Three Essays on Capital Structure

PhD Thesis

Constantinos V. Lambrinoudakis

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To my parents Vassilis and Calliope

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Introduction

Capital Structure is the mix of financial instruments used to finance real investments by corporations. There are four broad categories of financial instruments, namely common stock, preferred stock, debt and hybrid securities. Owners of common stock receive all corporate payouts after every other claimant has been paid and have the voting power to control corporate decision making. Owners of preferred stock receive payments before common stockholders, but they have no voting power. Debt holders are first in line for payment. They may not have voting power, but they have the right to force a bankruptcy proceeding and take over the company, if the company defaults on its payments. Some of the most widely used types of debt are bank loans, corporate bonds and commercial paper. Hybrid securities are combinations of different security types. For example, convertible bonds are debt securities that can be converted into equity at a specified price, at the lender's option.

Capital structure is one of the five major fields that corporate finance research consists of. The main question posed by capital structure research is whether the value of a firm is affected by its capital structure. In order to answer this question, capital structure literature explores the following issues:

- How do firms finance their operations?
- Which factors influence these choices?
- Is it possible to increase the value of a firm just by changing the mix of securities issued?

- Is there an optimal debt-equity combination that maximizes the value of the firm and if so how is it determined?

(A) Theoretical literature

Modern theory of capital structure starts with Modigliani and Miller's (1958) irrelevance proposition. Modigliani and Miller set the assumptions under which a firm's value is independent of its capital structure. Given that the irrelevance proposition relies on very strict assumptions, it certainly does not generate realistic predictions of how firms finance their operations. However, it provides a means of finding reasons of why financing may matter. If we can identify the conditions under which capital structure is irrelevant, we may be able to infer what makes it relevant. Therefore, Modigliani and Miller's proposition should be thought of as a benchmark, not an end result. The main theories that dominate capital structure literature until today were developed by relaxing one or more assumptions that generate Modigliani and Miller's proposition (Figure 1).

Trade-off theory was developed by relaxing the assumptions for taxes and bankruptcy costs. The use of debt entails both benefits and costs for the firms. Debt has a tax advantage over equity, because interest payments on debt are tax deductible, while dividend and retained earnings are taxed. On the other hand, debt creates the possibility of costly bankruptcy. According to the static trade-off theory, the optimal leverage ratio for a firm is determined by the trade-off between the tax benefits of debt and the expected costs of bankruptcy. At the optimum debt level, a marginal increase in the value of the tax shield will be equal to a marginal increase in expected bankruptcy costs. Bradley et al. (1984) present the standard version of the model. This model gives a solution for leverage, but it leaves no room for the firm to be anywhere but at the solution. Unlike the static trade-off theory, which posts that the optimal leverage ratio is determined by a single period trade-off between the tax benefits of debt and the expected costs of bankruptcy, dynamic trade-off models incorporate additional factors, such as optimality of financing choice in subsequent periods and transaction costs (e.g. Fisher et al., 1989; Goldstein et al., 2001; Strebulaev, 2007).

Pecking order theory was developed by relaxing the assumption about firms and individuals having the same information. The key idea is that owners/managers of firms know more about their firms' prospects than outside investors do. This asymmetric information generates adverse selection problems, when firms turn to external financing. This means that firms will issue mispriced securities. So, good firms should issue securities whose value is at least information sensitive, because they are least underpriced. Thus, according to pecking order theory, firms prefer internal to external funds and debt to equity, if external funds are required (Myers and Majluf, 1984). This implies that equity is used only as a last resort.

(B) Empirical literature and contribution of the thesis

The empirical capital structure literature can be categorized into four broad groups, namely (a) tests of the static trade-off theory, (b) tests of the pecking order theory, (c) tests of the dynamic trade-off theory and (d) identification of capital structure determinants. The first chapter of this thesis belongs in the literature group that tests dynamic trade-off theory, while the second and the third belong in the literature group that attempts to identify capital structure determinants (Figure 2).

(a) Tests of the static trade-off theory

As far as the static trade-off theory is concerned, a number of studies have tried to quantify expected bankruptcy costs (Warner, 1977; Weiss 1990; Andrade and Kaplan, 1998) and debt tax benefits (Graham, 2000). According to their estimates, most firms have much lower leverage than the leverage that would maximize firm value from a static trade-off perspective.

(b) Tests of the pecking order theory

In the pecking order group of papers, Shyam-Sunder and Myers (1999) report evidence consistent with the pecking order theory. In particular, they find that net debt issues track the financing deficit of a firm. However, Frank and Goyal (2003) show that net equity issues track the financing deficit of a firm more closely than net debt issues do. Fama and French (2005) find that equity issues occur often, they are on average large and equity issuers are not typically under stress. Both papers provide evidence which is at odds with the predictions of pecking order theory.

(c) Tests of the dynamic trade-off theory

A rather common characteristic across dynamic trade-off models is that security issuance implies transaction costs. This translates into the empirical hypothesis that actual debt ratios will revert towards an optimum/target level. In particular, firms will let their leverage ratio move away from their optimal level until the benefits from rebalancing outweigh transaction costs. The existence of mean-reversion in corporate leverage and the relevant speed of adjustment (mean reversion) have been at the epicenter of recent empirical literature (e.g., Fama and French, 2002; Flannery and Rangan, 2006; Lemmon, Roberts and Zender, 2008; Huang and Ritter, 2009). Results are mixed, in the sense that mean-reversion is documented in all papers, but the speed of adjustment estimates differ across papers, subject to different econometric procedures. The speed of adjustment is particularly important for the economic interpretation of the empirical evidence. The lower the speed of adjustment, the longer it takes for an average firm to offset deviations from the target. If the adjustment speed is low, then the view that firms engage in active rebalancing of their capital structure when making financing decisions becomes questionable.

The latest trend in this literature is the attempt to identify cross-sectional variation in adjustment costs (security issuance costs) and test whether such costs are correlated with capital structure activities. If adjustment costs do really impede firms from reaching their desired level of leverage, then higher adjustment costs should be associated with slower movements towards target leverage and vice versa. Documentation of such an empirical pattern would constitute strong evidence in favor of active rebalancing.

The first chapter of this thesis belongs and contributes to this strand of literature, i.e. testing of the relationship between transaction costs and adjustment speed. This study brings together elements from two strands of the literature: dynamic capital structure and security offerings literature. The novelty of this study is that, in contrast to existing literature, it employs directly measurable proxies for adjustment costs, i.e. security issuance cost determinants. So far, previous studies have attempted to capture adjustment cost variation indirectly, e.g. by identifying cases where firms would enter into financial transactions anyway (Faulkender et al, 2012).

According to the results, the speed of adjustment does not increase as costs decrease. It is positively related to adjustment costs or in some cases it is not related at all. From a dynamic trade-off perspective, these results are puzzling, in the sense that firms confronting lower costs should adjust faster. For this reason, these results cast serious doubt on the relevance of transaction costs in the adjustment process and indicate that dynamic trade-off theory leaves some aspects of the financing policy of firms unexplained.

(d) Identification of capital structure determinants

This literature group encompasses all studies that try to identify which factors affect the capital structure of firms. These papers are not definitive tests of any theory. Rather they provide empirical evidence that can help to refine, guide, and challenge theoretical models.

Some studies explore which firm-level and industry-level characteristics are related with capital structure. Rajan and Zingales (1997) and Frank and Goyal (2009), among others, find that leverage increases with size, tangibility and median industry leverage and decreases with profitability and market-to-book ratios.

Other papers study the effect of country-level variables on capital structure (Booth et al., 2001; Demirgüç-Kunt and Maksimovic, 1996; 1998; 1999; Giannetti, 2003; De Jong, 2008; Fan et al., 2012). Specifically, in order to explain leverage and debt maturity variation across countries, this line of research introduces an additional set of factors that proxy for the financial, legal and economic development of each country. The most commonly used factors are the development level of the capital markets and the banking sector, the content of the law and the quality of its enforcement, the degree of creditor/shareholder right protection and the degree of economic development. Concerning the debt-equity choice, these papers find that leverage is higher in countries with less effective legal system or higher level of corruption, with civil law legal system (across developed countries only), an explicit bankruptcy code (across developed countries only) and smaller government bond markets (across developing countries only). As far as the debt maturity choice is concerned, this line of research finds that debt maturity is longer in countries with higher level of economic development, more effective legal system or lower level of corruption, more active stock markets (across large firms only) and smaller banking sectors.

Other papers that belong to this group, explore the evolution of capital structure over time and how it is affected by macroeconomic conditions. Korajczyk and Levy (2003) show that for financially unconstrained firms, leverage varies counter-cyclically over the business cycle, while leverage of financially constrained firms is less sensitive to macroeconomic fluctuations. Cook and Tang (2010) show that firms adjust their leverage toward the target faster in good macroeconomic states relative to bad states. Lemmon et al. (2008) report evidence that leverage converges across firms over time. They argue that this happens because firms actively rebalance their capital structure in order to maintain a leverage ratio close to their target leverage ratio. A more recent study (Chen 2010) questions the results of Lemmon et al. (2008) concerning convergence. In particular, Chen (2010) argues that the convergence feature of leverage reported by Lemmon et al (2008) is due to a statistical accident, called regression fallacy, and is mechanical rather than real. **The second chapter of this thesis** tries to resolve this debate. The comparative advantage of this study is the use of the new panel convergence methodology developed by Phillips and Sul (2007) as a tool for testing convergence. It is the first study to conduct an explicit convergence test in the capital structure literature. The results are as follows. There is no convergence detected when the whole sample is tested. However, one big convergent club is detected, i.e. a group of convergent firms, accounting for 70% of the whole sample and consisting of financially unconstrained firms. The convergence within the club happens in rates. This means that, in every period, the leverage of these firms changes by the same rate. The generating force that drives convergence and makes the leverage of these firms fluctuate in tandem is the level of development of the financial markets. By testing for leverage convergence and exploring the economic force that drives any potential convergence feature, this study introduces a new way to disentangle and assess the impact of different systematic factors on leverage. Systematic factors encompass industry-level and country-level factors.

Finally, another group of papers study the effect of financial integration on the capital structure of firms. These studies could be classified as both capital structure and financial integration research. The impact of financial integration on firms is a very important issue, because financial integration-induced changes in firms' capital structure can significantly influence the performance of firms (Demirgüç-Kunt and Maksimovic, 1998; Mitton, 2006). **The third chapter of this thesis** belongs in this literature group. This study applies the panel convergence methodology developed by Philips and Sul (2007) on the debt maturity ratios of a set of firms in developed economies, to explore the effects of credit market integration on debt maturity choices. In contrast to prior studies (Mitton, 2006; Schmukler and Vesperoni, 2006; Agca et al., 2007; Lucey and Zhang, 2011) this methodology allows for a formal quantification of the integration process. Therefore, this methodology allows for tracking the evolution of integration over time and identifying the conditions under which it is stronger. According to the results, the average debt maturity divergence of the firms that are able to integrate with international credit markets relative to the firms that are not, tracks very closely the level of financial integration. Firms that are able to integrate with international credit markets face a lower degree of informational asymmetries and have higher collateral value. Furthermore, as firms integrate with international credit markets, they extend their debt maturity. This evidence provides support to the argument that financial integration has a positive impact on firms, by facilitating access to long-term capital. On the contrary, firms not affected by credit market integration, experience a decrease in their debt maturity, as integration continues.

FIGURE 1

Capital structure theories

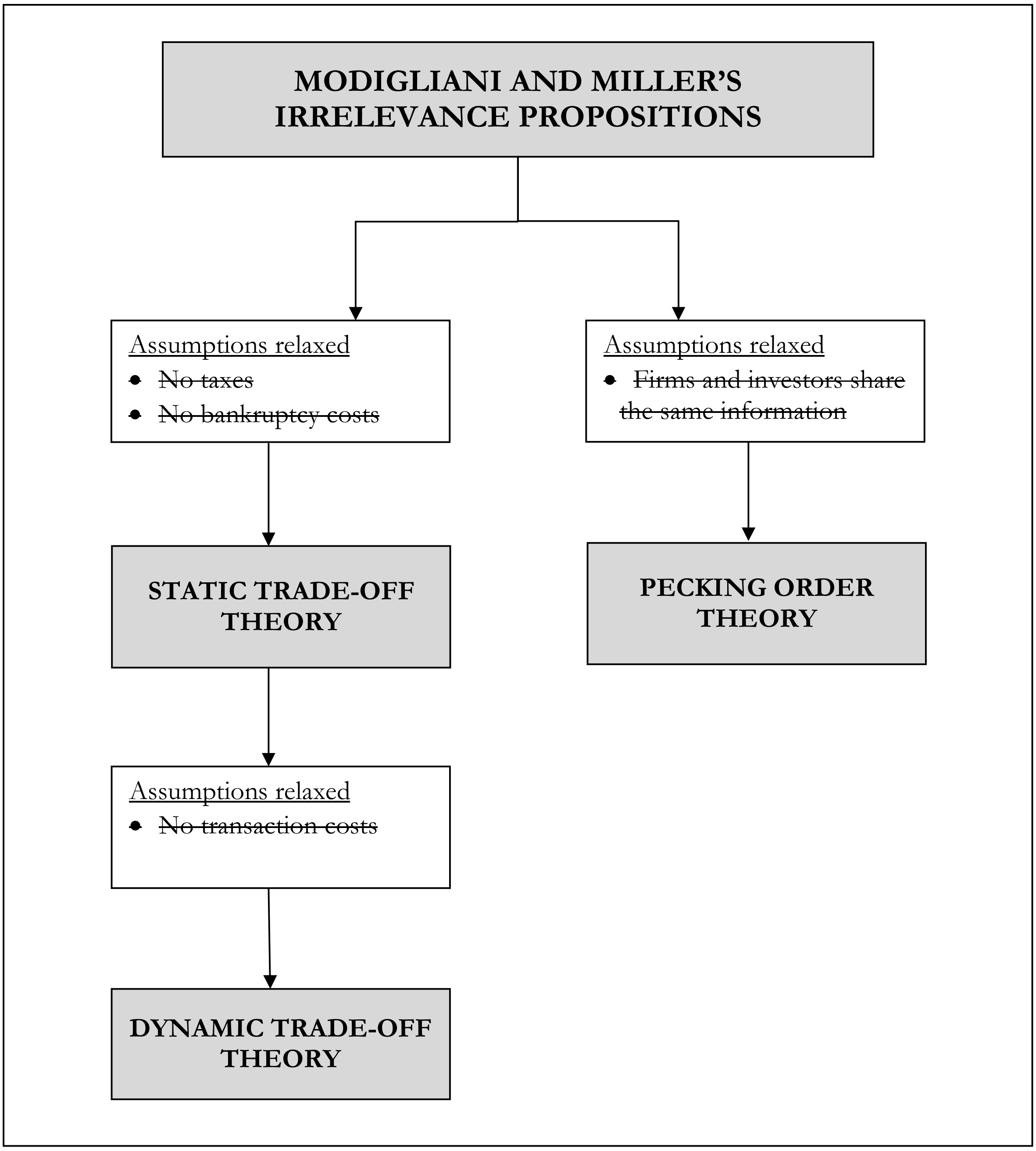
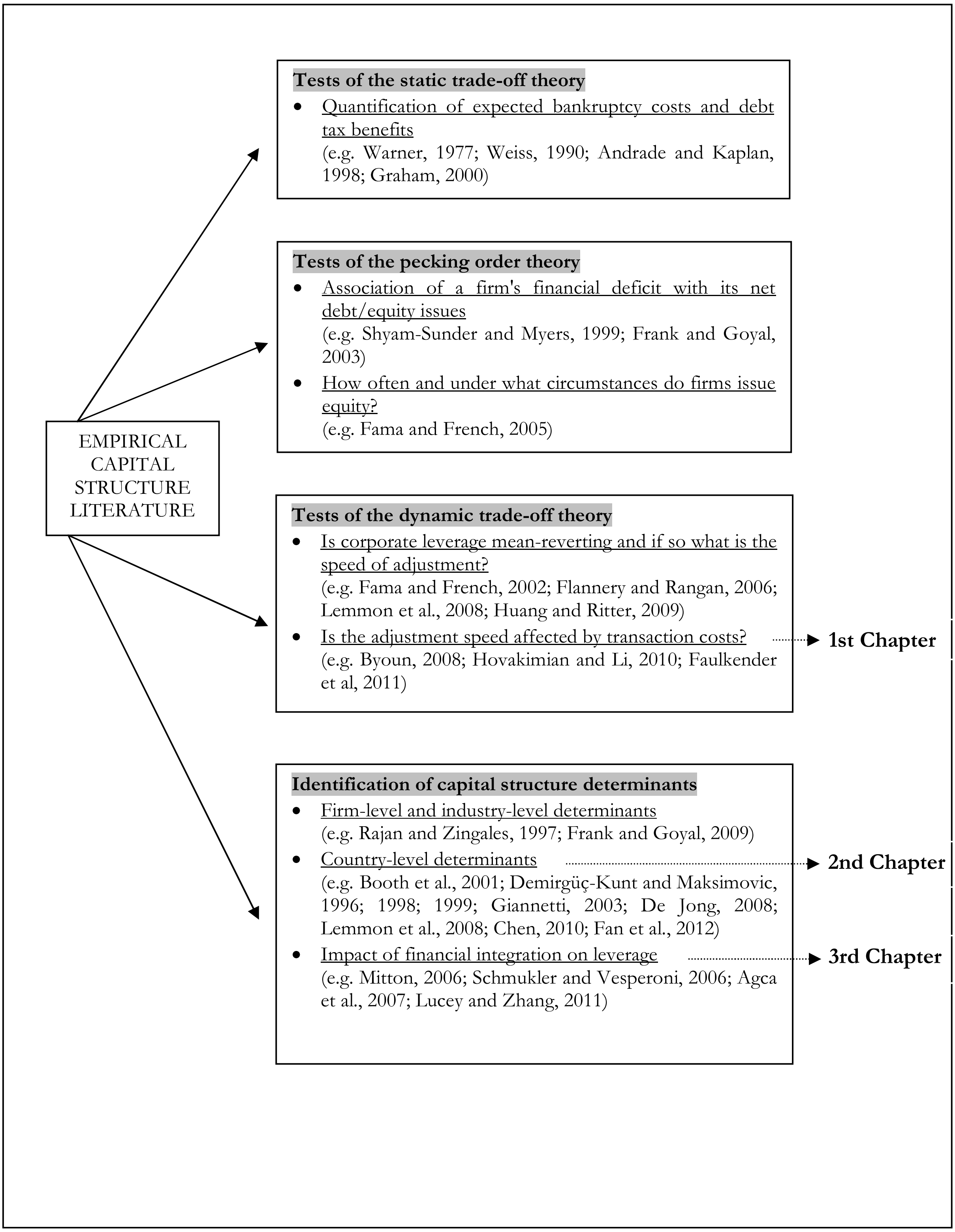


FIGURE 2

Empirical capital structure literature in a nutshell - Contribution of the thesis



CHAPTER 1

Theoretical Literature Review

1.1 Modigliani and Miller Irrelevance Proposition

Does capital structure affect firm value? It is possible to increase firm value by changing the financing policy of a firm? If so, is there an optimal debt-equity combination that could maximize firm value? Which factors influence the financing choices of firms? These are the basic questions that capital structure literature deals with.

The cornerstone of capital structure theory is the irrelevance proposition of Modigliani and Miller (1958). Before them, there was no generally accepted theory of capital structure. The irrelevance proposition identifies the circumstances under which the capital structure is irrelevant, i.e. it does not affect the value of the firm.

Modigliani and Miller (MM henceforth) showed that the value of the firm is independent of its capital structure when the following assumptions apply. Individuals and firms can borrow and lend at the same rate, have the same information and are price takers. There are no taxes, no bankruptcy costs, no transaction costs and capital markets are complete. Firms can issue two types of claims, debt and equity. MM compare two firms that have identical expected cash flows but have different capital structures. The one is unlevered, i.e. it is all-equity financed and the other is levered, meaning that it has issued both debt and equity. By relying on a no-arbitrage argument, MM show that the firms cannot have different market values. Suppose that at some point in time, the market value of the unlevered firm is higher than the market value of the levered firm. MM show that, investors that hold the equity of the unlevered firm can sell their shares and use the proceeds to buy debt and equity of the levered firm in such a combination that will allow them to make an arbitrage profit when expected cash flows are paid. Suppose now that the market value of the levered firm is higher than the market value of the unlevered firm. MM show that investors holding the equity of the levered firm can sell their shares, borrow additional funds and use the total amount to buy such a fraction of the unlevered firm's shares that will allow them to make an arbitrage profit when expected cash flows are paid. So, in both cases, by selling the overpriced securities and buying the underpriced securities, investors will arbitrage away the mispricing. Simply put, investors can exploit any arbitrage opportunities and eliminate any market value discrepancies. They key assumption, incorporated in MM's proof, is that investors can have equal access with firms to financial markets. This means that investors can replicate any level of leverage taken on by firms. Hence, a firm cannot command a premium over other firms for taking on more or less leverage compared to them.

The assumptions employed by MM are undoubtedly very strict. Therefore, the irrelevance proposition cannot provide a realistic description of how firms finance their operations. It should be considered as a benchmark, not an end result. It provides a theoretical foundation that allows for exploring the factors that influence the financing choices of firms. The intuition is that, since we have identified the conditions, under which capital structure is irrelevant, we might be able to find what makes it relevant. The main theories of capital structure, i.e. the trade-off theory and the pecking order theory, were developed by relaxing some of the assumptions that the irrelevance proposition relies on.

1.2 Trade-off theory

The trade-off theory was developed by relaxing the MM assumptions about taxes and bankruptcy costs.

Starting with taxes, the introduction of corporate taxes creates a difference between debt and equity. Interest payments on debt are tax-deductible, while dividend payments and retained earnings are taxed. This different tax treatment creates an advantage of debt over equity. Recall that the value of the firm depends on the sum of cash flows received by the equityholders and the debtholders of the firm. In that context, two firms that generate identical cash flows but have different level of debt in their capital structure will not have the same value. The introduction of corporate taxes makes the irrelevance proposition invalid, because firms can increase their value by increasing the debt-equity ratio.

Suppose that a firm generates cash flow X in perpetuity, i.e. in t=1, 2,… and has a constant amount of risk-free debt D in its capital structure. The corporate tax rate is indicated by τ_c, the risk-free rate by r_f and the value of the firm, if it was unlevered, by V_U. In each period, the after-tax cash flow to equityholders and debtholders will be $(1-\tau_c)(X-r_f D)+r_f D$. The first part, i.e. $(1-\tau_c)(X-r_f D)$, is the cash flow to equityholders, while the second part, i.e. $r_f D$, is the cash flow to debtholders. In order to estimate the value of the interest tax shield, we rewrite total cash flows as $(1-\tau_c)X+\tau_c r_f D$. Now, the first part is the cash flows to equityholders, if the firm was unlevered, and the second part is the fraction of cash flows that are paid to debtholders and would be paid as tax, if the firm was unlevered. Since we have assumed perpetuity of cash flows, the value of the levered firm is $V_L=\frac{(1-\tau_c)X}{r_U}+\frac{\tau_c r_f D}{r_f}=V_U+\tau_c D=V_U+V_{TS}$. Hence, the value of a levered firm will be higher than the value of a firm that generates identical cash flows but is all-equity financed. The value of the levered firm will be equal to the value of the unlevered firm plus the value of the interest tax shield.

The second MM assumption that is relaxed is about bankruptcy costs. Higher levels of debt raise the probability that the firm will default and thus will incur direct and indirect bankruptcy costs. Direct costs pertain to fees for lawyers and accountants, to administrative costs and to resources spent by management and creditors to deal with bankruptcy. Indirect costs, which are usually more severe, encompass fire sales of assets, loss of intangible assets like brand name and reputation of the firm, loss of key employees, customers and suppliers and loss of potential profitable investments. The expected bankruptcy costs are calculated as the product of the probability that the firm will default times the sum of estimated direct and indirect bankruptcy costs.

The trade-off theory brings together the aforementioned effects of debt on firm value. As debt increases, the present value of the interest tax shield increases and thus the value of the firm increases. At the same time, higher levels of debt raise the probability that the firm will default, and thus expected bankruptcy costs increase. According to the trade-off theory, at the optimum debt level for a firm, the marginal increase in the present value of the interest tax shield equals the marginal increase of expected bankruptcy costs. The notion of an optimal debt level implies that each firm has an optimal debt-equity ratio and, in turn an optimal leverage ratio (debt over total capital employed), which is referred to as the target leverage ratio.

This version is the standard version of the trade-off theory and is provided by Kraus and Litzenberger (1973) and Bradley et al (1984). The direct implications of the standard version is that firms will maintain a relatively constant leverage ratio and that leverage will increase with higher corporate tax rates and decrease with higher bankruptcy costs. This version of trade-off theory is often referred to as the static trade-off model. This model gives a solution for leverage, but it leaves no room for the firm to be anywhere but at the solution. Since the rebalancing of capital structure is costless, firms should react to adverse shocks immediately. By rebalancing of capital structure, we mean the issuance and/or repurchasing of debt and/or equity in such combinations that will bring the actual leverage ratio of the firm closer to its target ratio.

In order to overcome these restrictions, the theoretical literature developed the dynamic trade-off models. Unlike the static trade-off model, which posts that the optimal leverage ratio is determined by a single trade-off between expected bankruptcy costs and tax benefits of debt, dynamic trade-off models incorporate additional factors, such as optimality of financing choice in subsequent periods and transaction costs. There are two basic types of dynamic trade-off models, (i) the costly adjustment models, which have received the most attention in the empirical literature, and (ii) the endogenous investment models.

According to the first approach, the unrealistic assumption for costless rebalancing is relaxed (Fisher et al, 1989; Srebulaev, 2007). Because of transaction costs, firms allow their leverage to drift within a range around the optimal leverage ratio and rebalance only when the benefits of adjustment to the target are likely to exceed the costs. This implies that the optimal leverage ratio of a firm is surrounded by an upper and a lower boundary. At the boundaries, the benefits from rebalancing and returning to the optimal level are equal to the transaction costs that the firm will have to pay for the required rebalancing. So the firm will make an adjustment only when its leverage ratio exceeds these boundaries. Costly adjustment models account for empirical regularities that the static model cannot, such as the mean-reversion of leverage ratios. Furthermore, Strebulav (2007) develops a model which accounts for the negative correlation between profitability and leverage. This is an empirical regularity that was inconsistent with the static-trade-off model. According to the static trade-off approach, profitable firms should have more debt, since interest tax shields are more valuable and expected bankruptcy costs are lower. According to Strebulaev's (2007) model, profitability should be negatively correlated with leverage because of the mechanical impact of the profits or losses of the firm on its capital structure. If the firm has losses, total equity is reduced and thus leverage increases. The firm will permit the drift until the upper leverage boundary is reached and the firm recapitalizes. If the firm has profits, total equity is increased and thus leverage decreases. The firm will again permit the drift until the lower leverage boundary is reached. At that point it can load up on debt (e.g. firms engaging in M&As) or use stock-piled retained earnings.

According to the second approach of dynamic trade-off models, the negative relationship between profitability and leverage can be explained by endogenizing the firm's decision to invest. In Tserlukevich's (2008) model, when firms experience positive demand shocks, their profitability rises, their equity value is increased and thus their leverage is decreased. However, the decision to issue debt and invest is delayed because there is a fixed cost of exercising irreversible investment opportunities. Hence, investment frictions can delay the issuance of debt and let leverage drift downwards as profitability increases.

1.3 Pecking order theory

The pecking order theory is based on adverse selection considerations. The MM assumption that is relaxed is about asymmetric information between firms and investors. The key idea is that the owner/manager of the firm knows the true value of the firms' assets and investment opportunities, while outside investors do not and can only guess these values. When owners decide to sell debt or equity, then outside investors might be reluctant to buy the security because they know that owners often decide to issue securities when they are overpriced. Therefore, outside investors might demand a lower price than the price offered by the owners. In that way, securities issued by valuable firms might be underpriced.

Due to different payoff profiles, equity is more sensitive to underpricing than debt. Therefore firms should follow a hierarchy in their financing choices. They should first choose retained earnings to avoid the mispricing, then debt, if retained earnings are not enough, and finally equity, only as a last resort.

Pecking order theory was developed by Myers and Majluf (1984) and Myers (1984). Consider a firm with an original owner/manager, and potential investors. All agents are risk-neutral, there are no transaction costs and no discounting. The firm has existing assets in place and a positive NPV investment opportunity. The firm decides whether to undertake the project or not. If the project is not undertaken, the value of the firm is determined by the cash flows generated from the assets in place. If the project is undertaken, the value of the firm is determined by the cash flows generated by the assets in place plus the net payoffs of the investment. In order to undertake the investment project, the firm needs to raise funds from outside investors, because internal funds are not enough. Investors compete in an auction for the right to finance the project and demand in exchange a share of the firm's future cash flows that are generated by the assets in place and the undertaken investment.

Consider now many such firms, categorized in two types, good and bad. Cash flows generated by the good type firms are higher than cash flows generated by the bad type firms under both regimes, i.e. when both types invest and when both types do not invest. Each firm knows its true type but the investors can only guess. However, investors know the proportion of each type. As mentioned before, investors compete in an auction to finance the project in exchange for a fraction of the expected future cash flows of the firm. Since it is assumed that capital markets are competitive, the winner of the auction expects to break even in equilibrium. Hence, under full information, i.e. if the investor knew the type of the firm to which he offers the contract, all NPV of the investment would go to the firm. However, since the investor does not know if the firm is good or bad, he will offer a contract demanding for a fraction of future cash flows that falls between the fraction that would ask from a good firm and the fraction that would ask from a bad firm. Hence, any security issued by the good firm will be underpriced because the investor demands a higher fraction of future cash flows than the fraction he would demand if he knew that this is a good firm. On the contrary, any security issued by the bad firm will be overpriced, because the investor demands a lower fraction of future cash flows than the fraction he would demand if he knew that this is a bad firm. In equilibrium, investors are expected to break even on average, since both types of firms will invest. There is a unique pooling equilibrium, in which both types of firms accept the contracts offered by investors and invest, provided that the underpricing suffered by the good firms does not exceed the NPV of the investment project. If the underpricing in the securities of the good firms is greater than the NPV of the investment, undertaking the project would result in less cash flows from assets in place for the owner/manager of the firm. Therefore, the good type firms would not invest and the pooling equilibrium would collapse.

Concerning different types of securities, debt is less sensitive to the aforementioned mispricing than equity, due to different payoff profiles. Debt has a limited downside risk for investors compared to equity and thus investors are compensated with a smaller fraction of future payoffs. On the contrary, equity has an unlimited downside risk and therefore investors demand a higher fraction of expected future cash flows. So, Myers argues that firms should follow a hierarchy when making financing choices. First they should prefer internal to external financing, in order to avoid adverse selection costs. If internally generated funds are not enough and the firm has to resort in external financing, it should prefer debt to equity, because the former is less sensitive to the undepricing, induced by adverse selection problems. Finally, if no other option is available, the firm can resort to equity financing.

Pecking order theory can account for the observed market reactions when new security issues are announced. When a firm announces a new equity issue, its stock price falls. On the contrary, there is not a significant reaction in the stock price of a firm that announces a new debt issue. Furthermore, the positive correlation between leverage and profitability is consistent with the predictions of the pecking order theory. Firms prefer internal to external funds. Hence, more profitable firms – holding investments and dividends constant – will tend to be less levered.

CHAPTER 2

Empirical Literature Review

2.1. Tests of the static trade-off theory

The static trade-off model posts that each firm has an optimal leverage ratio determined by the trade-off between the tax benefits of debt and the expected bankruptcy costs. Since rebalancing is costless, firms can maintain their actual ratios at the target level. The main implication of this approach is that firms will have relatively constant leverage ratios that will be negatively related to bankruptcy costs and positively related to corporate tax rates.

These implications have been tested by a number of studies that tried to quantify expected bankruptcy costs and tax benefits. Bankruptcy costs are direct and indirect costs generated by the default of a firm. Direct costs are fees for lawyers and accountants, administrative costs and resources spent by management and creditors to deal with bankruptcy. Indirect costs are the loss of intangible assets like brand name and reputation of the firm, the loss of key employees, customers and suppliers, the loss of potential profitable investments and finally the fire sales of assets. Warner (1977) examines 11 bankrupt US railroads and reports direct costs between 1% (7 years before bankruptcy) and 5% (when entering bankruptcy) of the firm market value. Weiss (1990) studies 37 public US firms that went bankrupt and finds costs of 3.1% of firm market value at the fiscal year-end before entering bankruptcy. Andrade and Kaplan (1998) study 31 firms that went bankrupt and estimate the sum of direct and indirect costs to be between 10% and 23% of firm value. They measure indirect costs as the decline in operating margins – EBITDA/sales – from the first year that a firm reports EBITDA lower than interest expenses to the first year after bankruptcy resolution.

Recall that, in the trade-off theory framework, the relevant costs are the expected bankruptcy costs, which are calculated as the estimated bankruptcy costs as a percentage of firm value multiplied by the probability that the firm will default. Hence, the numbers reported in the aforementioned studies overestimate the relevant costs, because the firm value is especially low close to bankruptcy. Furthermore, since the probability of default is very small for firms operating at normal debt ratios, the expected bankruptcy costs will also be very low.

Graham (2000) examines a sample of US public firms. He estimates that the tax-reducing benefit is 10% of firm value on average. However, these firms are highly profitable and operating in stable industries. That means that they are facing a remote probability of financial distress. Therefore, Graham argues that they could lever up to still conservative debt ratios without being threatened by financial distress. He estimates that the mean incremental net benefit is 7.5% of firm value. Assuming that the new ratios would be optimal in a trade-off perspective and using Andrade and Kaplan (1998) estimates of bankruptcy costs, the implied default probabilities lie between 33% and 75%. Corporate bond default rates of issuers comparable to those in Graham's sample range between 0.4% and 7.2%. In sum, Graham (2000) showed that firms maintain lower debt levels than those that could maximize firm value from a static trade-off perspective.

Empirical studies provided little support for the predictions of the static trade-off model. In particular, empirical evidence showed that many firms use debt more conservatively compared to trade-off predictions. Besides, profitable firms which could have issued a large amount of debt, while still having a practically zero probability of bankruptcy, do not issue debt at all (e.g. Microsoft).

2.2. Tests of the pecking order theory

According to the pecking order theory, when a firm's internal cash flows are not enough for its real investments and dividend commitments, the firm issues debt. Equity is never issued, except when the firm can only issue junk debt and costs of financial distress are high. This translates to the empirical hypothesis that debt ratios are driven by the financing deficit of the firm.

Shyam-Sunder and Myers (1999) use a sample of 157 large public US firms for the period 1971-1989. They calculate financing deficit as $DEF_t = DIV_t + X_t + \Delta W_t - C_t$, where DIV_t are dividend payments, X_t are capital expenditures, ΔW_t is net increase in working capital and C_t is operating cash flows after interest and taxes. The pecking order hypothesis to be tested is $\Delta D_{it} = \alpha + \beta_{PO} DEF_{it} + \varepsilon_{it}$, where ΔD_{it} is the amount of debt issued (or retired if DEF_{it} is negative) by firm *i* in year *t*. The theory predicts that $a = 0$ and $\beta_{PO} = 1$. The slope coefficient indicates the extent to which new debt issues (retirements) are explained by financing deficits (surpluses). A semi-strong form of Pecking Order hypothesis implies that β_{PO} will be less than but close to unity. Shyam-Sunder and Myers (1999) find strong support for this prediction. For net debt issues, i.e. issues minus retirements, the coefficient β_{PO} is found to be 0.75 with an R^2 of 0.68. They argue that their results imply that pecking order is a first order descriptor of corporate financing behavior.

However, subsequent papers question the results of Shyam-Sunder and Myers (1999). Chirinco and Singha (2000) show that the statistical tests of Shyam-Sunder and Myers (1999) have low power. The key empirical prediction of the pecking order hypothesis is about ordering: equity issues, if they occur at all, are at the bottom of the financial hierarchy. The method proposed by Shyam-Sunder and Myers tests jointly (i) the ordering, i.e. debt comes before equity, and (ii) the proportions, i.e. equity issues constitute a low percentage of external finance. Chirinco and Singha (2000) show that the slope coefficient can be far less than one for a firm that follows the pecking order but the equity financing is a substantial percentage of overall external finance. (PO rejected when true). They also show that the slope coefficient can be close to unity when (i) a firm issues first equity and then debt or (ii) issues debt and equity in fixed proportions but the debt is a substantial percentage of overall external finance (PO not rejected when false).

Frank and Goyal (2003) test Shyam-Sunder and Myers' specification on a much larger sample of US public firms from 1971 to 1998. They report that on average net equity issues track the financing deficit more closely than net debt issues, indicating that pecking order fails to explain broad patterns of data. Concerning subsamples of firms, the greatest support for pecking order is found among large firms during the 1970s and the 1980s. On the contrary, pecking order seems to work worst among small high-growth firms. In general, support for the pecking order declines in the 1990s for all kinds of firms. The slope coefficient is at most 0.32 for the 1990s for the entire sample. Frank and Goyal argue that the decline in the 1990s occurs because a large number of small high-growth firms became publicly traded during the 1990s and because equity became more important during the 1990s for all kinds of firms. Finally, when they add deficit in regressions of leverage on conventional cross sectional factors, it only adds a small amount of extra explanatory power. In sum, Frank and Goyal (2003) show that the overwhelming results of Shyam-Sunder and Myers (1999) are sensitive to sample selection.

Fama & French (2005) take a more direct approach for testing pecking order theory, using a sample of US public firms for the period 1973-2002. They consider equity issuances. The novelty of this paper is that instead of running regressions of new issues on financing deficit or on the components of the deficit, they examine how often and under what circumstances firms issue equity. Considering that pecking order theory predicts that equity issues are rare and occur only when firms are close to financial distress, Fama and French are asking three questions: (i) how often do firms issue equity; (ii) how big are the issues; (iii) if firms issue equity only when they are under duress. They find that equity issues occur often: during 1973 to 1982, 54% of the sample firms make net equity issues each year, rising to 62% for 1983 to 1992 and 72% for 1993 to 2002. They also find that equity issues are on average large: during 1983 to 2002, the net equity issues of small firms are on average larger than their net issues of debt. The net equity issues of big firms are about one-third the size of their net debt issues during 1983 to 1992, and they are on the order of net debt issues during 1993 to 2002. Finally, equity issuers are not typically under duress: net issues are common among sample firms with moderate leverage and financing surpluses.

In sum, empirical studies indicate that pecking order theory has problems in explaining financing activity of broad samples of firms. Firms issue equity when they could issue debt. Pecking order theory seems capable of explaining financing choices only of large mature firms, which are expected to face the least severe asymmetric information problems. However, market reaction to security offerings announcement (negative for equity, none for bonds) is consistent with the implications of pecking order theory.

2.3. Tests of the dynamic trade-off theory

The trade-off theory predicts a target debt ratio that depends on the tax benefits of debt and the bankruptcy costs. The dynamic version predicts that due to transaction costs firms allow their leverage to drift until rebalancing benefits outweigh its costs. Hence, firms allow leverage to move within a range surrounding the optimal leverage ratio and rebalance when the boundaries of this range are reached. This translates to the empirical hypothesis that actual debt ratios will revert towards an optimum/target level. This strand of literature focus on two related questions:

(i) Does firm-level leverage revert to a target?

(ii) If so, how rapidly does this adjustment take place?

The second question is very important. If adjustment speed is low, implying that it takes a firm many years to offset any deviation of actual leverage from the target, then target leverage should be viewed as a secondary factor in corporate financing decisions. If adjustment is fast, then target leverage is of central importance.

In order to test for mean reversion, a two step procedure is adopted. First, an equation for the time-varying target leverage is estimated: $L_{i,t} = \beta X_{i,t-1} + \varepsilon_{i,t}$. $L_{i,t}$ is the leverage of firm *i* in year *t*, $X_{i,t-1}$ is a set of firm-specific characteristics that affect target leverage and β is the vector of parameters to be estimated. In the second step, the fitted value from the previous equation is incorporated into a partial-adjustment equation: $L_{i,t} - L_{i,t-1} = \lambda\left(L^*_{i,t} - L_{i,t-1}\right) + \varepsilon_{i,t}$, where $L^*_{i,t} = \hat{\beta} X_{i,t-1}$. Some studies adopt a one-step procedure with direct substitution of the first equation into the partial adjustment model. The estimated speed of adjustment is λ. A positive and significant λ implies that leverage is mean-reverting. For example, an estimated value of 0.65 implies that firms close on average 65% of the gap between current and desired leverage per year. The closer it is to 1, the fuller is the adjustment.

Concerning the first question, the literature commonly agrees that leverage is mean-reverting. Many studies estimate positive and statistically significant λ coefficients. This result is robust across different econometric techniques. On the contrary, the speed of adjustment is not a settled issue yet, since the results reported by the empirical literature are sensitive to different econometric techniques. In particular the estimated λ coefficients from existing studies range from 0.09 to 0.40, implying adjustment speeds between 9% and 40% per year. OLS delivers the lowest estimates ranging from 9% to 18% (Fama and French, 2002; Kayan and Titman, 2007), while fixed effects estimates are the highest, approaching the upper boundary of the 9%-40% range (Flannery and Rangan, 2006). GMM and instrumental variable estimates of adjustment speeds are about 20% (Lemmon et al, 2008; Huang and Ritter, 2009; Flannery and Hankins, 2011).

The latest trend in the literature is the attempt to identify cross-sectional variation in adjustment costs and test whether such costs are correlated with leverage changes. If adjustment costs do really impede firms from reaching their desired level of leverage, then higher adjustment costs should be associated with slower movements towards target leverage and vice versa. Hovakimian and Li (2010) explore cases of dual debt and equity issues/repurchases. The idea is that dual transactions offer greater flexibility concerning the combination of securities. The incremental cost of doing these transactions in a way that will move the capital structure of the firm closer to its target would be small. Faulkender et al (2012) test the hypothesis that firms will exhibit higher adjustment speeds when the absolute deviation between actual and target leverage is lower than their absolute cash flow outcome. The intuition is similar to Hovakimian and Li (2010); these firms will engage in financial transactions anyway, so they have the opportunity to choose a combination of securities that will move them closer to their target. The results of the two studies are mixed; Faulkender et al (2012) find evidence in favor of the negative correlation between adjustment costs and adjustment speed and Hovakimian and Li (2010) against.

2.4. Identification of capital structure determinants

Several empirical studies have explored the factors that influence the level of corporate leverage ratios. These papers are not definitive tests of any theory. Rather they provide empirical evidence that can help to refine, guide, and challenge theoretical models.

Starting with firm-level leverage determinants, i.e. firm-level characteristics that affect leverage, the literature has settled on a few factors that account for much of the variation in leverage across firms, namely size, profitability, market-to-book ratio and profitability (Harris and Raviv, 1991; Rajan and Zingales, 1995; Fama and French, 2002, Frank and Goyal, 2009). Leverage increases with size and tangibility and decreases with market-to-book ratio and profitability.

Concerning the main theories of capital structure, the static version of trade-off theory predicts correctly the sign of three out of the four leverage determinants, while the dynamic version predicts all four correctly. Large firms are expected to have more debt. They are thought of as more diversified, with less volatile earnings and therefore having lower default risk. Growth firms' most valuable assets are intangible (e.g. investment opportunities, human capital), hence growth firms lose more of their value when they go into distress. This means that market-to-book ratio is expected to have a negative relationship with leverage. Tangibility should be positively correlated with leverage. Tangible assets are easier to collateralize and suffer a smaller loss of their value than intangibles in bankruptcy. Concerning profitability, the static trade-off version predicts that profitable firms will have more debt, since interest tax shields are more valuable and expected bankruptcy costs are lower. However, the dynamic version predicts the opposite, since leverage will decrease (increase) mechanically when firms accumulate profits (losses).

On the contrary, pecking order theory predicts only the sign for profitability correctly. Firms prefer internal to external funds. Hence, more profitable firms – holding investments and dividends constant – will tend to be less levered. The other predictions are either inconsistent with empirical evidence or ambiguous. Concerning the market-to-book ratio, the pecking order hypothesis predicts that firms with more investments – holding profitability constant – should accumulate more debt over time. Hence the market-to-book ratio should be positively correlated with leverage. In sum, trade-off appears more helpful than pecking order in explaining cross-sectional evidence.

In many of the aforementioned studies (e.g. Frank and Goyal, 2009), it is also documented that leverage is affected by the median leverage of the industry that the firm belongs to. This implies that firms in the same industry face common forces that seem to affect their financing decisions. There is no direct link to a specific theory. This finding is interpreted as reflecting a number of otherwise omitted factors concerning common forces that face firms in the same industry.

Another group of papers examine the differences in firms' capital structure between different countries. In order to explain leverage and debt maturity variation across countries, this line of research introduced an additional set of factors that proxy for the financial, legal and economic development of each country. The most commonly used factors are the development level of the capital markets and the banking sector, the content of the law and the quality of its enforcement, the degree of creditor/shareholder right protection, and the degree of economic development. These studies try to answer the following questions:

a) Are the firm-specific factors that affect cross-sectional variability of leverage within individual countries similar across different countries?

b) Is firms' (i) leverage and (ii) debt maturity structure influenced by country-level institutional factors?

In their effort to answer the aforementioned questions, prior studies have focused on several issues: the effects of stock market development on financing choices (Demirguc-Kunt and Maksimovic, 1996); the relationship between firm growth, external financing and institutional factors (Demirguc-Kunt and Maksimovic, 1998); the relationship between long-term debt and institutional factors (Demirguc-Kunt and Maksimovic, 1999); firm-specific factors affecting leverage in developing countries (Booth et al, 2001); determinants of leverage and debt structure of unlisted firms (Gianneti, 2003); the influence of institutional factors on firm-specific factors (De Jong et al, 2008); introduction of new institutional factors (Fan et al, 2012).

The results of these papers are the following. Firm-specific factors identified in previous studies as affecting firm leverage in the U.S. are found to affect firm leverage across the majority of the other countries in the same way. The magnitude of the impact of the firm-specific factors on leverage varies across countries. This variation arises from the influence of country-specific factors on firm-specific factors. In general, the effects of firm-level determinants of leverage are reinforced and resemble those of the US firms in countries with a better legal environment and higher level of economic development. Concerning the debt-equity choice, leverage is higher in countries with less effective legal system or higher level of corruption, with civil law legal system (across developed countries only), an explicit bankruptcy code (across developed countries only) and smaller government bond markets (across developing countries only). Concerning the debt maturity choice, debt maturity is longer in countries with higher level of economic development, more effective legal system or lower level of corruption, more active stock markets (across large firms only) and smaller banking sectors.

Furthermore, two institutional factors are found to have a significant impact on the availability of external finance (long-term debt and equity) to firms (Demirguc-Kunt and Maksimovic, 1998). Firms in countries with (i) active stock markets and (ii) high effectiveness of the legal system use more extensively external financing and therefore grow faster, i.e. they grow at rates that exceed those that can be achieved if firms relied only on retained earnings and short-term debt.

Recently, the level of financial integration of a country was introduced as a potential country-level factor that influences corporate capital structure. Schmukler and Vesperoni (2006) study firms in 7 developing countries and find that the leverage and debt maturity ratios of firms are positively related to the level of financial integration. Similar results – with one exception – are reported by Agca et al. (2007) who study a group of developed and developing countries. The exception is that debt maturity ratios of firms operating in developing countries appear to be negatively affected by the level of financial integration. Lucey and Zhang (2011) study the capital structure of firms in 24 developing countries. They find that leverage is positively associated with credit market integration and negatively associated with equity market integration. However, they do not find any clear relationship between the level of credit market or equity market integration and debt maturity ratios. Finally, Mitton (2006) finds that firms whose stocks are available to foreign investors experience lower leverage.

CHAPTER 3

Adjustment Cost Determinants and Target Capital Structure

3.1. Introduction

The main goal of capital structure literature is to test whether capital structure, i.e. the mix of financial instruments used to finance real investments by corporations, affects the firm's value. Modigliani and Miller (MM henceforth) set out the assumptions under which a firm's value is independent of its capital structure. MM irrelevance proposition is considered the cornerstone of capital structure theory. It may not generate realistic predictions of how firms should finance their operations, as it relies on some strict assumptions, but it provides a means of identifying reasons for why financing may matter. Put simply, if we can identify the conditions under which capital structure is irrelevant, we may be able to infer what makes it relevant.

Indeed, the main theories that have dominated capital structure literature so far were developed by relaxing one or more assumptions that generate MM irrelevance propositions. On one hand, proponents of the trade-off theory argue that the optimal leverage ratio is determined by the trade-off between the bankruptcy costs and the tax benefits arising from the use of debt. On the other hand, pecking order theory suggests that it is the asymmetries in information between corporate insiders and outside investors that create the following hierarchy in financing choices: internal funds come first, then debt, then securities with option features (for example convertible debt) and finally equity as a last resort. This hierarchy is driven by the informational sensitivity of each financing instrument.

Though scoring some points when tested, the standard versions of the aforementioned theories[1] struggle to explain several significant empirical regularities. As far as the trade-off approach is concerned, a number of studies (Weiss, 1990; Andrade and Kaplan, 1998; Graham, 2000) have tried to quantify expected bankruptcy costs and debt tax benefits. According to their estimates, most firms have much lower leverage than the leverage that would maximize firm value from a static trade-off perspective. As far as the pecking order approach is concerned, Frank and Goyal (2003) reported that net equity issues track the financing deficit of a firm more closely than net debt issues do. Fama and French (2005) have found that equity issues occur often, they are on average large and equity issuers are not typically under stress. Both papers provide evidence which is at odds with the predictions of pecking order theory.

In an attempt to account for these regularities the theoretical literature developed a family of models, called the dynamic trade-off models. Unlike the static trade-off theory, which posts that the optimal leverage ratio is determined by a single period trade-off between the tax benefits of debt and the expected costs of bankruptcy, dynamic trade-off models incorporate additional factors, such as optimality of financing choice in subsequent periods, transaction costs and asymmetries in taxation.

A rather common characteristic across dynamic trade-off models is that security issuance implies transaction costs (e.g., Fischer, Heinkel and Zechner, 1989; Strebulaev, 2007). This translates into the empirical hypothesis that actual leverage ratios will revert towards an optimum/target level. In particular, firms will let their leverage ratio move away from their optimal level until the benefits from rebalancing outweigh transaction costs. The existence of mean-reversion in corporate leverage and the associated speed of adjustment have been at the heart of the recent empirical literature (e.g., Fama and French, 2002; Flannery and Rangan, 2006; Lemmon, Roberts and Zender, 2008; Huang and Ritter, 2009). Results are mixed, in the sense that mean-reversion is documented in all papers, but the

[1] See Bradley et al. (1984) and Myers and Majluf (1984) for the standard versions of the (static) trade-off and pecking order theories.

speed of adjustment estimates differ across papers, varying from 9% to 40%[2], depending on different variable definitions and econometric techniques. Put simply, it is estimated that firms close 9% to 40% of the gap between actual and desired leverage each year. The speed of adjustment is particularly important for the economic interpretation of the empirical evidence. The lower the speed of adjustment, the longer it takes for an average firm to offset deviations from the target and hence the view that firms engage in active rebalancing of their capital structure when making financing decisions becomes more questionable.

The latest trend in the literature is the attempt to identify cross-sectional variation in adjustment costs (security issuance costs) and test whether such costs are correlated with capital structure activities. If adjustment costs do really impede firms from reaching their desired level of leverage, then higher adjustment costs should be associated with slower movements towards target leverage and vice versa. Documentation of such an empirical pattern would constitute strong evidence in favor of active rebalancing.

Existing papers along this line of research differ mainly in the method they follow to identify cross-sectional variation in adjustment costs. Byoun (2008) argues that since equity is more costly than debt to issue, due to higher flotation and adverse selection costs, the adjustment should be faster for under-levered firms facing a financial deficit or over-levered firms facing a financial surplus than under-levered firms facing a financial surplus or over-levered firms facing a financial deficit. Hovakimian and Li (2010) explore cases of dual debt and equity issues/repurchases. The idea is that dual transactions offer greater flexibility, since they involve a combination of securities. Hence, the incremental cost of doing these transactions in a way that will move the capital structure of the firm closer to its target would be small. Faulkender et al (2011) test the hypothesis that firms will exhibit higher adjustment speeds when the absolute deviation between actual and target leverage is lower than their absolute cash flow outcome. The idea is similar to that of Hovakimian and Li (2010); these firms will engage in financial transactions anyway, so they have the opportunity to choose a combination of securities that will move them closer to their target. The results are mixed: Byoun (2008) and Faulkender et al (2011) find evidence in favor of the negative correlation between adjustment costs and adjustment speed and Hovakimian and Li (2010) against.

This study belongs and contributes to this strand of literature, namely testing of the relationship between transaction costs and adjustment speed. A different method for

[2] Assuming the same speed across all firms.

capturing the variation in adjustment costs is proposed. This approach brings together elements from two strands of the literature: dynamic capital structure and security offerings literature. More specifically, we employ the determinants of security issuance costs, as reported by the security offering literature[3]. These determinants are the firm's risk, the issue size and the firm's size.

The novelty of this approach is that we use measurable transaction cost determinants, documented in the security issuance literature, to proxy for adjustment cost variation. Existing studies[4] have attempted to test the relationship between adjustment costs and adjustment speed indirectly, e.g. by identifying cases where firms would enter into financial transactions anyway. In contrast, this approach employs directly measurable proxies for adjustment costs, i.e. security issuance cost determinants. Furthermore, since we estimate adjustment speeds separately for cases of issuing/repurchasing debt and equity[5], we can apply the adjustment cost proxies in the cases where they are relevant, i.e. when firms issue debt or equity. This is a clear-cut tool that allows us to explicitly test for the relationship between adjustment costs and adjustment speed.

We employ three different methods. Firstly we split the sample into portfolios based on each cost determinant (small vs large, rated vs non-rated, high volatility vs low volatility), re-estimate the adjustment speeds for each portfolio and compare the results. In addition, we further split these portfolios into sub-portfolios (e.g. small and rated vs small and non-rated, etc) to control for potential correlation between cost determinants. Secondly, we test the incremental effect of cost determinants on adjustment speed using an empirical model developed by Faulkender et al. (2012). Finally, we use an empirical model developed by Altinkilic and Hansen (2000) to estimate security issuance costs. Then we form portfolios based on these estimates (high cost vs. low cost) and compare the speeds of adjustment across the portfolios.

Although we find evidence in favor of mean-reversion, we do not find supporting evidence for the predicted negative relationship between adjustment speed and adjustment costs. In particular, firms are found to make the financial choices that will move them closer

[3] See Eckbo, Masulis and Norli (2008) for a thorough literature review.
[4] Hovakimian and Li (2010) and Faulkender et al (2012).
[5] A similar specification can be found in Byoun (2008). However, his specification does not capture changes in leverage, but only changes in debt. It ignores any change in equity. Our specification captures leverage changes, since it incorporates changes in both debt and equity.

to their targets under all four financing states, i.e. when issuing/repurchasing debt and when issuing/repurchasing equity. However, our estimates imply that firms adjust faster when they issue equity, i.e. when firms are over-levered and have a financial deficit, rather than debt, i.e. when firms are under-levered and have a financial deficit. This result contradicts the dynamic trade-off theory, as equity is a more costly security to issue.

As far as the relevance of transaction costs is concerned, the results are also not consistent with dynamic trade-off theory. In terms of book leverage, we find that, when firms issue debt, the adjustment speed is not affected by the variation of adjustment costs. The difference in adjustment speed between large and small, rated and non-rated and high and low volatility firms is statistically not different from zero. In terms of market leverage, our estimates suggest the small, non-rated and high volatility firms adjust faster than large, rated and low volatility firms, respectively. Both results contradict dynamic trade-off theory, which predicts that adjustment speed is negatively correlated with adjustment costs. The results for equity issues point to the same direction across all three cost determinants and across both leverage specifications. When issuing equity, small firms adjust faster than large firms, firms without a bond rating adjust faster than firms whose debt is rated and high volatility firms adjust faster than low-volatility firms. These estimates indicate that the adjustment speed rises as adjustment costs increase, an observation that is at odds with dynamic trade-off theory.

The second test concerning the incremental effect of costs on adjustment speed delivers similar results. In cases of equity issuance, the adjustment speed of firms decreases with size, and increases with stock return volatility, while the existence of a debt rating is negatively correlated with adjustment speed. Likewise, in cases of debt issuance, we do not detect a negative relationship between adjustment speed and adjustment costs when stock return volatility or the existence of a bond rating are considered. The incremental effect of firm size is an exception, in the sense that it is found positive and significant, implying a negative relation between adjustment costs and adjustment speed. However, we consider this to be a very weak result, because it is only marginally significant at the 10% level and economically trivial.[6]

[6] The estimated increase in adjustment speed is 2.2% whereas all other statistically significant changes range from 8.5% to 20.3%.

The results from the third test corroborate previous findings. Based on Altinikilic and Hansen (2000) empirical model, we find that, when issuing equity or debt, firms facing lower security issuance costs do not adjust faster than firms facing higher security issuance costs.

The paper is organized as follows. Section 3.2 illustrates the target adjustment model and the transaction cost determinant tests employed, Section 3.3 presents the dataset that is used, Section 3.4 presents and discusses the results, Section 3.5 illustrates the robustness checks and Section 3.6 contains the conclusions.

3.2. Methodology

3.2.1. Baseline estimation of the speed of adjustment

In order to test for leverage mean-reversion, we employ the following standard partial-adjustment model:

$$(1) \qquad \frac{D_{i,t}}{A_{i,t}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a + \lambda DEV_{i,t} + \varepsilon_{i,t} \qquad where \qquad DEV_{i,t} = \left[\frac{D}{A}\right]^{*}_{i,t} - \frac{D_{i,t-1}}{A_{i,t-1}}$$

$D_{i,t}$ is firm's i outstanding debt at time t, $A_{i,t}$ is firm's i total assets at time t and $DEV_{i,t}$ is the deviation of firm's i target leverage for time t from the actual leverage at time t-1. The coefficient of interest, which expresses the speed of adjustment, is λ. A positive and significant λ implies that leverage is mean-reverting. For example, an estimated value of 0.65 implies that on average firms close 65% of the gap between current and desired leverage per year. The closer it is to 1, the fuller the adjustment is. The variables are expressed in book values, but similar results are obtained if we use market values for equity and the associated values for assets. The target leverage is estimated by regressing observed leverage ratios on firm characteristics that are assumed to affect optimal leverage:

$$(2) \qquad \left[\frac{D}{A}\right]_{i,t} = \beta X_{i,t-1} + \varepsilon_{i,t}$$

$X_{i,t-1}$ is the set of firm characteristics for firm i at time t-1, which are described below. The fitted value from equation (2) is then substituted to the adjustment equation (1):

$$\left[\frac{D}{A}\right]_{i,t}^{*} = \hat{\beta}X_{i,t-1}$$

Many existing studies estimate $\hat{\beta}$ from full sample regressions. In particular, for an N-year sample, $\hat{\beta}$ is obtained by a firm fixed-effects panel regression of leverage ratios observed in years *2* through *N*, on firm characteristics observed in years *1* through *N-1*. Then, for any year *t*, the estimated target leverage is generated by the value $\hat{\beta}X_{t-1}$, i.e. in sample. Hovakimian and Li (2011) show that this estimation technique suffers from a significant look-ahead bias. Put simply, estimating the target leverage ratio using information about future leverage ratios leads to inflated adjustment speed estimates and to results severely biased in favor of the target-adjustment hypothesis.

In order to eliminate this bias, Hovakimian and Li (2011) propose a technique, where $\hat{\beta}$ is estimated separately for each year by rolling historical panel regressions. More specifically, for any year *t*, $\hat{\beta}_t$ is obtained by regressing leverage ratios observed in years *2* through *t* on firm characteristics observed in years *1* to *t-1*. Then, the estimated coefficients are used to generate proxies for target at time *t+1*, i.e. out of sample. In this study, we employ the rolling historical panel approach.

Other studies estimate $\hat{\beta}$ and the speed of adjustment concurrently in a one-step partial adjustment model obtained by substituting equation (2) into equation (1):

(3) $$\frac{D_{i,t}}{A_{i,t}} = a + \lambda\beta X_{i,t-1} + (1-\lambda)\frac{D_{i,t-1}}{A_{i,t-1}} + \varepsilon_{i,t}$$

We choose the two-step over the one-step version of the partial-adjustment model, because the historical panel approach can only be applied to the former.

The set of firm characteristics used to estimate equation (2) consists of factors that have been documented in previous empirical research (e.g. Flannery and Rangan, 2006; Faulkender et al., 2012) as being correlated with the leverage ratios of firms. According to the findings of these papers, these factors affect leverage in the way predicted by the trade-off theory. Size is expected to have a positive impact on leverage, as large firms are thought of as more diversified, with less volatile earnings and therefore as having lower default risk.

Profitability and leverage should be negatively related, as firms passively accumulate profits/losses and let their leverage mechanically drift most of the time until an upper or lower boundary is reached. Firms with high depreciation expenses should have lower leverage, since they have less need for deductible interest expenses. Tangibility of assets should be associated with higher leverage, because tangible assets are easier to collateralize and suffer a smaller loss in their value than intangibles in the event of bankruptcy. Likewise, firms with high R&D expenses and/or high market-to-book ratios have usually more intangible assets and therefore are expected to have lower leverage. Finally, earlier studies (e.g. Bradley et al., 1984) have documented significant positive industry effects on leverage. This effects are interpreted as reflecting otherwise omitted industry-specific factors. Table 3.1 illustrates the factors included in the estimation of equation (2), their proxies and the predicted relationship between them and leverage according to the trade-off theory.

3.2.2. Adjustment speed by degree of leverage and cash flow outcome

According to dynamic trade-off theory of capital structure, firms have optimal leverage ratios, which are determined from the trade-off between the tax benefits and the expected distress costs of debt. Furthermore, most dynamic trade-off models assume costly adjustment, i.e. costly recapitalization (e.g. Fischer, Heinkel and Zechner, 1989; Strebulaev, 2007). The implication stemming from this assumption is that a firm's actual leverage ratio will not be always at the optimal level. Firms will let their leverage ratio move away from their optimal/target level until the benefits from rebalancing outweigh transaction costs. At this point firms will rebalance their capital structure in such a way that their leverage ratio is brought back at the target level.

The aforementioned implication translates to the empirical hypothesis that the speed of adjustment towards target leverage, i.e. the fraction of the gap between actual and desired leverage that firms close each year on average, will be negatively correlated to adjustment costs. The reason is the following. As long as leverage stays within the rebalancing boundaries, firms are indifferent to the deviation between actual and target leverage and therefore take no rebalancing action. Consequently, the wider this "indifference" range around target leverage, the more infrequent the rebalancing will be and hence the lower the speed of adjustment, as defined above. Given that the distance of the rebalancing boundaries from the target is an increasing function of transaction costs, the speed of adjustment should be negatively related to the adjustment costs.

The empirical literature has recently started to test this implication by trying to identify cross-sectional variation in adjustment costs and test whether this variation is correlated with adjustment speed. Instead of estimating a uniform speed of adjustment for the whole sample, these studies split the sample of firms into different groups according to the cross-sectional variation of adjustment costs and allow for heterogeneity in the speed of adjustment across the groups (Byoun, 2008; Warr et al, 2012). The division of the sample is done with dummy variables, which are incorporated in the partial adjustment model and indicate whether a firm falls into a particular group in a particular year. The testable hypothesis is that groups of low-cost firms will adjust faster than groups of high-cost firms.

Along this line of research, we split the sample into four mutually-exclusive groups depending on whether firms in a particular year are above or below their leverage targets and whether they face a financial deficit or surplus. Essentially, the characteristic that distinguishes the four groups is the financial action through which adjustment to target can be achieved. As illustrated in Table 3.2, adjustment to target for overlevered (underlevered) firms with financial surplus calls for repurchasing debt (equity), while adjustment to target for overlevered (underlevered) firms with financial deficit calls for issuing equity (debt). Our goal is to identify the firm-years, where adjustment can be achieved through issuing debt or equity. This is very important to our subsequent analysis, because it enables us to apply the adjustment cost proxies, i.e. security issuance cost determinants, only in the cases where they are relevant, that is when firms issue debt or equity.

Our first step is the estimation of the annual cash flow outcomes of firms. We use a measure derived from the cash flow identity $OCF_{i,t} - I_{i,t} - \Delta W_{i,t} = -\Delta D_{i,t} + DIV_{i,t} - \Delta E_{i,t}$:

(4) $$FD_{i,t} = DIV_{i,t} + I_{i,t} + \Delta W_{i,t} - OCF_{i,t}$$

DIV is dividend payments, *I* is net investment, ΔW is change in net working capital, *OCF* is operating cash flows after interest and taxes, ΔD is change in net debt issues and ΔE is change in net equity issues[7]. *FD* stands for financial deficit. Positive values for *FD* imply financial deficits and negative values imply financial surpluses.

Next, we employ the following model, in order to capture the potential asymmetry in the speed of adjustment across different groups:

$$
\begin{aligned}
(5)\qquad \frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} &= a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit} \\
&+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it} \\
&+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}
\end{aligned}
$$

D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if $DEV<0$ ($DEV\geq 0$). $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if $FD<0$ ($FD\geq 0$). Essentially, this specification divides the sample into four groups, depending on whether a firm is under- or over-levered and whether it faces a financial deficit or surplus. As illustrated in Table 3.2, this distinction allow us to identify the proper action that a firm should take in each case (issue/retire debt/equity) in order to narrow down the gap between actual and desired leverage. If, for example, a group of under-levered firms with financial deficits raised equity instead of debt, in order to cover their cash flow needs, this choice would then result in a further widening of the gap. This would imply a negative λ_4 in our specification. The constant terms are included in our specification in order to capture changes in leverage that are not associated with target-adjustment motives. For example, a firm will still have to accommodate its financing gap (whether positive or negative) even when its leverage ratio is equal to its target ratio.

If leverage is indeed mean-reverting, then λ_1, λ_2, λ_3 and λ_4 should be positive and significant. This would be consistent with the predictions of trade-off theory. In addition, if dynamic trade-off theory holds true, then λ_4 should be greater than λ_2. The intuition is that issuing debt is cheaper than issuing equity[8], thus the adjustment through debt issues should be faster than the adjustment through equity issues.

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7 See Appendix for the exact definition of the variables used.

8 Altinkilic and Hansen (2000) and Kim, Palia and Saunders (2008) provide evidence that the issuance costs of debt are on average five times cheaper than the issuance costs of equity.

3.2.3. Adjustment speed and adjustment cost determinants

Next, we explicitly test whether the variation in adjustment speeds is associated to differential adjustment costs, i.e. if slower (faster) adjustment is the result of higher (lower) costs. Therefore we examine the variation in adjustment speeds with respect to the determinants of security issuance costs. After having extensively researched this topic[9], the security offerings literature reports that the most significant factors determining security issuance costs are (a) firm size, (b) firm risk and (c) issue size. Firm size is negatively related to costs, is usually proxied by total assets or net sales and is interpreted as capturing information asymmetries and asset diversification. Firm risk is positively related to costs and is usually proxied by the volatility of the firm's stock returns or the existence of a bond rating. Firms whose debt is rated and/or whose stock is less volatile are considered as less risky. Issue size is usually proxied by the amount of issue proceeds, while its relationship with costs is u-shaped. This relationship is interpreted as implying that security issuance costs entail both fixed and variable parts.

We use three methods to examine the variation in adjustment speeds with respect to the determinants of security issuance costs.

Firstly, we split the sample into groups based on firm size, proxied by total assets, and firm risk, proxied by the volatility of the firm's stock returns or alternatively by the existence of a bond rating or not. The last determinant, issue size, is not used in this part of the analysis, because it does not have a monotonic relationship with costs. When the variable used to divide up the sample is continuous, we use the median as the cut-off point. Hence, three pairs of groups are constructed, i.e. small vs. large, rated vs. non-rated and low volatility vs. high volatility. Then, adjustment speeds are re-estimated for each portfolio. If transaction costs do matter, then adjustment speeds when equity or debt is issued (coefficients λ_2 and λ_4 respectively) should rise with decreasing costs and vice versa. For instance, large firms should adjust faster than small firms when issuing equity (higher λ_2) or issuing debt (higher λ_4), *ceteris paribus*.

Secondly, an alternative specification is employed to examine the association between adjustment costs and adjustment speed. We test the incremental effect of cost determinants

[9] See Eckbo, Masulis and Norli (2008) for a thorough literature review.

on adjustment speed, by extending our target adjustment model in a way similar to the extension done by Faulkender et al. (2012):

$$(6)\quad \frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ (\lambda_1 + \gamma_1 Z_{i,t}) D_{it}^{over} D_{it}^{surplus} DEV_{it} + (\lambda_2 + \gamma_2 Z_{i,t}) D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ (\lambda_3 + \gamma_3 Z_{i,t}) D_{it}^{under} D_{it}^{surplus} DEV_{it} + (\lambda_4 + \gamma_4 Z_{i,t}) D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

Equation (6) is estimated three times, one for each cost proxy (Z), namely total assets, stock return volatility and the existence of a bond rating. The first two, being continuous variables, are normalized to have a mean of zero and a standard deviation of one to ease economic interpretation. The existence of a bond rating is captured by a dummy variable equal to one when the firm has a bond rating and zero otherwise. The coefficient γ_i measures the incremental effect of the cost determinant *Z* on the respective adjustment speed coefficient. Suppose that Z is the bond rating dummy. An estimated γ_2 = 0.2 would imply that, when issuing equity, a firm with rated debt adjusts to the target by 20% faster than a firm without debt rating. As far as the continuous variables are concerned, if Z was total assets, then an estimated γ_2 = 0.2 would imply that, when issuing equity, a firm that is one standard deviation above the mean size adjusts to the target by 20% faster than an average size firm.

Finally, we use two empirical models developed by Altinkilic and Hansen (2000)[10] to estimate equity and debt issuance costs:

(7) *Equity issuance cost = 4.04 + 25.65*(1/proceeds) + 2.64*(proceeds/market cap)*

(8) *Debt issuance cost = 0.50 + 25.17*(1/proceeds) + 4.63*(proceeds/market cap)*

Proceeds are the net change in equity or debt in each fiscal year, and *market cap* is the market capitalization of the firm at the end of the relevant fiscal year. We assume that the estimated cost for each year applies for all issuances that took place in that particular year[11]. We then

10 p. 201, Table 2, Model 3 and p.211, Table 5, Model 3 respectively

11 Leary and Roberts (2005) make a similar assumption when they use an analogous model by Altinkilic and Hansen (2000)

form groups based on the estimated costs (high cost vs. low cost) and compare the adjustment speeds across the groups.

Before we run any of our tests, we separate active from passive leverage changes and focus on the former. The latter are mechanical accounting changes, such as transferring the annual profit or loss to the corresponding equity account. Following the approach taken by previous researchers (e.g. Hovakimian et al., 2001; Leary and Roberts, 2005), we define a debt issuance or repurchase as any annual net change in the book value of debt above 5% of the book value of assets in the previous fiscal year. Likewise, a firm is defined as having issued or repurchased equity when the net value of equity issued or repurchased within a fiscal year is at least 5% of the book value of assets in the previous fiscal year. Equity repurchases use a 1.25% cut-off point, as there are numerous smaller-sized repurchase programs (Leary and Roberts (2005)).

3.3. Data

Accounting data is drawn from Compustat, has an annual frequency and covers the period 1971-2010. Cash flow statement data, which is necessary for our analysis, is available from 1971 onwards. Stock market data is drawn from CRSP-Compustat merged database. Following the approach taken in previous research, financial firms (SIC 6000-6999) and utilities (SIC 4900-4999) are excluded. Firm-years with firms that have nonpositive total assets, book or market value of equity or net sales are excluded, as these variables are used to standardize other variables and thus cannot be zero or negative. Firm-years with firms, for which the accounting cash flow identity $OCF_{i,t} - I_{i,t} - \Delta W_{i,t} = -\Delta D_{i,t} + DIV_{i,t} - \Delta E_{i,t}$ doesn't hold, are also excluded. Several cash flow statement accounts, which are used to calculate these six variables, are not reported or combined with other accounts in the cash flow statement in Compustat. The reason is that many firms do not report such data at all and Compustat classifies that data as missing. In order to avoid losing many observations, we replace all missing and combined values in these accounts with zero and keep the firm-years, for which the cash flow identity is not violated. We also exclude firms with a cash flow statement whose format code is either 4, 5 or 6 (5 is for Canadian firms and 4 and 6 are not specified by Compustat) and of course firm-years with missing observations.

The sample resulting from application of all the aforementioned restrictions consists of 128,839 firm-year observations. This is of course the initial sample. Depending on the required data for different types of analysis in the course of this study, the number of usable firm-year observations will vary accordingly. Variables are measured in constant 1983 dollars using the US CPI as a deflator. We winsorize all final variables at the 1st and the 99th percentile[12] to avoid the effect of outliers and misreported data.

3.4. Results

3.4.1. Baseline results

Our measurement for leverage is financial debt, i.e. interest bearing liabilities, over total assets. Our base definition is book leverage, namely total debt over book assets. All models are estimated using the Fama-MacBeth (Fama and MacBeth, 1973) approach. This approach involves estimating the empirical model separately for each year in the sample (cross-sectionally). Each coefficient is estimated as the mean of the respective annual coefficients. Each coefficient's t-statistic is estimated as the mean of the respective annual coefficients divided by the standard error of the estimated coefficient.

Table 3.3 shows the results from regressing leverage on those characteristics of firms assumed to affect target leverage. Most of the coefficients are statistically significant and have the sign predicted by the trade-off approach. In particular, profitability, growth, depreciation expenses and R&D expenses have a negative effect on leverage, while the firm's industry median leverage, firm size and tangibility of assets have a positive effect on leverage. The results hold under both leverage specifications, i.e. book and market leverage.

Some baseline results from estimating one-step and two-step versions of the target adjustment model for the whole sample are presented in Table 3.4. We would remind readers that, for the two-step model, we obtain the target coefficients in the first step separately for each year by using rolling historical panel regressions, as described in Section 3.2. The one-step models are estimated to ensure the robustness of the results. The existing literature has documented that the estimated adjustment speed is sensitive to the

12 Dividends and R&D expenses are winsorized at the 99th percentile only, as many firms do not pay dividends or don't make R&D expenses.

econometric technique used and ranges between approximately 10% and 40% per year. In particular, OLS generates the lowest estimates ranging from 9% to 18% (Fama and French, 2002; Hovakimian and Li, 2011), firm fixed effects estimates are the highest, approaching 40% (Flannery and Rangan, 2006) and GMM estimates are approximately 20% (Lemmon, Roberts and Zender, 2008). These results are in line with the findings of the existing literature. In particular, OLS, GMM and (one-step) firm fixed effects estimates are 14.5%, 23.9% and 38% respectively. Our base specification, i.e. the two-step firm fixed effects model with rolling historical panel regressions, delivers an estimate of 18.9%. This result closely resembles previous reported adjustment speeds, estimated from rolling historical panel specifications (Hovakimian and Li, 2010; Hovakimian and Li, 2011). It is much lower than the one-step firm fixed effects estimate, because we use rolling historical regressions instead of full-sample regressions. We also estimate the two-step firm fixed effect model with full-sample regressions and obtain a speed close to 40% (not reported for brevity). Our results are consistent with Hovakimian and Li (2011), who document that using rolling historical regressions, when estimating this fixed effects partial adjustment model, eliminates the look-ahead bias and thereby deflates the estimated speed of adjustment. Consistent with existing literature, the estimates for market leverage are similar to those for book leverage.

Next, we restrict our interest to cases of active rebalancing. As described in Section 3.2, an issuance or repurchase is defined as any net change above 5% (1.25% for equity repurchases) in equity or debt divided by the book value of assets for the previous fiscal year. We are left with 72,634 firm-year observations. As reported in Table 3.5, the adjustment speed is significantly increased, reaching 31.1% per year for book leverage and 33% per year for market leverage. This increase indicates that our screening technique does a good job in capturing active adjustment.

So far we have implicitly assumed that all firms adjust to the target with the same speed. From this point on we allow for different adjustment speeds across different circumstances. First, we estimate the adjustment speed for over-levered and under-levered firms. Consistent with existing studies (Byoun 2008, Faulkender et al 2012), our results indicate that over-levered firms adjust faster than under-levered firms (Table 3.5).

By estimating equation (5) we allow for different adjustment speeds across groups of firms with different deviations from target leverage and different cash flow outcomes. The results are presented in Table 3.6. In terms of both book and market leverage, all 4 adjustment speed coefficients are positive and significant, implying that leverage is mean-reverting. Moving on to the comparison of the coefficients between groups, the evidence is not consistent with dynamic trade-off theory. Firms with financial deficits adjust faster when they are over-levered than when they are under-levered. The results are similar under both leverage specifications. The coefficient estimates imply that over-levered firms eliminate on average 38.4% (37.5%) of the deviation from target leverage per year in terms of book (market) values while under-levered eliminate just 22.4% (19%) per year. The differences are highly significant, as indicated by our t-test p-values. This implies that firms adjust faster when they issue equity rather than debt, which is a less costly security to issue. In addition, under-levered firms adjust faster than over-levered firms when they face a financial surplus. Given that debt is cheaper, this result is not consistent with the notion that firms are more willing to reduce debt rather than equity when facing financial surpluses, in order to preserve debt capacity and maintain the opportunity to load up cheap debt if capital is needed in the future (Byoun 2008).

3.4.2. Adjustment speed and adjustment cost determinants

In the next test, we divide the sample by firm size and by firm risk and estimate the speed of adjustment for every new group. The number of usable observations in each pair of groups varies according to the availability of the required data. Firm bond ratings are available on Compustat for the years from 1985 onwards. Furthermore, daily stock market data on the CRSP/Compustat merged database is available from 1984 onwards. Paired t-tests are conducted to test the significance of the difference of the coefficients between groups. The results are reported in Table 3.7.

In terms of book leverage, when firms issue debt, our estimates suggest that the adjustment speed is not affected by the variation of adjustment costs. The difference in adjustment speed between large and small, rated and non-rated and high and low volatility firms is statistically not different from zero. When market leverage is considered, adjustment speed estimates are lower for firms that face lower costs. In particular, the speed drops to 16.3% for large firms from 21.7% for small firms, to 13% for rated firms from 22.3% for non-rated firms and to 16.1% for low volatility firms from 27.3% for high volatility firms. All differences are statistically significant at the 1% level. The results for both leverage specifications are contradictory to dynamic trade-off theory, which predicts that the adjustment speed is negatively associated with adjustment costs.

The results for equity issues point in the same direction. According to our estimates for book (market) leverage, the adjustment speed decreases to 27.1% (27.8%) for large firms compared to 45.8% (41.6%) for small firms, to 27.4% (28.5%) for rated firms compared to 43.5% (37.9%) for non-rated firms and to 29.1% (19.9%) for low volatility firms compared to 47.5% (39.7%) for high volatility firms. All these differences are statistically significant, most of them at the 1% level. These estimates indicate that adjustment speed falls as adjustment costs fall, an observation that is contradictory to dynamic trade-off theory.

Splitting our sample into sub-groups offers us the opportunity to test the robustness of our previous result, concerning the question of whether firms adjust faster when they issue equity or when they issue debt. We compare within each sub-group the adjustment speed between under- and over-levered firms with a financial deficit. The results are reported in Table 3.7. Across all six sub-groups and both leverage specifications, the speed of adjustment of over-levered firms facing a financial deficit is either higher or not statistically different from the adjustment speed of under-levered firms facing a financial deficit. Put simply, we do not find any evidence in favor of the implication of the dynamic trade-off theory, that firms should adjust faster when they issue debt rather than equity.

One might argue that the three adjustment cost proxies might be correlated. For instance, rated firms may be, at the same time, large firms and the ones that have low volatility stocks. Therefore we further split these groups into sub-groups and estimate our model again (e.g. small and rated vs. small and non-rated, etc) to control for potential correlation between cost determinants. Our results indicate that the positive association between adjustment costs and adjustment speeds (or the lack of any association) remains in the subgroups in most cases[13]. For example, small non-rated firms adjust faster than large non-rated firms when issuing equity. Likewise, when only large firms are considered, high volatility firms adjust faster than low volatility firms.

In the next test, we try to estimate the incremental effect of the three cost determinants on adjustment speed. The results, reported in Table 3.8, are in line with the findings from our previous analysis, indicating that in most cases higher adjustment costs are either positively or not associated with adjustment speed.

[13] Results are not reported to save space. They are available on request.

In terms of book leverage, when issuing equity, firms without a bond rating adjust by 20.3% faster than rated firms on average. Furthermore, the adjustment speed of a firm that is one standard deviation above the mean size is 8.5% lower than that of an average size firm. Likewise, a firm whose stock return volatility is one standard deviation higher than the average stock return volatility, adjusts by 10.1% faster than a firm with the average stock return volatility. In cases of debt issuance, the incremental effect of bond rating existence and volatility is statistically insignificant. The incremental effect of firm size is an exception, in the sense that it is found positive and significant, implying a negative relation between adjustment costs and adjustment speed. However, we consider this to be a very weak result in both economic and statistical terms. The incremental effect is estimated at 2.2%, while all other estimated incremental effects range between 8.5% and 20.3%. Furthermore, in statistical terms, it is only marginally significant at the 10% level.

The results for market leverage, reported in Table 3.8, also corroborate the findings from our previous sub-group analysis. In cases of equity issuance, the incremental effect on adjustment speed is negative for size, positive for stock return volatility and insignificant for the existence of a bond rating. In cases of debt issuances, the incremental effect of stock return volatility on adjustment speed is positive and highly significant. Furthermore, firms with rated debt adjust slower than firms without debt ratings, albeit the difference is marginally significant at the 10% level. Finally, the incremental effect of size on the adjustment is found positive. However, as in the case of book leverage, this result is rather weak, as it is only marginally significant in both economic and statistical terms.

In the last test we estimate debt and equity issuance costs by employing the empirical models of Altinkilic and Hansen (2000) specified by equations (7) and (8). Proceeds are the net increase in debt each fiscal year or the net value of equity issued each fiscal year. As before, in order to qualify as a debt or equity issue the change must be at least 5% of the book value of assets in the previous fiscal year. The firm's market capitalization is measured at the end of the relevant fiscal year. In order for the estimated costs to be relevant, it is very important to form a sample that is similar to that of Altinkilic and Hansen (2000). Therefore, we use the sample selection criteria suggested by Altinkilic and Hansen (2000). Equity or debt issues smaller than $10 million or larger than $1 billion in terms of proceeds[14] are

[14] In our sample this is translated into $8 million and $875 million respectively, because Altinkilic and Hansen measure variables in 1990 dollars

excluded. For debt issues, firms without an investment grade bond rating are also excluded. As posted in Table 3.9, the two new confined samples – the one for debt issues and the one for equity issues – are very similar to those of Altinkilic and Hansen (2000) in terms of estimated issuance costs, proceeds, market capitalization and stock return volatility. For example, the average issuance cost for debt in the sample of Altinkilic and Hansen is 1.09%[15]. The average issuance cost for debt in our sample, as estimated by equation (8), is 16.27%. When we constrain our sample on the basis of Altinkilic and Hansen selection criteria, the average cost drops to 1.19%, closely resembling the average cost in the sample of Altinikilic and Hansen.

The two samples are split again into two groups, using the medians of the estimated debt and equity issuance costs as the cutoff point. In the debt issues sample, we focus on the adjustment speed of under-levered firms that face a financial deficit, i.e. on firms that have to issue debt, in order to approach their target leverage. Our results indicate that the difference in the adjustment speed between the high- and the low-cost group is insignificant. In the equity issues sample, we focus on the adjustment speed of over-levered firms that face a financial deficit, i.e. on firms that have to issue equity, in order to approach their target leverage. The difference in the adjustment speed between the high- and the low-cost group is insignificant. In sum, the results from our test based on Altinkilic and Hansen's models imply that neither when issuing equity nor when issuing debt do low-cost firms adjust faster than high cost firms.

3.4.3. Adjustment costs over time: a natural experiment

Prior research has documented that specific changes that took place during the last 25 years in the legislation governing the US market for securities underwriting services led to a decline in underwriting fees. These changes concern the competitiveness of the underwriting market. In particular, commercial banks were shut out of the underwriting market until 1988, as the Glass-Steagall Act of 1933 prohibited them from underwriting any security issues. In 1989 the first important change in legislation took place. Commercial banks were given permission by the Federal Reserve to enter the underwriting market. However, this permission was conditional, as commercial banks had a lot of restrictions

[15] By issuance cost, we mean the underwriter spread, which is the compensation paid to the underwriter for selling the firm's security issue, as a percent of the capital raised.

placed on them and thus could not fully compete with investment banks. The second significant change in legislation occurred in 1999, when the Financial Services Modernization Act lifted all constraints and gave commercial banks an unconditional access to the underwriting market.

Kim, Palia and Saunders (2008) examine underwriting costs around the two changes in legislation and conclude that the entry of commercial banks into underwriting had a significant procompetitive effect. In particular, they find that issuance costs during the most competitive underwriting market, i.e. from 1999 onwards, are significantly lower than issuance costs during the least competitive period, i.e. until 1988. Furthermore, they document that this reduction affects all types of issuers equally, regardless of their quality.

This structural break in security issuance costs offers a great opportunity for a natural experiment about the relationship between adjustment costs and the speed of adjustment towards target leverage. If the adjustment speed is indeed negatively correlated with adjustment costs, then we should observe a higher adjustment speed in the period with the lower costs. Therefore, we estimate the adjustment speeds separately for the subsamples 1974-1988 and 1999-2010. We use the same confined sample that we used earlier in the test that incorporated Altinkilic and Hansen (2000) models.

Results are posted in Table 3.11. As in the previous test, when the debt issues sample is concerned, we focus on the adjustment speed of under-levered firms that face a financial deficit, i.e. firms that have to issue debt, in order to approach their target leverage. We do not detect a statistically significant difference in the estimated adjustment speed across the two periods. When the equity issues sample is concerned, we focus on the adjustment speed of over-levered firms that face a financial deficit, i.e. firms that have to issue equity, in order to approach their target leverage. The difference in the adjustment speed across the two periods is statistically insignificant. As posted in Panel B of Table 3.11, the results are qualitatively unchanged when market values of leverage are considered. In sum, we find that the speed of adjustment is on average the same across the two periods. This is another finding indicating that the speed of adjustment does not increase when adjustment costs fall.

3.5. Robustness checks

Our first robustness check concerns the estimation of the target leverage. Instead of using the fitted value from a regression specified by equation (2), we use the fitted value from a regression specified by equation (3). Put simply, we employ the one-step version of the partial adjustment model, in order to estimate target leverage. This technique has been used in previous studies (Byoun, 2008; Faulkender et al., 2012). We estimate equation (3) via Blundell and Bond's (1998) system GMM. Flannery and Hankins (2011) examine various econometric techniques for estimating dynamic panel models like the one specified in equation (3) and conclude that Blundell and Bond's system GMM estimators perform most consistently. After estimating target leverage via the aforementioned technique, we re-run all tests. We find similar results (Tables A3.1-A3.5 of the Appendix), i.e. we do not detect any evidence of negative association between adjustment costs and adjustment speed, across all three tests and across the two leverage specifications.

Our second robustness check is about the mechanical mean reversion of leverage. Leverage ratios are by definition bounded between zero and one. Therefore, leverage ratios that approach these boundaries are more likely to experience a change towards the mean, than towards the two extreme values. Furthermore, leverage ratios of one or zero cannot go up or down respectively. If they change, they will move towards more moderate levels. Several studies (e.g. Kayan and Titman, 2007; Chang and Dasgupta, 2009; Hovakimian and Li, 2011) argue that this feature of leverage ratios can lead to mechanical mean reversion and therefore can create an upward bias in the estimated speed of adjustment. Hovakimian and Li (2011) show that mechanical mean reversion generated by this feature reduces the power of the partial adjustment model to reject the hypothesis of target-adjustment when no target adjustment is present. Prior studies suggest that dropping observations with very high or/and very low values (Kayan and Titman, 2007; Hovakimian and Li, 2011) of leverage ratios mitigates the bias. Following previous research (Öztekin and Flannery, 2012; Warr et al., 2012), we drop leverage observations greater than 0.9 and less than 0.1. We re-run all our tests, using the new truncated sample. The results, presented in Tables B3.1-B3.5 of the Appendix, remain qualitatively unchanged. This implies that our findings are not affected by a potential upward bias in the estimated adjustment speeds, induced by extreme leverage ratio values.

Finally, we test the robustness of the results to the econometric technique chosen to estimate equation (2), i.e. to estimate the speed of adjustment. The majority of all prior studies that utilize the two-step version of the partial adjustment model, have used either Fama-MacBeth (Fama and French, 2002; Hovakimian and Li, 2010; Hovakimian and Li, 2011) or OLS with bootstrapped standard errors (Kayan and Titman, 2007; Faulkender et al, 2012). Since the former specification is our base specification, we re-run our tests by estimating equation (2) via OLS with bootstrapped standard errors. As illustrated in Tables C3.1-C3.3 of the Appendix, the results remain qualitatively unchanged.

3.6. Conclusions

The focus of this paper is to empirically test one of the central predictions of dynamic trade-off theory of capital structure. In particular, a rather common characteristic across dynamic trade-off models is that security issuance implies transaction costs (e.g., Fischer, Heinkel and Zechner (1989), Strebulaev (2007)). This translates to the empirical hypothesis that actual debt ratios will revert towards an optimum/target level, as firms will let their leverage ratio move away from their optimal level until the benefits from rebalancing outweigh transaction costs. The goal of this study is to identify cross-sectional variation in adjustment costs (security issuance costs) and test whether such costs are correlated with capital structure choices. If adjustment costs do really impede firms from reaching their desired level of leverage, then higher adjustment costs should be associated with slower movements towards target leverage and vice versa. In contrast to the existing papers, this study employs directly measurable proxies for adjustment costs, i.e. security issuance cost determinants.

Although we find evidence in favor of mean-reversion, we do not find supporting evidence for the predicted negative relationship between adjustment speed and adjustment costs. In particular, our results suggest that firms make the financial choices that will move them closer to their targets regardless of the security they need to issue/repurchase. Conversely, when we consider cases of debt and/or equity issuance, our estimates imply that firms adjust faster when they issue equity rather than debt, a result that contradicts dynamic trade-off, as equity is a more costly security to issue. Furthermore, we find that large firms do not adjust faster than small firms, firms whose debt is rated do not adjust faster than firms without a bond rating and low-volatility firms do not adjust faster than high-volatility firms. These findings are also inconsistent with the predictions of dynamic trade-off theory. Alternative tests concerning (i) the incremental effect of costs on adjustment speed and (ii) the estimated security issuance costs obtained from Altinkilic and Hansen (2000) models deliver similar results.

In summary, the results of this study indicate that the speed of adjustment does not increase as costs decrease. In contrast, the correlation between adjustment cost and the speed of adjustment appears to be either positive or zero. From a dynamic trade-off perspective, these results are puzzling in the sense that firms confronting lower costs should adjust faster, and they cast serious doubt on the relevance of transaction costs in the adjustment process.

However, these results do not necessary invalidate the basic idea behind dynamic trade-off models. Theoretical models may be extended to include some additional frictions. These enriched models may suggest some other elements of adjustment costs, which we are currently not taking into account.

3.7. Tables and Figures

TABLE 3.1

Target leverage determinants and their expected effect on leverage according to trade-off theory

Factors		Expected effect on leverage according to trade-off theory
Industry median leverage	(+)	There is no direct link to a specific theory. It is interpreted as reflecting a number of factors otherwise omitted concerning common forces that firms in the same industry face.
Firm size (Log of total assets)	(+)	Large firms (which are usually more mature) are thought of as more diversified, with less volatile earnings and therefore as having **lower default risk.**
R&D (R&D expenditures/Net sales)	(-)	Firms with high R&D expenses have usually more intangible assets and hence **lose more of their value when they go into distress.**.
Depreciation (Dep. & amort. /Total assets)	(-)	**Substitute to interest for tax shields**. Firms with high dep. expenses have less need for deductible interest expenses.
Profitability (EBITDA/Total assets)	(+)	Static trade-off: Profitable firms should have more debt, since **interest tax shields are more valuable and expected bankruptcy costs are lower**.
	(-)	Dynamic trade-off: **Firms allow their leverage to drift most of the time**, and only adjust if it gets too far out of line. If the firm loses money so that debt increases, it will permit the drift to continue until the upper leverage boundary is reached and the firm recapitalizes. If the firm earns money, then it will again permit the drift to continue until the lower leverage boundary is reached. At that point it can load up on debt (e.g. firms engaging in M&As) or use stock-piled retained earnings.
Tangibility of Assets (Fixed assets/Total assets)	(+)	Tangible assets are **easier to collateralize** and suffer a smaller loss in their value than intangibles in the event of bankruptcy.

Growth (Market-to-book)	(-)	The most valuable assets of growth firms are intangible assets (e.g. investment opportunities, human capital), hence growth firms **lose more of their value when they go into distress.**

Table 1 illustrates the factors included in the estimation of equation (2), their proxies and their expected effect on leverage according to trade-off theory. These factors are assumed to affect target leverage. Actual leverage ratios are regressed on these factors and the estimated coefficients are used to estimate target leverage. The fitted value of target leverage is then substituted into the adjustment equation (1).

TABLE 3.2

Firms grouped by deviation from target leverage and cash flow outcome

Coefficient in equation (4) – Adjustment speed	Variable in equation (4)	Firms are…	Mean reversion implies that the firm…
λ_1	$D^{over}*D^{surplus}*DEV$	…over-levered with excess capital	…retires debt
λ_2	$D^{over}*D^{deficit}*DEV$	…over-levered with capital needed	…issues equity
λ_3	$D^{under}*D^{surplus}*DEV$	…under-levered with excess capital	…retires equity
λ_4	$D^{under}*D^{deficit}*DEV$	…under-levered with capital needed	…issues debt

Table 2 presents the split of the sample into four mutually-exclusive groups based on the deviation from target leverage and the cash flow outcome of the firms. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. This splitting up allows us to categorize firms according to the proper action (issue/retire debt/equity) that they should do, in order to narrow down the gap between actual and desired leverage.

TABLE 3.3

Parameter estimates of determinants of target leverage

Equation: $\left[\frac{D}{A}\right]_{i,t} = \beta X_{i,t-1} + \varepsilon_{i,t}$

	TD/BA	*TD/MA*
Med	0.426***	0.439***
	22.10	*32.07*
LnA	0.031***	0.037***
	20.38	*27.45*
MB	-0.004***	-0.011***
	-7.46	*-26.96*
EBITDA	-0.107***	-0.108***
	-21.28	*-25.73*
FA	0.165***	0.165***
	18.21	*20.06*
DEP	-0.009	-0.109***
	-0.30	*-4.39*
R&D	-0.003***	-0.002***
	-4.12	*-6.11*
R&D dummy	0.003	0.002
	0.81	*0.54*
Adj. R^2	0.652	0.676
N	128,839	128,839

TD is total debt and *BA (MA)* is book (market) value of assets. *Med* is the median leverage of the industry (based on Fama French 49 industry groups) that the firm belongs to. *EBITDA* is earnings before interest, taxes, depreciation and amortization divided by book assets. *MB* is the sum of book liabilities plus market value of equity divided by book assets. *LnA* is the natural log of book assets expressed in 1983 US dollars. *DEP* is depreciation and amortization divided by book assets. *FA* is fixed assets divided by book assets. *R&D* is research and development expense divided by net sales. *R&D dummy* is a dummy variable equal to one if the firm doesn't report R&D expense and zero otherwise. The reported t-statistics reflect standard errors (White standard errors clustered by firm) robust to heteroskedasticity and to residual dependence within firms. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 3.4

Target adjustment models

(i) 2-step model

Equation (1): $\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a + \lambda\left(\left[\frac{D}{A}\right]^{*}_{i,t} - \frac{D_{i,t-1}}{A_{i,t-1}}\right) + \varepsilon_{i,t}$ Equation (2): $\left[\frac{D}{A}\right]^{*}_{i,t} = \hat{\beta}X_{i,t-1}$

(ii) 1-step model

$$\frac{D_{it}}{A_{it}} = a + \lambda\beta X_{i,t-1} + (1-\lambda)\frac{D_{i,t-1}}{A_{i,t-1}} + \varepsilon_{i,t}$$

	TD/BA		TD/MA	
	λ	P-values	λ	P-values
(A) 2-step firm fixed effects (HP)	0.189***	*0.000*	0.216***	*0.000*
(B) 1-step OLS	0.145***	*0.000*	0.145***	*0.000*
(C) 1-step firm fixed effects (FSP)	0.380***	*0.000*	0.390***	*0.000*
(D) 1-step GMM	0.239***	*0.000*	0.225***	*0.000*
N	128,839		128,839	

TD is total debt and BA (MA) is book (market) value of assets. λ is the speed of adjustment to target leverage. For the 2-step model, β is estimated with rolling historical panel (HP) regressions of observed debt ratios on target determinants and the estimated coefficients are used for the estimation of target leverage each year. Then the fitted values of target leverage are substituted in equation (1), which is estimated via Fama-MacBeth regressions. The estimation of the 1-step fixed effect model incorporates full-sample panel (FSP) regressions of observed debt ratios on target determinants. For the 1-step models, standard errors (White standard errors clustered by firm) are robust to heteroskedasticity and to residual dependence within firms. Numbers in italics are p-values. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 3.5

Baseline adjustment speeds

Equation (A): $\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a + \lambda DEV_{i,t-1} + \varepsilon_{i,t}$ where $DEV_{i,t-1} = \left[\frac{D_{it}}{A_{it}}\right]^{*} - \frac{D_{i,t-1}}{A_{i,t-1}}$

Equation (B): $\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D^{over} + a_2 D^{under} + \lambda_1 D^{over} DEV_{i,t-1} + \lambda_2 D^{under} DEV_{i,t-1} + \varepsilon_{i,t}$

	Δ(TD/BA)			Δ(TD/MA)		
	Equation (A)	Equation (A) (active leverage changes only)	Equation (B) (active leverage changes only)	Equation (A)	Equation (A) (active leverage changes only)	Equation (B) (active leverage changes only)
α	0.002	0.008***		0.000	0.004	
	1.15	*3.11*		*0.07*	*0.80*	
D^{over}			0.010***			0.009*
			3.37			*1.68*
D^{under}			0.015***			0.013***
			5.94			*3.02*
DEV	0.189***	0.311***		0.216***	0.330***	
	34.48	*35.26*		*20.01*	*26.56*	
D^{over}DEV			0.360***			0.430***
			24.46			*23.42*
D^{under}DEV			0.222***			0.205***
			13.49			*14.78*
Adjusted R^2	0.033	0.059	0.062	0.047	0.075	0.081
N	128,839	72,634	72,634	128,839	72,634	72,634

All equations are estimated via Fama-MacBeth regressions. Δ stands for difference. TD is total debt and BA (MA) is book (market) value of assets. DEV is estimated target leverage minus actual leverage. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). Active leverage changes are those leverage changes that occur due to debt/equity issuance/repurchase as defined in Section 3.2. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 3.6

Adjustment speeds by degree of indebtedness and cash flow outcome

Equation: $$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

target adjustment implies to			Δ(TD/BA)	Δ(TD/MA)
	$D^{over}*D^{surplus}$	α_1	-0.042***	-0.039***
			-15.10	*-8.33*
	$D^{over}*D^{deficit}$	α_2	0.046***	0.041***
			13.57	*8.02*
	$D^{under}*D^{surplus}$	α_3	-0.034***	-0.029***
			-17.36	*-7.74*
	$D^{under}*D^{deficit}$	α_4	0.044***	0.038***
			15.40	*7.85*
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.241***	0.335***
			10.69	*13.25*
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.384***	0.375***
			21.60	*15.83*
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.129***	0.161***
			5.00	*5.96*
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.224***	0.190***
			14.19	*12.41*
	Adjusted R^2		0.172	0.182
	N		72,634	72,634
	t-stat for λ_4-λ_2		*-6.81*	*-6.95*
	p-value		*0.000*	*0.000*

The equation is estimated via Fama-MacBeth regressions. Δ stands for difference. TD is total debt and BA (MA) is book (market) value of assets. The sample is split into four mutually-exclusive groups based on the deviation from target leverage and the cash flow outcome of the firms. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are t-statistics. The t-statistic for λ_4-λ_2 is for a paired t-test of the null hypothesis that the difference between coefficients is zero. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 3.7

Adjustment speeds by degree of indebtedness, cash flow outcome and adjustment cost determinants

Equation: $$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

Panel A: TD/BA

target adjustment implies to			small firms	large firms	t-stat for difference	non-rated firms	rated firms	t-stat for difference	high volatility firms	low volatility firms	t-stat for difference
retire debt	D^{over}*$D^{surplus}$*DEV	λ_1	0.295***	0.168***	*-4.12*	0.267***	0.090***	*-4.72*	0.244***	0.189***	*-1.36*
			10.15	*6.98*	*(0.000)*	*11.06*	*3.10*	*(0.000)*	*6.39*	*9.40*	*(0.174)*
issue equity	D^{over}*$D^{deficit}$*DEV	λ_2	0.458***	0.271***	*-5.09*	0.435***	0.274***	*-3.02*	0.475***	0.291***	*-3.28*
			17.31	*10.48*	*(0.000)*	*21.67*	*5.20*	*(0.000)*	*18.58*	*6.74*	*(0.001)*
retire equity	D^{under}*$D^{surplus}$*DEV	λ_3	0.091***	0.165***	*1.59*	0.085***	0.213***	*2.42*	0.041	0.075***	*0.42*
			2.74	*4.71*	*(0.112)*	*3.61*	*3.54*	*(0.016)*	*0.50*	*2.69*	*(0.675)*
issue debt	D^{under}*$D^{deficit}$*DEV	λ_4	0.222***	0.224***	*0.09*	0.226***	0.184***	*-0.83*	0.235***	0.239***	*0.15*
			8.56	*12.86*	*(0.928)*	*11.76*	*3.88*	*(0.407)*	*8.20*	*9.96*	*(0.880)*
	Adj. R^2		0.169	0.186		0.179	0.245		0.167	0.221	
	N		36,317	36,317		48,052	8,003		24,737	24,737	
	t-stat for λ_4-λ_2		*-6.29*	*-1.43*		*-6.92*	*-1.17*		*-7.35*	*-1.14*	
	p-value		*(0.000)*	*(0.153)*		*(0.000)*	*(0.242)*		*(0.000)*	*(0.254)*	

Panel B: TD/MA

target adjustment implies to			small firms	large firms	t-stat for difference	non-rated firms	rated firms	t-stat for difference	high volatility firms	low volatility firms	t-stat for difference
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.347***	0.303***	*-1.15*	0.366***	0.181***	*-4.71*	0.358***	0.244***	*-1.33*
			12.11	*9.00*	*(0.250)*	*11.44*	*4.29*	*(0.000)*	*6.43*	*4.20*	*(0.184)*
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.416***	0.278***	*-3.49*	0.379***	0.285***	*-1.79*	0.397***	0.199***	*-2.69*
			13.60	*9.42*	*(0.000)*	*13.05*	*6.14*	*(0.073)*	*10.46*	*3.86*	*(0.007)*
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.141***	0.160***	*0.38*	0.088***	0.155***	*1.48*	0.128***	0.049**	*-1.74*
			4.24	*4.61*	*(0.700)*	*4.33*	*3.45*	*(0.134)*	*2.75*	*2.55*	*(0.082)*
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.217***	0.163***	*-2.24*	0.223***	0.130***	*-2.32*	0.273***	0.161***	*-2.89*
			9.06	*10.21*	*(0.025)*	*13.68*	*3.51*	*(0.021)*	*8.57*	*9.64*	*(0.004)*
	Adj. R^2		0.180	0.185		0.188	0.228		0.188	0.218	
	N		35,614	35,614		48,052	8,003		24,737	24,737	
	t-stat for λ_4-λ_2		*-5.29*	*-3.55*		*-5.01*	*-2.33*		*-2.43*	*-0.67*	
	p-value		*(0.000)*	*(0.000)*		*(0.000)*	*(0.020)*		*(0.015)*	*(0.503)*	

All equations are estimated via Fama-MacBeth regressions. TD is total debt and BA (MA) is book (market) value of assets. The sample is divided into small and large firms, using the median of total assets as the cutoff point, into rated and non-rated firms, based on whether a firm has a bond rating or not and into high and low volatility firms, using the median of the daily stock return standard deviation of the firm, measured over the trading days of the relevant fiscal year, as the cutoff point. Depending on the required data for each type of sample division, the number of usable firm-year observations varies accordingly. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are t-statistics. Numbers in brackets are p-values. The t-statistics for difference are for paired t-tests of the null hypothesis that the difference between coefficients of different groups is zero. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 3.8

Incremental effect of cost determinants on adjustment speed

Equation (6): $$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ (\lambda_1 + \gamma_1 Z_{i,t}) D_{it}^{over} D_{it}^{surplus} DEV_{it} + (\lambda_2 + \gamma_2 Z_{i,t}) D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ (\lambda_3 + \gamma_3 Z_{i,t}) D_{it}^{under} D_{it}^{surplus} DEV_{it} + (\lambda_4 + \gamma_4 Z_{i,t}) D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

Panel A: TD/BA

target adjustment implies to		base (λ)	Z:size (γ)	base (λ)	Z:rate (γ)	base (λ)	Z:volatility (γ)
retire debt	$D^{over}*D^{surplus}*DEV$	0.195***	-0.118***	0.252***	-0.152***	0.192***	0.054***
		12.27	*-11.05*	*12.22*	*-5.12*	*11.59*	*4.59*
issue equity	$D^{over}*D^{deficit}*DEV$	0.376***	-0.085***	0.439***	-0.203***	0.364***	0.101***
		19.12	*-6.80*	*18.66*	*-5.84*	*18.86*	*7.15*
retire equity	$D^{under}*D^{surplus}*DEV$	0.107***	0.063***	0.101***	0.072	0.103***	-0.040***
		6.66	*6.39*	*6.22*	*1.30*	*6.04*	*-2.66*
issue debt	$D^{under}*D^{deficit}*DEV$	0.205***	0.022*	0.202***	-0.003	0.204***	-0.015
		13.15	*1.75*	*12.20*	*-0.06*	*13.26*	*-1.29*
	Adjusted R^2	0.191		0.190		0.189	
	N	47,887		47,887		47,887	

Panel B: TD/MA

target adjustment implies to		base (λ)	Z:size (γ)	base (λ)	Z:rate (γ)	base (λ)	Z:volatility (γ)
retire debt	$D^{over}*D^{surplus}*DEV$	0.316***	-0.083***	0.377***	-0.184***	0.323***	0.026**
		16.73	*-6.53*	*18.25*	*-4.24*	*15.98*	*2.09*
issue equity	$D^{over}*D^{deficit}*DEV$	0.320***	-0.069***	0.355***	-0.066	0.286***	0.102***
		13.77	*-5.07*	*12.56*	*-1.29*	*12.75*	*6.36*
retire equity	$D^{under}*D^{surplus}*DEV$	0.095***	0.037***	0.091***	0.058	0.119***	0.054***
		6.13	*4.19*	*5.6*	*1.36*	*6.85*	*3.28*
issue debt	$D^{under}*D^{deficit}*DEV$	0.183***	0.019*	0.197***	-0.067*	0.195***	0.054***
		12.56	*1.74*	*12.67*	*-1.81*	*13.38*	*4.46*
	Adjusted R^2	0.192		0.193		0.193	
	N	47,887		47,887		47,887	

Table 8 presents results from estimating equation (6) via OLS regressions with bootstrapped standard errors. The dependent variable is total debt over book assets. Z for size is total assets and Z for volatility is the daily stock return standard deviation measured over all trading days of the relevant fiscal year. Both variables are normalized to have mean zero and standard deviation of one. Z for rate is a dummy variable equal to 1 if the firm has a bond rating and 0 otherwise. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are z-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 3.9

Debt and equity issuance cost estimates

Panel A: Debt issuance cost = 0.50 + 25.17*(1/proceeds) + 4.63*(proceeds/market cap)

		Debt issues: Altinkilic and Hansen sample	Debt issues: Our sample (Altinkilic and Hansen selection criteria)	Debt issues: Our sample (no selection criteria)
Proceeds	mean	146	236	75
	median	119	171	11
Market cap	mean	3,280	4,505	859
	median	1,830	2,429	68
Volatility	mean	1.97%	2.03%	3.68%
	median	1.80%	1.90%	3.24%
Issuance cost	mean	1.09%	1.19%	16.27%
	median		1.07%	4.82%
N		628	1,770	33,372

Panel B: Equity issuance cost = 4.04 + 25.65*(1/proceeds) + 2.64*(proceeds/market cap)

		Equity issues: Altinkilic and Hansen sample	Equity issues: Our sample (Altinkilic and Hansen selection criteria)	Equity issues: Our sample (no selection criteria)
Proceeds	mean	47	49	24
	median	33	26	7
Market cap	mean	341	733	380
	median	153	295	85
Volatility	mean	3.60%	3.89%	4.67%
	median	3.43%	3.62%	4.32%
Issuance cost	mean	5.38%	5.62%	21.83%
	median		5.43%	8.32%
N		1,325	8,197	17,755

Debt/equity issuance costs are the percentage underwriter spreads. Proceeds are the net increase in debt each fiscal year or the net value of equity issued each fiscal year. In order to qualify as a debt or equity issue the change must be at least 5% of the book value of assets in the previous fiscal year. Market cap is the market capitalization of the firm at the end of the relevant fiscal year. We assume that the estimated cost for each year applies for all issuances that took place in that particular year. Volatility is the daily stock return standard deviation of the firm, measured over the trading days of the relevant fiscal year. According to Altinkilic and Hansen (2000) sample selection criteria, equity or debt issues smaller than $10 million or larger than $1 billion in proceeds (in our sample this is translated to $8 millions and 875 millions respectively, because Altinkilic and Hansen measure variables in 1990 dollars) are excluded. For debt issues, firms without an investment grade bond rating are also excluded. Variables are trimmed at the 99th percentile. All monetary variables are measured in 1983 (million) dollars using the US CPI as a deflator.

TABLE 3.10

Adjustment speeds by degree of indebtedness, cash flow outcome and estimated issuance cost

Equation:
$$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

Panel A: TD/BA

			Debt Issues			Equity Issues		
target adjustment implies to			high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)	high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.247	-0.017	*(0.317)*	-0.039	0.198**	*(0.132)*
			1.06	*-0.14*		*-0.31*	*2.05*	
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.172***	-0.001	*(0.019)*	0.527***	0.452***	*(0.331)*
			3.23	*-0.01*		*9.43*	*8.76*	
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.323*	0.294*	*(0.910)*	0.425	0.183	*(0.610)*
			1.69	*1.75*		*1.21*	*0.53*	
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.151***	0.121**	*(0.678)*	0.170***	0.119***	*(0.404)*
			2.78	*2.53*		*3.64*	*3.02*	
	Adj. R^2		0.628	0.514		0.314	0.304	
	N		885	885		4,098	4,098	

Panel B: TD/MA

			Debt Issues			Equity Issues		
target adjustment implies to			high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)	high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.614*	0.712**	*(0.843)*	0.332**	0.384***	*(0.784)*
			1.72	*1.98*		*2.17*	*3.35*	
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.072	0.155*	*(0.500)*	0.492***	0.577***	*(0.395)*
			0.82	*1.76*		*7.28*	*8.68*	
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.123	0.069	*(0.799)*	0.000	0.137	*(0.773)*
			0.65	*0.85*		*0.00*	*0.58*	
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.042	0.003	*(0.483)*	0.125***	0.063*	*(0.252)*
			0.83	*0.12*		*2.94*	*1.91*	
	Adj. R^2		0.580	0.340		0.125	0.171	
	N		885	885		4,098	4,098	

All equations are estimated via OLS regressions with bootstrapped standard error. The dependent variable is total debt over book assets. The sample is divided into high and low issuance cost firms, using the median of the estimated debt and equity issuance costs as the cutoff point. The debt and equity issuance costs are estimated by the following equations: Debt issuance cost = 0.50 + 25.17*(1/proceeds) + 4.63*(proceeds/market cap) and Equity issuance cost = 4.04 + 25.65*(1/proceeds) + 2.64*(proceeds/market cap). D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are z-statistics. Numbers in brackets are p-values. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 3.11

Adjustment speeds by degree of indebtedness, cash flow outcome and underwriting market regime

Equation:
$$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

Panel A: TD/BA

			Debt Issues			Equity Issues		
target adjustment implies to			(1974-1988) high cost	(1999-2010) low cost	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)	(1974-1988) high cost	(1999-2010) low cost	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.287	-0.013	*(0.568)*	0.166	0.100	*(0.718)*
			0.30	*-0.09*		*1.38*	*0.75*	
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.111	0.059	*(0.681)*	0.428***	0.531***	*(0.310)*
			1.08	*0.87*		*4.83*	*10.09*	
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.789**	0.239	*(0.175)*	0.927	-0.182	*(0.263)*
			2.32	*1.23*		*0.99*	*-1.09*	
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.100	0.135*	*(0.753)*	0.229***	0.122***	*(0.160)*
			1.24	*1.75*		*3.57*	*2.75*	
	Adj. R^2		0.489	0.424		0.176	0.304	
	N		376	505		1,941	3,679	

Panel B: TD/MA

			Debt Issues			Equity Issues		
target adjustment implies to			(1974-1988) high cost	(1999-2010) low cost	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)	(1974-1988) high cost	(1999-2010) low cost	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.012	0.666**	*(0.577)*	0.234	0.506***	*(0.222)*
			0.01	*2.58*		*1.56*	*3.08*	
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	-0.118	-0.041	*(0.719)*	0.393***	0.561***	*(0.173)*
			-0.74	*-0.3*		*3.67*	*8.3*	
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.508*	0.029	*(0.127)*	0.492	-0.340	*(0.168)*
			1.71	*0.29*		*0.85*	*-1.61*	
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.028	0.079	*(0.602)*	0.120**	0.134***	*(0.833)*
			0.62	*0.9*		*2.21*	*2.94*	
	Adj. R^2		0.367	0.325		0.157	0.147	
	N		376	505		1,941	3,679	

All equations are estimated via OLS regressions with bootstrapped standard error. The dependent variable is total debt over book assets. High-cost regime is defined as 1974-1988 and is the least competitive underwriting market, wherein no commercial banks were allowed to underwrite any issue. Low-cost regime is defined as 1999-2010 and is the most competitive underwriting market, wherein all previous restrictions on commercial banks were withdrawn. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are z-statistics. Numbers in brackets are p-values. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

3.8. Appendix

Definition of variables used

SYMBOL	DESCRIPTION	COMPUSTAT ACCOUNTS
	Leverage definitions	
TD/BA	Long-term debt plus debt in current liabilities to book assets	(DLTT+DLC)/AT
TD/MA	Long-term debt plus debt in current liabilities to market value of assets	(DLTT+DLC)/mv_a
mv_a	Market value of assets = Book assets minus total equity plus preferred stock minus deferred tax and investment tax credit plus market equity (market equity = stock market price times shares outstanding)	AT-SEQ-TXDITC+PREF_ST+(CSHO*PRCC_F)
	Target leverage variables	
Med	The median leverage ratio of the industry (based on Fama-French 49 industry groups), that the firm belongs to.	
EBITDA	Earnings before interest and taxes to book assets	OIBDP/AT
MB	Market value of assets to book assets	mv_a/AT
LnA	Natural logarithm of real book assets expressed in 1983 US dollars	log(AT/CPI)
DEP	Depreciation & amortization to book assets	DP/AT
FA	Fixed assets to book assets	PPENT/AT
R&D	Research & development expense to net sales	XRD/SALE
R&D dummy	Dummy variable equal to one if the firm doesn't report R&D expense and zero otherwise	dummy: 1 if XRD missing, 0 otherwise
	Cash flow variables	
OCF	Operating cash flows after interest and taxes	Format code 1,2,3: IBC+XIDOC+DPC+TXDC+ESUBC+SPPIV +FOPO+FSRCO Format code 7: OANCF-RECCH-INVCH-APALCH-TXACH+EXRE-AOLOCH
INV	Net investment	Format code 1,2,3: CAPX+IVCH+AQC+FUSEO-SPPE-SIV Format code 7: CAPX+IVCH+AQC-SPPE-SIV-IVSTCH-IVACO
ΔD	Net total debt issues	Format code 1: DLTIS-DLTR-DLCCH Format code 2,3,7: DLTIS-DLTR+DLCCH
ΔE	Net equity issues	Format code 1,2,3,7: SSTK-PRSTKC
ΔW	Change in net working capital	Format code 1: WCAPC+CHECH Format code 2,3: -WCAPC+CHECH Format code 7: -RECCH-INVCH-APALCH-TXACH-AOLOCH+CHECH-FIAO
DIV	Dividend payments	Format code 1,2,3,7: DV

TABLE A3.1

Baseline adjustment speeds

(Target coefficients estimated by GMM)

Equation (A): $\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a + \lambda DEV_{i,t-1} + \varepsilon_{i,t}$ where $DEV_{i,t-1} = \left[\frac{D_{it}}{A_{it}}\right]^* - \frac{D_{i,t-1}}{A_{i,t-1}}$

Equation (B): $\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D^{over} + a_2 D^{under} + \lambda_1 D^{over} DEV_{i,t-1} + \lambda_2 D^{under} DEV_{i,t-1} + \varepsilon_{i,t}$

	Δ(TD/BA)			Δ(TD/MA)		
	Equation (A)	Equation (A) (active leverage changes only)	Equation (B) (active leverage changes only)	Equation (A)	Equation (A) (active leverage changes only)	Equation (B) (active leverage changes only)
α	0.002	0.013***		0.003	0.011**	
	1.48	*5.22*		*0.84*	*2.43*	
D^{over}			0.005*			0.000
			1.84			*0.10*
D^{under}			0.021***			0.021***
			8.14			*4.63*
DEV	0.134***	0.239***		0.121***	0.200***	
	37.11	*61.25*		*19.03*	*31.43*	
D^{over}DEV			0.229***			0.203***
			43.04			*32.54*
D^{under}DEV			0.217***			0.149***
			42.72			*18.26*
Adjusted R^2	0.059	0.118	0.122	0.064	0.108	0.118
N	128,839	72,634	72,634	128,839	72,634	72,634

The equations are estimated via Fama-MacBeth regressions. Δ stands for difference. TD is total debt and BA (MA) is book (market) value of assets. DEV is estimated target leverage minus actual leverage. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). All equations are estimated via Fama-MacBeth regressions. Active leverage changes are those leverage changes that occur due to debt/equity issuance/repurchase as defined in Section 3.2. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE A3.2

Adjustment speeds by degree of indebtedness and cash flow outcome

(Target coefficients estimated by GMM)

Equation: $$\frac{D_{it}}{A_{it}}-\frac{D_{i,t-1}}{A_{i,t-1}}=a_1 D_{it}^{over} D_{it}^{surplus}+a_2 D_{it}^{over} D_{it}^{deficit}+a_3 D_{it}^{under} D_{it}^{surplus}+a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+\lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it}+\lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+\lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it}+\lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it}+\varepsilon_{i,t}$$

target adjustment implies to			Δ(TD/BA)	Δ(TD/MA)
	D^{over}*$D^{surplus}$	α_1	-0.044***	-0.044***
			-20.84	*-10.42*
	D^{over}*$D^{deficit}$	α_2	0.039***	0.033***
			10.67	*6.11*
	D^{under}*$D^{surplus}$	α_3	-0.033***	-0.025***
			-19.70	*-6.86*
	D^{under}*$D^{deficit}$	α_4	0.051***	0.045***
			17.80	*9.09*
retire debt	D^{over}*$D^{surplus}$*DEV	λ_1	0.148***	0.161***
			19.18	*19.52*
issue equity	D^{over}*$D^{deficit}$*DEV	λ_2	0.256***	0.179***
			30.99	*17.30*
retire equity	D^{under}*$D^{surplus}$*DEV	λ_3	0.191***	0.158***
			35.26	*16.63*
issue debt	D^{under}*$D^{deficit}$*DEV	λ_4	0.220***	0.130***
			29.85	*16.03*
	Adjusted R^2		0.228	0.211
	N		72,634	72,634
	t-stat for λ_4-λ_2		*-3.26*	*-5.20*
	p-value		*0.000*	*0.000*

The equation is estimated via Fama-MacBeth regressions. Δ stands for difference. TD is total debt and BA (MA) is book (market) value of assets. The sample is split into four mutually-exclusive groups based on the deviation from target leverage and the cash flow outcome of the firms. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are t-statistics. The t-statistic for λ_4-λ_2 is for a paired t-test of the null hypothesis that the difference between coefficients is zero. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE A3.3

Adjustment speeds by degree of indebtedness, cash flow outcome and adjustment cost determinants

(Target coefficients estimated by GMM)

Equation: $$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

Panel A: TD/BA

target adjustment implies to			small firms	large firms	t-stat for difference	non-rated firms	rated firms	t-stat for difference	high volatility firms	low volatility firms	t-stat for difference
retire debt	D^{over}*$D^{surplus}$*DEV	λ_1	0.162***	0.118***	*-4.27*	0.160***	0.105***	*-3.75*	0.152***	0.153***	*0.07*
			16.51	*15.31*	*(0.000)*	*17.82*	*8.22*	*(0.000)*	*10.31*	*14.58*	*(0.944)*
issue equity	D^{over}*$D^{deficit}$*DEV	λ_2	0.298***	0.199***	*-8.06*	0.274***	0.191***	*-5.14*	0.290***	0.218***	*-3.48*
			26.97	*25.91*	*(0.000)*	*26.00*	*13.24*	*(0.000)*	*24.83*	*14.15*	*(0.000)*
retire equity	D^{under}*$D^{surplus}$*DEV	λ_3	0.220***	0.164***	*-4.40*	0.190***	0.155***	*-1.96*	0.184***	0.186***	*0.08*
			24.88	*21.58*	*(0.000)*	*31.30*	*10.42*	*(0.050)*	*11.13*	*15.36*	*(0.936)*
issue debt	D^{under}*$D^{deficit}$*DEV	λ_4	0.238***	0.205***	*-3.12*	0.212***	0.234***	*0.94*	0.243***	0.214***	*-2.21*
			22.19	*27.00*	*(0.002)*	*25.48*	*9.07*	*(0.347)*	*23.46*	*19.41*	*(0.027)*
	Adj. R^2		0.227	0.237		0.225	0.279		0.211	0.278	
	N		36,317	36,317		48,052	8,003		24,737	24,737	
	t-stat for λ_4-λ_2		*-3.72*	*0.61*		*-4.57*	*-1.18*		*-2.95*	*-0.25*	
	p-value		*(0.000)*	*(0.535)*		*(0.000)*	*(0.242)*		*(0.003)*	*(0.802)*	

Panel B: TD/MA

target adjustment implies to			small firms	large firms	t-stat for difference	non-rated firms	rated firms	t-stat for difference	high volatility firms	low volatility firms	t-stat for difference
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.184***	0.133***	*-4.36*	0.175***	0.127***	*-2.11*	0.172***	0.149***	*1.28*
			17.96	*13.39*	*(0.000)*	*16.73*	5.77	*(0.035)*	*10.99*	*10.71*	*(0.201)*
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.196***	0.148***	*-3.43*	0.168***	0.133***	*-1.51*	0.177***	0.102***	*-3.62*
			13.33	*14.06*	*(0.000)*	*12.80*	5.85	*(0.131)*	*9.16*	*7.24*	*(0.000)*
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.204***	0.138***	*-4.80*	0.161***	0.130***	*-1.84*	0.174***	0.153***	*-1.39*
			15.70	*12.10*	*(0.000)*	*12.34*	8.96	*(0.065)*	*10.57*	*10.55*	*(0.164)*
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.158***	0.110***	*-4.74*	0.121***	0.088***	*-1.89*	0.147***	0.081***	*-3.92*
			15.50	*11.05*	*(0.000)*	*13.39*	5.98	*(0.059)*	*13.52*	*5.47*	*(0.000)*
	Adj. R^2		0.211	0.212		0.208	0.243		0.201	0.251	
	N		35,614	35,614		48,052	8,003		24,737	24,737	
	t-stat for λ_4-λ_2		*-2.59*	*-3.82*		*-3.82*	*-1.65*		*-1.44*	*-1.34*	
	p-value		*(0.009)*	*(0.000)*		*(0.000)*	*(0.099)*		*(0.149)*	*(0.180)*	

All equations are estimated via Fama-MacBeth regressions. TD is total debt and BA (MA) is book (market) value of assets. The sample is divided into small and large firms, using the median of total assets as the cutoff point, into rated and non-rated firms, based on whether a firm has a bond rating or not and into high and low volatility firms, using the median of the daily stock return standard deviation of the firm, measured over the trading days of the relevant fiscal year, as the cutoff point. Depending on the required data for each type of sample division, the number of usable firm-year observations varies accordingly. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are t-statistics. Numbers in brackets are p-values. The t-statistics for difference are for paired t-tests of the null hypothesis that the difference between coefficients of different groups is zero. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE A3.4

Incremental effect of cost determinants on adjustment speed

(Target coefficients estimated by GMM)

Equation (6):
$$\frac{D_{it}}{A_{it}}-\frac{D_{i,t-1}}{A_{i,t-1}}=a_1D_{it}^{over}D_{it}^{surplus}+a_2D_{it}^{over}D_{it}^{deficit}+a_3D_{it}^{under}D_{it}^{surplus}+a_4D_{it}^{under}D_{it}^{deficit}$$
$$+(\lambda_1+\gamma_1Z_{i,t})D_{it}^{over}D_{it}^{surplus}DEV_{it}+(\lambda_2+\gamma_2Z_{i,t})D_{it}^{over}D_{it}^{deficit}DEV_{it}$$
$$+(\lambda_3+\gamma_3Z_{i,t})D_{it}^{under}D_{it}^{surplus}DEV_{it}+(\lambda_4+\gamma_4Z_{i,t})D_{it}^{under}D_{it}^{deficit}DEV_{it}+\varepsilon_{i,t}$$

Panel A: TD/BA

target adjustment implies to		base (λ)	Z:size (γ)	base (λ)	Z:rate (γ)	base (λ)	Z:volatility (γ)
retire debt	D^{over}*$D^{surplus}$*DEV	0.147***	-0.052***	0.162***	-0.053***	0.157***	-0.001
		20.17	*-6.95*	*19.21*	*-3.51*	*21.75*	*-0.12*
issue equity	D^{over}*$D^{deficit}$*DEV	0.245***	-0.058***	0.271***	-0.090***	0.247***	0.038***
		30.00	*-7.15*	*27.87*	*-5.39*	*29.46*	*4.78*
retire equity	D^{under}*$D^{surplus}$*DEV	0.189***	-0.020***	0.187***	-0.014	0.187***	0.003
		28.06	*-3.59*	*26.37*	*-0.8*	*27.60*	*0.34*
issue debt	D^{under}*$D^{deficit}$*DEV	0.220***	-0.024***	0.219***	0.012	0.219***	0.014*
		30.80	*-3.13*	*27.85*	*0.62*	*31.12*	*1.84*
	Adjusted R^2	0.241		0.240		0.238	
	N	47,887		47,887		47,887	

Panel B: TD/MA

target adjustment implies to		base (λ)	Z:size (γ)	base (λ)	Z:rate (γ)	base (λ)	Z:volatility (γ)
retire debt	D^{over}*$D^{surplus}$*DEV	0.168***	-0.029***	0.179***	-0.055***	0.172***	-0.004
		26.31	*-4.07*	*24.30*	*-3.39*	*27.47*	*-0.62*
issue equity	D^{over}*$D^{deficit}$*DEV	0.148***	-0.033***	0.152***	-0.016	0.139***	0.044***
		19.12	*-4.11*	*17.24*	*-0.89*	*18.78*	*5.05*
retire equity	D^{under}*$D^{surplus}$*DEV	0.166***	-0.033***	0.159***	-0.024	0.158***	0.028***
		22.56	*-7.85*	*21.42*	*-1.63*	*22.01*	*3.96*
issue debt	D^{under}*$D^{deficit}$*DEV	0.120***	-0.034***	0.119***	-0.046***	0.116***	0.062***
		17.11	*-5.97*	*15.92*	*-2.91*	*17.10*	*8.40*
	Adjusted R^2	0.213		0.211		0.215	
	N	47,887		47,887		47,887	

Table 8 presents results from estimating equation (6) via OLS regressions with bootstrapped standard errors. The dependent variable is total debt over book assets. Z for size is total assets and Z for volatility is the daily stock return standard deviation measured over all trading days of the relevant fiscal year. Both variables are normalized to have mean zero and standard deviation of one. Z for rate is a dummy variable equal to 1 if the firm has a bond rating and 0 otherwise. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are z-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE A3.5

Adjustment speeds by degree of indebtedness, cash flow outcome and estimated issuance cost (Target coefficients estimated by GMM)

Equation: $$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

Panel A: TD/BA

			Debt Issues			Equity Issues		
target adjustment implies to			high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)	high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.214***	0.144**	*(0.480)*	0.170*	0.247***	*(0.527)*
			3.21	*2.02*		*1.76*	*3.61*	
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.183***	0.124***	*(0.164)*	0.395***	0.324***	*(0.019)*
			5.72	*4.29*		*17.58*	*15.54*	
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.011	0.231***	*(0.067)*	0.482***	0.180**	*(0.020)*
			0.11	*3.16*		*4.42*	*2.37*	
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.253***	0.199***	*(0.130)*	0.334***	0.266***	*(0.007)*
			10.39	*7.82*		*18.03*	*16.16*	
	Adj. R^2		0.634	0.520		0.293	0.294	
	N		885	885		4,098	4,098	

Panel B: TD/MA

			Debt Issues			Equity Issues		
target adjustment implies to			high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)	high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.090	0.231***	*(0.306)*	0.360***	0.299***	*(0.500)*
			0.81	*2.68*		*4.74*	*7.03*	
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.131***	0.088***	*(0.366)*	0.338***	0.330***	*(0.799)*
			3.76	*2.73*		*14.12*	*15.79*	
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.066	0.050	*(0.879)*	0.305**	0.280***	*(0.865)*
			0.71	*1.12*		*2.35*	*3.38*	
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.145***	0.060***	*(0.004)*	0.243***	0.241***	*(0.928)*
			5.92	*3.62*		*14.32*	*14.29*	
	Adj. R^2		0.358	0.603		0.231	0.278	
	N		885	885		4,098	4,098	

All equations are estimated via OLS regressions with bootstrapped standard error. The dependent variable is total debt over book assets. The sample is divided into high and low issuance cost firms, using the median of the estimated debt and equity issuance costs as the cutoff point. The debt and equity issuance costs are estimated by the following equations: Debt issuance cost = 0.50 + 25.17*(1/proceeds) + 4.63*(proceeds/market cap) and Equity issuance cost = 4.04 + 25.65*(1/proceeds) + 2.64*(proceeds/market cap). D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if $DEV<0$ ($DEV\geq 0$). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if $FD<0$ ($FD\geq 0$). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are z-statistics. Numbers in brackets are p-values. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE B3.1

Baseline adjustment speeds

(Observations with leverage ratios below 0.1 and above 0.9 are excluded)

Equation (A): $\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a + \lambda DEV_{i,t-1} + \varepsilon_{i,t}$ where $DEV_{i,t-1} = \left[\frac{D_{it}}{A_{it}}\right]^* - \frac{D_{i,t-1}}{A_{i,t-1}}$

Equation (B): $\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D^{over} + a_2 D^{under} + \lambda_1 D^{over} DEV_{i,t-1} + \lambda_2 D^{under} DEV_{i,t-1} + \varepsilon_{i,t}$

	Δ(TD/BA)		Δ(TD/MA)	
	Equation (A) (active leverage changes only)	Equation (B) (active leverage changes only)	Equation (A) (active leverage changes only)	Equation (B) (active leverage changes only)
α	0.028***		0.026***	
	10.38		*4.45*	
D^{over}		0.026***		0.025
		8.00		*4.08*
D^{under}		0.031***		0.036***
		10.11		*5.91*
DEV	0.356***		0.394***	
	42.14		*30.86*	
D^{over}DEV		0.340***		0.422***
		25.04		*27.60*
D^{under}DEV		0.336***		0.283***
		18.99		*17.08*
Adjusted R^2	0.082	0.083	0.105	0.109
N	54,870	54,870	47,524	47,524

The equations are estimated via Fama-MacBeth regressions. Δ stands for difference. TD is total debt and BA (MA) is book (market) value of assets. DEV is estimated target leverage minus actual leverage. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). All equations are estimated via Fama-MacBeth regressions. Active leverage changes are those leverage changes that occur due to debt/equity issuance/repurchase as defined in Section 3.2. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE B3.2

Adjustment speeds by degree of indebtedness and cash flow outcome

(Observations with leverage ratios below 0.1 and above 0.9 are excluded)

Equation: $$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

target adjustment implies to			Δ(TD/BA)	Δ(TD/MA)
	$D^{over}*D^{surplus}$	α_1	-0.034***	-0.033***
			-13.25	*-6.56*
	$D^{over}*D^{deficit}$	α_2	0.065***	0.064***
			18.30	*10.47*
	$D^{under}*D^{surplus}$	α_3	-0.033***	-0.024***
			-12.68	*-4.66*
	$D^{under}*D^{deficit}$	α_4	0.063***	0.064***
			19.26	*10.73*
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.187***	0.264***
			9.39	*12.42*
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.367***	0.410***
			18.44	*18.89*
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.276***	0.298***
			7.17	*8.57*
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.279***	0.216***
			16.31	*11.84*
	Adjusted R^2		0.210	0.220
	N		54,870	47,524
	t-stat for λ_4-λ_2		*-3.45*	*-8.50*
	p-value		*0.001*	*0.000*

The equation is estimated via Fama-MacBeth regressions. Δ stands for difference. TD is total debt and BA (MA) is book (market) value of assets. The sample is split into four mutually-exclusive groups based on the deviation from target leverage and the cash flow outcome of the firms. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are t-statistics. The t-statistic for λ_4-λ_2 is for a paired t-test of the null hypothesis that the difference between coefficients is zero. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE B3.3

Adjustment speeds by degree of indebtedness, cash flow outcome and adjustment cost determinants

(Observations with leverage ratios below 0.1 and above 0.9 are excluded)

Equation:
$$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

Panel A: TD/BA

target adjustment implies to			small firms	large firms	t-stat for difference	non-rated firms	rated firms	t-stat for difference	high volatility firms	low volatility firms	t-stat for difference
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.206***	0.141***	*-2.10*	0.187***	0.091***	*-3.01*	0.161***	0.170***	*0.35*
			8.73	*5.59*	*(0.036)*	*10.65*	*3.12*	*(0.003)*	*6.41*	*10.67*	*(0.726)*
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.465***	0.237***	*-5.88*	0.416***	0.277***	*-2.49*	0.512***	0.247***	*-7.75*
			16.57	*8.30*	*(0.000)*	*21.26*	*5.24*	*(0.013)*	*20.98*	*8.91*	*(0.000)*
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.278***	0.261***	*-0.31*	0.218***	0.253***	*0.52*	0.349***	0.222***	*-0.77*
			5.46	*5.85*	*(0.756)*	*4.54*	*3.85*	*(0.603)*	*2.22*	*4.61*	*(0.441)*
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.289***	0.272***	*-0.45*	0.298***	0.215***	*-1.69*	0.262***	0.310***	*1.14*
			10.25	*12.06*	*(0.652)*	*12.93*	*5.12*	*(0.091)*	*7.89*	*10.16*	*(0.254)*
	Adj. R^2		0.225	0.207		0.227	0.260		0.227	0.256	
	N		27,390	27,390		32,866	7,533		17,970	17,970	
	t-stat for λ_4-λ_2		*-4.86*	*0.96*		*-3.63*	*-0.85*		*-6.64*	*-1.79*	
	p-value		*(0.000)*	*(0.337)*		*(0.000)*	*(0.395)*		*(0.000)*	*(0.073)*	

Panel B: TD/MA

target adjustment implies to			small firms	large firms	t-stat for difference	non-rated firms	rated firms	t-stat for difference	high volatility firms	low volatility firms	t-stat for difference
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.264***	0.254***	*-0.24*	0.275***	0.156***	*-2.96*	0.288***	0.201***	*-1.18*
			9.25	*7.91*	*(0.810)*	*10.53*	*4.20*	*(0.003)*	*8.89*	*3.58*	*(0.238)*
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.481***	0.289***	*-4.20*	0.437***	0.302***	*-2.57*	0.526***	0.252***	*-3.00*
			14.96	*9.23*	*(0.000)*	*15.18*	*6.09*	*(0.010)*	*13.95*	*3.01*	*(0.003)*
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.312***	0.271***	*-0.69*	0.228***	0.216***	*-0.18*	0.308***	0.147***	*-2.42*
			7.28	*5.85*	*(0.492)*	*5.57*	*3.63*	*(0.857)*	*5.01*	*4.39*	*(0.016)*
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.247***	0.200***	*-1.55*	0.253***	0.146***	*-2.56*	0.286***	0.181***	*-2.30*
			8.74	*10.05*	*(0.121)*	*11.48*	*3.79*	*(0.010)*	*7.30*	*7.87*	*(0.021)*
	Adj. R^2		0.239	0.208		0.239	0.243		0.259	0.249	
	N		23,165	23,165		27,513	6,528		15,099	15,099	
	t-stat for λ_4-λ_2		*-6.71*	*-2.57*		*-5.67*	*-2.20*		*-4.61*	*-0.83*	
	p-value		*(0.000)*	*(0.010)*		*(0.000)*	*(0.027)*		*(0.000)*	*(0.406)*	

All equations are estimated via Fama-MacBeth regressions. TD is total debt and BA (MA) is book (market) value of assets. The sample is divided into small and large firms, using the median of total assets as the cutoff point, into rated and non-rated firms, based on whether a firm has a bond rating or not and into high and low volatility firms, using the median of the daily stock return standard deviation of the firm, measured over the trading days of the relevant fiscal year, as the cutoff point. Depending on the required data for each type of sample division, the number of usable firm-year observations varies accordingly. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are t-statistics. Numbers in brackets are p-values. The t-statistics for difference are for paired t-tests of the null hypothesis that the difference between coefficients of different groups is zero. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE B3.4

Incremental effect of cost determinants on adjustment speed

(Observations with leverage ratios below 0.1 and above 0.9 are excluded)

Equation (6): $$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ (\lambda_1 + \gamma_1 Z_{i,t}) D_{it}^{over} D_{it}^{surplus} DEV_{it} + (\lambda_2 + \gamma_2 Z_{i,t}) D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ (\lambda_3 + \gamma_3 Z_{i,t}) D_{it}^{under} D_{it}^{surplus} DEV_{it} + (\lambda_4 + \gamma_4 Z_{i,t}) D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

Panel A: TD/BA

target adjustment implies to		base (λ)	Z:size (γ)	base (λ)	Z:rate (γ)	base (λ)	Z:volatility (γ)
retire debt	D^{over}*$D^{surplus}$*DEV	0.157***	-0.068***	0.186***	-0.079***	0.156***	0.022**
		10.9	*-6.88*	*10.05*	*-2.81*	*10.66*	*2.06*
issue equity	D^{over}*$D^{deficit}$*DEV	0.399***	-0.007	0.439***	-0.200***	0.391***	0.036***
		21.51	*-0.59*	*20.21*	*-5.97*	*21.5*	*2.93*
retire equity	D^{under}*$D^{surplus}$*DEV	0.253***	0.020	0.268***	-0.041	0.261***	0.012
		7.48	*1.08*	*7.47*	*-0.51*	*7.78*	*0.48*
issue debt	D^{under}*$D^{deficit}$*DEV	0.255***	-0.126***	0.256***	-0.028	0.253***	0.114***
		14.22	*-9.38*	*13.03*	*-0.54*	*13.64*	*7.88*
	Adjusted R^2	0.280		0.279		0.278	
	N	34,629		34,629		34,629	

Panel B: TD/MA

target adjustment implies to		base (λ)	Z:size (γ)	base (λ)	Z:rate (γ)	base (λ)	Z:volatility (γ)
retire debt	D^{over}*$D^{surplus}$*DEV	0.280***	-0.028***	0.316***	-0.132***	0.291***	-0.007
		14.38	*-2.25*	*14.87*	*-3.00*	*14.29*	*-0.62*
issue equity	D^{over}*$D^{deficit}$*DEV	0.416***	0.022	0.450***	-0.150***	0.405***	0.026
		15.90	*1.26*	*14.48*	*-2.85*	*16.27*	*1.60*
retire equity	D^{under}*$D^{surplus}$*DEV	0.273***	-0.044***	0.264***	-0.020	0.302***	0.191***
		8.05	*-2.42*	*6.79*	*-0.29*	*9.3*	*6.94*
issue debt	D^{under}*$D^{deficit}$*DEV	0.210***	-0.145***	0.189***	-0.036	0.231***	0.252***
		11.91	*-11.58*	*9.35*	*-0.84*	*12.04*	*13.9*
	Adjusted R^2	0.296		0.305		0.305	
	N	29,026		29,026		29,026	

Table 8 presents results from estimating equation (6) via OLS regressions with bootstrapped standard errors. The dependent variable is total debt over book assets. Z for size is total assets and Z for volatility is the daily stock return standard deviation measured over all trading days of the relevant fiscal year. Both variables are normalized to have mean zero and standard deviation of one. Z for rate is a dummy variable equal to 1 if the firm has a bond rating and 0 otherwise. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are z-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE B3.5

Adjustment speeds by degree of indebtedness, cash flow outcome and estimated issuance cost

(Observations with leverage ratios below 0.1 and above 0.9 are excluded)

Equation: $$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

Panel A: TD/BA

			Debt Issues			Equity Issues		
target adjustment implies to			high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)	high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.247	-0.017	*(0.327)*	0.046	0.296***	*(0.083)*
			1.03	*-0.14*		*0.43*	*3.13*	
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.172***	-0.002	*(0.019)*	0.409***	0.411***	*(0.981)*
			3.33	*-0.03*		*7.85*	*7.29*	
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.464**	0.323	*(0.614)*	0.428	0.059	*(0.558)*
			2.28	*1.70*		*1.01*	*0.13*	
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.167***	0.126**	*(0.549)*	0.361***	0.272***	*(0.366)*
			2.96	*2.53*		*4.92*	*4.37*	
	Adj. R^2		0.583	0.460		0.121	0.159	
	N		870	870		2,527	2,527	

Panel B: TD/MA

			Debt Issues			Equity Issues		
target adjustment implies to			high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)	high cost firms	low cost firms	Probability ($\lambda_{high\ cost} = \lambda_{low\ cost}$)
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.591*	0.815**	*(0.644)*	0.332**	0.284**	*(0.797)*
			1.79	*2.38*		*2.40*	*2.26*	
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.082	0.264***	*(0.148)*	0.472***	0.733***	*(0.026)*
			0.93	*3.18*		*6.19*	*8.49*	
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.027	0.168	*(0.633)*	0.336	-0.288	*(0.323)*
			0.10	*1.38*		*0.61*	*-1.16*	
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.066	0.006	*(0.352)*	0.272***	0.123**	*(0.103)*
			1.14	*0.20*		*3.65*	*2.32*	
	Adj. R^2		0.384	0.601		0.130	0.170	
	N		744	744		1,993	1,993	

All equations are estimated via OLS regressions with bootstrapped standard error. The dependent variable is total debt over book assets. The sample is divided into high and low issuance cost firms, using the median of the estimated debt and equity issuance costs as the cutoff point. The debt and equity issuance costs are estimated by the following equations: Debt issuance cost = 0.50 + 25.17*(1/proceeds) + 4.63*(proceeds/market cap) and Equity issuance cost = 4.04 + 25.65*(1/proceeds) + 2.64*(proceeds/market cap). D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if $DEV<0$ ($DEV \geq 0$). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if $FD<0$ ($FD \geq 0$). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are z-statistics. Numbers in brackets are p-values. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE C3.1

Baseline adjustment speeds

(Estimated by OLS with bootstrapped standard errors)

Equation (A): $\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a + \lambda DEV_{i,t-1} + \varepsilon_{i,t}$ where $DEV_{i,t-1} = \left[\frac{D_{it}}{A_{it}}\right]^* - \frac{D_{i,t-1}}{A_{i,t-1}}$

Equation (B): $\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D^{over} + a_2 D^{under} + \lambda_1 D^{over} DEV_{i,t-1} + \lambda_2 D^{under} DEV_{i,t-1} + \varepsilon_{i,t}$

	Δ(TD/BA)			Δ(TD/MA)		
	Equation (A)	Equation (A) (active leverage changes only)	Equation (B) (active leverage changes only)	Equation (A)	Equation (A) (active leverage changes only)	Equation (B) (active leverage changes only)
α	0.002***	0.008***		0.003	0.004***	
	7.12	*17.79*		*1.54*	*10.18*	
D^{over}			0.010***			0.011***
			9.95			*11.22*
D^{under}			0.016***			0.015***
			19.02			*19.02*
DEV	0.189***	0.307***		0.213***	0.331***	
	50.22	*55.44*		*58.77*	*60.40*	
D^{over}DEV			0.354***			0.450***
			31.01			*32.32*
D^{under}DEV			0.205***			0.189***
			19.42			*19.38*
Adjusted R^2	0.034	0.060	0.068	0.041	0.070	0.081
N	128,839	72,634	72,634	128,839	72,634	72,634

The equations are estimated via OLS with bootstrapped standard errors. Δ stands for difference. TD is total debt and BA (MA) is book (market) value of assets. DEV is estimated target leverage minus actual leverage. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). All equations are estimated via Fama-MacBeth regressions. Active leverage changes are those leverage changes that occur due to debt/equity issuance/repurchase as defined in Section 3.2. Numbers in italics are z-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE C3.2

Adjustment speeds by degree of indebtedness and cash flow outcome

(Estimated by OLS with bootstrapped standard errors)

Equation:
$$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

target adjustment implies to			Δ(TD/BA)	Δ(TD/MA)
	D^{over}*$D^{surplus}$	α_1	-0.044***	-0.039***
			-35.49	*-28.19*
	D^{over}*$D^{deficit}$	α_2	0.048***	0.044***
			34.84	*32.45*
	D^{under}*$D^{surplus}$	α_3	-0.034***	-0.028***
			-30.27	*-23.38*
	D^{under}*$D^{deficit}$	α_4	0.046***	0.041***
			42.75	*42.12*
retire debt	D^{over}*$D^{surplus}$*DEV	λ_1	0.226***	0.343***
			16.05	*21.52*
issue equity	D^{over}*$D^{deficit}$*DEV	λ_2	0.397***	0.385***
			22.49	*18.44*
retire equity	D^{under}*$D^{surplus}$*DEV	λ_3	0.110***	0.131***
			7.58	*8.52*
issue debt	D^{under}*$D^{deficit}$*DEV	λ_4	0.224***	0.177***
			17.73	*15.53*
	Adjusted R^2		0.176	0.178
	N		72,634	72,634
	χ^2-statistic for λ_4-λ_2		*64.25*	*74.57*
	p-value		*0.000*	*0.000*

The equation is estimated via OLS with bootstrapped standard errors. Δ stands for difference. TD is total debt and BA (MA) is book (market) value of assets. The sample is split into four mutually-exclusive groups based on the deviation from target leverage and the cash flow outcome of the firms. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are z-statistics. The χ^2-statistic for λ_4-λ_2 is for a Wald test of the null hypothesis that the difference between coefficients is zero. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE C3.3

Adjustment speeds by degree of indebtedness, cash flow outcome and adjustment cost determinants

(Estimated by OLS with bootstrapped standard errors)

Equation: $$\frac{D_{it}}{A_{it}} - \frac{D_{i,t-1}}{A_{i,t-1}} = a_1 D_{it}^{over} D_{it}^{surplus} + a_2 D_{it}^{over} D_{it}^{deficit} + a_3 D_{it}^{under} D_{it}^{surplus} + a_4 D_{it}^{under} D_{it}^{deficit}$$
$$+ \lambda_1 D_{it}^{over} D_{it}^{surplus} DEV_{it} + \lambda_2 D_{it}^{over} D_{it}^{deficit} DEV_{it}$$
$$+ \lambda_3 D_{it}^{under} D_{it}^{surplus} DEV_{it} + \lambda_4 D_{it}^{under} D_{it}^{deficit} DEV_{it} + \varepsilon_{i,t}$$

Panel A: TD/BA

target adjustment implies to			small firms	large firms	z-stat for difference	non-rated firms	rated firms	z-stat for difference	high volatility firms	low volatility firms	z-stat for difference
retire debt	D^{over}*$D^{surplus}$*DEV	λ_1	0.286***	0.141***	*-5.42*	0.256***	0.097***	*-5.78*	0.220***	0.173***	*-1.56*
			12.6	*9.89*	*(0.000)*	*13.69*	*4.90*	*(0.000)*	*8.9*	*10.38*	*(0.119)*
issue equity	D^{over}*$D^{deficit}$*DEV	λ_2	0.471***	0.278***	*-5.90*	0.449***	0.252***	*-5.82*	0.455***	0.273***	*-5.15*
			19.19	*13.02*	*(0.000)*	*20.51*	*10.20*	*(0.000)*	*17.22*	*11.59*	*(0.000)*
retire equity	D^{under}*$D^{surplus}$*DEV	λ_3	0.098***	0.122***	*0.85*	0.095***	0.186***	*1.68*	0.117***	0.103***	*-0.40*
			4.25	*6.49*	*(0.395)*	*5.91*	*3.75*	*(0.093)*	*4.5*	*5.14*	*(0.688)*
issue debt	D^{under}*$D^{deficit}$*DEV	λ_4	0.215***	0.232***	*0.66*	0.220***	0.188***	*-0.79*	0.207***	0.209***	*0.05*
			11.29	*13.88*	*(0.508)*	*14.74*	*4.74*	*(0.428)*	*9.46*	*11.14*	*(0.963)*
	Adj. R^2		0.167	0.199		0.180	0.251		0.167	0.228	
	N		36,317	36,317		48,052	8,003		24,737	24,737	
	χ^2-statistic for λ_4-λ_2		*67.60*	*2.95*		*76.39*	*1.85*		*51.01*	*4.70*	
	p-value		*(0.000)*	*(0.086)*		*(0.000)*	*(0.174)*		*(0.000)*	*(0.030)*	

Panel B: TD/MA

target adjustment implies to			small firms	large firms	z-stat for difference	non-rated firms	rated firms	z-stat for difference	high volatility firms	low volatility firms	z-stat for difference
retire debt	$D^{over}*D^{surplus}*DEV$	λ_1	0.356***	0.299***	*-1.82*	0.376***	0.191***	*-4.95*	0.345***	0.300***	*-1.59*
			15.90	*14.14*	*(0.068)*	*18.96*	*6.06*	*(0.000)*	*13.58*	*13.2*	*(0.111)*
issue equity	$D^{over}*D^{deficit}*DEV$	λ_2	0.418***	0.328***	*-2.24*	0.403***	0.297***	*-2.26*	0.398***	0.199***	*-6.04*
			14.65	*12.16*	*(0.025)*	*15.60*	*7.75*	*(0.024)*	*11.88*	*7.09*	*(0.000)*
retire equity	$D^{under}*D^{surplus}*DEV$	λ_3	0.141***	0.123***	*-0.57*	0.085***	0.159***	*1.64*	0.170***	0.062***	*-3.12*
			5.87	*6.61*	*(0.571)*	*5.34*	*3.91*	*(0.101)*	*5.67*	*3.83*	*(0.002)*
issue debt	$D^{under}*D^{deficit}*DEV$	λ_4	0.215***	0.146***	*-2.98*	0.212***	0.124***	*-2.59*	0.257***	0.143***	*-4.90*
			11.65	*9.94*	*(0.003)*	*14.29*	*4.07*	*(0.010)*	*11.05*	*9.62*	*(0.000)*
	Adj. R^2		0.173	0.188		0.183	0.220		0.179	0.225	
	N		36,317	36,317		48,052	8,003		24,737	24,737	
	χ^2-statistic for λ_4-λ_2		*35.97*	*35.50*		*40.56*	*12.39*		*12.04*	*3.15*	
	p-value		*(0.000)*	*(0.000)*		*(0.000)*	*(0.000)*		*(0.000)*	*(0.076)*	

All equations are estimated via OLS with bootstrapped standard errors. TD is total debt and BA (MA) is book (market) value of assets. The sample is divided into small and large firms, using the median of total assets as the cutoff point, into rated and non-rated firms, based on whether a firm has a bond rating or not and into high and low volatility firms, using the median of the daily stock return standard deviation of the firm, measured over the trading days of the relevant fiscal year, as the cutoff point. Depending on the required data for each type of sample division, the number of usable firm-year observations varies accordingly. D^{over} (D^{under}) is a dummy variable equal to one if leverage is above (below) target, i.e. if DEV<0 (DEV≥0). DEV is the difference between target and actual leverage. $D^{surplus}$ ($D^{deficit}$) is a dummy variable equal to one if the firm has a financial surplus (deficit), i.e. if FD<0 (FD≥0). FD is the financial deficit estimated as dividend payments plus net investment plus change in net working capital minus operating cash flows after interest and taxes. Numbers in italics are z-statistics. Numbers in brackets are p-values. The χ^2-statistic for λ_4-λ_2 is for a Wald test of the null hypothesis that the difference between coefficients is zero. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

CHAPTER 4

An Explicit Test for Capital Structure Convergence

4.1. Introduction

Does capital structure affect firm value? Is there an optimal level of leverage that maximizes firm value? Which factors influence the financing choices of firms? The main goal of capital structure literature is to answer these questions.

Concerning the theoretical literature, two theories have prevailed. The first is the trade-off theory (Bradley et al., 1984; Fisher et al., 1989) which posts that each firm has an optimal leverage ratio that is determined by the trade-off between the costs and benefits of the use of debt, namely the expected costs of bankruptcy and the tax benefits of debt. Expected bankruptcy costs are the direct and indirect costs of bankruptcy times the probability of default. Tax benefits occur because interest payments are tax-deductible, while dividend payments are not. The second is the pecking order theory (Myers, 1984), in which firms follow an hierarchy in their financing choices. In particular, firms choose first retained earnings, then debt, if internal financing is not enough, and finally equity as a last resort and only when the other two sources of funding are not available. The intuition is that asymmetric information between the firm and outside investors/creditors creates adverse selection costs. As a result, securities issued by firms are underpriced. Therefore, the firm should choose first internally generated funds to avoid the underpricing and then - if it has to resort to external financing - debt, because it is less sensitive to asymmetric information than equity.

The empirical literature has tested the aforementioned theories in many ways, namely by indentifying factors that affect leverage (e.g. Rajan and Zingales; 1995, Frank and Goyal, 2009), by testing for mean-reversion in firm leverage (e.g., Fama and French, 2002; Flannery and Rangan, 2006; Huang and Ritter, 2009), by exploring the relationship between firm cash flow outcome and leverage (e.g. Shyam-Sunder and Myers, 1999; Frank and Goyal, 2003), and always attempts to come up with new tests.

In such an attempt, Lemmon et al (2008) study the evolution of corporate leverage ratios in order to assess previously identified leverage determinants and detect new ones. One of their findings is that leverage converges across firms over time. They sort the firms of their sample into quartiles according to their leverage ratios and accordingly create four portfolios. They study the evolution of the average leverage of each portfolio. One of the detected features is that the portfolios with the highest and the lowest average leverage ratio tend to move toward more moderate levels as time goes by. They also provide evidence indicating that the convergence feature is due to the active management of capital structure by firms. Active management of capital structure means that firms have specific leverage targets, which they actively pursue through the issuance and repurchasing of debt and equity. The notion of target leverage and active management of capital structure is an implication of the trade-off theory.

A more recent study (Chen 2010) questions the results of Lemmon et al (2008) concerning convergence. In particular, Chen (2010) argues that the convergence feature of leverage reported by Lemmon et al is due to a statistical accident, called regression fallacy, and is mechanical rather than real. When he uses the median or the last year of the event period as the portfolio formation year, the convergence feature becomes questionable. He also sorts the firms in terms of the time-series average of leverage instead of the portfolio formation year leverage and shows that the convergence feature is substantially weaker.

The contribution of this study to the ongoing debate on the existence of convergence among firms' leverage can be of particular value. Its comparative advantage is the use of the new panel convergence methodology developed by Phillips and Sul (2007) as a tool for testing convergence. It is the first study to conduct an explicit convergence test in the capital structure literature using a formal econometric methodology. More importantly, any kind of misclassification problem, such as the one reported by Chen (2010), is avoided, because – in contrast with the existing studies (Lemmon et al, 2008; Chen, 2010) – we let the data guide us, rather than imposing any direct or indirect restrictions on the data and relying on leverage averages to make inferences about convergence.

This study also contributes significantly to the understanding of leverage determinants. There are three types of leverage determinants, namely (i) firm-level, (ii) industry-level and (iii) economy-wide factors, such as the macroeconomic environment and factors related to the development of financial markets. Firm-level factors are idiosyncratic, while industry-level and economy-wide factors are systematic, in the sense that they impact many firms simultaneously. Given that the generating force of convergence can only be a systematic force, testing for convergence and exploring convergence's generating force offers an excellent opportunity to disentangle and assess the impact of different systematic factors on leverage.

We find no evidence of full-sample convergence either in rates or in levels[16], when the whole sample is tested. However, we detect convergent clubs, i.e. subgroup of firms whose leverage exhibits convergence. The convergence happens in rates, i.e. in every period, leverage has the same rate of change across firms belonging to the same group. There is one big club detected, accounting of 70% of the sample tested, and many small ones. In addition, we detect a high degree of heterogeneity across clubs and there are no signs of convergence across clubs. Firms that do not belong to any club account for 10% of the sample. Our analysis focuses on the big club. The reason is that the rest of the convergent clubs consist of such a small number of firms, that are inadequate for many econometric tests involved in our analysis. Nevertheless, the big club is sufficient for testing our hypotheses.

Firms in the big club are bigger, more profitable, have lower market-to-book ratios, higher tangibility and higher payout ratios than the rest of the firms. Our analysis indicates that the characteristic that qualifies firms to be members in the big club is the high degree of access to external financing. Simply put, the big club consists of financially unconstrained firms[17]. This is not surprising, given that prior literature (Gertler and Gilchrist, 1993; Gertler

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[16] Convergence in rates means that the variable of interest has the same rate of change across different cross sectional units, while convergence in levels means that the variable of interest converges to the same value.

[17] The terms financially unconstrained and financially constrained are relative terms and denote differential access of firms to external financing. The term financially constrained does not pertain to firms that are about

and Gilchrist, 1994; Demirgüç-Kunt and Maksimovic, 1996; Korajczyk and Levy, 2003) has showed that the leverage of unconstrained firms is much more sensitive to economy-wide factors than the leverage of constrained firms.

We also explore the force that generates the detected convergence. We try industry-level, macroeconomic and financial development factors. We find that the detected convergence feature across the club of unconstrained firms is driven by the development of financial markets. Neither industry-level nor macroeconomic factors are relevant. These findings suggest that the impact of financial development factors on firms' leverage is stronger than the rest of the economy-wide factors.

According to the findings, leverage is positively related to the level of financial development. This is consistent with the predictions of both main theories of capital structure. Higher development of financial markets implies an increase in the supply of funds and more financing resources for firms. Hence, everything else held constant, firms face a lower probability of default and in turn lower expected bankruptcy costs. In a trade-off theory context, this translates to higher optimal leverage. Turning to the pecking order context, firms are reluctant to use debt instead of retained earnings, because they will have to incur extra costs induced by asymmetric information. Since the development of financial markets is associated with better investor/creditor protection, asymmetric information is mitigated and thus debt becomes cheaper for firms.

The study is organized as follows. Section 4.2 contains a literature review on capital structure convergence and develops the basic hypotheses. Section 4.3 briefly illustrates the panel convergence methodology developed by Phillips and Sul (2007). Section 4.4 presents the dataset that is used. Sections 4.5 to 4.7 present and discuss the results that concern convergence tests (4.5), determinants of firm membership in convergent clubs (4.6) and drivers of convergence (4.7). Section 4.8 contains the conclusions.

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to default or are completely shut out of capital markets. A firm is considered to be financially constrained when it has a low degree of access to external financing and faces high costs when resorting to it. Big (small) firms and firms with high (low) payout ratios are usually considered to be financially unconstrained (constrained).

4.2. Reasons for expecting leverage convergence

4.2.1. Existing literature

In a recent empirical paper, Lemmon et al. (2008) explore the evolution of leverage ratios in order to assess previously identified determinants of capital structure and detect new ones. Thereby, they introduce the notion of convergence in capital structure literature, albeit this is not the main focus of the paper *per se.* They find that corporate leverage ratios converge over time, in the sense that firms with relatively high or low leverage ratios tend to move toward more moderate levels. The methodology of Lemmon et al (2008) is as follows. Each calendar year, firms are sorted into quartiles (i.e., four portfolios) according to their leverage ratios. The portfolio formation year is denoted event year 0. The average leverage for each portfolio is calculated in each of the subsequent 20 years. This sorting and averaging is repeated for every year in the sample period, resulting in 39 sets of time series (one for each calendar year in the sample) for each of the four portfolio categories. Finally, the average leverage of each portfolio category is computed and plotted by event year. The resulting graph shows that the portfolios with the highest and the lowest initial leverage converge to more moderate levels towards the end of the 20-year event period. Furthermore, they provide evidence consistent with the idea that the detected pattern occurs - at least in part - because firms try to maintain a leverage ratio close to their target leverage ratio[18] through the active management of their capital structure. Active management of capital structure means that firms issue and/or repurchase debt and equity in combinations that will eliminate any shock-driven deviations from the target. Given that it is more likely that target leverage ratios lie in the intermediate zone of leverage ratio values, rather than close to the boundaries of one and zero, their argument is plausible. So, according to this interpretation, the detected convergence pattern is consistent with the implications of the trade-off theory.

A more recent study (Chen 2010) questions the methodology of Lemmon et al (2008). He argues that the detected convergence feature is due to a statistical accident, called regression fallacy, and is mechanical rather than real. When he uses the median or the last year instead of the first year of the event period as the portfolio formation year, the

[18] The notion of target leverage ratio stems from the trade-off theory. Target leverage is the firm's optimal leverage ratio that balances the expected bankruptcy costs with the tax benefits of debt. The main implication of trade-off theory is that firms have target leverage ratios, which they actively pursue through the management of their capital structure.

convergence feature becomes questionable. The greatest dispersion among portfolios occurs always in the formation year and the dispersion decreases as we move away from it, irrespective of whether we move forward or backward. Hence, portfolios seem to diverge before and converge after the base year. This happens because leverage is stationary. Chen sorts the firms in terms of the time-series average of leverage instead of the portfolio formation year leverage and shows that the convergence feature is substantially weaker.

4.2.2. New approach

In this study, the approach for exploring capital structure convergence differs significantly from the approach taken in the existing literature.

Starting with the methodology, the novelty of this study is the use of the new panel convergence methodology developed by Phillips and Sul (2007) as a tool for testing convergence. This study is the first to conduct an explicit convergence test in the capital structure literature using a formal econometric methodology. Furthermore, this methodology allows for testing for two types of convergence: convergence in level, i.e. when the variable of interest across cross-sectional units converges to the same value, and convergence in rates, i.e. when the variable of interest has the same rate of change across different cross-sectional units. It also allows for the detection of convergent clubs, i.e. sub-groups of convergent firms. The contribution of this study is important, because – in contrast with the existing studies (Lemmon et al, 2008; Chen, 2010) – we let the data guide us, rather than imposing any direct or indirect restrictions on the data and relying on leverage averages to make inferences about convergence. As a consequence, we avoid any kind of misclassification problems, such as the one reported by Chen. The methodology of Phillips and Sul (2007) is presented in detail in Section 4.3.

We also explore the economic forces that might drive any potential convergence in the capital structure of firms. The empirical capital structure literature has documented that there are three types of factors that affect the leverage ratios of firms: firm-level, industry-level and economy-wide factors.

Firm-level factors pertain to firm-specific characteristics that are correlated with leverage. Prior research has tested many firm-specific characteristics and has concluded (Frank and Goyal, 2009) that the most reliable factors for explaining leverage are four: size and tangibility, which are both positively correlated with leverage, and profitability and market-to-book ratio, which are both negatively correlated with leverage. Firm-level determinants of leverage cannot generate any type of convergence feature in leverage ratios, given that their impact is idiosyncratic. For instance, an increase in the size of a firm will raise its debt capacity, but it will not affect the debt capacity of another firm.

Previous studies (e.g. Bradley et al, 1984; Flannery and Rangan, 2006) have identified industry effects in the cross-section of firms' leverage. However, these effects have no unique interpretation. They are assumed to reflect factors affecting corporate capital structure, such as business risk, regulation or type of assets, that vary across industries and remain relatively constant for the firms within the same industry. Given that industry-level factors affect many firms simultaneously, they can generate convergence in leverage ratios of firms. In particular, we would expect the formation of convergent clubs, with each club consisting of firms that belong to the same industry.

Economy-wide factors include the macroeconomic environment and factors related to the development of financial markets and the banking sector. Prior research has showed that such factors have a differential effect on the cross-section of firms. In particular, the leverage ratio of financially unconstrained firms is much more sensitive to such factors than the leverage ratio of financially constrained firms. Gertler and Gilchrist (1993) find that private and public debt issues increase for large firms but remain flat for small firms in the aftermath of economic downturns. Furthermore, Gertler and Gilchrist (1994) document that small firms have more stable short-term debt over the business cycle than large firms. The intuition is that financially unconstrained firms, having a higher degree of external financing access, find it more easy to borrow to smooth cash flows during economic downturns or in periods following a shock in the economy. In addition, Korajczyk and Levy (2003) show that financially unconstrained firms exploit good market conditions by timing their issues to coincide with periods where the relative price of the security issued is favorable, while constrained firms do not. As a consequence, the leverage of unconstrained firms is affected by changes in macroeconomic and capital market conditions, while the leverage of constrained firms is not. In a paper analyzing the effects of stock market development on the leverage of firms, Demirgüç-Kunt and Maksimovic (1996) find that, in contrast to big firms, the leverage of small firms is not affected by stock market development, until development proceeds to advanced stages.

Given the aforementioned evidence, we expect that financially unconstrained firms will form a convergent club and that the leverage of these firms will converge in rates. If macroeconomic fluctuations are the common force that drives convergence, then the leverage of these firms will vary counter-cyclically over the business cycle, i.e. it will decrease during expansions and increase during recessions. Recall that Korajczyk and Levy (2003) have shown that the leverage of unconstrained firms is negatively related to macroeconomic fluctuations. If the development of financial markets is the common force that drives convergence, then we should expect that the leverage of the firms in the club will be positively related to the level of financial development. This prediction relies on the implications of both main theories of capital structure. Developed financial markets imply that firms face more supply of funding and thus have expanded financing resources. So, everything else held constant, the probability of default is lower in an environment with developed markets. In a trade-off theory context, lower probability of default means lower expected bankruptcy costs[19] and in turn higher optimal leverage. According to the pecking order theory, a firm relies on its retained earnings to finance its investments. It will resort to debt financing only if the NPV of a potential investment exceeds the asymmetric-information-induced undepricing of the debt security issued. However, the development of financial markets is usually associated with better protection of investors/creditors and better legal enforcement. This means that asymmetric information problems are mitigated and the underpricing incurred by firms falls. Hence, in a pecking order context, higher development leads to more debt financing and in turn to higher leverage for firms.

In sum, we do not expect to detect any type of convergence across all firms. The reason is that any systematic force that could generate convergence, i.e. industry-level and economy-wide factors, has a differential impact across different types of firms. Therefore, we expect the formation of convergent clubs. Summarizing our preceding analysis, we test the following hypotheses:

H1: There is no leverage convergence across all firms in the sample.
H2: Sub-groups of firms form at least one convergent club.
H3: Each club consists of firms that belong to the same industry.

[19] Expected bankruptcy costs are the product of all direct and indirect costs associated with default times the probability of default for the firm.

H4: Financially unconstrained firms form a convergent club.
H4a: The leverage of the firms in the club is negatively correlated with the business cycle
H4b: The leverage of the firms in the club is positively correlated to the level of financial development.

4.3. Phillips and Sul methodology

We employ the methodology proposed by Phillips and Sul (2007) to test for leverage convergence in a panel of US firms. In essence, this methodology tests whether the dispersion across cross-sectional units of the variable of interest declines over time. Compared to other convergence tests, such as sigma or beta convergence tests, this one has the advantage of being more general in some aspects. No specific assumptions concerning the stationarity of the variable of interest or the existence of common factors are needed, while the methodology relies on a rather general form of a nonlinear time varying factor model. To the best of my knowledge, it is the first time that an explicit convergence test is used in the capital structure literature. A short description of the Phillips Sul methodology follows.

Suppose we have a panel dataset and X_{it} is the parameter of interest, with $i=1,2,..N$ and $t=1,2,\ldots T$ denoting cross-sectional units and time periods respectively. The variable of interest is deconstructed into a common component and an idiosyncratic component. Both of them are time varying. In the context of this test, convergence occurs when the idiosyncratic components across the cross-sectional units converge over time. The idiosyncratic/transitory component is estimated as:

(1) $$\hat{h}_{it} = \frac{X_{it}}{\frac{1}{N}\sum_{i=1}^{N} X_{it}}$$

This estimated transition parameter for a specific cross-sectional unit at a specific time period is essentially the ratio of the variable value for the cross-sectional unit to the value of the cross-sectional average in the specific period. For example, suppose that $\hat{h}_{it}=1.2$; this implies that the variable value for the i_{th} cross-sectional unit in the t_{th} time period is 20% higher than the value of the cross-sectional average in that period. By plotting the transition parameters over time we get the transition curves, which allow us a visual inspection of the convergence process. In particular, we have convergence when the transition curves move towards one. Transition parameters can be calculated for groups of cross-sectional units as well. The only difference is that the denominator is the average of the variable values of the cross-sectional units that comprise the group.

The next step in the methodology is to calculate the time-varying variance H_t of the transition parameter:

(2) $$H_t = \frac{1}{N}\sum_{i=1}^{N}(\hat{h}_{it} - 1)^2$$

As shown by Phillips and Sul, this has a limiting form of

(3) $$H_t \sim \frac{A}{L(t)^2 t^{2\alpha}} \text{ as } t \to \infty$$

where A is a positive constant, $L(t)$ is a slowly varying function like $log(t+1)$, and a denotes the speed of convergence. It distinguishes between two convergence types. In particular, when $0 \leq \alpha < 1$, we have convergence in rates and when $\alpha \geq 1$, we have convergence in levels. The former means that the variable of interest has the same rate of change across different cross-sectional units, while the latter means that the variable of interest converges to the same value. The null hypothesis of convergence in rates (levels) is that $\alpha \geq 0$ ($\alpha \geq 1$), against the alternative that $\alpha < 0$ ($\alpha < 1$). Phillips and Sul test the null hypothesis using the following log$t$ regression:

(4) $$\log\left(H_1 / H_t\right) - 2\log(t+1) = \hat{c} + \hat{b}\log t + u_t$$

The null hypothesis of convergence is rejected if t_b<*-1.65*, where t_b is the t-statistic of the estimated $\hat{b}$ coefficient. The fitted coefficient of *logt* is $\hat{b} = 2\hat{\alpha}$, where $\hat{\alpha}$ is the estimate of α in the null hypothesis. Put simply, given statistical significance, values of $\hat{b}$ between 0 (included) and 2 imply convergence in rates, while values of $\hat{b}$ equal to or greater than 2 imply convergence in levels. Standard errors are heteroskedasticity and autocorrelation consistent (HAC)[20]. The data for this regression start at $t = [rT]$, where $[rT]$ is the integer part of rT and *r=0.3*, as suggested by Phillips and Sul.

Rejection of the null hypothesis of convergence for the full sample does not imply that there is no evidence of convergence in sub-groups in the panel. Phillips and Sul extend their methodology in order to test for club convergence. They develop a four-step procedure. First, cross-sectional units are ordered according to their last observation in the panel. In the second step, the core convergent group is formed. To do so, we take the cross-sectional unit that was ranked first in Step 1 and run sequential log*t* regressions by adding further units one by one, based on the Step 1 ranking. The core convergent group is the one with the maximum t-statistic, provided of course that it is statistically significant, i.e. t_b>*-1.65*. In the third step, cross-sectional units not included in the core group are evaluated for membership in that group. One unit at a time is added to the core group and the t-statistic from the log*t* regression is calculated. A new unit qualifies for membership if the t-statistic of the associated log*t* regression is positive. In the end, we also check if the newly-formed group – initial group plus the units that qualified – still satisfies the log*t* regression criterion for convergence. In the fourth step, all units that have not been included in the group identified in the previous steps are tested to see whether they form a convergent group. If so, we conclude that our sample consists of two convergent subgroups/clubs. If not, we repeat Steps 1 to 3 on the units not included in the core group to determine whether there is a smaller group of convergent units. If no new group is detected, we conclude that the remaining units are divergent.

[20]The Quadratic spectral kernel is employed and the bandwidth is determined by means of the Andrews (1991) data-dependent procedure.

4.4. Data

We use annual accounting data drawn from the Compustat North America database over the period 1970-2007. The sample consists of US firms. Depending on the required data for different types of analysis in the course of the study, the number of usable firm-year observations will vary accordingly. Following the approach taken in previous research, financial firms (SIC 6000-6999) and utilities (SIC 4800-4999) are excluded. Firm-years with firms that have non-positive total assets, book or market value of equity are excluded, as these variables are used to standardize other variables and thus cannot be zero or negative. We also exclude firm-years with missing observations. Variables are measured in constant 1983 dollars using the US CPI as a deflator. We winsorize all (final) accounting variables at the 1^{st} and the 99^{th} percentile to avoid the effect of outliers and misreported data.

We also make use of variables characterizing the macroeconomic environment and the financial development of US during our sample period. CREDIT is calculated as the natural logarithm of the sum of credit provided by banks and other financial institutions and bond market capitalization as a share of GDP. It proxies for the development of the credit market, i.e. the development of the banking sector and the corporate bond market. STOCK is calculated as the natural logarithm of stock market capitalization as a share of GDP. It proxies for the development of the stock market. GDP_R is the natural logarithm of real GDP. It proxies for macroeconomic conditions.

Data on credit provided by banks and other financial institutions are collected from World Bank Financial Structure Database. Data on stock and corporate bond market development in World Bank Database are available from 1989 and 1990 onwards, respectively. Being available from 1970 onwards, data were collected from the US Flow of Funds Account. Details on the calculation of the indices for stock and bond market development indices can be found in the Appendix. The correlation of these indices with the indices of World Bank Database during the overlapping period is 0.99.

4.5. Main Results

4.5.1. Convergence test results

The variable of interest in this study is leverage. Following the approach taken in previous research, our measurement for leverage is financial debt, i.e. interest bearing liabilities over total assets[21].

Our initial sample covers all firms that have available accounting data in Compustat for all years during the period 1970-2007. We cannot allow for any gaps in the data, because the Phillips-Sul methodology requires a balanced panel. It could be argued, though, that this restriction might be strict enough to introduce a survivorship bias in our analysis. In order to ensure that our results are not driven by a survivorship bias, we create two more samples by moving the beginning of the time period under consideration forward and applying the same restriction. The number of firms grows in the second and the third sample, because shorter time horizons imply more firms with no missing observations. We end up with three nested samples. As indicated in column (1) of Table 4.1, the first sample covers the period 1970-2007 and includes 236 firms, the second covers the period 1980-2007 and includes 396 firms – 236 from the previous sample plus 160 new – and the third covers the period 1985-2007 and includes 611 firms – 396 from the previous sample and 215 new. The convergence tests and the subsequent analysis are applied separately on each of the three samples.

The convergence tests generated an array of results, which are presented in Table 4.1. First of all, there is no full-sample convergence detected in any of the three samples. As indicated in column (3) of 4.1, the t-statistic of $\hat{b}$ is below the critical value of -1.65 in all samples, ranging from -9.93 for the first sample to -7.09 for the third sample. Hence, the null hypothesis of convergence in the whole sample is rejected across all three samples. Given the absence of full-sample convergence, we implement the four-step procedure suggested by Phillips and Sul (2007) to identify clubs of firms that satisfy the convergence criterion. Column (4) of Table 4.1 contains the number of estimated clubs in each sample. There are 10 convergent clubs detected in sample 1970-2007, 13 clubs in sample 1980-2007 and 34 clubs in sample 1985-2007. Despite the different number of estimated clubs between samples, the three samples share one common characteristic with respect to the distribution of firms across the clubs. In every sample there is one big club that includes the majority of

21 See Appendix for the descriptions of the variables used.

each sample's firms and many small ones. As presented in column (5) of Table 4.1, the big club in the first sample comprises of 181 firms, accounting for 76.7% of total firms in the sample. Similarly, the big clubs in the second and the third sample consist of 287 and 401 firms, accounting for 72.5% and 65.6% of each sample respectively. Column (7) contains summarized information about the rest of the detected clubs. They are relatively small, ranging from 2 to 24 firms or in relative terms from 0.2% to 4.5% of total firms. Not all firms in each sample belong to a convergent club. As shown in column (8) of Table 4.1, a small fraction of firms in each sample display a divergent behavior, ranging from 5.5% for the first sample to 9.8% for the third sample. Table 4.2 shows in detail the distribution of firms across clubs in every sample. The t-statistic of $\hat{b}$ is above the critical value of -1.65 in all clubs, indicating that all clubs satisfy the convergence criterion. Furthermore, the estimated $\hat{b}$ coefficients are less than two in all three big clubs and in most of the small ones, indicating convergence in rates. This means that leverage has the same rate of change across the firms belonging to a club. To save space, the estimated $\hat{b}$ coefficients for each club are not reported but are available upon request.

Our results are in line with the hypothesis that there is no convergence in leverage across all firms (H1). Furthermore, the detection of convergent clubs provides support to hypothesis H2.

4.5.2. Relative transition curves

After having identified convergent clubs in all three samples, we turn to the analysis of the relative transition curves of these clubs. We remind the reader that the relative transition curve is the evolution of the relative transition parameter over time and its main purpose is to allow for visual inspection of the convergence process. The relative transition parameter can be calculated for both individual firms and groups of firms. Our subsequent analysis focuses on convergent clubs. The relative transition parameter for a convergent club is calculated every year as the ratio of the cross-sectional average of the variable of interest for the firms that belong in the club over the cross-sectional average of the variable of interest for all firms in the sample.

Our analysis focuses on two issues. First, we examine the evolution of the clubs' curves. Special attention is given to if and when a club is above or below the cross-sectional average of the whole sample. This translates to examining when a club's relative transition curve lies above or below one, since the value of one corresponds to the cross-sectional average of the variable of interest in every period. Recall that the relative transition curve of a group that consists of all firms in the sample is always equal to one. Second, we examine the distance between the curves over time and the degree of heterogeneity across clubs. If, for example, the distance between two clubs' curves decreased over time, then this would be an indication of convergence across the two clubs. Concerning the heterogeneity issue, we conjecture that the smaller the number of clubs and the smaller and more stable the distance between them, the lower the degree of cross-sectional heterogeneity.

Figure 4.1 portrays the relative transition curves for leverage for the ten detected convergent clubs in our basic sample that covers the period 1970-2007. There is not a clear sign of convergence across clubs, since neither do curves move towards one nor does the distance between them decrease. Furthermore, the distance between the clubs' curves is very volatile, indicating a high degree of heterogeneity between clubs. As for the evolution of curves over time, the curve of the big club (club 1) is consistently below one and decreasing from the beginning of the sample period until 1986. It increases henceforth, crosses the value of one in 1993 and reaches its highest value in the sample period in 2005. Recall that, by construction, the value of a relative transition curve is unit free and expresses a relative notion. For example, the value of 1.2 in 2005 means that the big club's firms had on average 20% higher leverage ratios than the average leverage ratio of all firms. The evolution of the big club's curve will become more apparent in Figure 4.2, where the scale of the graph is different. In general, curve values above one imply above-average leverage values and curve values below one below-average leverage values. The majority of the rest of the club's curves experienced a decrease during the 1990s and the 2000s. Essentially, our analysis indicates that, in relative terms, the firms of the big club increased their leverage ratio substantially after the mid-1980s. The results are qualitatively similar for the other two samples, covering the periods 1980-2007 and 1985-2007. Given the similarity of results and the larger number of detected convergent clubs that results in a rather messy graph, we do not present the respective figures for the other two samples. Of course, they are available on request. Besides, the curves of the big clubs of the two samples are presented and discussed in Figures 4.3 and 4.4.

As discussed in section 4.5.1., the big club in sample 1970-2007 accounts for the overriding majority of the firms, i.e. 76.7% of total firms in the sample. Therefore, we focus our subsequent analysis on the big club. Our goal is to explore two issues: first, the evolution of leverage of the big club firms relative to the leverage of the rest of the firms and second, potential factors that might determine firm membership in the big club. As shown in Figure 4.2, in addition to the big club's relative transition curve for leverage, we also calculate and plot the big club's relative transition curves for certain firm-specific characteristics, namely size (total assets), market-to-book ratio, profitability and tangibility of assets. Detailed description of these variables can be found in the Appendix. The interpretation of the new curves is the same as the one of the leverage curve; curve values above (below) one indicate above(below)-average values for the underlying variable. For example, suppose that the curve for the market-to-book ratio had a value of 1.3 in 2000. This would imply that in 2000 the big club firms had on average 30% higher market-to-book ratios than the average market-to-book ratio of all firms in the sample. We incorporate these characteristics into our analysis, in order to detect any firm-specific characteristic that would distinguish the firms belonging to the big club from the rest of the firms. For example, if the curve for profitability remained throughout the whole sample period above one, this would imply that the firms in the big club are consistently more profitable than the rest of the firms. We know, of course, that this is not a sufficient condition for declaring profitability, or any other characteristic, to be a factor that qualifies firms to be members of the big club. This calls for a formal econometric treatment, which is conducted in section 4.6. Nevertheless, the visual inspection of the relative transition curves can be very indicative and allows us to observe the variability of these characteristics in relative terms over time. The reason for choosing these particular four characteristics is because they have been documented in the empirical capital structure literature as been correlated with leverage (e.g. Rajan and Zingales; 1995, Frank and Goyal, 2003; Lemmon et al, 2008).

Figure 4.2 pertains to the sample that covers the period 1970-2007. It portrays the relative transition curves for the big club. The curve for leverage is the same curve depicted in Figure 4.1 under the name "Club 1". The variability of this curve is more clear in Figure 4.2 due to the different scales of the graphs. The curve stays below one and exhibits a downward trend from the beginning of the sample period until the mid-1980s, reaching a trough of 0.92 in 1986. From this year forth, the curve follows an upward trend, crosses the value of one in 1993 and reaches a peak of 1.2 in 2005. The evolution of the leverage curve indicates that, in relative terms, the big club firms have been raising their leverage ratio since the mid-1980s. As for the firm-specific characteristics, the curves for assets and tangibility are relatively stable and remain throughout the whole sample period above one. This implies that firms belonging to the big club have been consistently bigger and had more tangible assets as a fraction of total assets than the rest of the firms during the whole sample period. On the contrary, the curves for market-to-book ratio and profitability are more volatile. They move in a similar way, fluctuating within a band between 1 and 1.05 until the early 1990s and following henceforth a downward path. Since these curves are not consistently above or below one, we do not have clear evidence indicating whether big club firms differ systematically from the rest of the firms in terms of profitability and market-to-book ratio.

Figures 4.3 and 4.4 illustrate the relative transition curves for the big clubs in sample 1980-2007 and 1985-2007 respectively. The basic patterns of the curves' paths are very similar to those observed in sample 1970-2007. In particular, the leverage curves are falling until the early 1990s and rising henceforth. Furthermore, the curves for assets and tangibility are relatively stable and remain above one for most of the time. As for profitability and market-to-book ratio, the curves move in tandem and follow a downward trend from the early 1990s forth. Despite the aforementioned similarities in terms of general trends, there are some minor differences between the three samples. Specifically, the leverage curves in the second and third sample start rising a few years later than the curve in the first sample. Moreover, in the second and third samples the profitability curves remain in almost all years above one, while the market-to-book curves are more often than the curve in the first sample in the below-one territory. Finally, in the third sample, the tangibility curve falls below one for a few years. We explore the potential drivers for these differences in the following subsection.

4.5.3. Relative transition curves: explanation of differences between samples

Our analysis has so far revealed that, in terms of general trends, the big clubs' relative transition curves in the second and third samples are very similar to those in the first sample. However, there are some minor differences such as the timing of the trough in leverage curves, an upward shift in the profitability curve and some changes in the variability of market-to-book and tangibility curves. In this subsection, we explore what drives these differences.

There are two potential explanations. We conjecture that it is either the new firms entering the second and the third sample or the different time intervals that drive the differences in the results. Of course, it might be a combination of the two forces. In order to test which of the two explanations is valid, we are making the following test. We re-run all convergence tests on the 236 firms of the 1970-2007 sample twice, once for the period 1980-2007 and once for the period 1985-2007, and compare the new relative transition curves with those of the period 1970-2007. If the previously detected differences in the relative transition curves do not show up, then this means that the choice of the time period does not affect the results and hence does not drive the differences. In that case, we regard the introduction of new firms as the driver of the previously detected differences in the results.

Table 4.3 presents the results of the convergence tests on the 236 firms for the period 1980-2007 and for the period 1985-2007. The results for both truncated periods resemble those of the period 1970-2007. We do not find evidence of full-sample convergence, while we detect one big club and many small ones. The big club in the 1980-2007 period consists of 136 firms and accounts for 57.6% of total firms and in the 1985-2007 period of 114 firms and accounts for 48.3% of total firms. Convergence in the big clubs happens in rates.

Figures 4.5 and 4.6 portray the relative transition curves for the big clubs in periods 1980-2007 and 1985-2007 respectively. The previously identified differences are not detected in either of the two truncated periods. In other words, the curves in both truncated periods strongly resemble those of the period 1970-2007. In particular, the trough of the leverage curve occurs in 1986 and not in the early 1990s, the profitability curve drops below 1 for more than a couple of years and the tangibility curve remains consistently above one. These findings imply that the previously identified differences in results are due to the introduction of new firms, rather than the choice of different time periods.

We next compare the firm-specific characteristics of the three original samples, in order to understand in what terms do the firms that are introduced in the second and the third sample differ. We remind the reader that the three samples are nested, i.e. the first one consists of 236 firms, the second consists of the 236 firms from the first sample plus 160 new and the third consists of the 396 firms from the second sample plus 215 new[22]. In Table 4.4, we present the means and the medians of leverage, assets, profitability, market-to-book ratios and tangibility for the three samples. We find a monotonic trend in all five characteristics as we move from the first to the third sample. Firms in Sample 2 are on average smaller, less profitable, have higher market-to-book ratios and less tangible assets than firms in Sample 1[23]. Likewise, firms in Sample 3 are on average less levered, smaller, less profitable, have higher market-to-book ratios and less tangible assets than firms in Sample 2. The student's t-test for mean equality implies that all these differences are statistically significant at the 1% level. To ensure that our results are not due to distributional assumptions about the underlying variables, we also compare medians and conduct Kruskal-Wallis tests to examine the difference in medians. Results point to the same direction. The above findings suggest that firms that are introduced to the second and third sample are on average less levered, smaller, less profitable and have higher market-to-book ratios and less tangible assets than firms already in the sample. One possible explanation for some of these differences might be that the newly introduced firms are likely younger and therefore at an earlier stage of their life cycle[24]. As firms become more mature, they tend to be bigger, to have more debt capacity and lower growth opportunities. However, we cannot test this explanation formally, because Compustat provides only IPO dates and not founding dates for companies.

4.6. Club participation results

In this section, we try to identify any potential factors that might determine firm membership in the big club. Put simply, we explore if and in what terms big club firms differ from the rest of the firms in each sample. We employ several candidate factors that concern industry and firm-level characteristics, in order to test hypotheses H3 and H4.

From this point forth, our analysis focuses on the big club. The reason is that the rest of the convergent clubs consist of such a small number of firms, that are inadequate for

[22] Table A1 in the Appendix presents the distribution of firms across the three samples in detail.
[23] For leverage, only the difference in medians is statistically significant.
[24] Recall that firms in the 1970-2007 sample are at least 38 years old, while firms added in the 1980-2007 and 1985-2007 samples are at least 28 and 23 years old respectively.

many econometric tests involved in our analysis. Nevertheless, the big club is sufficient for testing our hypotheses.

4.6.1. Industry

Previous studies on corporate capital structure (e.g. Bradley et al, 1984; Flannery and Rangan, 2006) have documented significant industry effects in the cross-section of firms' leverage. These findings suggest that there might exist unobservable factors affecting corporate capital structure, such as business risk, that vary across industries and remain relatively constant for the firms within the same industry. In that context, the big club in this study might have captured firms from the same or similar industries and the cross-sectional co-movement of leverage ratios within the big club might be the result of industry-specific forces. Therefore, we examine if the big clubs are biased towards any specific industry. As shown in Table 4.5, for every sample, we compare the distribution of big club firms across industries with the distribution of total firms across industries. Our categorization follows the Global Industry Classification Standard (GICS), developed by MSCI and S&P. The results indicate that, in every sample, the big club has almost the same analogy of industries as the corresponding full sample. This implies that none of the big clubs is biased towards any specific industry. Thus, there is no evidence indicating that industry determines firm membership in the big club. These findings do not support hypothesis H3. The results suggest that the impact of industry-level factors on leverage is not strong enough to generate convergence across firms.

4.6.2. Firm-specific characteristics

4.6.2.1. Main results

Next, we explore if certain firm-specific characteristics qualify firms to be members in the big club. We test for size (total assets), market-to-book ratio, profitability and tangibility. The reason for choosing these characteristics is that previous research has documented that they are correlated with leverage (e.g. Rajan and Zingales; 1995, Frank and Goyal, 2003; Lemmon et al, 2008). The visual inspection of the relative transition curves in subsection 4.5.2. gave us an indication for the differences between big club firms and the rest of the firms. Here we conduct a formal econometric test.

We run a Probit regression, where the dependent variable is a binary variable taking the value one if the firm belongs to the big club and zero otherwise. The independent variables are total assets, market-to-book ratio, profitability and tangibility. A positive (negative) and significant estimated coefficient for any of the independent variables would imply that the higher the value for the underlying characteristic, the more (less) likely it is that the firm will be a member of the big club. For example, a positive and significant coefficient for profitability would imply that the more profitable the firm, the more likely it is to belong to the big club.

Panel A of Table 4.6 shows the results from estimating the Probit regression separately for every sample. In sample 1970-2007, the only significant coefficients are the ones for assets and tangibility. This indicates that bigger firms and firms with more tangible assets as a fraction of total assets are more likely to become members of the big club. This finding is in line with the information conveyed by the relative transition curves. Recall that the tangibility and assets curves were consistently above one (see Figure 4.2). In sample 1980-2007, all coefficients are significant. According to these findings, firms in the big club are more likely to be bigger, more profitable, to have lower market-to-book ratios and more tangible assets. Like in the previous sample, the paths of the relative transition curves for assets, profitability and tangibility are consistent with the results. The path of the curve for market-to-book was not clear enough to infer the negative relationship that was estimated via the Probit regression. In the 1985-2007 sample, three out of the four coefficients are significant. According to our findings, firms in the big club are more likely to be bigger, more profitable and have lower market-to-book ratios. In sum, the results across the three samples are not contradictory to each other, in the sense that - provided statistical significance - the sign of the estimated coefficient for each variable is the same across the three samples. In order to test the robustness of our findings, we proceed with a sensitivity analysis on these results.

4.6.2.2. Cross-sectional sensitivity analysis

The Probit regression showed that only size is significant across all three samples. The rest of the explanatory variables, namely market-to-book, profitability and tangibility are significant in only two samples. Next, we test if these differences across samples are due to the different firm composition of the three samples or due to different time periods considered. Our test resembles the one conducted in subsection 4.5.3. Having re-implemented all convergence tests on the 236 firms of the 1970-2007 sample twice, once for the period 1980-2007 and once for the period 1985-2007 (see Table 4.3), we run two Probit regressions on the truncated samples. If the results are similar to those of the sample 1970-2007, then we can conclude that it is the introduction of new firms, rather than the choice of different time periods, driving the difference in results across the three original samples.

As shown in Panel B of Table 4.6, the results for the truncated samples, presented in columns (2) and (3), are similar to the results for the 1970-2007 sample, presented in column (1). Across the three samples, coefficients for total assets and tangibility are positive and statistical significant at the 1% level, while coefficients for profitability and market-to-book ratios are insignificant. The only exception is the coefficient for market-to-book ratio in the 1980-2007 sample. However, we regard this to be weak evidence, since it is only marginally significant at the 10% level. Hence, our findings indicate that it is the different firm composition that drives the difference in results between the three original samples.

4.6.2.3. Intertemporal sensitivity analysis

Reverting back to the analysis of the three original samples, we test the robustness of our results over time. So far, the dependent and the explanatory variables of the Probit regressions were concurrent. Next, we try lagged values for the explanatory variables, using one-year, five-year and average five-year lags. We want to be sure that our results are not sensitive to the time lag chosen. Suppose that a coefficient for an explanatory variable, e.g. profitability, retains its sign and its statistical significance across all different time lags considered. We regard this as a finding that enhances the credibility of the explanatory variable as a determinant of firm membership in the big club.

Table 4.7 presents the results. Panels A, B and C correspond to Probit regression specifications with one-year, five-year and average five-year lags, respectively. In order to ease interpretation of the findings for the reader, we note that the comparison should be vertical, i.e. we compare results between the three panels and within the same column. Starting with column (1), which contains the results for the sample 1970-2007, we see that only the coefficients for total assets and tangibility retain their sign and their statistical significance at the 1% level across the three panels. In sample 1980-2007, all four coefficients retain their sign and their statistical significance at the 1% level across the three panels.

Finally in the sample 1985-2007, only coefficients for total assets and profitability have the same sign and are statistical significant at the 1% level across all panels.

Panel A of Table 4.6 presents the variables that were identified as determinants of club membership in the big club by the concurrent Probit regression, i.e. size and tangibility for the first sample; size, market-to-book, profitability and tangibility for the second sample; and size, market-to-book and profitability for the third sample. In sum, the sensitivity analysis showed that almost all variables are robust to different time lag specifications. The only exception is market-to-book for the third sample. This is not surprising, given that among all significant coefficients in the concurrent regression, it was the only coefficient that was not significant at the 1% level.

4.6.3. Access to external financing

Our analysis so far has indicated that the firms of the big club are on average bigger, more profitable, have more tangible assets and lower market-to-book ratios compared to the rest of the firms[25]. Prior research (Korajczyk and Levy, 2003) has documented that these are typical characteristics of financially unconstrained firms.

Next, we test formally if big club firms have indeed a higher degree of access to external financing compared to the rest of the firms. Prior research has used many alternative criteria to assign firms to constrained and unconstrained groups. However, the validity of some of these criteria has been debated in the literature. Therefore, we employ the two most widely used and less debatable criteria, namely size and payout ratio. Small firms are more likely to be financially constrained due to the higher degree of informational asymmetries and lower degree of collateral value. Gertler and Gilchrist (1994), Almeida et al (2004) and Campello and Chen (2010) are just a few of the studies that have used size to categorize firms into constrained and unconstrained ones. Payout ratio was introduced as a classification criterion by Fazzari et al (1988) and was subsequently used in many studies (e.g., Korajczyk and Levy, 2003; Hahn and Lee, 2009; Hovakimian, 2010). The intuition is that dividends plus equity repurchases and investment are competing uses of funds. Hence,

[25] The difference in size is significant in all three samples, the difference in market-to-book and profitability in the second and third sample and the difference in tangibility in the first and the second sample. The results across the three samples are not contradictory to each other, in the sense that - provided statistical significance - the sign of the estimated coefficient for each variable is the same across the three samples.

firms that have a lower degree of access to external financing will retain more of their internally generated cash flow for investment and thus will have lower payout ratios.

The results corroborate our previous findings. As shown in Table 4.8, the firms belonging to the big group have twice the size of the rest of the firms across all three samples. This is consistent with our previous findings from the Probit regression, where size was the only coefficient that was significant across all three samples. Turning to payout ratio, it is defined as the sum of dividends and share repurchases divided by income before extraordinary items. As shown in Table 4.8, big club firms have higher payout ratios than the rest of the firms across all three samples. All differences for both size and payout ratio are statistically significant at the 1% level. In sum, our results suggests that big club firms are less constrained in obtaining external financing than the rest of the firms. These findings strongly support H4.

4.7. Explanation of convergence drivers

Our preceding analysis has established that the big club consists of financially unconstrained firms. In these sections we are going to test hypotheses H4a and H4b. Specifically, we are going to explore the driver of the convergence feature, trying both the variation of the business cycle and the level of financial development.

Essentially, we want to test the hypothesis that the force that impacts all firms in the club and makes their leverage move in tandem is an economy-wide factor. As analyzed in sub-section 4.2.2, economy-wide factors affect significantly the leverage ratio of unconstrained firms and less so the leverage of constrained firms. Hence, any impact of these factors on the leverage of unconstrained firms would be more evident in the difference between the leverage of these firms and the rest of the firms. Documenting a significant relationship between economy-wide factors and the difference in leverage between unconstrained firms and the rest of the firms would provide strong support to our hypothesis. Therefore, we test the relationship between our proxies for economy-wide factors and the leverage relative transition curve of the big club. Recall that the leverage relative transition curve expresses the differential between the average leverage of the big club firms and the average leverage of the rest of the firms. A rising curve implies that the average leverage of the big club firms increases relative to the average leverage of the rest of the firms and vice versa.

We employ real GDP (GDP_R) for capturing the variation of the business cycle and two proxies for capturing financial development, namely a credit market development index (CREDIT) and a stock market development index (STOCK). These variables are discussed in Section 4.4 and presented in detail in the Appendix. According to hypotheses H4a and H4b, we expect to find a negative relationship between the relative transition curve and GDP and a positive relationship between the relative transition curve and the financial development proxies. We transform all series by taking natural logarithms. First, we test all our variables for stationarity. As shown in Table 4.9, the financial development proxies, GDP_R and the relative transition curve in the sample 1970-2007 (BIGLEV_70) are I(1). The relative transition curves of the other two samples are not I(1) and thus excluded from the analysis.

We proceed with a Johansen test for the existence of a cointegrating relation between the remaining relative transition curve and (i) GDP_R, (ii) the credit market development index and (iii) the stock market development index. The results of the tests are presented in Table 4.10. There is no cointegration equation detected between the curve and GDP_R. This result does not provide support to hypothesis H4a. It rather suggests that the fluctuations of the business cycle are not the generating mechanism of the detected convergence feature. Turning to financial development indices, the results of the test indicate that the relative transition curve is cointegrated with both indices. Having established the existence of cointegrating relations, we proceed with the estimation of the Vector Error Correction Models. Table 4.11 presents results of the estimation of a VECM that includes the relative transitions curve and the credit development index. The coefficient in the cointegrating equation is positive and highly significant, indicating a positive long-run relationship between the two variables. This finding is in line with hypothesis H4b. Furthermore, the error correction term (λ) for the relative transition curve is negative and highly significant. This implies that any short-run deviations from the equilibrium relation between the two variables in one period are covered - in part - in the next period by adjustments of the relative transition curve. The fact that the error correction term of the credit market development index is only marginally significant indicates that the adjustment of short-run deviations from equilibrium is done mostly by the relative transition curve. This result is economically intuitive and provides extra support to our hypothesis (H4b), as it suggests that it is the leverage of the firms that adjusts to changes in the level of financial development and not the other way round. Table 4.12 presents results of the estimation of a VECM that includes the relative transitions curve and our second financial development proxy, i.e. the stock market development index. Results point to the same direction. The coefficient in the cointegrating equation is positive and highly significant, suggesting a positive long-run relationship between the two variables. The error-correction term is negative and significant for the relative transition curve and insignificant for the stock market development index. This finding suggests that it is the leverage of the firms that adjusts to changes in the level of financial development and not the other way round. The results strongly support H4b.

Finally, we are conducting a robustness check. Our results indicate that the difference in leverage between the big club firms and the rest of the firms is due to the impact of financial development on the leverage of the big club firms. If that's true, then the remaining part of leverage of the big club firms should be explained - at least in part - by firm-specific and industry-level variables. In order to test this, we calculate for each year the difference between the cross-sectional average leverage of the big club firms and the cross-sectional average leverage of the rest of the firms. Then, we subtract this difference from each individual big club firm's leverage. Finally, we regress the new variable of "truncated" leverage on size, tangibility, market-to-book ratio, profitability and the median leverage of the industry group that each firm belongs to. As shown in Table 4.13, almost all coefficients are significant and with the expected signs, providing support to our hypothesis.

4.8. Conclusions

In this study we test for leverage convergence across a panel of US firms. Prior studies that tested for leverage convergence report conflicting results. Lemmon et al. (2008) find that leverage converges across firms, in the sense that firms with relatively high or low leverage tend to move towards more moderate values as time goes by. They also show that these findings are consistent with some of the implications of the trade-off theory of capital structure. Chen (2010) questions these results. He shows that the methodology of Lemmon et al. (2008) is subject to a statically fallacy called "regression fallacy" and thus their results might be mechanical rather than real.

This study avoids the misspecification problems of the prior literature by employing a formal econometric tool for testing convergence, namely the new panel convergence methodology developed by Phillips and Sul (2007). According to the findings, financially unconstrained firms form a convergent club, i.e. a group of convergent firms. Their leverage converges in rates. This means that, in every period, the leverage of these firms changes by the same rate. The generating force that drives convergence and makes the leverage of these firms fluctuate in tandem is the level of development of the financial markets. Higher level of financial development leads to higher leverage for unconstrained firms. This finding is consistent with the predictions of both trade-off and pecking order theories of capital structure, since higher financial development implies, *ceteris paribus*, lower probability of default for firms and lower asymmetric information between investors and firms. We also tested other systematic determinants of leverage, such as industry-level and macroeconomic factors, but we did not find evidence implying that these factors generate the detected convergence feature.

These findings indicate that financial development exerts a stronger influence on corporate leverage than other systematic determinants of leverage. By testing for convergence and exploring the economic force that drives any potential convergence feature, this study introduces a new way to disentangle and assess the impact of different systematic factors on leverage. Conducting these tests in countries other than the US, would be a fruitful avenue for future research.

4.9. Tables and Figures

TABLE 4.1

Convergence test results

Sample	Number of firms in sample	Full sample convergence		Number of clubs	Big club as % of total	Convergence of the big club in…	Other clubs as % of total	Divergent firms as % of total
(1)	(2)	(3a)	(3b)	(4)	(5)	(6)	(7)	(8)
1970 - 2007	236	$t_{\hat{b}}$: -9.93	NO	10	76.7% (181)	Rates	0.8%-3.4% (2-8)	5.5% (13)
1980 - 2007	396	$t_{\hat{b}}$: -9.71	NO	13	72.5% (287)	Rates	0.5%-4.5% (2-18)	9.6% (38)
1985 - 2007	611	$t_{\hat{b}}$: -7.09	NO	34	65.6% (401)	Rates	0.3%-3.9% (2-24)	9.8% (60)

We test for leverage convergence across firms over time. This table presents the results of Phillips and Sul (2007) convergence tests, implemented in three nested samples of US firms. Column (3) shows results of tests for full-sample convergence. Columns (4) to (8) present results of tests for the existence of convergent clubs, i.e. sub-groups of convergent firms. Column (3) shows the number of clubs, columns (5) and (7) the relative and absolute size of clubs, column (6) the type of convergence and column (8) the number of firms that do not belong to any club. Convergence in rates means that the variable of interest has the same rate of change across the cross-sectional units, while convergence in levels means that it converges to the same value. Figures in parentheses are numbers of firms.

TABLE 4.2

Convergent clubs

	1970 - 2007		1980 - 2007		1985 - 2007	
Convergent club	$t_{\hat{b}}$	Number of firms	$t_{\hat{b}}$	Number of firms	$t_{\hat{b}}$	Number of firms
1	-0.93	181	0.42	287	-0.66	401
2	-1.41	2	-1.63	9	3.51	24
3	-1.35	8	-1.33	4	1.30	2
4	-0.75	5	-1.53	10	1.38	2
5	1.96	2	-1.01	10	1.26	2
6	-1.52	8	0.76	4	-0.73	8
7	1.35	4	-0.61	4	1.42	2
8	1.72	3	-1.38	18	-1.11	2
9	-1.18	2	-0.43	3	1.00	2
10	-1.33	8	-0.58	2	-0.43	9
11			-1.50	2	-0.50	5
12			-0.78	3	-1.22	4
13			-1.44	2	0.63	2
14					0.45	3
15					-1.47	2
16					0.88	2
17					0.74	4
18					0.78	2
19					-0.83	2
20					1.12	2
21					-0.68	2
22					-0.56	8
23					-0.62	2
24					-1.04	5
25					1.70	2
26					-1.24	2
27					1.05	4
28					-1.09	10
29					-0.71	4
30					2.17	4
31					-1.29	9
32					-1.01	2
33					-1.22	10
34					-1.33	5
Divergent firms		13		38		60
Total		236		396		611

This table presents the results of Phillips and Sul (2007) convergence test for the existence of convergent clubs, i.e. sub-groups of convergent firms. A t-statistic of b above the critical value of -1.65 indicates that the club satisfies the convergence criterion.

TABLE 4.3

Convergence test results for the sample 1970-2007 across different time periods

Period	Number of firms in sample	Full sample convergence		Number of clubs	Big club as % of total	Convergence of the big club in…	Other clubs as %of total	Divergent firms as % of total
(1)	(2)	(3a)	(3b)	(4)	(5)	(6)	(7)	(8)
1970 - 2007	236	$t_{\hat{b}}$: -9.93	NO	10	76.7% (181)	Rates	0.8%-3.4% (2-8)	5.5% (13)
1980 - 2007	236	$t_{\hat{b}}$: -9.82	NO	16	57.6% (136)	Rates	0.8%-6.4% (2-15)	8.5% (20)
1985 - 2007	236	$t_{\hat{b}}$: -8.98	NO	13	48.3% (114)	Rates	0.8%-11.9% (2-28)	7.6% (18)

We test for leverage convergence across firms over time. This table presents the results of Phillips and Sul (2007) convergence tests, implemented in a sample of US firms over three different periods. Column (3) shows results of tests for full-sample convergence. Columns (4) to (8) present results of tests for the existence of convergent clubs, i.e. sub-groups of convergent firms. Column (3) shows the number of clubs, columns (5) and (7) the relative and absolute size of clubs, column (6) the type of convergence and column (8) the number of firms that do not belong to any club. Convergence in rates means that the variable of interest has the same rate of change across the cross-sectional units, while convergence in levels means that it converges to the same value. Figures in parentheses are number of firms.

TABLE 4.4

Differences in firm characteristics across the three samples

	Sample 1	Sample 2	Sample 3	Probability that means/medians across different samples are equal	
	1970-2007	1980-2007	1985-2007	2-1	3-2
LEV					
Mean	0.204	0.202	0.198	0.576	0.013
Median	0.197	0.192	0.186	0.011	0.000
ASSETS					
Mean	6.160	5.633	5.305	0.000	0.000
Median	6.059	5.541	5.230	0.000	0.000
MB					
Mean	1.540	1.620	1.695	0.000	0.000
Median	1.267	1.324	1.356	0.000	0.000
PROF					
Mean	0.160	0.144	0.130	0.000	0.000
Median	0.159	0.147	0.137	0.000	0.000
TANG					
Mean	0.347	0.334	0.324	0.000	0.000
Median	0.309	0.289	0.276	0.000	0.000
N	8,968	11,088	14,053		

This table reports the means and medians of firm-level variables across the three samples. LEV is total debt divided by total assets. ASSETS is the natural log of book assets expressed in 1983 US dollars. MB is market value of assets divided by total assets. Market value of assets is book assets minus total equity plus preferred stock minus deferred tax and investment tax credit plus market equity. PROF is operating income divided by total assets. TANG is net fixed assets divided by total assets. We also test the null hypothesis that the difference between means or medians across different samples is zero. For the means we use the standard t-test, and for the medians the Kruskal-Wallis test. In the last two columns, we report the p-values derived from t-statistics for the difference in means test and p-values derived from χ^2-statistics for the difference in medians test. N is firm-year observations.

TABLE 4.5

Business sector composition of big convergent clubs

	Full sample 1970-2007	**Big club 1970-2007**	**Full sample 1980-2007**	**Big club 1980-2007**	**Full sample 1985-2007**	**Big club 1985-2007**
Number of firms	236	168	401	292	611	401
Composition of clubs:						
Energy	6.8%	5.0%	7.0%	6.2%	7.7%	8.0%
Materials	11.0%	13.3%	10.2%	12.0%	9.5%	10.5%
Industrials	33.1%	32.6%	31.7%	31.8%	27.0%	25.9%
Consumer Discretionary	22.9%	23.8%	21.4%	22.9%	19.6%	21.9%
Consumer Staples	13.1%	14.4%	11.5%	13.0%	10.5%	10.2%
Health Care	5.9%	6.1%	6.5%	5.5%	9.0%	7.7%
Information Technology	7.2%	5.0%	11.7%	8.6%	16.7%	15.7%

This table provides information about the business sector composition of the big convergent clubs across the three samples. Our categorization follows the Global Industry Classification Standard (GICS), developed by MSCI and S&P.

TABLE 4.6

Big club participation criteria

Equation: $Y_{i,t} = c + \beta X_{i,t} + \varepsilon_{i,t}$

	(1)	(2)	(3)
	1970-2007	1980-2007	1985-2007
Panel A: Different number of firms across different time periods			
c	-0.119**	-0.034	-0.006
	-2.06	*-0.80*	*-0.16*
ASSETS	0.101***	0.097***	0.073***
	11.94	*15.68*	*14.02*
MB	0.024	-0.062***	-0.021**
	1.33	*-5.07*	*-2.16*
PROF	0.121	0.844***	0.584***
	0.62	*5.84*	*5.39*
TANG	0.558***	0.249***	-0.046
	6.77	*3.80*	*-0.87*
N	8,968	11,088	14,053
# of firms	236	396	611
Panel B: Same firms across different time periods			
c	-0.119**	-0.53***	-0.67***
	-2.06	*-8.65*	*-10.16*
ASSETS	0.101***	0.09***	0.06***
	11.94	*11.18*	*6.52*
MB	0.024	-0.04*	-0.02
	1.33	*-1.77*	*-0.86*
PROF	0.121	-0.26	-0.40
	0.62	*-1.21*	*-1.63*
TANG	0.558***	0.64***	0.98***
	6.77	*7.35*	*10.46*
N	8,968	6,608	5,428
# of firms	236	236	236

All equations are estimated via Probit regressions. Y is a binary variable taking the value 1 if the firm belongs to the big club and 0 otherwise. X is a vector of firm-level variables, namely ASSETS, MB, PROF and TANG. ASSETS is the natural log of book assets expressed in 1983 US dollars. MB is market value of assets divided by total assets. Market value of assets is book assets minus total equity plus preferred stock minus deferred tax and investment tax credit plus market equity. PROF is operating income divided by total assets. TANG is net fixed assets divided by total assets. In panel A, the number of firms differs across different time periods. In panel B, we use the same firms across the three different time periods. Standard errors are robust to heteroskedasticity using the Huber/White estimator. N is firm-years. Numbers in italics are z-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 4.7

Big club participation criteria: Sensitivity analysis

	(1)	(2)	(3)
	1970-2007	1980-2007	1985-2007
Panel A: $Y_{i,t} = c + \beta X_{i,t-1} + \varepsilon_{i,t}$			
c	-0.13**	-0.05	0.00
	-2.20	*-1.00*	*-0.12*
ASSETS	0.10***	0.10***	0.07***
	11.62	*14.80*	*13.78*
MB	0.03*	-0.06***	-0.02**
	1.73	*-4.50*	*-1.98*
PROF	0.13	0.90***	0.63***
	0.61	*6.12*	*5.75*
TANG	0.56***	0.26***	-0.06
	6.69	*3.77*	*-1.08*
N	8,732	11,070	14,023
# of firms	236	396	611
Panel B: $Y_{i,t} = c + \beta X_{i,t-5} + \varepsilon_{i,t}$			
c	-0.17***	-0.11**	-0.03
	-2.79	*-2.36*	*-0.96*
ASSETS	0.10***	0.09***	0.07***
	10.42	*13.90*	*12.87*
MB	0.06***	-0.03**	0.00
	2.88	*-2.49*	*0.26*
PROF	0.22***	1.10***	0.73***
	0.98	*7.63*	*6.76*
TANG	0.57***	0.28***	-0.07
	6.39	*3.99*	*-1.28*
N	7,788	10,814	13,461
# of firms	236	396	611
Panel C: $Y_{i,t} = c + \beta \bar{X}_{i,(t-5\ to\ t-1)} + \varepsilon_{i,t}$			
c	-0.16**	-0.09*	-0.03
	-2.50	*-1.86*	*-0.79*
ASSETS	0.10***	0.09***	0.07***
	10.65	*13.63*	*12.25*
MB	0.05**	-0.07***	-0.02*
	2.00	*-4.94*	*-1.69*
PROF	0.24	1.57***	1.09***
	0.89	*8.93*	*7.78*
TANG	0.54***	0.23***	-0.09
	5.87	*3.22*	*-1.52*
N	7,788	10,814	13,461
# of firms	236	396	611

All equations are estimated via Probit regressions. Y is a binary variable taking the value 1 if the firm belongs to the big club and 0 otherwise. X is a vector of firm-level variables, namely ASSETS, MB, PROF and TANG. ASSETS is the natural log of book assets expressed in 1983 US dollars. MB is market value of assets divided by total assets. Market value of assets is book assets minus total equity plus preferred stock minus deferred tax and investment tax credit plus market equity. PROF is operating income divided by total assets. TANG is net fixed assets divided by total assets. Standard errors are robust to heteroskedasticity using the Huber/White estimator. N is firm-years. Numbers in italics are z-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 4.8

Variables used to distinguish constrained from unconstrained firms

	1970-2007	1980-2007	1985-2007
ASSETS			
Mean of the big club firms	571.17	355.03	253.76
Mean of the rest of the firms	254.88	148.77	129.61
p-value for mean	0.000	0.000	0.000
p-value for distribution	0.000	0.000	0.000
PAYOUT RATIO			
Mean of the big club firms	0.577	0.564	0.522
Mean of the rest of the firms	0.480	0.439	0.414
p-value for mean	0.000	0.000	0.000
p-value for distribution	0.000	0.000	0.000
N	8,968	11,088	14,053

This table reports the mean of total assets and payout ratios for firms belonging to the big club and for the rest of them within each sample. ASSETS is book assets expressed in 1983 US dollars. PAYOUT RATIO is common dividends plus preferred dividends plus purchase of common and preferred stock divided by income before extraordinary items. This table reports p-values for the null hypotheses of mean and distribution equality between the two groups within each sample. The test of mean equality is a standard t-test and the test of distribution equality is a Kolmogorov-Smirnov nonparametric test. Assets are measured in $millions. N is firm-years.

TABLE 4.9

Unit root tests for relative transition curves for leverage, GDP and financial development indices

	Levels		1st difference	
	PP t-stat	significance	PP t-stat	significance
BIGLEV_70	*0.61*		*-5.88*	***
BIGLEV_80	*0.66*		*-2.64*	
BIGLEV_85	*-0.56*		*-2.56*	
GDP_R	*-0.78*		*-6.49*	***
CREDIT	*3.53*		*-3.23*	**
STOCK	*0.77*		*-3.53*	**

This table presents Phillips-Peron unit root tests for financial development indices and relative transition curves. BIGLEV_70, BIGLEV_80 and BIGLEV_85 are the natural logarithm of the leverage relative transition curves of the big club in samples 1970-2007, 1980-2007 and 1985-2007, respectively. GDP_R is the natural logarithm of real GDP. CREDIT is the natural logarithm of the sum of credit provided by banks and other financial institutions and bond market capitalization as a share of GDP. STOCK is the natural logarithm of stock market capitalization as a share of GDP. The null hypothesis for each time series is that it has a unit root. PP t-stat are Phillips-Peron t-statistics. For PP t-stats, MacKinnon (1996) critical values are used for rejection of the null hypothesis. *** and ** indicate 1% and 5% statistical significance levels, respectively.

TABLE 4.10

Johansen cointegration test for relative transition curve for leverage, GDP and financial development indices

(1)	(2)	(3)	(4)	(5)	(6)
Panel A: BIGLEV_70 and GDP_R					
(i) Trace test	Eigenvalue	Trace Statistic	5% critical value	p-values	**# of cointegr. eqn(s)**
None cointegrating equation	0.148	*5.94*	*15.49*	0.703	**0**
At most 1 cointegrating equation	0.001	*0.02*	*3.84*	0.887	
(ii) Maximum Eigenvalue Test	Eigenvalue	Max-Eigen Statistic	5% critical value	p-values	**# of cointegr. eqn(s)**
None cointegrating equation	0.148	*5.92*	*14.26*	0.624	**0**
At most 1 cointegrating equation	0.001	*0.02*	*3.84*	0.887	
Panel B: BIGLEV_70 and CREDIT					
(i) Trace test	Eigenvalue	Trace Statistic	5% critical value	p-values	**# of cointegr. eqn(s)**
None cointegrating equation ***	0.436	*20.92*	*15.49*	0.007	**1**
At most 1 cointegrating equation	0.009	*0.33*	*3.84*	0.567	
(ii) Maximum Eigenvalue Test	Eigenvalue	Max-Eigen Statistic	5% critical value	p-values	**# of cointegr. eqn(s)**
None cointegrating equation ***	0.436	*20.60*	*14.26*	0.004	**1**
At most 1 cointegrating equation	0.009	*0.33*	*3.84*	0.567	
Panel C: BIGLEV_70 and STOCK					
(i) Trace test	Eigenvalue	Trace Statistic	5% critical value	p-values	**# of cointegr. eqn(s)**
None cointegrating equation **	0.424	*19.33*	*15.49*	0.013	**1**
At most 1 cointegrating equation	0.000	*0.02*	*3.84*	0.895	
(ii) Maximum Eigenvalue Test	Eigenvalue	Max-Eigen Statistic	5% critical value	p-values	**# of cointegr. eqn(s)**
None cointegrating equation ***	0.424	*19.31*	*14.26*	0.007	**1**
At most 1 cointegrating equation	0.000	*0.02*	*3.84*	0.895	

Panel A reports results for testing the number of cointegrating relations between variables BIGLEV_70 and GDP_R, Panel B between BIGLEV_70 and CREDIT and Panel C between BIGLEV_70 and STOCK. BIGLEV_70 is the natural logarithm of the leverage relative transition curve of the big club in sample 1970-2007. GDP_R is the natural logarithm of real GDP. CREDIT is the natural logarithm of the sum of credit provided by banks and other financial institutions and bond market capitalization as a share of GDP. STOCK is the natural logarithm of stock market capitalization as a share of GDP. Two types of tests are reported, i.e. Trace Test and Maximum Eigenvalue Test. Column (1) reports the number of cointegrating relations r under the null hypothesis. The null hypothesis is tested against the alternative of $r+1$ relations (Maximum Eigenvalue Test) or the alternative of k (Trace Test), where k is the number of variables. To determine r, we proceed sequentially from *r=0* to *r=k-1* until we fail to reject. Column (3) reports the test statistics, column (4) the (nonstandard) 5% critical values from MacKinnon, Haug and Michelis (1999) and column (5) the associated p-values. Column (6) reports the number of cointegrating equations, as indicated by the tests. *** and ** indicate 1% and 5% statistical significance levels, respectively.

TABLE 4.11

Vector Error Correction Model for relative transition curve for leverage & financial development index

$$\Delta(BIGLEV\_70)_t = c_1 + \lambda_1(BIGLEV\_70_{t-1} - \alpha - \beta CREDIT_{t-1}) + \gamma_1\Delta(BIGLEV\_70)_{t-1} + \delta_1\Delta(CREDIT)_{t-1} + \varepsilon_t$$

$$\Delta(CREDIT)_t = c_2 + \lambda_2(BIGLEV\_70_{t-1} - \alpha - \beta CREDIT_{t-1}) + \gamma_2\Delta(BIGLEV\_70)_{t-1} + \delta_2\Delta(CREDIT)_{t-1} + \varepsilon_t$$

Panel A: Cointegrating equation

Cointegrating equation: $BIGLEV\_70 = -0.144 + 0.376 \times CREDIT$
(10.41)

Panel B: Error correction and short-term dynamics

	$\Delta(BIGLEV\_70)_t$	$\Delta(CREDIT)_t$
λ	-0.206***	-0.164*
	-3.78	*-1.90*
$\Delta(BIGLEV\_70)_{t-1}$	-0.229	-0.295
	-1.48	*-1.21*
$\Delta(CREDIT)_{t-1}$	-0.156	0.306
	-1.29	*1.60*
c	0.010**	0.021***
	2.52	*3.17*
Adj. R^2	0.290	0.313
N	36	36

This table presents results from estimating a VECM for BIGLEV_70 and CREDIT. BIGLEV_70 is the natural logarithm of the leverage relative transition curve of the big club in sample 1970-2007. CREDIT is the natural logarithm of the sum of credit provided by banks and other financial institutions and bond market capitalization as a share of GDP. Panel A presents the estimated cointegrating equation and Panel B the estimated error correction term λ and the short-term dynamics between the two variables. The optimal number of lags for the terms in differences is determined according to the Akaike Information Criterion. N is years. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 4.12

Vector Error Correction Model for relative transition curve for leverage & financial development index

$$\Delta(BIGLEV\_70)_t = c_1 + \lambda_1(BIGLEV\_70_{t-1} - \alpha - \beta STOCK_{t-1}) + \gamma_{11}\Delta(BIGLEV\_70)_{t-1} + \gamma_{12}\Delta(BIGLEV\_70)_{t-2} + \delta_{11}\Delta(STOCK)_{t-1} + \delta_{12}\Delta(STOCK)_{t-2} + \varepsilon_t$$

$$\Delta(STOCK)_t = c_2 + \lambda_2(BIGLEV\_70_{t-1} - \alpha - \beta STOCK_{t-1}) + \gamma_{21}\Delta(BIGLEV\_70)_{t-1} + \gamma_{22}\Delta(BIGLEV\_70)_{t-2} + \delta_{21}\Delta(CREDIT)_{t-1} + \delta_{22}\Delta(CREDIT)_{t-2} + \varepsilon_t$$

Panel A: Cointegrating equation

Cointegrating equation: *BIGLEV_70 = 0.071 + 0.191×STOCK*
(7.78)

Panel B: Error correction and short-term dynamics

	$\Delta(BIGLEV\_70)_t$	$\Delta(STOCK)_t$
λ	-0.242***	0.169
	-4.53	*0.36*
$\Delta(BIGLEV\_70)_{t-1}$	-0.121	-0.208
	-0.90	*-0.18*
$\Delta(BIGLEV\_70)_{t-2}$	0.297**	0.872
	2.22	*0.75*
$\Delta(STOCK)_{t-1}$	-0.016	0.616***
	-0.81	*3.51*
$\Delta(STOCK)_{t-2}$	-0.067***	-0.332
	-2.89	*-1.65*
c	0.006**	0.010
	2.40	*0.45*
Adj. R^2	0.428	0.196
N	35	35

This table presents results from estimating a VECM for BIGLEV_70 and STOCK. BIGLEV_70 is the natural logarithm of the leverage relative transition curve of the big club in sample 1970-2007. STOCK is the natural logarithm of stock market capitalization as a share of GDP. Panel A presents the estimated cointegrating equation and Panel B the estimated error correction term λ and the short-term dynamics between the two variables. The optimal number of lags for the terms in differences is determined according to the Akaike Information Criterion. N is years. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 4.13

Leverage regressions on firm-specific characteristics

Equation (A): $LEV_{i,t} - LEV\_DIF_t = c + \beta X_{i,t-1} + MED\_IND_{i,t-1} + \varepsilon_{i,t}$

	1970-2007	1980-2007	1985-2007
c	0.145***	0.152***	0.107***
	5.87	*6.63*	*6.25*
ASSETS	0.008***	0.004	0.009***
	2.74	*1.31*	*4.33*
MB	-0.021***	-0.018***	-0.016***
	-5.45	*-4.64*	*-6.13*
PROF	-0.229***	-0.275***	-0.122***
	-3.78	*-4.91*	*-4.14*
TANG	0.126***	0.054*	0.076***
	3.40	*1.68*	*3.16*
MED_IND	0.138*	0.379***	0.467**
	1.74	*3.72*	*7.16*
Adj. R^2	0.138	0.097	0.140
N	6,170	6,976	8,593

This table reports the results from estimating equation (A) for the samples 1970-2007. 1980-2007 and 1985-2007. LEV is leverage. LEV_DIF for the year t is the cross-sectional average leverage of the big club firms in year t minus the cross-sectional average leverage of the rest of the firms in year t. X is a vector of firm-level variables, namely ASSETS, MB, PROF and TANG. ASSETS is the natural log of book assets expressed in 1983 US dollars. PROF is operating income divided by total assets. MB is market value of assets divided by total assets. Market value of assets is book assets minus total equity plus preferred stock minus deferred tax and investment tax credit plus market equity. TANG is net fixed assets divided by total assets. MED_IND is the median leverage of the industry group that the firms belongs to. Numbers in italics are t-statistics. Standard errors (White standard errors clustered by firm) are robust to heteroskedasticity and to residual dependence across time. N is in firm-year observations.

FIGURE 4.1

Relative transition curves for leverage for all convergent clubs in 1970-2007 sample

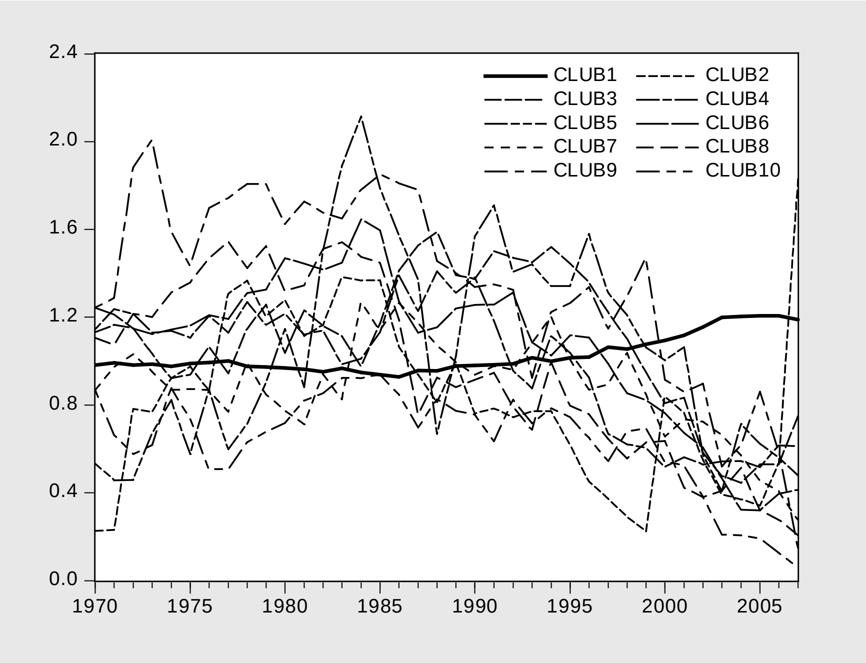


FIGURE 4.2. Big club, sample 1970-2007

Relative transition curves for leverage, assets, market-to-book ratio, profitability and tangibility

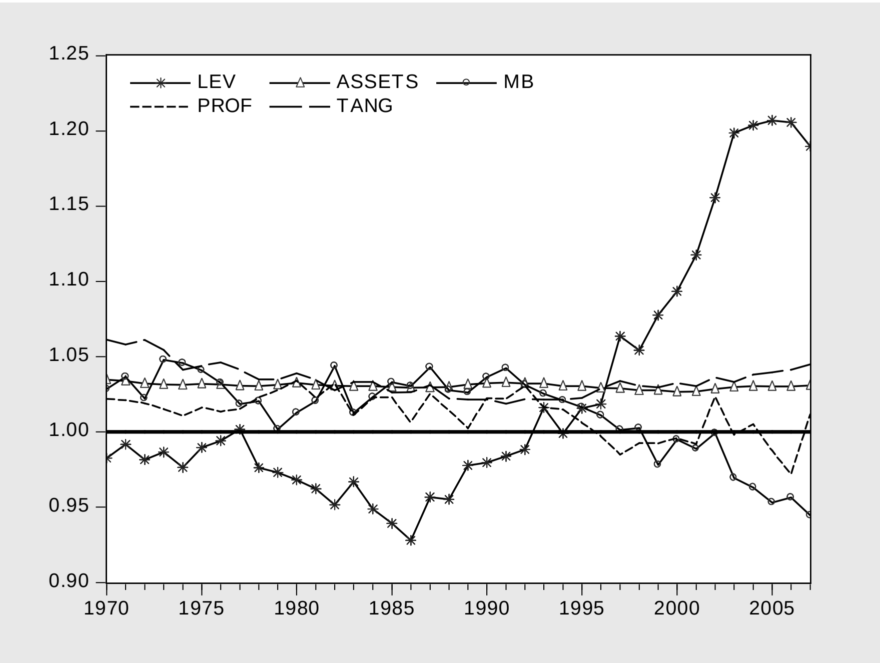


FIGURE 4.3. Big club, sample 1980-2007

Relative transition curves for leverage, assets, market-to-book ratio, profitability and tangibility

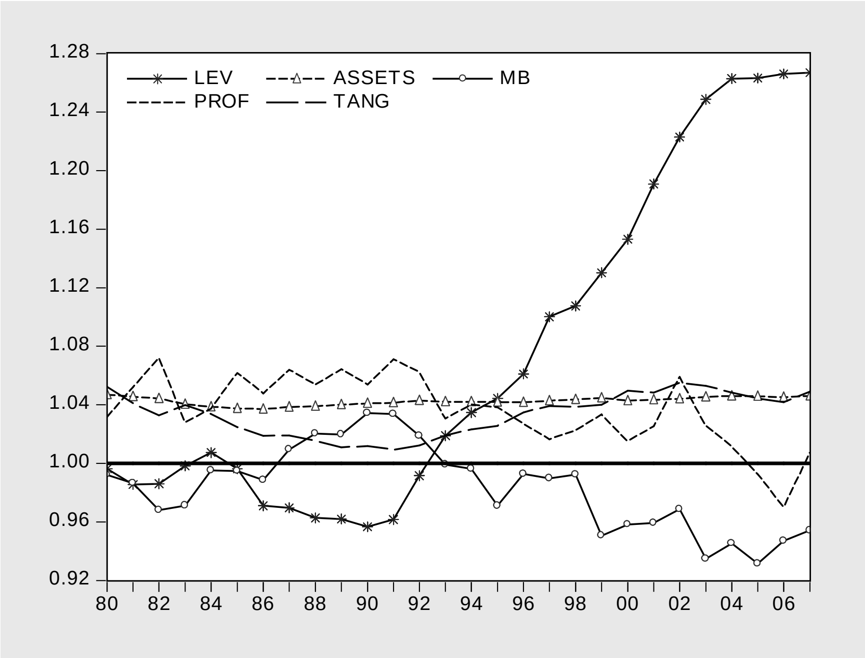


FIGURE 4.4. Big club, sample 1985-2007

Relative transition curves for leverage, assets, market-to-book ratio, profitability and tangibility

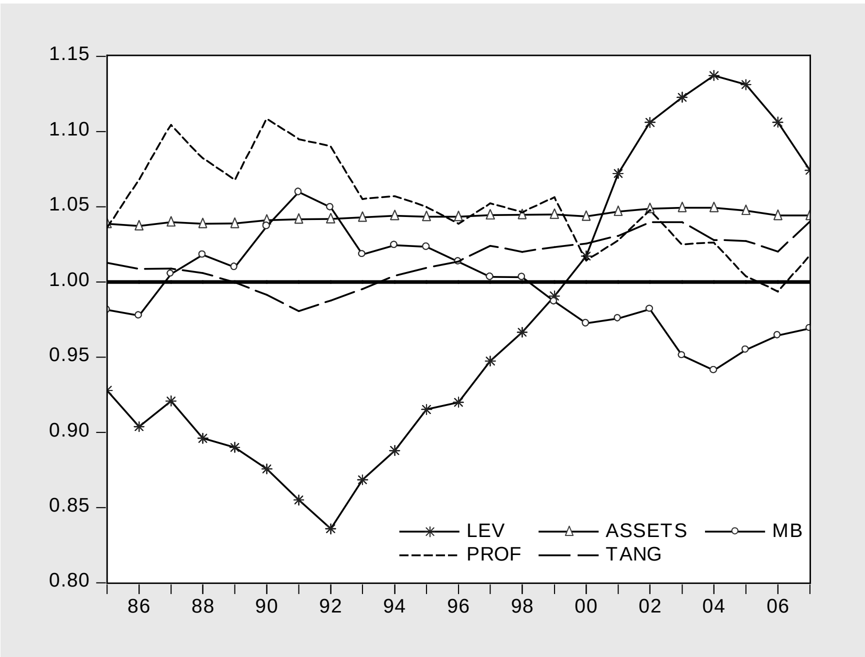


FIGURE 4.5. Big club, sample 1970-2007, period 1980-2007

Relative transition curves for leverage, assets, market-to-book ratio, profitability and tangibility

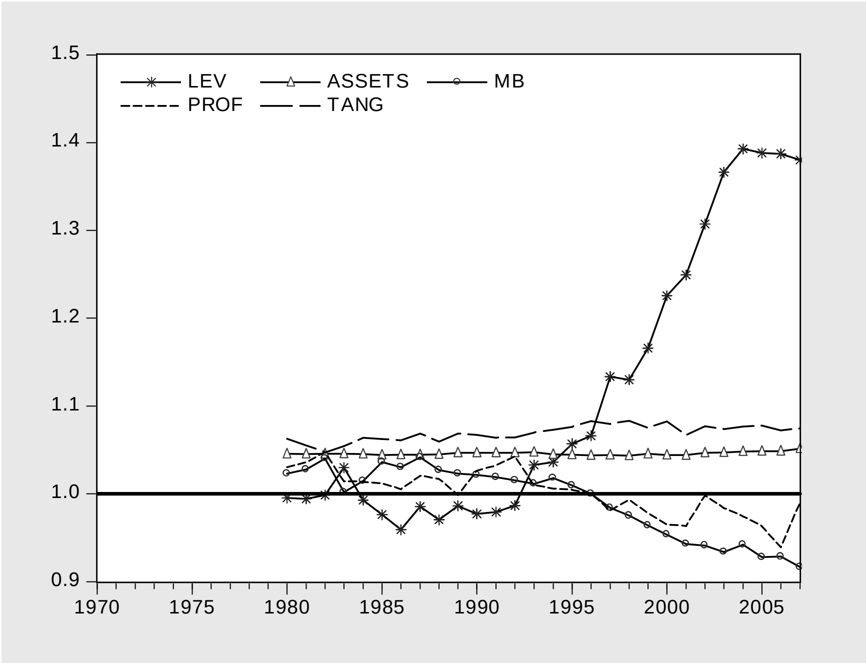
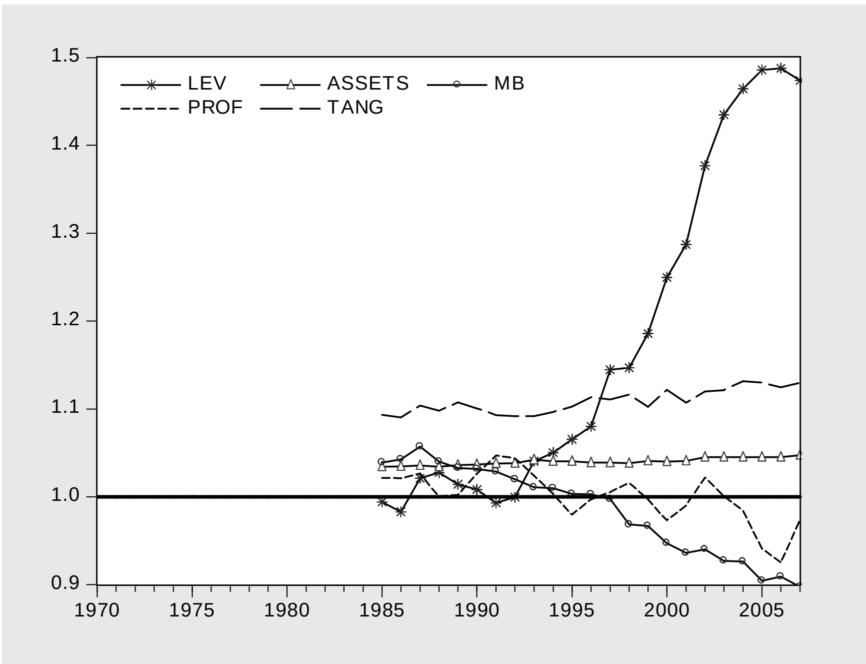


FIGURE 4.6. Big club, sample 1970-2007, period 1985-2007

Relative transition curves for leverage, assets, market-to-book ratio, profitability and tangibility

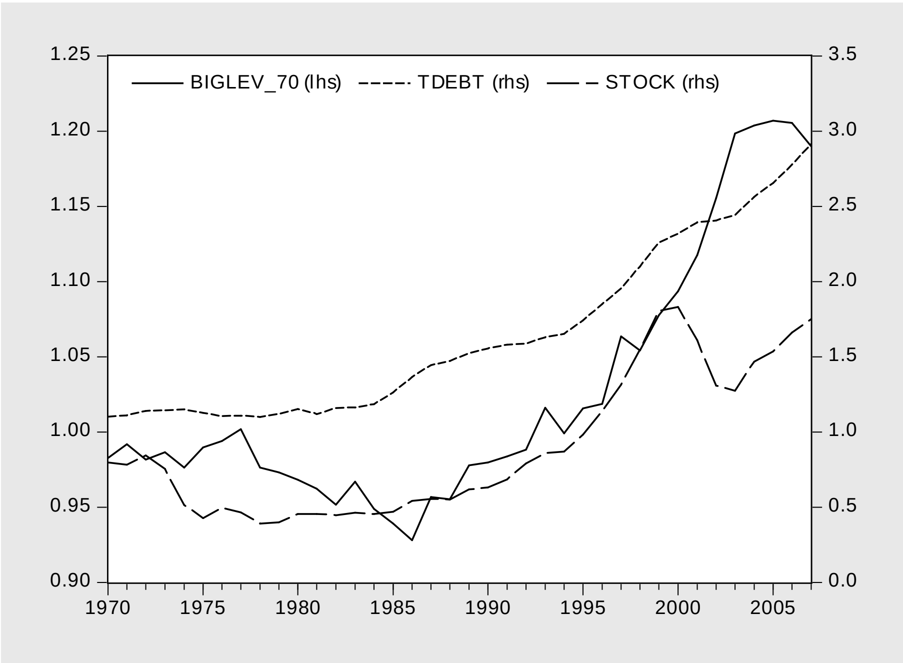


Figures 4.1-4.6: The relative transition curve is the evolution of the relative transition parameter over time. The relative transition parameter for a convergent club is calculated every year as the ratio of the cross-sectional average

of the variable of interest for the firms that belong in the club over the cross-sectional average of the variable of interest for all firms in the sample.

FIGURE 4.7. Big club, sample 1970-2007

Relative transition curve for leverage and financial development indices



BIGLEV_70 is the leverage relative transition curve of the big club in sample 1970-2007. CREDIT is the sum of credit provided by banks and other financial institutions and bond market capitalization as a share of GDP. STOCK is stock market capitalization as a share of GDP.

4.10. Appendix

Definition of variables used

FIRM-LEVEL VARIABLES		
SYMBOL	DESCRIPTION	COMPUSTAT ACCOUNTS
LEV	Long-term debt plus debt in current liabilities to book assets	(data9+data34)/data6
PROF	Earnings before interest and taxes to book assets	data13/data6
MB	Market value of assets to book assets	mv_a/data6
mv_a	Market value of assets = Book assets minus total equity plus preferred stock minus deferred tax and investment tax credit plus market equity (market equity = stock market price times shares outstanding)	data6-data216+data10-data35+(data25 *data199)
ASSETS	Natural logarithm of real book assets expressed in 1983 US dollars	ln of data6
TANG	Fixed assets to book assets	data8/data6
PAYOUT RATIO	Common dividends plus preferred dividends plus purchase of common and preferred stock to income before extraordinary items	(data21+data19+data115)/data18

ECONOMY-WIDE VARIABLES		
SYMBOL	DESCRIPTION	SOURCE
BANK	Private credit by deposit money banks and other financial institutions to GDP, calculated using the following deflation method: {(0.5)*[Ft/P_et + Ft-1/P_et-1]}/[GDPt/P_at] where F is credit to the private sector, P_e is end-of period CPI, and P_a is average annual CPI	World Bank Financial Structure Dataset
BOND	Value of private debt securities (issued by financial institutions and corporations) outstanding as a share of GDP, calculated using the following deflation method: {(0.5)*[Ft/P_et + Ft-1/P_et-1]}/[GDPt/P_at] where F is value of debt securities outstanding, P_e is end-of period CPI, and P_a is average annual CPI	- Debt securities: US Flow of Funds Accounts, Table L.212 "Corporate and Foreign Bonds", Account "Total Liabilities" and Table L.208 "Open market paper", Account "Total outstanding, All types" - GDP and CPI: Federal Reserve Economic Data, http://research.stlouisfed.org/fred2
CREDIT	BANK+BOND	
STOCK	Value of listed shares to GDP, calculated using the following deflation method: {(0.5)*[Ft/P_et + Ft-1/P_et-1]}/[GDPt/P_at] where F is stock market capitalization, P_e is end-of period CPI, and P_a is average annual CPI	- Shares: US Flow of Funds Accounts, Table L.213 "Corporate Equities", Account "Issues at Market Value" - GDP and CPI: Federal Reserve Economic Data, http://research.stlouisfed.org/fred2
GDP_R	Real Gross Domestic Product	Federal Reserve Economic Data, http://research.stlouisfed.org/fred2

TABLE A4.1

Composition of samples

	Firm (gvkey)	1970-2007	1980-2007	1985-2007
1	1004	x	x	x
2	1104	x	x	x
3	1209	x	x	x
4	1234	x	x	x
5	1239	x	x	x
6	1246	x	x	x
7	1254	x	x	x
8	1266	x	x	x
9	1300	x	x	x
10	1327	x	x	x
11	1356	x	x	x
12	1380	x	x	x
13	1397	x	x	x
14	1408	x	x	x
15	1410	x	x	x
16	1468	x	x	x
17	1491	x	x	x
18	1496	x	x	x
19	1554	x	x	x
20	1593	x	x	x
21	1598	x	x	x
22	1618	x	x	x
23	1632	x	x	x
24	1655	x	x	x
25	1663	x	x	x
26	1678	x	x	x
27	1722	x	x	x
28	1891	x	x	x
29	2061	x	x	x
30	2101	x	x	x
31	2154	x	x	x
32	2282	x	x	x
33	2285	x	x	x
34	2346	x	x	x
35	2390	x	x	x
36	2393	x	x	x
37	2403	x	x	x
38	2410	x	x	x
39	2435	x	x	x
40	2436	x	x	x
41	2444	x	x	x
42	2482	x	x	x
43	2490	x	x	x
44	2538	x	x	x
45	2574	x	x	x
46	2593	x	x	x
47	2606	x	x	x
48	2787	x	x	x
49	2802	x	x	x
50	2845	x	x	x
51	2916	x	x	x
52	2982	x	x	x
53	2991	x	x	x
54	2999	x	x	x
55	3054	x	x	x
56	3093	x	x	x
57	3107	x	x	x
58	3126	x	x	x
59	3144	x	x	x
60	3158	x	x	x
61	3246	x	x	x
62	3416	x	x	x
63	3465	x	x	x
64	3502	x	x	x
65	3580	x	x	x
66	3639	x	x	x
67	3662	x	x	x
68	3833	x	x	x
212	10609	x	x	x
213	10618	x	x	x
214	10658	x	x	x
215	10777	x	x	x
216	10789	x	x	x
217	10793	x	x	x
218	10867	x	x	x
219	11012	x	x	x
220	11060	x	x	x
221	11094	x	x	x
222	11096	x	x	x
223	11115	x	x	x
224	11178	x	x	x
225	11185	x	x	x
226	11228	x	x	x
227	11343	x	x	x
228	11361	x	x	x
229	11446	x	x	x
230	11455	x	x	x
231	11456	x	x	x
232	11499	x	x	x
233	11566	x	x	x
234	11584	x	x	x
235	11649	x	x	x
236	11672	x	x	x
237	1094		x	x
238	1117		x	x
239	1161		x	x
240	1173		x	x
241	1230		x	x
242	1633		x	x
243	1634		x	x
244	1635		x	x
245	1704		x	x
246	1712		x	x
247	1728		x	x
248	1783		x	x
249	1820		x	x
250	1823		x	x
251	1884		x	x
252	1926		x	x
253	1968		x	x
254	1981		x	x
255	2049		x	x
256	2220		x	x
257	2237		x	x
258	2342		x	x
259	2556		x	x
260	2596		x	x
261	2710		x	x
262	2953		x	x
263	2960		x	x
264	3026		x	x
265	3138		x	x
266	3157		x	x
267	3170		x	x
268	3203		x	x
269	3342		x	x
270	3505		x	x
271	3556		x	x
272	3594		x	x
273	3612		x	x
274	3785		x	x
275	3937		x	x
276	4052		x	x
277	4058		x	x
278	4077		x	x
279	4127		x	x
423	2595			x
424	2615			x
425	2675			x
426	2697			x
427	2698			x
428	2703			x
429	2807			x
430	2888			x
431	3007			x
432	3048			x
433	3062			x
434	3116			x
435	3129			x
436	3275			x
437	3310			x
438	3516			x
439	3538			x
440	3570			x
441	3584			x
442	3647			x
443	3761			x
444	3806			x
445	3807			x
446	3916			x
447	4059			x
448	4072			x
449	4124			x
450	4156			x
451	4274			x
452	4275			x
453	4277			x
454	4476			x
455	4494			x
456	4498			x
457	4599			x
458	4645			x
459	4669			x
460	4860			x
461	5116			x
462	5165			x
463	5205			x
464	5404			x
465	5442			x
466	5520			x
467	5539			x
468	5680			x
469	5697			x
470	5783			x
471	5903			x
472	5973			x
473	5978			x
474	5980			x
475	6003			x
476	6021			x
477	6034			x
478	6097			x
479	6110			x
480	6130			x
481	6152			x
482	6169			x
483	6194			x
484	6308			x
485	6346			x
486	6357			x
487	6370			x
488	6500			x
489	6527			x
490	6532			x

69	3835	x	x	x	280	4225		x	x	491	6565			x
70	3946	x	x	x	281	4273		x	x	492	6588			x
71	3964	x	x	x	282	4279		x	x	493	6672			x
72	3969	x	x	x	283	4418		x	x	494	6694			x
73	4016	x	x	x	284	4448		x	x	495	6768			x
74	4036	x	x	x	285	4579		x	x	496	6771			x
75	4040	x	x	x	286	4802		x	x	497	6946			x
76	4060	x	x	x	287	4903		x	x	498	7107			x
77	4066	x	x	x	288	4918		x	x	499	7124			x
78	4087	x	x	x	289	4925		x	x	500	7132			x
79	4145	x	x	x	290	4936		x	x	501	7161			x
80	4186	x	x	x	291	5109		x	x	502	7251			x
81	4194	x	x	x	292	5218		x	x	503	7268			x
82	4199	x	x	x	293	5237		x	x	504	7275			x
83	4321	x	x	x	294	5338		x	x	505	7300			x
84	4423	x	x	x	295	5475		x	x	506	7331			x
85	4450	x	x	x	296	5523		x	x	507	7343			x
86	4460	x	x	x	297	5530		x	x	508	7350			x
87	4462	x	x	x	298	5560		x	x	509	7469			x
88	4503	x	x	x	299	5572		x	x	510	7576			x
89	4523	x	x	x	300	5594		x	x	511	7682			x
90	4560	x	x	x	301	5723		x	x	512	7685			x
91	4608	x	x	x	302	6008		x	x	513	7691			x
92	4768	x	x	x	303	6013		x	x	514	7798			x
93	4771	x	x	x	304	6115		x	x	515	7936			x
94	4809	x	x	x	305	6136		x	x	516	7980			x
95	4818	x	x	x	306	6214		x	x	517	7984			x
96	4843	x	x	x	307	6215		x	x	518	7985			x
97	4881	x	x	x	308	6311		x	x	519	8009			x
98	4911	x	x	x	309	6314		x	x	520	8017			x
99	4941	x	x	x	310	6315		x	x	521	8020			x
100	4988	x	x	x	311	6326		x	x	522	8071			x
101	5047	x	x	x	312	6437		x	x	523	8073			x
102	5050	x	x	x	313	6461		x	x	524	8133			x
103	5125	x	x	x	314	6506		x	x	525	8169			x
104	5179	x	x	x	315	6512		x	x	526	8333			x
105	5210	x	x	x	316	6543		x	x	527	8334			x
106	5252	x	x	x	317	6617		x	x	528	8341			x
107	5254	x	x	x	318	6619		x	x	529	8387			x
108	5256	x	x	x	319	6733		x	x	530	8388			x
109	5301	x	x	x	320	6821		x	x	531	8402			x
110	5458	x	x	x	321	6839		x	x	532	8446			x
111	5492	x	x	x	322	6845		x	x	533	8666			x
112	5496	x	x	x	323	6972		x	x	534	8832			x
113	5567	x	x	x	324	6994		x	x	535	8858			x
114	5568	x	x	x	325	7022		x	x	536	8864			x
115	5581	x	x	x	326	7114		x	x	537	8867			x
116	5597	x	x	x	327	7281		x	x	538	8881			x
117	5667	x	x	x	328	7295		x	x	539	8892			x
118	5690	x	x	x	329	7471		x	x	540	8901			x
119	5691	x	x	x	330	7481		x	x	541	9034			x
120	5709	x	x	x	331	7506		x	x	542	9098			x
121	5824	x	x	x	332	7636		x	x	543	9125			x
122	5878	x	x	x	333	7662		x	x	544	9289			x
123	6066	x	x	x	334	7799		x	x	545	9305			x
124	6078	x	x	x	335	7875		x	x	546	9521			x
125	6104	x	x	x	336	7911		x	x	547	9619			x
126	6266	x	x	x	337	7912		x	x	548	9647			x
127	6268	x	x	x	338	7921		x	x	549	9916			x
128	6335	x	x	x	339	7995		x	x	550	9919			x
129	6375	x	x	x	340	8047		x	x	551	9954			x
130	6435	x	x	x	341	8105		x	x	552	10008			x
131	6573	x	x	x	342	8162		x	x	553	10200			x
132	6574	x	x	x	343	8176		x	x	554	10221			x
133	6639	x	x	x	344	8336		x	x	555	10235			x
134	6829	x	x	x	345	8386		x	x	556	10364			x
135	6830	x	x	x	346	8423		x	x	557	10382			x
136	6900	x	x	x	347	8463		x	x	558	10426			x
137	7106	x	x	x	348	8512		x	x	559	10530			x
138	7154	x	x	x	349	8515		x	x	560	10532			x
139	7163	x	x	x	350	8687		x	x	561	10598			x
140	7171	x	x	x	351	8699		x	x	562	10631			x
141	7203	x	x	x	352	8717		x	x	563	10734			x
142	7228	x	x	x	353	8850		x	x	564	10840			x
143	7257	x	x	x	354	8902		x	x	565	10981			x
144	7260	x	x	x	355	8947		x	x	566	11032			x

145	7409	x	x	x
146	7420	x	x	x
147	7435	x	x	x
148	7486	x	x	x
149	7566	x	x	x
150	7585	x	x	x
151	7620	x	x	x
152	7692	x	x	x
153	7750	x	x	x
154	7762	x	x	x
155	7850	x	x	x
156	7923	x	x	x
157	8068	x	x	x
158	8210	x	x	x
159	8219	x	x	x
160	8247	x	x	x
161	8304	x	x	x
162	8348	x	x	x
163	8350	x	x	x
164	8357	x	x	x
165	8358	x	x	x
166	8440	x	x	x
167	8475	x	x	x
168	8479	x	x	x
169	8530	x	x	x
170	8543	x	x	x
171	8549	x	x	x
172	8551	x	x	x
173	8582	x	x	x
174	8606	x	x	x
175	8762	x	x	x
176	8859	x	x	x
177	8958	x	x	x
178	8972	x	x	x
179	9216	x	x	x
180	9225	x	x	x
181	9258	x	x	x
182	9299	x	x	x
183	9402	x	x	x
184	9459	x	x	x
185	9590	x	x	x
186	9599	x	x	x
187	9761	x	x	x
188	9771	x	x	x
189	9777	x	x	x
190	9778	x	x	x
191	9812	x	x	x
192	9818	x	x	x
193	9922	x	x	x
194	10000	x	x	x
195	10005	x	x	x
196	10030	x	x	x
197	10056	x	x	x
198	10156	x	x	x
199	10159	x	x	x
200	10190	x	x	x
201	10198	x	x	x
202	10215	x	x	x
203	10236	x	x	x
204	10247	x	x	x
205	10345	x	x	x
206	10374	x	x	x
207	10386	x	x	x
208	10441	x	x	x
209	10540	x	x	x
210	10565	x	x	x
211	10581	x	x	x
356	9016		x	x
357	9173		x	x
358	9302		x	x
359	9319		x	x
360	9323		x	x
361	9372		x	x
362	9472		x	x
363	9501		x	x
364	9715		x	x
365	9774		x	x
366	9882		x	x
367	9937		x	x
368	9999		x	x
369	10115		x	x
370	10124		x	x
371	10195		x	x
372	10275		x	x
373	10286		x	x
374	10305		x	x
375	10349		x	x
376	10353		x	x
377	10466		x	x
378	10615		x	x
379	10685		x	x
380	10686		x	x
381	10839		x	x
382	10877		x	x
383	10902		x	x
384	11017		x	x
385	11027		x	x
386	11161		x	x
387	11213		x	x
388	11257		x	x
389	11300		x	x
390	11302		x	x
391	11315		x	x
392	11366		x	x
393	11537		x	x
394	11538		x	x
395	11600		x	x
396	15247		x	x
397	1021			x
398	1034			x
399	1082			x
400	1210			x
401	1262			x
402	1518			x
403	1523			x
404	1533			x
405	1562			x
406	1577			x
407	1602			x
408	1682			x
409	1864			x
410	1878			x
411	2055			x
412	2111			x
413	2124			x
414	2163			x
415	2251			x
416	2337			x
417	2406			x
418	2536			x
419	2537			x
420	2555			x
421	2573			x
422	2589			x
567	11051			x
568	11065			x
569	11169			x
570	11172			x
571	11258			x
572	11443			x
573	11509			x
574	11511			x
575	11694			x
576	11749			x
577	11779			x
578	11781			x
579	11790			x
580	11832			x
581	11914			x
582	11930			x
583	11976			x
584	12065			x
585	12091			x
586	12142			x
587	12321			x
588	12507			x
589	12616			x
590	13169			x
591	13400			x
592	13994			x
593	13997			x
594	14010			x
595	14042			x
596	14062			x
597	14067			x
598	14068			x
599	14102			x
600	14265			x
601	14312			x
602	14316			x
603	14538			x
604	15000			x
605	15007			x
606	15014			x
607	15016			x
608	15020			x
609	15042			x
610	15083			x
611	19661			x

CHAPTER 5

Debt Maturity and Financial Integration

5.1. Introduction

Since the mid-1980s, many countries around the world have implemented financial deregulation policies and have opened their domestic financial markets to foreign investors and financial institutions. This financial globalization process, i.e. the financial liberalization and the integration of countries with the international financial system, has greatly affected domestic financial systems around the world by increasing competition between financial intermediaries and giving firms the opportunity to expand their financing choices significantly.

The benefits and risks associated with financial globalization have been studied by the existing literature. Prior studies have documented that financial liberalization and integration decreases the cost of capital (e.g., Clarke et al, 2001; Chari and Henri, 2004) and boosts economic growth and private investment (e.g. Gruben and McLeod, 1998; Bosworth and Collins, 2000; Kumar and Pradhan, 2001). On the other hand, Jeanne (2003), McKinnon and Pill (1997), Mendoza and Quadrini (2010), among others, have shown that financial globalization has made the international financial system more vulnerable to crises, due to maturity and exchange rate mismatches and increased contagion risk.

It is often argued that among all types of international capital flows, the greatest risk stems from short-term flows, because they are very sensitive to herding behavior. Even small negative changes in market sentiment about a country can generate abrupt and large foreign capital outflows, creating costly liquidity runs for domestic borrowers (Chang and Velasco, 2000). Many empirical studies provide strong support to the argument that short-term flows are more unstable than long-term flows and more sensitive to negative shifts of market sentiment (Chuhan et al, 1996; Sarno and Taylor, 1999; Dadush et al, 2000). The higher the proportion of short-term funds flowing into a country, the higher is the risk of large capital flow reversals and liquidity runs suffered by domestic borrowers.

It becomes obvious that the maturity structure of the foreign capital flows is an important determinant for whether the recipient country will have net benefits from integrating with the word financial system. Thus motivated, we explore the effect of credit market integration on the maturity structure of firms operating in developed economies. There are different arguments concerning the financial integration effects on debt maturity. According to the first argument, firms that access international markets should experience a positive shift in their debt maturity, given that international markets are more developed and more liquid than domestic markets and therefore facilitate long-term financing. According to another view, foreign creditors face informational disadvantages when lending to domestic borrowers and therefore prefer to lend short-term, in order to be able to discipline them.

Previous studies exploring the effect of financial integration on corporate debt maturity report mixed results. Schmukler and Vesperoni (2006) document that financial integration has a different impact on firms that access international debt and equity markets and on firms that rely only on domestic credit and equity markets. The former increase their long-term debt and extend their debt maturity, while the latter decrease their long-term debt and their debt maturity. Agca et al. (2007) show that increased credit market integration leads to longer debt maturity in developed countries and shorter debt maturity in developing countries. Lucey and Zhang (2011) report that the relationship between credit market integration and debt maturity is not clear.

This paper belongs and contributes to this strand of literature. This work differs from the aforementioned studies in a very significant aspect, namely the methodological approach. The classic method used in the existing literature for testing the integration process involves regressing debt maturity ratios on variables that proxy for the level of financial integration and domestic financial development/liberalization. The limitation of this method is that it cannot capture the dynamic component of the integration process. In particular, it does not quantify the integration process in a formal way and therefore it does not give an indication of how integration evolves over time and when integration is stronger.

Thus motivated, we address the aforementioned methodological issue by applying the panel convergence methodology developed by Philips and Sul (2007) on the debt maturity ratios of a set of firms. This methodology allows for visual inspection of the evolution of convergence over time and identifies two types of convergence, namely in levels and in rates. Convergence in rates means that the variable of interest has the same rate of change across different cross sectional units, while convergence in levels means that the variable of interest converges to the same value. This methodology also identifies convergent clubs, i.e. subgroups of convergent firms. We make the plausible assumption that, since integration affects in tandem all firms accessing international credit markets, firms that are involved in the process of integration should experience some form of convergence in their debt maturity ratios. Our strategy is as follows. After identifying convergent clubs, i.e. firms whose debt maturity ratio converges in levels or in rates, we test the relationship between the debt maturity ratios and the financial integration proxies for the constituent firms of each club.

We identify one big convergent (in rates) club, consisting of firms whose debt maturity is affected by the level of credit market integration. The rest of the firms in the sample are not affected by the level of credit market integration. These results indicate that firms belonging to the club are subject to less informational asymmetries and have higher collateral value than the rest of the firms. More importantly, the debt maturity of the firms that belong to the big club increases with the level of credit market integration. This finding provides support to the argument that access to international markets alleviates financial constraints for firms and facilitates long-term financing. The debt maturity of the rest of the firms may not be sensitive to the level of integration, but it decreases as integration proceeds to higher levels. In addition, the maturity structure of the rest of the firms is affected to a larger extent by the development of the domestic banking system, compared to the maturity structure of the big club firms

The paper is organized as follows. Section 5.2 contains a brief literature review and also develops the main hypotheses. Section 5.3 refers to the panel convergence methodology developed by Phillips and Sul (2007). Section 5.4 describes the data that are used. Section 5.5 presents and discusses the results and Section 5.6 concludes.

5.2. Literature review and hypotheses development

During the last 30 years many countries encouraged foreign capital inflows by removing restrictions and controls on foreign investment, liberalizing domestic financial markets and making market-oriented reforms. This process of integration with the international financial system entails both costs and benefits for the countries involved. Financial integration may stimulate economic growth, boost domestic investment and lower the cost of capital. In addition to potential benefits, financial integration may also generate significant costs in terms of increased volatility of capital flows that makes countries, which are integrated with the international financial system, more vulnerable to financial crises.

Starting with the benefits, foreign capital inflows help the recipient country to raise the level of domestic investment and in turn the rate of economic growth. This happens through two channels. First, foreign capital inflows supplement domestic saving and thus increase the available capital for investment. Second, foreign investments may also involve the transfer of managerial and technological know-how, improving the skills of domestic labor force and thereby raising productivity and competitiveness of the domestic economy (Borensztein et al, 1998). Studies testing the impact of international financial integration on investment and economic growth usually employ the level of foreign capital inflows as a proxy for the degree of integration (e.g. Gruben and McLeod, 1998; Bosworth and Collins, 2000; Kumar and Pradhan, 2001). According to their findings, the level of capital inflows has a positive impact on the level of domestic investment and the rate of GDP growth of the recipient country.

Another argument in favor of financial integration concerns the decline in the cost of capital. According to this view, the entry of foreign investors and financial institutions in the domestic financial system may create competitive pressures on domestic financial institutions and thereby mitigate or even eliminate excessive profits associated with oligopolistic financial market structures (Levine, 1996). Another similar argument is that the cost of capital is reduced because foreign financial institutions introduce advanced techniques in the financial intermediation process and therefore increase the efficiency of the domestic financial system. Empirical evidence provides support to the aforementioned arguments. Clarke et al (2001) study the impact of foreign bank penetration in 38 economies and find significant benefits for firms in terms of interest rate costs and availability of long-term loans. Chari and Henri (2004) find that firms that become investible for foreign investors, experience a significant positive stock price revaluation, which suggests a reduction in the cost of equity.

Turning to the potential costs, it is argued that short-term capital flows can be very unstable. In particular, a negative change in domestic economic fundamentals or in an international factor such as world interest rates can trigger sudden and massive capital outflows by foreign investors., creating the risk of a financial crisis. Even small shifts in market sentiment can generate significant withdrawals of foreign capital, especially by hedge funds and other investors with speculative trading investment style. The reason is that short-term flows are very sensitive to herding behavior due to asymmetric information problems. International investors and portfolio managers are often partially informed about the countries they invest in, so they prefer to hide in the herd, i.e. mimic the actions of the majority of other investors, in order to avoid criticism in both the good and the bad times. Besides, when a negative economic shock occurs in the recipient country, investors may not be able to fully understand the consequences and thus prefer to withdraw all of their capital. Chang and Velasco (2000) argue that sudden short-term capital outflows can create severe liquidity runs for borrowers.

Several empirical studies have examined the volatility of foreign capital flows. Their main conclusion is that there is a significant difference in the volatility of long-term and short-term flows, with the former being more stable than the latter. Chuhan et al (1996) find that short-term flows are more sensitive to turbulence in financial markets than long-term flows. Sarno and Taylor (1999) decompose different types of capital flows into permanent and cyclical components. They find that long-term flows have the highest permanent component of all other flows. Dadush et al (2000) find evidence implying that short-term flows are pro-cyclical over the business cycle, while medium-term and long-term flows are weakly counter-cyclical. This means that short-term flows decline in bad times and thus may exacerbate economic downturns. The same study documents that short-term inflows in Asian countries declined significantly during the Asian crisis in 1997-1998, while long-term flows remained stable.

The preceding discussion highlights that the time horizon of the foreign capital that flows into a country is very significant in determining whether the recipient country will have net benefits from financial integration or not. The higher the proportion of short-term funds, the higher the risk of large capital flow reversals and liquidity runs suffered by domestic borrowers. Thus motivated, we explore the effect of financial integration on the debt maturity of firms operating in developed countries. We use firm-level data instead of aggregate data, because they allow us to focus only on the firms that are able to integrate with the international financial system.

We study how access to international credit markets affects the debt structure of firms. There are two different arguments concerning this effect. According to the first approach, the debt maturity of firms that gain access to international credit markets will be prolonged, because international markets are more mature, more liquid and operate within a more developed legal and institutional environment than many domestic financial markets. As a consequence, access to international markets alleviates financial constraints and facilitates long-term financing (Clarke et al, 2001). Furthermore, domestic borrowing is also facilitated, since access in international markets is considered to be a credible signal by domestic lenders for the creditworthiness of the firm. According to the second approach, international investors often face informational disadvantages when investing in a foreign country. Therefore, they prefer to provide short-term instead of long-term financing, in order to be able to discipline the borrowers. Short-term is considered to be a discipline device that mitigates the risk that investors will be expropriated by firms, because it has to be rolled over by firms frequently (Rodrik and Velasco, 2003). Hence, we test the following two hypotheses:

H1a: The debt maturity of firms is positively affected by the degree of credit market integration.
H1b: The debt maturity of firms is negatively affected by the degree of credit market integration.

The literature group that explores the effect of financial integration on the capital structure of firms using firm-level data is relatively young. Therefore, there is only a limited number of previous studies that examine the impact of equity and/or credit market integration on leverage ratios and debt maturity ratios of firms. Schmukler and Vesperoni (2006) study firms in 7 developing countries and document that financial integration has a different impact on firms that access international debt and equity markets and on firms that rely only on domestic credit and equity markets. The former increase their long-term debt and extend their debt maturity, while the latter decrease their long-term debt and their debt maturity. Mitton (2006) finds that firms whose stocks are available to foreign investors experience lower leverage. Agca et al. (2007) show that increased credit market integration leads to higher leverage and longer debt maturity in developed countries and to higher leverage but shorter debt maturity in developing countries. Lucey and Zhang (2011) studies the capital structure of firms in 24 developing countries and find that leverage is positively associated with credit market integration and negatively associated with equity market integration. They also report that the relationship between credit or equity market integration and debt maturity is not clear.

In sum, previous evidence about the impact of financial integration on debt maturity of firms is mixed. The goal of this study is to contribute to the clarification of this unsettled issue. As analyzed in the introduction, the novelty of this study is that we employ a different methodology that has two advantages compared to previous studies. First, it is appropriate for detecting the firms that are mostly affected by financial integration. Second, it quantifies the integration process in a formal way and therefore gives an indication of how integration evolves over time and when integration is stronger.

5.3. Panel convergence methodology

We employ the methodology proposed by Phillips and Sul (2007) to test for debt maturity ratio convergence in a panel of firms. In essence, this methodology tests whether the dispersion across cross-sectional units of the variable of interest declines over time. It allows for testing for two types of convergence. Convergence in rates means that the debt maturity ratio – the variable of interest in this study – of different firms changes by the same rate every year. Convergence in rates means that the debt maturity ratio of different firms converges to the same value as time goes by. It also allows for testing for convergent clubs, namely for groups of firms whose debt maturity ratios converge. A detailed description of the methodology can be found in Section 4.3.

5.4. Data

Firm-level accounting data are collected from Worldscope, have an annual frequency and cover the period 1990-2010. Our dataset consists of public firms from 22 developed countries. Following previous research, financial firms (SIC 6000-6999) and utilities (SIC 4900-4999) are excluded. Variables are measured in constant 1983 dollars using the US CPI as a deflator. We winsorize all (final) accounting variables at the 1st and the 99th percentile to avoid the effect of outliers and misreported data.

Country-level variables, which are necessary for our analysis, are available from 1990 onwards. Financial system deposits (DEPOS) are demand, time and saving deposits in deposit money banks and other financial institutions, as a share of GDP. Total insurance premium (INS) is the sum of life and nonlife insurance premium volume as a share of GDP. International Debt Securities (INTDEBT) is the outstanding amount of bonds, notes and money market instruments placed in international markets, as a share of GDP. The Corruption Perception Index (CORRUPT) measures the perceived levels of public sector corruption in each country. The original index is reversed, i.e. it ranges from 0 to 10, with larger values indicating more severe corruption. Data on DEPOS, INS and INTDEBT are collected from the Financial Structure Dataset of World Bank. Data on CORRUPT are collected from the Transparency International.

Depending on the required data for different types of analysis in the course of this study, the number of usable firm-year observations will vary accordingly.

5.5. Results

5.5.1. Convergence tests

Our first convergence test concerns the whole sample. In particular, we examine if the debt maturity ratios of al firms in our sample exhibit some form of convergence. Given that only a fraction of firms are able to integrate with international markets (Schmukler and Vesperoni, 2006) and that there is no other universal force that could generate convergence in debt structure across all firms from different countries, it is unlikely that we detect convergence in debt maturity ratios. As expected, the results of our full-sample convergence test indicate that there is no convergence detected when the whole sample is tested. As Table 5.3 indicates, the null hypothesis of convergence is rejected at the 1% level, since the t-statistic of $\hat{b}$ is -33.46, significantly lower than the critical value of -1.65.

Given the absence of convergence in the whole sample, we implement the club convergence algorithm to identify clubs of firms that satisfy the convergence criterion. If financial integration exerts a sufficiently strong influence – either positive or negative – on debt maturity ratios, then we expect this influence to become evident through the formation of a convergent club. Simply put, we expect that firms that are able to access international markets will form a convergent club, provided that the influence of financial integration on debt maturity ratios is significant and sufficiently strong. The results are presented in Table 5.4. There are 36 convergent clubs detected. There is one big club comprising of 965 firms and accounting for 77% of the sample. The rest of the detected clubs are relatively small ranging from 0.2% to 7.7% of the sample. The convergence within the big club happens in rates, i.e. debt maturity ratio has the same rate of change across the firms belonging in the club. The divergent firms, i.e. firms that do not belong in any club, account for 1.4% of the sample.

The detection of a convergence club is not a sufficient finding, of course, for drawing any final conclusions about the impact of financial integration on firms. To establish that the formation of a convergent club is driven by financial integration forces, we need to make extra tests. In particular, we have to examine the sensitivity of corporate debt structure towards the level of financial integration across firms that belong in the club and firms that do not belong in a club. Such tests are conducted and discussed in the following subsections.

5.5.2. Is convergence driven by financial integration?

Our next goal is to examine if one of the detected clubs is formed due to financial integration forces. Our methodology is as follows. Suppose we want to test club X. We separate firms into those that belong to club X and those that do not and test how credit market integration affects the maturity ratios of the firms across the two groups. If the formation of club X is driven by financial integration, then we should find a significant association between debt maturity ratios and the level of financial integration only for the firms that belong to club X. Given that the detected big club accounts for the majority of the firms in the sample, it is our prime candidate for testing.

In order to assess the impact of integration on corporate debt structure, we regress debt maturity ratios of firms on the level of credit market integration. Two separate panel regressions are run, i.e. one for the firms that belong to the big club and one for the rest of the firms. To proxy for the level of credit market integration of each country, we use the outstanding amount of bonds, notes and money market instruments placed in international markets, as a share of GDP.

We also control for the development of the domestic financial system. In order to capture domestic financial system development, prior studies have used the amount of bank assets or the size and the turnover of stock and bond markets. As correctly pointed by Fan et al (2012), these variables raise endogeneity issues, since financial intermediaries may develop in ways that satisfy the needs of firms. Therefore, following Fan et al (2012), we use two variables that measure the supply of funds to financial intermediaries. Deposits as a share of GDP are used to capture the amount of funds that are available to the banking sector. Banks tend to have short-term liabilities and thus they may prefer to provide short-term credit. Therefore, we expect to find a negative relationship between debt maturity ratios of firms and the development of the banking sector. The sum of life and nonlife insurance premium volume as a share of GDP is used to capture the amount of funds that are available to the insurance industry and the pension fund schemes respectively. Insurance companies and pension funds tend to have long-term liabilities and thus they may prefer to hold long-term assets. Therefore, we expect to find a positive relationship between debt maturity ratios of firms and the development of the industry and pension fund industry.

We also control for the integrity of the legal system in each country. We use the Corruption Perception Index, which measures the perceived levels of public sector corruption in each country. Creditors, in order to make a long-term commitment, require a legal system that can deter opportunistic behavior of borrowers and enforce compensation in case of violation. Therefore, we expect that debt maturity will be negatively associated with the level of public sector corruption.

Finally, we control for certain firm-specific characteristics, namely size and market-to-book ratio, which are expected to be correlated with debt structure. According to adverse selection models of capital structure (Flannery, 1986; Diamond 1993), asymmetric information between borrowers and lenders introduces a bias towards short-term debt. This happens because, when firms have favorable private information about their value and the creditors cannot distinguish between good and bad firms, the debt issued by the good firms will be underpriced. Since the pricing of long-term debt is more sensitive to changes in firm value than the pricing of short-term debt, the undepricing of long-term debt will be more severe. Therefore, higher levels of asymmetric information imply greater bias towards short-term debt. Given that the market has usually more information about large firms than for small firms, the undepricing will be less severe and thus larger firms are expected to use more long-term debt. Therefore, debt maturity is expected to be positively correlated with size. Another distortion induced by asymmetric information is the underinvestment problem. When firms are levered, the proceeds from undertaking future investments are split between shareholders and creditors. According to the underinvestment hypothesis (Myers, 1977), the presence of debt in the capital structure of a firm creates the risk that the firm will forgo positive net present value investments. Myers (1977) argues that sometimes, when firms are highly levered, the creditors extract enough of the future proceeds of a potential investment project, so that shareholders have no incentive to undertake it. According to Myers, short-term debt mitigates the risk of underinvestment and thus firms with more growth opportunities will prefer short-term to long-term debt. Given that the market-to-book ratio proxies for the investment opportunity set of a firm, we expect that it will be negatively related to debt maturity.

The results of the regressions of debt maturity ratios on the level of credit market integration and all the aforementioned control variables are presented in Tables 5.5 and 5.6. Table 5.5 contains the results from the two separate regressions, i.e. one for the big club firms and one for the rest of the firms. We also test if the difference between the estimated coefficients across the two groups is statistically significant, by running one regression for the whole sample and incorporating an interaction variable that takes the value of one if a firm belongs to the big club and zero otherwise. The results are presented in Table 5.6. All regressions incorporate country, industry and year dummy variables to account for any country, industry or year-specific effect.

There is an array of important findings. First, as shown in Table 5.5, the financial integration variable is significant only for the big club firms. This implies that credit market integration affects the maturity structure of the firms that belong to the big club, and not the maturity structure of the rest of the firms. This result is robust even after controlling for firm-specific characteristics (columns 2a and 2b), the level of domestic financial system development (columns 3a and 3b) and the integrity of the domestic legal system (columns 4a and 4b). This finding provides strong support to the hypothesis that the detected convergence within the big club may be attributed to financial integration forces. In other words, results imply that the big club captures the firms that were able to access international credit markets.

Another important finding is that the detected relationship is positive, i.e. a higher level of integration is associated with more extended maturities. This finding is in line with hypothesis H1a, providing support to the argument that gaining access to international markets, which are usually more liquid and developed than domestic markets, alleviates financial constraints for domestic firms and allows them to obtain long-term financing more easily. Our results are consistent with previous findings of the literature. Demirgüç-Kunt and Maksimovic (1999) compare the financial structure of firms in developed and developing countries and find the greatest difference to be in the provision of long-term credit. In another paper, Demirgüç-Kunt and Maksimovic (1998) find that in countries whose legal and financial systems are developed, firms grow faster. More importantly, the authors show that this happens, because a developed financial and legal environment facilitates firms' access to long-term financing, i.e. long-term debt and equity. De la Torre and Schmukler (2005) show that the ability of a firm to obtain credit under multiple jurisdictions is considered to be a credible signal by lenders for the creditworthiness of the firm. Therefore, such firms become more able to borrow long-term.

The positive relationship between integration and debt maturity does not support hypothesis H1b. The evidence is not consistent with the view that partially informed international investors will prefer to lend short-term to domestic firms in order to be able to discipline them. This is not surprising, given that our sample consists of firms from developed countries. Consequently, asymmetric information problems between foreign lenders and domestic borrowers may not be so severe to induce a shortening of the debt maturity. It should be noted though, that this result should be interpreted with caution. It does not necessarily imply that asymmetric information considerations are not in force when foreign lenders provide credit to domestic borrowers. Such problems may manifest themselves in other ways. For instance, lenders may not decide to lend short-term, but they still might prefer to lend only large firms, given that markets usually possess more information about large firms.

Turning to results concerning the firm-level variables, the coefficient for size, as shown in Table 5.5, is significant and has the expected positive sign across both groups and all different regression specifications. Consistent with the adverse selection models of capital structure (Flannery, 1986), it appears that larger firms have debt of longer maturity. We also find that, as predicted by the underinvestment hypothesis (Myers, 1977), debt maturity is negatively correlated with the market-to-book ratio. However, this applies only for the firms that belong in the big club. For the rest of the firms, there is not a significant relationship detected. Myers (1977) argues that the underinvestment problem is more likely to arise in highly levered firms. Hence, it is not surprising that the market-to-book ratio affects the debt structure of the big club firms and not the debt structure of the rest of the firms, because the former are on average more levered than the latter. Table 5.8 (columns (2) and (3)) presents evidence implying that big club firms are more levered than the rest of the firms. The results are from a Probit regression, where the dependent variable is a binary variable taking the value of one if the firm belongs to the big club and zero otherwise. The independent variable is corporate leverage. The estimated coefficient for leverage is positive and significant, indicating that the more levered the firm, the higher the probability that it will belong in the big club. This holds for both types of leverage, i.e. financial debt over assets and total liabilities over assets.

The next group of findings pertains to variables proxying for the development of domestic financial system. We find that, in both groups, the development of the banking sector is associated with shorter maturities, while the development of the insurance/pension fund industry is associated with longer maturities (Table 5.5). This was expected, given that banks have relatively short-term investment horizon preferences, while insurance companies and pension funds have relatively long-term preferences. In addition, as shown in columns (3) and (4) in Table 5.6, the development of the banking sector has a stronger impact on the maturity structure of the firms that do not belong in the big club, indicating a more significant reliance of these firms on the domestic banking system. This finding provides extra support to the hypothesis that the big club consists of firms that have access to international markets. Firms with expanded financing resources will likely depend less on domestic banks.

Concerning the impact of the legal environment on debt structure, we find that higher levels of perceived corruption have a negative impact on debt maturity across both groups, as expected (columns (4a) and (4b) in Table 5.5). It appears that creditors provide more easily long-term debt within a more efficient legal environment.

Another factor that may have influenced corporate debt maturity is investors' demand for long-term bonds. The upward trend in bond prices during the last 30 years increased dramatically the demand for long-term bonds by speculative trading institutions like hedge funds. So, the observed shift to the long term in corporate debt maturity may be the result of increased demand for long-term bonds by speculators in credit markets. In order to test for this effect, we incorporate in our regression a variable that captures the increase in bond prices around the world. This variable is the annual returns of J.P. Morgan Global Aggregate Bond Index, which is the global investment grade debt benchmark for fixed-income investors. Results are presented in Table 5.7. The estimated coefficient is positive and significant for the firms in the big club, indicating that the rise in bond prices is positively correlated with corporate debt maturities. This implies that increased investors' demand has also influenced the choice of firms to issue long-term debt. Furthermore, the coefficient of the financial integration proxy is still positive and significant, indicating that the effect of financial integration on corporate debt maturity is robust even after controlling for speculators' demand.

5.5.3. Characteristics of firms that have access to international markets

The preceding analysis provided evidence indicating that firms that belong to the big club are those that have access to international financing. Next, we explore the differences between these firms and the rest of the firms, in terms of firm-level characteristics. We conjecture that firms with less informational asymmetries and higher collateral value will find it easier to tap international markets. We run a Probit regression, using as independent variables certain firm-specific variables, namely size, profitability, market-to-book ratio and tangibility. The dependent variable is a binary variable taking the value of one if the firm belongs to the big club and zero otherwise. Positive (negative) and significant estimated coefficients for any of the independent variables would imply that higher values of the underlying characteristic raise (lower) the probability that the firm will belong to the big club.

Results are presented in column (1) of Table 5.8. Firms that, according to our previous findings, have access to international markets are more likely to be larger, more profitable, to have lower market-to-book ratio and more tangible assets. The results make economic sense. Markets have more information about large firms. Profitability is an indication of the ability of the firm to generate internal resources. Market-to-book ratio is a proxy for growth opportunities. Firms, whose value is determined to a large extent from future growth opportunities, are usually more sensitive to asymmetric information problems compared to firms, whose value depends mostly on harvesting assets-in-place. Tangibility is a proxy for the available collateral of the firm. In sum, firms that can access foreign financing appear to face less informational asymmetries and have higher collateral values, compared to the rest of the firms.

5.5.4. Evolution of debt maturity ratios and the level of integration

We also calculate and plot the average cross-sectional debt maturity ratio for each year across the two groups and plot it on the same graph. As portrayed in Figure 5.1, the firms in the big club appear to have higher ratios on average throughout the whole sample period. Furthermore, the difference between the two groups widens from 1996 onwards. This pattern becomes more evident when we calculate and plot the relative transition curve for the big club. The relative transition curve is calculated every year as the ratio of the cross-sectional average maturity ratio of the big club firms to the cross-sectional average maturity ratio of all the firms in the sample. It measures the diversion between the maturity ratios of the two groups. A rising curve implies that the maturity ratios of the big club firms increase relative to the maturity ratios of the rest of the firms. The curve, depicted in Figure 5.2, is relatively flat until 1996 and rises henceforth. In order to test if the change indicated by the visual inspection of these graphs is significant, we regress the debt maturity ratio on a dummy variable that takes the value of one for observations in years 1996 to 2010 and zero otherwise. The regression is estimated separately for each of the two groups. Table 5.9 presents the results. For the big club firms, the coefficient of the dummy variable is positive and significant, indicating that maturity ratios of the firms in the big club are higher after 1996. On the contrary, for the rest of the firms, the coefficient of the dummy variable is negative and significant, indicating that the maturity ratios of these firms are lower after 1996.

We also plot the relative transition curve together with curves that show the evolution of country-level variables (Figures 5.2 to 5.4). As shown in Figure 5.2, the relative transition curve of the big club tracks very closely the curve that depicts the evolution of outstanding amount of internationally issued debt securities as a share to GDP. This implies that the average debt maturity divergence of the firms that are able to integrate with international credit markets relative to the firms that are not, tracks very closely the level of financial integration. This is consistent with our previous results in subsection 5.5.2 that showed that only big club firms are affected by the level of financial integration. On the contrary, the relative transition curve does not track the evolution of financial system deposits (Figure 5.3) or total insurance premiums (Figure 5.4).

In sum, the analysis of the evolution of debt maturity ratios yields two results. First, as integration proceeds to higher levels, the debt maturity ratios of firms that integrate with international markets are prolonged. This corroborates the findings concerning the positive relationship between the maturity ratios and the level of integration reported in subsection 5.5.2. Second, firms that are not affected by integration, experience a shortening in their debt maturity ratios, as integration proceeds to higher levels.

5.5.5. Direct and indirect impact of financial integration on debt maturity

Prior studies (e.g. De Jong et al, 2008) that tested the effect of country-level determinants on debt-equity ratios have documented that, in addition to the direct effects, there are also indirect effects. Specifically, country-level variables change the way that firm-specific variables affect the debt-equity ratios of firms. For example, an improvement in creditor right protection mitigates asymmetric information problems between firms and creditors. As a result, the role of firm size as a proxy for informational asymmetries may be mitigated.

Thus motivated, we test if the level of financial integration influences the impact of firm-specific variables, i.e. size and market-to-book ratios, on debt maturity ratios. We follow the methodology of De Jong et al (2008). First we run a regression of debt maturity ratios on firm size and market-to-book ratios. We only include the firms that belong to the big club, since the rest of the firms are not affected by the level of financial integration. We incorporate in the regression country dummies to capture cross-country differences:

$$MAT_{i,t} = \sum_{c=1}^{22} \alpha_c d_c + \sum_{c=1}^{22} \beta_{1c} d_c ASSETS_{i,t} + \sum_{c=1}^{22} \beta_{2c} d_c MB_{i,t} + \varepsilon_{i,t} \qquad (1)$$

$MAT_{i,t}$, $ASSETS_{i,t}$ and $MB_{i,t}$ are the debt maturity ratio, total assets and the market-to-book ratio, respectively of firm *i* in year *t*. d_c are country dummies and *c* denotes a country. Essentially, the coefficients estimated form this regression are equal to the coefficients we would obtain, if we run separate regressions for each of the 22 countries.

Next, we explore if the estimated coefficients for the countries are correlated with the level of financial integration of each country. Therefore we run three similar cross-sectional regressions:

$$\hat{\alpha}_c = \gamma_0 + \gamma_1 AVINTDEBT_c + \varepsilon_c \qquad (2)$$

$$\hat{\beta}_{1c} = \lambda_0 + \lambda_1 AVINTDEBT_c + \varepsilon_c \qquad (3)$$

$$\hat{\beta}_{2c} = \zeta_0 + \zeta_1 AVINTDEBT_c + \varepsilon_c \qquad (4)$$

Equation (2) is estimated by a Weighted Least Squares regression of country dummy coefficients $(\hat{\alpha}_c)$ estimated from equation (1) against the average level of financial integration (AVINTDEBT) for each country during the sample period. The weights are the inverse standard errors of the corresponding country dummy coefficients, estimated from equation (1). These weights allow us to take into account the statistical significance of the related variables. In essence, the estimated dummy coefficients are a proxy for the level of debt maturity ratios of each country's firms after controlling for firm-specific effects. So, equation (2) captures the direct effects of financial integration on debt maturity. Hence, given our previous results, we expect to find a positive correlation between dummy coefficients and the level of financial integration of each country.

Equation (3) is a Weighted Least Squares regression of size coefficients $(\hat{\beta}_{1c})$ estimated from equation (1) against the average level of financial integration (AVINTDEBT) for each country. The weights are the inverse standard errors of the corresponding size coefficients, estimated from equation (1). With this regression we estimate the indirect impact of financial integration on debt maturity, via a firm-level determinant, i.e. size

Equation (4) is a Weighted Least Squares regression of market-to-book ratio coefficients $(\hat{\beta}_{2c})$ estimated from equation (1) against the average level of financial integration (AVINTDEBT) for each country. The weights are the inverse standard errors of the corresponding market-to-book ratio coefficients, estimated from equation (1). With this regression we estimate the indirect impact of financial integration on debt maturity, via a firm-level determinant, i.e. market-to-book ratio.

The results are presented in Table 5.10. Starting with regression (2), the coefficient of the level of financial integration is positive and significant, indicating that the direct impact of financial integration on corporate debt maturity is positive. In countries that firms are on average more integrated with international markets, corporate debt maturity is longer. This result is consistent with the preceding results in this study. In regression (3) the coefficient for the level for financial integration is positive and significant. This means that, in countries that firms are more integrated with the financial system, the coefficient for size is higher. Given that size is positively related to debt maturity, this result implies that the impact of size is reinforced with higher levels of financial integration. The results from regression (4) point to the same direction. The coefficient for financial integration is negative and significant. This means that in countries that firms are more integrated with international markets, the coefficient for market-to-book ratios is lower. Since the market-to-book ratio is negatively related to debt maturity, this result implies that the effect of market-to-book ratio is reinforced with higher levels of financial integration.

Our analysis showed that the magnitude of size and market-to-book ratio as determinants of corporate debt maturity is higher when firms integrate with international markets. Since both variables proxy for informational asymmetries between firms and creditors, one possible explanation for our finding could be that potential informational disadvantages of international investors may manifest themselves through the reinforcement of firm-level determinants. Foreign creditors, being aware that they are partially informed when approaching domestic borrowers, may be biased towards safer firms when providing long-term debt, i.e. towards larger firms and firms whose value depends more on assets-in-place and less on uncertain future investments. In that case, it appears that from all the firms that are able to tap international markets and access long-term finance, large firms and firms with more assets-in-place are those that benefit the most.

5.6. Conclusions

In this paper, we apply the panel convergence methodology developed by Philips and Sul (2007) on the debt maturity ratios of a set of firms in developed economies, to explore the effects of credit market integration on debt maturity choices. In contrast to prior studies, this methodology allows for a formal quantification of the integration process. Therefore, we are able to track the evolution of integration over time and identify the conditions under which it is stronger.

Our analysis yields three main findings. First, firms that are able to integrate with international credit markets, face on average a lower degree of informational asymmetries and have higher collateral value. Second, as firms integrate with international credit markets, they extend their debt maturity. Finally, firms not affected by credit market integration, experience a decrease in their debt maturity, as integration continues.

Our results provide support to the argument that financial integration has a positive impact on firms by facilitating access to long-term capital. We also find that this effect is stronger for large firms and firms whose value depends more on assets-in-place and less on uncertain future investments. This finding is consistent with the view that foreign investors, being aware that they are partially informed when approaching domestic borrowers, are less reluctant to provide long-term financing to firms, for which the markets possess more information.

An interesting question arises from our third result: why do firms that do not integrate with international markets experience a shortening in their debt maturity, as integration continues? One possible explanation that has been proposed in prior literature[26] relies on a "crowding in" effect. After some firms obtain financing globally, more funds are available domestically. Therefore, firms that were previously shut out of the credit market, may now be able to obtain credit in the domestic market. However, the lack of reputation for the "newcomers" may lead creditors to lend short-term, to better monitor and discipline borrowers. This is certainly an interesting topic for future research.

5.7. Tables and Figures

[26] Schmukler and Vesperoni (2006) report a similar result. The find that domestic-only-financed firms experience a shortening of their debt maturity structure with financial liberalization.

TABLE 5.1

Descriptive statistics of firm-level variables

	MAT	LEV	TOTAL LEV	ASSETS	PROF	MB	TANG	N
Australia	0.711	0.254	0.510	6.918	0.044	1.431	0.433	105
Austria	0.667	0.194	0.638	9.272	0.060	1.170	0.517	21
Belgium	0.535	0.242	0.619	6.322	0.055	1.304	0.354	252
Canada	0.468	0.277	0.501	5.949	0.098	1.263	0.389	126
Chile	0.450	0.226	0.457	6.527	0.103	1.575	0.542	84
Denmark	0.581	0.252	0.532	6.247	0.054	1.329	0.320	336
Finland	0.674	0.317	0.573	7.026	0.061	1.370	0.348	189
France	0.514	0.209	0.579	7.081	0.064	1.318	0.235	987
Germany	0.523	0.221	0.638	7.342	0.043	1.410	0.309	882
Greece	0.618	0.272	0.506	6.802	0.106	1.791	0.465	42
Ireland	0.632	0.286	0.559	5.541	0.073	1.171	0.413	63
Italy	0.471	0.254	0.615	7.208	0.028	1.172	0.285	483
Japan	0.448	0.280	0.599	7.218	0.039	1.206	0.314	11,970
Korea	0.463	0.406	0.654	7.930	0.063	1.021	0.428	525
Mexico	0.703	0.340	0.521	8.595	0.103	1.250	0.603	63
Netherlands	0.606	0.247	0.652	7.317	0.080	1.455	0.354	273
Portugal	0.484	0.344	0.676	6.664	0.004	1.147	0.317	84
Spain	0.504	0.249	0.559	7.460	0.064	1.366	0.408	252
Sweden	0.533	0.239	0.621	8.125	0.069	1.319	0.346	210
Switzerland	0.581	0.237	0.558	6.734	0.058	1.294	0.293	378
United Kingdom	0.498	0.193	0.561	6.263	0.088	1.481	0.331	1,113
United States	0.806	0.245	0.546	7.613	0.105	1.742	0.341	7,875
All countries	0.575	0.261	0.581	7.279	0.064	1.398	0.326	26,313

This table provides the mean of firm-level variables during the period 1990-2010. MAT is long-term debt divided by total debt. LEV is total debt divided by total assets. TOTAL LEV is total liabilities divided by total assets. ASSETS is the natural log of book assets expressed in 1983 US dollars. PROF is operating income divided by total assets. MB is total assets minus total shareholder equity plus market value of equity divided by total assets. TANG is net fixed assets divided by total assets. Data for all firm-level variables are collected from Worldscope. N is firm-year observations.

TABLE 5.2

Descriptive statistics of country-level variables

	DEPOS	INS	INTDEBT	CORRUPT
Australia	0.654	0.081	0.331	1.397
Austria	0.830	0.056	0.461	2.218
Belgium	0.793	0.080	0.553	3.156
Canada	0.994	0.067	0.284	1.135
Chile	0.411	0.036	0.053	3.125
Denmark	0.546	0.069	0.222	0.562
Finland	0.498	0.079	0.372	0.611
France	0.625	0.087	0.270	3.012
Germany	0.813	0.064	0.410	2.056
Greece	0.630	0.018	0.281	5.445
Ireland	0.750	0.122	0.660	2.272
Italy	0.549	0.053	0.241	5.414
Japan	1.959	0.106	0.077	2.969
Korea	0.677	0.115	0.082	5.511
Mexico	0.226	0.016	0.142	6.809
Netherlands	0.911	0.094	0.684	1.120
Portugal	0.883	0.056	0.382	3.781
Spain	0.809	0.051	0.393	3.856
Sweden	0.446	0.063	0.423	0.846
Switzerland	1.431	0.107	0.404	1.146
United Kingdom	0.987	0.136	0.414	1.636
United States	0.658	0.088	0.176	2.451
All countries	1.284	0.096	0.173	2.723
N	24,830	24,962	25,060	23,807

This table provides the mean of country-level variables during the period 1990-2010. DEPOS is total financial system deposits, i.e. demand, time and saving deposits in deposit money banks and other financial institutions, as a share of GDP. INS is total, i.e. life and nonlife, insurance premium volume as a share of GDP. INTDEBT is International Debt Securities (Amt Outstanding), i.e. bonds, notes and money market instruments placed in international markets, as a share of GDP. CORRUPT is the Corruption Perception Index, which measures the perceived levels of public sector corruption in each country. The original index is reversed, i.e. it ranges from 0 to 10, with larger values indicating more severe corruption. Data on DEPOS, INS and INTDEBT are collected from Financial Structure Dataset of World Bank. Data on CORRUPT are collected from the Transparency International. N is firm-year observations.

TABLE 5.3

Full-sample convergence test

Equation (A): $\log\left(H_1 / H_t\right) - 2\log(t+1) = c + b\log t + \varepsilon_t$

Variable of interest	$\hat{b}$
MAT (Debt maturity)	-0.880*** *-33.46*
N	26,313

This table provides the regression results of testing for debt maturity convergence across all firms of the sample. The null hypothesis of convergence is rejected if $t_b < -1.65$, where t_b is the t-statistic of the estimated coefficient $\hat{b}$. MAT (Debt maturity) is long-term debt divided by total debt. N is firm-year observations. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 5.4

Convergent clubs

Number of convergent clubs	Type of convergence	Number of firms in each club	Number of firms in each club / number of all firms in the sample
1	In rates	965	77.0%
35	In levels/In rates	2 to 97	0.2% to 7.7%
Divergent firms	-	18	1.4%
All firms	-	1,253	100.0%

This table provides information about the structure of the detected convergent clubs. Convergence in rates means that the variable of interest has the same rate of change across the cross-sectional units, while convergence in levels means that it converges to the same value. Divergent firms are firms that do not belong in any convergent club.

TABLE 5.5

Determinants of debt maturity

Equation (A): $Y_{i,t} = a_c + a_t + a_s + b_1 X_{i,t} + b_2 Z_{c,t} + \varepsilon_{i,t}$

	Big club firms	Rest of the firms	Big club firms	Rest of the firms	Big club firms	Rest of the firms	Big club firms	Rest of the firms
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
Fin. integration variable								
INTDEBT	0.156***	-0.011	0.148***	-0.021	0.154***	0.042	0.142***	0.043
	8.29	*-0.30*	*7.76*	*-0.59*	*5.90*	*0.75*	*5.47*	*0.78*
Firm-level variables								
ASSETS			0.017***	0.029***	0.016***	0.029***	0.017***	0.028***
			5.88	*4.00*	*5.88*	*4.08*	*6.19*	*3.92*
MB			-0.028***	-0.003	-0.029***	-0.009	-0.030***	-0.009
			-5.72	*-0.24*	*-5.90*	*-0.74*	*-6.30*	*-0.77*
Country-level variables								
DEPOS					-0.085***	-0.231***	-0.036	-0.163***
					-4.08	*-5.36*	*-1.43*	*-3.10*
INS					0.894***	1.720***	0.490**	1.301***
					3.89	*3.50*	*2.10*	*2.69*
CORRUPT							-0.020***	-0.036**
							-2.93	*-2.36*
Adj. R^2	0.371	0.282	0.383	0.295	0.383	0.303	0.402	0.302
N	19,300	5,760	19,300	5,760	19,030	5,702	17,100	5,126

This table reports the results from estimating equation (A) via OLS regressions. The dependent variable Y is MAT, i.e. long-term debt divided by total debt. α_c, α_t and α_s denote country, year and industry dummy variables, respectively. X is a vector of firm-level variables, namely ASSETS and MB. ASSETS is the natural log of book assets expressed in 1983 US dollars. MB is total assets minus total shareholder equity plus market value of equity divided by total assets. Z is a vector of country-level variables, namely INTDEBT, DEPOS, INS and CORRUPT. INTDEBT is International Debt Securities (Amt Outstanding), i.e. bonds, notes and money market instruments placed in international markets, as a share of GDP. DEPOS is total financial system deposits, i.e. demand, time and saving deposits in deposit money banks and other financial institutions, as a share of GDP. INS is total, i.e. life and nonlife, insurance premium volume as a share of GDP. CORRUPT is the Corruption Perception Index, which measures the perceived levels of public sector corruption in each country. The original index is reversed, i.e. it ranges from 0 to 10, with larger values indicating more severe corruption. Standard errors (clustered by firm)) are robust to heteroskedasticity and to residual dependence within firms. N is firm-year observations. Country, year and industry dummy variable estimates are not reported for brevity. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 5.6

Determinants of debt maturity: differences across convergent clubs

Equation (A): $Y_{i,t} = a_c + a_t + a_s + b_1 X_{i,t} + b_2 Z_{c,t} + \varepsilon_{i,t}$

	(1)	(2)	(3)	(4)
Fin. integration variable				
INTDEBT*D_CLUB	0.167***	0.169***	0.112*	0.099*
	4.206	*4.207*	*1.869*	*1.653*
Firm-level variables				
ASSETS*D_CLUB		-0.012	-0.013*	-0.011
		-1.585	*-1.672*	*-1.447*
MB*D_CLUB		-0.025**	-0.020	-0.021*
		-2.023	*-1.610*	*-1.754*
Country-level variables				
DEPOS*D_CLUB			0.146***	0.127**
			3.172	*2.258*
INS*D_CLUB			-0.826	-0.811
			-1.591	*-1.558*
CORRUPT*D_CLUB				0.016
				0.995
Adj. R^2	0.434	0.444	0.447	0.468
N	25,060	25,060	24,732	22,226

This table reports the results from estimating equation (A) with interaction terms for club membership via OLS regressions. The interaction indicator D_CLUB is a dummy variable equal to one if the firm belongs in the big club and zero otherwise. The dependent variable Y is MAT, i.e. long-term debt divided by total debt. α_c, α_t and α_s denote country, year and industry dummy variables, respectively. X is a vector of firm-level variables, namely ASSETS and MB. ASSETS is the natural log of book assets expressed in 1983 US dollars. MB is total assets minus total shareholder equity plus market value of equity divided by total assets. Z is a vector of country-level variables, namely INTDEBT, DEPOS, INS and CORRUPT. INTDEBT is International Debt Securities (Amt Outstanding), i.e. bonds, notes and money market instruments placed in international markets, as a share of GDP. DEPOS is total financial system deposits, i.e. demand, time and saving deposits in deposit money banks and other financial institutions, as a share of GDP. INS is total, i.e. life and nonlife, insurance premium volume as a share of GDP. CORRUPT is the Corruption Perception Index, which measures the perceived levels of public sector corruption in each country. The original index is reversed, i.e. it ranges from 0 to 10, with larger values indicating more severe corruption. Standard errors (clustered by firm) are robust to heteroskedasticity and to residual dependence within firms. N is firm-year observations. For brevity, we only report the coefficient estimates of the interaction terms. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 5.7

Determinants of debt maturity: incorporating investor demand

Equation (A): $Y_{i,t} = a_c + a_t + a_s + b_1 R_t + b_2 X_{i,t} + b_3 Z_{c,t} + \varepsilon_{i,t}$

	Big club firms	Rest of the firms	Big club firms	Rest of the firms	Big club firms	Rest of the firms	Big club firms	Rest of the firms
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
Fin. integration variable								
INTDEBT	0.156***	-0.011	0.148***	-0.021	0.154***	0.042	0.142***	0.043
	8.29	*-0.30*	*7.76*	*-0.59*	*5.90*	*0.75*	*5.47*	*0.78*
Investor demand variable								
BOND_RET	0.081***	-0.017	0.066***	-0.042*	0.074***	-0.033	0.057**	-0.074**
	3.59	*-0.73*	*2.92*	*-1.78*	*3.30*	*-1.41*	*2.53*	*-2.56*
Firm-level variables								
ASSETS			0.017***	0.029***	0.016***	0.029***	0.017***	0.028***
			5.88	*4.00*	*5.88*	*4.08*	*6.19*	*3.92*
MB			-0.028***	-0.003	-0.029***	-0.009	-0.030***	-0.009
			-5.72	*-0.24*	*-5.89*	*-0.74*	*-6.30*	*-0.77*
Country-level variables								
DEPOS					-0.085***	-0.231***	-0.036	-0.163***
					-4.08	*-5.36*	*-1.43*	*-3.10*
INS					0.894***	1.720***	0.490**	1.301***
					3.89	*3.50*	*2.10*	*2.69*
CORRUPT							-0.020***	-0.036**
							-2.93	*-2.36*

Adj. R^2	0.375	0.289	0.386	0.303	0.385	0.310	0.404	0.310
N	19,300	5,760	19,300	5,760	19,030	5,702	17,100	5,126

This table reports the results from estimating equation (A) via OLS regressions. The dependent variable Y is MAT, i.e. long-term debt divided by total debt. α_c, α_t and α_s denote country, year and industry dummy variables, respectively. R stands for BOND_RET and is the annual returns of the J.P. Morgan Global Aggregate Bond Index. X is a vector of firm-level variables, namely ASSETS and MB. ASSETS is the natural log of book assets expressed in 1983 US dollars. MB is total assets minus total shareholder equity plus market value of equity divided by total assets. Z is a vector of country-level variables, namely INTDEBT, DEPOS, INS and CORRUPT. INTDEBT is International Debt Securities (Amt Outstanding), i.e. bonds, notes and money market instruments placed in international markets, as a share of GDP. DEPOS is total financial system deposits, i.e. demand, time and saving deposits in deposit money banks and other financial institutions, as a share of GDP. INS is total, i.e. life and nonlife, insurance premium volume as a share of GDP. CORRUPT is the Corruption Perception Index, which measures the perceived levels of public sector corruption in each country. The original index is reversed, i.e. it ranges from 0 to 10, with larger values indicating more severe corruption. Standard errors (clustered by firm)) are robust to heteroskedasticity and to residual dependence within firms. N is firm-year observations. Country, year and industry dummy variable estimates are not reported for brevity. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 5.8

Firm-level characteristics across convergent clubs

Equation (A): $Y_{i,t} = a_c + a_t + a_s + bX_{i,t} + \varepsilon_{i,t}$

	(1)	(2)	(3)
ASSETS	0.529***		
	42.51		
MB	-0.138***		
	-4.25		
PROF	1.941***		
	4.78		
TANG	1.939***		
	14.32		
LEV		3.297***	
		25.37	
TOTAL LEV			2.637***
			24.35
N	26,313	26,313	26,313

This table reports the results from estimating equation (A) via logit regressions. Y is a binary variable taking the value 1 if the firm belongs in the big club and 0 otherwise. α_c, α_t and α_s denote country, year and industry dummy variables, respectively. X is a vector of firm-level variables, namely LEV, TOTAL LEV, ASSETS, PROF, MB and TANG. LEV is total debt divided by total assets. TOTAL LEV is total liabilities divided by total assets. ASSETS is the natural log of book assets expressed in 1983 US dollars. PROF is operating income divided by total assets. MB is total assets minus total shareholder equity plus market value of equity divided by total assets. TANG is net fixed assets divided by total assets. Standard errors are robust to heteroskedasticity using the Huber/White estimator. N is firm-year observations. Country, year and industry dummy variable estimates are not reported for brevity. Numbers in italics are z-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 5.9

Debt maturity ratio before and after 1996

Equation (A): $Y_{i,t} = a_c + a_t + a_s + d\_96 + bX_{i,t} + \varepsilon_{i,t}$

	Big club firms	Rest of the firms	Big club firms	Rest of the firms
D_96	0.581***	-0.233***	0.474***	-0.243***
	4.46	*-11.49*	*3.98*	*-11.96*
ASSETS			0.018***	0.029***
			34.87	*4.37*
MB			-5.555***	-0.005
			-3.23	*-0.62*
N	20,265	6,048	20,265	6,048

This table reports the results from estimating equation (A) via OLS regressions. Y is MAT, i.e. long-term debt divided by total debt. α_c, α_t and α_s denote country, year and industry dummy variables, respectively. D_96 is a dummy variable taking the value 1 for observations in years 1996 to 2010 and 0 otherwise. X is a vector of firm-level variables, namely ASSETS and MB. ASSETS is the natural log of book assets expressed in 1983 US dollars. MB is total assets minus total shareholder equity plus market value of equity divided by total assets. Standard errors (clustered by firm) are robust to heteroskedasticity and to residual dependence within firms. N is firm-year observations. Country, year and industry dummy variable estimates are not reported for brevity. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

TABLE 5.10

Direct and indirect impact of financial integration on debt maturity

Equation (1): $MAT_{i,t} = \sum_{c=1}^{22} \alpha_c d_c + \sum_{c=1}^{22} \beta_{1c} d_c ASSETS_{i,t} + \sum_{c=1}^{22} \beta_{2c} d_c MB_{i,t} + \varepsilon_{i,t}$

Equation (2): $\hat{\alpha}_c = \gamma_0 + \gamma_1 AVINTDEBT_c + \varepsilon_c$

Equation (3): $\hat{\beta}_{1c} = \lambda_0 + \lambda_1 AVINTDEBT_c + \varepsilon_c$

Equation (4): $\hat{\beta}_{2c} = \zeta_0 + \zeta_1 AVINTDEBT_c + \varepsilon_c$

	Intercept	AVINTDEBT	Adj. R^2	N
Equation (2): Country dummy	-0.727	2.004**	0.367	22
	0.62	*2.40*		
Equation (3): ASSETS	0.507	0.056***	0.156	22
	1.11	*4.36*		
Equation (4): MB	1.004*	-0.196***	0.522	22
	2.04	*-3.05*		

Equation (1) is a regression of debt maturity ratios (MAT) on country dummies (d_c), firm size (ASSETS) and market-to-book ratio (MB), in which *i* denotes a firm, *t* denotes a year and *c* denotes a country. Only firms that belong in the big club are included. Standard errors in equation (1) are robust to heteroskedasticity and to residual dependence within firms. Equation (2) is a Weighted Least Squares regression of country dummy coefficients $(\hat{\alpha}_c)$ estimated from equation (1) against the average level of financial integration (AVINTDEBT) for each country. The weights are the inverse standard errors of the corresponding country dummy coefficients, estimated from equation (1). Equation (3) is a Weighted Least Squares regression of size coefficients $(\hat{\beta}_{1c})$ estimated from equation (1) against the average level of financial integration (AVINTDEBT) for each country. The weights are the inverse standard errors of the corresponding size coefficients, estimated from equation (1). Equation (4) is a Weighted Least Squares regression of market-to-book ratio coefficients $(\hat{\beta}_{2c})$ estimated from equation (1) against the average level of financial integration (AVINTDEBT) for each country. The weights are the inverse standard errors of the corresponding market-to-book ratio coefficients, estimated from equation (1). Standard errors in equations (2), (3) and (4) are robust to heteroscedasticity. N is the number of countries. Numbers in italics are t-statistics. ***, ** and * indicate 1%, 5% and 10% statistical significance levels, respectively.

FIGURE 5.1

Cross-sectional average of debt maturity ratio per year

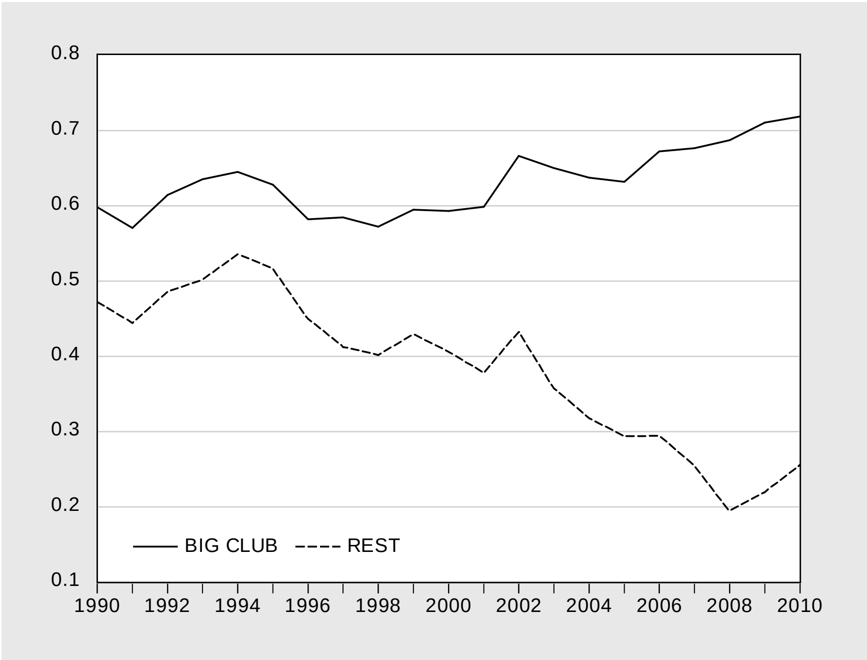


FIGURE 5.2

Transition curve of debt maturity ratio and international debt

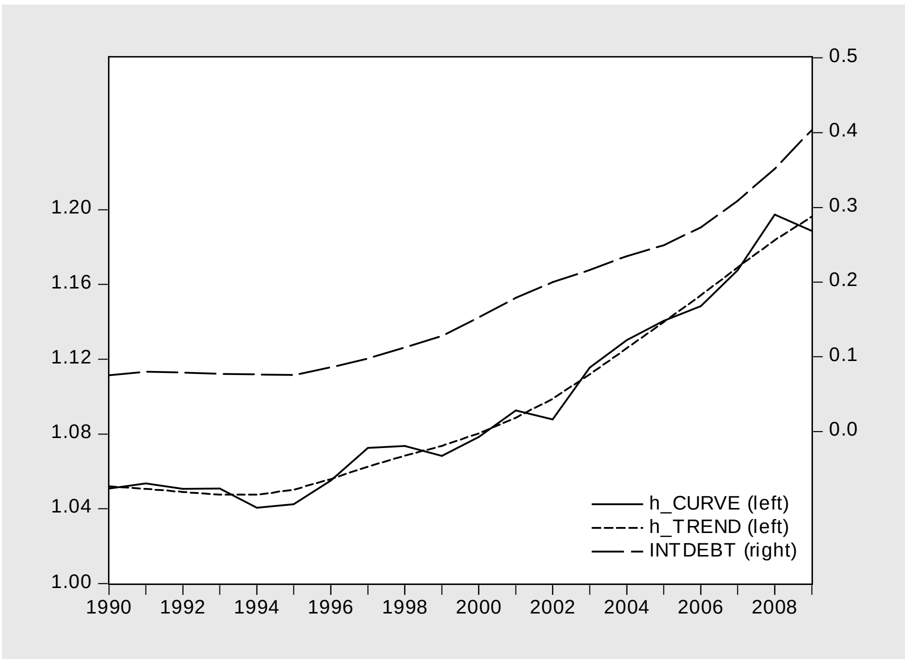


FIGURE 5.3

Transition curve of debt maturity ratio and financial system deposits

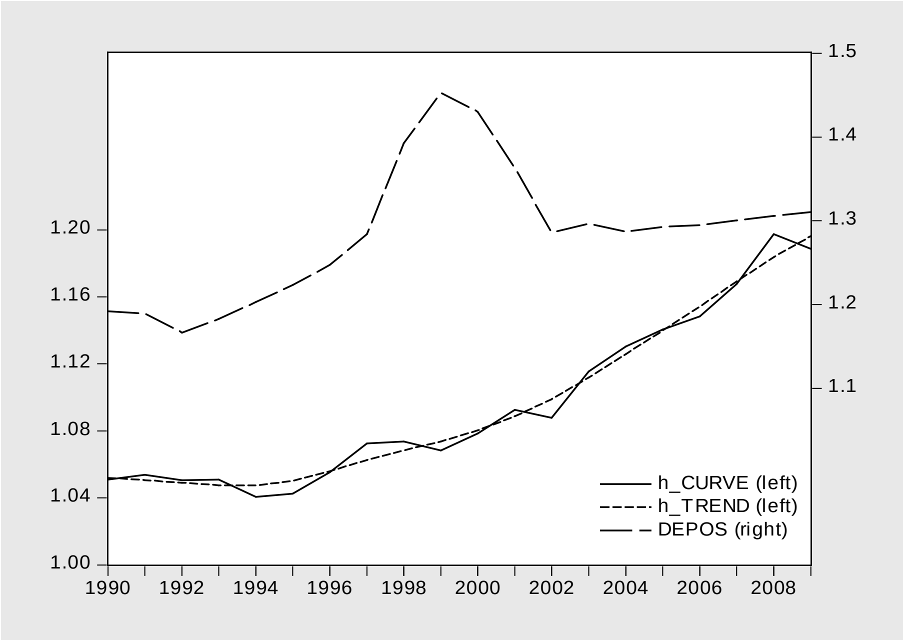


FIGURE 5.4

Transition curve of debt maturity ratio and insurance premium volume

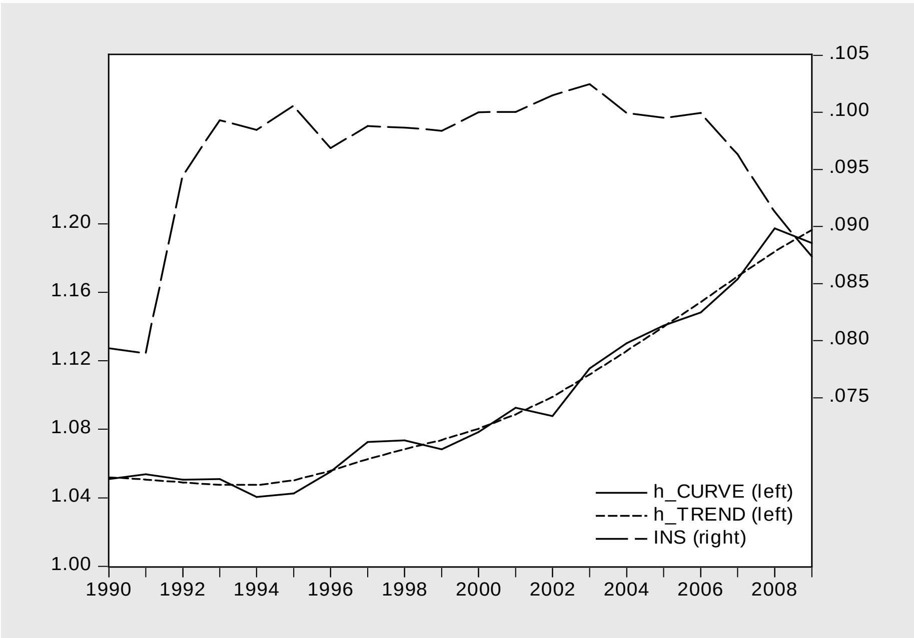


Figure 5.1 plots the cross-sectional average of the debt maturity ratio for the firms that belong in the big club and for the rest of the firms. Figures 5.2, 5.3 and 5.4 plot some of the country-level variables and the relative transition parameter for the big club over time (h-curve). The relative transition parameter for the big club is calculated every

year as the ratio of the average cross-sectional debt maturity ratio of the big club firms over the average cross-sectional debt maturity ratio of all firms.

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