Finance Research Letters 50 (2022) 103290

Contents lists available at ScienceDirect

Finance Research Letters

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

# Does minority management affect a firm's capital structure? Evidence from Japan

Rami Zeitun *, Mohamed Goaied, Hisham Al Refai

*Department of Finance and Economics, College of Business and Economics, Qatar University, P.O. Box 2713, Doha, Qatar*

ARTICLE INFO

*Keywords:*
Minority management
Agency problem
Monitoring power
Leverage
Dynamic panel threshold

ABSTRACT

This study evaluates the effect of minority management (MG) on capital structure for a sample of listed Japanese companies over three sectors. We used a dynamic panel, threshold-based model that can control for endogeneity to investigate the linkage between the speed of adjustment of leverage and MG, with the results proving that there is significant linkage between MG and leverage. We also observed that the level of MG has a threshold effect on leverage, such that firms with a high level of MG can reach their optimal leverage faster than those with a low level of MG.

## 1. Introduction

Over the previous few decades, the corporate finance literature has widely recognized the vital role that debt contracts play as an important tool for minimizing the agency problem, which arises due to the shareholders and managers having conflicting interests, as well as disparities between controlling and minority shareholders (Jensen and Meckling, 1976). This is because debt financing helps to bring managers' and shareholders' interests more into alignment. Thus far, various theoretical and empirical studies have focused on how corporate performance is affected by capital structure (e.g., Harris and Raviv, 1991) and managerial ownership (e.g., Morck et al., 1988), as well as the connection between ownership and leverage (e.g., Short et al., 2002; Yusuf and Sulung, 2019; Do et al., 2020; Lee, 2020).

The aim of this study is to examine minority management's influence on corporate financing decisions (capital structure) in Japan using an innovative dynamic panel, threshold-based model. We also investigate the link between leverage's speed of adjustment (SA) and the minority management level. The justification for believing that minority management may affect corporate financing decisions derives from agency theory (Harris and Raviv, 1991; Jensen and Meckling, 1976). It has been argued that minority managers are able to solve complex problems because they bring distinct knowledge and experience, different career qualifications and educational experiences, and exceptional communications skills (Torchia et al., 2011; Miller and Triana, 2009; Bear et al., 2010; Hambrick et al., 1996; Zweigenhaft and Domhoff, 2011; Cox et al., 1991), all of which may help a management team to make the most appropriate decisions, including deciding the optimal leverage ratio for improving a firm's value and performance (e.g., Cannella et al., 2008). It is also argued that they can influence a firm's decision-making process in a way that helps achieve a better balance between different stakeholders' interests (i.e., internal and external) (Francoeur et al., 2008; Carter et al., 2010).

In the literature, corporate managers and the board of directors (BOD) are generally categorized according to ethnicity, gender, culture, and social class (e.g., Zweigenhaft and Domhoff, 2011; Harvey and Maclean, 2010). The literature then relates such factors with their effect on corporate value, governance, and finance decisions based on there being *variety among decision-makers* (VADM) (e.

* Corresponding author.
*E-mail address:* rami.zeitun@qu.edu.qa (R. Zeitun).

https://doi.org/10.1016/j.frl.2022.103290
Received 15 February 2022; Received in revised form 8 June 2022; Accepted 25 August 2022
Available online 28 August 2022

g., Torchia et al., 2011). On the one hand, a significant positive influence of VADM on corporate performance has been documented in previous empirical studies (Miller and Triana, 2009; Torchia et al., 2011), as has a positive significant connection between BOD diversity and both product innovation (i.e., development) and corporate governance (Cook and Glass, 2015; Lee, 2020). On the other hand, VADM can also diminish corporate performance by widening the scope for conflict among managers, which may in turn affect a leveraging decision (Pelled et al., 1999; Hogg et al., 2012). Regardless, although growing importance is attributed to VADM in terms of its effects on corporate strategy, product development, firm performance, and financing decisions, no study has yet provided empirical evidence for the impact of minority management on corporate financing decisions. In this study, we therefore argue that minority managers are more likely to effectively influence corporate financing decisions in a way that enhances corporate value by achieving the optimal leverage ratio. Minority managers could also help mitigate conflicts of interest (i.e., by decreasing the agency problem) between managers and shareholders, since minority managers are able to "exercise power and authority" by providing alternative opinions about corporate financing decisions, which may in turn upsurge a firm's value by achieving the optimal level of leverage (Harris and Raviv, 1991). Moreover, we speculate that the higher the level of minority management in a firm, the faster this firm will adjust to its optimal leverage ratio, implying that the distinguished and diverse characteristics of these managers could help improve the quality of corporate decisions.

Several studies have investigated the managerial power impact on capital structure and documented its significant effect on leverage (e.g., Cronqvist et al., 2012; Jiraporn et al., 2012; Bertrand and Schoar, 2003). For example, Jiraporn et al. (2012) found that firms tend to use a lower level of debt as managerial power (e.g., CEO) increases. Nevertheless, Chintrakarn et al. (2014) argued that managerial power's influence on capital structure is more complicated, suggesting that "the simple linear relation is spurious," so they recommended using nonlinear models when investigating the nexus between managerial power and leverage.

Our paper contributes to the literature in the following aspects: First, it is the first research paper to investigate minority management's effect on corporate financing decisions, at least to the best of our knowledge. Second, it also represents an initial endeavor at providing evidence from Japan using a dynamic panel, threshold-based method for examining the impact of minority management on the determinants of capital structure. Third, this study is innovative in scrutinizing the link between minority management and the speed at which a firm can adjust to its optimal leverage. Fourth, this paper provides a new evidence to the corporate governance literature by linking minority management with corporate leverage. Finally, it is the first study to reveal that the effect of minority management on capital structure has a nonlinear nature. Our results have important policy implications for several stakeholders, including managers, decision-makers, shareholders, and investors. What is more, our research could inspire further empirical and theoretical studies of the relationship between minority management and corporate leverage, as well as other financing decisions.

The remainder of this paper is presented as follows: Section 2 presents the econometrics methodology. Section 3 presents the data and discusses the empirical findings. Section 4 concludes the study and supplies some implications for stakeholders.

## 2. Econometric methodology

For balanced panel data, we used Eq. (1) below to establish the existence of a nonlinear linkage between minority management (Minority-MGT) and corporate leverage.

$$y_{it} = \alpha_i + [X_{it}^{'} \quad y_{it-1}] \begin{bmatrix} \theta_1 \\ \delta_1 \end{bmatrix} I(Minority - MGT_{it} \leq \gamma) + [X_{it}^{'} \quad y_{it-1}] \begin{bmatrix} \theta_2 \\ \delta_2 \end{bmatrix} I(Minority - MGT_{it} \succ \gamma) + \varepsilon_{it} \tag{1}$$

We refer to the firm by $i$ and to the year by $t$, with leverage being denoted by $y$. Minority management was used as a threshold for dividing our sample into two regimes, so we could specify how the independent variables affect leverage. The X vector represents the independent variables (Table 1 defines the independent variables).

In order to calculate the SA and capture the dynamics of leverage, we included the lagged value of leverage as another regressor. To test for the existence of two regimes, $\theta_1, \quad \delta_1$ is the vector of the respective regression slopes for regime 1, while $\theta_2, \quad \delta_2$ is the

**Table 1**
Definitions for dependent and independent variables.

| Variable | Definition |
|---|---|
| Leverage(TD-R) | Total debt/total market value of equity and debt (i.e., total assets) |
| Leverage(SD-TA) | Short-term debt (SD)/market value of equity and debt (i.e., total assets) |
| Leverage(SD-TD) | Short-term debt (SD)/total debt (TD) |
| Profitability (Prof) | Earnings before interest and tax (EBIT)/total assets (TA) |
| Tangibility(FA-TA) | Net fixed assets (NFA)/total assets (TA) |
| Growth(S-GRO) | Annual growth in sales |
| liquidity(LIQU) | Current assets (CA)/current liabilities (CL) |
| Risk(R-OCF) | The standard deviation of operational cash flow for three years, and we alternatively used the Altman Z-score |
| Size | The natural logarithm (Ln) of total assets |
| Minority-MGT | This definition is provided by Bloomberg: "Number of minorities employed in management positions at the company expressed as a percentage of the total group number of employees in management positions. Minorities should be expressed as such by the company." |

equivalent for regime 2. *I*, meanwhile, is a dichotomous function that yields 1 if minority management is less than or equivalent to a certain cutoff value and 0 otherwise.

The dynamic panel threshold technique (DPTT) introduced by Kremer et al. (2013) was adopted for our study, and this is an expansion of Hansen's (1999) innovative work that considered endogenous regressors. We also followed the work of Caner and Hansen (2004) in estimating Eq. (1) so as to overcome endogeneity issues and utilize the GMM method. We also applied the instrumental variable procedure (IVP), where the identified instruments were based on theory, previous studies, and external knowledge. Initially, we used the Arellano and Bover (1995) forward orthogonal deviation method to flush out the firm-specific fixed effect $l$ (Chao et al., 2017; Kurul, 2017). Next, we used the 2SLS method to specify the threshold level for minority management. We initially followed a reduced-form approach for every endogenous variable based on a set of the chosen instruments with their lagged values. In the second stage, the endogenous factors were substituted by their projected values in Eq. (1). Following this, we ran the least-squares estimation method (LSEM) for a fixed threshold γ in order to estimate the threshold value γ by minimizing the designated S(γ) through an iterative process, as expressed in Eq. (2) below:

$$\widehat{\gamma} = \text{argmin},_{\gamma} \mathrm{S}(\gamma) \tag{2}$$

where S(γ) is the resulting sum of squared residuals. The estimated value $\widehat{\gamma}$ is used as a sample categorization for delimitating the estimation technique into regime 1 and regime 2. To estimate the 95% "confidence interval of the threshold (CIOT)", given the critical values, we used Hansen's (2000) test, as shown below in Eq. (3:)

$$\Gamma = \{\gamma : LR(\gamma) \leq C(\alpha)\} \tag{3}$$

where the likelihood ratio is denoted by $LR(\gamma)$and the asymptotic distribution is denoted by $C(\alpha)$. Finally, the slope parameters $\theta_1$, $\delta_1$and $\theta_2$, $\delta_2$ in Eq. (1) were estimated by the GMM method for the specified sub-samples.

## 3. Data and empirical results

### 3.1. Data

Our fully balanced sample comprised 911 publicly listed Japanese firms over three sectors—namely industrials, basic materials, and technology—for the 2008–2018 period, with the most recent years being omitted owing to incomplete data.[1] We collected data for minority management, leverage, and control factors from Bloomberg's database.

The summary statistics for the independent, dependent, and minority management variables are given in Table 2. The average level of minority management was 12.60%, while the average leverage for the firms was 22.6% for the TD-R measure and 9.30% for the SD-TA measure. The average profitability was 3.80%. The inter-correlation matrix for the minority management and control variables showed low correlation, as can be seen in Table 3, so no serious multicollinearity issues were expected during the estimation process.

**Table 2**
Descriptive statistics for the variables.

| Variable | Average | STDV | Minimum | Maximum |
|---|---|---|---|---|
| TD-R | 21.90 | 18.09 | 0.07 | 88.90 |
| SD-TA | 8.05 | 8.23 | 0.04 | 42.10 |
| SD-TD | 19.09 | 21.63 | 0.04 | 94.13 |
| Size | 7.33 | 2.35 | 3.12 | 13.50 |
| FA-TA | 28.17 | 21.37 | 0.15 | 89.64 |
| LIQU | 1.96 | 1.12 | 0.33 | 8.02 |
| S-GRO | 5.85 | 17.31 | -31.05 | 86.45 |
| R-OCF | 21.32 | 114.58 | 0.05 | 321.65 |
| Prof | 3.86 | 4.78 | -11.46 | 21.49 |
| Minority-MGT | 12.99 | 8.67 | 0.00 | 55.00 |

Note: Table 1 defines the variables. The total number of observations was 10021.

[1] Due to the unavailability of data related to minority management and the limited sample size of some sectors, we focused our study on these three sectors. For instance, firms in the oil and gas sector were excluded due to a small sample size. Moreover, we wanted to use balanced panel data, thus limiting our choice of sectors due to missing data.

**Table 3**
Matrix of correlations for independent variables.

| Variables | (i) | (ii) | (iii) | (iv) | (v) | (vi) | (vii) |
|---|---|---|---|---|---|---|---|
| (i) Size | | | | | | | |
| (ii) FA-TA | -0.10* | | | | | | |
| (iii) LIQU | -0.21* | -0.32* | | | | | |
| (iv) S-GRO | 0.067* | -0.042* | -0.028* | | | | |
| (v) R-OCF | 0.35* | -0.048* | -0.101* | -0.013 | | | |
| (vi) Prof | 0.14* | -0.064* | 0.137* | 0.275* | -0.003 | | |
| (vii) Minority-MGT | 0.001 | -0.024* | -0.004 | -0.001 | 0.052* | -0.04* | |

Note: Table 1 defines the variables.

### 3.2. Empirical findings and analysis

The results for the dynamic panel threshold method (DPTM) shown in Table 4 demonstrate that the minority management variable, Minority-MGT, has a significant effect on the Japanese firms' financing decisions. Moreover, the existence of a significant Minority-MGT threshold at 13% confirms the nonlinear nature of minority management's influence on corporate leverage. This estimated threshold split our sample into two regimes: regime 1, where minority management is less than or equal to 13%, and regime 2, where it is above 13%. This finding in itself supported our argument that the level of minority management can significantly influence corporate financing decisions in Japanese firms.

Tangibility (FA-TA), profitability (Prof), liquidity (LIQU), and size (Size) are significant determinants of capital structure in both regimes, but risk (R-OCF) is only significant in regime 1, while growth (S-GRO) is insignificant in both regimes. Interestingly, as determinates of leverage, the economic importance of tangibility (FA-TA), profitability (Prof), and size (Size) increases at higher levels of minority management, while the economic importance of liquidity (LIQU) decreases at higher levels of minority management. These observations imply that the level of minority management and the threshold can influence decisions based on the determinants of capital structure, with their importance varying for different regimes.

The SA for reaching a targeted leverage position is also affected by the level of minority management. More specifically, the SA was 18.2% in regime 1 and 18.7% in regime 2, implying that firms with a high level of minority management can achieve optimal leverage faster than firms with a low level of minority management. It therefore seems that in addition to influencing decisions about a firm's corporate leverage, the level of minority management also participates in determining the SA to an optimal leverage position. This supports our argument that a higher level of minority management brings diverse, distinguished qualities that can enhance corporate decision-making (e.g., Bear et al., 2010; Miller and Triana, 2009; Torchia et al., 2011). It also suggests a reduced agency problem

**Table 4**
Dynamic panel threshold estimation (DPTE) using the GMM system for TD-R leverage.

| | **Regime 1** | | **Regime 2** |
|---|---|---|---|
| TD-R(t-1) | 0.818*** | | 0.813*** |
| | (0.0325) | | (0.0306) |
| FA-TA(t) | 0.0364*** | | 0.0445*** |
| | (0.0104) | | (0.0119) |
| S-GRO(t) | 0.0009 | | 0.00368 |
| | (0.0132) | | (0.016) |
| LIQU(t) | -0.903*** | | -0.777*** |
| | (0.206) | | (0.299) |
| R-OCF(t) | -0.00042** | | -0.000054 |
| | (0.0002) | | (0.0002) |
| Size(t) | 0.683*** | | 0.695*** |
| | (0.11) | | (0.136) |
| Prof(t) | -0.382*** | | -0.461*** |
| | (0.0849) | | (0.0934) |
| ***Observations*** | 5559 | | 3558 |
| ***Threshold estimates: 95% Confidence interval*** | | $\hat{\gamma}$ **=13% [12.2% 13.4%] | |

Notes: Every regime encompasses at least 5% of the total number observations, as indicated by Hansen (1999). Table 1 defines the variables. The lagged value for TD-R (t-2) is used as an instrument for TD-R(t-1). Lagged values for asset growth, returned earnings to total assets, and the natural log (Ln) of net fixed assets are used as instruments for S-GRO(t). Lagged values of the Altman Z-score and working capital to total assets are used as instruments for R-OCF. Lagged values of Prof and the Altman Z-score are used as instruments for Prof. SA for TD-R in regime 1 is 18.2% (1–0.818), which is about 5.50 years, while the SA for TD-R in regime 2 is 18.7% (1–0.813), which is about 5.35 years (1/18.7%). Standard errors are shown in parentheses. **, and *** indicate significance at less than 5% and 1%, respectively.

**Table 5**
Threshold estimates by sector.

| Sectors | Threshold level |
|---|---|
| Industrials | NS |
| Basic materials | $\widehat{\gamma}$***=13% [12.2 14.77] |
| Technology | $\widehat{\gamma}$**=4.6% [4.1 4.9] |

Notes: NS. Not significant. $\widehat{\gamma}$ is the cutoff point (threshold level). **, and *** indicate significance at less than 5% and 1%, respectively.

**Table 6**
Threshold effect test using different measures of capital structure.

| Leverage Indicators | Threshold Level (cutoff point) |
|---|---|
| TD-R | $\widehat{\gamma}$**=13% [12.2% 13.4%] |
| SD-TD | $\widehat{\gamma}$***=36% |
| SD-TA | $\widehat{\gamma}$**=7% [5.5% 8%] |

Notes: Table 1 defines the variables. NS. Not significant. $\widehat{\gamma}$ is the cutoff point (threshold level). **, and *** indicate significance at less than 5% and 1%, respectively.

between insider and outsider stakeholders, which is consistent with the literature (e.g., Francoeur et al., 2008; Carter et al., 2010; Cook and Glass, 2015).

We also looked at whether the threshold effect for leverage presents in different sectors differently. Table 5 reports the threshold tests for the three sectors, showing that the threshold effect of minority management on capital structure is most pronounced in the basic materials and technology sectors, while it is insignificant for the industrials sector. The highest cutoff point (13%) was found for the basic materials sector, followed by the technology sector with a cutoff point of 4.6%. The threshold level is therefore affected by industry sector, which explains the significant influence of minority management on corporate decisions, including financing ones. The low level of minority managers in the technology sector reflects their influence on financing decisions in this sector, since such a sector typically depends more on innovation and product development, which are vital for decision-makers in private and public sectors.

We used other measures of capital structure to validate the robustness of our results, as shown in Table 6, Appendix 1, and Appendix 3. The results reported in Table 6 confirm the validity of our findings in Table 4 and prove that there is also a threshold effect of minority management when using the alternative measures of leverage (i.e., SD-TA and SD-TD). The thresholds are highly significant at cutoff points of 7% and 36% for SD-TA and SD-TD, respectively, so our findings can be deemed valid. Appendix 1 provides a detailed regression for the SD-TA alternative measure of leverage. What is more, further estimations were conducted using additional determinants of leverage (firm factors), external factors (e.g., SMTV_GDP), and alternative measures for the determinants of leverage (see Appendices 2, 3, and 4), further proving the existence of a threshold effect for minority management and confirming the robustness and validity of our findings.

## 4. Conclusion and policy implications

This study represents an early attempt to examine the influence of minority management on corporate leverage for a sample of listed Japanese companies. Its results support the notion that minority management influences a firm's leverage. Furthermore, we have provided evidence to confirm the existence of a threshold-based impact for this influence, thus confirming that this relationship has a nonlinear nature. In addition, the speed for a firm to adjust to its optimal leverage position is also affected by the level of minority management. Moreover, we find that the threshold level for minority management's influence on corporate financing decisions vary according to the particular sector. We also conducted several robustness tests to validate our results based on alternative measures of leverage (See Table 6 and Appendices 1 and 3), additional determinants, and alternative measures for the determinants of leverage (see Appendices 2, 3, and 4), therefore confirming the validity and the robustness of our results.

These findings have important implications for various stakeholders (e.g., managers, decision-makers, shareholders, and investors), as well as the relevant Japanese authorities. For example, public authorities could initiate and promote programs and develop certain policies with the aim of increasing the level of minority management in firms, seeing as high levels of minority management seem to enhance corporate financing decisions in terms of the optimal leverage. What is more, the number of minority managers should also be considered by individual firms due to the role this can play in balancing the various stakeholders' interests and minimizing the agency problem.

Nonetheless, this study is not without limitations. First, the definition of minority management we used was restricted to that provided by Bloomberg for its data, so future studies could consider other aspects that may determine minority status, such as nationality and gender. Second, the sample is limited to Japanese firms, so more countries could be considered in future studies to gain a wider understanding of minority management's effect on leverage.

## CRediT authorship contribution statement

**Rami Zeitun:** Conceptualization, Methodology, Data curation, Validation, Visualization, Writing – original draft. **Mohamed Goaied:** Methodology, Software, Writing – review & editing. **Hisham Al Refai:** Writing – review & editing.

## Declaration of Competing Interest

There is no conflict of interest to declare when writing this paper.

## Acknowledgement

We would like to thank the Editor-in-Chief Prof. Jonathan Batten and the anonymous reviewers for their helpful comments and suggestions. Other errors are our own. Open Access funding provided by the Qatar National Library.

## Appendix

**Appendix 1**
Dynamic panel threshold estimation (DPTE) using the GMM system with the SD-TA leverage measure for the basic model.

| | Regime 1 | Regime 2 | |
|---|---|---|---|
| SD-TA(t-1) | 0.664*** | 0.751*** | |
| | (0.0366) | (0.0230) | |
| FA-TA(t) | -0.0174*** | -0.0147*** | |
| | (0.00503) | (0.00326) | |
| S-GRO(t) | 0.00536 | 0.0389*** | |
| | (0.0123) | (0.00946) | |
| LIQU(t) | -1.800*** | -1.693*** | |
| | (0.142) | (0.103) | |
| R-OCF(t) | 0.000111 | 0.000198* | |
| | (0.000178) | (0.000112) | |
| Size(t) | -0.252*** | -0.238*** | |
| | (0.0628) | (0.0584) | |
| Prof(t) | -0.200*** | -0.272*** | |
| | (0.0618) | (0.0414) | |
| constant | 9.131*** | 7.962*** | |
| | (0.906) | (0.697) | |
| *N* | 2894 | 6223 | |
| ***Threshold estimates: 95% Confidence interval*** | | | $\hat{\gamma}$**=7% [5.5% 8%] |

Notes: This appendix presents the results for the DPTE with the SD-TA leverage ratio. Every regime encompasses at least 5% of the total number of observations, as indicated by Hansen (1999). Table 1 defines the variables. The lagged value for SD-TA(t-2) is used as an instrument for SD-TA(t-1). Lagged values for asset growth, returned earning to total assets, and the natural log (Ln) of net fixed assets are used as instruments for S-GRO(t). Lagged values of the Altman Z-score and working capital to total assets are used as instruments for R-OCF. Lagged values of Prof and the Altman Z-score are used as instruments for Prof. Speed of adjustment (SA) for SD-TA in regime 1 is 33.6% (1–0.664), which is about 2.98 years, while SA for SD-TA in regime 2 is 24.9% (1–0.751), which is about 4.02 years. Standard errors are shown in parentheses. *, **, and *** indicate significance at less than 10%, 5% and 1%, respectively.

**Appendix 2**
Dynamic panel threshold estimation (DPTE) with TD-R using additional determinants of leverage (a firm's factors) and alternative measures for growth and size determinants.

| | **Extended Model** | | **Modified Model** | | **Extended Modified Model** | |
|---|---|---|---|---|---|---|
| | Regime 1 | Regime 2 | Regime 1 | Regime 2 | Regime 1 | Regime |
| TD-R (t-1) | 0.773*** | 0.829*** | 0.774*** | 0.814*** | 0.774*** | 0.820*** |
| | (0.0147) | (0.0160) | (0.0146) | (0.0165) | (0.0146) | (0.0161) |
| FA-TA(t) | 0.0380*** | 0.0428*** | 0.0402*** | 0.0439*** | 0.0401*** | 0.0450*** |
| | (0.00437) | (0.00621) | (0.00447) | (0.00616) | (0.00447) | (0.00605) |

(*continued on next page*)

**Appendix 2** (*continued*)

| | **Extended Model** | | **Modified Model** | | **Extended Modified Model** | |
|---|---|---|---|---|---|---|
| | Regime 1 | Regime 2 | Regime 1 | Regime 2 | Regime 1 | Regime |
| S-GRO(t) | 0.0138 | 0.0145 | | | | |
| | (0.00981) | (0.0128) | | | | |
| LIQU(t) | -1.110*** | -0.320** | -1.057*** | -0.600*** | -1.061*** | -0.463** |
| | (0.103) | (0.152) | (0.102) | (0.152) | (0.102) | (0.149) |
| R-OCF(t) | -0.000364** | -0.000157 | -0.000251 | -0.000147 | -0.000247 | -0.000136 |
| | (0.000169) | (0.000121) | (0.000168) | (0.000122) | (0.000168) | (0.000120) |
| Size(t) | 0.720*** | 0.464*** | | | | |
| | (0.0593) | (0.0707) | | | | |
| Prof(t) | -0.429*** | -0.449*** | -0.529*** | -0.362*** | -0.531*** | -0.376*** |
| | (0.0459) | (0.0567) | (0.0503) | (0.0550) | (0.0503) | (0.0541) |
| DIVID(t) | -0.154 | -33.30*** | | | -0.136 | -35.82*** |
| | (0.136) | (2.844) | | | (0.137) | (2.687) |
| RETA(t) | 0.0590*** | 0.0405 | | | 0.0652** | 0.0390 |
| | (0.0208) | (0.0288) | | | (0.0210) | (0.0287) |
| TOB-Q(t) | | | 2.014*** | -0.251 | 2.024*** | -0.587* |
| | | | (0.290) | (0.329) | (0.290) | (0.329) |
| Size2(t) | | | 0.425*** | 0.655*** | 0.426*** | 0.367*** |
| | | | (0.0550) | (0.0803) | (0.0549) | (0.0753) |
| Constant | 1.570*** | -0.196 | 1.631** | 0.211 | 1.561** | 1.390** |
| | (0.472) | (0.675) | (0.574) | (0.776) | (0.575) | (0.769) |
| *N* | 6144 | 2973 | 6144 | 2973 | 6144 | 2973 |
| ***Threshold estimates: 95% Confidence interval*** | $\widehat{\gamma}^{***}$=15% [13.7% 15.9%] | | $\widehat{\gamma}^{**}$=15% [13.8% 15.9%] | | $\widehat{\gamma}^{***}$ =15% [13.8% 15.9%] | |

**Notes**: This appendix presents results for the DPTE with the TD-R leverage ratio. Every regime encompasses at least 5% of the total number of observations, as indicated by Hansen (1999). Table 1 defines the variables. The firm-specific variables (FA-TA, S-GRO, LIQU, R-OCF, Size and Prof) with slope coefficients switching between the two regimes (1 and 2) depend on the value of minority management. The lagged value for TD-R (t-2) is used as an instrument for TD-R(t-1). Lagged values for asset growth, returned earning to total assets, and the natural log (Ln) of net fixed assets are used as instruments for S-GRO(t). Lagged values of the Altman Z-score and working capital to total assets are used as instruments for R-OCF. Lagged values of Prof and the Altman Z-score are used as instruments for Prof. Estimation results for the extended model, including additional factors DIVID (dividends paid to common equity) and RETA (retained earnings to total assets), are presented in columns 1 and 2. Columns 3 and 4 present the estimation results of the Modified Model, where S-GRO and Size are replaced respectively by TOB_Q (market value of the company divided by the total assets of the company) and Size2 (Ln of sales). We also used the Ln of the market capitalization of the company as an alternative measure of size, leading to similar results. The quick ratio (current assets - inventory to current liability) is also used as alternative measure of LIQU, and again we obtained similar results. Columns 5 and 6 include the results of the extended modified model with DIVID and RETA as additional factors. There is a weak correlation (ranging from 0.06 to 0.30) between the new variables used (DIVID, RETA, TOB-Q, and Size2) and other independent variables, so no serious multicollinearity issues were expected during the new estimation process obtained in this appendix. Standard errors are shown in parentheses. **, and *** indicate significance at less than 5% and 1%, respectively.

**Appendix 3**

Dynamic panel threshold estimation (DPTE) with SD-TA when using additional determinants of leverage (a firm's factors) and alternative measures for growth and size determinants.

| | **Extended Model** | | **Modified Model** | | **Extended Modified Model** | |
|---|---|---|---|---|---|---|
| | Regime 1 | Regime 2 | Regime 1 | Regime 2 | Regime 1 | Regime 2 |
| SD-TA(t-1) | 0.673*** | 0.751*** | 0.620*** | 0.728*** | 0.629*** | 0.728*** |
| | (0.0369) | (0.0230) | (0.0359) | (0.0226) | (0.0358) | (0.0226) |
| FA-TA(t) | -0.0176*** | -0.0147*** | -0.0182*** | -0.0210*** | -0.0184*** | -0.0210*** |
| | (0.00506) | (0.00326) | (0.00478) | (0.00321) | (0.00482) | (0.00321) |
| S-GRO(t) | 0.00541 | 0.0389*** | | | | |
| | (0.0125) | (0.00946) | | | | |
| LIQU(t) | -1.783*** | -1.692*** | -2.080*** | -1.969*** | -2.059*** | -1.969*** |
| | (0.146) | (0.103) | (0.134) | (0.101) | (0.135) | (0.101) |

(*continued on next page*)

**Appendix 3** (*continued*)

| | **Extended Model** | | **Modified Model** | | **Extended Modified Model** | |
|---|---|---|---|---|---|---|
| | Regime 1 | Regime 2 | Regime 1 | Regime 2 | Regime 1 | Regime 2 |
| R-OCF(t) | 0.000110 | 0.000197* | 0.000110 | 0.000206* | 0.000111 | 0.000205* |
| | (0.000180) | (0.000112) | (0.000167) | (0.000109) | (0.000169) | (0.000109) |
| Size(t) | -0.256*** | -0.239*** | | | | |
| | (0.0631) | (0.0584) | | | | |
| Prof(t) | -0.194*** | -0.272*** | -0.128** | -0.202*** | -0.126** | -0.201*** |
| | (0.0610) | (0.0414) | (0.0587) | (0.0425) | (0.0590) | (0.0425) |
| DIVID(t) | -2.254 | -0.0432 | | | -1.677 | -0.0270 |
| | (1.728) | (0.137) | | | (1.553) | (0.133) |
| RETA(t) | 0.0258 | -0.0120 | | | 0.0184 | -0.00859 |
| | (0.0284) | (0.0203) | | | (0.0275) | (0.0199) |
| TOB-Q(t) | | | -0.143 | 0.333 | -0.118 | 0.332 |
| | | | (0.340) | (0.247) | (0.342) | (0.247) |
| Size2(t) | | | -0.398*** | -0.429*** | -0.400*** | -0.429*** |
| | | | (0.0627) | (0.0583) | (0.0630) | (0.0583) |
| Constant | 8.946*** | 7.978*** | 11.13*** | 9.739*** | 10.94*** | 9.753*** |
| | (0.915) | (0.698) | (0.970) | (0.729) | (0.970) | (0.730) |
| ***Observations*** | 2894 | 6223 | 2913 | 6204 | 2913 | 6204 |
| ***Threshold estimates:*** | | $\widehat{\gamma}^{***}$=7% | | $\widehat{\gamma}^{**}$=8% | | $\widehat{\gamma}^{**}$=8% |
| ***95% Confidence interval*** | | [5.5% 8%] | | [6% 8.8%] | | [6% 8.8%] |

**Notes**: This appendix presents results for the DPTE with the SD-TA leverage ratio. Every regime encompasses at least 5% of the total number of observations, as indicated by Hansen (1999). Table 1 defines the variables. The firm-specific variables (FA-TA, S-GRO, LIQU, R-OCF, Size and Prof) with slope coefficients switching between the two regimes (1 and 2) depends on the value of minority management. The lagged value for SD-TA (t-2) is used as an instrument for SD-TA (t-1). Lagged values for asset growth, returned earning to total assets, and the natural log of net fixed assets are used as instruments for S-GRO(t). Lagged values of the Altman Z-score and working capital to total assets are used as instruments for R-OCF. Lagged values of Prof and the Altman Z-score are used as instruments for Prof. Estimation results for the extended model, including the additional factors DIVID (dividends paid to common equity) and RETA (retained earnings to total assets), are presented in columns 1 and 2. Columns 3 and 4 present the estimation results of the Modified Model, where S-GRO and Size are replaced, respectively, by TOB-Q (market value of the company divided by the total assets of the company) and Size2 (Ln of sales). We also used the Ln of the market capitalization of the company as an alternative measure of size and yielded similar results. The quick ratio (current assets minus inventory to current liability) is also used as alternative measure of LIQU, again leading to similar results. Columns 5 and 6 include the results of the extended modified model with DIVID and RETA as additional factors. There is a weak correlation (ranging from 0.06 to 0.30) between the new variables used (DIVID, RETA, TOB-Q, and Size2) and other independent variables, so no serious multicollinearity issues were expected during the new estimation process obtained in this appendix. Standard errors are shown in parentheses. ***, **, and * indicate significance at less than 1%, 5% and 10%, respectively.

**Appendix 4**

Dynamic panel threshold estimation (DPTE) with TD-R and SD-TA and an external determinant of leverage (Stock market value to GDP).

| | TD-R | | SD-TA | |
|---|---|---|---|---|
| | Regime 1 | Regime 2 | Regime 1 | Regime 2 |
| TD-R (t-1) | 0.803*** | 0.844*** | | |
| | (0.0154) | (0.0171) | | |
| SD-TA(t-1) | | | 0.665*** | 0.757*** |
| | | | (0.0364) | (0.0230) |
| FA-TA(t) | 0.0323*** | 0.0312*** | -0.0180*** | -0.0149*** |
| | (0.00472) | (0.00585) | (0.00503) | (0.00327) |
| S-GRO(t) | -0.00636 | -0.00197 | -0.000148 | 0.0333*** |
| | (0.0103) | (0.0125) | (0.0124) | (0.00957) |
| LIQU(t) | -0.921*** | -0.468*** | -1.765*** | -1.665*** |
| | (0.103) | (0.159) | (0.142) | (0.103) |
| R-OCF(t) | -0.000273 | -0.000107 | 0.000104 | 0.000208 |
| | (0.000169) | (0.000126) | (0.000178) | (0.000112) |
| Size(t) | 0.683*** | 0.692*** | -0.237*** | -0.222*** |

(*continued on next page*)

**Appendix 4** (*continued*)

| | TD-R | | SD-TA | |
|---|---|---|---|---|
| | Regime 1 | Regime 2 | Regime 1 | Regime 2 |
| | (0.0619) | (0.0728) | (0.0628) | (0.0585) |
| Prof(t) | -0.401*** | -0.395*** | -0.214*** | -0.271*** |
| | (0.0483) | (0.0541) | (0.0615) | (0.0414) |
| SMTV_GDP(t) | 0.0179*** | 0.0180*** | 0.00979*** | 0.00778*** |
| | (0.00200) | (0.00264) | (0.00256) | (0.00188) |
| Constant | -0.757 | -2.596*** | 8.045*** | 6.990*** |
| | (0.541) | (0.766) | (0.953) | (0.740) |
| *N* | 5559 | 3558 | 2894 | 6223 |
| ***Threshold estimates:*** | | | $\hat{\gamma}$**=13% $\hat{\gamma}$**=7% | |
| ***95% Confidence interval*** | | | [12.3% 14.67%] [6% 8.8%] | |

**Notes**: This appendix presents results for the DPTE with the TD-R and SD-TA leverage ratios. Every regime encompasses at least 5% of the total number of observations, as indicated by Hansen (1999). Table 1 defines the variables. The firm-specific variables (FA-TA, S-GRO, LIQU, R-OCF, Size and Prof) and external determinant of leverage (SMTV_GDP) with slope coefficients switching between the two regimes (1 and 2) depend on the value of minority management. SMTV_GDP is defined as the value of stock market capitalization divided by gross domestic product (GDP). We denote TD-R or SD-TA as a dependent variable. The lagged value for TD-R (t-2) is used as an instrument for TD-R(t-1), while the lagged value for SD-TA (t-2) is used as an instrument for SD-TA (t-1). Lagged values for asset growth, returned earning to total assets, and the natural log (Ln) of net fixed assets are used as instruments for S-GRO(t). Lagged values of the Altman Z-score and working capital to total assets are used as instruments for R-OCF. Lagged values of Prof and the Altman Z-score are used as instruments for Prof. Speed of adjustment (SA) for TD-R in regime 1 is 19.7% (1–0.803), which is about 5.08 years, while SA for TD-R in regime 2 is 15.6% (1–0.844), which is about 6.4 years. SA for SD-TA in regime 1 is 33.5% (1–0.665), which is about 2.99 years, while SA for SD-TA in regime 2 is 24.3% (1–0.757), which is about 4.12 years. There is a weak correlation (ranging from 0.09 to 0.17) between the new variable used (SMTV_GDP) and other independent variables, so no serious multicollinearity issues were expected during the new estimation process obtained in this appendix. Standard errors are shown in parentheses. ***, **, and * indicate significance at less than 1%, 5% and 10%, respectively.

## References


Arellano, M., Bover, O., 1995. Another look at the instrumental variable estimation of error-component models. J. Econ. 68, 29–52.

Bear, S., Rahman, N., Post, C., 2010. The impact of board diversity and gender composition on corporate social responsibility and firm reputation. J. Bus. Ethics 97, 207–221.

Bertrand, M., Schoar, A., 2003. Managing with style: the effect of managers on firm policies. Q. J. Econ. 118 (4), 1169–1208.

Cannella, A.A., Park, J., Lee, H., 2008. Top management team functional background diversity and firm performance: examining the roles of team member co-location and environmental uncertainty. Acad. Manag. J. 51, 768–784.

Caner, M., Hansen, B.E., 2004. Instrumental variable estimation of a threshold model. Econ. Theory 20, 813–843.

Carter, D., D'Souza, F., Simkins, B., Simpson, W.G., 2010. The gender and ethnic diversity of US boards and board committees and firm financial performance. Corporate Governance: An Int. Rev. 18 (5), 396–414.

Chao, C.C., Hu, M., Munir, Q., Li, T., 2017. The impact of CEO power on corporate capital structure: new evidence from dynamic panel threshold analysis. Int. Rev. Econ. Financ. 51, 107–120.

Chintrakarn, P., Jiraporn, P., Singh, M., 2014. Powerful CEOs and capital structure decisions: evidence from the CEO pay slice (CPS). Appl. Econ. Lett. 21 (8), 564–568.

Cook, A., Glass, C., 2015. Do minority leaders affect corporate practice? analyzing the effect of leadership composition on governance and product development. Strategic Organ. 13 (2), 117–140.

Cox, T.H., Lobel, S.A., McLeod, P.L., 1991. Effects of ethnic group cultural differences on cooperative and competitive behavior on a group task. Acad. Manag. J. 34, 827–847.

Cronqvist, H., Makhija, A.K., Yonker, S.E., 2012. Behavioral consistency in corporate finance: CEO personal and corporate leverage. J. Financ. Econ. 103 (1), 20–40.

Do, T.K., Lai, T.N., Tran, T.T.C., 2020. Foreign ownership and capital structure dynamics. Financ. Res. Lett. 36.

Francoeur, C., Labelle, R., Sinclair-Desgagne, B., 2008. Gender diversity in corporate governance and top management. J. Bus. Ethics 81, 83–95.

Hambrick, D., Cho, T., Chen, M., 1996. The influence of top management team heterogeneity on firms' competitive moves. Adm. Sci. Q. 41 (4), 659–684.

Hansen, B.E., 1999. Threshold effects in non-dynamic panels: estimation, testing, and inference. J. Econ. 93 (2), 345–368.

Harvey, C., Maclean, M., 2010. Transnational boards and governance regimes: a franco-British comparison. In: Djelic, M.L., Quack, S. (Eds.), Transnational Communities. Cambridge University Press, Cambridge, pp. 107–129.

Harris, M., Raviv, A., 1991. The theory of capital structure. J. Financ. 46 (2), 297–355.

Hogg, M., van Knippenberg, D., Rast, D, 2012. Intergroup leadership in organizations: leading cross group and organizational boundaries. Acad. Manag. Rev. 37 (2), 232–255.

Jensen, M., Meckling, W., 1976. Theory of the firm: managerial behavior, agency costs and ownership structure. J. Financ. Econ. 3, 305–360.

Jiraporn, P., Chintrakarn, P., Liu, Y., 2012. Capital structure, CEO dominance, and corporate performance. J. Financ. Services Res. 42 (3), 139–158.

Kremer, S., Bick, A., Nautz, D., 2013. Inflation and growth: new evidence from a dynamic panel threshold analysis. Empir. Econ. 44, 861–878.

Kurul, Z., 2017. Nonlinear relationship between institutional factors and FDI flows: dynamic panel threshold analysis. Int. Rev. Econ. Financ. 48, 148–160.

Lee, G., 2020. Does CEO inside debt promote corporate innovation? Financ. Res. Lett. 37.

Miller, T., Triana, M.D.C., 2009. Demographic diversity in the boardroom: mediators of the board diversity-firm performance relationship. J. Manag. Stud. 46 (5), 755–786.

Morck, R., Shleifer, A., Vishny, R., 1988. Management ownership and market valuation: an empirical analysis. J. Financ. Econ. 20, 293–316.

Pelled, L.H., Eisenhardt, K.M., Xin, K.R., 1999. Exploring the black box: an analysis of work group diversity, conflict and performance. Adm. Sci. Q. 44, 1–28.

Short, H., Keasey, K., Duxbury, D., 2002. Capital structure, management ownership and large external shareholders: a UK analysis. Int. J. Econ. Bus. 9 (3), .375–.399.

Torchia, M., Calabro, A., Huse, M., 2011. Women directors on corporate boards: from Tokenism to critical mass. J. Bus. Ethics 102, 299–317.

Yusuf, M.R., Sulung, L.A.K., 2019. Experience, board size, and firm capital structure. Adv. Social Sci. Educ. Humanities Res. 348.

Zweigenhaft, R., Domhoff, G.W., 2011. The New CEOs: Women, African American, Latino and Asian American Leaders of Fortune 500 Companies. Rowman & Littlefield, New York.