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State ownership and adjustment speed toward target leverage: Evidence from a transitional economy

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ABSTRACT

Using a quantile regression approach and 5,374 Vietnamese firm-year observations from 2000 to 2016, this paper examines the effect of state ownership on the speed of adjustment SOA toward target leverage across various levels of capital structure. The findings consistently show that these effects on SOA vary depending on the leverage level. The relationship is negative for low-leveraged firms, positive for high-leveraged firms, but insignificant in the central area of leverage distribution. Moreover, the negative effects are greater than the positive effects.

1. Introduction

The trade-off theory suggests that, a firm who has an optimal capital structure, will adjust their debt to the desired level to maximise firm value. However, with the presence of adjustment costs, firms rebalance their capital structure only when the benefits of adjustment outweigh its costs (Fischer et al., 1989; Strebulaev, 2007). Since self-interested managers may distort firm policies to maximise their benefit rather than the wealth of shareholders, agency costs resulting from conflicts between managers and shareholders are a part of adjustment costs (Chang et al., 2014). Hence, one could expect that the speed of adjustment (SOA) to the optimal capital structure has a latent relationship with the agency problem.

In this paper, we explore the effect of state ownership on SOA. Indeed, state-owned enterprises play an essential role in countries with transitional economies, moving from centrally planned to market-oriented economic systems. Due to certain factors, moreover, state-owned enterprises generally bear greater agency costs than private companies. First, supported by the government, state-controlled banks are likely to bail out state-owned firms for their losses, resulting in "soft budget" constraints. The flexibility of the budget has a negative effect on state-owned enterprises managers' incentives (Zhu, 2012). Second, there is a divergence between voting rights and cash flow rights where government shareholders have equity voting rights but not cash flow rights (Zou and Xiao, 2006). Third, the purpose of state-owned enterprises is not to maximise shareholder wealth, but to achieve political objectives (Zhou and Xie, 2015). Therefore, the more the state ownership characterises firms have, the more severe the agency problems they face. Henceforth, state ownership is perceived to be a proxy for the agency problem, in turn exerting an influence on SOA.

While the relationship between state ownership and SOA has been studied recently in China, we examine Vietnam, which is an

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important transitional emerging market in Asia. The Vietnamese context provides a unique financial system to investigate the impact of state ownership on SOA due to different institutional environment features. First, apart from European Western countries, Vietnamese Communities Leading Party (PCVN) employed the transitional process to change the economy from centralised and planned model into the market-oriented framework; nevertheless, the transformation focuses only on the economic aspects of the society. Until now, Vietnam has partially but not fully completed the transitional process. Second, the state-owned enterprises (SOEs) have a substantial influence on the economy. Some of them are the leading companies in their own industries with good corporate governance and strong financial health.[1] Third, the Vietnamese stock market is at the infant stage of the development. Ho Chi Minh trading centre was first established in 2000 with only 2 listed firms. The number of firms on public trading system raised rapidly to 1,115 in 2016 over three stocks exchange markets.[2] Moreover, Vietnam' stock market is strongly concentrated but not high liquid.[3] Finally, Vietnamese firms deal with the issues of information asymmetry, high transaction costs and volatility which are in turn effect on capital structure decision (Vo, 2017)

Before 1986, Vietnam followed a centrally planned economic system which depended heavily on state-owned firms. However, the socialist model failed, resulting in hyperinflation and a period of fiscal crisis. Consequently, in 1986 the government implemented a reform program to transform the economy from a planned to a market system. One principal feature of this program was to convert state-owned enterprises into private firms.

Since privatisation is still ongoing, state-owned enterprises, which contribute 29 % to the country's GDP, play a crucial role in the Vietnamese economy. Notably, the bad debt and inefficiency of some large state-owned enterprises have led to severe consequences for the economy. Accordingly, investigating the influence of state ownership on SOA is necessary for policymakers to adjust and improve the performance of state-owned enterprises. Since any deviation away from the target is likely to reduce the firms' value and the speed of adjustment back to the optimal pertains to value recovery, all previous studies in the Vietnamese context have investigated the relationship between state ownership and debt level; however, none of them has examined the effect of state ownership on SOA. Hence, the examination on such effect enriches the evidence on the impacts of governments' control on capital structure decisions of firms in the emerging markets.

This paper contributes to the literature by exploring the effect of state ownership on SOA in Vietnam under a quantile regression framework. While the linkage between state ownership and SOA produces mixed results, according to the literature, we come up with new evidence that the effect of state ownership on SOA is conditional on the level of leverage. Specifically, the effect is significant where there are extreme leverage values, both very high and very low, but is not significant in the central area of leverage distribution. This effect is adverse for low-leveraged firms but positive for high-leveraged firms. Moreover, the extent of adverse influence on SOA is greater than that of favourable influence. This implies an average negative effect of state ownership on SOA. These findings, indeed, are firstly revealed in the literature.

Regarding the Vietnamese data sources, most studies are based on publicly listed companies on the Ho Chi Minh (HOSE) and Hanoi stock exchanges (HNX). This paper is the first one to consider companies recorded on the unlisted public companies (UPCoM) list, while other papers focusing on the issues of Vietnamese firms use the data of publicly listed companies on the Ho Chi Minh (HOSE) and Hanoi stock exchanges (HNX). In addition, by using a quantile regression approach, this paper finds some facts neglected in other papers. This trading system of UPCoM encourages unlisted firms to join the stock market. At the end of 2016, UPCoM had the most significant number of listed firms among the three trading systems, and its market capitalisation accounted for 32.3 % of the total capital market. Due to its crucial role and the increase in size and trading volume of UPCoM, the inclusion of this market helps to provide a more thorough view on the effect of state ownership on SOA.

This paper is organized as follows. Section 2 reviews the literature and develops the research hypotheses. Section 3 explains the research method. Section 4 shows variable definition and data. Section 5 presents the empirical results. Section 6 shows the findings of the robustness tests. Finally, Section 7 summarises the study and draws some policy implications.

2. Literature review and hypotheses development

2.1. Literature review

2.1.1. The impact of state ownership on capital structure

From the perspective of agency theory, conflicts between managers and shareholders distort firm policies, resulting in the poor performance of these companies. To explain the influence of self-interested managers on finance policies, Chang et al. (2014) analyse two agency framework debt models, the disciplinary effect and the takeover defence effect. When managers consider debt as a takeover defence tool, they maintain high leverage to prevent raiders from taking over the company; on the other hand, while debt is employed as a disciplinary tool, managers are likely to issue more equity than debt to gain the benefits of free cash flow. Moreover, applying a variety of measurements for corporate governance, the relationship between corporate governance and leverage can be seen from a range of perspectives (Ahmed Sheikh and Wang, 2011).

[1] For instance, Vietnam Airline, Petrol Vietnam Power Corporation (PV Power), Binh Son Refinery and Chemicals Corporation (BSR), and Petro Vietnam Oil Corporation (PV Oil).

[2] Hanoi stock exchange market started in 2005 and Unlisted Public Companies (UPCoM) first appeared in 2009.

[3] The leading 40 firms by market capitalization account over three-fourths of the entire market, both market turnover are between 30% and 40% of GDP, which is less than other countries in South East Asia.

As a proxy for corporate governance, ownership structure, reflected in monitoring costs, the threat of takeovers, and managers' risk aversion, have a principal effect on leverage level (King and Santor, 2008). Different types of ownership structure are also revealed in the literature. For instance, Liao et al. (2015) review institutional ownership – the percentage of a firm's common shares owned by institutional investors – as a factor for identifying debt ratio. Specifically, the presence of institutional investors provides better monitoring of managers. Hence, the managers are likely to promote shareholders' interests rather than their own. Besides, owning a substantial proportion of a company, large shareholders can monitor managers to ensure that they work effectively for the firm. Accordingly, leverage is closely associated with large ownership (Le and Tannous, 2016; Nhung and Okuda, 2015; Zeckhauser and Pound, 1990).

Adopting the Herfindahl index to estimate ownership concentration, Céspedes et al. (2010) maintain that shareholders with a high concentration of ownership have a preference of taking on debt rather than equity to mitigate loss from dilution. Additionally, in the literature, the effect of managerial ownership on leverage is found mixed. A negative relation between managerial ownership and leverage implies that managers are likely to avoid the risk of high-leveraged firms (Holderness and Sheehan, 1988) whereas a positive relation suggests that there is an incentive for managers to reinforce their control and avoid share dilution (Harris and Raviv, 1988; Kim and Sorensen, 1986).

Despite broad discussion of a range of ownership in studies above, little attention has been paid to state ownership. State-controlled firms play an essential role in transitional economy countries, going through the process from a centrally planned system to a market economy. Generally, when state-owned firms are on the brink of bankruptcy, because of government support, state-controlled banks are very likely to bail out those companies for their losses, resulting in "soft budget" constraints. This flexibility in the budget has an adverse influence on state-owned firm's managers' incentives (Zhu, 2012).

Additionally, according to Grosman et al. (2016), state control entails minimal transparency and disclosure because current or former government officials are generally appointed as board members in these firms, and they adopt a corporate governance mechanism to protect their interests rather than those of shareholders. Therefore, wholly state-owned enterprises are less transparent than partially state-controlled firms (Pöyry and Maury, 2010).

Although several investigations have been conducted to examine the linkage between state ownership and leverage, this relationship remains an empirical issue in different contexts. Carrying out the analysis for 216 firms from 1993 to 2000 in China, Zou and Xiao (2006) conclude that state-owned enterprises maintain a high debt ratio level. First, they have better access to bank loans. In particular, with the support of the State bank, state-owned firms are less likely to face bankruptcy. Therefore, creditors readily lend to state-owned firms.

Second, to prevent the loss of state control and to preserve their voting rights, government shareholders avoid issuing equity and increasing debt for financing needs. Third, the high level of state ownership leads to severe conflicts between shareholders and managers. Specifically, there is a complete separation between voting rights and cash flow rights. Government shareholders have equity voting rights but no cash flow rights because ownership belongs to the citizens, and the dividends from shares are allocated to the ministry of finance (Zou and Xiao, 2006). Thus, by monitoring managers, issuing debt can reduce this problem (Jensen, 1986). Similarly, Li et al. (2009) explore private firms in China from 2000 to 2004 and also find a positive relation between state ownership and leverage. This result is consistent with that of Huang et al. (2011), who analyse 767 firms listed on the Chinese stock market from 2000 to 2005. They also emphasise that the effect of state ownership on capital structure is mostly seen in high-leveraged firms.

As a transitional economy, Vietnam offers a prime case for examining the relationship between state ownership and leverage. Nguyen and Ramachandran (2006) conducted a survey of 558 small and medium enterprises (SMEs) in Vietnam from 1998 to 2001 and noted that state-owned enterprises have a good relationship with the bank and gain considerable advantages when borrowing money. Likewise, Nguyen et al. (2012) employ a panel GMM system to consider the determinants of 116 non-financial firms listed on the Ho Chi Minh (HOSE) and Hanoi stock exchanges (HNX). Owing to the high level of government ownership of commercial banks, state-owned enterprises get support from these banks to issue debt. Consequently, state ownership is highly correlated with the debt ratio. Okuda and Nhung (2012) analyse 299 firms listed on HOSE and HNX and point out the discrepancy between state-owned and private enterprises regarding the debt ratio. Furthermore, they disclose that firms listed on HOSE rely less on debt than those listed on HNX. In the recent empirical studies, Le and Tannous (2016) and Thai (2017) also argue that state-owned firms can issue debt at a lower cost as a result of their strong relationship with the state-controlled bank and government guarantees. For these reasons, there is a positive relationship between state ownership and capital structure.

The positive relationship between state ownership and leverage is also consistent in the Russian context. Investigating 95 publicly traded firms in the Russian Trading System (RTS) during the period 2000–2004, Pöyry and Maury (2010) highlight that companies with a large proportion of shares held by the state are likely to maintain a high level of debt because of favourable borrowing conditions.

While most of the researchers report a positive relationship between state ownership and leverage, a few studies reveal different results. For instance, Dharwadkar et al. (2000) investigate nine transitional economies in Europe[4] and demonstrate that most state-controlled enterprises are generally characterised by weak corporate governance and poor transparency monitoring systems. Therefore, banks are reluctant to lend them money to avoid the bad debt. As a result, there is an inverse relationship between state ownership and capital structure.

[4] Of 26 countries in the process of privatization in Europe, Dharwadkar et al. (2000) examine 9 – Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, and Slovenia.

2.1.2. The influence of state ownership on the speed of adjustment of capital structure

According to trade-off theory, firms achieve optimal capital structure when the marginal costs of debt are equal to the marginal benefits of debt. The existence of a target debt level becomes a debatable topic since any deviation of the observed leverage away from its optimal level decreases firm value. Various factors have been identified to explain how quickly firms adjust to their optimal leverage. To this point, there have been rich discussions investigating the impact of state ownership on capital structure, but the literature has been silent on the effects of state ownership on the speed of adjustment of capital structure. To the best of our knowledge, only two studies have discussed the impact of state ownership on SOA, both of which examine the Chinese market.

Qian et al. (2009) employ DPD-GMM to examine the determinants of SOA for 650 Chinese publicly listed companies from 1999 to 2004. They explain how quickly firms achieve their target deriving from transaction costs associated with debt issuance and re-purchase. With favourable conditions for accessing loans and a good relationship with the state-controlled banks, state-owned firms can raise funds more cheaply and adjust their leverage rate more quickly than non-state-owned firms. Qian et al. (2009) measure the state ownership proxy as the percentage of shares held by the state whereas Zhou and Xie (2015) use dummy variables to distinguish between state-controlled and private firms. Interestingly, they obtain different results, whereby state-owned companies have a slower adjustment speed than private companies do. The researchers argue that state-owned firms are likely to pursue political objectives rather than seek to maximise the wealth of shareholders. Therefore, state-controlled firms work less effectively than private firms and their SOA should be lower.

The evidence that different leverage levels are associated with various costs of adjustment has been revealed in the literature. Specifically, low-leveraged firms can readily increase debt to take advantage of tax shields, due to their low agency and bankruptcy costs, whereas firms with high financial leverage are likely to face considerable restructuring costs because of the strong probability of bankruptcy and severe conflicts between shareholders and managers. Accordingly, some studies have reported heterogeneity and asymmetry in SOA, depending on the leverage level. For instance, Leary and Roberts (2005) employ three simulation models and reveal that firms adjust their leverage when the debt ratio is relatively high or low. Using a sub-sampling approach, Komera and Jijo Lukose (2016) conclude that there is a positive correlation between leverage level and SOA, whereas Galvao and Montes-Rojas (2010), employing penalised quantile regression, indicate that there is a negative influence for this relationship. Sánchez-Vidal (2014) confirms that factors related to these costs can have varying effects on firms, depending on the debt level. Due to the separation of voting rights from cash flow rights, the conflict between political objectives and shareholder interests, and the negative influence on managers' incentives from "soft budget constraints," state-owned enterprises generally suffer from substantial agency costs.

The literature also indicates a positive relationship between agency costs and leverage. Notably, as debt increases, agency costs rise because leveraged firms are less likely to follow the investment policy of maximising the benefit of shareholders (Jensen, 1986; Myers, 1977). Some researchers also provide evidence of agency costs with high debt ratios. For instance, Smith and Watts (1992) document a negative relation between investment opportunities and leverage while Titman and Wessels (1988) disclose the adverse effect of leverage on research and development (R&D). The agency costs of debt are relatively low for low-leveraged firms but considerably high for firms with high financial leverage. Meanwhile, one could expect the existence of state ownership affects agency costs which in turn raise the adjustment costs. Given these reasons, we argue that state ownership has an effect on SOA and this effect varies across the leverage levels. While most studies only investigate the overall impact of state ownership on the leverage adjustment toward the optimal level, we fill the gap by examining varying effects across leverage levels using the quantile regression approach.

Although the linkage between state ownership and SOA has been highlighted in China, this relation has remained unexplored in the literature in the Vietnamese market. In fact, before 1986, Vietnam pursued a centrally-planned economic system which relied heavily on state-owned firms. However, the socialist model did not work effectively and Vietnam underwent hyperinflation and a period of fiscal crisis. As a result, in 1986 the government implemented a reform program, named *Doi Moi,* to transform the economy from a planned to a market system. As a result of this policy, Vietnam's economy has achieved significant growth and sustainable development. In the privatisation process, wholly state-owned enterprises will become partially state-owned enterprises. However, since they contribute 29 % of the country's GDP, state-owned enterprises continue to play a crucial role in the economy due to the incomplete privatisation process (Thai, 2017).

Vietnam stock market is in the early stage of the development with only two listed firms in Ho Chi Minh stock exchange HOSE in 2000. After that, Hanoi Stock Exchange HNX was established in 2005 with the purpose of encouraging the industrial modernisation and trading the government bonds and the stock of mid-sized start-ups. Also, the government has implemented some policies to promote the stock trading markets. For instance, firms were exempted from corporate income tax for the first two years after they are listed on the trading systems; however, this policy ended in 2006. Therefore, the number of firms on the stock exchange market grew quickly to 1,115 firms at the end of 2016. The Vietnamese stocks were heavily influenced by the global financial crisis: The VN-Index has reached a peak of 1,200 points in 2007 but dropped dramatically to 235 points by February 2009. Furthermore, the stock market in Vietnam is strongly concentrated but not highly liquid as the leading 30–40 firm's account for around 75 % of the market capitalisation. According to Vo (2017), due to unique legal, institutional and culture features, Vietnamese firms raise the issues of information asymmetry, high transaction costs and volatility which are in turn effect on their capital structure option.

Notably, the bad debt and inefficiency of some of the largest state-owned firms have entailed severe consequences for the economy.[5] Some banks have embroiled with these state-owned firms and have become insolvent. Consequently, by December 31,

[5] The Vinashin Business Group, for instance, was established in 2006, owned by the Vietnamese government. By the end of 2010, Vinashin's total unpaid debt (bad debt) totalled USD 6 billion (Vu et al., 2018).

2016, the Vietnam State Bank had bought three banks[6] for 0 VND and appointed VietinBank and VietcomBank to help them restructure (Vu et al., 2018). According to ADB (2016), there are some problems to maintain the market financial stability in Vietnam. For instance, many agencies are responsible for supervising and regulating the market which does not provide a sustainable framework for firms to operate. Moreover, the weak supervision system for banks which is far behind the international standards. The lending activities incur substantial risk as the credits keep raising on the unproductive sectors including inefficient public firms and real estate.

Moreover, while most studies on SOA focus only on developed markets, the emerging Vietnamese market provides a different perspective on SOA because of its institutional framework such as financial features, legal, regulatory rules and regulations (Supra et al., 2016). Therefore, it is necessary to investigate the effects of state ownership on SOA in Vietnam.

Regarding the Vietnamese market, most studies focus on public stock exchange markets, namely HOSE and HNX. The Unlisted Public Company Market (UPCoM) seems to be ignored in the literature. However,the UPCoM trading system, established in 2009, aims to motivate unlisted companies to join the securities market. The current goods are mainly stocks and convertible bonds of unlisted firms. When listed on UPCoM, stocks become visible and accessible to investors so that firms can increase their equity liquidity. A listing on UPCoM is also a useful step to enhance the transparency of corporate governance as firms are required to disclose the information regarding the transactions of board directors, the board of management and supervisory board. However, the requirement for the information disclosure for firms traded on UPCoM is less than those operated on HOSE and HNX. In the next steps, they are encouraged to list on the HOSE and HNX exchange markets.

Since the State Securities Commission (SSC) pushes state-owned firms to list on UPCoM to improve their transparency, UPCoM plays an important role in monitoring state-owned enterprises. Some large-cap SOEs operated on UPCoM; for example, Vietnam Airlines which government has 86 % ownership, and Hanoi Been Alcohol Beverage Corporation (Habeco) with the state holding of 82 %. As the post -Initial Public Offering (IPO) of SOEs is regulated to trade on UPCoM; market regulators are likely to attract more investors and enhance the influence of the unlisted exchange market. Several SOEs traded on UPCoM are also considered as the leading in their own industries with strong corporate governance and good financial capacity such as Petrol Vietnam Power Corporation (PV Power), Binh Son Refinery and Chemicals Corporation (BSR), and Petro Vietnam Oil Corporation (PV Oil). Therefore, prior studies that ignored the UPCoM may provide a limited picture of state-owned firms.

Moreover, UPCoM constitutes a new market with a legal and regulatory framework for investors. In 2011, the new regulation required firms to trade in the regulated markets within in one year before they want to make the IPO. When this law came into effect, a significant number of companies are forced to trade on the government-run markets. Therefore, by the end of 2016, UPCoM had the most significant number of listed firms among the three trading systems (414 firms compared to 320 and 375 firms listed on HOSE and HNX, respectively), and the market capitalisation of UPCoM rose to VND 306,639 turn (USD 13.6bn), accounting for 32.3 % of the total capital market. UpCOM also recorded as the highest growth market with the number of listed stock soaring rapidly from 256 in 2015 to 414 in 2016. Furthermore, the total market capitalisation has a leap from VND 61.03trn (2.7bn) to VND303.36 ($13.6bn) between 2015 and 2016. UPCoM is somewhat similar to publicly listed stock exchanges in that both are regulated by the Law on Securities and managed by Vietnam Securities Depository (VSD) regarding the registering and depositing securities. Besides, UPCoM also protects the investors by creating a warning list consisting of the restricted and suspended stock for trading. As UPCoM plays a crucial role for firms and investors and enables the SSC to monitor state-owned enterprises, the inclusion of firms listed on UPCoM is necessary when examining the Vietnamese market.

In short, although the effects of state ownership on SOA have been identified in the literature, there are two gaps that we want to fill. First, we re-examine the relationship between state ownership and the adjustment speed of capital structure, which is conditional on the level of leverage. Second, while the relationship between state ownership and SOA has recently been explored in the Chinese context, we investigate a new transitional economy and emerging market, Vietnam. Additionally, because of the increase in the size and trading volume of UPCoM, we consider three stock exchanges, namely HOSE, HNX and UPCoM, instead of including only publicly listed stock exchanges, as most studies of the Vietnamese market have conducted.

2.2. Hypotheses development

According to the trade-off theory, firms maximise their value by adjusting their leverage to reach an optimal level where the marginal cost of debt is equal to the marginal benefits of debt. Nevertheless, adjustment costs are impediments for firms seeking to achieve their target leverage level (Fischer et al., 1989; Strebulaev, 2007). Due to the fact that self-interested managers are likely to distort firm policies and promote their benefit rather than the wealth of shareholders, agency costs resulting from conflicts between managers and shareholders account for part of the adjustment costs (Chang et al., 2014; Liao et al., 2015).

Moreover, the agency costs of debt fluctuate according to leverage level. Specifically, with a high debt ratio, leveraged firms may be unable to follow investment policy to maximise shareholder benefit (Jensen, 1986; Myers, 1977). Similarly, Smith and Watts (1992) and Titman and Wessels (1988) reaffirm the considerable agency costs of highly leveraged debt when examining the relationship between leverage, investment opportunities, and R&D. As the level of agency costs varies by degree of leverage, the impact of factors associated with agency costs depends on the leverage level. To support this argument, Sánchez-Vidal (2014) affirms that different leverage levels are related to various adjustment expenses. Therefore, factors related to these costs can have multiple effects on firms, depending on their debt level.

[6] The three banks are the Vietnam Construction Bank (VNCB), Ocean Bank and The Global Petroleum Bank (GP Bank).

Resulting from the divergence of cash flow rights and voting rights, the conflict between political objectives and shareholder interests, and the negative impact of "soft budget constraints" on managers' incentives, state-owned enterprises generally incur considerable agency costs. According to the agency theory, firms with large state ownership ratio are likely to have a slower speed of leverage adjustment as they bear larger agency costs, which prevent firms from achieving the optimal level. On the other hand, based on transactions costs, firms with a higher level of state ownership have easier access to the local financial systems and incur fewer costs to make the leverage adjustments. This is especially the case where the leverage is higher than the target, and state-owned firms need to reduce debt ratio. High-leveraged state-owned firms are pressured to alleviate debt by government to avoid the potential insolvency risk. Since the governments possess a tight control of both financial systems and state-owned firms, it is easier for state-owned firms to reduce the debt levels to fulfil the orders imposed by the governments than non-state-owned firms. In such sense, the state ownership might have a positive effect on SOA.

For these reasons, we hypothesize a competition between those two effects leads to different impacts of the state ownership on SOA across the leverage levels. When the leverage is low, the agency problems are a major concern when the state-owned firms need to adjust the leverage ratio upwards. In this situation, state-owned firms are safe from bankruptcy and insolvency problems. Hence a negative effect of state ownership may take the lead. For these reasons, we have the following hypothesis:

Hypothesis 1. *There is a negative relationship between state ownership and SOA in low-leveraged firms.*

When leverage level is high, state-owned firms are likely to reduce debt to alleviate the probability of bankruptcy and insolvency problems, presenting a good image to the government. To help the state-owned firms accomplish the mission, the local governments make it easier for state-owned firms to retire the debts or issue new shares. In other words, state-owned enterprises with high state ownership are entitled to lower adjustment costs than non- state-owned firms. Hence, one may expect a positive relationship between state ownership and SOA. Therefore, we propose the following hypothesis:

Hypothesis 2. *There is a positive relationship between state ownership and SOA in high-leveraged firms.*

3. Econometric models

3.1. QR model

The quantile regression developed by Koenker and Bassett (1978) affords a complete overview of how explanatory variables affect the conditional distribution of the dependent variable. Moreover, while ordinary least squares (OLS) is likely to be biased and inefficient for the data with a large outlier and non-normal distribution of the disturbances, quantile regression is robust regarding the normality and skewed tails distribution (Mata and Machado, 1996). To explore QR, we can start with the following linear model:

$$y_{it} = x_{it}'\beta_{\theta} + u_{\theta it} \tag{1}$$

Where y_{it} is the dependent variable and x_{it} is the *k x 1* vector of explanatory variables for the firm *i* and in time period *t*. In Eq. (1), θ is the quantile value of the y_{it} variable. Specifically, θ indicates the position where an observation lies within an ordered series of y_i. It refers to a cumulative probability function (CDF) of y_{it} with a range from 0% to 100 %. When F(y) is the cumulative distribution of a random variable *y*:

$Q_{(\theta)} = \inf y: F(y) \geq \theta$ in which inf means the infimum. In other words, the lowest value of *y* meets the condition.

To resolve Eq. (1), Koenker and Bassett (1978) minimise the sum of absolute deviation residuals in the following equation:

$$\begin{aligned} &\min \sum_{it:u^{\theta it}>0} \theta \times |u_{\theta it}| + \sum_{it:u^{\theta it}<0} (1-\theta) \times |u^{\theta it}| \\ &= \sum_{it:y^{it}-x^{it\prime}\cdot\beta_{\theta}>0} \theta \times |y^{it} - x^{it\prime}\beta_{\theta}| + \sum_{it:y^{i,t}-x^{it\prime}\cdot\beta_{\theta}<0} (1-\theta) \times |y_{it} - x_{it}'\beta_{\theta}|. \end{aligned} \tag{2}$$

Eq. (2) shows that the estimator vector of β_{θ} changes according to θ, the quantile value of the dependent variable (i.e., the *y* variable). By contrasting β_{θ} estimates across various θ, we are able to examine whether the relationship between the *x* and *y* variables is non-uniform across the entire distribution of the latter. This is the crucial advantage of the QR method.

In Ordinary Least Square (OLS), the mean is the key to minimise the sum of squared residuals, whereas in least absolute deviation (LAD), the median is the answer to solve the question of minimising the sum of absolute residuals. Obviously, quantile regression does not employ the OLS method but the LAD to find the solution. Additionally, LAD, a special case of quantile regression under the restriction of θ = 50 %, employs the same weight on positive and negative errors. In QR, there is a different weight for the positive and negative errors (i.e., θ for positive errors and (1-θ) for negative errors).

3.2. Empirical models

In the first stage, the target leverage is defined by a function of the firm's characteristics. These factors are identified by the trade-off theory and some empirical studies as the main determinants of the optimal capital structure (Antoniou et al., 2008; Hovakimian and Li, 2011; Liao et al., 2015)

$$LEV^{*}_{i,t+1} = \beta X_{i,t} \tag{3}$$

where *LEV** refers to a firm's target leverage, and *X* is a set of explanatory variables, including firm size (*SIZE*), asset tangibility (*TANG*), depreciation and amortisation (*DEP),* and operating income before depreciation (*PROFIT).*

In the second stage, to estimate how quickly a firm moves its current leverage to the optimal level, we employ the partial adjustment model (Chang et al., 2014; Fama and French, 2002; Kayhan and Titman, 2007). According to the trade-off theory, firms should fully adjust to their target leverage to maximise their value. However, due to adjustment costs, they can only partially adjust their leverage.

$$LEV_{i,t+1} - LEV_{i,t} = \alpha + \delta(LEV^{*}_{i,t+1} - LEV_{i,t}) + \varepsilon_{i,t} \tag{4}$$

Where *LEV* and *LEV** represents the firm's achieved target leverage levels, and δ is the SOA of leverage at its optimal level. The value of SOA = 1 implies that firms fully adjust to the optimal level, whereas SOA < 1 indicates the presence of adjustment costs.[7] Following the literature (Flannery and Rangan, 2006; Hovakimian and Li, 2011), we merge Eqs. (3) and (4) to achieve a reduced-form partial adjustment leverage model:

$$LEV_{i,t+1} = \alpha + \beta\delta X_{i,t} + (1 - \delta)LEV_{i,t} + \varepsilon_{i,t+1} \tag{5}$$

According to Öztekin and Flannery (2012), the firm's characteristics obviously influence both target leverage and the adjustment speed of capital structure. Hence, we apply the same control variables in the regression to examine the effect of state ownership on SOA:

$$\delta_{i,t} = \partial_0 + \partial_1 SO_{i,t} + \partial_2 X_{i,t} \tag{6}$$

Where $SO_{i,t}$ is the state ownership of firm *i* at time *t*, $X_{i,t}$ is a vector of control variables,

including firm size (*SIZE*), asset tangibility (*TANG*), depreciation, amortisation, and operating income before depreciation (*PROFIT).*[8]

Now, we substitute Eq. (6) into Eq. (5) to obtain the following model:

$$LEV_{i,t+1} = \alpha + \beta\delta X_{i,t} + [1 - (\partial_0 + \partial_1 SO_{i,t} + \partial_2 X_{i,t})]LEV_{i,t} + \varepsilon_{i,t+1} \tag{7}$$

Partly multiplying Eq. (7) out, we obtain:

$$LEV_{i,t+1} = \alpha + \partial_1'(SO_{i,t}{*}LEV_{i,t}) + \partial_2'(X_{i,t}{*}LEV_{i,t}) + (1 - \partial_0)LEV_{i,t} + \beta\delta X_{i,t} + \varepsilon_{i,t+1} \tag{8}$$

where $\partial_1^{'} = -\partial_1$, $\partial_2^{'} = -\partial_2$. In Eq. (8), the effect of state ownership on SOA is represented in the interaction terms of state ownership and the leverage, with the same magnitude but with the opposite sign. We apply quantile regression for Eq. (8) to examine the effects of state ownership on the conditional distribution of the leverage (Liao et al., 2015). Moreover, we also follow Blendell and Bond (1998) and Antoniou et al. (2008) to apply system generalized method of moment (GMM) for Eq. (8) to consider the overall effect of state ownership on SOA as GMM can alleviate the potential endogenity problems of the independent variables and control for firm fixed effects.

4. Variable definition and data

4.1. Variable definition

4.1.1. Leverage ratio

Empirical studies have applied both market and book values to investigate leverage (Chang et al., 2014; Cook and Tang, 2010; Dang et al., 2015; Hovakimian and Li, 2011). Nevertheless, according to Flannery and Rangan (2006), the book values are likely to be far from the market values for small firms. Chang et al. (2014) also affirm that market values play a more important role than book values in finance theory. Therefore, we adopt market values first and use book values for the robustness test. Accordingly, our market leverage ratio is:

$$MLEV_{i,t} = \frac{D_{i,t}}{D_{i,t} + S_{i,t}P_{i,t}} \tag{9}$$

$D_{i,t}$ denotes the book value of firm *i*' s interest-bearing debt at time t, $S_{i,t}$ is the number of common shares outstanding of the firm at time t, and $P_{i,t}$ denotes the stock price per share at time *t*. For the book leverage ratio, we use:

$$BLEV_{i,t} = \frac{D_{i,t}}{TA_{i,t}} \tag{10}$$

[7] The adjustment costs may come from financial distress and other costs of debt (Hovakimian and Li, 2011).

[8] Since firms with good corporate governance are likely to enhance the accountability, trust, and transparency which in turn mitigate the agency costs and increase the speed of adjustment of capital structure (SOA) (Chang et al., 2014; Liao et al., 2015), corporate governance factors are considered as determinants of SOA. Moreover, according to Cook and Tang (2010), firms tend to adjust the SOA more quickly in the good macroeconomic states than in the bad scenarios. Therefore, we try to add four corporate governance variables in our model, namely board independence (BIND), CEO duality (DUALITY), Board ownership (BO), and CEO and BOD ownership (CO) and two macro-economic variables consisting of GDP growth (GDPG) and Inflation (INF) to check the robustness of our results. The findings (Table A3 and Fig. A1) are shown in the Appendix A.

$D_{i,t}$ is the sum of short-term debt and the long-term debt book value of interest-bearing. $TA_{i,t}$ denotes the book value total assets of firm i at time t.

4.1.2. State ownership

State ownership is a typical feature of firms in a transition from a planned to a market economy. China and Vietnam are prominent examples. Some studies employ dummy variables to distinguish between state and private ownership (Nhung and Okuda, 2015; Zhou and Xie, 2015). However, since our purpose is to examine the relationship between the level of state ownership and SOA, we follow the literature and measure state ownership as the percentage of shares held by the state (Huang, 2006; Le and Tannous, 2016; Li et al., 2009; Zou and Xiao, 2006).

4.1.3. Firm characteristics

As the adjustment costs are likely to be different from firm to firm, firm characteristics are important factors for determining the target leverage as well as SOA. We follow the literature in applying the crucial elements to identify the choice of capital structure.

Large firms are likely to have more debt as their assets are less volatile. These firms, moreover, have easy access to public loan markets. We follow Rajan and Zingales (1995), Hovakimian and Li (2011) and Chang et al. (2014) in measuring firm size *(SIZE)* as the natural logarithm of total assets.

Firms with considerable assets generally face little risk of bankruptcy and have a good credit rating. Thus, they can readily increase debt. We estimate asset tangibility (TANG) as fixed assets, consisting of property, plant and equipment (Rajan and Zingales, 1995; Titman and Wessels, 1988).

With a high percentage of depreciation, firms can save money from taxation and are therefore less likely to take advantage of debt as a tax shield. Depreciation (*DEP)* is measured as the ratio of depreciation to total assets (Chang et al., 2014; Hovakimian and Li, 2011).

Due to their high retention of earnings, firms with large profits can reduce the need to issue debt. We follow Fama and French (2002) and Hovakimian and Li (2011) to measure profit (*PROFIT)* as operating income before depreciation.

4.2. Data

We obtain data from three stock exchange markets, namely the Ho Chi Minh stock exchange (HOSE), the Hanoi stock exchange (HOSE) and the Unlisted Public Company Market (UPCoM) from 2000 to 2016. We start in 2000 because the Ho Chi Minh stock exchange was established in that year.[9] The sample ends in 2016 owing to the availability of the data at the time when the study starts. Tai Viet Corporation (Vietstock), a leading financial information service provider in Vietnam, provided all the financial and ownership data.

Following standard practice, firms in the finance industries (SIC codes 6000–6999) and regulated utilities (SIC codes 4900–4999) are excluded from our analyses (Bauer et al., 2008; Dittmar and Mahrt-Smith, 2007; Laing and Weir, 1999; Ukaegbu and Oino, 2014). Each sample firm must have at least two consecutive years of data. We also restrict our data by dropping firms if large amounts of basic data are missing and if observations include an extreme value.[10] Finally, our sample consists of 662 firms with 5374 firm-year observations.

Table 1 represents the summary statistics for the main variables in our model. The results for firm variables are similar to those of other studies of the Vietnamese market (Le and Tannous, 2016; Nhung and Okuda, 2015). The highest percentage of ownership reported in this paper is greater than that reported in other studies because our database covers an extended period (17 years). We also consider the listed stock exchanges as well as the Unlisted Public Company Market. The sample selection criteria is provided in Table 2.

To test the multicollinearity problem, we disclose the correlation coefficients among explanatory variables in Table 3.

It can be seen from Table 2 that those variables are not highly correlated. Therefore, our analysis is not affected by multicollinearity problems.

5. Empirical results

5.1. Ordinary least square (OLS) and Least absolute deviation (LAD) estimates

Table 3 provides the estimation results of Eq. (8) in which leverage is the dependent variable. Also, this paper presents the OLS, LAD and GMM estimates in comparison with QR estimates. Since we concentrate primarily on the influence of state ownership on the rate at which firms adjust towards their targets, we report the results of the interactive coefficient *(leverage * state ownership)* in Table 4.

As can be seen from Table 4, the OLS and GMM method show significant negative estimate, implying an inverse relationship between state ownership and SOA. This results are consistent with Qian et al. (2009) who investigate the Chinese market from 1999 to 2004. In contrast, the LAD delivers an insignificant estimate at any conventional level, suggesting there is no relationship between

[9] The Hanoi stock exchange (HOSE) was established in 2005, whereas the Unlisted Company Market first appeared in 2009.

[10] For instance, observations with a leverage ratio above 1 or below 0 are excluded from our database.

Table 1
Descriptive statistics of variables.

Variable	N	Mean	SD	Min	Max
Leverage (LEV)	5,374	0.535	0.267	0.000	1.000
Firm size (SIZE)	5,374	15.286	1.470	11.667	21.314
Tangibility (TANG)	5,374	0.196	0.196	0.000	0.976
Depreciation (DEP)	5,374	0.220	0.274	0.000	5.308
Profitability (PROFIT)	5,374	0.058	0.119	−3.842	0.993
State Ownership (SO)	5,374	0.213	0.244	0.000	0.967

This table presents the number of observations, mean, standard deviation, minimum and maximum of the variables (2000–2016). All firm variables are collected from the Ho Chi Minh stock exchange (HOSE), the Hanoi stock exchange (HNX) and the unlisted public company market (UPCoM). The state ownership is collected from the annual report.

Table 2
Sample selection criteria.

	Hanoi Stock Exchange (HNX)	Ho Chi Minh Stock Exchange (HOSE)	Unlisted Public Company (UPCOM)
Number of listed firms in 2016	375	320	414
Less than 2 years	33	18	249
Financial and Utilities firms	28	25	29
Leverage less than 0 or higher than 1	10	9	24
Zero market capitalisation			22
Final sample	304	268	90

Table 3
Correlation among variables.

Variable	LEV	SIZE	TANG	DEP	PROFIT	SO
LEV	1.000					
SIZE	0.224	1.000				
TANG	−0.006	0.008	1.000			
DEP	−0.115	−0.193	0.434	1.000		
PROFIT	−0.481	−0.009	−0.021	0.018	1.000	
SO	0.045	0.061	0.149	0.213	0.106	1.000

Table 4
The impacts of state ownership on SOA across various leverage quantiles.

$$LEV_{i,t+1} = \alpha + \partial_1'(SO_{i,t}{*}LEV_{i,t}) + \partial_2'(X_{i,t}{*}LEV_{i,t}) + (1-\partial_0)LEV_{i,t} + \beta\delta X_{i,t} + \varepsilon_{i,t+1}$$

Quantile	Estimate	P-value	Quantile	Estimate	P-value
0.05	−0.198	(0.00)**	0.55	0.007	(0.37)
0.10	−0.157	(0.00)**	0.60	0.008	(0.23)
0.15	−0.115	(0.00)**	0.65	0.008	(0.22)
0.20	−0.087	(0.00)**	0.70	0.014	(0.04)*
0.25	−0.073	(0.00)**	0.75	0.018	(0.01)**
0.30	−0.043	(0.01)**	0.80	0.018	(0.04)*
0.35	−0.038	(0.01)**	0.85	0.019	(0.00)**
0.40	−0.017	(0.12)	0.90	0.023	(0.04)*
0.45	−0.010	(0.39)	0.95	0.029	(0.00)**
0.50 (LAD)	−0.004	(0.69)	**OLS**	−0.040	(0.00)**
			GMM	−0.238	(0.00)**

Note: * Significant at the 5% level, ** Significant at the 1% level. Results from Eq. (8) when we apply quantile regression to find the different values of $\partial_1^{'}$ throughout the distribution of the leverage. With each value of $\partial_1^{'}$, we find the impacts of state ownership on SOA : $\partial_1^{'} = -\partial_1$. We provide the estimate of ∂_1 in the table. To compare the results of quantile approach versus the LAD/OLS, we also show the coefficient of the interaction terms under LAD and OLS method. While quantile regression shows the impacts of state ownership on different degree of the leverage, LAD/OLS method just shows one effect conditional on the mean or the median of leverage over time. We also check the average impact by GMM approach.

the state ownership and SOA.

It is particularly noteworthy that both OLS and LAD concentrate mainly on the central area of the leverage distribution. Specifically, in OLS the mean is the key for which the sum of squared residuals is minimised whereas in LAD, the median is the core question around which the sum of absolute residuals is minimised. Naturally, it is reasonable to examine the linkage between state

Table 5
Statics tests of the equality of slope estimates across leverage quantile.

Quantile	F-statistic	P-value
0.05 vs. 0.95	26.61	(0.00)**
0.10 vs. 0.90	53.36	(0.00)**
0.15 vs. 0.85	27.05	(0.00)**
0.20 vs. 0.80	17.26	(0.00)**
0.25 vs. 0.75	21.34	(0.00)**
0.30 vs. 0.70	11.12	(0.00)**
0.35 vs. 0.65	12.38	(0.00)**
0.40 vs. 0.60	7.64	(0.00)**
0.45 vs. 0.55	7.79	(0.00)**

Note: * Significant at the 5% level, ** Significant at the 1% level.

ownership and SOA in the non-central area (i.e., in the left or right tail of the leverage distribution), which would reveal new evidence regarding the interaction between state ownership and SOA. To deal with this issue, we adopt the quantile regression to explore the effect of state ownership on SOA, which is conditional on the leverage level.

5.2. QR estimates

While estimating QR, we begin with a 5% quantile of leverage, and then repeat estimations by increments of 5% quantile for each. The process ends with the 95 % quantile. In Table 4, the estimate of the interactive coefficient *(leverage * state ownership)* changes substantially across quantile levels of leverage regarding the sign and magnitude. At low quantile levels from 5% to 35 %, the coefficients ∂_1 are significantly negative. The size of impact becomes weaker as the leverage increases (e.g., 0.198 at the 5% quantile and 0.043 at the 35 % quantile). Between 40 % and 65 % quantiles of leverage, the estimates of the interactive coefficient are insignificant at any conventional level. Starting from quantile level of 70 %, the interactive coefficient turns out to be significant and positive, along with an increase in the size (e.g., 0.014 at the 70 % quantile, 0.018 at the 80 % quantile and 0.029 at the 95 % quantile). Therefore, the results of Table 4 suggest that when the leverage level is relatively low (high) whereby firms need to adjust the leverage upwards (downwards), the state ownership has a negative (positive) relationship with SOA. Henceforth, Hypotheses 1 and 2 are not rejected. Moreover, as the leverage level is extremely high (low), the state ownership exerts a substantially positive (negative) influence on the speed of adjustment. Implications of the findings are discussed in Section 5.3.

Table 5 shows the *F* tests of the equality-of-slope of the interactive estimate *(leverage * state ownership)* across various quantiles of leverage. The differences between the slope estimates at the θ and (1- θ) quantiles of the interaction terms are highlighted. Interestingly, the outcomes of the comparison are significant at the 1% level for all quantiles. The results of Table 4 confirm that the effects of the state ownership on SOA differ between high and low leverage levels. The effects when firms adjust downwards are differentiated from those when firms adjust upwards.

Fig. 1 depicts the QR estimates of the interactive coefficient *(leverage * state ownership)* with 95 % confidence intervals across quantiles of leverage. For comparison, OLS estimates are also given in the figure. As discussed above, the OLS result only indicates the

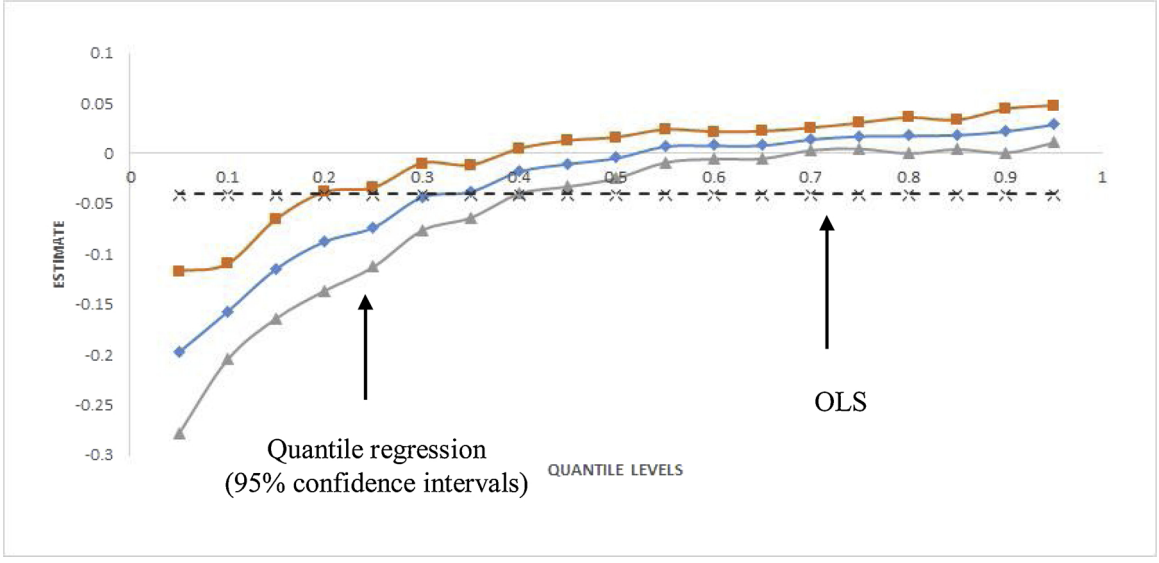

Fig. 1. The impact of state ownership on SOA across leverage quantiles: QR estimates with 95 % confidence level vs. OLS estimate.

effect of state ownership on SOA conditional on the mean of leverage. But such a method fails to capture the effects across the various levels of leverage.

It is apparent from Fig. 1 that in the central region of leverage distribution, the interaction coefficients are insignificant, whereas they are significant at the right and left tails of the leverage distribution. Notably, the sign effects of state ownership on SOA change from negative to positive. The adverse effects are more significant than the favourable ones (e.g., 0.198 at the 5% quantile and 0.029 at the 95 % quantile). Fig. 1 consists with the results in Table 3.

5.3. Further discussions

Our results show that in Vietnam for firms with low financial leverage an adverse relation exists between state ownership and SOA. This relation is positive for high-leveraged firms. Although the impact is substantial for the extreme values of leverage – both very high and very low – the evidence indicates that adverse effects are much higher than favourable ones.

The adverse effect at the low quantile of leverage supports the arguments of Zhou and Xie (2015), who justify their assessment of adjustment speed based on agency costs. In particular, due to the separation of voting rights from cash flow rights, state-owned enterprises are likely to focus on political objectives rather than on maximising the benefit for shareholders. Moreover, “soft budget constraints” have a negative effect on managers’ motivations. Consequently, state-owned enterprises bear considerable agency costs, which prevent firms from adjusting leverage to the optimal level. In such sense, the regulators associated with state-owned enterprises in Vietnam need to pay more attention to the impediments incurred by high control of government on the process that the firms adjust the leverage upward to the target.

On the other hand, a positive relationship between state ownership and SOA for highly leveraged state-owned enterprises is consistent with Qian et al. (2009), who analyse SOA based on transaction costs. Specifically, state-owned enterprises do not only maintain a strong relationship with the state-controlled banks but also enjoy government guarantees against bankruptcy and insolvency. Consequently, they can borrow at lower cost, resulting in a faster leverage adjustment speed than that of private firms. These features in Vietnam explain why when state-owned enterprises need to adjust the leverage downwards, it is easier for them to do transactions in a quick manner. The higher the extent to which the Vietnamese government controls the firms, the higher the efficiency of downward adjustment. Moreover, in Vietnam, the members of state-owned enterprises boards of directors are generally government officials or former government officials. Since a high debt ratio often results in bankruptcy, insolvency, non-performing loans and therefore a bad reputation, managers in state-owned enterprises try to reduce debt levels to avoid losing their jobs and seek to impress the government with better performance.

Finally, although the effects of state ownership on SOA are non-uniform across the debt level, the adverse effects are reported to be greater than the positive ones. This implies that the governments’ connections in Vietnam make it easier for state-owned firms to reduce the debt when a need arises; therefore, the low efficiency of increasing debt level is more substantive. This is especially the case when the Vietnam government’s shares in state-owned firms are high. The local regulators and practitioners should pay more attention to this phenomenon and consider possible ways to mitigate such impacts.

6. Robustness tests

6.1. Alternative measure of leverage

In order to determine whether the results shown in Section 5 are robust, we carry out additional tests. In the first test, we apply an alternative measure of leverage to check if the results change. We use the book-value measure of leverages – total debt leverage (total debt/book value of total assets) – and re-run the QR estimation. The empirical results are presented in Table 5 and Fig. 2.

The results from Table 5 and Fig. 2 are consistent with those using the book value of leverage. In particular, the effects of state ownership on SOA are only significant for extreme values of leverage, both very high and very low. Moreover, the adverse effects in the lower quantile of leverage outweigh those in the top quantile.

6.2. Non-zero debt issuance firms

According to Cook et al. (2008), the issues on the equivalent question between debt-equity choice and how much debt firms want to incur can be more serious when studies include zero leverage and non-zero leverage firms in the sample. Additionally, in terms of the different incentives between zero leverage and non-zero leverage firms, the financial constraints on firms, their financial flexibility and need for external financing (Devos et al., 2012; Huang et al., 2017), the findings between the sample with and without zero leverage can be different. In turn, we run the QR estimation with data only including non-zero debt issuance firms. The results are shown in Table 6 and Fig. 3.

As can be seen from Table 6 and Fig. 3, the influence of state ownership on SOA varies across the leverage level. Specifically, the effects are significantly negative (positive) at the left (right) tails. Negative effects are greater than positive effects. These results are similar to the sample with both zero and non-zero debt issuance firms (Table 7).

6.3. The impact of state ownership on SOA with winsorizng the data

In order to check the robustness of the results revealed in Section 5 are robust, we re-arrange our data in a different way by

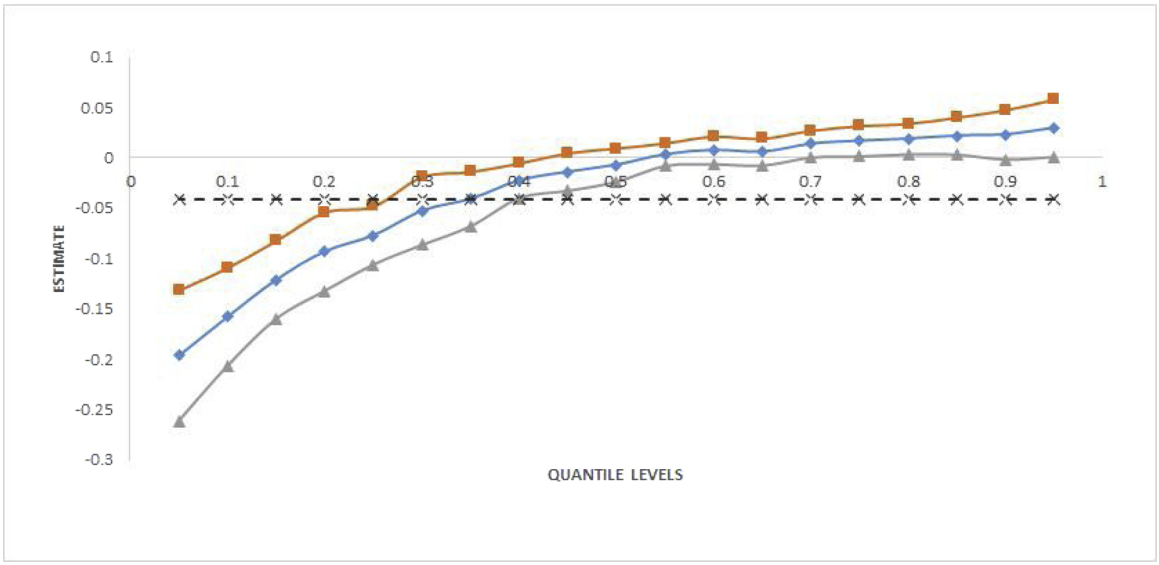

Fig. 2. The impact of state ownership on SOA across the book value of leverage quantiles: QR estimates with 95 % confidence level vs. OLS estimate.

Table 6
The impacts of state ownership on SOA across various book value of the leverage quantiles.

Quantile	Estimate	P-value	Quantile	Estimate	P-value
0.05	−0.196	(0.00)**	0.55	0.003	(0.58)
0.10	−0.158	(0.00)**	0.60	0.007	(0.30)
0.15	−0.121	(0.00)**	0.65	0.006	(0.41)
0.20	−0.093	(0.00)**	0.70	0.014	(0.04)*
0.25	−0.077	(0.00)**	0.75	0.016	(0.05)*
0.30	−0.053	(0.00)**	0.80	0.019	(0.04)*
0.35	−0.041	(0.00)**	0.85	0.022	(0.02)*
0.40	−0.023	(0.01)	0.90	0.023	(0.05)*
0.45	−0.014	(0.14)	0.95	0.029	(0.04)*
0.50 (LAD)	−0.007	(0.40)	**OLS**	−0.040	(0.00)**
			GMM	−0.267	(0.00)**

Note: * Significant at the 5% level, ** Significant at the 1% level. Results from Eq. (8) when we apply quantile regression to find the different values of $\partial_1^{'}$ throughout the distribution of the leverage. With each value of $\partial_1^{'}$, we find the impacts of state ownership on SOA : $\partial_1^{'} = -\partial_1$. We provide the estimate of ∂_1 in the table. To compare the results of quantile approach versus the LAD/OLS, we also show the coefficient of the interaction terms under LAD and OLS method. While quantile regression shows the impacts of state ownership on different degree of the leverage, LAD/OLS method just shows one effect conditional on the mean or the median of leverage over time.

following Chang et al. (2014) and Liao et al. (2015) to winsorize all the variables at the 1st and 99th percentiles to alleviate the effect of outliers and avoid the influence of extreme values.

As can be seen from Table 8 and Fig. 4, the sign and the magnitude of the impact of state ownership on SOA varies across the leverage distribution. Notably, the effects are significantly negative and higher at the left tail but positive and smaller at the right tail. Additionally, the influence is insignificant in the central region of leverage distribution. These results are similar to the sample by removing the extreme values.

7. Conclusions

The effects of state ownership on the adjustment speed of capital structure in emerging economies are inconclusive in the literature. These effects are found either positive or negative depending on different underlying reasons such as transaction costs (Qian et al., 2009) or agency costs. Vietnam is still going through the privatisation process, in which wholly state-owned enterprises are transformed into partially state-owned enterprises. Additionally, privatisation is complete only when all state-owned enterprises become private companies. Since the process is not complete yet, state-owned firms still play an essential role in the economy. Hence it is our academic interest to investigate how state ownership affects the efficiency of capital structure adjustment in the Vietnamese market with some special institutional features.

This paper contributes to the literature by using a quantile regression approach to examine this issue in Vietnam. This model enables examining the varying relationships between state ownership and SOA across the distribution of leverage. New evidence is

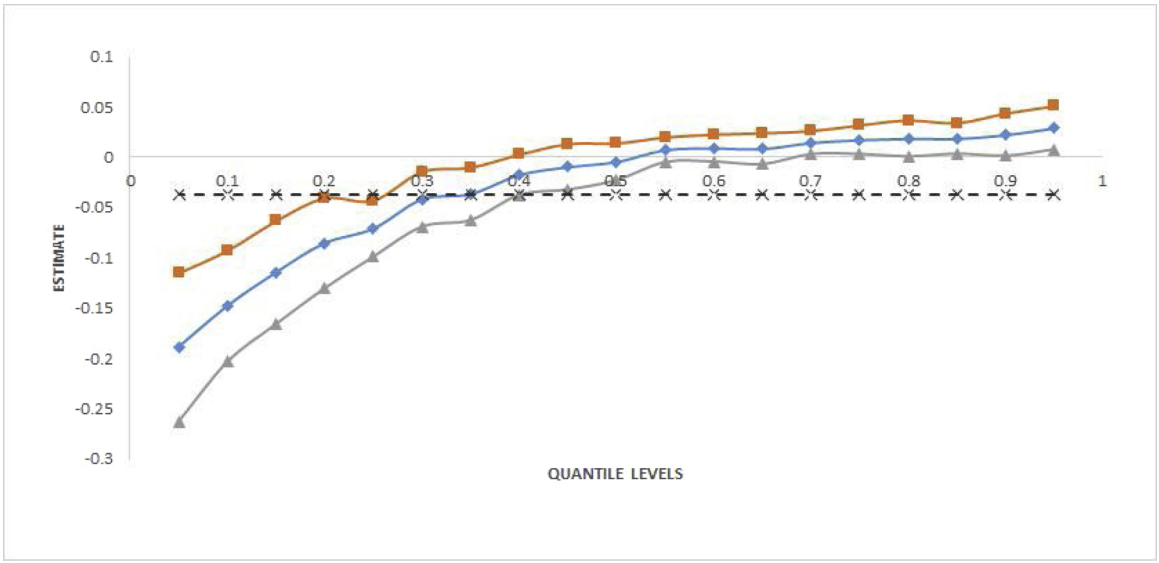

Fig. 3. The impacts of state ownership on SOA across various leverage quantiles for non-zero debt issuances firms.

Table 7
The impacts of state ownership on SOA across various leverage quantiles for non–zero debt issuances firms.

$$LEV_{i,t+1} = \alpha + \partial_1'(SO_{i,t}{*}LEV_{i,t}) + \partial_2'(X_{i,t}{*}LEV_{i,t}) + (1-\partial_0)LEV_{i,t} + \beta\delta X_{i,t} + \varepsilon_{i,t+1}$$

Quantile	Estimate	P-value	Quantile	Estimate	P-value
0.05	−0.189	(0.00)**	0.55	0.008	(0.23)
0.10	−0.148	(0.00)**	0.60	0.009	(0.18)
0.15	−0.115	(0.00)**	0.65	0.009	(0.22)
0.20	−0.085	(0.00)**	0.70	0.015	(0.27)
0.25	−0.071	(0.00)**	0.75	0.017	(0.01)**
0.30	−0.042	(0.00)**	0.80	0.019	(0.02)*
0.35	−0.036	(0.01)**	0.85	0.019	(0.02)**
0.40	−0.017	(0.09)	0.90	0.023	(0.04)*
0.45	−0.009	(0.41)	0.95	0.029	(0.01)**
0.50 (LAD)	−0.004	(0.64)	**OLS**	−0.037	(0.00)**
			GMM	−0.266	(0.00)**

Note: * Significant at the 5% level, ** Significant at the 1% level. Results from Eq. (8) when we apply quantile regression to find the different values of ∂_1' throughout the distribution of the leverage. With each value of ∂_1', we find the impacts of state ownership on SOA : $\partial_1' = -\partial_1$. We provide the estimate of ∂_1 in the table. To compare the results of quantile approach versus the LAD/OLS, we also show the coefficient of the interaction terms under LAD and OLS method. While quantile regression shows the impacts of state ownership on different degree of the leverage, LAD/OLS method just shows one effect conditional on the mean or the median of leverage over time.

revealed. It is found that the influence of state ownership on SOA is negative for low-leveraged firms while positive for high-leveraged firms. Notably, the adverse effects are greater than the favourable effects.

Our findings suggest, first, the government should speed up the privatisation process to ensure that high control by the government in the state-owned firms cannot be the cause of negative consequences for the economy. Second, since for low-leveraged state-owned firms the adjustment process suffers from low efficiency, the local regulators and practitioners should be cautious about the impediments brought about by the high state control via the agency conflicts. Third, since high-leveraged state-owned firms enjoy favourable conditions when repurchasing debt or increasing equity to lower their leverage, the government should impose policies to monitor state-owned firms when their leverage is relatively high and needed to be adjusted downwards.

CRediT authorship contribution statement

Thao Nguyen: Conceptualization, Data curation, Writing - original draft. **Min Bai:** Visualization, Supervision, Investigation, Writing - review & editing. **Greg Hou:** Visualization, Supervision, Investigation, Writing - review & editing. **Manh-Chien Vu:** Data curation, Software.

Table 8
The impacts of state ownership on SOA across various leverage quantiles With winsorizing the data.

$LEV_{i,t+1} = \alpha + \partial_1'(SO_{i,t}{*}LEV_{i,t}) + \partial_2'(X_{i,t}{*}LEV_{i,t}) + (1-\partial_0)LEV_{i,t} + \beta\delta X_{i,t} + \varepsilon_{i,t+1}$

Quantile	Estimate	P-value	Quantile	Estimate	P-value
0.05	−0.182	(0.00)**	0.55	0.026	(0.02)*
0.10	−0.116	(0.00)**	0.60	0.030	(0.00)**
0.15	−0.085	(0.00)**	0.65	0.034	(0.00)**
0.20	−0.052	(0.00)**	0.70	0.033	(0.00)**
0.25	−0.045	(0.03)*	0.75	0.038	(0.00)**
0.30	−0.021	(0.14)	0.80	0.039	(0.00)*
0.35	−0.006	(0.63)	0.85	0.036	(0.00)**
0.40	0.011	(0.40)	0.90	0.042	(0.00)**
0.45	0.017	(0.15)	0.95	0.031	(0.02)*
0.50 (LAD)	0.018	(0.11)	**OLS**	−0.032	(0.02)*
			GMM	−0.157	(0.02)*

Note: * Significant at the 5% level, ** Significant at the 1% level. Results from Eq. (8) when we apply quantile regression to find the different values of $\partial_1^{'}$ throughout the distribution of the leverage. With each value of $\partial_1^{'}$, we find the impacts of state ownership on SOA : $\partial_1^{'} = -\partial_1$. We provide the estimate of ∂_1 in the table. To compare the results of quantile approach versus the LAD/OLS, we also show the coefficient of the interaction terms under LAD and OLS method. *X* includes firms' variables, corporate governance variables and macroeconomic variables. Variables are winsorized at the 1 st and 99th percentile.

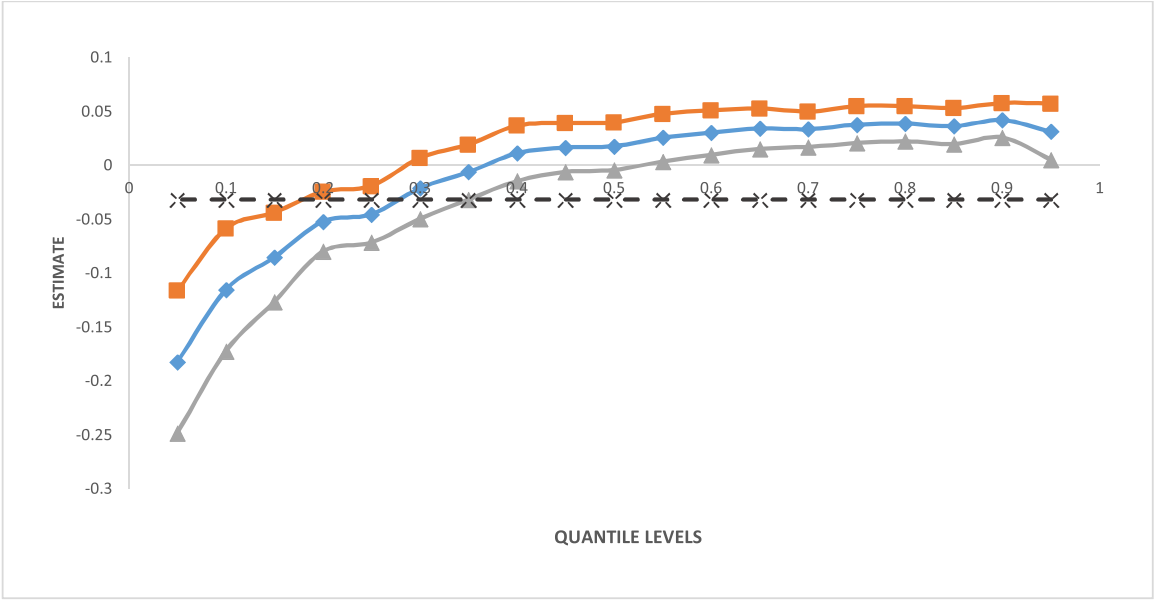

Fig. 4. The impacts of state ownership on SOA across various leverage quantiles with winsorizing the data.

Appendix A. Results with new/alternative Macro and Corporate Governance Variables

Results with new/alternative macroeconomics and corporate governance remain quantitatively unchanged. More specifically, the impacts of state ownership on SOA are only significant for the low and high levels of leverage but not in the central region of leverage distribution. The sign changes from negative for low-levered firms to positive for high-levered firms. Furthermore, the adverse effects in the lower quantile of leverage outweigh those in the top quantile (Tables A1 and A2).

Table A1
Definition of the new control variables.

Variables	Definitions
Corporate governance variables	
Board independent (BIND)	The percentage of independent directors on the board
CEO duality (DUALITY)	The dummy variable equals to one if CEO is also the chairman of the board, otherwise zero
Board ownership (BO)	Ratio of shares held by board of directors
CEO and BOD ownership (CO)	Ratio of shares held by CEO and board of directors
Macroeconomics variables	
GDP growth (GDPG)	Annual growth in nominal gross domestic product (GDP)
Inflation (INF)	Annual Inflation rate. Growth in consumer price index

Table A2
Descriptive statistics of the new control variables.

Variable	N	Mean	SD	Min	Max
Board independent (BIND)	5,374	0.596	0.201	0.000	1.000
CEO duality (DUALITY)	5,374	0.369	0.482	0.000	1.000
Board ownership (BO)	5,374	0.140	0.161	0.000	0.854
CEO and BOD ownership (CO)	5,374	0.132	0.250	0.000	1.000
GDP growth (GDPG)	5,374	6.054	0.565	5.247	7.547
Inflation (INF)	5,374	8.058	5.931	−1.710	23.116

This table presents the number of observations, mean, standard deviation, minimum and maximum of the new control variables (2000–2016).

Table A3
The impacts of state ownership on SOA across various leverage quantiles With different control variables.

$LEV_{i,t+1} = \alpha + \partial_1'(SO_{i,t}{*}LEV_{i,t} + \partial_2'(X_{i,t}{*}LEV_{i,t}) + (1 - \partial_0)LEV_{i,t} + \beta\delta X_{i,t} + \varepsilon_{i,t+1}$

Quantile	Estimate	P-value	Quantile	Estimate	P-value
0.05	−0.173	(0.00)**	0.55	0.011	(0.19)
0.10	−0.108	(0.00)**	0.60	0.011	(0.21)
0.15	−0.099	(0.00)**	0.65	0.022	(0.01)**
0.20	−0.062	(0.00)**	0.70	0.019	(0.01)**
0.25	−0.044	(0.03)*	0.75	0.021	(0.00)**
0.30	−0.033	(0.00)**	0.80	0.027	(0.00)*
0.35	−0.019	(0.15)	0.85	0.029	(0.00)**
0.40	−0.005	(0.69)	0.90	0.032	(0.00)*
0.45	0.001	(0.92)	0.95	0.026	(0.00)**
0.50 (LAD)	0.008	(0.44)	**OLS**	−0.032	(0.02)*
			GMM	−0.142	(0.03)*

Note: * Significant at the 5% level, ** Significant at the 1% level. Results from Eq. (8) when we apply quantile regression to find the different values of ∂_1' throughout the distribution of the leverage. With each value of ∂_1', we find the impacts of state ownership on SOA : $\partial_1' = -\partial_1$. We provide the estimate of ∂_1 in the table. To compare the results of quantthe ile approach versus the LAD/OLS, we also show the coefficient of the interaction terms under LAD and the OLS method. *X* includes firms' variables, corporate governance variables and macroeconomic variables.

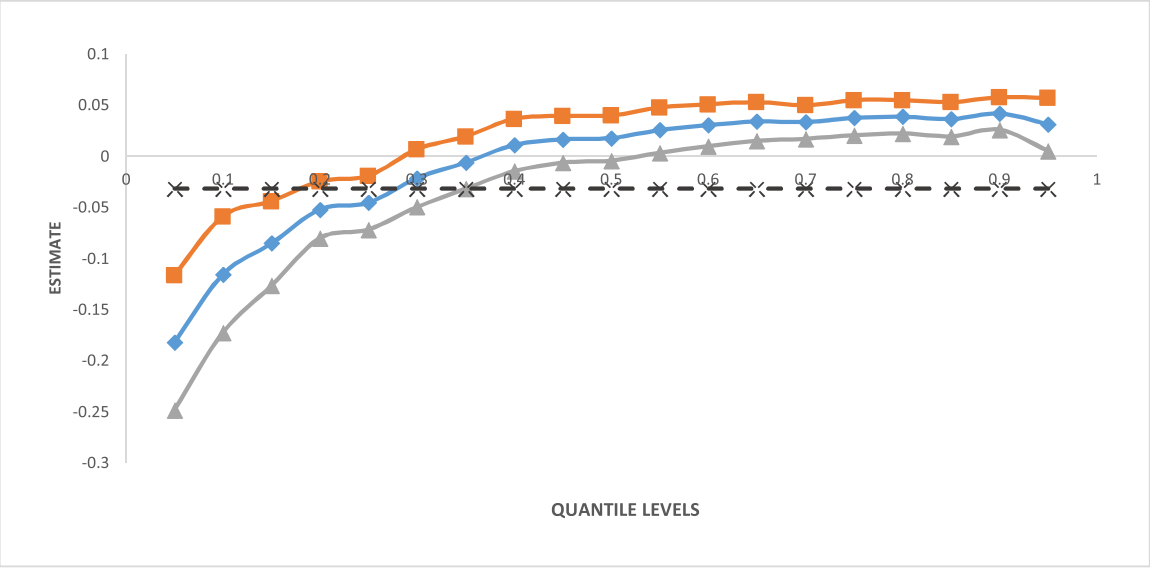

Fig. A1. The impacts of state ownership on SOA across various leverage quantiles with different control variables.

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