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Target Capital Structure and Adjustment Speed in Asia*

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Abstract

Studies on the capital structure of Asian corporations are rare, and most of those studies support different explanations of financing decisions compared to the ones accepted for the USA and Europe. We test relationships that are typical of the Tradeoff Theory and the Pecking Order Theory, and analyze the speed of adjustment toward target capital structures for 1239 companies with capitalizations of more than US$1 billion listed on 11 Asian stock exchanges and belonging to eight industrial sectors. Our results are based on generalized method of moments (GMM) estimations for the determinants of capital structures and system-GMM estimations for the speed of adjustment, and robustness is checked using book leverage and market leverage on the basis of ordinary least squares estimations and two-stage least squares estimations. We contribute to the literature by finding strong evidence that companies in Asia pursue target capital structures, as predicted by the Tradeoff Theory. Only in one respect does the Pecking Order Theory demonstrate superior explanatory power. We further show that the convergence to target capital structures is consistent with international evidence, estimated at an annual adjustment speed of 24–45% of original leverage levels. Finally, our comparison among eight industries shows that the capital structure choice in Asia is influenced by fixed effects.

Keywords Capital structure; Dynamic adjustment; Panel models

JEL Classification: G10, G32

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1. Introduction

While there is overwhelming information about capital structure decisions by Western corporations, only a few such studies have been conducted on Asian firms. A few authors include Asia in a global comparison, such as Clark *et al.* (2009), and some concentrate on a narrow selection of Asian countries, such as Booth *et al.* (2001). There are also some studies that focus on the impacts of the Asian Crises of 1997, such as Driffield *et al.* (2005) and Driffield and Pal (2008). Ko and Yoon (2011) analyze the aftermath of the 1997 Asian financial crisis in the Korean equity market and find that underleveraged firms lost significant tax savings that would have been available if they had increased debt levels. To arrive at a more complete picture, we study the determinants of the capital structure on the basis of 1239 Asian corporations with a market capitalization of more than US$1 billion that are listed on 11 Asian stock exchanges, and we differentiate between industries to identify sector effects. Our econometric approach applies different estimation methods and uses book and market value definitions of leverage as explanatory variables. This methodology corresponds to previous studies of American and European capital markets (Drobetz and Wanzenried, 2006; Flannery and Rangan, 2006). To ensure comparability to studies of these capital markets, our selection of capital structure determinants follows Frank and Goyal (2009). Furthermore, we enhance the homogeneity and comparability of the panel data set by imposing a size restriction to control for different financing cost structures between small and large companies (Hennessy and Whited, 2007). By following the established methodology, our results are comparable to results for US and European corporations and lay the basis for research of additional region-specific factors, such as regional differences in the macroeconomic conditions on the speed of adjustment (Cook and Tang, 2010).

There are competing theories to explain the capital structures of firms. The Tradeoff Theory indicates that leverage decisions are based on firm-specific factors, the statistical significance of which varies across countries. The Pecking Order Theory is mainly based on informational asymmetries. Which of these theories offers a better explanation is under debate. Evidence from the USA and Europe favors the Tradeoff Theory, while the existing empirical evidence regarding Asia reveals mainly Pecking Order behavior in finance decisions (Pandey, 2000; Fan and So, 2004). The empirical evidence regarding Asian countries is based on a few studies, with China being a unique market in terms of institutional determinants (Guney *et al.*, 2011).[1] Thus, the puzzle, which theory reflects the capital structure choice most accurately and why different theories are predominant in different parts of the world, requires further research in Asian markets. Therefore, our motivation is to provide one of

[1]Öztekin and Flannery (2012) find institutional determinants of capital structure adjustment speeds to be consistent with the Dynamic Tradeoff Theory in a broad international study, including some Asian markets.

the first studies to empirically test the Pecking Order Theory against the Tradeoff Theory in Asia. According to survey-based evidence (Fan and So, 2004) firms listed on the Hong Kong stock exchange demonstrate a Pecking Order behavior of financing. However, the Pecking Order Theory is not only questioned in Asia, but is also under discussion in the USA (Frank and Goyal, 2003). We hypothesize that, due to the regulatory environment and peer group comparisons for large corporations, there should not be a significant difference between the financing behavior of large corporations in Asia compared to the USA and Europe. We contribute to the existing literature by showing the first comprehensive and comparable empirical results for Asian firms following target capital structures. Our results are predominantly in line with the Tradeoff Theory, and therefore show that large Asian corporations finance their businesses in a comparable way to large US and European corporations.

Our econometric approach to testing capital structure theories in Asia is based on the idea that companies follow a changing capital structure over time. This changing target is determined by the variation of endogenous and exogenous factors. In a second step, we research the speed of adjustment of Asian companies in adapting their balance sheets to these target capital structures. We add a regional perspective to the speed of adjustment in addition to firm and industry characteristics similar to the approach toward US firms by John *et al.* (2012). Altogether, this study provides a Tradeoff Theory analysis for the Asian market based on three questions. First, we investigate whether companies set target capital structures and measure the convergence toward the target. Second, we establish a global picture by comparing our findings for the Asian market with earlier findings from the USA and Europe. Third, by categorizing the companies by industry, we check to what extent industry-fixed effects are present.

2. Literature Review

The epitome of capital structure research is the study by Modigliani and Miller (1958), which argues that in a perfect capital market the value of a business is independent of how the business is financed. If there are dividends, corporate taxes, transaction costs, or information asymmetries, the capital structure is relevant to the value. For example, in a recent study, Byoun and Xu (2013) examine debt-free firms and find that by paying high dividends, debt-free firms maintain their ability to raise equity capital on favorable terms, maintain good reputations in equity markets, thereby reducing the agency costs of free cash flow. Jung and Kim (2008) find that firms with sufficient cash are more likely to take advantage of interest tax shields in Korea.

Myers (1984) distinguishes major schools of thought on capital structure: static and dynamic versions of the Tradeoff Theory, the Pecking Order Theory, and the Market Timing Theory. Subsequent empirical research has focused on testing these theories. Reviewing the literature, we emphasize the static and dynamic versions of the Tradeoff Theory and the Pecking Order Theory.

2.1. Static and Dynamic Tradeoff Theory

In a subsequent paper, Modigliani and Miller (1963) analyze capital structure decisions with taxes, where the interest payment on debt, other than profits or dividends, is tax-exempt. Bradley *et al.* (1984) report evidence on this Static Tradeoff Theory, according to which companies in different industry sectors increase debt levels until the tax shield equals the marginal cost of debt, including the premium to be paid for the increasing probability of financial distress or default. Thus, companies wish to reach this static optimal debt level, also addressed as target capital structure. Bris *et al.* (2006) report that the utility of tax shields rises with profitability, higher tax rates, and lower depreciations, estimating the costs of financial distress to 2–20% of assets. Andrade and Kaplan (1998) report costs of financial distress between 10% and 20% of assets. Jalilvand and Harris (1984) extend this research by looking at transaction costs and other forms of market imperfections. Hence, the capital structure may not exactly correspond to the target. The authors also note that convergence toward the target influences financing decisions. Transaction costs lead to three questions. First, which magnitude do transaction costs have that explains deviations from the target? Second, what determines the adjustment speed toward the target capital structure? Third, how do firms react upon capital structure shocks? These questions extend the Static Tradeoff Theory and create the framework of the Dynamic Tradeoff Theory.

The Dynamic Tradeoff Theory is tested by the so-called target adjustment hypothesis (Frank and Goyal, 2007). The optimal target capital structure changes over time as a function of exogenous and endogenous factors. Fischer *et al.* (1989) formulate a theory of dynamic capital structure choice and find evidence for firm-specific effects related to debt ratio ranges. Flannery and Hankins (2007) note that the adjustment speed toward the target capital structure depends on the adjustment costs as well as on the costs of deviating from the target capital structure. Adjustment costs depend on transaction costs and the market value of the equity. Costs for deviating from the target capital structure are a function of the probability of financial distress and the value of the tax shield. Leland and Toft (1996) develop a dynamic model with endogenous levels of bankruptcy, thereby explaining the optimal amount and maturity of debt. Hennessy and Whited (2005) analyze a dynamic tradeoff model with endogenous choice of leverage and real investment in the presence of taxes and transaction costs. They find that leverage is path-dependent and decreasing in liquidity. Research on the departures from target capital structures due to shocks in the market value of equity, shows that companies weigh the rebalancing decision against the transaction costs of rebalancing (Leary and Roberts, 2005; Byoun, 2008). As corporate investment decisions and capital structures are correlated, a strategy that maximizes firm value can entail not returning immediately to the target capital structure, which depends on the nature of investment opportunities (Uysal, 2011). Hovakimian and Li (2009) suggest in an ex-post and ex-ante comparison of transactions and capital structures that firms follow target debt ranges rather than unique target debt ratios.

Rajan and Zingales (1995) analyze the determinants of capital structure choices for firms in the G-7 countries and find firm leverage to be similarly correlated in different countries. Fan *et al.* (2008) examine capital structure and debt maturity choices in 39 developed and developing countries. The authors find a strong relationship between profitability and leverage in countries with weak shareholder protection. In countries with strong legal frameworks for financial claims, firms tend to hold less total debt and more long-term debt as a proportion of total debt. In addition, firms that choose cross listings tend to employ more equity and long-term debt. For capital markets in the USA, there exists a positive correlation between leverage and company size, the tangibility of assets, expected inflation, and the industry median. Positive shocks to profitability lead to an increase in equity and a decrease in debt. As firms do not adjust capital structures immediately after shocks due to transaction costs, a negative correlation can be detected between profitability and leverage. Regarding Asia, Ang *et al.* (1997) investigate the capital structure and dividend policies of a sample of large publicly traded Indonesian firms and find weak support for the Tradeoff Theory, and firms thus operate as if there exists an optimal debt level. Deesomsak *et al.* (2004) include companies from Thailand, Malaysia, Singapore, and Australia, and find that the capital structure decision is influenced by the non-debt tax shield, liquidity, and share price information.

2.2. Pecking Order Theory

Although the roots of the Pecking Order Theory can be traced to Donaldson (1961), the publications of Myers (1984) and Myers and Majluf (1984) establish the Pecking Order Theory as an alternative model to the Tradeoff Theory. According to the Pecking Order Theory, firms prefer internal to external financing, and they prefer debt to equity. Therefore, firms do not possess a specific target debt-to-value ratio. Myers (1984) argues that asymmetric information between managers and investors causes costs of adverse selection. This ties the firm to the Pecking Order in financing new projects. The adverse selection costs stem from markdowns on share prices when new equity is issued because investors assume an overvaluation of the company. The issuance of debt increases the probability of financial distress, which in turn increases the cost of capital. Therefore, firms first recur to internal financing for new projects. If internal resources are not available, the safest securities are issued first, implying the issuance of debt before equity. Halov and Heider (2006) emphasize that large firms face lesser costs of adverse selection than small firms when the possibility of risky or mispriced debt is considered. Equity is only issued if other financing options, such as internal funds and debt, are not available. Hovakimian *et al.* (2001) argue that short-term Pecking Order behavior is supported by the data. Thus, small projects are financed in the short-term with internal funds while large projects are financed externally if the issuance of debt is cheaper than the issuance of equity (Welch, 2007).

A few studies have looked at Pecking Order behavior using samples of firms in Europe. Bessler *et al.* (2008) present European evidence for Welch's (2004) notion that a large part of firms' variation in leverage is determined by stock price movements. In a panel of 425 European firms the results are consistent with US findings during the period 1990–2005.[2]

Regarding the validity of the Pecking Order Theory, Asia shows mixed evidence. Wiwattanakantang (1999) analyzes the Thai capital market with regard to tax effects, signaling effects and agency costs that are reflected in financing decisions, thus underlining the Pecking Order Theory. Fattouh *et al.* (2005) confirm significant nonlinearities in the determinants of capital structure of South Korean firms in the years 1992–2001. This nonlinearity supports the hypothesis of asymmetric information. Colombage (2005) empirically investigates the capital structure of Sri Lankan companies and finds that the financing trends of Sri Lankan firms also support the Pecking Order hypothesis. There are negative correlations between leverage and profitability, leverage and growth, and leverage and retained earnings. However, there is also evidence against the Pecking Order Theory in Asia. Yau *et al.* (2008) analyze Malaysian firms from 1999 to 2005 and find a negative correlation between long-term debt and external financing needs. Furthermore, conventional leverage determinants, such as profitability, firm size, and asset tangibility are positively related to debt levels. Overall, firms issue equity more often than would be expected under the Pecking Order hypothesis. Consequently, the existing studies on the best theoretical explanation of financing decisions of Asian firms show no clear picture. This motivates our study.

2.3. Target Adjustment Hypothesis

The adoption of transaction costs in dynamic tradeoff models produces three strongly debated research questions: (i) the adjustment speed to target capital structures; (ii) the magnitude of transaction costs; and (iii) firms' behavior in response to capital structure shocks. These questions reach beyond the classical Tradeoff Theory and are therefore discussed in the framework of the target adjustment hypothesis (Frank and Goyal, 2007). Flannery and Hankins (2007) note that the adjustment speed toward the target capital structure depends on the adjustment costs, as well as on the costs of deviating from the target. Adjustment costs are in turn dependent on transaction costs and the market value of the firm's stock. Costs incurred from deviating from the target capital structure are a function of the probability of financial distress and the present value of the tax shield (Flannery and Hankins, 2007). Faulkender *et al.* (2008) find that adjustment speeds of firms with positive and negative cash flows differ significantly from adjustment speeds of firms with free cash

[2]See also Drobetz and Fix (2005) for Switzerland, Ozkan (2001) for the UK, Bontempi (2002) for Italy, and de Miguel and Pindado (2001) for Spain.

flows close to zero. Firms that find it necessary to take up or distribute capital must bear deeper transaction costs and thus adjust their leverage ratios more quickly.

In terms of the measurement of yearly adjustment speed rates, the literature is still discordant. Estimations made on the basis of substituting the target capital structure for adjustment speeds in the regression equation yield the following values: 34% (Flannery and Rangan, 2006), 13% in LS regressions and 25% in generalized method of moments (GMM) regressions (Lemmon *et al.*, 2008), 17% (Huang and Ritter, 2009), 15% (Frank and Goyal, 2007), 18% in least squares (LS) regressions and 15% in Blundell–Bond GMM regressions (Flannery and Hankins, 2007). Furthermore, on the basis of different models for the calculation of adjustment speeds: 7–18% (Fama and French, 2002), 21–39% (Tsyplakov, 2008) and 16% (Roberts, 2002). The adjustment speed measure is sensitive to the econometric design. Econometric challenges are unobservable variables, heterogeneous panel data, short panel biases, autocorrelation, and unbalanced panels (Zhao and Sumsel, 2008). The average half-life of the stated adjustment speed is a minimum of 1.77 years (39%) and a maximum of 9.9 years for the slowest adjustment speed of 7%. These measures are usually expressed in terms of the time needed to return to the target capital structure after a shock.

3. Methodology

We use several explanatory variables constructed from the cross-section of balance sheets of Asian companies to test the Tradeoff Theory versus the Pecking Order Theory. Seven explanatory variables, deemed determinants of capital structure, are regressed against the variable leverage (LEV). The variable leverage (LEV) is constructed as the value of debt divided by the sum of total capital and structured debt. In line with the literature, we use a book value and a market value definition of leverage.

3.1. Determinants of Capital Structure

To ensure comparability, our selection of capital structure determinants is comparable to Frank and Goyal (2009), who deliver a benchmark long-term study for the US capital market using data from 1950 to 2003. Accordingly, we test the validity of the Tradeoff Theory versus the Pecking Order Theory by means of profitability (PR), size (SI), market expectations (ME), tangibility of assets (TA), non-debt tax shield (NT), retained earnings (RE), and the industry median of leverage (IM). Table 1 gives an overview of the variables and the signs predicted by the Tradeoff Theory and the Pecking Order Theory.

According to the Tradeoff Theory, profitable companies have a lower bankruptcy probability, which is an argument in favor of a positive correlation between profitability and leverage. However, a negative correlation can be explained by the dynamic version of the Tradeoff Theory, as it is cost-effective not to adjust the capital structure immediately after a decrease in the value of equity. For company size

Table 1 Determinants of the target capital structure and their sign according to theory

**Financial information is from the Worldscope database.

	Determinant	Tradeoff Theory	Pecking Order Theory	Proxy**
PR	Profitability	+/−	−	$\frac{EBIT}{Total\ assets}$
SI	Size	+	−	ln ($Total\ assets$)
ME	Market expectation	−	+	$\frac{Market\ price\ year\ end}{Book\ value\ per\ share}$
TA	Tangibility of assets	+	−	$\frac{Fixed\ assets}{Total\ assets}$
NT	Non-debt tax shield	−		$\frac{Expenses\ for\ Depreciation}{Total\ assets}$
RE	Retained earnings		−	*Earnings retention rate*
IM	Industry median of leverage	+		*Calculation based on LEV*

(SI), the Tradeoff Theory predicts a positive relationship to leverage because bankruptcies of large corporations are less likely due to less volatile and more diversified cash flows. As corporate growth (ME) implies a reduction of free cash flow, the Tradeoff Theory predicts a negative relationship. Tangible assets (TA) can be used as collateral and are therefore positively related to leverage (Scott, 1977). As collateral serves as a guarantee for debt repayment, it influences the amount of secured debt a company can issue, as well as the interest rate at which the company can borrow money. The determinant non-debt tax shield (NT) measures the earnings reduction caused by depreciation expenses as expenses for depreciation over total assets. Depreciation expenses reduce profits and therefore lower the value of the debt tax shield, which leads to a negative relationship between leverage and the non-debt tax shield. Finally, as firms in an industry face common forces that affect their financing decisions, the Tradeoff Theory predicts a positive relationship between leverage and the variable industry median of leverage (IM).

According to the Pecking Order Theory, profitability (PR) and leverage are negatively correlated because companies prefer internal to external financing. In terms of size (SI), the information asymmetry between outside investors and management is low due to the disclosure duties of large companies. This results in a negative relationship between leverage and size. The same reasoning applies to corporate growth (ME) financed by debt, when management is confident in future corporate investments. Thus, a positive relationship between market expectation (ME) and leverage corresponds to the Pecking Order Theory. The variable tangibility of assets (TA) is predicted to be negatively related to leverage because low information asymmetry associated with tangible assets makes equity issuances more attractive. Therefore, leverage is predicted to be lower for firms with higher asset tangibility (TA). The decision concerning the retention of earnings (RE) is connected to dividend policy aspects.

According to the Pecking Order Theory, the dividend policy conveys information on the future internal investment possibilities of the firm. The higher dividend payouts are, the better the internal investment prospects. Additionally, higher dividend payouts usually determine the degree of debt financing. This implies a negative relationship between leverage and retained earnings. Graham and Harvey (2001) find moderate evidence for this conjecture. In terms of the non-debt tax shield (NT) and industry median of leverage (IM), no clear statement can be made according to the Pecking Order Theory.

3.2. Regression Method

We use one period-lagged determinants of capital structure to explain the target capital structure (LEV*). This procedure takes into account that capital structure determinants are known by CFOs at the time of the financing decision. In addition, the problem of endogeneity is less severe when using lagged variables. Thus, the target capital structure (LEV*) of company i at time $t + 1$ can be explained by the regression equation:

$$LEV^*_{i,t+1} = \alpha_t + \beta_1 PR_{i,t} + \beta_2 SI_{i,t} + \beta_3 ME_{i,t} + \beta_4 TA_{i,t} + \beta_5 NT_{i,t} + \beta_6 RE_{i,t} + \beta_7 IM_{i,t} + \varepsilon_{i,t} \quad (1)$$

For all eight industries,[3] we estimate Equation (1) by ordinary least squares (OLS), two-stage least squares (TSLS) and the GMM. For the OLS estimation a parameter μ_i, denoting firm fixed effects, is added to the regression equation because the set of explanatory variables is a priori unknown. In the case of OLS regressions, we use the Durbin–Watson test to check for serial correlation and multicollinearity by inspecting the correlation matrix of regressors and computing the variance inflation factor (VIF) in the case of doubts.[4]

Using several regression methods provides a better understanding of the robustness of the overall results because TSLS and GMM estimations are immune to serial correlation and heteroscedasticity and mitigate the problem of endogeneity. Determining whether a variable is endogenous is assessed in two steps. In the first step, we conduct a causality analysis. In the second step, we use the Hausman test to determine whether the factors qualify as endogenous (Hausman, 1978). Determinants such as profitability (PR), market expectations (ME), and industry median of leverage (IM) are beyond the control of managers and qualify as exogenous according to the causality analysis. The remaining capital structure determinants, size (SI),

[3]Refer to Section 4. Data for further information regarding industries are analyzed.

[4]The VIF of a determinant is computed as 1 divided by 1 minus the coefficient of determination of the determinant. The coefficient of determination of the determinant is generated with an auxiliary regression of one of the determinants on the remaining determinants. Strong multicollinearity is indicated by VIF values larger than two, indicating unreliable OLS estimators.

tangibility of assets (TA), non-debt tax shield (NT), and retained earnings (RE), qualify as potentially endogenous. For TSLS and GMM regressions, we use designated instruments, which satisfy the requirement of instrument relevance and instrument exogeneity for every potentially endogenous determinant. The first requirement means that a high correlation of the instrument and the endogenous variable must be present. The second requirement stipulates that no correlation between the instrument and the error term is allowed to be present. As the residuals of the population are unknown, the second requirement cannot be controlled and hence remains an assumption. Section 5.4 discusses the results of the Hausman test and proves that the potentially endogenous determinants are truly exogenous. All determinants that qualify as endogenous by the Hausman test are instrumentalized by the one-period lagged variable. Tangibility of assets (TA) is also instrumentalized by the factor research and development.[5]

3.3. Industry Fixed Effects vs. Firm Fixed Effects

Based on a US sample, MacKay and Phillips (2005) find that industry fixed effects explain approximately 13% of the variation in leverage, and firm fixed effects account for 54% of the variation of leverage. Although the unobservable firm fixed effects elucidate the majority of leverage variation over time, Roberts (2002) highlights that the average degrees of leverage ratios analyzed for 50 industry sectors in the USA span from a minimum of 9% to a maximum of 54%. Almazan and Molina (2005) argue that intra-industry capital structure dispersion is greater in industries that are more concentrated, use leasing more intensively, and exhibit looser corporate governance practices. With regard to country-specific evidence, Glen and Singh (2004) report that companies in emerging markets display lower debt levels than their peers in industrialized countries. An exception to this observation is reported by Kim (2009), who detects higher book levels of debt for Korean companies compared to their US peers in the same industries. From an economic perspective, firm fixed effects are the permanent, time-invariant component of debt. The drastic increase in explanatory power through the inclusion of firm fixed effects indicates a certain degree of persistence in capital structures.[6] We control for firm fixed effects by variable μ_i in regression (1) and focus our investigation on industry-specific effects.

3.4. Estimation of the Speed of Adjustment

The speed of adjustment is commonly expressed as the time needed to return to the target capital structure after a deviation. The estimation of the speed of

[5]The factor research and development is defined as expenditures for research and development divided by total sales.

[6]Flannery and Rangan (2006) report an adjusted coefficient of determination of 45%. In the studies of Lemmon *et al.* (2008) and Antoniou *et al.* (2008), the amounts are adjusted to 60% and 66%, respectively.

adjustment is a two-step process. In the first step, the target capital structure is constructed. The calculation is based on model (1) and estimated with the GMM method. In the second step, we calculate the annual change of the gap between the target capital structure and the actual capital structure as follows:

$$LEV_{i,t+1} = \lambda LEV^{*}_{i,t} + (1-\lambda)LEV_{i,t} + \varepsilon_{i,t+1}, \quad (2)$$

where *LEV* is leverage, *LEV** stands for target capital structure, λ is the speed of adjustment and $\varepsilon_{i,t+1}$ is the error term. The target adjustment model is a dynamic regression model. It is inherent to dynamic regression models that the regressant acts as a regressor in the same equation in a lagged variation. Some new econometric challenges come with this form of regression, as $LEV_{i,t+1}$ is a function of the error term and $LEV_{i,t}$ is a function of the error term, (Baltagi, 1995). Therefore, endogeneity is present.

Ultimately, the discussion of whether target capital structures exist must balance the tradeoff between consistency and efficiency of the methods for estimating the speed of adjustment.[7] We use GMM-Sys to estimate the speed of adjustment. The approach was developed by Arellano and Bover (1995) and Blundell and Bond (1998) to make dynamic regressions with firm fixed effects possible.[8] GMM-Sys has the advantage of robustness to endogeneity and the short panel bias (Greene, 2008). We use lagged values as instruments for the endogenous variable $LEV_{i,t}$. Thus, we do not define a concrete lag as an instrument but rather define a range, which is dynamically enhanced from one up to a maximum of five period lags. This implies that the leverage of the first four periods cannot be instrumentalized over five periods. GMM does not only use the lagged values to build the instrument but also uses the differences of the absolute values of two lagged variables. For instrument validity, there must be a correlation between the endogenous variable and the instrument. Furthermore, serial correlation of a higher order than the periods for which the instrument is lagged must be absent. Finally, we indicate that the GMM-Sys estimation can be biased in the case of a highly persistent dependent variable. If this is the case, long difference estimation would provide more reliable estimates (Hahn *et al.*, 2007, Huang and Ritter, 2009).

[7]The following methods are generally accepted: System-GMM (GMM-Sys) by Clark *et al.* (2009), Lemmon *et al.* (2008) and Antoniou *et al.* (2008), difference-GMM by Flannery and Rangan (2006), long difference estimator by Huang and Ritter (2009), corrected least squares dummy variables estimation by Flannery and Hankins (2007), Kalman filter estimation by Zhao and Sumsel (2008), restricted maximum likelihood method by Byoun (2008), two-step partial adjustment model with fixed effect proxies by Hovakimian and Li (2011).

[8]The authors and the literature refer to this method as extended GMM.

4. Data

The dataset is taken from Worldscope, a database designed for the comparison of corporate figures between countries. All figures are calculated with standardized definitions to offset disclosure and representation differences in local accounting standards, as well as differences in legal and fiscal regulations. This immunizes our results against distortions because 90% of the companies in our sample use local accounting standards and only 10% base their reporting on International Financial Reporting Standards (IFRS) or US-Generally Accepted Accounting Principles (US-GAAP).

The company figures EBIT, total assets, fixed assets, and expenses for depreciation are scaled to the unit of 1 million, where longitudinal fluctuation of the currency is offset by definition. The determinant size (SI) is converted to US dollars to ensure comparability. The dataset contains all companies with a market capitalization of at least US$1 billion as of December 2009 listed on a major Asian stock exchange market. This yields an unbalanced panel data set of 1239 companies from 1995 to 2009, of which 497 are from China, 413 are from Japan, 91 are from South Korea, 72 are from Taiwan, 48 are from India, 41 are from Singapore, 31 are from Malaysia, 20 are from Thailand, 11 are from Indonesia, nine are from the Philippines, and six are from Pakistan. The availability of the financial information varies according to industry and determinants. Thus, we collect leverage information for 14 241 firm-year observations based on 1239 firms with an average of 11.49 years. We also impose a size restriction to obtain a sample with homogenous financing costs. This allows us to draw comparisons between the speeds of adjustment in different industries, which are not distorted by different financing costs due to a different median size of the companies of an industry.

We use the Industry Classification Benchmark (ICB) to subdivide the dataset into ten industries. The classification is extracted from Worldscope. We concentrate on eight out of these ten industries, excluding Financials and Utilities because their capital structures are chosen in accordance with country-specific regulations and therefore reflect regulation-specific factors. Table 2 shows the analyzed industries and the number of companies per industry.

In the database we find outliers, which cannot be explained by economic theory. Therefore, the dataset is winsorized at the 0.5% level on both tails of the distribution.

5. Results

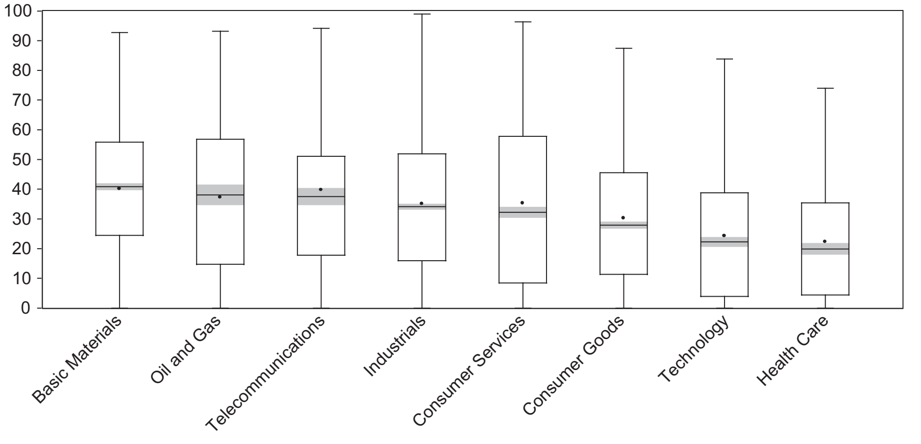
5.1. Descriptive Statistics

The boxplots show that leverage is significantly different between the eight industries, that it is highly volatile within each industry, and that the magnitude of the within-industry dispersion varies from industry to industry. With 40% leverage, Basic Materials is the most leveraged industry in the dataset. With 20% leverage, Health Care uses the most conservative financing approach. Consumer Services has the highest leverage dispersion. Figure 1 shows the leverage per industry in the years

Table 2 Number of companies per industry and country

	Total per industry	China	Japan	South Korea	Taiwan	India	Singapore	Malaysia	Thailand	Indonesia	Philippines	Pakistan
Oil and Gas	38	6	10	3	1	11	1	1	3	1	1	–
Basic Materials	217	124	72	0	1	5	2	3	3	3	0	4
Industrials	374	165	108	42	14	11	14	10	5	2	3	
Consumer Goods	228	86	82	21	7	7	11	8	1	3	1	1
Health Care	61	25	26	4	–	4	1	–	1	–	–	–
Consumer Services	174	59	75	10	5	3	7	7	5	1	2	
Telecommunications	29	5	3	4	3	3	4	2	1	1	2	1
Technology	118	27	37	7	41	4	1	–	1	–	–	–
Total Asia	1239	497	413	91	72	48	41	31	20	11	9	6

Figure 1 Leverage per industry



1995–2009. The length of the box corresponds to the inter-quartile range, which includes 50% of the values. The line in the middle represents the median, and the average is marked with a point. We do not show outliers. The smallest and largest values, which are not yet outliers, are marked by the staples.

5.2. Regression Results

The adjusted coefficient of determination and the significance[9] of the capital structure determinants are high among all three regression methods (Table 3). Owing to serial correlation and possible heteroscedascity, the subsequent analysis of the capital structure determinants and their signs are solely based on the TSLS and GMM regressions. The differences concerning significance of the determinants and sign are small between the two methods. As the model does not explain the data for Telecommunications, we exclude this industry from further analysis.

The judgment on whether the model fits the data of a particular industry is based on the *R*-squared adjusted of the OLS regression. Although this type of regression may be biased upward due to endogeneity, we nevertheless can approximately assess the explanatory content of the model. This stands in contrast to the instrumental variable regression, where the coefficient of determination has no natural explanation and hence does not reflect the explanatory content.

To answer the question of whether the data fits the model, the adjusted coefficient of determination is estimated by two OLS regressions. One regression (OLS I) includes firm-fixed effects and the second regression (OLS II) excludes firm-fixed effects. Table 3 shows the results. In the estimation with firm-fixed effects, OLS I leads to values between 0.72 and 0.88. Hence, the explanatory power of OLS I is high and the volatility is low. For the estimation without firm-fixed effects (OLS II), the values lie between 0.22 and 0.55. These values are close to the values

[9]If not stated otherwise, significance will always be reported at a 0.05 level.

Table 3 *R*-squared adjusted by method of regression and industry

	OLS I	OLS II	TSLS	GMM
Oil & Gas	0.84	0.38	0.49	0.37
Basic Materials	0.82	0.33	0.42	0.42
Industrials	0.80	0.23	−0.05	−0.98
Consumer Goods	0.76	0.22	0.11	−0.04
Health Care	0.79	0.41	0.45	0.42
Consumer Services	0.88	0.55	0.71	0.61
Technology	0.72	0.31	0.34	0.34

for the US market and for the US market plus Japan and parts of Europe, as measured by Antoniou *et al.* (2008). They are somewhat higher than the values reported by Frank and Goyal (2007). The model explains the Consumer Services, Oil and Gas and Basic Materials industries well.

The capital structure decisions of Asian firms are driven by the factors profitability (PR) and tangibility of assets (TA), independent of the industry. Individual industry factors complete the picture. The regression results are presented in Table 4. The industry median (IM) is significant in the following five out of seven industries: Oil and Gas, Basic Materials, Industrials, Consumer Goods, and Technology. Size (SI) is significant in the following five out of seven industries: Basic Materials, Industrials, Consumer Goods, Health Care, and Technology. The non-debt tax shield (NT) is significant in the following three industries: Oil and Gas, Basic Materials, and Industrials. Retained earnings (RE) are not significant in any of the industries. The factor market expectation (ME) only influences the Basic Materials and Consumer Services industries.

Accordingly, we show that the capital structure decision is a tradeoff influenced by multiple factors. Moreover, we can separate capital structure choices into a common and industry-based component. It seems that the non-debt tax shield (NT) is an industry-based component for companies in the secondary sector.

A consistent sign is found in all seven industries for profitability (PR) and tangibility of assets (TA). Profitability (PR) is negatively correlated with leverage. Although this can be explained by the Tradeoff Theory, it is basically considered as evidence for the Pecking Order Theory. Tangibility of assets (TA) behaves as predicted by the Tradeoff Theory and is therefore positively related to leverage. The factors size (SI) and non-debt tax shield (NT) show the signs predicted by the Tradeoff Theory, except in the case of the Health Care industry. Market expectation behaves, again apart from in the Health Care industry, in accordance with the Pecking Order Theory. The signs are stable over the industries. They can, largely, be predicted by the Tradeoff Theory. However, this does not enable us to reject the Pecking Order Theory completely because the observed negative relationship between profitability and leverage is more in line with the Pecking Order Theory.

Table 4 Regression results

This table contains the estimated regression coefficients of the OLS, TSLS, and GMM estimates for the following model:

$$LEV^{*}_{i,t+1} = \alpha_t \beta_1 PR_{i,t} + \beta_2 SI_{i,t} + \beta_3 ME_{i,t} + \beta_4 TA_{i,t} + \beta_5 NT_{i,t} + \beta_6 RE_{i,t} + \beta_7 IM_t + \varepsilon_{i,t}$$

For the OLS estimation, a parameter μ_i denoting firm fixed effects must be added to the regression equation. *t*-statistics are shown in parentheses. *t*-statistics of the TSLS and GMM estimations are robust to serial correlation and heteroskedascity. *denotes statistical significance at the 0.05 level. **denotes statistical significance at the 0.1 level. The results are classified by industry and regression technique. LEV* stands for target capital structure, PR stands for profitability, SI for size, ME for market expectations, TA for tangibility of assets, NT for non-debt tax shield, RE for retained earnings, and IM for industry median of leverage.

	Oil & Gas				Basic Materials				Industrials		
	OLS	TSLS	GMM		OLS	TSLS	GMM		OLS	TSLS	GMM
PR	−87.25	−87.81	−108.06	PR	−92.09	−144.53	−141.72	PR	−60.43	−120.13	−112.99
	*(−6.25)	*(−2.68)	*(−2.68)		*(−16.19)	*(−7.10)	*(−7.31)		*(−12.22)	*(−5.94)	*(−4.99)
SI	2.71	2.38	2.33	SI	3.028	6.097	6.768	SI	6.33	6.30	7.45
	**(1.81)	(0.94)	(0.79)		*(3.99)	*(4.37)	*(4.76)		*(11.78)	*(5.29)	*(5.77)
ME	−0.20	0.11	0.90	ME	0.44	2.33	2.49	ME	−0.23	1.04	0.60
	(−0.56)	(0.03)	(0.25)		**(1.87)	*(4.05)	*(4.26)		(−1.43)	*(2.00)	(0.91)
TA	27.44	66.31	62.82	TA	21.680	65.984	69.799	TA	13.17	65.36	61.44
	*(3.40)	**(1.97)	*(2.06)		*(4.70)	*(4.81)	*(4.77)		*(4.67)	*(6.57)	*(4.91)
NT	−259.82	−957.23	−894.82	NT	−51.33	−400.51	−426.29	NT	−18.17	−253.48	−257.79
	*(−4.41)	*(−3.33)	*(−2.94)		**(−1.8)	*(−4.31)	*(−4.30)		(−0.72)	*(−3.27)	*(−2.96)
RE	−0.01	0.10	0.16	RE	0.001	0.036	−0.004	RE	0.00	0.31	0.53
	(−1.43)	(0.64)	(0.80)		(0.33)	(0.42)	(−0.05)		(0.31)	*(2.33)	*(2.49)
IM	0.37	0.66	0.78	IM	0.76	1.19	1.09	IM	1.12	1.20	1.17
	*(4.30)	*(2.47)	*(2.31)		*(14.08)	*(10.21)	*(9.44)		*(21.54)	*(5.23)	*(4.12)

Table 4 (*Continued*)

	Consumer Goods				Health Care				Consumer Services		
	OLS	TSLS	GMM		OLS	TSLS	GMM		OLS	TSLS	GMM
PR	−67.21	−98.97	−89.83	PR	−84.53	−111.73	−89.03	PR	−51.36	−112.92	−148.34
	*(−12.06)	*(−5.35)	**(−1.84)		*(−6.71)	*(−3.96)	*(−3.33)		*(−7.99)	*(−1.67)	*(−4.14)
SI	2.49	2.78	5.05	SI	4.64	−4.77	−5.06	SI	5.41	1.36	0.86
	*(3.26)	*(2.31)	*(3.09)		*(3.36)	*(−3.65)	*(−3.76)		*(8.27)	(0.69)	(0.49)
ME	0.24	1.95	1.31	ME	−0.55	−0.53	−0.57	ME	0.57	3.16	2.48
	(1.59)	*(3.47)	(1.44)		**(−1.71)	−0.95	(−0.97)		*(3.89)	*(3.14)	*(3.82)
TA	13.39	31.73	38.08	TA	−10.68	53.47	46.20	TA	15.49	97.55	89.99
	*(2.90)	*(3.25)	*(2.72)		(−1.21)	*(2.37)	*(2.21)		*(5.09)	*(9.90)	*(10.05)
NT	28.79	16.35	21.22	NT	35.56	−15.34	−16.80	NT	−59.82	−229.77	−111.99
	(1.06)	(0.22)	(0.14)		(0.66)	(−0.11)	(−0.14)		*(−2.20)	**(−1.83)	(−0.92)
RE	−0.01	−0.11	−0.18	RE	0.01	0.08	0.04	RE	−0.002	−0.05	0.10
	*(−2.38)	(−0.63)	(−0.37)		(0.99)	(0.76)	(0.32)		(−0.82)	(−0.24)	**(1.72)
IM	0.92	0.82	1.35	IM	0.63	0.21	0.16	IM	0.60	0.25	0.19
	*(12.49)	*(3.00)	*(4.14)		*(6.25)	(1.26)	(1.04)		*(4.64)	(0.41)	(0.54)

	Telecommunications				Technology		
	OLS	TSLS	GMM		OLS	TSLS	GMM
PR	−231.42	−14.19	−13.65	PR	−43.71	−72.02	−71.56
	*(−12.83)	(−0.27)	(−0.06)		*(−7.48)	*(−9.10)	*(−5.74)
SI	2.32	0.36	−0.44	SI	4.09	3.70	3.93
	(0.67)	(0.24)	(−0.16)		*(5.16)	*(6.86)	*(3.33)
ME	0.83	0.44	−0.51	ME	0.05	0.24	0.18

Table 4 (*Continued*)

	Telecommunications				Technology		
	OLS	TSLS	GMM		OLS	TSLS	GMM
	*(2.21)	(0.27)	(−0.2)		(0.66)	(1.23)	(1.09)
TA	−21.53	8.20	−1.32	TA	38.23	23.82	23.34
	(−1.1)	(0.43)	(−0.04)		*(6.28)	(3.99)	*(2.07)
NT	207.55	15.08	57.10	NT	−54.71	−13.85	−9.21
	*(2.76)	(0.18)	(0.6)		(−2.65)	(−0.43)	(−0.18)
RE	0.01	0.55	0.47	RE	0.00	−0.02	0.01
	(0.77)	*(2.98)	(1.01)		(−0.52)	(−0.15)	(0.04)
IM	1.38	0.07	0.67	IM	0.85	0.75	0.82
	*(3.06)	(0.10)	(1.15)		*(7.77)	*(4.15)	*(2.99)

5.3. Robustness Tests – Regression Results with Market Leverage

This section reports on robustness by providing the results of the following estimation:

$$MLEV^{*}_{i,t+1} = \alpha_t + \beta_1 PR_{i,t} + \beta_2 SI_{i,t} + \beta_3 ME_{i,t} + \beta_4 TA_{i,t} + \beta_5 NT_{i,t} + \beta_6 RE_{i,t} + \beta_7 IM_{i,t} + \varepsilon_{i,t} \quad (3)$$

where MLEV* is the target capital structure based on market leverage. We estimate this model with OLS, TSLS, and GMM. For the OLS estimation, a parameter μ_i denoting firm-fixed effects is added to the regression equation. The only difference to regression model (1) is that book leverage (LEV) is replaced by market leverage (MLEV). Market leverage is constructed by dividing total debt by the sum of total debt and market value of the company at the end of the year. The regression specifications used are identical to the ones used in estimate model (1). The market leverage model (MLEV) confirms our main findings that the capital structure is a tradeoff influenced by common and industry-based components. The results are presented in Table 5.

The explanatory content of model (3) is consistent with the results of model (1) and therefore confirms that the capital structure decision of Asian companies is based on the defined determinants. Owing to serial correlation and possible heteroscedascity in the model, the subsequent analysis of the capital structure determinants and their signs is based on TSLS and GMM regressions. The differences concerning significance of the determinants and sign are marginal between the two methods. Although model (3) explains Telecommunications, we do not further include it in the robustness discussion because model (1) lacks explanatory content for this industry. The GMM estimation confirms, except in the case of the Oil and Gas industry, that the Asian capital structure is driven by the factors profitability (PR) and tangibility of assets (TA), independent of industry affiliation. Additionally, model (3) adds size (SI) as a common industry factor. The most widely used industry-based factors are industry median of leverage (IM) and market expectation (ME), which are significant at the 0.1 level in two industries, and retained earnings (RE), which is significant in one industry. The low significance of retained earnings (RE) in the market leverage model underscores the earlier finding, that companies do not counteract the mechanical effects of stock returns on their leverage. Concerning similarities at the industry level, both models report high factor significance for Basic Materials and Industrials compared to Consumer Goods, Health Care, and Technology.

Turning to predictions of the sign, we find consistent signs for profitability (PR), tangibility of assets (TA), and industry median of leverage (IM) in all seven industries. Whereas the relationship between leverage and profitability (PR) is negative according to the predictions of the Pecking Order Theory, the relationship between leverage and tangibility of assets (TA), as well as the relationship between industry median of leverage (IM), is positive according to the Tradeoff Theory. In addition, the sign of size (SI) matches the prediction of the Tradeoff Theory in all

Table 5 Regression results for market leverage

This table contains the estimated regression coefficients of the OLS, TSLS, and GMM estimates for the following model:

$$MLEV^{*}_{i,t+1} = \alpha_t \beta_1 PR_{i,t} + \beta_2 SI_{i,t} + \beta_3 ME_{i,t} + \beta_4 TA_{i,t} + \beta_5 NT_{i,t} + \beta_6 RE_{i,t} + \beta_7 IM_t + \varepsilon_{i,t}$$

For the OLS estimation, a parameter μ_i denoting firm fixed effects must be added to the regression equation. *t*-statistics are shown in parentheses. *t*-statistics of the TSLS and GMM estimations are robust to serial correlation and heteroskedascity. *denotes statistical significance at the 0.05 level. **denotes statistical significance at the 0.1 level. The results are classified by industry and regression technique. MLEV* stands for target capital structure based on market leverage, PR for profitability, SI for size, ME for market expectations, TA for tangibility of assets, NT for non-debt tax shield, RE for retained earnings, and IM for industry median of leverage.

	Oil & Gas				Basic Materials				Industrials		
	OLS	TSLS	GMM		OLS	TSLS	GMM		OLS	TSLS	GMM
PR	−0.93	−0.29	−1.27	PR	−0.83	−1.32	−1.32	PR	−0.61	−1.07	−1.08
	*(−5.57)	(−0.59)	*(−2.24)		*(−10.46)	*(−6.07)	*(−5.72)		*(−9.12)	*(−5.55)	*(−5.22)
SI	0.15	0.03	0.05	SI	0.03	0.05	0.06	SI	0.10	0.07	0.07
	*(8.66)	(0.83)	(1.21)		*(2.94)	*(3.46)	*(4.13)		*(13.47)	*(6.26)	*(6.28)
ME	−0.02	−0.11	−0.04	ME	−0.02	−0.01	−0.01	ME	−0.02	−0.02	−0.02
	*(−5.17)	*(−2.19)	(−0.87)		*(−4.70)	(−1.37)	(−1.12)		*(−8.27)	*(−2.89)	*(−2.72)
TA	0.58	0.17	0.30	TA	0.18	0.58	0.57	TA	0.13	0.72	0.78
	*(6.10)	(0.32)	(0.76)		*(2.78)	*(3.90)	*(3.53)		*(3.53)	*(7.77)	*(8.26)
NT	−2.63	−4.26	−7.07	NT	−0.56	−3.75	−3.22	NT	−0.18	−3.42	−3.71
	*(−3.75)	(−0.85)	(−1.63)		(−1.43)	*(−3.40)	*(−2.71)		(−0.52)	*(−5.08)	*(−5.34)
RE	−0.00	−0.00	0.00	RE	−0.00	0.00	0.00	RE	−0.00	0.00	0.00
	(−1.35)	(−0.78)	(0.39)		*(−1.86)	(0.77)	(0.46)		(−1.43)	(1.92)	*(2.11)
IM	0.01	0.00	0.00	IM	0.01	0.01	0.01	IM	0.01	0.01	0.01
	*(6.76)	(0.54)	(0.81)		*(8.04)	*(7.15)	*(7.69)		*(16.53)	*(6.07)	*(6.09)

Table 5 (*Continued*)

	Consumer Goods				Health Care				Consumer Services		
	OLS	TSLS	GMM		OLS	TSLS	GMM		OLS	TSLS	GMM
PR	−0.66	−0.83	−0.75	PR	−0.63	−0.91	−89.03	PR	−51.36	−0.76	−0.77
	*(−10.15)	*(−5.42)	*(−3.76)		*(−5.14)	*(−3.52)	*(−3.33)		*(−7.99)	*(−5.16)	*(−5.00)
SI	0.05	0.05	0.04	SI	0.04	−0.03	−5.06	SI	5.41	0.05	0.05
	*(5.99)	*(3.95)	*(3.14)		*(3.14)	*(−2.05)	*(−3.76)		*(8.28)	*(3.72)	*(3.75)
ME	−0.00	0.00	−0.00	ME	−0.01	−0.02	−0.57	ME	0.57	0.01	0.01
	*(−2.09)	(0.26)	(−0.45)		*(−2.07)	*(−2.73)	(−0.97)		*(3.89)	*(1.98)	**(1.83)
TA	0.11	0.22	0.23	TA	−0.37	0.17	46.20	TA	15.49	0.49	0.49
	*(2.09)	*(2.62)	*(2.46)		*(4.30)	(1.01)	*(2.21)		*(5.09)	*(7.30)	*(7.02)
NT	0.34	0.57	1.21	NT	1.23	0.92	−16.80	NT	−59.82	−0.55	−0.48
	(1.07)	(0.76)	(1.31)		*(2.36)	(0.88)	(−0.14)		*(−2.20)	(−0.89)	*(−0.76)
RE	−0.00	−0.00	−0.00	RE	0.00	0.00	0.04	RE	−0.00	−0.00	−0.00
	*(−2.92)	(−1.02)	(−1.14)		(0.82)	(0.94)	(0.33)		(−0.82)	(−1.18)	(−1.39)
IM	0.01	0.01	0.00	IM	0.01	0.00	0.16	IM	0.60	0.00	0.00
	*(7.61)	(1.59)	(0.82)		*(6.06)	*(2.31)	(1.04)		*(4.64)	(0.43)	(0.33)

	Telecommunication				Technology		
	OLS	TSLS	GMM		OLS	TSLS	GMM
PR	−0.57	−0.81	−0.84	PR	−0.39	−0.67	−0.66
	*(−7.09)	*(−5.44)	*(−5.17)		*(−6.25)	*(−6.36)	*(−5.99)
SI	0.07	−0.03	−0.03	SI	0.06	0.04	0.04
	*(4.57)	**(−1.69)	**(−1.72)		*(7.43)	*(3.73)	*(3.68)
ME	0.00	0.00	0.00	ME	0.00	0.00	−0.00

Table 5 (*Continued*)

	Telecommunication				Technology		
	OLS	TSLS	GMM		OLS	TSLS	GMM
	(0.08)	*(1.98)	(0.99)		(0.25)	(0.00)	(−0.21)
TA	0.30	0.26	0.28	TA	0.26	0.19	0.20
	*(3.36)	*(2.22)	*(2.32)		*(4.00)	**(1.94)	**(1.85)
NT	−1.418	−1.282	−1.445	NT	−0.08	−0.03	−0.04
	*(−4.30)	**(−1.79)	**(1.92)		(−0.36)	(−0.06)	(−0.07)
RE	−0.00	0.00	0.00	RE	−0.00	0.00	0.00
	(−0.22)	(1.25)	(1.27)		(−1.79)	(0.13)	(0.36)
IM	0.00	0.00	0.00	IM	0.00	0.00	0.00
	*(2.50)	(0.04)	(−0.43)		*(3.26)	(0.81)	(0.42)

industries except for Health Care. The fact that tangibility of assets (TA), industry median of leverage (IM), and size (SI) show signs according to the Tradeoff Theory completes our finding that the leverage decision of Asian companies is based on the rationale of the Tradeoff Theory. However, because profitability is negatively correlated with leverage, the Pecking Order Theory cannot be rejected completely.

5.4. Regression Test Results[10]

After analyzing the causality structure of the model, the factors size (SI), tangibility of assets (TA), non-debt tax shield (NT), and retained earnings (RE) are considered potentially endogenous. We conduct a Hausman test based on an instrumental variables regression model to control for potentially endogenous factors. We depict the concrete approach for the potentially endogenous factor size (SI). In the first step, we conduct a regression of size (SI) on the exogenous variables and the instrument:

$$\begin{aligned} \mathrm{SI}_{I,t} = {} & \alpha_t + \beta_1 \mathrm{PR}_{I,t-1} + \beta_3 \mathrm{ME}_{I,t-1} + \beta_4 \mathrm{TA}_{I,t-2} + \beta_5 \mathrm{NT}_{I,t-2} + \beta_6 \mathrm{RE}_{I,t-2} \\ & + \beta_7 \mathrm{IM}_{I,1} + \varepsilon_{i,t-1} \end{aligned} \tag{4}$$

In the second step, we include the residuals of regression (4) in the original regression model (1) and check their significance based on an OLS regression. This leads to the finding that Oil and Gas, Basic Materials, Technology, and Consumer Goods contain only exogenous factors. Tangibility of assets (TA) is endogenous for Health Care. Endogeneity is most present in Industrials, where tangibility of assets (TA), size (SI), and retained earnings (RE) are endogenous, as well as in Consumer Services, where tangibility of assets (TA) and size (SI) are endogenous. Hence, if endogeneity is present, it is mainly caused by tangibility of assets (TA) and size (SI). In conclusion, the Hausman tests prove that endogeneity in the model can be caused by all potentially endogenous factors except for the non-debt tax shield (NT).

Multicollinearity is detected with the variance inflation factor (VIF, Table 6). These factors are below two for six out of seven industries. High multicollinearity is only found for tangibility of assets (TA) and non-debt tax shield (NT) in the Technology industry. The values for tangibility of assets (TA) are higher than those of the other determinants. The values of research and development (RD) are below those of tangibility of assets (TA). To ensure consistency of IV estimates, all instruments must be tested for relevance. Relevance can be taken for granted if there exists, under inclusion of all exogenous variables, a relationship between the instrument and the endogenous variable. The statistical implementation of this test is based on the following reduced regression model:

$$x_{G+1} = \alpha_1 + \beta_1 x_1 + \cdots + \beta_G x_G + \theta_1 z_1 + \cdots \theta_L z_L + \varepsilon \tag{5}$$

where x_{G+1} is the endogenous variable, x_1 to x_G are additional exogenous or endogenous variables, z_1 to z_L are instruments, α, β and θ_1 are parameters and $\boldsymbol{\varepsilon}$ is the

[10]All tests are based on regression model (1).

Table 6 Variance inflation factor per determinant and industry

	PR	SI	ME	TA	NT	RE	IM	RD
Oil & Gas	1.78	1.27	1.21	1.70	1.86	1.07	1.08	1.40
Basic Materials	1.20	1.08	1.20	1.21	1.25	1.00	1.03	1.09
Industrials	1.23	1.11	1.21	1.37	1.32	1.00	1.05	1.06
Consumer Goods	1.65	1.23	1.59	1.18	1.20	1.00	1.04	1.11
Health Care	1.39	1.44	1.47	1.49	1.20	1.03	1.13	1.39
Consumer Services	1.38	1.46	1.19	1.51	1.38	1.01	1.03	1.13
Technology	1.33	1.22	1.26	2.30	2.41	1.04	1.09	1.08

error term. Relevance is given if the null hypothesis, that the parameters of all instruments equal zero, is strongly rejected. According to the rule of thumb, variables with a *t*-statistic below 3.3 should be classified as weak instruments. The overall test is based on a repetition of the test above for every potentially endogenous variable. The overall picture of all individual *t*-statistics does not, however, stand for a test of the comprehensive model. Hence, the absence of weak instruments cannot be completely guaranteed. In addition, weak instruments can be presumed if the standard errors of the IV estimation are higher than those for the OLS estimation. The *t*-statistics of the endogenous variables SI, tangibility of assets (TA), and non-debt tax shield (NT) and the one-period lagged instruments of these variables show strong instrument relevance in all industries. Only the instrument of the endogenous variable RE must be classified as weak for Consumer Goods and Basic Materials. In addition, we test the instrument relevance of research and development (RD) and tangibility of assets (TA). Whereas research and development (RD) is a relevant instrument for tangibility of assets (TA) in four out of seven industries, this does not hold for the Oil and Gas and Technology industries.[11]

It must be assumed that instrument exogeneity cannot be tested. As serial correlation is a frequent problem in time series, lagged instruments are likely correlated with the error term. We mitigate this problem by using instruments that are, compared to the dependent variable, lagged for two periods. Additionally, we detect and report first-order serial correlation with the Durbin–Watson statistic. Durbin–Watson values are reported in Table 7. An average Durbin–Watson statistic of 0.86 stands for positive serial correlation in all industries. Serial correlation is only absent for the GMM estimation in the Consumer Services industry.

5.5. Speed of Adjustment

This section reports the results of model (1) with book leverage and model (3) with market leverage estimated with two slightly different GMM-Sys regressions. Detailed

[11]The factor RD, research and development, is defined as expenditures for research and development divided by sales. Robustness tests were also conducted by substituting the factor TA with the factor RD in equation (1). However, this did not improve the significance or the explanatory power of the model and is therefore not further discussed.

Table 7 Durbin–Watson statistic per determinant and industry

	OLS	TSLS	GMM
Oil & Gas	1.42	0.70	0.95
Basic Materials	0.98	0.40	0.37
Industrials	0.89	0.96	1.47
Consumer Goods	0.81	0.54	0.92
Health Care	1.07	0.47	0.38
Consumer Services	0.92	0.52	2.00
Technology	0.96	0.39	0.39

results are reported in Table 8. The first GMM-Sys regression (GMM-Sys dyn(–2,–5)) uses leverage (LEV) as a dynamic instrument starting at a lag of two periods and ending at a lag of five periods. The second GMM-Sys regression (GMM-Sys dyn(–1,–5)) uses leverage (LEV) as a dynamic instrument starting at a lag of one period and ending at a lag of five periods. By reporting two leverage measures plus variation in instrument choice, we provide the essential information that the convergences towards target capital structures are robust regarding the underlying target capital structure model and the instrument choice.

We report Hansen's *J*-statistic, a GMM compatible version of the Sargan-test, to provide information on the validity of the instruments. As the high values may be interpreted as evidence for suboptimal instrument choice, the emphasis of the subsequent analysis lies on the GMM-Sys dyn(–2,–5) regression, which has lower statistics. Our main findings are therefore based on model (1) with dyn(–2,–5) instrument specifications.

All four estimations report evidence on the target capital structure behavior of companies listed on Asian stock markets. According to our main findings, the speed of adjustment lies between 25% and 45% and is, on average, 32% for all seven industries. Based on this range, the companies' average half-life lies between 1.54 and 2.77 years. Because of the individual speeds of adjustments of each industry and because the averages are high, the pursuance of a target capital structure is not influenced by industry fixed effects. This finding is consistent with the results of model (3). Nevertheless, we show that industry effects influence the speed of adjustment. Our model (1) estimation with GMM-Sys dyn(–2,–5) leads to a maximum half-life of 2.77 years for the Consumer Services industry and a minimum half-life of 1.33 years for the Telecommunications industry.

With regard to absolute values and dispersion, the speed of adjustment is consistent with findings for the USA and Europe as well international findings, where speeds of adjustment range between 12% and 47%, as reported in the literature. A higher speed was anticipated due to the restriction of the dataset to large firms with a market capitalization of at least US$1 billion. This is an empirical indication that large firms, which are well established on stock markets, have lower transaction

Table 8 Speed of adjustment and Hansen's *J*-statistic

This table reports the main results of the speed of adjustment (Model (1)) as well as the speed of adjustment of the robustness check (Model (3)). All results are based on GMM-Sys estimation. Both models are further estimated with LEV/MLEV as dynamic instruments starting at a lag of two periods and ending at a lag of five periods in the case of dyn(−2,−5), and starting at a lag of one period and ending at a lag of five periods in the case of dyn(−1,−5). Hansen *J*-statistics are reported in parentheses.
*dyn(–2,–5) denotes that the instrument is dynamically enlarged from the second lag to maximal five lags.
**dyn(–1,–5) denotes that the instrument is dynamically enlarged from the first lag to maximal five lags.

	Model (1)		Model (3)	
	dyn(−2,−5)*	dyn(−1,−5)**	dyn(−2,−5)	dyn(−1,−5)
Oil & Gas	35%	37%	44%	46%
	(28)	(29)	(25)	(28)
Basic Materials	31%	33%	39%	34%
	(75)	(82)	(73)	(85)
Industrials	27%	26%	43%	42%
	(103)	(109)	(127)	(138)
Consumer Goods	32%	32%	35%	34%
	(76)	(84)	(76)	(83)
Health Care	28%	25%	12%	14%
	(26)	(30)	(40)	(42)
Consumer Services	25%	16%	35%	32%
	(43)	(60)	(58)	(71)
Technology	45%	32%	47%	48%
	(48)	(53)	(50)	(57)
Average	32%	29%	36%	36%

costs and better access to capital. Owing to the higher speed of adjustment in the Asian market, we conjecture that Asian companies with a market capitalization exceeding US$1 billion do not face significantly higher transaction costs than US companies.

6. Conclusion

We report on Asian financing decisions in a comprehensive study from a geographical and econometrical point of view (1239 corporations, 11 Asian countries, eight industry sectors). Our results contradict earlier indications of Pecking Order behavior in Asia. Instead, we find significant evidence that large Asian companies pursue target capital structures as in the USA and Europe. Our study relies on the capital structure determinants as they are identified in the literature. We find that the capital structure decisions in Asia can be divided into common and industry-based components. Profitability and tangibility of assets are the common determinants. Industry median, size, and non-debt tax shield, which determine capital structures in Asia, are the most popular industry-based components. Hence, decisions about capital structure are predominantly influenced by industry fixed effects. Although the relationship between leverage and tangibility of assets, size, and non-debt tax shield behaves as predicted by the Tradeoff Theory, the Pecking Order Theory cannot be rejected completely due to its correct prediction of the signs of profitability and market expectations. We underscore our finding of target capital structure behavior by reporting convergences toward target capital structures at annual speeds of adjustment ranging from 24% to 45%. These values are akin to the values measured for the US market. As convergence toward target capital structures is observed in all industries, the effective adjustment speed seems to be influenced by industry fixed effects.

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