

# “Dynamic capital structure in China: determinants and adjustment speed”

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## Dynamic capital structure in China: determinants and adjustment speed

### Abstract

This paper examines the determinants and adjustment speed of capital structure by using a dynamic panel data, two-step system GMM estimator with the latest data covering the years 2008-2013 in China. The results present a significant difference in the determinants and adjustment speed of capital structure compared to past studies. The authors find that firms adjust debt ratio towards leverage targets at speeds of 37% per annum, yielding a half-life of 1.52 years. Next, it is found that the profitability is no longer a core determinant of capital structure in Chinese listed firms. In addition, the results point out that the capital structure decision is not only affected by financial variables, but is also significantly influenced by human resource factors.

**Keywords:** China, dynamic capital structure, developing country, GMM.

**JEL Classification:** G32, 100.

### Introduction

Prior studies revealed that many firms adjusted debt leverage towards a leverage target. This implies that firms have a strategy capital structure and correct deviations from the targeted debt leverage instantaneously by adjusting debt-equity ratio (e.g. Qian et al., 2009; DeAngelo et al., 2011; Ebrahim et al., 2014). These decisions have important influence on firms' investment decisions, cost of capital and expected returns, and firm value. In this paper we pursue an explanation of the decisions by examining both the determinants and adjustment speed of capital structure.

To be specific, the objective of this paper is presented by two main aims. The first aim is to find the determinants of capital structure on the basis of a set of firm-specific variables; namely, profitability, firm size, non-debt tax shield, growth, dividend, and liquidity. Meanwhile, influence of macroeconomic and human resource factors on capital structure decision of firms have emerged as a reasonable aspect and attracted a growing attention in recent years (e.g., Frank and Goyal, 2009; Fan et al., 2012; Mokhova and Zinecker, 2014; Kale et al., 2007, 2013). With reference to these studies, we include inflation, government debt to GDP, employment size, employee productivity, and employment in industry to the empirical model. We examine relationships by three models to establish whether the capital structure decisions are explained by both macroeconomic and human resource factors, as well as firm-specific variables.

The second aim is to identify dynamic capital structure and the adjustment speed of the structure. We examine if firms adjust deviations from leverage targets instantaneously. We analyze the speed on the three models in order to recognize if firms respond to deviations in different speeds according to the determinants of capital structure involved. By observing the relationships between leverages in year  $t-1$  and  $t$ , we estimate the adjustment speed for Chinese listed firms to provide evidence from an emerging market.

We source firm-specific panel data on 663 Chinese A-share listed firms covering 2008-2013, yielding 3,978 firm-year observations. We use the dynamic panel-data, two-step system GMM model (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998) to establish the dynamic capital structure of Chinese firms, and regression analysis to identify the determinants of the dynamic capital structure.

In preview, the results show that firms in China set leverage targets and adjust debt leverage towards the optimal capital structure at speeds of 37% per annum, without being affected by whether the human resource factors are involved or not. The analysis of the determinants of capital structure report that firm size and non-debt tax shield are the most important determinants, rather than profitability, as reported by past studies (e.g., Huang and Song, 2006; Qian et al., 2009). The capital structure decision is also significantly affected by human resource factors.

The remainder of the paper is as follows. Section 1 presents literature review. Section 2 explains the research design including data source and research method. Section 3 reports the results and discussion of determinants and adjustment speed of capital structure. Finally, the last Section presents the conclusion.

### 1. Literature review

**1.1. Dynamic capital structure.** Our proxy of capital structure is debt leverage. Debt leverage can

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be measured in various ways. Some studies argue that book value has an efficient function in investigation of firm financial behaviors. Due to its effective explanation of assets in place with a stable price and the fact that managers prefer to make financial decisions based on book value, since it's costly for firms to adjust assets value responding to market condition (e.g., Myers, 1997; and Graham and Harvey, 2001). In this study, we measure debt leverage by the book total debt to book total assets.

There are also some studies which have examined dynamic capital structure by modelling lagged debt leverage. For instance, Guney et al. (2011) present a dynamic capital structure, by which they show an adjustment speed of 36% for Chinese firms. Ebrahim et al. (2014) state a speed of 28% with dynamic capital structure for Malaysia firms. This means debt leverage is inherently dynamic with different speeds. Applying these findings to our study, we apply lagged debt leverage into dynamic panel data model to formulate a dynamic capital structure, furthermore, to identify adjustment speed.

**1.2. Determinants of capital structure.** The independent variables of this study are firm's financial, macroeconomic, and human resource factors. We observe some of the most agreeable firm financial variables which have been used to explain firm capital structure in both developing and developed countries. They are profitability, firm size, growth, non-debt tax shield, dividend, and liquidity. For the macroeconomic factors, we observe inflation and government debt to GDP. Employment size, employee productivity, and employment in industry are investigated as proxy of human resource effects. We next discuss the factors regarding findings of past studies.

*Profitability:* The pecking order theory states that firms prefer internal funds to external source (Myers, 1984). Agency theory suggests high profitable firms tend to raise more debt in order to reduce agency cost resulted from managers' misusing of free cash flow (Jensen, 1986). Baskin (1989) argues that past profits have a significant implication for current debt leverage. We use both current and lagged profitability to examine capital structure decision, which is measured by earnings before interest and tax.

*Firm size:* Firm size is one of the traditional variables in prior researches on capital structure. Studies show that large firms have more stable profitability and cash flow which result in lower risk of bankruptcy, and, therefore, they can obtain higher debt from external source (Fama and French, 2005; Frank and Goyal, 2009). In contrast, Titman and Wessels (1988) show that firm size is inversely related to debt leverage

since large firms have more advantage to issue equity than do small firms. We observe firm size measured by logarithm of total book assets.

*Non-debt tax shield:* Non-debt tax shield is another traditional variable popularly analyzed by studies. Trade-off theory states that firms tend to raise more debt when they can benefit from high tax shield. This conjecture predicts an inverse relationship between non-debt tax shield and debt leverage (DeAngelo and Masulis, 1980). We measure non-debt tax shield by sum of depreciation and amortization to total assets.

*Growth:* Some studies predict that growth and debt leverage are inversely related because firms have easy access to equity fund when they are perceived as having high market growth opportunity (e.g. Myers and Majluf, 1984; Frank and Goyal, 2009). However, Guney et al. (2011) state a positive impact of growth for debt decision. Shyam-Sunder and Myers (1999) suggest that the change of book assets plays role in capital structure decision due to its direct effect on financial deficit. In this paper, we examine firm size by both book asset growth and market growth opportunity. They are measured by growth rate of book total assets and market to book ratio of assets.

*Dividend:* A few studies have examined dividend on capital structure. Jensen et al. (1992) state that the impact of dividend can be either positive or negative, since firms make dividend decisions by trading off fixed financial charges. Chen et al. (2009) report a positive relationship between dividend and debt leverage for Chinese firms because firms deliberately tunnel profits to shareholders via dividend. We use dividend per share in this study to measure its impact on debt leverage.

*Liquidity:* Leary and Roberts (2010) state that some firms tend to reserve debt capacity for future investment, or to avoid negative results of underinvestment problems associated to high debt leverage. Agency cost theory suggests that firms raise debt in order to reduce free cash flow by paying interest (Jensen, 1986). Guney et al. (2011) report that higher liquidity measured by current ratio lead to lower debt but higher collateral predicts higher debt for Chinese firms. To account for these mixed findings, we use current ratio, cash from operation, and cash and marketable securities to deeply investigate the impact of liquidity. In addition, we also observe quick ratio to identify collateral function in liquidity because quick ratio is obtained by excluding inventories from current ratio.

*Macroeconomic factors:* In operation terms, firm financial behaviors are influenced by macroeconomic policy and condition. Studies state that

inflation has significant impact on capital structure. Since a higher inflation rate creates greater interest tax shields for firms (e.g., Frank and Goyal, 2009; Fan et al., 2012). Mokhova and Zinecker (2014) show that government debt to GDP also has significant implications for capital structure. In this study, we apply two possible measures for macroeconomic influence.

*Human resource factors:* As a priority, we observe human resource factors in this study. Grossman and Hart (1982) examine “incentive problem” and discuss the role of possibility of bankruptcy in motivating managers to maximize their output. They suggest that manager productivity can be related to financial structure in a reasonable way. Kale et al. (2007) find that debt served as a bonding mechanism and correlated positively with employee productivity, because employees try to avoid job loss by producing higher productivity when firm is faced with high debt, which implies a potential risk of bankruptcy. Meanwhile, Kale et al. (2013) suggest that the degree of relationship between employee productivity and debt leverage is negatively influenced by outside employment opportunities. That is to say, the role of debt as a disciplining mechanism is weakened when outside employment opportunities are increased. However, this is no study conducted to analyze if employee productivity and employment size have impact on capital structure decision. In addition, Sapienza (2004) reports that state-owned banks preferred to provide credits for firms with large labor force. We thus observe employment size, employee productivity, and employment in industry as proxy of human resource impact on capital structure.

## 2. Hypotheses development

Following the literature documented in previous section, we examine whether the firm financial, macroeconomic, and human resource factors impact capital structure decision, as well as the adjustment of dynamic capital structure. Formally, we test hypotheses as:

*H (1.1): Profitability has significant effects on capital structure decision.*

*H (1.2): Lagged profitability has significant effects on capital structure decision.*

*H (1.3): Firm size has significant effect on capital structure decision.*

*H (1.4): Tax has significant effect on capital structure decision.*

*H (1.5): Growth has significant effect on capital structure decision.*

*H (1.6): Dividend has significant effect on capital structure decision.*

*H (1.7): Liquidity has significant effect on capital structure decision.*

*H (2.1): Inflation has significant effect on capital structure decision.*

*H (2.2): Government debt to GDP has significant effect on capital structure decision.*

*H (3.1): Employee productivity has significant effect on capital structure decision.*

*H (3.2): Employee size has significant effect on capital structure decision.*

*H (3.3): Employment in industry has significant effect on capital structure decision.*

*H (4): There is a significant instantaneous adjustment of leverage.*

Specifically, we test which factors in firm financial, macroeconomic, and human resource exert significant impact on debt leverage. Furthermore, as discussed previously, if we find support for Hypothesis 4, then this will consequently report the estimated adjustment speed and half-life of leverage targets.

## 3. Research design

**3.1. Data source.** The firm-specific data used in this study are collected from Bloomberg database. Employment size and employee productivity are also obtained from Bloomberg database based on firm-specific annual report. This data set contains firm financial data of A-share listed firms over 2008-2013. The inflation, government debt to GDP, and employee in industry are obtained from the World Bank. We filter the sample by excluding firms in financial and utilities sectors. After deleting missing value, the panel data set contains 663 firms, yielding a final sample with 3,978 firm-year observations.

**3.2. Research method.** As documented in Section 2, the capital structure decision is expected to be driven by firm-specific, macroeconomic, and human resource factors. Following previous work (e.g., Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998), we consider a dynamic panel-data, two-step system GMM model. In a first step, we examine a set of firm-specific factors. The equation is specifically written as:

$$Y_{it} = \alpha_0 + \sum_{k=1}^K \gamma_k X_{k,it} + \eta_i + \varepsilon_{it}, \quad (1)$$

where  $Y_{it}$  represents debt leverage of firm  $i$  in year  $t$  and explained as book total debt.  $X$  is a measure of the vector of explanatory variables.  $\mu_i$  is time-invariant unobservable firm-fixed effects;  $\eta_i$  time-fixed effects;  $\alpha_0$  is the constant;  $\gamma_k$  are unknown parameters to be estimated. The time-varying

disturbance term  $\varepsilon_{it}$  is assumed to be serially uncorrelated with mean zero and variance  $\sigma^2$ . The vector of explanatory variables,  $X$ , includes  $k$  factors ( $k = 1, \dots, 12$ ). These are measures of 1) *EBIT*, 2) *Lagged EBIT*, 3) firm size, 4) non-debt tax shield, 5) assets growth, 6) growth opportunities, 7) dividend per share, 8) cash and marketable securities, 9) current ratio, 10) quick ratio, 11) cash from operation.

The previous sections have assumed that firms adjust debt leverage to an optimal capital structure (e.g., Guney, 2011; Ebrahim et al., 2014). To account for this finding, Model (1) is modified to present a dynamic panel data model as:

$$Y_{it} = \alpha_0 + \alpha_1 Y_{i,t-1} + \sum_{k=1}^k \gamma_k X_{k,it} + \eta_t + \varepsilon_{it}, \tag{2}$$

where  $\alpha_1$  is unknown parameters to be estimated;  $Y_{i,t-1}$  is a lagged dependent variable to identify adjustment speed. Others are the same to definitions of equation (1) and do not change.

In a second step, we add macroeconomic factors,  $M$ , into the model (2) as:

$$Y_{it} = \alpha_0 + \alpha_1 Y_{i,t-1} + \sum_{k=1}^k \gamma_k X_{k,it} + \sum_{j=1}^j \gamma_j M_{j,it} + \eta_t + \varepsilon_{it}, \tag{3}$$

where the vector of explanatory variables,  $M$ , are added to consist of  $j$  factors ( $j = 1, 2$ ). They are measures of 1) inflation and 2) government debt to GDP.  $\gamma_j$  are unknown parameters to be estimated. Others do not change and the same to definition of equation (1).

In a third step, we add vector of explanatory variables,  $H$ , to model the effects of human resource factors. It consists of  $l$  factors ( $l = 1, 2, 3$ ). They are measures of 1) employment size, 2) employee productivity, and 3) employment in industry. The equation can be expressed as:

$$Y_{it} = \alpha_0 + \alpha_1 Y_{i,t-1} + \sum_{k=1}^k \gamma_k X_{k,it} + \sum_{j=1}^j \gamma_j M_{j,it} + \sum_{l=1}^l \gamma_l H_{l,it} + \eta_t + \varepsilon_{it}, \tag{4}$$

where  $\gamma_l$  are unknown parameters to be estimated. Others have no change and the same to definition of equation (1).

The system GMM estimator is used to define the partial adjustment model to control for endogeneity, referring to Flannery and Hankins (2013) and Ebrahim et al. (2014). We also apply dummy variables in the equation to control industry-specific effects, due to the leverage variables across different industries and their different impacts on capital structure decision (e.g., Harris and Raviv, 1991; and Frank and Goyal, 2009). The year-specific effect is also controlled by referring to Antoniou et al. (2008) and Ebrahim et al. (2014). We run a Hansen test to check specification of over-identifying restrictions and Arellano and Bond's test for diagnose of autocorrelation problem.

#### 4. Result

**4.1. Descriptive statistics.** Table 1 reports the descriptive statistic of all the variables. Panel A, Table 1 reports descriptive statistics for the full sample. The mean debt ratio for all sample is 49%. The ratio is similar to the findings of Guney et al. (2011) who also examine the data of Chinese firms. This means that Chinese firms are more levered than firms in other developing countries (e.g., Bas et al., 2009; Ebrahima et al., 2014) but lower than other developed countries (e.g., Rajan and Zingales, 1995; Margaritis and Psillaki, 2010). This is inconsistent with the findings of most existing studies on Chinese firms which reported the book debt ratios are lower than this study (e.g., Huang and Song, 2006; Bhabra et al., 2008; Qian et al., 2009). This implies that the firms have used more debt compared to past years.

Table 1. Descriptive statistics

Variable	Mean	Std. dev.	Min	Max	No. of obs
Panel A: Descriptive statistics for the full sample					
tdb	0.488	0.2618	0.0071	6.7406	3978
lebit	19.0875	1.5701	9.9506	25.9726	3667
llagebit	18.9746	1.56	9.9506	26.0338	3653
lnassets	22.0395	1.2879	16.9394	28.4821	3978
ndts	0.0277	0.0175	0	0.1706	3978
grassets	0.3011	4.0957	-0.6931	247.9692	3978
grmb	2.2987	1.7996	0.6438	41.8859	3978
divps	0.0927	0.186	0	5.8355	3978
cashms	20.0992	1.4047	9.7558	25.2148	3978
cratio	1.8526	3.8993	0.0385	204.7421	3978
qratio	1.3885	3.2294	0.0356	158.245	3978
lcfo	19.1377	1.6451	8.7703	26.4693	3073
fla	4.2165	3.3129	-0.6063	7.8047	3978
govdgdg	23.75	6.1111	17	33.5	3978

Table 1 (cont.). Descriptive statistic

Variable	Mean	Std. dev.	Min	Max	No. of obs
Panel A: Descriptive statistics for the full sample					
emsize	7.8983	1.3633	1.0986	13.2228	3978
emsaleinv	13.9124	1.0516	8.7554	20.6867	3978
emind	27.82	1.1306	25.9	29.5	3978
Panel B: Descriptive statistics for the debt ratio by year					
2008	0.4928	0.2839	0.0183	4.7832	3978
2009	0.4947	0.3302	0.0178	6.7406	3978
2010	0.4893	0.2288	0.0168	3.1831	3978
2011	0.4894	0.3087	0.0071	6.6845	3978
2012	0.4831	0.1924	0.0314	0.9135	3978
2013	0.4787	0.1930	0.0446	0.9016	3978

Notes: tdb denotes book total debt, lebit denotes logarithm of earnings before interest and tax (EBIT), llagebit denotes logarithm of lagged earnings before interest and tax (LagEBIT). Inassets denotes firm size, ndts denotes non-debt tax shield. graseets denotes book asset growth, grmb denotes market growth opportunity. divps denotes dividend per share, cashms denotes cash and marketable securities, cratio denotes current ratio, qratio denotes quick ratio, lcf0 denotes cash from operation. fla denotes inflation, govdbgdp denotes government debt to GDP, emsize denotes employment size, emsaleinv denotes employee productivity, emind denotes employment in industry.

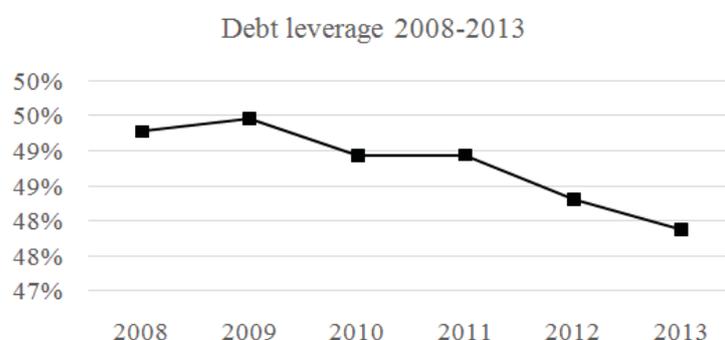


Fig. 1. Debt leverage, 2008-2013

Next, we observe debt ratios for the past six years. Panel B, Table 1 provides descriptive statistics for the debt ratios by year. There are some differences between average debt leverage across different years. The highest is year 2009 with a ratio of 49.47%, however, the ratio has decreased since then. Figure 1 reports a downward trend in debt leverage during 2008-2013 suggesting firms have used less debt on average compared past years.

**4.2. Correlation matrix.** Table 2 (see Appendix) presents correlations matrix for all variables examined in the study. We observe that the coefficients of the correlations between the explanatory variables and debt leverage are generally consistent with prediction documented in Section 2. Furthermore, most of correlations between the dependent variable and independent variables are at 1% significance level.

**4.3. Determinants of capital structure.** The regression results are reported in Table 3. Model 1 and Model 2 report same coefficients for firm-specific factors meaning the effects of firm-specific factors have been considered equally in the two models. The regression coefficients of firm-specific and macroeconomic factors have tiny changes in

magnitudes in model 3 indicating the factors have similar influence in three models. Panel B, Table 3 presents the sample information and diagnostic tests. The  $p$ -values for the Arellano-Bond and Hansen  $J$ -statistic are rejected indicating all the models are free from over-identified and second order serial correlation problem. Based on this observation we next document the overall findings.

**4.3.1. Firm-specific factors.** The both current and lagged profitability show no effect on debt leverages in all three models. This finding is different from past studies which reported that profitability is the most important determinant of capital structure decision in China (e.g., Huang and Song, 2006; Qian et al., 2009). This significant difference signals that firm financial behavior has changed compared to past years before 2008. One of reason is that the capital market in China has rapidly developed in recent years, which enables firms to find funds in more diverse ways instead of relying on profits. This is a significant difference in capital structure decision of listed firms in China compared to findings reported by past studies.

The coefficients on firm size of all models are positive and statistically significant meaning that the

bigger firms are likely to have greater debt. In particular, this shows that firm size has become the most important determinant of capital structure instead of profitability. One of important reasons is that the development of listed firms is very fast, particular the size of firm capitalization. According to the World Bank, the number of listed firms in China increases to 2,532 at the end of 2013, accounting for more than 4,000 billion USD market capitalization and representing around 45% of GDP. That is to say, the remarkable development of China's economy has brought significant effect on firm financial behavior, particularly on capital structure decision.

The non-debt tax shield enters with negative signs in all models and ranks as the third important determinant of capital structure by following firm size and liquidity. This indicates that tax also plays a significant role in capital structure decision of domestic firms, while An (2012) who reported that tax plays a significant role in capital structure decision of foreign investment firms. It might be concluded that the new Tax Law effected on 1<sup>st</sup> January 2008 has also effected financial behavior of domestic firms.

Negative sign for book asset growth is also found in all models. However, we observe a statistically significant positive effect of the market asset growth on capital structure. This is in line with finding of Chang et al. (2014) who suggested that the positive relationship reflects "financial constraints of Chinese listed firms in raising equity because of intense governmental scrutiny". Another explanation for this might be that the capital structure decision is also positively affected by stock pricing. At the same time, this is the first study examining both book assets and market assets. The finding indicates that assets have different impact on capital structure based on whether they are measured by book value or market value.

The dividend per share has negative significant coefficients in all models, meaning that firms do not tunnel cash from debtholders to shareholders by raising debt to pay dividend as it was reported by Lee and Xing (2004) and Chen et al. (2009). This might be explained that the second split share structure reform has efficiently reduced the tunnel problem (Liu and Tian, 2012).

Current ratio and cash from operation present negative and statistically significant signs, while cash and marketable securities enter with insignificant and negative signs. This is in line with finding of Guney et al. (2011) who reported that liquidity represented by current ratio has negative impact on debt leverage. However, the quick ratio

has a significant positive effect on total debt in all models. One explanation for this might be that inventories have a potential negative impact on capital structure decision, because quick ratio is calculated by excluding inventories from current ratio. This reminds researchers to recognize that liquidity measured by different variables have different influence on capital structure decision.

*4.3.2. Macroeconomic factors.* Compared to firm-specific factors, the macroeconomic factors have less significant effect on capital structure decision. The inflation has significant negative coefficient on total debt in all models in which it is involved. This finding is consistent with and Chang et al. (2014) who reported that inflation has negative influence on capital structure decision of Chinese firms. However, like Chang et al. (2014), we don't suggest that inflation is a core determinant of capital structure for Chinese firms, since the coefficients are presented very small in both two models. Against expectations, the coefficients on government debt to GDP in both model 2 and model 3 have no explanatory power for total debt. This means debt decisions of firms are not influenced by aggregate debt issuance of country.

*4.3.3. Human resource factors.* The coefficient for employment size shows firms with large labor force carry more debt and suggests that capital structure decision is significantly affected by employment size. Sapienza (2004) reports that state-owned banks preferred to provide credits for firms with large labor force. Regarding the case in China, state-owned banks are main source for firms in debt financing because financial markets are underdeveloped. This seemingly confirms that firms with large labor force have easier access to external funds, probably to bank funds.

The coefficient on employment productivity has a positive and statistically significant sign meaning that high employee productivity firms are likely to have more debt. This confirms our hypothesized expectation on determinant of capital structure decision, i.e., firms with higher employee productivity show greater firm value and create higher debt capacity for firms. Therefore, the greater is the employee productivity, the higher is the debt leverage. This finding presents an inverse relationship to findings of Kale et al. (2007) suggesting there is reaction between employee productivity and debt leverage on each other.

Lastly, we find a small but significant coefficient revealing a positive relationship between employment in industry and debt leverage. One explanation for the fact that more employment in industry results in less employment opportunity for

individuals, might be that employment in industry has work on capital structure through pushing unemployment stress on employees indirectly and thus to produce high employee productivity. As a result, to increase debt capacity for firms to borrow more. This positive influence is also in line with the relationship between debt leverage and employment size. One explanation for this, thus, might be that capital structure decision is not only positively affected by internal employment size of firms, but also influenced by aggregate labor force with a similar impact.

**4.4. The adjustment speed.** Our findings so far report that capital structure decision of firms in China are reliably related to both firm-specific and human resource factors, and, thus, they seem to pursue an optimal capital structure by adjusting debt leverage. In the next step, we report the findings of dynamic capital structure decision by presenting the adjustment speed.

We use system GMM estimator to examine adjustment speed for dynamic capital structure to determine if firms in China set leverage targets and adjust debt leverage towards an optimal capital structure. The first row of Table 3 reports the coefficient of the lagged leverage which is significant at the 1% level. From the coefficient value of 0.632 in Model 1, we infer that firms adjust debt leverage towards an optimal capital structure and the adjustment speed is 36.8% per annum. The signs of the estimated coefficients of Model 2 are the same to Model 1. This means the adjustment speed is not changed, given the effect of macroeconomic factors. We observe coefficient is 36.6% in Model 3. Again, the estimate is similar to both Model 1 and Model 2. This presents that firms adjust deviations from optimal debt leverage with similar speeds to Model 1 and Model 2, without being effected by the human resource factors involved.

Table 3. Dynamic panel-data estimator, two-step system GMM report

	Model 1 (1)	Model 2 (2)	Model 3 (3)
Panel A: Regression result			
<i>Leverage<sub>t-1</sub></i>	<b>0.632<sup>***</sup></b> (8.35)	<b>0.632<sup>***</sup></b> (8.35)	<b>0.634<sup>***</sup></b> (9.65)
<i>SOA (%)</i>	<b>36.8</b>	<b>36.8</b>	<b>36.6</b>
<i>EBIT</i>	0.004 (0.28)	0.004 (0.28)	-0.012 (-0.95)
<i>Lagged EBIT</i>	-0.009 (-0.98)	-0.009 (-0.98)	-0.010 (-1.53)
<i>Firm size</i>	<b>0.088<sup>***</sup></b> (3.87)	<b>0.088<sup>***</sup></b> (3.87)	<b>0.073<sup>***</sup></b> (3.30)
<i>Non-debt tax shield</i>	<b>-0.889<sup>*</sup></b> (-1.82)	<b>-0.889<sup>*</sup></b> (-1.82)	<b>-1.225<sup>**</sup></b> (-2.37)

<i>Asset growth</i>	<b>-0.036<sup>*</sup></b>	<b>-0.036<sup>*</sup></b>	-0.288
	<b>(-1.68)</b>	<b>(-1.68)</b>	(-1.31)
<i>Market growth opportunity</i>	<b>0.008<sup>**</sup></b>	<b>0.008<sup>**</sup></b>	<b>0.012<sup>***</sup></b>
	<b>(1.97)</b>	<b>(1.97)</b>	(3.16)
<i>Dividend per share</i>	<b>-0.025<sup>**</sup></b>	<b>-0.025<sup>**</sup></b>	<b>-0.024<sup>**</sup></b>
	<b>(-2.41)</b>	<b>(-2.41)</b>	(-2.31)
<i>Cash &amp; marketable securities</i>	-0.011	-0.011	-0.012
	(-0.85)	(-0.85)	(-0.98)
<i>Current ratio</i>	<b>-0.039<sup>**</sup></b>	<b>-0.039<sup>**</sup></b>	<b>-0.046<sup>**</sup></b>
	<b>(-2.15)</b>	<b>(-2.15)</b>	(-2.27)
<i>Quick ratio</i>	<b>0.038<sup>*</sup></b>	<b>0.038<sup>*</sup></b>	<b>0.044<sup>**</sup></b>
	<b>(1.92)</b>	<b>(1.92)</b>	(1.99)
<i>Cash from operation</i>	<b>-0.031<sup>***</sup></b>	<b>-0.031<sup>***</sup></b>	<b>-0.022<sup>***</sup></b>
	<b>(-2.71)</b>	<b>(-2.71)</b>	(-2.20)
<i>Inflation</i>		<b>-0.001<sup>*</sup></b>	<b>-0.002<sup>*</sup></b>
		<b>(-1.40)</b>	(-1.92)
<i>Government debt to GDP</i>		-0.000	000
		(-0.23)	(0.04)
<i>Employment size</i>			<b>0.029<sup>*</sup></b>
			(1.68)
<i>Employee productivity</i>			<b>0.030<sup>*</sup></b>
			(1.78)
<i>Employee in industry</i>			<b>0.006<sup>***</sup></b>
			(2.71)
<i>_cons</i>	-0.920	-0.899	-1.181
	(-3.06)	(-3.11)	(-3.41)
Panel B: Diagnose test and model information			
Number of firms	618	618	618
Observations	2331	2331	2331
Time fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
m <sub>1</sub> -statistic(p-value)	0.000	0.000	0.000
m <sub>2</sub> -statistic(p-value)	0.223	0.223	0.189
Hansen J-statistic (p-value)	0.203	0.203	0.243

Note: \* Significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%.

Compared to the context of findings reported by other studies from dynamic panel data models, the adjustment speed of Chinese firms is broadly higher than others. For instance, studies from US reported the speed at around 25% (Lemmon et al., 2008), 27% (Frank and Goyal, 2009), 23%-26% (Faulkender et al., 2012), while firms in G-7 countries presented a mean speed of 20% and Malaysia firms are at 28% (Ebrahim et al., 2014). The ratio is also faster than findings reported from past studies in China (Qian et al., 2009), meaning capital structure decision has had remarkable changes compared to past decade. The changes are not only the determinants of capital structure, but also the adjustment speed of capital structure. One of reason is that China's economy is rapidly developing which stimulates firms to respond market condition by adjusting financial strategy in a faster way.

In addition, we translate the estimates of adjustment into half-lives of the impact of a shock on the leverage ratios by using formula  $\log(0.5)/\log(1-\lambda)$ ,

referring to Drobetz et al. (2013). Adjustment speeds reported above are 36.8%, 36.8%, and 36.6%. The mean of all estimates is 36.7%, which presents a half-life of 1.52 years. As a comparison, all estimates we documented above in other countries are below 30%. This means their half-lives are longer than 1.52 years reported by this study. Our results, thus, conclude that Chinese firms adjust debt leverage to target deviations much faster than do firms in other countries. One of the reasons is that China has a very active investment environment in recent years and firms adjust financial strategies quickly in responding to current market conditions.

## Conclusion

In this paper we investigate the firm-specific, macroeconomic, and human resource factors for determining the capital structure of firms. The study is based on both firm-level and macroeconomic-level data from China in 2008-2013. We obtained our results from dynamic panel data, two-step system GMM model.

The first aim of this paper is to identify the determinants of capital structure. The regression analysis of debt leverage presents some surprising findings for some firm-specific factors in capital structure decision. For instance, profitability is no

longer the core determinant for debt leverage. In contrast, firm size and non-debt tax shield have statistically significant coefficients. At the same time, it is suggested that the top three determinants of capital structure are firm size, non-debt tax shield, and liquidity. This is significantly different from past studies. More importantly, we find that human resource, particularly employment size and employee productivity, are also significant determinants of capital structure.

The second aim of this paper is to formulate dynamic capital structure, and therefore, to determine adjustment speed of debt leverage. Using a system GMM estimator, we obtain a dynamic partial adjustment model. Firms are reported to adjust debt leverage towards to an optimal level at a speed around 36.7% per annum, yielding a half-life of 1.52 years. Our study suggests that capital structure decision of Chinese firms has significant difference from past studies. We believe our paper provides insights to understanding firm financial behavior in capital structure decisions in the context of emerging markets.

One limitation of the study is we were unable to incorporate the latest data of 2014, because the latest data were not available when the study was done. However, we would not expect the results to change dramatically due to one year exclusion.

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## Appendix

Table 2. Correlation matrix

	tdb	lebit	llagebit	lnassets	ndts	grassets	grmb	divps	cashms	cratio	qratio	cfo	fla	govdgdgdp	emsize	emsaleinv	emind
tdb	1																
lebit	0.16***	1															
llagebit	0.11***	0.88***	1														
lnassets	0.18***	0.81***	0.81***	1													
ndts	-0.07***	0.11***	0.12***	0.07***	1												
grassets	0.03*	0.02	-0.05***	0.02	-0.03	1											
grmb	0.08***	-0.17***	-0.19***	-0.43***	-0.05***	-0.02	1										
divps	-0.11***	0.37***	0.37***	0.25***	-0.01	-0.01	0.07***	1									
cashms	0.05***	0.71***	0.71***	0.84***	-0.08***	0.02	-0.32***	0.29***	1								
cratio	-0.24***	-0.08***	-0.06***	-0.14***	-0.06***	-0.01	0.13***	0.02	-0.03	1							
qratio	-0.26***	-0.09***	-0.06***	-0.15***	-0.05***	-0.01	0.15***	0.02	-0.01	0.99***	1						
lcfo	-0.01	0.31***	0.32***	0.34***	0.17***	-0.00	-0.04**	0.12***	0.24***	-0.02	-0.03	1					
fla	0.01	-0.01	-0.03*	-0.06***	0.01	-0.00	-0.07***	-0.03*	-0.05***	0.02	0.02	-0.01	1				
govdgdgdp	-0.01	0.11***	0.14***	0.16***	-0.05***	0	-0.20***	0.08***	0.14***	0.03*	0.03	0	0.18***	1			
emsize	0.09***	0.61***	0.63***	0.72***	0.28***	-0.08***	-0.32***	0.21***	0.61***	-0.13***	-0.13***	0.27***	-0.04***	0.09***	1		
emsaleinv	0.19***	0.24***	0.22***	0.32***	-0.30***	0.13***	-0.14***	0.08***	0.31***	-0.01	-0.03**	0.08***	0.02	0.09***	-0.30***	1	
emind	0.01	0.03	-0.03	-0.01	0.03	-0.02	0.12***	-0.02	0.01	0.03*	0.03*	0.01	0.46***	0.10***	-0.03*	0.03**	1

Notes: \* Significant at 10%, \*\* significant at 5%, \*\*\* significant at 1%. tdb denotes book total debt, lebit denotes logarithm of earnings before interest and tax (EBIT), llagebit denotes logarithm of lagged earnings before interest and tax (LagEBIT). lnassets denotes firm size, ndts denotes non-debt tax shield. grassets denotes asset growth, grmb denotes market growth opportunity. divps denotes dividend per share, cashms denotes cash and marketable securities, cratio denotes current ratio, qratio denotes quick ratio, lcfo denotes cash from operation. fla denotes inflation, govdgdgdp denotes government debt to GDP, emsize denotes employment size, emsaleinv denotes employee productivity, emind denotes employment in industry.