expected costs of bankruptcy. By contrast, the pecking order theory predicts that risky firms tend to borrow more due to adverse selection effect. The empirical evidence for the Chinese firms on the relationship between firm leverage ratio and firm risk is mixed. For instance, Chen (2004) finds that firm risk is negatively related to leverage. Chang et al. (2014) show that the relationship between firm risk and leverage remains positive for SOEs, whereas it becomes negative for non-SOEs. They argue that SOEs can obtain the guarantees from the government, thus risky SOEs can use more borrowing to avoid financial distress costs; whereas non-SOEs often encounter difficulty in obtaining bank loans because they have less support from the government. In this study, we use the Altman's Z-score (Altman, Zhang, & Yen, 2007) to measure firm financial distress potential (RISK).

Theoretical arguments about the relationship between firm leverage and growth opportunities are inconsistent. On the one hand, firms with high growth opportunities are easily subject to small free cash-flow problems. The pecking order theory predicts that firms with higher growth opportunities might have higher capital demand for debt for financing projects. On the other hand, high-growth firms are more likely to have interest conflict with creditors in the case of financial distress, thus resulting in a high agency cost of debt. In the agency cost framework, firms with high-growth opportunities should apply less debt financing to reduce the underinvestment problem (Myers, 1977). Trade-off theory also suggests that debt financing decreases with growth opportunities. Prior empirical studies present contradicting results about how growth opportunities influence Chinese firms' leverage ratios (Chang et al., 2014). In this study, following Huang and Song (2006), and Chang et al. (2014) we employ Tobin's Q to measure the firm's growth opportunities (GROWTH).

A firm's board plays both monitoring and advisory roles in a company's business operation. A strong corporate board structure is recognised as a mechanism to alleviate the agency conflict between CEO and owners. Weisbach (1988) argues that a CEO will face more vigorous monitoring when the board of directors is dominated by independent directors. Conyon and Peck (1998), and Guest (2008) indicate that a large board can increase its monitoring capability, thus reducing the autonomy of CEO decision-making. The advisory role of a board is to provide the CEO with additional business expertise, information and resources, which is more efficiently carried out by independent directors (Fama & Jensen, 1983). Guest (2008) argues that both the numbers of directors and outsiders should increase as the requirement for advice increases since large boards and more outsiders can provide greater information. They also find that board size and outsider proportion are positively related to firm leverage. However, ambiguous findings have been reported on this relationship among Chinese listed firms. For instance, Chen and Al-Najjar (2012) suggest a non-statistically significant relationship between board structure and leverage for a sample of firms over 1999–2003. Huang and Wang (2015) report that board size is significantly and positively related to leverage for the listed Chinese firms during 2003–2011. In this study, board composition (BCOPN) is measured as the percentage of independent directors out of total directors. Board size (BSIZE) is proxied as the total number of directors on the board.

4.3. Empirical model and estimation method

4.3.1. Empirical model

To investigate the relationship between CEO power and firm capital structure, we develop the following empirical model:

$$\begin{aligned}\mathrm{LEVERAGE}_{it} = {} & \alpha_i + \beta_1 PINDX_{it} + \beta_2 PINDX_{it}^2 + \phi_1 SIZE_{it} + \phi_2 TAX_{it} + \phi_3 TANG_{it} + \phi_4 PROF_{it} + \phi_5 RISK_{it} + \phi_6 GROWTH_{it} \\ & + \phi_7 BCOPN_{it} + \phi_8 BSIZE_{it} + \sum_{j=1}^{n} \gamma_j Industry_j + \sum_{t=1}^{n} \varphi_t Year_t + \varepsilon_{it}\end{aligned} \quad (1)$$

where subscripts i and t denote firm ($i = 1,2, \ldots, 297$) and time ($t = 2009,2010, \ldots, 2013$), respectively. β, ϕ, Υ, and φ are the parameters to be estimated. ε_{it} is the idiosyncratic error term which is used to capture all the other unobserved effects. The definition of all the variables are summarized in Appendix A. Eq. (1) considers the nonlinear relations between leverage and CEO power when the squared ($PINDX^2$) term is included. Previous studies (e.g., Chintrakarn et al., 2014) find that at a low level, CEO power is positively related to corporate leverage; at a high level, CEO power is negatively related to leverage. This study examines whether a similar non-monotonic relationship exists in Chinese SMEs. Thus, our main coefficients of interest are β_1 and β_2. When $\beta_2<0$ it indicates that the relationship is hump-shaped.

4.3.2. Estimation method

We begin by using a pooled OLS technique which is commonly applied in cross-sectional regression. Nevertheless, it may omit significant explanatory variables, hence resulting in bias in the estimated relation between CEO power and leverage. In addition, since our final sample is panel data, it is essential to use some estimate methods that are designed to take advantage of panel data. Fixed effects estimation can help to control for unobservable firm-specific characteristics. Nonetheless, FE estimation can lead to a loss of degrees of freedom and might result in inconsistent results given a large N (297 firms in this study) and a fixed small T (5 years in this study) (Baltagi, 2005). Therefore, this study also applies random effects estimation as an alternative to FE estimation. Year dummies and industry dummies are included in the regressions. In order to determine the most appropriate model between fixed and random effects, this study employs the Hausman specification test. As suggested by Petersen (2009), all the regressions are also estimated with robust standard errors clustered at the firm level to account for potential serial correlation and heteroscedasticity in the data.

5. Empirical results

5.1. Descriptive statistics and correlation matrix

To reduce the influence of extreme values, we winsorize each continuous variable at the top and bottom 2.5% of their distributions.[3] Table 1 reports the descriptive statistics for the sample selected from 2009 to 2013. Panel A shows the statistics for leverage. Our two measures of leverage—book value-based leverage and market value-based leverage average (BLVE and MLVE) are 38.4% and 19.3%, respectively. The book value-based leverage is similar to that of the Chinese SMEs reported in Liu and Tian (2009). However, both of the BLVE and MLVE are much lower than those of Chinese listed companies as reported in other previous studies (e.g., Chang et al., 2014; Guney et al., 2011; Ruan et al., 2011). One reason is that their sample consists of a substantial amount of large-sized firms which might have higher average leverage than those of SMEs. The market value-based debt ratio is much lower than book value-based debt ratio, indicating the higher equity valuation of Chinese listed firms (Chang et al., 2014). Finally, it shows that the distribution of BLVE and MLVE are skewed with positive kurtosis.

In Panel B, we report the measurements of CEO power separately. It shows that the chair and the CEO position are held by the same individual in 32.6% observations, which is much greater than those of firms from the US and UK reported in Adams et al. (2005), and Florackis and Ozkan (2009), indicating that the CEO-Chair functions are highly concentrated in Chinese listed SMEs. Table 1 further shows that in 44.3% of firm-years, the CEO is one of the corporate founders. Regarding the variable of ownership power, 36.8% of CEOs held more than 10% of firm shares, suggesting that a significant number of firms adopt a managerial-ownership governance approach. The average of compensation pay slice is 26.2%, which is much lower than the findings from the US as reported in previous studies (Bebchuk et al., 2011; Chintrakarn et al., 2014; Jiraporn et al., 2012), implying that the compensation gap between CEO and other executives among Chinese listed firms is less conspicuous (Hu et al., 2013).

Panel C presents the descriptive statistics on firm-level control variables, including firm size, tax rate, tangibility, profitability, financial risk, growth opportunity, board composition and board size. The reported results are comparable to those described in prior studies (e.g., Chen, 2004; Chen & Al-Najjar, 2012; Chang et al., 2014; Huang & Song, 2006). We also divided our sample into 12 different industries according to the SZSE.[4] Panel D reports the descriptive statistics for BLVE by industry. It shows that there are some differences between average leverage across different industries. Industries such as real estate (64.2%), utilities (62.3%), and construction (60.0%) have the highest book value-based leverage which is in line with the finding of Guney et al. (2011). On the other hand, we observe that the IT and information industry have the lowest leverage (20.3%).

Table 2 reports the correlation matrix between the main variables. The two measures of leverage, BLVE and MLVE, are highly correlated with each other (0.845), indicating that they are close substitutes (Chang et al., 2014). It also illustrates that both BLVE and MLVE are positively correlated with SIZE, TAX, TANG, and BSIZE, while negatively correlated with PROF, RISK, GROWTH, and three power variables, including FNDR, TITLE, and CEOWNP. In addition, the results shown in Table 2 suggest that multicollinearity would not be a problem in following regression analysis.

5.2. Construction of CEO power index

As aforementioned, this study uses PCA to construct CEO power index. PCA is a statistical method used to aggregate a set of correlated variables into a smaller number of independent principle components by finding the linear combinations of the original CEO power attributes that account for as much variation in the original dataset as possible. Hence, the weights of factors in this CEO power index are based on a statistical procedure instead of using equal or arbitrarily chosen weights. However, applying the standard PCA to discrete variables may bias the estimates (Kolenikov and Angeles, 2004).[5] In order to address this issue, the present study employs discrete PCA (proposed by Kolenikov and Angeles (2004)) which involves modifying the standard PCA methodology to suit the discrete variables.

[3] According to Belsley, Kuh, and Welsch (1980), observations with Cook's D-statistic greater than $4/(n-k-1)$ (where n is the sample size, k is number of regressors.) can cause undue influences on the estimation results. In fitting Eq. (1) on our full sample, about 4–5% of the observations are identified as such influential observations. We therefore winsorize the continuous variables at the top and bottom 2.5% of their respective distributions.

[4] See: http://www.szse.cn/main/en/marketdata/sinformation/index.shtml?CATALOGID=1693&TABKEY=tab3.

[5] Strictly speaking, the PCA should be applied primarily to continuous and normally distributed variables. We are thankful to one of the referee who pointed out this issue.

Table 1
Descriptive statistics of the full sample.

Variable	Mean	SD	Minimum	Median	Maximum	Skewness	Kurtosis	Obs
Panel A: Leverage:								
BLVE	0.384	0.189	0.061	0.375	0.723	0.145	2.086	1485
MLVE	0.193	0.158	0.013	0.151	0.630	1.095	3.522	1485
Panel B: CEO power measures:								
FNDR	0.443	0.497	0.000	0.000	1.000	0.229	1.052	1485
TITLE	0.326	0.469	0.000	0.000	1.000	0.742	1.550	1485
CEOWNP	0.368	0.483	0.000	0.000	1.000	0.546	1.298	1485
CPS	0.262	0.076	0.017	0.250	0.762	0.895	6.638	1485
Panel C: Control variables:								
SIZE	21.336	0.817	19.888	21.275	23.337	0.667	2.764	1485
TAX	0.165	0.044	0.000	0.150	0.250	0.588	4.460	1485
TANG	0.240	0.138	0.016	0.223	0.552	0.446	2.453	1485
PROF	0.060	0.053	−0.043	0.052	0.199	0.634	3.265	1485
RISK	1.195	0.605	0.126	1.119	2.725	0.556	3.010	1485
GROWTH	1.876	1.063	1.041	1.562	5.695	1.731	5.700	1485
BCOPN	0.369	0.055	0.125	0.333	0.667	1.128	6.115	1485
BSIZE	5.000	1.603	5.000	9.000	17.000	0.304	4.480	1485
Panel D: Industry								
Agriculture	0.419	0.122	0.136	0.430	0.615	−0.356	2.447	25
Mining	0.388	0.077	0.286	0.368	0.504	0.140	1.472	15
Manufacturing	0.371	0.175	0.061	0.368	0.763	0.105	2.116	1160
Utilities	0.623	0.179	0.274	0.695	0.763	−0.915	2.482	10
Construction	0.600	0.160	0.249	0.671	0.763	−0.846	2.292	55
Retailing	0.548	0.107	0.323	0.577	0.735	−0.575	2.502	30
Transportation	0.214	0.163	0.061	0.187	0.404	0.027	1.078	10
Hoteling	0.314	0.144	0.120	0.290	0.641	1.014	3.900	10
IT and information	0.203	0.129	0.061	0.156	0.569	1.088	3.469	90
Real estate	0.642	0.176	0.180	0.703	0.763	−1.648	4.268	35
Social service	0.490	0.214	0.133	0.542	0.763	−0.283	1.897	40
Others	0.487	0.105	0.371	0.479	0.597	0.038	1.294	5

This table reports the descriptive statistics of the sample of 297 Chinese listed firms. Panel A reports summary statistics for the leverage. Panel B reports summary statistics on CEO power index components. Panel C reports summary statistics for control variables. Panel D reports summary statistics for book value-based leverage by industry. The industry classification is based on that of the Shenzhen Stock Exchange SME Board website. The definitions of all variables are provided in Appendix A.

Table 3 presents the results of the discrete PCA. As can be seen in Panel A, the first two principle components have higher eigenvalues, which together explains about 89.2% of the total standardized variance. However, according to the suggestion of Kaiser (1960) that only the factors that have eigenvalues greater than one are retained for interpretation, the first principal component is presented in this study. From Panel A, this component is mainly characterized by FNDR, TITEL, and CEOWNP, as they have significantly different weights (loadings) with CPS. All of the positive signs of the loadings are in line with our expectations, suggesting that a CEO who holds a chair position, large percentage of shares, and is one of the founders has a higher degree of decision-making power. Panel C reports the descriptive statistics for the first principal component.

5.3. CEO power and capital structure

We hypothesize that CEO power can affect corporate financing decisions. To test the relationship between CEO power and leverage, we begin our empirical examination from the linear regression where the dependent variables are the firm's book value-based leverage and market value-based leverage, respectively. The explanatory variables include CEO power (PINDX), firm size (SIZE), tax rate (TAX), tangibility (TANG), profitability (PROF), growth opportunity (GROWTH), board composition (BCOPN), and board size (BSIZE). Hence, the model is similar with Eq. (1) but excluding the squared term of PINDX.

After having established by the Hausman test that the random effect models are inappropriate (each of p-values is 0), we used the fixed effect models. The left panel of Table 4 presents the linear regression results for both BLVE and MLVE using the OLS and FE methods. The F tests (unreported) are significant for Mode (1)–(4) with adjusted R^2 ranging from 0.4041 to 0.7460. As shown in Model (3) and (4), the estimates on CEO power are all positive and notably significant, providing evidence in support of the notion that more entrenched CEOs might have more incentives to pursue high leverage to achieve self-interests. For instance, CEOs can increase debt to obtain more cash to build their “management empire” or achieve the suboptimum investment (Ruan et al., 2011). Furthermore, CEOs can use high leverage to consolidate their voting power, because the debt financing does not dilute a CEOs' shareholding right (Stulz, 1990). However, our results are in contrast with Jiraporn et al. (2012) which shows a negative relationship between CEO power, which is proxied by CPS, and leverage for a sample of US firms. Nonetheless, it is important to be cautious about these results, because linear regression in this section does not allow us to consider whether CEO power can more complexly influence firm leverage. Chintrakarn et al. (2014) suggest that the impact of CEO power on leverage is nonlinear.

Table 2
Correlation matrix.

	BLVE	MLVE	SIZE	TAX	TANG	PROF	RISK	GROWTH	BCOPN	BSIZE	FNDR	TITLE	CEOWNP	CPS
BLVE	1.000													
MLVE	0.845***	1.000												
SIZE	0.501***	0.590***	1.000											
TAX	0.202***	0.220***	0.238***	1.000										
TANG	0.122***	0.143***	−0.009	0.064**	1.000									
PROF	−0.421***	−0.484***	0.018	−0.004	−0.200***	1.000								
RISK	−0.677***	−0.671***	−0.157***	−0.145***	−0.274***	0.890***	1.000							
GROWTH	−0.362***	−0.554***	−0.349***	−0.186***	−0.089***	0.438***	0.510***	1.000						
BCOPN	−0.029	−0.040	0.043*	0.031	−0.088***	−0.010	0.023	0.027	1.000					
BSIZE	0.173***	0.183***	0.209***	0.032	0.135***	0.012	−0.072***	−0.097***	−0.450***	1.000				
FNDR	−0.091***	−0.108***	−0.136***	−0.025	−0.142***	0.026	0.087***	0.051**	0.151***	−0.139***	1.000			
TITLE	−0.098***	−0.122***	−0.051**	−0.053**	−0.135***	0.052**	0.107***	0.092***	0.226***	−0.211***	0.521***	1.000		
CEOWNP	−0.106***	−0.125***	−0.067**	−0.038	−0.163***	0.059**	0.113***	0.049*	0.198***	−0.188***	0.603***	0.552***	1.000	
CPS	−0.027	−0.028	0.009	0.038	0.040	−0.006	−0.013	0.001	−0.019	0.047*	0.009	0.063**	0.029	1.000

This table reports the correlations matrix of the variables used in our econometric analyses. The definitions of all variables are provided in Appendix A.

[*] Denote significance at the 10% level.

[**] Denote significance at the 5% level.

[***] Denote significance at the 1% level.

Table 3
Principle component analysis.

Panel A: Principle component weight								
Principal component			Eigenvalues		% of variance		Cumulative %	
1			2.568		0.642		0.642	
2			1.000		0.250		0.892	
3			0.256		0.064		0.956	
4			0.175		0.044		1.000	
Variable			Factor loading					
FNDR			0.515					
TITLE			0.626					
CEOWNP			0.597					
CPS			0.046					
Panel B: Principal component descriptive statistics								
	Mean	SD	Min	Median	Q3	Max	Skewness	Kurtosis
PINDX	0.000	1.138	−1.112	−0.153	0.873	1.797	0.486	1.620

This table reports the discrete principle component analysis results. Panel A gives the index weights of CEO power. Panel B reports the principle component descriptive statistics. PINDX is for the principle component 1. The definitions of other variables are provided in Appendix A.

We now turn to investigate whether the non-monotonic relationship between CEO power and firm leverage exist among Chinese SMEs. The right panel of Table 4 reports the nonlinear regression results, with the models being based on Eq. (1) which includes the squared term of PINDX. The control variables remain as they are in the above linear regressions. As can be seen from the right panel of Table 4, the coefficients of the CEO power variable are positive and statistically significant, whereas the coefficients of CEO power squared are negative and significant in all four regression specifications. These results reveal that the association between corporate leverage and CEO power is in fact non-monotonic in Chinese SMEs. CEO power is positively associated with leverage level at lower levels of CEO power and negatively associated with leverage levels at higher levels of power. Specifically, firms with less powerful CEOs tend to be in favor of higher debt ratios. The possible explanation for this is that CEOs with lower degrees of decision-making power have less ability to manipulate the debt ratio. Under this scenario, firms tend to use more debt to align the interests of owners and CEOs. However, when power goes beyond a certain threshold, the entrenched CEOs are more likely to pursue their own self-interests, resulting in a reduced debt ratio. This is because high leverage increases the possibility of bankruptcy and restricts the availability of free cash flow.

The findings supplement the evidence from Chintrakarn et al. (2014), in which a nonlinear inverted U-shaped relationship exists between the level of CEO power and leverage in US firms. Therefore, the results confirm that the effect of CEO power on debt financing is more complex than the simple monotonic relation documented in prior literature (Chintrakarn et al., 2014).

The coefficients on firm characteristics variables also offer some important insights. As Table 4 shows, large-size firms are more likely to raise debt in their capital structure, consistent with the findings of Chen (2004), Huang and Song (2006) and Chang et al. (2014). The positive sign of the TANG coefficient demonstrates that firms with more tangible assets are more likely to use debt, which is in line with previous empirical studies of Chinese firms (see above). In accord with the static trade-off theory, we find that profitability positively affects firm debt levels. However, the result is inconsistent with certain prior empirical studies in China (Chang et al., 2014; Guney et al., 2011; Huang & Song, 2006). Risk is measured as an Altman's Z-score, the higher the score the lower the risk. All of the models show that the coefficients of the Z-score are negative and significant at a 1% level, suggesting that Chinese SMEs rely heavily on debt financing.

As a common proxy of firm growth opportunities, Tobin's Q is positively and significantly related to book value-based leverage, while the sign of coefficient become inverse when using market value-based leverage to measure the levels of debt ratio. The findings are consistent with those reported in the study by Chang et al. (2014). They argue that high growth Chinese firms might not be able to obtain funds through equity markets due to its strict constraints on equity issues. Consequently, firms with high growth opportunities have to fund their growth through borrowing. Such negative coefficients of the Tobin's Q in the regressions of market value-based leverage might be caused by the mechanically negative relationship between them (Chang et al., 2014). Finally, consistent with the findings of Chen and Al-Najjar (2012), we observe no significant association between corporate governance variables and firm leverage in the listed Chinese SMEs.

5.4. Relation between CEO power and capital structure in different industry groups

As the above result shows, the manufacturing industry represents around 78.11% of our sample. To eliminate the concern that the documented main findings are driven by the manufacturing sector alone, we reran the regressions based on industry classification.[6] Table 5 reports the regression results with respect to eight industry classifications using the OLS method. The

[6] We wish to thank one of the anonymous referee for suggesting this analysis.

Table 4
Regression of CEO power effect on capital structure.

	Linear				Non-Linear			
	OLS-pooled BLVE (1)	MLVE (2)	Fixed effects BLVE (3)	MLVE (4)	OLS BLVE (5)	MLVE (6)	Fixed Effects BLVE (7)	MLVE (8)
PINDX	0.0049 (0.0039)	0.0025 (0.0029)	0.0115** (0.0047)	0.0060* (0.0034)	0.0110** (0.0050)	0.0072* (0.0038)	0.0165*** (0.0048)	0.0102** (0.0042)
$PINDX^2$					−0.0111** (0.0052)	−0.0087** (0.0043)	−0.0101** (0.0050)	−0.0086* (0.0045)
SIZE	0.0729*** (0.0079)	0.0700*** (0.0060)	0.0787*** (0.0130)	0.0586*** (0.0134)	0.0730*** (0.0078)	0.0700*** (0.0060)	0.0788*** (0.0130)	0.0586*** (0.0133)
TAX	−0.2573** (0.1287)	−0.1095 (0.1032)	0.1680* (0.0964)	0.0940 (0.0935)	−0.2473* (0.1283)	−0.1018 (0.1035)	0.1755* (0.0960)	0.1004 (0.0935)
TANG	−0.0632* (0.0378)	0.0318 (0.0274)	0.2184*** (0.0385)	0.0891** (0.0370)	−0.0614 (0.0382)	0.0331 (0.0279)	0.2172*** (0.0386)	0.0881** (0.0373)
PROF	2.1701*** (0.3058)	0.7739*** (0.1643)	1.2802*** (0.2181)	0.3491** (0.1382)	2.1920*** (0.3018)	0.7910*** (0.1619)	1.2977*** (0.2190)	0.3640** (0.1381)
RISK	−0.3895*** (0.0290)	−0.1996*** (0.0158)	−0.2091*** (0.0253)	−0.1080*** (0.0159)	−0.3892*** (0.0288)	−0.1993*** (0.0157)	−0.2096*** (0.0254)	−0.1084*** (0.0159)
GROWTH	0.0223*** (0.0046)	−0.0147*** (0.0034)	0.0148 (0.0035)	−0.0172*** (0.0034)	0.0217*** (0.0046)	−0.0152*** (0.0034)	0.0144*** (0.0035)	−0.0176*** (0.0033)
BCOPN	0.0001 (0.0773)	−0.0777 (0.0599)	−0.0180 (0.0576)	−0.0209 (0.0566)	0.0077 (0.0765)	−0.0718 (0.0598)	−0.0082 (0.0574)	−0.0126 (0.0567)
BSIZE	0.0038 (0.0030)	0.0031 (0.0025)	−0.0044 (0.0030)	−0.0014 (0.0026)	0.0034 (0.0030)	0.0027 (0.0025)	−0.0041 (0.0030)	−0.0012 (0.0025)
Constant	−0.9071*** (0.1854)	−1.1529*** (0.1338)	−1.1845*** (0.2829)	−0.9661*** (0.2826)	−0.8980*** (0.1826)	−1.1458*** (0.1336)	−1.1788*** (0.2821)	−0.9611*** (0.2827)
Industry dummies	Yes	Yes	No	No	Yes	Yes	No	No
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	1,485	1,485	1,485	1,485	1,485	1,485	1,485	1,485
Adjusted R^2	0.7225	0.7460	0.4041	0.5824	0.7245	0.7478	0.4069	0.5840
Hausman test (*p*-value)			138.64 (0.0000)	72.02 (0.0000)			108.94 (0.0000)	57.01 (0.0000)

This table reports the panel regression results of firm leverage using OLS and FE methods. Robust standard errors are clustered at the firm level and reported in parentheses. Time and industry dummies are used for the models based on the estimation method. The definitions of all variables are provided in Appendix A.

* Denote significance at the 10% level.
** Denote significance at the 5% level.
*** Denote significance at the 1% level.

dependent variable for each of the regressions is book value-based leverage (BLVE).

The findings reveal that the nature of the relationship between CEO power and firm leverage varies across industries. Regarding the industry groups of construction; IT and information; and others, CEO power exhibits a linear relationship with firm leverage. More specifically, we find that CEO power has a negative effect on debt ratio among construction and IT and information firms. For the others sector, which represents the combined industry groups of mining, utilities, transportation, hoteling and other services, CEO power exhibits a positive influence on leverage. Among the other explanatory variables, while the influence of firm size, profitability, risk and growth opportunity on capital structure is uniform across industries, the other factors affect firm leverage differently.

The above results obtained from the industry regressions only show a linear relationship between CEO power and leverage however. In the present study, we are more interested in the nonlinear relationship between CEO power and corporate capital structure. In particular, we are anxious about the non-monotonic association between PINDX and firm leverage obtained from the baseline regressions (see the right panel of Table 4) that is driven by the manufacturing industry alone. As shown in Table 5, the relationship between PINDX and leverage turns out to be in an inverted-U shape form for the agriculture, manufacturing and retailing industries. Suffice it to say that CEO power and firm leverage are positively associated at low degrees of CEO power and are negatively related at high levels of CEO power. Hence, we can conclude that the hump-shaped relation between CEO power and capital structure is not solely attributed to the manufacturing industry.

5.5. Ownership structure and relation between CEO power and capital structure

In this section, we analyze whether the influence of CEO power on firm leverage differs across the ownership structure. To this end, the overall sample is divided into SOEs and POEs. A firm is identified as an SOE if it is ultimately controlled by the government and other governmental institutions. A firm is considered to be a POE when its ultimate controlling shareholder is an individual or a legal person. We firstly conduct univariate analysis to test whether there are significant differences between the main variables of POEs and SOEs. The results have been summarized in Panel A of Table 6.

With respect to capital structure variables, POEs exhibit lower BLVE and MLVE, thus low levels of debt ratio, relative to those of SOEs. Their CEO power index on average is higher than those in the SOEs, consistent with Firth et al. (2006) and Ruan et al. (2011). They also have lower operational risk, higher proportions of independent directors, and smaller BOD sizes. In contrast, state-owned SMEs have larger sizes and higher tangibility, consistent with previous findings in Chinese capital structure literature (Chang et al., 2014). Finally, these results suggest that it is essential to control for firm characteristics in analyzing capital structure.

We next perform a multivariate regression to examine the effect of CEO power on firm capital structure. Panel B of Table 6 presents the OLS and FE estimated results using samples of the POEs. Consistent with our expectation that CEO power and capital structure are non-monotonously integrated, we observe that the coefficient of PINDX and $PINDX^2$ are significantly positive and negative respectively. Hence, the results suggest that leverage is significantly related to CEO power in a hump-shaped fashion in private Chinese SMEs. The estimation results of our OLS and FE (or RE) regressions for SOEs are reported in Panel C of Table 6. The findings reveal that the hump-shaped relationship also holds for state-owned firms, but the statistical significance (in terms of PINDX) is somewhat weaker than those for POEs.

With regard to the control variables, the results in Table 6 are mostly consistent with the findings reported in Table 4. Nevertheless, we notice that the proportion of independent directors (BCOPN) is negatively related to the market value-based leverage of POEs, suggesting that Chinese private SMEs with more independent boards tend to use less debt. This finding reflects that more independent boards, which can provide increased monitoring capability, reduce the firm bankruptcy risk and the likelihood of fraud cases that arise from high levels of debt ratio. However, the same relationship turns out to be positive and statistically significant for SOEs, in line with the prior findings (Chen & Al-Najjar, 2012). The result suggests that SOEs with more debt might need strong internal control mechanisms to monitor the managers.

Furthermore, we examine the question of whether the hump-shaped association between CEO power and firm leverage is weaker in SOEs. For this purpose, we re-estimate Eq. (1) by adding three more variables to it—STATE, STATE × PINDX, and $STATE \times PINDX^2$. STATE is a dummy variable equal to one if the firm is an SOE. STATE × PINDX, and $STATE \times PINDX^2$ are two different interaction terms. If the coefficient on STATE × PINDX is negative and statistically significant, it indicates that the aligned effect of CEO power on firm leverage is less pronounced in SOEs. If the coefficient on $STATE \times PINDX^2$ is positive and statistically significant, it suggests that the entrenchment effect of CEO power on firm leverage becomes weaker in SOEs. As shown in Panel D of Table 6, the sign of coefficients on the interaction term $STATE \times PINDX^2$ is negative for market value-based leverage. This results suggests that the entrenchment impact of CEO power on firm leverage becomes more prominent in SOEs.

5.6. Robustness tests

5.6.1. Piecewise linear specifications

In this section, we estimate the piecewise linear regression as inspired by Morck, Shleifer, & Vishny (1988) to confirm whether the nonlinearity relation between CEO power and firm leverage is robust under different model specifications. Unlike the quadratic specification, this approach requires a split of the CEO power (PINDX) into the three following components: PINDX_(median) =PINDX when PINDX≤Median, and the median value otherwise. PINDX_(median-Q3)=0 if PINDX≤Median; and when Median < PINDX < Q3 (75^{th} percentile value), PINDX_(median-Q3)=PINDX − Median; otherwise, PINDX_(median-Q3)=Q3. PINDX_(Q3) =0 if PINDX < Q3; and when PINDX ≥ Q3, PINDX_(Q3)=PINDX − Q3. These piece-linear terms allow the slope coefficient to

Table 5
CEO power and capital structure in Chinese SMEs: OLS regressions based on industry groups.

Industry	Agriculture	Manufacturing	Construction	Retailing	IT	Real estate	Social service	Others
PINDX	0.0423* (0.0173)	0.0136** (0.0056)	−0.0403** (0.0138)	−0.0447 (0.0273)	−0.0324* (0.0155)	−0.0191 (0.0207)	−0.0301 (0.0304)	0.0853** (0.0317)
$(PINDX)^2$	−0.0920* (0.0418)	−0.0134** (0.0060)	−0.0171 (0.0116)	−0.0259* (0.0115)	0.0046 (0.0152)	0.0143 (0.0266)	−0.0036 (0.0345)	−0.0335 (0.0313)
SIZE	0.0206 (0.1330)	0.0696*** (0.0090)	0.0474** (0.0184)	0.0989* (0.0398)	0.0789** (0.0309)	0.0522* (0.0252)	0.0743 (0.0431)	0.1131*** (0.0308)
TAX	0.3656** (0.1217)	−0.2058 (0.1580)	−0.0928 (0.3076)	−0.0748 (0.3658)	0.5883 (0.3809)	−0.1472 (0.3741)	−1.1636*** (0.3188)	0.3039 (0.6631)
TANG	0.5100* (0.2204)	−0.0569 (0.0423)	−0.5240*** (0.1296)	0.3490 (0.2280)	0.1039 (0.1181)	−0.9730** (0.2675)	−0.3964** (0.1259)	0.7325** (0.2422)
PROF	0.5589 (1.6153)	2.1986*** (0.3467)	4.1984*** (0.5098)	−0.3834 (1.4807)	1.5381*** (0.6665)	0.1468 (0.9333)	3.7180** (1.1789)	0.1410 (1.1934)
RISK	−0.2351** (0.0999)	−0.3897*** (0.0329)	−0.5004*** (0.0361)	−0.1372 (0.1365)	−0.2566*** (0.0796)	−0.3061** (0.1073)	−0.5338*** (0.1064)	−0.1888 (0.1141)
GROWTH	0.0323 (0.0229)	0.0198*** (0.0055)	−0.0101 (0.0149)	0.0433 (0.0242)	0.0210** (0.0090)	0.0385* (0.0192)	0.0112 (0.0516)	0.0269* (0.0135)
BCOPN	0.6589* (0.3209)	0.0315 (0.0944)	−0.0177 (0.0919)	1.4388 (0.9765)	−0.1892 (0.1934)	0.1609 (0.2386)	−0.3306 (0.3166)	0.1270 (0.4373)
BSIZE	0.0343** (0.0098)	0.0044 (0.0036)	0.0200** (0.0078)	−0.0094 (0.0121)	−0.0001 (0.0095)	0.0164 (0.0128)	−0.0088 (0.0124)	−0.0170 (0.0155)
Constant	−0.5777 (2.6495)	−0.7899*** (0.2026)	−0.2950 (0.3672)	−2.0322 (1.3474)	−1.1676 (0.6797)	−0.4825 (0.6223)	−0.4040 (1.0260)	−2.0116** (0.6896)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25	1,160	55	30	90	35	40	50
Adjusted R^2	0.9068	0.6626	0.8796	0.8797	0.7005	0.9305	0.7886	0.8165

This table reports the OLS regression results of firm leverage with respect to different industry classifications. Robust standard errors are clustered at the firm level and reported in parentheses. Time dummies are used for the models based on the estimation method. The industry classification is based on that of the Shenzhen Stock Exchange SME Board website. The industry groups of mining, utilities, transportation, hoteling and other services are combined as others due to small sample size. The definitions of all variables are provided in Appendix A.

* Denote significance at the 10% level.
** Denote significance at the 5% level.
*** Denote significance at the 1% level.

Table 6
Mean comparison of variables and Regression of CEO power on capital structure between POEs and SOEs.

Panel A: means test

	POE			SOE			Means test	
	N	Mean	SD	N.	Mean	SD	Diff.	T-value
BLVE	1,155	0.3681	0.1836	330	0.4390	0.1960	−0.0709***	−6.0945
MLVE	1,155	0.1791	0.1456	330	0.2403	0.1862	−0.0612***	−6.3093
PINDX	1,155	0.2024	1.1674	330	−0.7122	0.6366	0.9147***	13.6628
SIZE	1,155	21.2764	0.7983	330	21.5461	0.8463	−0.2697***	−5.3394
TAX	1,155	0.1643	0.0429	330	0.0027	0.0489	−0.0044	−1.5905
TANG	1,155	0.2248	0.1314	330	0.2933	0.1460	−0.0686***	−8.1505
PROF	1,155	0.0612	0.0534	330	0.0542	0.0523	0.0070**	2.1143
RISK	1,155	1.2326	0.5955	330	1.0650	0.6212	0.1676***	4.4643
GROWTH	1,155	2.1229	1.0452	330	2.1147	1.1234	0.0083	0.1244
BCOPN	1,155	0.3720	0.0574	330	0.3573	0.0445	0.0147***	4.2966
BSIZE	1,155	8.5455	1.5460	330	9.5879	1.5357	−1.0424***	−10.8180

	Panel B: POE				*Panel C: SOE*				*Panel D*	
	Pooled OLS		FE		Pooled OLS		FE	RE	OLS	OLS
	BLVE (1)	MLVE (2)	BLVE (3)	MLVE (4)	BLVE (5)	MLVE (6)	BLVE (7)	MLVE (8)	BLVE (9)	MLVE (10)
PINDX	0.0108* (0.0057)	0.0077* (0.0041)	0.0174*** (0.0055)	0.0128*** (0.0043)	0.0065 (0.0113)	−0.0084 (0.0124)	−0.0047 (0.0094)	−0.0055 (0.0088)	0.0114** (0.0057)	0.0087** (0.0040)
(PINDX)^2	−0.0087 (0.0060)	−0.0073 (0.0045)	−0.0105* (0.0060)	−0.0118*** (0.0044)	−0.0299** (0.0114)	−0.0379*** (0.0135)	−0.0239** (0.0094)	−0.0173 (0.0109)	−0.0097 (0.0060)	−0.0078* (0.0045)
SOE									0.0231 (0.0168)	0.0249 (0.0207)
SOE*PINDX									−0.0089 (0.0109)	−0.0186** (0.0095)
SOE*(PINDX)^2									−0.0210* (0.0119)	−0.0265* (0.0154)
SIZE	0.0699*** (0.0085)	0.0669*** (0.0065)	0.0728*** (0.0169)	0.0448*** (0.0162)	0.0781*** (0.0177)	0.0780*** (0.0139)	0.0847*** (0.0173)	0.0802*** (0.0142)	0.0722*** (0.0077)	0.0693*** (0.0059)
TAX	−0.3216** (0.1423)	−0.0771 (0.1090)	0.1963 (0.1320)	0.2075* (0.1158)	0.0841 (0.2514)	0.0838 (0.2256)	0.1204 (0.1154)	−0.0854 (0.1525)	−0.2421* (0.1290)	−0.0963 (0.1048)
TANG	−0.0486 (0.0426)	0.0403 (0.0278)	0.2184*** (0.0472)	0.1175*** (0.0431)	−0.0878 (0.1072)	0.0053 (0.0754)	0.2042*** (0.0607)	0.0414 (0.0608)	−0.0661* (0.0392)	0.0258 (0.0282)
PROF	2.2630*** (0.3372)	0.7499*** (0.1762)	1.3214*** (0.3039)	0.3137* (0.1626)	2.3320*** (0.6856)	1.0631*** (0.3630)	1.3348*** (0.1719)	0.7724*** (0.1992)	2.2005*** (0.3004)	0.7976*** (0.1613)
RISK	−0.4026*** (0.0327)	−0.1903*** (0.0171)	−0.2185*** (0.0345)	−0.1035*** (0.0192)	−0.3686*** (0.0622)	−0.2368*** (0.0346)	−0.1910*** (0.0255)	−0.1765*** (0.0179)	−0.3900*** (0.0287)	−0.2004*** (0.0155)
GROWTH	0.0251*** (0.0056)	−0.0110*** (0.0038)	0.0137*** (0.0041)	−0.0200*** (0.0038)	0.0116 (0.0074)	−0.0223*** (0.0076)	0.0179*** (0.0060)	−0.0104** (0.0044)	0.0217*** (0.0047)	−0.0148*** (0.0035)
BCOPN	−0.0028 (0.0887)	−0.1291** (0.0597)	−0.0522 (0.0603)	−0.0830 (0.0531)	0.0026 (0.1789)	0.2101 (0.1462)	0.1155 (0.1214)	0.2114* (0.1179)	0.0035 (0.0762)	−0.0794 (0.0591)
BSIZE	0.0032 (0.0034)	0.0019 (0.0028)	−0.0058 (0.0035)	−0.0039 (0.0030)	0.0007 (0.0075)	0.0032 (0.0057)	0.0008 (0.0052)	0.0054 (0.0042)	0.0029 (0.0030)	0.0020 (0.0025)
Constant	−0.8360*** (0.1994)	−1.0867*** (0.1461)	−1.0198*** (0.3711)	−0.6438*	−0.9530** (0.3806)	−1.3303*** (0.2881)	−1.4024*** (0.3600)	−1.4379***	−0.8771***	−1.1192***

(continued on next page)

Table 6 *(continued)*

Panel A: means test		POE			SOE			Means test		
		N	Mean	SD	N.	Mean	SD	Diff.	T-value	
				(0.3389)				(0.2919)	(0.1781)	(0.1323)
Industry dummies	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	No	No	Yes	Yes	No	No	Yes	No	No	No
Adjusted R^2	0.7138	0.7396	0.4002	0.5679	0.7468	0.7889	0.4412	0.7844	0.7249	0.7499
N	1,155	1,155	1,155	1,155	330	330	330	330	1,485	1,485
Hausman test (*p*-value)			107.44 (0.0000)	57.39 (0.0000)			29.50 (0.0426)	8.25 (0.9746)		

Panel A presents the mean values for the variables across the two subsamples POE and SOE based on ownership type and the T-value for the difference test. Panel B and C report the OLS, FE or RE regression results for POE and SOE respectively. Robust standard errors are clustered at the firm level and reported in parentheses. Time and industry dummies are used for the models based on estimation method. The definitions of all variables are provided in Appendix A.

* Denote significance at the 10% level.

** Denote significance at the 5% level.

*** Denote significance at the 1% level.

change at Median and Q3. Table 7 presents the results of the piecewise regressions.

Consistent with our earlier findings, we observe a positive and significant relationship between leverage and CEO power index when PINDX is less than the median value; meanwhile, the relevant coefficients of the regression model are negative and significant when PINDX is more than the median value. These results are suggestive of a hump-shaped relation for observations under full sample and POEs. However, the same relation becomes tenuous for SOEs given the weak statistical significance for the relevant estimated coefficients. The possible reason is due to the fact that unlike the quadratic model, this specification forces the relation to be linear between cutoff points (Kim & Lu, 2012). In addition, we find that PINDX is negatively associated with market value-based leverage when PINDX is greater than the 75th percentile in SOEs. The coefficient of −0.1382 is significant at the 1% level and suggests that CEOs with higher degrees of decision-making power are more likely to adopt lower leverage. This result confirms our earlier finding that the entrenchment effect of CEO power on leverage becomes more severe in SOEs. Overall, the piecewise regressions suggest that the relation between CEO power and leverage is nonlinear.

5.6.2. *Endogeneity and capital structure dynamics*

In the previous sections, we employ cross-sectional, FE, and RE techniques to the analysis of our panel dataset. Although the estimation such as FE can help to control time-invariant heterogeneity, this method may still suffer from endogeneity, which is a crucial issue in investigating the effects of CEO power on firm leverage. Two types of endogeneity could possibly confound the previous results (Chintrakarn et al., 2014). First, there may be a reverse causation relationship between leverage and CEO power, specifically leverage choices might lead to strong or weak CEO power. Second, there could be an endogeneity bias that arises due to unobservable firm characteristics which are highly related to regressors. Moreover, the previous sections assume that the leverage choice of Chinese SMEs is static. Recent literature argues that corporate capital structure decisions may be dynamic in nature and managers tend to adjust their financing strategies when firms encounter external shocks and internal changes (e.g., Guney et al., 2011; Florackis & Ozkan, 2009).

To control for such considerations, we modify Eq. (1) and get the following dynamic model:

$$\text{LEVERAGE}_{it} = \alpha_0 + \alpha_1 LEVERAGE_{it-1} + \sum_{k=1} \beta_k X_{k,it} + \mu_i + \gamma_t + \varepsilon_{it} \tag{2}$$

where subscripts i and t denote firm ($i = 1,2, \ldots, 297$) and time ($t = 2009,2010, \ldots, 2013$), respectively; α_0 is the intercept term; α_1 andβ_k are parameters to be estimated; X_k is a vector of the explanatory variables. μ_i and γ_t represent an individual firm specific effect and a common time effect respectively, while ε_{it} is the classical error term.

To estimate the Eq. (2), we employ the system generalized method of moments as proposed by Arellano and Bover (1995) and Blundell and Bond (1998). Both the one and two-step estimators are implemented in the regressions. For the two-step SYS-GMM,

Table 7
Leverage and CEO power: pooled OLS piecewise regressions.

	BLVE			MLVE		
	Full sample (1)	POE (2)	SOE (3)	Full sample (4)	POE (5)	SOE (6)
PINDX_(median)	0.0704*** (0.0234)	0.0686** (0.0279)	0.0894** (0.0379)	0.0590*** (0.0213)	0.0568** (0.0224)	0.0672 (0.0488)
PINDX_(median-Q3)	−0.0290* (0.0157)	−0.0282 (0.0177)	−0.0387 (0.0261)	−0.0264** (0.0131)	−0.0242* (0.0136)	−0.0285 (0.0317)
PINDX_(Q3)	0.0036 (0.0165)	0.0083 (0.0174)	−0.0352 (0.0289)	0.0020 (0.0121)	0.0042 (0.0122)	−0.1382*** (0.0290)
SIZE	0.0727*** (0.0077)	0.0699*** (0.0084)	0.0779*** (0.0175)	0.0698*** (0.0059)	0.0669*** (0.0065)	0.0783*** (0.0139)
TAX	−0.2417* (0.1280)	−0.3237** (0.1417)	0.0833 (0.2502)	−0.0961 (0.1027)	−0.0785 (0.1079)	0.0782 (0.2252)
TANG	−0.0555 (0.0379)	−0.0407 (0.0418)	−0.0896 (0.1074)	0.0381 (0.0278)	0.0466* (0.0270)	0.0065 (0.0756)
PROF	2.1825*** (0.2975)	2.2500*** (0.3332)	2.3285*** (0.6782)	0.7833*** (0.1593)	0.7392*** (0.1741)	1.0659*** (0.3637)
RISK	−0.3879*** (0.0285)	−0.4011*** (0.0324)	−0.3686*** (0.0617)	−0.1982*** (0.0154)	−0.1890*** (0.0168)	−0.2370*** (0.0346)
GROWTH	0.0221*** (0.0045)	0.0252*** (0.0056)	0.0132* (0.0077)	−0.0149*** (0.0034)	−0.0110*** (0.0037)	−0.0225*** (0.0073)
BCOPN	0.0027 (0.0759)	−0.0013 (0.0879)	−0.0123 (0.1821)	−0.0751 (0.0598)	−0.1277** (0.0593)	0.2153 (0.1470)
BSIZE	0.0034 (0.0030)	0.0033 (0.0033)	0.0011 (0.0076)	0.0028 (0.0025)	0.0019 (0.0027)	0.0029 (0.0057)
Constant	−0.8713*** (0.1792)	−0.8201*** (0.1975)	−0.9124** (0.3761)	−1.1226*** (0.1322)	−1.0735*** (0.1462)	−1.3268*** (0.2924)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	No	No	No	No	No	No
Observations	1,485	1,155	330	1,485	1,155	330
Adjusted R^2	0.7262	0.7157	0.7471	0.7497	0.7417	0.7891

This table reports the piecewise linear regressions results of firm leverage using ordinary lease squares methods. Robust standard errors are clustered at the firm level and reported in parentheses. Time and industry dummies are used for the models. PINDX_(median) is equal to PINDX when PINDX is lower than the median value and it is equal to median value otherwise; PINDX_(median-3Q) is equal to zero if PINDX is lower than the median value and when PINDX is in the range of the median value to third quartile value, PINDX_(median-3Q) is equal to PINDX minus median value; otherwise, PINDX_(median-3Q) is equal to the third quartile value; and PINDX_(3Q) is equal to zero if PINDX is lower than the third quartile value; when PINDX is over the third quartile value, PINDX_(3Q) is equal to PINDX minus the third quartile value. The definitions of other variables are provided in Appendix A.

* Denote significance at the 10% level.
** Denote significance at the 5% level.
*** Denote significance at the 1% level.

we use the finite-sample correction suggested by Windmeijer (2005) to take into account the issue that the asymptotic standard errors can be downward biased[7] in small samples.

Table 8 presents the results for the one and two-step SYS-GMM estimators. The hump-shaped relation between CEO power and leverage continues to hold, but the statistical significance of the coefficient on PINDX is considerably weaker for Chinese state-owned SMEs. As for the other explanatory variables, leverage is positively associated with firm size, tangibility, profitability and growth opportunity, which is consistent with our earlier findings. The tax rate is positively related to leverage, supporting the trade-off theory which suggests that firms with high tax rates should use more debt to increase the value of tax shields. This finding is also in line with the result obtained from FE models (see Table 4). However, the significant and positive relation between the proportion of independent directors (BCOPN) and leverage is inconsistent with what Chen and Al-Najjar (2012) reported, this includes our earlier finding.

In addition, the diagnostics tests indicate that our models are well-fitted. The AR (1) and AR (2) statistics show the absence of first and second-order serial correlations in the residuals. The Sargan and Hansen over-identification tests confirm that the instruments used in the SYS-GMM model are valid.

5.6.3. Alternative measures of control variables and CEO power

In order to further check the robustness of the estimators reported in the above sections, we employ several alternative measures for the control variables, including firm size, profitability, growth opportunity and CEO power. We first explore whether our results are sensitive to the alternative control variables by repeating our analysis in Model (2) of Table 8. $SIZE_{-SALE}$, calculated as the natural logarithm of sales, is the alternative measure of firm size. The alternative proxy of profitability is the ratio of operating profit over total sales ($PROF_{-SALE}$). We also use sale (asset) growth rate ($GROWTH_{-SALE/ASSET}$) as an alternative proxy for growth opportunity, measured as the difference in the total sales (assets) between the current year and the previous year divided by the total sales (assets) in the previous year.

The regression results are derived by using these alternative measures of control variables and are reported in the columns (1)–(7) of Table 9.[8] They indicate that the association between CEO power and leverage remains as an inverted U-shaped, supporting our earlier findings. As for the control variables, the results are consistent with the findings in Table 8, whatever alternative measurements are used. The only exception is $GROWTH_{-ASSET}$ which is positively related to leverage but statistically insignificant.

In addition, we also implement an alternative measurement for CEO power index to test the robustness of our findings. Following the extant literature (e.g., Luo, 2015; Ting, 2013), we construct the new CEO power index using an average of the four aforementioned measures. Since FNDR, TITLE, and CEOWNP are dummy variables, we set an additional dummy variable for the CPS. The dummy variable is equal to one if the value of the CPS is equal to or higher than its median value. Hence, the construction of the new index is based on the strong assumption that all the decision-making power attributes contribute equally to the CEO power index. The results for the alternative CEO power are reported in columns (8) and (9) of Table 9. We find that the coefficients on the CEO power index (POWER) remain positive and statistically significant, whereas the coefficients of the CEO power index squared ($POWER^2$) are negative and significant. These results again confirm a hump-shaped relation between CEO power index and firm leverage.

6. Conclusion

In this paper, we investigate the effect of CEO power on firm leverage using a sample involving 297 of China's listed SMEs during the period of 2009–2013. Particularly, this study examines the relationship between CEO power and leverage based on agency theory. To this end, we firstly use discrete PCA to construct a CEO power measure that represents an index based on the attributes of four related power variables. We then employ pooled OLS, FE, and RE methods to estimate the regressions.

Consistent with Chintrakarn et al. (2014), our empirical results show a nonlinear relation between CEO power and firm leverage, even after controlling firm characteristics. More specifically, the debt ratio increases alongside increasing levels of CEO power until the turning point (threshold); thereafter, debt ratio declines with the increase in levels of CEO power. The positive relationship provides evidence for interest alignment and monitoring hypotheses (Jensen & Meckling, 1976). This is because debt plays an important role in aligning the interests of managers and owners. In addition, high leverage can alleviate free cash flow problems, thus reducing agency costs. As a consequence, firms with lower CEO power are likely to use more debt. However, when CEOs are afforded more decision power, they tend to manipulate the level of debt ratio to pursue their private interests. Low leverage can reduce the risk of bankruptcy associated with debt and increase the availability of free cash flow. Therefore, the relationship becomes negative.

We perform further regressions according to different classifications, such as industry classifications and ownership structure classifications. Based on the regressions, this study reports significant differences across various industry groups regarding the association of CEO power with firm leverage. In addition, we find that the hump-shaped relation is existent for both of SOEs and POEs, but statistical significance is weak for SOEs. However, the entrenchment impact of CEO power on leverage becomes more severe in SOEs when we use the market-value based leverage as the dependent variable. Finally, this study employs two alternative

[7] Also due to this issue, many previous researchers draw inference based on one-step GMM estimators, although it is less efficient than the two-step estimators.
[8] Only the two-step SYS-GMM results are reported and discussed because the two-step SYS-GMM regression controls for endogeneity and is more efficient than one-step SYS-GMM.

Table 8
Dynamic panel data results (SYS-GMM estimates).

	Full sample		POE		SOE	
	(1) One-step	(2) Two-step	(3) One-step	(4) Two-step	(5) One-step	(6) Two-step
$BLVE_{t-1}$	0.6306*** (0.0867)	0.6045*** (0.0633)	0.6783*** (0.0968)	0.6586*** (0.0785)	0.4588*** (0.1479)	0.4294** (0.1861)
PINDX	0.0271** (0.0129)	0.0348*** (0.0103)	0.0270** (0.0135)	0.0268** (0.0105)	−0.0138 (0.0286)	0.0113 (0.0421)
$(PINDX)^2$	−0.0341** (0.0161)	−0.0330** (0.0133)	−0.0370** (0.0172)	−0.0293* (0.0156)	−0.0414* (0.0235)	−0.0411 (0.0307)
SIZE	0.0590*** (0.0179)	0.0546*** (0.0142)	0.0394 (0.0247)	0.0413* (0.0221)	0.0810*** (0.0248)	0.0963*** (0.0311)
TAX	0.2427** (0.1215)	0.2593** (0.1188)	0.2323 (0.1420)	0.1653 (0.1414)	0.1733 (0.2320)	0.2552 (0.3350)
TANG	0.1005* (0.0523)	0.1094** (0.0515)	0.1014* (0.0576)	0.1089* (0.0578)	0.0826 (0.0926)	0.1097 (0.1417)
PROF	0.7861*** (0.2259)	0.5616*** (0.2004)	0.7656** (0.3243)	0.4818 (0.3263)	1.1067*** (0.2092)	1.0863*** (0.2742)
RISK	−0.1449*** (0.0246)	−0.1273*** (0.0206)	−0.1497*** (0.0347)	−0.1341*** (0.0337)	−0.1667*** (0.0274)	−0.1566*** (0.0224)
GROWTH	0.0184*** (0.0055)	0.0164*** (0.0056)	0.0130** (0.0058)	0.0164*** (0.0061)	0.0324*** (0.0091)	0.0274*** (0.0085)
BCOPN	0.1558** (0.0647)	0.1275** (0.0607)	0.1953*** (0.0713)	0.1499** (0.0752)	−0.0199 (0.1217)	0.0151 (0.1689)
BSIZE	−0.0007 (0.0038)	−0.0013 (0.0034)	0.0005 (0.0042)	0.0016 (0.0038)	−0.0109 (0.0076)	−0.0034 (0.0070)
Constant	−1.0949*** (0.3742)	−0.9855*** (0.3057)	−0.6905 (0.5319)	−0.7305 (0.4884)	−1.3649*** (0.5173)	−1.7664*** (0.6275)
Industry dummies	No	No	No	No	No	No
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,188	1,188	924	924	264	264
Wald χ^2	393.79***	510.27***	282.24***	349.24***	289.94***	386.93***
AR(1)	−6.67***	−5.97***	−6.25***	−5.37***	−3.40***	−2.09**
AR(2)	−1.27	−1.22	−0.80	−0.84	−1.23	−0.92
Sargan test	16.42 (0.746)	16.42 (0.746)	19.38 (0.561)	19.38 (0.561)	28.92 (0.116)	28.92 (0.116)
Hansen test	13.53 (0.889)	13.53 (0.889)	20.34 (0.500)	20.34 (0.500)	24.01 (0.292)	24.01 (0.292)
Diff-in-Hansen tests p-value	0.465	0.465	0.114	0.114	0.895	0.895

This table reports the results from the system generalized method of moment estimators. $BLVE_{t-1}$ is book value-based leverage lagged by (t−1). For the difference equations, levels lagged at (t−2) to (t−4) are used as instruments. Robust standard errors are reported in parentheses. Whenever the two-step estimator is applied, the Windmeijer correction procedure is employed to calculate the standard errors. Time dummies are included in all the models. AR(1) and AR(2) are tests for first-order and second-order serial correlation in the first-differenced equations, under the null of no serial correlation. The Sargan/Hansen tests of over-identification is under the null hypothesis that all instruments are valid. The definitions of all variables are provided in Appendix A.

* Denote significance at the 10% level.
** Denote significance at the 5%level.
*** Denote significance at the1% level.

approaches, the piecewise linear regression and the SYS-GMM dynamic model which are also applied to account for the endogeneity problem, as well as alternative measurements to check robustness. The above-mentioned findings still hold to the different specifications.

To the best of our knowledge, ours is the first major study of this subject in China. The findings of this paper accordingly have important implications for shareholders and policy makers, as well as contributing valuable comparisons to the theoretical viewpoints and empirical findings to be found in the previous literature. For instance, this study demonstrates that CEOs in Chinese SMEs, particularly in SOEs, with higher degrees of decision-making power are more likely to manipulate capital structure to pursue their own interests. Such an action might harm shareholders' benefits. Thus, owners of Chinese SMEs should adopt more effective tools to discipline management, such as improving the quality of the BOD and SB. Previous studies have shown an ineffectiveness on the part of Chinese independent directors (Chen & Al-Najjar, 2012). For policy-makers and regulators, they might use these findings to inform policy development initiatives concerning the balance of managerial power that can moderate inferior actions of executives.

Despite the aforementioned implications and contributions, this study suffers from some limitations, many of which may indicate fruitful avenues for future research. The first one is generalizability of findings. While this study includes a sample of 297 firms from the Shenzhen Stock Exchanges SMEs Board, it does not necessarily represent all of China's SMEs, especially the 327 publicly traded firms listed on the board at the end of 2009, which make up only a small fraction of all the SMEs in China. Thus, gathering CEO power data from unlisted SMEs seems to be important. Second, although the concise PINDX (and POWER) is developed in accordance with supporting literature and reflects the major characteristics of decision-making power, other practices should be taken into account and represented as additional characteristics to composite PINDX when the data are publicly available in future studies. Finally, only CEO power and firm-level characteristics are considered to be associated with corporate capital structure in this study. However, other CEO characteristics such as age, gender and degree of confidence might also influence firm leverage. Future studies should consider incorporating these potential factors into the leverage equation used in this study.

Table 9
Robustness checks with alternative measures.

	SYS-GMM (twos-step)								
	BLVE (1)	BLVE (2)	BLVE (3)	BLVE (4)	BLVE (5)	BLVE (6)	BLVE (7)	BLVE (8)	MLVE (9)
$BLVE_{t-1}$ ($MLVE_{t-1}$)	0.6248*** (0.0537)	0.6067*** (0.0867)	0.6130*** (0.0621)	0.6236*** (0.0654)	0.6156*** (0.0546)	0.6558*** (0.0606)	0.6184*** (0.0577)	0.6834*** (0.0575)	0.6366*** (0.0704)
PINDX	0.0302*** (0.0087)	0.0378*** (0.0125)	0.0341*** (0.0094)	0.0332*** (0.0104)	0.0310*** (0.0089)	0.0326*** (0.0093)	0.0323*** (0.0093)		
$PINDX^2$	−0.0329*** (0.0120)	−0.0303** (0.0141)	−0.0340*** (0.0127)	−0.0345*** (0.0127)	−0.0329*** (0.0117)	−0.0355** (0.0139)	−0.0343*** (0.0118)		
POWER								0.2360*** (0.0803)	0.2424** (0.1013)
$POWER^2$								−0.2221** (0.0921)	−0.1900* (0.1015)
SIZE		0.0790** (0.0361)	0.0335** (0.0138)	0.0373** (0.0161)				0.0332*** (0.0102)	0.0571*** (0.0090)
SIZE(LNSALE)	0.0366*** (0.0108)				0.0452*** (0.0102)	0.0140 (0.0122)	0.0397*** (0.0106)		
TAX	0.2590** (0.1215)	0.2371* (0.1321)	0.2720** (0.1173)	0.2626** (0.1185)	0.2557** (0.1256)	0.2984** (0.1267)	0.2628** (0.1289)	0.1233 (0.1206)	0.2100** (0.1017)
TANG	0.0540 (0.0538)	0.1334** (0.0647)	0.1106** (0.0530)	0.1173** (0.0534)	0.0581 (0.0546)	0.0735 (0.0549)	0.0921* (0.0521)	0.0362 (0.0472)	−0.0050 (0.0278)
PROF	0.4019** (0.2050)		0.4721** (0.2020)	0.6199*** (0.1993)				0.5908** (0.2391)	−1.4761** (0.6179)
PROF (LNSALE)		0.0827** (0.0844)			0.1396* (0.0755)	0.1040 (0.0763)	0.1175 (0.0731)		
RISK	−0.1198*** (0.0208)	−0.0981*** (0.0196)	−0.1188*** (0.0212)	−0.1260*** (0.0210)	−0.1106*** (0.0157)	−0.0996*** (0.0163)	−0.1007*** (0.0152)	−0.1300*** (0.0253)	0.0530 (0.0553)
GROWTH	0.0144*** (0.0056)	0.0217*** (0.0058)			0.0168*** (0.0056)			0.0143*** (0.0040)	−0.0144 (0.0157)
GROWTH(SALE)			0.0304*** (0.0094)			0.0396*** (0.0111)			
GROWTH(ASSET)				0.0040 (0.0167)			0.0120 (0.0153)		
BCOPN	0.1191* (0.0614)	0.1274** (0.0647)	0.1222* (0.0649)	0.1412** (0.0634)	0.1207* (0.0630)	0.1274* (0.0668)	0.1319** (0.0655)	0.0916 (0.0608)	−0.0636 (0.0589)
BSIZE	−0.0015 (0.0035)	−0.0020 (0.0037)	−0.0016 (0.0037)	−0.0011 (0.0037)	−0.0017 (0.0036)	−0.0020 (0.0038)	−0.0018 (0.0039)	−0.0033 (0.0033)	0.0027 (0.0023)
Constant	−0.5691** (0.2252)	−1.5272** (0.7686)	−0.5170* (0.2889)	−0.6017* (0.3378)	−0.7514** (0.2137)	−0.1091 (0.2491)	−0.6285*** (0.2182)	−0.5560*** (0.2147)	−1.1187*** (0.2187)
Industry dummies	No	No	No	No	No	No	No	No	No
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,188	1,188	1,188	1,188	1,188	1,188	1,188	1,188	1,188
Wald χ^2	727.03***	463.48***	547.90***	482.05***	765.33***	701.79***	663.25***	958.05***	2384.16***
AR(1)	−6.31***	−5.58***	−5.96***	−5.91***	−6.31***	−6.23***	−6.18***	−6.40***	−4.47***
AR(2)	−1.53	−0.86	−0.82	−1.03	−1.51	−0.81	−1.02	−1.63	−1.20
Sargan test	14.43 (0.850)	17.88 (0.657)	14.03 (0.868)	12.98 (0.909)	13.23 (0.900)	13.62 (0.885)	11.15 (0.960)	98.97 (0.055)	20.51 (0.305)
Hansen test	11.94 (0.941)	13.47 (0.891)	15.92 (0.774)	13.87 (0.875)	11.07 (0.961)	14.39 (0.852)	11.52 (0.952)	73.34 (0.628)	21.04 (0.278)
Diff-in-Hansen tests p-value	0.704	0.400	0.183	0.540	0.748	0.288	0.683	0.647	0.713

This table reports the results from the two-step SYS-GMM estimators by using alternative measures. $BLVE_{t-1}$ is book value-based leverage lagged by (t−1). $MLVE_{t-1}$ is market value-based leverage lagged by (t−1). For the difference equations, levels lagged at (t−2) to (t−4) are used as instruments. The Windmeijer correction procedure is employed to calculate standard errors. Time dummies are included in all the models. AR(1) and AR(2) are tests for first-order and second-order serial correlations in the first-differenced equations, under the null of no serial correlation. The Sargan/Hansen tests of over-identification is under the null hypothesis that all instruments are valid. The definitions of all variables are provided in Appendix A.

* Denote significance at the 10% level.
** Denote significance at the 5%level.
*** Denote significance at the 1% level.

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Appendix A. Variable definitions

Variables	Definitions
Panel A: Capital structure	
BLVE	Book value-based leverage, calculated as the book value of total debt divided by total assets.
MLVE	Market value-based leverage, calculated as the total debt divided by the sum of book debt and the market value of equity.
Panel B: CEO power measures	
FNDR	A dummy variable equal to 1 if the CEO is one of the company's founders and 0 otherwise.
TITLE	A dummy variable equal to 1 if the CEO is the chairman on the board and 0 otherwise.
CEOWNP	A dummy variable equal to 1 if the CEO owns more than 10% of the firm's share and 0 otherwise.
CPS	CEO pay slice, calculated as the CEO's total compensation divided by the combined total compensation of top five executives in the given company.
PINDX	CEO power index, the first factor of applying discrete principal components analysis of four proxies of CEO power: FNDR, TITLE, CEOWNP, and CPS.
POWER	CEO power index, calculated as an average of the four measures of CEO power.
Panel C: Control variables	
SIZE	Firm size, calculated as the natural logarithm of total assets.
$SIZE_{\text{-SALE}}$	Firm size, calculated as the natural logarithm of sales.
TAX	Firm's official tax rate.
TANG	Tangibility, calculated as the fixed assets divided by total assets.
PROF	Profitability, calculated as the operating profit divided by total assets.
$PROF_{\text{-SALE}}$	Profitability, calculated as the operating profit divided by total sales.
RISK	China version of the Altman's zscore, based on Altman et al., (2007):$z = 0.517 - 0.460X_1+9.320X_2+0.388X_3+1.158X_4$ where X_1 is the total liabilities to total assets, X_2 is the ratio of net profit to total assets, X_3 is the ratio of working capital to total assets, and X_4 is the ratio of retained earnings to total assets.
GROWTH	Tobin's Q, calculated as the book value of total debt plus the market value of equity divided the book value of assets.
$GROWTH_{\text{-SALE}}$	Sale growth rate, calculated as the difference in the sales between current year and previous year divided by the sales in previous year.
$GROWTH_{\text{-ASSET}}$	Asset growth rate, calculated as the difference in the total assets between current year and previous year divided by the total assets in previous year.
BCOPN	Board composition, calculated as the number of independent directors divided total directors on the board.
BSIZE	Board size, the total number of directors on the board.

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