Heterogeneity in the Speed of Adjustment across Countries and over the Business Cycle

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First version: March, 2011

This draft: April, 2014

Abstract

This study analyzes the heterogeneity in the speed of adjustment of leverage ratios after deviations from the target. We provide evidence for an active capital structure adjustment policy in a comprehensive sample of firms from the G-7 countries. Using a doubly-censored Tobit estimation methodology adjusted for models with fractional dependent variables, the speed of adjustment is roughly 25% per year in the full sample, supporting the economic relevance of the trade-off theory. Firms from market-based countries rebalance faster after leverage shocks than firms from bank-based countries. Differences in the adjustment speed across distinct financial systems are mainly attributable to differences in the costs of adjustment. Besides institutional differences, macroeconomic and micro-level supply-side constraints affect the dynamics of leverage. Firms adjust more slowly during recessions, and the effect is most pronounced for financially constrained firms in market-based countries.

Keywords: Capital structure, speed of adjustment, institutional arrangements, business cycle, dynamic panel methods
JEL Classification Codes: G30, G32

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‡ *Acknowledgments*: We would like to thank two anonymous referees, Manuel Rocha Armada, Gonul Colak, Ettore Croci, John Doukas (the editor), Yilmaz Guney, Ottorino Morresi, Tatjana Puhan as well as participants of the 2012 Financial Management Association (FMA) Europe conference in Istanbul, the 2013 Midwest Finance Association (MFA) meeting in Chicago, and the 2013 European Financial Management (EFMA) meeting in Reading for helpful comments.

I. Introduction

One of the main research questions in corporate finance is how fast firms adjust back to their target capital structure subsequent to leverage shocks. Huang and Ritter (2009) even call it ‘the most important issue in capital structure research.’ An estimate of the speed of adjustment can help to sort out theories that explain the dynamics of capital structure. Most important, a positive speed of adjustment may be interpreted as evidence for the existence of a target leverage ratio, or more generally, a dynamic trade-off model of capital structure. For example, Fischer et al.’s (1989) dynamic trade-off model shows that even small adjustment costs can lead to large swings in capital structure. While any variant of the dynamic trade-off model with low or moderate adjustment costs implies a positive adjustment speed, the pecking order theory predicts no measurable adjustment (Fama and French, 2002). Instead, there is no target leverage ratio, and corporate leverage changes according to the financing deficit (Myers and Majluf, 1984). Market-timing theories even support a negative speed of adjustment. If firms respond to increasing stock prices by issuing equity, the measured adjustment speed will be lower than zero (Baker and Wurgler, 2002; Dittmar and Thakor, 2007).

Adjustment speed depends on (i) the costs of deviating from the target capital structure and (ii) the costs of adjusting back to the target. Financial managers must assess the trade-off between the costs of being off the target leverage ratio and the costs of adjustment. On the one hand, the financial status of a firm, such as the degree of target deviation and the magnitude of the financing deficit, have an impact on the speed of adjustment (Faulkender et al., 2012). On the other hand, both the costs of deviating from the target leverage ratio and the costs of adjustment are affected by a firm’s institutional, legal, and financial environment (Antoniou et al., 2008; Öztekin and Flannery, 2012). Finally, macroeconomic conditions may have an impact on firms’ time-varying abilities to readjust subsequent to a leverage shock, as recession periods are often accompanied by a shortage of capital supply (Cook and Tang, 2010; Halling et al., 2012). Overall, firm-level, country-level, and macroeconomic factors are likely to be responsible for the observed heterogeneity in the speed of adjustment.

In our study, we use a comprehensive sample of firms from the G-7 countries and explore the heterogeneity in the speed of adjustment in two ways. First, we make cross-country comparisons to determine whether there are differences between bank-based and market-based financial systems with respect to adjustment speed. For example, firms in countries with a bank-oriented financial system tend to suffer from less liquid capital markets, making it more expensive for them to issue new or to retire outstanding securities and to rebalance after a leverage shock. Second, we contribute to the literature by comparing the speed of adjustment in different macroeconomic states. On the one hand, adverse selection costs vary over the business cycle, implying that issuing (or retiring) securities becomes more expansive and that external relative to internal financing costs increase during economic downturns. On the other hand, the business cycle may influence the aggregate supply of capital, thereby affecting financing choices at the economy level. To the extent that firms depend on external financing to adjust their capital structure, these effects will increase firms' rebalancing costs and slow down their speed of adjustment particularly during financial crises episodes.

In addition to measuring heterogeneity in the speed of adjustment, we also provide a methodological contribution. By imposing a large set of dynamic panel estimators on a regime-switching partial adjustment model for international data, our results can be interpreted as an out-of-sample test given that these estimators have been tested mostly on U.S. data. To mitigate the biases inherent in virtually all estimators for the speed of adjustment (Chang and Dasgupta, 2009; Iliev and Welch, 2010), we employ a new estimator for dynamic panel models introduced by Elsas and Florsysiak (2012) and compare it to the more standard estimators used in other recent studies. This fractional dependent variables estimator (DPF-estimator) exhibits the smallest bias in their U.S. sample and delivers adjustment speed estimates that support the trade-off theory of capital structure. Comparing the estimates from all commonly used dynamic panel estimators, we find that that the mean speed of adjustment is closest in magnitude to the DPF-estimator.

The empirical results enhance our understanding of firms' capital structure dynamics. Based on our full sample of firms from the G-7 countries and estimating the regime-switching partial adjustment model using the DPF-estimator, the estimated speed of adjustment in our regime-switching partial adjustment model is approximately 25% per year. The implied half-life of the average shock of roughly 2.5 years supports the economic relevance of the trade-off theory. As expected, the speed of adjustment is significantly faster in market-based countries than in bank-based countries. The differences in adjustment speed across countries are attributable to differences in both the costs of deviation from target and the costs of adjustment back to the target, although the latter effect seems to be much stronger. Furthermore, the macroeconomic environment has an impact on the speed of adjustment. Firms adjust more slowly during bad macroeconomic states, and this effect is most pronounced for financially constrained firms in countries with a market-based financial system.

The remainder of our study is as follows: Section II provides a brief literature overview. Section III discusses the econometric problems involved in estimating adjustment speeds in the framework of dynamic panel models. Section IV describes the data. Section V compares the speed of adjustment across countries and explores the influence of different institutional arrangements. Section VI analyzes the heterogeneity in the speed of adjustment over the business cycle. Finally, Section VII concludes and provides an outlook for future research.

II. Review of the Literature

Modigliani and Miller (1958) conclude that a company's capital structure is irrelevant for its valuation. Their original framework is very restrictive and implies no adjustment to any target capital structure. Modigliani and Miller (1963) extend their model to include corporate income taxes, showing how debt can act to shield the negative effect of income taxes. Kraus and Litzenberger (1973) further add costs of financial distress or bankruptcy costs. Their static trade-off model incorporates both the benefits of debt and the costs of bankruptcy resulting from excessive debt. As a result, there exists an optimal capital structure, which balances the bankruptcy costs and the tax shield (in present value terms). Their model predicts that firms are always at their optimal leverage ratio and offset shocks immediately, implying an infinite speed of adjustment.

Fischer et al. (1989) extend the static trade-off theory by incorporating costs of adjustment. They analyze the trade-off between the costs of adjustment and the benefits of being at the target capital structure. Even with low adjustment costs, their dynamic trade-off model generates large swings in the debt-to-equity ratio but ultimately predicts a positive speed of adjustment. In the presence of adjustment costs, however, firms can exhibit large deviations from their target leverage ratios. Survey evidence confirms the existence of a target capital structure and the importance of adjustment speed. In particular, Graham and Harvey (2001) report that more than 80% of the companies in their survey sample pursue a target debt-to-equity ratio. Finally, Hackbarth et al.'s (2006) contingent claims model predicts that firms align their financing policies to the state of the economy when macroeconomic conditions have an impact on cash flows. Firms exhibit a higher speed of adjustment during good macroeconomic states compared to recessions.

Recent empirical studies provide evidence for the existence of capital structure targets. Flannery and Rangan (2006) estimate a partial adjustment model and document a high speed of adjustment of 30% per year in the United States, while Roberts (2002) even estimates a much lower half-life of only about one year by using a state-space framework. Kayhan and Titman (2007) apply a OLS methodology and document a slower 10% speed of adjustment per year for book leverage and 8.3% for market leverage. Based on the GMM methodology, Lemmon et al. (2008) report an annual 25% speed of adjustment for book leverage. Byoun's (2008) results also fall into this range, at about 20% when firms are below and 33% when they are above their target leverage ratio. Huang and Ritter (2009) estimate a lower adjustment speed between 11% and 23% by using a long-difference panel estimator. Taken together, estimates for the speed of adjustment based on U.S. data seem to be generally low, albeit the magnitude strongly depends on the applied estimator. In an international setting, Antoniou et al. (2008) report that the speed of adjustment substantially differs across the G-5 countries, ranging from annual 11% in Japan to 40% in France. Öztekin and Flannery (2012) use a large country sample and show that firms from countries with strong legal institutions, a financial structure based on the effectiveness of capital markets instead of intermediaries, and better functioning financial systems adjust to their leverage targets as much as 50% more rapidly.

Faulkender et al. (2012) analyze firm-level (rather than country-level) heterogeneity in the speed of adjustment. They document that the benefits and costs of adjustment vary with the sign of a firm's leverage gap, its operating cash flow, investment opportunities, and access to capital markets. For example, over-leveraged firms generally adjust more quickly. Firms with large (either positive or negative) operating cash flow make more aggressive changes in their leverage ratios because adjustment costs are "shared" with market transactions related to the firm's operating cash flows. This cash flow effect is more pronounced for over-leveraged firms compared to under-leveraged firms. In addition, constrained firms adjust more slowly when they are under-leveraged, but more quickly when they are over-leveraged.[1]

In another strand of literature, Cook and Tang (2010) relate the speed of adjustment to macroeconomic conditions. They report higher adjustment speeds during better macroeconomic states. Depending on the state of the economy (and the proxy variable for the business cycle), the speed of adjustment ranges from 15% to 50% per year in their U.S. sample. Halling et al. (2012) study the speed of adjustment over the course of the business cycle using a large international sample from developed and emerging markets. As predicted in Hackbarth et al.'s (2006) model, they also find a lower speed of adjustment during recession periods compared with boom periods.

Most prior studies work with different variants of dynamic panel estimators. Chang and Dasgupta (2009) provide a general critique of this class of estimators for adjustment speed. Based on simulation analysis, they show that dynamic panel estimators have low power to reject the null of no capital structure adjustment. In fact, comparable estimates are obtained when target behavior in simulation samples is fairly vigorous as when financing is random. Iliev and Welch (2010) and Hovakimian and Li (2011) investigate different estimators and argue that a mechanical mean reversion effect in leverage ratios results in a biased estimate of the speed of adjustment. In a related strand of literature, Hovakimian and Li (2012) question the standard interpretation of partial adjustment coefficients as economically meaningful measures of the importance of target debt ratios. They report that even at rebalancing points (i.e., in years with significant corporate financing activity) the estimated speeds of adjustment are well below one, which seems inconsistent with the premise of the partial adjustment model.

[1] Elsas and Florysiak (2011) also show heterogeneity in the speed of adjustment depending on firm size, growth opportunities, the size of the financing deficit, and industry classification using their DPF-estimator.

III. Theoretical Foundations and Methodological Issues

This section discusses the theoretical foundations of our analysis and methodological issues. We start with a presentation of the regime-switching partial adjustment model, which we use throughout all our analyses. We proceed with a discussion of alternative estimation methods for dynamic panel models. Our focus is on Elsas and Florisiak's (2012) doubly-censored Tobit- or DPF-estimator, the methodology we employ to estimate the speed of adjustment after deviations from the target leverage. Finally, to verify the benefits of the DPF-estimator, we use our full sample and compare the adjustment speed estimates from different dynamic panel estimators.

A. Modeling capital structure adjustments

Most prior studies that estimate the speed of adjustment use the class of dynamic panel models, where today's leverage ratio is dependent on lagged leverage. The econometric specification of such a model in the most stylized manner is:

$$L_{i,t} - L_{i,t-1} = \lambda\left(L^*_{i,t} - L_{i,t-1}\right) + \varepsilon_{i,t}, \tag{1}$$

where the change in leverage depends on the speed of adjustment λ and the distance between lagged leverage $L_{i,t-1}$ and the (time-varying) target leverage $L^*_{i,t}$. While an estimate of $\lambda = 0$ implies no adjustment to leverage shocks (random leverage hypothesis), an estimate of $\lambda = 1$ indicates an immediate (and full) correction of deviations from the target leverage. The target leverage is modeled as a linear combination of a set of firm characteristics related to the costs and benefits of debt and equity in different capital structures as well as unobserved components. Including this definition of target leverage into (1), we have:

$$L_{i,t} = (1-\lambda)L_{i,t-1} + \lambda\beta X_{i,t} + \eta_i + \eta_t + \varepsilon_{i,t}, \tag{2}$$

where $X_{i,t}$ is a vector with firm-specific determinants of the target leverage ratio of firm i at time t, β is a coefficient vector including a constant term, η_i is a firm fixed effect, and η_t is a time fixed effect. Defining $\alpha = 1 - \lambda$ and $\gamma = \lambda\beta$ in (2) results in a testable model:

$$L_{i,t} = \alpha L_{i,t-1} + \gamma X_{i,t} + \eta_i + \eta_t + \varepsilon_{i,t}. \tag{3}$$

The specification in (3) assumes that both parameters λ (the speed of adjustment) and β (the impact of firm characteristics on target leverage) are time-invariant and constant over groups. We choose this model as a base case wherever we are interested in the speed of adjustment in general and where we believe that intra-sample heterogeneity can be neglected. However, as we are primarily interested in the determinants of the heterogeneity in adjustment speeds, the constant coefficients model in (3) must be extended to allow for time-variation or inter-group variation in the speed of adjustment parameter λ. Furthermore, as indicated in (2), assuming heterogeneity in the speed of adjustment requires incorporating variation in the relative importance of the firm-specific leverage factors (captured by the $\gamma = \lambda\beta$ coefficients).

To test the heterogeneity in the speed of adjustment, we specify a regime-switching partial adjustment model, where both the adjustment speed and the relative importance of target leverage factors are allowed to vary over two different regimes. Regimes can describe different states of the economy (i.e., recessions or expansions), different institutional environments (i.e., bank-based or market-based financial system), or different degrees of a firm's financial flexibility (i.e., financially constrained or unconstrained). Provided that the separate models for regime 1 and regime 2 are given by:

$$L_{i,t}^{(1)} = \alpha_1 L_{i,t-1}^{(1)} + \gamma_1 X_{i,t}^{(1)} + \eta_{1,i} + \eta_{1,t} + \varepsilon_{i,t}^{(1)}, \tag{4}$$

$$L_{i,t}^{(2)} = \alpha_2 L_{i,t-1}^{(2)} + \gamma_2 X_{i,t}^{(2)} + \eta_{2,i} + \eta_{2,t} + \varepsilon_{i,t}^{(2)}, \tag{5}$$

we can write the resulting regime-switching partial adjustment model as:

$$L_{i,t} = D_1(\alpha_1 L_{i,t-1} + \gamma_1 X_{i,t} + \eta_i + \eta_t + \varepsilon_{i,t}) + D_2(\alpha_2 L_{i,t-1} + \gamma_2 X_{i,t} + \eta_i + \eta_t + \varepsilon_{i,t}), \tag{6}$$

where D_1 and D_2 are two regime dummy variables that equal to 1 if firm i is in the respective regime at time t and zero otherwise. The extended model in (6) allows a direct statistical comparison of the adjustment speeds (α_1 and α_2) in the two different regimes (in our context, countries and institutional regimes or macroeconomic states). To simplify the tests of statistical significance in the differences of adjustment speeds and for reasons of numerical stability, we transform (6) and estimate the following model in our empirical analyses:

$$L_{i,t} = \alpha_1 L_{i,t-1} + (\alpha_2 - \alpha_1) L_{i,t-1} D_2 + \gamma_2 X_{i,t} + (\gamma_2 - \gamma_1) X_{i,t} D_2 + \eta_i + \eta_t + \varepsilon_{i,t}. \quad (7)$$

Although expressed more generally, the specification in (7) is econometrically identical to the model already implemented in Halling et al. (2012), who call it the dynamic (time-varying) coefficients model. In what follows, however, we refer to this specification as the regime-switching partial adjustment model to better emphasize the binary nature of the estimated regime-specific coefficients.

B. Estimating dynamic panel modes with the DPF-estimator

Estimating the capital structure adjustment speed is a challenging task, and the existing empirical evidence is mixed. Ordinary least squares (OLS), fixed effect estimation (FE), instrumental variables techniques (IV), Generalized Methods of Moments (GMM), or longest differencing (LD) have been used in the literature to estimate dynamic partial adjustment models such as (3). Recent studies emphasize that these estimation techniques fail to account for the particular characteristics of corporate financial data and conclude that adjustment speed estimates are severely biased (Chang and Dasgupta, 2009; Iliev and Welch, 2010; Flannery and Hankins, 2012; Elsas and Florisiak, 2012). In particular, the inconsistency of the estimates may arise from (i) the unbalanced panel structure of corporate financial data; (ii) the inclusion of the lagged dependent variable as an explanatory variable; (iii) the presence of unobserved heterogeneity; and (iv) the fractional nature of the dependent variable.[2] While GMM approaches (Arellano and Bond, 1991; Blundell and Bond, 1998) and long difference estimation (Hahn et al., 2007) are consistent with the dynamic model structure and account for unobserved heterogeneity, they suffer from the fractional nature of the dependent variable (i.e., from being bounded between 0 and 1). In particular, Chang and Dasgupta (2009) and Iliev and Welch (2010) emphasize that mean reversion of leverage ratios may lead to strongly upward-biased speed of adjustment estimates.

[2] OLS generally ignores the unobserved heterogeneity of leverage ratios at the firm level and produces upward-biased coefficient estimates for the lagged dependent variable (Bond, 2002). In contrast, the within-estimator (FE) overestimates the true adjustment speed due to correlation between the lagged dependent variable and the error term (Nickell, 1981). Monte Carlo simulations confirm that estimation biases are severe in most cases and increase in the presence of a censored dependent variable (Flannery and Hankins, 2013; John et al., 2012; Elsas and Florysiak, 2012).

Elsas and Florysiak (2012) address the issue of mechanical mean reversion. They propose a doubly-censored (bounded between 0 and 1) Tobit estimator for unbalanced panel data, which is unbiased in the presence of fractional dependent variables and accounts for unobserved heterogeneity. Their so-called DPF-estimator relies on a latent variable approach to account for the fractional nature of the dependent leverage variable. Based on work of Baltagi (2005) and Loudermilk (2007), they extend the fixed effects distribution such that the estimator does not require a balanced panel and is robust to missing data in unbalanced panels. Starting point is the assumption that an unobserved latent variable, denoted as $L_{i,t}^{+}$, evolves according to the dynamic model in (3):

$$L_{i,t}^{+} = \alpha L_{i,t-1} + \gamma X_{i,t} + \eta_i + \eta_t + \varepsilon_{i,t}. \tag{8}$$

The observable doubly-censored dependent variable $L_{i,t}$ with two possible corner outcomes is as follows:

$$L_{i,t} = \begin{cases} 0 & \text{if } L_{i,t}^{+} \leq 0 \\ L_{i,t}^{+} & \text{if } 0 < L_{i,t} < 1 \\ 1 & \text{if } L_{i,t}^{+} \geq 1 \end{cases} \tag{9}$$

where $L_{i,t}^{+}$ is the unobserved latent variable, which is set equal to zero when it is below zero and to one when it is higher than one. As described in Elsas and Florysiak (2012), in economic terms the unobserved latent variable in (8) can be interpreted as the firm's debt capacity. While the debt capacity can arguably lie outside the [0,1] range, the observed debt ratio $L_{i,t}$ is bounded between zero an one. In empirical applications, replacements according to (9) primarily correct data errors because leverage ratios below zero and above one are unusual.

The model in (8) requires specifying the conditional distribution for the firm fixed effect, η_i (unobserved heterogeneity). In particular, the unobserved firm fixed effect depends on the mean of the firm specific variables, $E(X_i)$, and the leverage ratio in the initial period, $L_{i,0}$:

$$\eta_i = \alpha_0 + \alpha_1 L_{i,0} + \alpha_2 E(X_i) + \alpha_i, \tag{10}$$

with error term $\alpha_i \sim N(0, \sigma_a^2)$. Tobit estimation of (8) given the conditions in (9) and (10) can be implemented using maximum likelihood.

Elsas and Florysiak (2011, 2012) and John et al. (2012) evaluate the properties of the DPF-estimator in partial adjustment models with unbalanced panel data. Their Monte Carlo results indicate that the estimates are unbiased. We use the DPF-estimator to estimate the speed of capital structure adjustment in dynamic panel modes. In particular, we apply it on our regime-switching partial adjustment model in (7) to assess the speed of adjustment in different institutional regimes and over different macroeconomic states.

C. Empirical comparison of different dynamic panel estimators

Before proceeding with our main empirical analysis based on the DPF-estimator, we compare adjustment speed estimates using different dynamic panel estimators and examine whether the theoretical results and the Monte Carlo simulation findings in other studies (Hovakimian and Li, 2011; Flannery and Hankins, 2012; Elsas and Florysiak, 2012) appear in our international sample (see Section IV for a data description). Based on these prior findings, we expect the FE-estimator to deliver the lowest estimate for the coefficient on lagged leverage (thus the highest adjustment speed), followed by the AB-estimator (Arellano and Bond, 1991), the LD-estimator (longest differencing estimator with the maximum number of lags; Flannery and Hankins, 2011), the LD4-estimator (long differencing estimator with a lag of only four years; Huang and Ritter, 2009), and the DPF-estimator (Elsas and Florysiak, 2012). In contrast, the BB-estimator (or system GMM-estimator; Blundell and Bond, 1998) and the OLS-estimator (in the presence of unobserved heterogeneity) are expected to generate the highest estimates for the coefficient on lagged leverage (thus the lowest adjustment speed).[3] Table A.I in the appendix shows our results for the full sample when estimating the model in (3) and applying the different dynamic panel estimators (including the DPF-estimator) for both book and market leverage.

Corroborating the theoretical considerations, the OLS estimate for book leverage is the highest with a value for $(1-\lambda)$ of 0.887, implying a very slow adjustment speed α of 11.3% per

[3] Among all dynamic panel estimators, OLS and FE represent the upper and lower bound, respectively. In particular, the FE-estimator strongly overestimates for low speeds of adjustment. The evidence for the GMM- and LD-estimators is more ambiguous. Blundell and Bond's (1998) system-GMM estimator and the long differencing estimator by Hahn et al. (2007) tend to underestimate when the true adjustment speed is low but overestimate when the true adjustment speed is high.

year. In contrast, the lowest estimated coefficient of 0.619 is observed for the FE-estimator, indicating a relatively fast adjustment speed of 38.1% per year. Further consistent with expectations, the coefficient for the AB-estimator is the second lowest with 0.730, and that for the system GMM-estimator is the second highest with 0.818.[4] The remaining estimated coefficients are in a close range: 0.776 for the LD-, 0.770 for the LD4-, and 0.750 for the DPF-estimator.[5] Overall, our estimates fall into the range documented in recent U.S. and international studies (Huang and Ritter, 2009; Faulkender et al., 2012; Elsas and Florysiak, 2011; Öztekin and Flannery, 2012; among others). As expected, taking the average over all estimates, the mean speed of adjustment is roughly 25% per year, which is closest in magnitude to the (unbiased) DPF-estimator and corresponds to a half-life of a shock of about 2.5 years.[6]

The literature reports mixed results on whether adjustment speed is higher or lower for market leverage compared to book leverage ratios (Faulkender et al., 2012). Table A.I in the appendix reports generally higher adjustment speeds for market leverage ratios than for book leverage ratios. Huang and Ritter (2009) argue that the capital structure inertia (as reported in Welch, 2004) is offset by the effect that the leverage ratio sharply increases after stock price declines. There are two possibilities in these cases: (i) a firm declares bankruptcy and leaves the sample or (ii) the firm's stock price increases, and the leverage ratio sharply decreases. Empirical tests can only capture the latter effect and potentially overestimate the market leverage speed of adjustment.

Finally, our dynamic panel regression results for the entire sample allow interpreting the signs of the variables that determine the target leverage ratio. Our results confirm the existing evidence in the literature on the determinants of target leverage. Profitability exhibits a negative effect on leverage, which is usually interpreted as being consistent with the pecking order theory (suggesting that firms have a preference for internal funds). The market-to-book ratio also has a negative sign in most regressions, thus a higher market-to-book ratio is accompanied by lower leverage. As a high market-to-book ratio is associated with higher bankruptcy costs, this finding could be consistent with the trade-off-theory. While depreciation and R&D

[4] In all BB-model specifications, the lagged dependent variables are modeled to be predetermined. Contemporaneous firm-specific variables are considered to be endogenous (using lags 2 and 3 as instruments).
[5] The long differencing (LD) estimator loses observations due to the high number of lags used as instruments.
[6] The half-life of a leverage shock is calculated as $ln(0.5)/(1-\lambda)$.

are negatively associated with leverage, size, tangibility, and the median industry leverage all exhibit a positive relationship with leverage. These findings support the trade-off theory of capital structure.

IV. Data

To analyze the dynamics of corporate capital structures, we obtain annual firm-level accounting data and market data for listed companies from the United States (USA), Canada (CAN), the United Kingdom (GBR), Germany (DEU), France (FRA), Italy (ITA), and Japan (JPN) from the Compustat Global database. The sample period is from 1992 through 2011. Both active and inactive publicly traded firms are included to avoid a survivorship bias. As usual in capital structure studies, we omit firms with SIC codes inside the ranges 4900-4999 (utilities) and 6000-6999 (financial firms) that operate in regulated markets and whose financing decisions may be driven by special factors. Because small firms are expected to suffer from very high adjustment costs and their leverage determinants might differ from those of large firms (Flannery and Rangan, 2006), we further exclude companies with book assets below 10 million U.S. dollars. To account for a company's total liabilities, we only consider firms that report fully consolidated balance sheets. Financial data are deflated to constant year 2000 U.S. dollars using the consumer price index from the Bureau of Labor Statistics.

A company enters our sample when it has non-missing values for the following data items in Compustat: total assets (AT), debt in current liabilities (DLC), long-term debt ($DLTT$), market value of equity ($MKVAL$), book equity (CEQ), depreciation (DP), income before extraordinary items (IB), interest expenses ($XINT$), taxes (TXT), sales ($SALE$), property, plants, and equipment ($PPENT$), R&D expenses (XRD), and capital expenditures ($CAPX$). A firm remains in our sample as long as Compustat reports non-missing values on all these items and the company's shares remain listed. We require firms to have at least three years of consecutive data. After all data cleaning steps, we remain with complete information for 115,537 firm-year observations from 10,772 firms (with an average of 13.62 years each).

In our empirical analyses, we consider both book leverage and market leverage. As in Flannery and Rangan (2006), target leverage is modeled using the following factors: profitability, market-to-book, depreciation, size, tangibility, R&D expenses, no-R&D dummy variable, and industry leverage. Table I summarizes the definition and construction principles of all variables. To mitigate the impact of outliers and to eradicate errors in the data, all variables are winsorized at the upper and lower one percentile.

[Insert Table I here]

In addition to the standard firm-level variables, we collect several country-specific variables as well as macroeconomic indicators. First, we assume that institutional factors affect a firm's capital structure adjustment behavior and interpret different institutional arrangements as affecting the costs and benefits of adjustment. As surveyed in La Porta et al. (2008), the literature provides many indicators of the strength of national institutions. Following Öztekin and Flannery (2012), we collect data describing country-level structural and institutional characteristics that are borrowed from the law and finance literature and proxy for the costs and benefits of a firm's adjustment to the target leverage. For the sake of brevity, Table II provides detailed information for all the G-7 countries in our sample. As in Öztekin and Flannery (2012), the variables are classified as (i) legal and financial traditions, (ii) adjustment costs, and (iii) adjustment benefits (see Section V for a detailed discussion). Second, we expect that the macroeconomic environment affects the speed of adjustment. Recession data for each country are obtained from the Economic Cycle Research Institute. Data on banking crisis and stock market crisis are provided by Carmen Reinhart on her website.[7]

[Insert Table II here]

Table III shows summary statistics of all firm-specific variables. Most important, the mean and median book leverage ratio is 20.4% and 17.2%, respectively. Figure I depicts the evolution of book and market leverage ratios over time in each country. On average, firms in bank-based countries are more leveraged than those in market-based countries during the entire sample period. The observation that the financial traditions in which companies operate affect the level of debt is consistent with earlier evidence in Rajan and Zingales (1995), Antoniou et

[7] For detailed information, see Reinhart and Rogoff (2011) and Carmen Reinhart's website http://www.carmen-reinhart.com/data/browse-by-topic/topics/7/.

al. (2008), Fan et al. (2012), Bessler et al. (2013), among others. On the one hand, firms with strong banking relationships tend to have higher leverage ratios. These firms are able to carry more leverage because the laws in bank-based countries are more oriented toward lender protection. As Antoniou et al. (2008) emphasize, firms that operate in a system in which lenders and borrowers have close ties and face lower threat of bankruptcy borrow more.[8] On the other hand, the managerial preference for equity capital in market-based countries due to the dispersed share ownership and firms' arm's length relationship with their lenders explains their relatively lower leverage ratios. Finally, the observation in Figure I that leverage ratios tend to increase during economic downturns is consistent with the findings in Halling et al. (2012). They report counter-cyclical target leverage ratios. The observed leverage ratios in our sample exhibit similar dynamics albeit with smaller variability.

[Insert Table III and Figure I here]

V. Adjustment Speed Across Countries

A firm has different possibilities to adjust its leverage ratio towards a target. On the one hand, the firm can issue new debt or repurchase shares when it has above-target leverage. On the other hand, it can issue new equity or retire debt when it has below-target leverage. Alternatively, the firm can accomplish leverage adjustments internally by keeping profits as retained earnings or paying them out as dividends. In this section, we analyze whether country-level and institutional factors have an impact on these choices and ultimately determine the speed of adjustment subsequent to leverage shocks. The association between the speed of adjustment and the macroeconomic environment is examined in Section VI. An analysis of both country-level and macroeconomic influences allows us to assess the impact of supply-side constraints on financing decisions and the speed of adjustment. This particular focus of our analyses is in contrast to other recent studies, which mainly investigate demand-side (firm-level) factors that influence leverage dynamics (Faulkender et al., 2012; Elsas and Florysiak, 2011; John et al., 2013). This section starts with a discussion of the theoretical arguments

[8] For an analysis of the relationship between bankruptcy codes and leverage see Acharya et al. (2010, 2011).

why firms from market-based countries are expected to exhibit faster adjustment speeds than firms from bank-based countries. We proceed by presenting our empirical results.

A. Theoretical arguments

Economic theory suggests that the speed of adjustment is dependent on a country's institutional arrangements. Although our analysis contains the most developed G-7 countries, we nevertheless conjecture that there is heterogeneity in the speed of adjustment and that it varies across countries in our sample. Adjustment speed depends on two concepts: (i) the costs of deviating from the target capital structure (or the benefits of adjustment) and (ii) the costs of adjustment back to the target. Managers must assess the trade-off between the costs of being off the target ratio and the costs of adjustment. On the one hand, if a country's institutional environment makes it expensive to issue debt and equity, firms in that country are expected to adjust with a slower speed. On the other hand, institutional characteristics that increase the benefits of being close to the target leverage should lead to higher adjustment speeds. Firms in countries with similar institutional characteristics face similar adjustment costs and benefits and arguably exhibit similar adjustment speeds. One empirical approach is to examine the difference in adjustment speed between the two archetypes of financial systems with their distinguishing corporate governance traditions, i.e., market-based and bank-based financial systems (Allen and Gale, 2000). As argued in Levine (2002), the 'bank-based view' holds that banks – when unhampered by regulatory restrictions on their activities – can exploit scale economies in information processing, ameliorate moral hazard through effective monitoring, and form long-run relationships with firms to ease asymmetric information distortions. In contrast, the 'market-based view' highlights the enhancing role of well-functioning markets in fostering greater incentives to conduct research about firms since it is easier to profit from this information by trading in large, liquid markets (Holmstrom and Tirole, 1993), enhancing corporate governance by easing corporate takeovers and making it easier to tie managerial compensation to firms performance (Jensen and Murphy, 1990), and facilitating risk management (Levine, 1991; Obstfeld, 1994).

The distinction between market-based and bank-based financial systems divides our sample of G-7 countries along several structural and institutional arrangements that affect both the costs and benefits of adjusting leverage. To assess the relative importance of these two forces, we further divide our sample based on the underlying factors that supposedly determine the costs and benefits of adjustment. Based on Öztekin and Flannery (2012), Table II summarizes the set of country-level indexes or scores from the law and finance literature that we consider as important for explaining differences in the speed of adjustment in our cross-section of countries. These country-level variables are classified as (i) legal and financial traditions, (ii) adjustment costs, and (iii) adjustment benefits.

A.1 Costs of adjustment

In a first step, we hypothesize that the costs of adjustment are higher and adjustment speed is slower in bank-based countries than in market-based countries. One component of the costs of adjustment is the ease of access to capital markets. In countries with impeded access to capital markets issuing (or retiring) either debt or equity is more difficult and more costly. Market-based countries are usually characterized by better-functioning capital markets, thus firms from these countries tend to operate in markets with higher liquidity (Holmstrom and Tirole, 1993) and are able to manage their transactions more actively due to their reduced securities trading costs. As shown in Table II, the larger (relative) size of the financial system (Levine, 2002) in market-based countries serves as an indicator for higher market liquidity compared to bank-based countries. A related argument suggests that more sophisticated financial systems reduce market imperfections and are able to provide better financial services. Levine (2002) proposes the 'financial services view' and assesses the efficiency of countries' financial sectors. Generally speaking, market-based countries tend to exhibit higher efficiency scores than bank-based countries, although Japan and Germany also have high efficiency scores in our sample.[9] Moreover, stronger shareholder rights (Claessens et al., 2000; La Porta et al., 2002) and better quality of their enforcement (La Porta et al., 1997, 1998; Levine, 1999) are likely to be associated with lower external financing cost. The bank- and market-based groups of countries in our G-7 sample are congruent with the classification into countries with civil law and common law traditions ('law and finance view'). As indicated in Ta-

[9] Cochrane (2013) provides a discussion about the association between the optimal 'size of finance' and the efficiency of the finance industry.

ble II, common law countries are generally believed to better protect shareholders and offer better quality of contract enforcement and a higher integrity of the legal system, as indicated by the higher law and order score (La Porta et al., 1998; Djankov et al., 2003). All these arguments support our main conjecture that adjustment speed is higher in market-based countries than in bank-based countries.

Information asymmetry is another factor that increases the costs of issuing (or retiring) securities (Myers and Majluf, 1984). For example, to the extent that the quality of accounting information is higher in market-based countries, firms from these countries benfit from lower adverse selection problems and lower costs of external finance (Verrecchia, 2001; Lambert et al., 2007). In fact, based on La Porta et al.'s (1998) corporate transparency index reported in Table II, the common law countries in our G-7 sample tend to exhibit a higher quality of accounting standards than the civil law countries. Moreover, information sharing in the equity and debt markets is determined by the securities laws, which define mandatory disclosure rules, liability standards, and public enforcement (La Porta et al., 2006). All three indexes are shown in Table II and differ across countries in our sample. A related aspect is that transaction costs are arguably higher in stock markets in which insiders (who have access to privileged information) trade with impunity (Daouk et al., 2006; Bhattacharya and Daouk, 2002). As firms from countries with common law traditions are usually assumed to operate under stricter securities as well as insider trading laws (La Porta et al., 2006) and suffer from less pronounced information asymmetry, we hypothesize that their adjustment speeds are higher than those of firms from countries with civil law traditions.

A.2 Benefits of adjustment

In a second step, we hypothesize that the costs of being off the target leverage (or benefits of adjustment) relative to the costs of adjustment are lower and adjustment speed is slower in bank-based countries than in market-based countries. Firms from the former group traditionally have close ties with their creditors, house-banks exert control, and deviations from the target leverage ratio can be negotiated instead of being punished immediately by the market (Antoniou et al., 2008). Arguably, the costs of deviating from the target leverage are lower in bank-based countries than in market-based ones, thus it is feasible for firms to adjust more slowly toward their leverage target without incurring substantial agency costs. Furthermore, although firms from bank-based countries may have easier access to (bank) debt capital, they may need to rely less on debt (and some optimal amount of leverage) as a signal of quality. In contrast to firms from market-based countries, they are not confronted with a large number of dispersed shareholders and a corporate governance system that operates at arm’s length.

A related notion is that loan and debt covenants are likely to increase the benefits of adjustment. While a firm’s covenants restrictions are not observable, the pressure to correct any suboptimal leverage situation can be assessed based on a country’s quality of contract enforcement, its strength of law and order, and its quality of institutions. Based on the ‘law and finance view’, common law countries are believed to put more constraints on executive power (Djankov et al., 2002), ensure a better quality of contract enforcement and a higher integrity of the legal system (La Porta et al., 1998; Djankov et al., 2003), thereby generally inducing stronger governance. The dynamic trade-off model in Morellec et al. (2012) provides a theoretical framework for a positive association between corporate governance and capital structure adjustment speed on a firm-level basis. Using U.S. data, Liao et al. (2013) confirm the model’s main prediction that firms with a better quality of corporate governance have a higher speed of adjustment and lower leverage deviations. As shown in Table II, country-level corporate governance can be measured using indices for contract enforcement, legal system integrity (law and order), corruption, expropriation risk, and repudiation risk. While the index scores do not always allow a clear-cut ranking, the overall picture nevertheless suggests that firms from market-based countries tend to operate in better corporate governance environments and suffer from higher deviation penalties, eventually leading to higher adjustment speeds compared to firms from bank-based countries.

Harris and Raviv (1993) argue that the principles of a country’s bankruptcy law play an important role in determining the leverage ratio that creditors are willing to accept. We therefore expect that distress costs impact the speed of adjustment, with higher distress costs leading to faster adjustment speed. Bankruptcy codes, creditor rights, and the related court mechanisms affect the resolution of financial distress. Djankov et al. (2007) document that there are large variations in the insolvency procedures across countries. In equity-friendly countries there is an explicit bankruptcy code that specifies and limits the rights and claims of creditors and facilitates the reorganization of an ongoing business. In contrast, in debt-friendly countries without bankruptcy codes or weakly enforced codes, creditors hastily claim the collateral by liquidating distressed firms without seeking reorganization (Davydenko and Franks, 2008).[10] We expect that in countries in which lenders can easily force repayment, repossess collateral, gain control of the firms, or enforce debt contracts, the ex-ante financial distress costs are higher and thus the speed of adjustment will be faster. However, the predictions for groups of market- and bank-based countries are ambiguous. As shown in Table II, Germany and France (two bank-based countries) exhibit high and low creditor protection scores (creditor rights), respectively. Similarly, the United Kingdom and the United States (two market-based countries) are also characterized by high and low creditor protection scores, respectively (La Porta et al., 1998; Djankov et al., 2007).[11]

Ex-ante distress costs could also be anticipated by variables that describe the efficiency of the bankruptcy resolution process as the deadweight costs will be less significant. Djankov et al. (2008) document that in market-based countries the bankruptcy process tends to be less time consuming (shorter time to repay), the bankruptcy costs are lower, and the efficiency of bankruptcy is higher than in bank-based countries. Table II reports the corresponding scores for bankruptcy costs and bankruptcy efficiency. Lower deadweight costs associated with the insolvency process in market-based countries compared to bank-based countries support our main hypothesis that adjustment speed is faster in the former group of countries.

B. Empirical results: Cross-country differences

Our empirical results for heterogeneity in the speed of adjustment across the G-7 countries are shown in Table IV. The DPF-based adjustment speed estimates largely confirm our hypotheses. Based on book leverage, country-wise estimation of the dynamic panel model in (3) delivers a 35.4% speed of adjustment for Canada, 32.0% for the U.K., and 26.1% for the U.S.

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[10] Fan et al. (2012) and Bessler et al. (2013) show that the existence of an explicit bankruptcy code (and thus lower creditor rights) is associated with higher debt ratios. Acharya et al. (2011) document that managers choose to reduce leverage in countries with stronger creditor rights.

[11] The four aspects of creditor protection (creditor rights) in the creditor protection score (CPS) are: no automatic stay on assets, rights of secured creditors, restrictions for going into reorganization, and management control in reorganization.

per year. In contrast, firms from bank-based countries tend to exhibit substantially slower adjustment speeds; the speed of adjustment is particularly low in Japan and Italy with 19.5% and 22.6% per year, respectively. The estimated adjustment speeds in Germany and France are slightly higher. The results based on market leverage are qualitatively similar. However, comparing the estimates for book leverage with those for market leverage for the individual countries, market-leverage adjustment speeds are again slightly higher.

[Insert Tables IV here]

Overall, the results corroborate our hypothesis that firms from bank-based countries, on average, exhibit a slower capital structure adjustment speed than firms from market-based countries. While these findings are in line with related studies (Öztekin and Flannery, 2012; Halling et al., 2012), the differences reported in Table IV should nevertheless be on the conservative side for two reasons. First, the G-7 countries in our sample are the most developed large industrial countries, and their governance systems have shown signs of convergence in recent years (Bessler et al., 2012). Second, as discussed in Section III.C, the BB-estimator (GMM system estimator) used in prior studies underestimates for low adjustment speeds and overestimates for higher adjustment speeds, thus generating upward-biased spreads in adjustment speeds across countries. In contrast, the DPF-estimator used here is the only unbiased estimator over all true adjustment speeds.

C. Empirical results: Institutional differences

The simplistic distinction between bank-based and market-based financial systems arguably conceals important differences between the speed of adjustment across countries. Therefore, we now use a more granular measure of institutional differences on the country-level. Specifically, the G-7 countries in our sample are assigned into groups on the basis of the classification schemes shown in Table II (legal and financial traditions, adjustment costs, and adjustment benefits). We rank all countries according to their scores for the different institutional characteristics, and we then aggregate the individual rankings by computing a country's average ranking in each of the three main categories. Based on these average rankings, we finally assign each G-7 country into the following groups: (i) high and low aggregate financial market quality; (ii) high and low adjustment costs; and (iii) high and low adjustment benefits.[12] This approach allows us to test whether the differences in adjustment speed across countries are attributable to differences in the efficiency of financial markets, the costs of adjustment, or the benefits of adjustment. Given that we group each country in all three categories into a high or low group (regime), we pool all observations and estimate the regime-switching partial adjustment model in (7) using the DPF-estimator. Differences in the speed of adjustment in each category (high versus low group) can be tested by using a simple Wald-test for differences in the estimated coefficients on lagged leverage (α_1 and α_2). The results are shown in Table V. For the sake of brevity, we only report the coefficients on lagged leverage and omit the coefficients on all other variables in the X vector in (7), which determine the target leverage ratio.

[Insert Tables V here]

The results from the regime-switching partial adjustment model in (7) generally support our hypotheses. Most important, the speed of adjustment of firms in countries with low adjustment costs is 28.0%, while it is 20.2% in countries with high adjustment costs. A Wald-test indicates that this roughly eight percentage points lower adjustment speed in countries with high adjustment costs is significantly different from that in countries with low adjustment costs at the 1% level. As a result, while it takes about two years for half of a shock to be adjusted in the former group, it takes roughly three years in the latter group. Another expected finding is that firms from countries with high adjustment benefits exhibit a faster speed of adjustment than firms from countries with lower adjustment benefits. However, compared to adjustment costs, the results for the influence of adjustment benefits are less pronounced. The relatively low 2.6 percentage points difference in the speed of adjustment is statistically significant for book leverage, but this value becomes even smaller and is lost in estimation error for market leverage. Against expectations, the speed of adjustment tends to be higher in coun-

[12] The average country rankings in the three categories are shown at the bottom of Table II. The rankings in the category ‘aggregate financial market quality’ (Öztekin and Flannery, 2012) only contain the two subcategories ‘financial market size’ and ‘financial market efficiency’. Based on these average rankings, we assign the G-7 countries as follows: high aggregate quality (USA, CAN, GBR, JPN) versus low aggregate quality (DEU, FRA, ITA); high adjustment costs (DEU, FRA, ITA, JPN) versus low adjustment costs (USA, CAN, GBR); high adjustment benefits (USA, CAN, GBR, DEU, JPN) versus low adjustment benefits (FRA, ITA).

tries with low financial market efficiency, albeit the differences in the estimated adjustment speeds are small.[13]

Taken together, we show that differences in the institutional environment affect the speed of adjustment even in our sample of G-7 countries. As expected by theory, both the adjustment costs and the adjustment benefits have an impact on firms' capital structure dynamics. Given the magnitude of the differences in the estimated coefficients on lagged leverage in the regime-switching partial adjustment model, however, it seems that cross-country heterogeneity is mainly driven by differences in the costs of adjustment. Firms from countries with low adjustment costs adjust with a faster speed than firms from countries with high adjustment costs; the estimated difference is economically relevant and statistically significant. Furthermore, in our G-7 sample the split into countries with high versus low adjustment costs is congruent with the classification into countries with bank-based or market-based financial systems. Given that this simple and aggregate measure of institutional structures generates the largest differences in the estimated speed of adjustment across the G-7 countries, we proceed in the remaining empirical analyses with groups of market-based and bank-based countries (bearing in mind that the wedge in adjustment speed is mainly driven by differences in adjustment costs).

While the analysis so far implicitly assumes symmetry in the debt and equity issuance frictions and the speed of adjustment, additional interaction effects can be incorporated when assessing the impact of institutional structures. For example, in market-based countries one expects a more active debt market. However, depending on the size and liquidity of the government bond market, firms may be crowded-out, ultimately resulting in limited access to this market. Alternatively, the strong reliance on financial institutions in bank-based countries may result in a more liquid debt market without competition from the government sector. Our regime-switching partial adjustment model in (7) is flexible enough to analyze any asymmetry between debt and equity issuance costs (and thus adjustment speed) in the two different financial systems. Specifically, we measure whether a firms is a net debt or a net equity issuer

[13] An explanation for this unexpected result is that the aggregated scores in the category 'financial market efficiency' strongly depend on the size of a country's financial market. Japan (with its large number of firm-year observations) falls into the group of high efficiency countries, albeit the estimated speed of adjustment in Japan is nevertheless very low (see Table IV).

and estimate the speed of adjustment; a firm is classified as a ‘debt-adjuster’ or an ‘equity-adjuster’ if net debt or net equity is larger than zero, respectively.[14] In particular, firms that issue net debt in more than half of their years of sample coverage are treated as ‘debt-adjusters’. Accordingly, firms that issue net equity in more than half of their years of sample coverage are treated as ‘equity adjusters’. Table VI shows the results for this time-invariant classification using the DPF-estimator.[15] For the sake of brevity, we again only report the coefficients on lagged leverage and omit all other estimated coefficients from our regime-switching partial adjustment model.

[Insert Tables VI here]

There are three important findings. First, irrespective of whether a firm is a debt- or an equity-adjuster, the estimated speed of adjustment is again higher in market-based countries than in bank-based countries. Second, there are only small differences in the speed of adjustment between debt- and equity adjusters in market-based countries; these differences are small in magnitude, and the difference becomes statistically insignificant for book leverage. Both observations suggest that the financial markets in these countries are more efficient and adjustment costs are lower compared to bank-based countries. Third, firms in bank-based countries seem to face asymmetric issuance frictions. Table VI reports a significantly higher speed of adjustment for debt-adjusters than for equity-adjusters; the differences are above four percentage points and statistically significant for both book and market leverage. This asymmetry in adjustment speed supports the notion that firms in bank-based countries have a better and relatively cheaper access to bank debt – arguably through relationship lending by their house-bank – than equity, and their relative advantage in obtaining bank debt is reflected in firms’ capital structure adjustment dynamics.

[14] Net debt issuance is defined as the change in total liabilities (*LT*) minus proceeds from the sale of common and preferred stock (*SSTK*) plus the amount of common and preferred stock repurchased (*PRSTKC*) plus the change in the value of preferred stock (*PSTK*). If this difference is positive (negative), the target leverage adjustment is mostly implemented through net debt (net equity) changes (‘debt-adjuster’ versus ‘equity-adjuster’).
[15] See Elsas and Florysiak (2011) for a discussion of the advantages of time-invariant classifications when using the DPF-estimator rather than assigning each firm-year into a specific group or category.

VI. Adjustment Speed over the Business Cycle

The results so far confirm our hypothesis that institutional characteristics affect the speed of adjustment. In addition to these country-specific influences, another potential driver of capital structure decisions is the macroeconomic environment. Model evidence for the business cycle effects on corporate leverage is provided by Hackbarth et al. (2006). They develop a contingent claims model which predicts that the pace and the size of the adjustment will be positively correlated with macroeconomic conditions because the default (restructuring) threshold selected by shareholders is reduced in bad states. This effect leads to decreased bankruptcy costs, lower benefits from adjustment, and slower adjustment during recessions. While prior empirical studies often focus on firm-level factors as determinants of the speed of adjustment (Faulkender et al., 2012; Elsas and Florysiak; 2011), evidence for the impact of business cycle frictions is limited. To the best of our knowledge, only Cook and Tang (2010) and Halling et al. (2012) analyze macroeconomic determinants of adjustment speed, but they devote little attention to cross-country differences in the business cycle effects. Therefore, in this section we analyze how the business cycle affects adjustment speed under different institutional regimes. Our analysis proceeds in two steps. First, we investigate the speed of adjustment during periods of real economy crises and financial system crises separately for bank- and market-based countries. Second, we test whether these business cycle effects in adjustment speed are further dependent on a firm's financial status.

A Adjustment speed during real economy and financial system crises

Prior empirical literature provides evidence for the business cycle dependence of firms' financing decisions. Korajczyk and Levy (2003) find that book and market leverage are countercyclical for financially unconstrained firms, but procyclical for constrained firms. Erel et al. (2012) show that the business cycle affects the choice of debt versus equity capital, the structure of debt contracts, and the usage of capital. Most important, while capital raising is procyclical for noninvestment-grade borrowers, it is countercyclical for investment-grade borrowers. Erel et al. (2012) conclude that supply-side effects play an important role in firms' financing decisions. Similarly, Becker and Ivashina (2011) show a strong substitution effect from loans to bonds during recessions, which they also attribute to supply-driven effects.

While these findings suggest an association between financing decisions and the macroeconomic environment, virtually all prior studies ignore the impact of the business cycle on the speed of adjustment. The studies by Cook and Tang (2010) and Halling et al. (2012) are two exceptions. From a theoretical perspective, the business cycle may affect target leverage ratios and adjustment behavior through different channels. On the one hand, default risk and information asymmetries between firms and investors are expected to be higher during economic downturns. This adverse selection effect implies that issuing (or retiring) securities becomes more expansive and that external relative to internal financing costs increase. To the extent that firms depend on external financing to adjust their capital structure, this effect will lead to an increase in firms' rebalancing costs and slow down their speed of adjustment during economic downturns. However, given that firms' business models may be affected differently during crises, the effects of business cycle fluctuations on adjustment costs and benefits arguably will not be constant across firms. Given differences in firm characteristics and their changes over time, the impact of the business cycle on the target leverage and on the adjustment speed will – at least to some extent – be firm-specific. On the other hand, the business cycle may influence aggregate capital supply, as documented by phenomena such as "credit crunches" (Holmstrom and Tirole, 1997) or "flight-to-quality" (Vayanos, 2004), thereby affecting financing choices at the economy level. During recessions banks may tighten their loan activities and liquidity in the primary and secondary markets for corporate securities is expected to decrease (Duffie et al., 2007; Hennessy and Zechner, 2011). This effect impedes access to external capital markets, increases corporate financing costs, and consequently decreases the speed at which firms are able to adjust after deviations from their target leverage. Overall, these arguments suggest that the speed of adjustment is higher in good macroeconomic states than in bad states.

In addition to the arguments related to default risk, adverse selection, and aggregate capital supply, a few further aspects are noteworthy. Halling et al. (2012) emphasize that the supply-side effects may interact with issuer-driven financing decisions. Starting point is the 'market timing view' of the capital structure (Baker and Wurgler, 2002), which suggests that capital structure changes due to management-initiated financing decisions are implemented in an attempt to exploit 'windows of opportunities.' In particular, market timing behavior is consistent with more and larger equity issuances subsequent to a stock price-run up (Baker and Wurgler, 2002, Bessler et al., 2011).[16] A related interpretation of business cycle effects in capital structure dynamics is that they are in line with trade-off models with time-varying leverage targets. In particular, as argued by Hovakimian (2006), a firm's target leverage is lower when its equity valuation is high and/or after a stock price run-up, and additional equity issuances are necessary to arrive at the new target. The factors that are assumed to influence the target capital structure (i.e., the variables in the X vector in (2)) change over the business cycle, thus demand-driven (or issuer-driven) explanations further support our main hypothesis that the speed of adjustment is higher in good states than in bad states.

Second, our expectations are compatible with the time-varying adverse selection explanation of firms' financing choices, where firms tend to issue equity when stock prices are high and if a higher stock price coincides with lower adverse selection. In Lucas and McDonald's (1990) model, a price run-up will be associated with lower information asymmetry because it may be the gradual resolution of information asymmetry that has triggered the price run-up. Assuming that the degree of information asymmetry is time-varying, the magnitude of adverse selection costs is to some extent under the firm's control (Korajczyk et al. 1992). By choosing the time of an equity issuance, the firm will issue when it expects relatively little information asymmetry. One prediction of this dynamic version of the pecking order theory is that firms announce equity issuances after information releases, even with costly delays of issuances. Choe et al. (1993) and Bayless and Chaplinsky (1996), for example, show that equity issuances cluster during business cycle expansions, which they interpret as being consistent with the idea of time-varying adverse selection. Apart from market timing effects, firms with easier and cheaper (in terms of adverse selection costs) access to capital markets during good macroeconomic conditions are able to adjust faster subsequent to target leverage deviations.

[16] Bessler et al. (2008) even advocate that one should hardly expect to observe that debt ratios are immediately adjusted to stock prices changes. Managers will rather intensify the return-induced changes in leverage in the short-run by exploiting windows of opportunities, and target debt ratios become only important in the long-run. Using Welch's (2004) methodology, they confirm that debt ratio dynamics of European firms are – to a large extent – explained by stock return-induced effects over short- and long-run horizons. However, there is enough capital structure-relevant corporate issuing activity that counteracts a large proportion of stock return-induced equity growth in the long-run.

The contingent claims model of Hackbarth et al. (2006) predicts that the pace and the size of the adjustment will be positively correlated with macroeconomic conditions because the default (or restructuring) threshold selected by shareholders is reduced in bad states. This effect implies decreased bankruptcy costs and lower benefits from adjustment, ultimately leading to a slower speed of adjustment during bad macroeconomic states. Cook and Tang (2010) and Halling et al. (2013) confirm the theoretical prediction of a lower adjustment speed during recessions. With regards to institutional differences, Halling et al. (2012) report a higher adjustment speed for firms from market-based countries compared to bank-based countries independent from the macroeconomic conditions. In addition, adjustment behavior tends to be less sensitive to the business cycle in the former group of countries. The robustness of the speed of adjustment in market-based countries may be attributable to their more developed capital markets and to lower transaction costs in these countries.

Building on the existing empirical evidence, the focus of our analysis is twofold. First, we analyze the business cycle effects on the speed of adjustment depending on the financial system a firm operates in. Second, we provide an analysis of the pure supply-side driven component of the business cycle effect on the speed of adjustment by differentiating between real economy crises and financial system crises. As argued in Halling et al. (2012), supply-side effects are amplified during periods when the economy is contemporaneously hit by a real economy crises and a financial system crisis. They assume that the impact of real economy-only crises on the speed of adjustment through demand-driven factors should not be further intensified by a concurrent financial system crisis. As a result, any differences in adjustment speed estimates during real economy-only and combined (real economy and financial system) crises should serve as an indicator for the strength of the pure supply-side effects.

Adapting the identification strategy in Halling et al. (2012), we define a combined real economy and financial system crisis as a period where a real economy crisis is accompanied by a banking and/or stock market crisis. Our definition of real economy crises for the G-7 countries is based on the Economic Cycle Research Institute (ECRI) business cycle dates. A firm-year is classified as a recession year if at least six months of the firm's fiscal year overlap with a recession period. The data for banking and stock market crisis are taken from Reinhart and Rogoff (2011). Adjustment speeds for expansion and recession periods (regimes) are estimated separately for firms from bank-based and market-based countries since our regime-switching partial adjustment model in (7) only allows for two regimes. Panel A of Table VII presents the results for real economy-only crises, while Panel B shows the estimates for combined real economy and financial system crises. To save space, the estimated coefficients on the target leverage variables are not reported.

[Insert Table VII here]

Overall, our results are consistent with expectations. As shown in Panel A, firms from market-based countries generally adjust faster than firms from bank-based countries in both good and bad economic states, i.e., firms from market-based countries manage their capital structure more actively independent of the given economic state. This observation is in line with our conjecture that the benefits of adjustment are higher and the costs of adjustment are lower in a market-based financial system; thus it confirms our results from Section VI.A for different macroeconomic regimes. The results in Panel B suggest that there are supply-side effects in addition to demand-side effects which influence firms' adjustment behavior. For market leverage in the full sample, the (absolute) decrease in adjustment speed is 4.8 percentage points higher during combined crises periods than during real economy-only crises (9.1% in Panel B versus 4.3% in Panel A). Nevertheless, the institutional differences in business cycle effects allow for richer interpretations. The subsample results for firms from market-based and bank-based countries reveal that the supply-side effects strongly depend on the institutional regime a firm operates in. While the adjustment speed of firms from bank-based countries is significantly lower during real economy-only crises (see Panel A), the adjustment behavior of firms from market-based countries is nearly unaffected by such shocks (Panel B); this observation holds particularly for market leverage. In sharp contrast, firms from market-based countries suffer substantially during periods with contemporaneous real economy and financial crises. Compared to real economy-only crises, the speed of adjustment of firms in market-based countries sharply decreases during combined economic and financial crises. Most important, the spread between good and bad states increases to 6.7 percentage points for book leverage and to 22.7 percentage points for market leverage (see Panel B). While these estimates indicate a strong supply-side induced decrease in adjustment speed for firms from market-based countries, the adjustment behavior of firms from bank-based economies is largely unaffected by the nature of the crisis. One possible explanation for these more robust adjustment speed patterns in bank-based countries is that firms from these countries typically benefit from their strong banking relationships, thus they are able to borrow more from their house-bank and face a lower threat of bankruptcy (Antoniou et al., 2008). To the extent that during crisis periods this relationship-based financial flexibility outweighs the advantages of a market-based financial system, it explains the relatively less pronounced supply-side effects in bank-based countries.

B. Business cycle effects and financial constraints

Results show that firms adjust their capital structure slower during economic recessions. Particularly in market-based countries, supply-driven effects play a major role in explaining changes in the speed of adjustment over time. Depending on their individual characteristics, however, some firms will suffer more from economic downturns than others. As pointed out, the sensitivity of firm-specific adjustment costs to business cycle fluctuations are not expected to be constant across firms, thus the firm-level effect on adjustment speed should also be dependent on the specific characteristics of a firm. One important distinction at the firm-level can be made for financially constrained relative to financially unconstrained firms. Financially constrained firms arguably suffer from restricted access to public capital markets and will find it expensive (or even impossible) to issue securities which allow them to move toward their target leverage ratios. Öztekin and Flannery (2012) argue that the adjustment costs are higher for constrained firms, implying slower capital structure adjustment speed. In contrast, Dang et al. (2012) emphasize that constrained firms face higher bankruptcy and liquidation costs, implying that constrained firms' costs of deviating from their target leverage ratio are relatively high, and they may even adjust faster after a leverage shock compared to unconstrained firms.

From a business cycle perspective, one expects that capital market (or supply-side) frictions further amplify for constrained firms during economic downturns, thus constrained firms suffer more from recessions than unconstrained firms. These business cycle effects on firm-level adjustment costs may additionally depend on the institutional environment the firm operates in. We expect that financial constraints play a stronger role in market-based countries. Given that access to public capital markets is more important for firms with relatively weaker banking relationships, constrained firms from market-based countries may suffer even more from crisis and adjust slower during those periods than their counterparts from bank-based countries. Finally, this effect should be most pronounced during economic recessions which are accompanied by a financial crisis.

To analyze the interaction between financial constraints and the macroeconomic environment, we use estimated rating probabilities according to Faulkender and Petersen (2006) as a proxy for the financial flexibility of a firm in a given year. Using estimated rating probabilities instead of real credit ratings as an indicator of capital market access accounts for the fact that firms without bond ratings might have chosen to rely on equity financing despite having the flexibility and capacity to issue rated debt. We run a logistic regression using our full sample over the 1992-2011 period in order to assess whether a firm is likely able to access debt markets. The dependent binary variable has a value of 1 if firm i in year t has a long-term credit rating and 0 otherwise.[17] As in Faulkender and Petersen (2006) and Lemmon and Zender (2010), the predicting firm characteristics are: tangibility, size, market-to-book, EBIT to sales, research and development expenses, age, volatility, and industry dummy variables for all 2-digit SIC codes in the sample.[18] In order to divide our sample into constrained and unconstrained firms, we insert the estimated coefficients into the logit regression model and compute the estimated probabilities that a given firm would be able to obtain a bond rating in each sample year. The levels of these probabilities are used as a time-invariant indicator for financial constraints in any given firm. Firms are then grouped into deciles according to their median estimated rating probability over the full sample period. We classify firms from the lowest three deciles, i.e., the 30 percent of firms with the lowest median rating probability, as financially constrained; all other firms are considered as financially unconstrained. Table VIII

[17] We use S&P's RatingsXpress historical rating files to determine whether a firm has a long-term credit rating. These files contain ratings for all rating levels and rating types.

[18] We follow Faulkender and Petersen (2006) and exclude leverage as an explanatory variable because we analyze firms' leverage decisions. The regression model includes year, industry, and country fixed effects.

presents the results from our regime-switching partial adjustment model in (7) for different combinations of institutional regimes and financial status.

[Insert Table VIII here]

In line with our prior findings, firms from market-based countries (both constrained and unconstrained) manage their leverage ratios more actively. Consistent with our notion that constrained firms face higher costs of target deviation, they exhibit a slightly faster speed of adjustment than unconstrained firms in the full sample, independent of their institutional environment. During real economy-only crises firms from bank-based countries reduce their adjustment speed between three and seven percentage points (see Panel A); the differences between constrained and unconstrained firms are small in this case. In market-based countries, we observe similar reactions by constrained firms, albeit unconstrained firms seem more or less unaffected by a real economy-only crisis. More pronounced effects are observed during recessions with a concurrent financial crisis. We find a strong decrease in the speed of adjustment for constrained firms in bank-based countries. Arguably, even in a bank-based system unconstrained and less risky firms are preferred by financial intermediaries during a financial crisis due to their regulatory equity requirements, implying that it could be more expensive or even impossible for constrained firms to access capital and to adjust leverage. As expected, these patterns are even stronger in market-based countries. In particular, the difference in the estimated speed of adjustment across macroeconomic states increases sharply to 17.1 percentage points (book leverage) and 23.8 percentage points (market leverage) for constrained firms, suggesting that financially constrained firms from market-based countries are shut out from capital markets during financial system crises.

VII. Conclusions

This study analyzes the heterogeneity in the speed of adjustment of leverage ratios after deviations from the target across countries and over the business cycle. Using a sample of firms from the G-7 countries, we estimate capital structure adjustment speeds using a wide range of different dynamic panel methodologies. To mitigate the biases in other dynamic panel estimators, e.g., emanating from the fact that leverage is bounded and exhibits mechanical mean reversion, we focus on a censored Tobit- or DPF-estimator. Based on this unbiased estimator, the estimated speed of adjustment is 25% per year for the full sample, corresponding to a shock's half-life of approximately 2.5 years. This finding supports the economic relevance of the trade-off theory. In order to compare the differences in the speed of adjustment across financial systems or over macroeconomic states, we specify a regime-switching partial adjustment model. On the one hand, a comparison of adjustment speeds between market- and bank-based economies shows that firms from market-based countries rebalance faster after leverage shocks. The observed differences can be explained by differences in the costs and benefits of adjustment due to the different institutional arrangements. In particular, our analysis indicates that differences in the adjustment costs are the main driver for differences in the estimated adjustment speeds across G-7 countries. On the other hand, the macroeconomic environment has an impact on the speed of adjustment. Firms adjust more slowly during bad macroeconomic states, and this effect is most pronounced for financially constrained firms in market-based countries. The differences in the speed of adjustment both across countries and over the business cycle are statistically significant and economically relevant.

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Tables

Table I

Definitions of Variables

Variable	Definition	Compustat items
Book leverage	Debt in current liabilities plus long-term debt divided by total assets	(DLC+DLTT)/AT
Market leverage	Debt in current liabilities plus long-term debt divided by market value of assets	(DLC+DLTT)/(AT-CEQ+MKVAL)
Profitability	Income before extraordinary items plus interest expenses plus taxes divided by total assets	(IB+XINT+TXT)/AT
Market-to-book	Market value of assets divided by book value of assets	(AT-CEQ+MKVAL)/AT
Depreciation	Depreciation divided by total assets	DP/AT
Size	Natural logarithm of sales	ln(SALE)
Tangibility	Property, plants, and equipment divided by total assets	PPENT/AT
R&D	R&D expenses divided by total assets	XRD/AT
No-R&D	Dummy variable that is equal to one if the firm has no R&D expenses in a given year and zero otherwise	---
Ind. book leverage	Median industry book leverage for Fama-French (1997) industry classification	---
Ind. market leverage	Median industry market leverage for Fama-French (1997) industry classification	---

Table II

Institutional Characteristics

The table shows the institutional characteristics in the sample of G-7 countries that affect the costs and benefits of the speed of adjustment. The G-7 countries are the United States (USA), Canada (CAN), the United Kingdom (GBR), Germany (DEU), France (FRA), Italy (ITA), and Japan (JPN). 'Legal tradition' refers to a dummy variable that is equal to one (zero) if a country has a common (civil) law tradition. 'Financial system' refers to a dummy variable that is equal to one (zero) if a country has market-based (bank-based) financial system. 'Financial system size' and 'financial market efficiency' are taken from Levine (2002). The index of 'shareholder rights' ranges from zero (weak shareholder rights) to five (strong shareholder rights), and the index of 'creditor rights' (creditor protection score, CPS) ranges from zero (weak creditor rights) to four (strong creditor rights). These indices are taken from La Porta et al. (1998) and Djankov et al. (2007). The quality of 'shareholder rights enforcement' is measured as an anti-self-dealing index (Djankov et al., 2008), with higher values indicating higher legal protection of minority shareholders. The quality of 'creditor rights enforcement' is based on a formalism index (Djankov et al., 2003), where the index ranges from zero (strong enforcement) to seven (weak enforcement). Several indices capture the degree of asymmetric information: (i) the 'corporate transparency' index measures the quality of accounting standards (La Porta et al., 1998); (ii) the 'equity disclosure requirements', 'equity liability standards', and 'equity public enforcement' scores are qualitative measures of security laws and regulations (La Porta et al., 2006); (iii) 'insider trading' measures the prevalence of insider trading (La Porta et al., 2006), which ranges from one (pervasive) to seven (extremely rare). 'Enforceability of contracts' measures the degree to which contract agreements are honored (Djankov et al., 2003); the scale ranges from zero (lowest enforceability) to ten (highest enforceability). The 'law and order' index refers the integrity of the legal system (measured on a ten-point scale). The 'corruption' index indicates the rule of law (a higher index value corresponds to less corruption). Both indices are obtained from Djankov et al. (2003). 'Expropriation' and 'repudiation' are indices taken from La Porta et al. (1998). A higher expropriation index indicates lower expropriation risk, a lower repudiation index higher risks of contract modification. 'Bankruptcy costs' refer to the costs to complete the insolvency proceeding (in % of the bankruptcy estate at the time of entry to bankruptcy), and 'bankruptcy efficiency' measures the present value of the terminal value of the firm after bankruptcy costs; both variables are taken from Djankov et al. (2008). Average category rankings at the bottom of the table are obtained from ranking the sample countries according to the institutional variables in each of the three categories. The ranking on 'aggregate financial market quality' only captures the last two variables from the category 'legal and financial traditions'.

	USA	CAN	GBR	DEU	FRA	ITA	JPN
Legal and financial traditions:							
Legal tradition	1	1	1	0	0	0	0
Financial system	1	1	1	0	0	0	0
Financial market size	5.24	4.81	5.02	4.71	4.71	4.13	5.49
Financial market efficiency	2.24	1.84	2.72	1.91	0.64	0.13	3.32
Adjustment costs:							
Shareholder rights	5	5	5	1	3	1	4
Creditor rights	1	1	4	3	0	2	2
Shareholder rights enforcement	0.65	0.64	0.95	0.28	0.38	0.42	0.50
Creditor rights enforcement	2.62	2.09	2.58	3.51	3.23	4.04	2.98
Corporate transparency	71	74	78	62	69	62	65
Equity disclosure requirements	1.00	0.92	0.83	0.42	0.75	0.67	0.75

(continued)

Table II – continued

Equity liability standards	1.00	1.00	0.66	0.00	0.22	0.22	0.66
Equity public enforcement	0.90	0.80	0.68	0.22	0.77	0.48	0.00
Insider trading	5.50	5.20	6.20	4.90	5.10	4.20	5.10
Adjustment benefits:							
Enforceability of contracts	8.73	8.38	8.50	8.40	6.36	5.18	7.57
Law and order	10.00	10.00	10.00	8.33	8.33	10.00	8.33
Corruption	8.63	10.00	9.11	8.93	9.05	6.13	8.51
Expropriation	9.98	9.67	9.71	9.90	9.65	9.35	9.67
Repudiation	9.00	8.96	9.63	9.77	9.19	9.17	9.69
Bankruptcy costs	0.07	0.04	0.06	0.08	0.09	0.22	0.04
Bankruptcy efficiency	85.80	93.20	92.30	57.00	54.10	45.30	95.50
Average category rankings:							
Aggregate financial market quality	2.50	4.50	2.50	4.50	5.50	7.00	1.00
Adjustment costs	2.44	2.67	2.33	5.44	4.56	4.89	4.22
Adjustment benefits	3.14	3.00	2.43	3.43	5.14	5.86	3.43

Table III
Descriptive Statistics

The sample consists of 115,537 firm-year observations originating from 10,772 firms incorporated in the G-7 countries (with an average of 13.62 yearly observations each) and is obtained from the Compustat Global database. The sample period is 1992 through 2011. Descriptive statistics include the mean, the standard deviation (SD), the median, the 25th and 75th percentile, as well as the minimum (Min.) and the maximum (Max.) value of each variable. All variables are winsorized at the upper and lower one percentile.

				Percentiles			
	Mean	SD	Median	25th	75th	Min.	Max.
Book leverage	0.204	0.174	0.043	0.180	0.323	0.000	0.679
Market leverage	0.172	0.165	0.026	0.130	0.274	0.000	0.652
Profitability	0.042	0.133	0.015	0.055	0.106	-0.613	0.319
Market-to-book	1.684	1.282	0.985	1.251	1.844	0.544	8.406
Depreciation	0.039	0.029	0.020	0.034	0.052	0.000	0.168
Size	5.778	1.806	4.577	5.712	6.945	1.162	10.381
Tangibility	0.274	0.200	0.116	0.238	0.382	0.008	0.883
R&D	0.028	0.059	0.000	0.000	0.026	0.000	0.346
No-R&D	0.494	0.500	0.000	0.000	1.000	0.000	1.000
Ind. book leverage	0.178	0.079	0.122	0.194	0.235	0.016	0.333
Ind. market leverage	0.138	0.075	0.075	0.146	0.192	0.006	0.309

Table IV

Speed of Adjustment across Countries

The table presents the speed of adjustment estimates for each G-7 country. The G-7 countries are the United States (USA), Canada (CAN), the United Kingdom (GBR), Germany (DEU), France (FRA), Italy (ITA), and Japan (JPN). The single-country adjustment speed estimates are obtained from the partial adjustment model in (3) using the DPF-estimator. The sample period is from 1992 through 2011. Book leverage and market leverage are the dependent variable. Target leverage is modeled as a function of the factors profitability, market-to-book, depreciation, size, tangibility, R&D, and industry leverage. To account for unobserved heterogeneity across firms and over time, each specification includes firm and year fixed effects. Standard errors are heteroskedasticity consistent. ***, **, and * denote statistical significance at the 1%, the 5% and the 10% level, respectively.

	(USA)	(CAN)	(GBR)	(JPN)	(DEU)	(FRA)	(ITA)
Dependent variable: Book leverage							
Book leverage$_{t-1}$	0.739***	0.646***	0.680***	0.805***	0.739***	0.724***	0.774***
	(0.005)	(0.028)	(0.011)	(0.004)	(0.013)	(0.014)	(0.022)
Speed of adjustment (%)	26.1%	35.4%	32.0%	19.5%	26.1%	27.6%	22.6%
Profitability	-0.207***	-0.175***	-0.172***	-0.298***	-0.208***	-0.226***	-0.292***
	(0.005)	(0.018)	(0.008)	(0.005)	(0.011)	(0.013)	(0.025)
Market-to-book	-0.006***	-0.006**	-0.001	-0.002***	0.000	0.001	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Depreciation	-0.597***	-0.452***	-0.505***	-0.150***	-0.272***	-0.355***	-0.634***
	(0.030)	(0.102)	(0.047)	(0.023)	(0.046)	(0.053)	(0.122)
Size	0.018***	0.020***	0.026***	0.018***	0.018***	0.015***	0.013***
	(0.001)	(0.004)	(0.002)	(0.001)	(0.002)	(0.002)	(0.003)
Tangibility	0.107***	0.089***	0.112***	0.064***	0.167***	0.063***	0.041*
	(0.007)	(0.024)	(0.010)	(0.005)	(0.015)	(0.018)	(0.025)
No-R&D	0.001	0.014	-0.005	-0.003**	-0.001	-0.008**	0.006
	(0.003)	(0.011)	(0.003)	(0.001)	(0.004)	(0.003)	(0.006)
R&D	-0.151***	0.052	-0.074**	-0.072**	-0.177***	-0.160***	-0.028
	(0.017)	(0.081)	(0.036)	(0.029)	(0.044)	(0.042)	(0.155)
Industry book leverage	0.149***	0.266***	0.067**	0.055***	0.086**	0.072**	0.131**
	(0.018)	(0.075)	(0.031)	(0.012)	(0.038)	(0.036)	(0.058)

(continued)

Table IV – continued

Dependent variable: Market leverage							
Market leverage$_{t-1}$	0.664***	0.601***	0.627***	0.734***	0.701***	0.669***	0.736***
	(0.005)	(0.023)	(0.010)	(0.004)	(0.012)	(0.013)	(0.021)
Speed of adjustment (%)	33.6%	39.9%	37.3%	26.6%	29.9%	33.1%	26.4%
Profitability	-0.173***	-0.162***	-0.139***	-0.231***	-0.173***	-0.182***	-0.222***
	(0.004)	(0.016)	(0.008)	(0.006)	(0.010)	(0.012)	(0.025)
Market-to-book	-0.016***	-0.014***	-0.016***	-0.021***	-0.015***	-0.015***	-0.024***
	(0.000)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Depreciation	-0.555***	-0.431***	-0.427***	-0.139***	-0.285***	-0.303***	-0.615***
	(0.026)	(0.087)	(0.045)	(0.026)	(0.043)	(0.050)	(0.122)
Size	0.020***	0.021***	0.027***	0.021***	0.021***	0.017***	0.012***
	(0.001)	(0.003)	(0.002)	(0.001)	(0.002)	(0.002)	(0.003)
Tangibility	0.091***	0.119***	0.101***	0.076***	0.140***	0.082***	0.037
	(0.006)	(0.020)	(0.009)	(0.006)	(0.014)	(0.017)	(0.025)
No-R&D	-0.003	0.002	-0.007**	-0.001	-0.003	-0.005	0.005
	(0.003)	(0.009)	(0.003)	(0.001)	(0.004)	(0.003)	(0.006)
R&D	-0.130***	-0.029	-0.119***	-0.078**	-0.179***	-0.121***	0.017
	(0.015)	(0.069)	(0.035)	(0.033)	(0.041)	(0.040)	(0.155)
Industry market leverage	0.233***	0.318***	0.125***	0.103***	0.093***	0.091***	0.211***
	(0.015)	(0.060)	(0.028)	(0.013)	(0.034)	(0.032)	(0.057)
Observations	41,730	1,921	10,909	36,275	5,928	5,966	2,035

Table V

Speed of Adjustment and the Institutional Environment

The table presents the speed of adjustment (SOA) estimates in different institutional environments. The speed of adjustment is modeled as dependent on financial market efficiency, adjustment costs, and adjustment benefits. In all three categories, the G-7 countries are ranked into two groups: countries with low/high financial market efficiency, countries with low/high adjustment costs, and countries with low/high adjustment benefits. Country rankings are based on the institutional characteristics and average category rankings as described in Table II. All observations are pooled and the regime-switching partial adjustment model in (7) is estimated using the DPF-estimator. Differences in the speed of adjustment in each category (high versus low group) can be tested by using a simple Wald-test for differences in the estimated coefficients on lagged leverage (α_1 and α_2). The sample period is from 1992 through 2011. Book leverage and market leverage are the dependent variable. For the sake of brevity, the table only reports the coefficients on lagged leverage and omits the coefficients on all target leverage variables contained in the X vector (profitability, market-to-book, depreciation, size, tangibility, R&D, and industry leverage). To account for unobserved heterogeneity across firms and over time, each specification includes firm and year fixed effects. Standard errors are heteroskedasticity consistent. ***, **, and * denote statistical significance at the 1%, the 5% and the 10% level, respectively.

	Financial market efficiency	Adjustment costs	Adjustment benefits
Dependent variable: Book leverage			
Low	0.725***	0.720***	0.753***
	(0.006)	(0.003)	(0.003)
SOA (%)	27.5%	28.0%	24.7%
High	0.755***	0.798***	0.727***
	(0.003)	(0.004)	(0.009)
SOA (%)	24..5%	20.2%	27.3%
Difference SOA (abs.)	3.0%***	7.8%***	2.6%***
Dependent variable: Market leverage			
Low	0.678***	0.650***	0.689***
	(0.006)	(0.004)	(0.003)
SOA (%)	32.2%	35.0%	31.1%
High	0.690***	0.728***	0.675***
	(0.003)	(0.004)	(0.009)
SOA (%)	31.0%	27.2%	32.5%
Difference SOA (abs.)	1.2%*	7.8%***	1.4%
Observations	104,764	104,764	104,764

Table VI

Equity- versus Debt-Adjustment

The table presents tests for the asymmetry between equity and debt issuance costs and their impact on the speed of adjustment (SOA) in bank- and market based financial systems. The adjustment speed estimates are reported for 'equity-adjusters' and 'debt-adjusters'. Equity-adjusters are firms that mainly adjust their capital structure though equity issues, while debt-adjusters primarily manage their capital structure through debt issues. Firms from the G-7 countries are classified based on their median net debt issues. In particular, firms that issue net debt in more than half of their years of sample coverage are treated as debt-issuers. Firms that issue net equity in more than half of their years of sample coverage are treated as equity-issuers. All sample observations are pooled, and the regime-switching partial adjustment model in (7) is estimated using the DPF-estimator. Differences in the speed of adjustment between equity- and debt-adjusters can be tested by using a simple Wald-test for differences in the estimated coefficients on lagged leverage (α_1 and α_2). Adjustment speeds for equity- and debt-adjusters are estimated separately for firms from bank-based and market-based countries. The sample period is from 1992 through 2011. Book leverage and market leverage are the dependent variable. For the sake of brevity, the table only reports the coefficients on lagged leverage and omits the coefficients on all target leverage variables contained in the X vector (profitability, market-to-book, depreciation, size, tangibility, R&D, and industry leverage). To account for unobserved heterogeneity across firms and over time, each specification includes firm and year fixed effects. Standard errors are heteroskedasticity consistent. $***$, $**$, and $*$ denote statistical significance at the 1%, the 5% and the 10% level, respectively.

	Full sample	Bank-based countries	Market-based countries
Dependent variable: Book leverage			
Equity-adjuster	0.764***	0.812***	0.735***
	(0.004)	(0.005)	(0.007)
SOA (%)	23.6%	18.8%	26.5%
Debt-adjuster	0.743***	0.767***	0.732***
	(0.003)	(0.004)	(0.005)
SOA (%)	25.7%	23.3%	26.8%
Difference SOA (abs.)	2.1%***	4.5%***	0.3%
Dependent variable: Market leverage			
Equity-adjuster	0.706***	0.748***	0.669***
	(0.004)	(0.005)	(0.006)
SOA (%)	29.4%	25.2%	33.1%
Debt-adjuster	0.676***	0.707***	0.652***
	(0.003)	(0.004)	(0.005)
SOA (%)	32.4%	29.3%	34.8%
Difference SOA (abs.)	3.0%***	4.1%***	1.7%**
Observations	104,764	50,204	54,560

Table VII

Speed of Adjustment over the Business Cycle

The table presents speed of adjustment (SOA) estimates in good and bad macroeconomic states. All sample observations are pooled, and the regime-switching partial adjustment model in (7) is estimated using the DPF-estimator for two different crisis definitions: real economy crises (Panel A) and combined real economy and financial system crises (Panel B). A combined real economy and financial system crisis is defined as a period where a real economy crisis is accompanied by a banking and/or stock market crisis. The definition of real economy crises for the different G-7 countries is based on the Economic Cycle Research Institute (ECRI) business cycle dates. A firm-year is classified as a recession year if at least six month of the firm's fiscal year overlap with a recession period. The data for combined crises are taken from Reinhart and Rogoff (2011). Differences in the speed of adjustment between good and bad macroeconomic states can be tested by using a simple Wald-test for differences in the estimated coefficients on lagged leverage (α_1 and α_2). Adjustment speeds for expansion and recession periods are estimated separately for firms from bank-based and market-based countries. The sample period is from 1992 through 2011. Book leverage and market leverage are the dependent variable. For the sake of brevity, the table only reports the coefficients on lagged leverage and omits the coefficients on all target leverage variables contained in the X vector (profitability, market-to-book, depreciation, size, tangibility, R&D, and industry leverage). To account for unobserved heterogeneity across firms and over time, each specification includes firm and year fixed effects. Standard errors are heteroskedasticity consistent. ∗∗∗, ∗∗, and ∗ denote statistical significance at the 1%, the 5% and the 10% level, respectively.

	Full sample	Bank-based countries	Market-based countries
Panel A: Adjustment speeds during real economy crises			
Dependent variable: Book leverage			
Good state	0.742***	0.768***	0.729***
	(0.003)	(0.004)	(0.005)
SOA (%)	25.8%	23.2%	27.1%
Recession	0.783***	0.806***	0.752***
	(0.005)	(0.005)	(0.008)
SOA (%)	21.7%	19.4%	24.8%
Difference SOA (abs.)	4.1%***	3.8%***	2.3%***
Dependent variable: Market leverage			
Good state	0.672***	0.692***	0.659***
	(0.003)	(0.004)	(0.004)
SOA (%)	32.8%	30.8%	34.1%
Recession	0.715***	0.755***	0.649***
	(0.004)	(0.005)	(0.008)
SOA (%)	28.5%	24.5%	35.1%
Difference SOA (abs.)	4.3%***	6.3%***	1.0%

(continued)

Table VII – continued

Panel B: Adjustment speeds during combined crises (real economy and financial system crises)

Dependent variable: Book leverage			
Good state	0.747***	0.778***	0.730***
	(0.003)	(0.004)	(0.004)
SOA (%)	25.3%	22.2%	27.0%
Recession	0.806***	0.826***	0.797***
	(0.007)	(0.008)	(0.013)
SOA (%)	19.4%	17.4%	20.3%
Difference SOA (abs.)	5.9%***	4.8%***	6.7%***
Dependent variable: Market leverage			
Good state	0.677***	0.711***	0.652***
	(0.003)	(0.004)	(0.004)
SOA (%)	32.3%	28.9%	34.8%
Recession	0.768***	0.764***	0.879***
	(0.007)	(0.008)	(0.015)
SOA (%)	23.2%	23.6%	12.1%
Difference SOA (abs.)	9.1%***	5.3%***	22.7%***
Observations	104,764	50,204	54,560

Table VIII

Macroeconomic Conditions, Financial Constraints, and the Speed of Adjustment

The table presents speed of adjustment (SOA) estimates for constrained and unconstrained firms in good and bad macroeconomic states. Firms are grouped into constrained and unconstrained firms based on their rating probability (see Section VI.B). All sample observations are pooed, and the regime-switching partial adjustment model in (7) is estimated for real economy crises (Panel A) and combined real economy and financial crises (Panel B) using the DPF-estimator. A combined real economy and financial system crisis is defined as a period where a real economy crisis is accompanied by a banking and/or stock market crisis. The definition of real economy crises for the different G-7 countries is based on the Economic Cycle Research Institute (ECRI) business cycle dates. A firm-year is classified as a recession year if at least six month of the firm's fiscal year overlap with a recession period. The data for combined crises are taken from Reinhart and Rogoff (2011). Differences in the speed of adjustment in in good and bad states can be tested by using a simple Wald-test for differences in the estimated coefficients on lagged leverage (α_1 and α_2). Adjustment speeds for financially constrained and unconstrained are estimated separately for firms from bank-based and market-based countries. The sample period is from 1992 through 2011. Book leverage and market leverage are the dependent variable. For the sake of brevity, the table only reports the coefficients on lagged leverage and omits the coefficients on all target leverage variables contained in the X vector (profitability, market-to-book, depreciation, size, tangibility, R&D, and industry leverage). To account for unobserved heterogeneity across firms and over time, each specification includes firm and year fixed effects. Standard errors are heteroskedasticity consistent. $***$, $**$, and $*$ denote statistical significance at the 1%, the 5% and the 10% level, respectively.

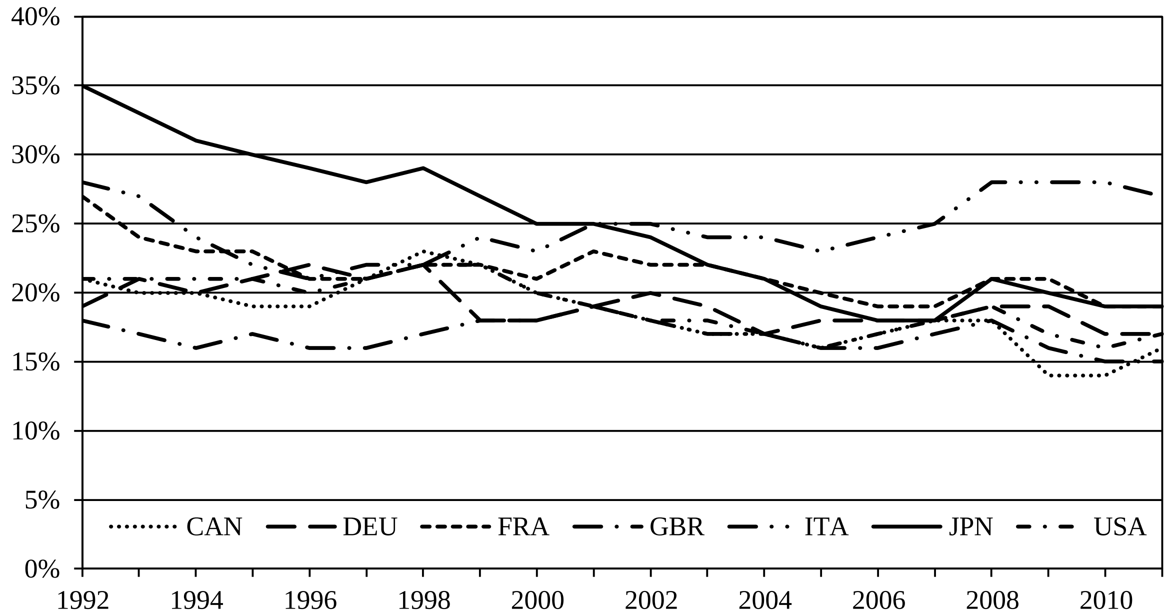
	Full sample		Bank-based countries		Market-based countries	
	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained
Panel A: Adjustment speeds during real economy crises						
Dependent variable: Book leverage						
Good state	0.749***	0.713***	0.813***	0.730***	0.733***	0.675***
	(0.004)	(0.006)	(0.005)	(0.007)	(0.005)	(0.016)
SOA (%)	25.1%	28.7%	18.7%	27.0%	26.7%	32.5%
Recession	0.786***	0.771***	0.845***	0.778***	0.754***	0.736***
	(0.005)	(0.009)	(0.006)	(0.009)	(0.008)	(0.033)
SOA (%)	21.4%	22.9%	15.5%	22.2%	24.6%	26.4%
Difference SOA (abs.)	3.7%***	5.8%***	3.2%***	4.8%***	2.1%***	6.1%***
Dependent variable: Market leverage						
Good state	0.676***	0.660***	0.717***	0.666***	0.661***	0.641***
	(0.003)	(0.006)	(0.005)	(0.007)	(0.005)	(0.014)
SOA (%)	32.4%	34.0%	28.3%	33.4%	33.9%	35.9%

(continued)

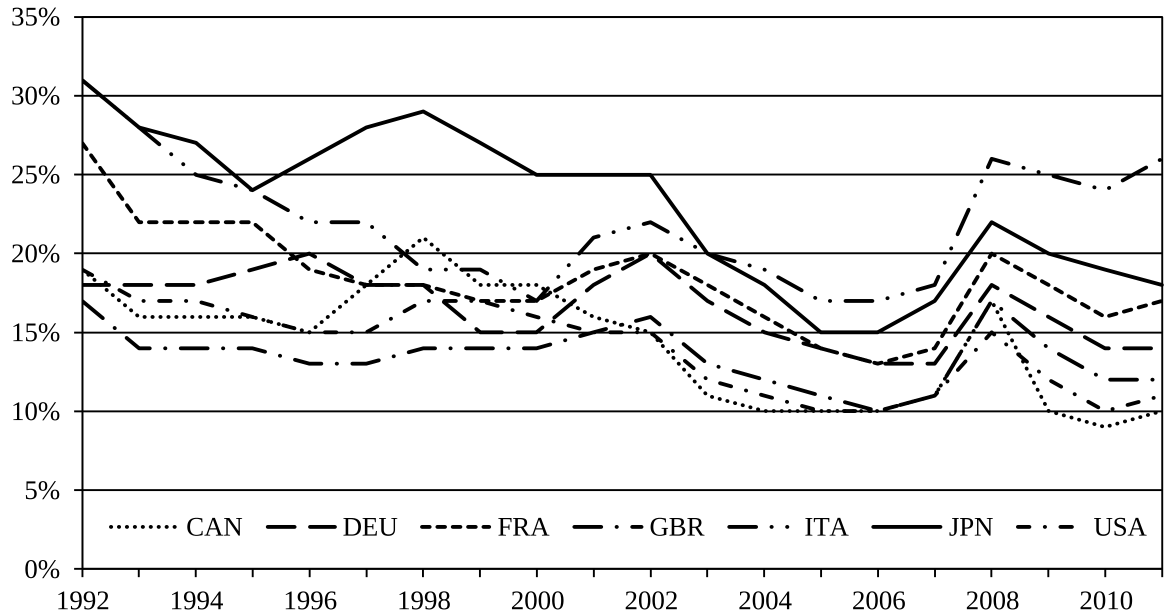
Table VIII – continued

Recession	0.710*** (0.005)	0.732*** (0.008)	0.773*** (0.006)	0.739*** (0.009)	0.649*** (0.008)	0.692*** (0.027)
SOA (%)	29.0%	26.8%	22.7%	26.1%	35.1%	30.8%
Difference SOA (abs.)	3.4%***	7.2%***	5.6%***	7.3%***	1.2%	5.1%*
Panel B: Adjustment speeds during combined crises (real economy and financial crises)						
Dependent variable: Book leverage						
Good state	0.753*** (0.003)	0.721*** (0.006)	0.823*** (0.005)	0.739*** (0.007)	0.735*** (0.005)	0.680*** (0.015)
SOA (%)	24.7%	27.9%	17.7%	26.1%	26.5%	32%%
Recession	0.803*** (0.008)	0.810*** (0.015)	0.851*** (0.009)	0.811*** (0.015)	0.794*** (0.014)	0.851*** (0.058)
SOA (%)	19.7%	19.0%	14.9%	18.9%	20.6%	14.9%
Difference SOA (abs.)	5.0%***	8.9%***	2.8%***	7.2%***	5.9%***	17.1%***
Dependent variable: Market leverage						
Good state	0.678*** (0.003)	0.676*** (0.006)	0.734*** (0.005)	0.685*** (0.006)	0.652*** (0.004)	0.647*** (0.014)
SOA (%)	32.2%	32.4%	26.6%	31.5%	34.8%	35.3%
Recession	0.770*** (0.008)	0.765*** (0.014)	0.768*** (0.009)	0.763*** (0.014)	0.877*** (0.016)	0.885*** (0.054)
SOA (%)	23.0%	23.5%	23.2%	23.7%	12.3%	11.5%
Difference SOA (abs.)	9.2%***	8.9%***	3.4%***	7.8%***	22.5%***	23.8%***
Observations	76,178	28,586	28,826	21,378	47,352	7,208

Figures



(a) Book leverage



(b) Market leverage

Figure I. Mean leverage ratios over time. The sample consists of 115,537 firm-year observations originating from 10,772 firms incorporated in the G-7 countries (with an average of 13.62 yearly observations each) and is obtained from the Compustat Global database. The G-7 countries are the United States (USA), Canada (CAN), the United Kingdom (GBR), Germany (DEU), France (FRA), Italy (ITA), and Japan (JPN). The sample period is 1992 through 2011. The figures present mean book leverage ratios (a) and mean market leverage ratios (b) for each sample country. Firm-year leverage ratios are winsorized at the upper and lower one percentile.

Appendix

Table A.I

Comparison of Dynamic Panel Estimators

The table presents speed of adjustment estimates for seven different dynamic panel estimators using a comprehensive set of firms from the G-7 countries: the ordinary least squares estimator (OLS); the fixed effect estimator (FE); Arellano and Bond's (1991) difference GMM estimator (AB); Bundell and Bond's (1998) system GMM estimator; Elsas and Florysiak's (2010) censored Tobit estimator (DPF); Huang and Ritter's (2009) four period long differencing implementation of Hahn et al.'s (2007) balanced panel estimator (LD4); and a longest differencing version of Hahn et al.'s (2007) balanced panel estimator (LD). Estimates are based on the partial adjustment model in (3). The sample period is from 1992 through 2011. Book leverage and market leverage are the dependent variable. Target leverage is modeled as a function of the factors profitability, market-to-book, depreciation, size, tangibility, R&D, and industry leverage. To account for unobserved heterogeneity across firms and over time, each model includes firm and year fixed effects (except the OLS model). Standard errors are heteroskedasticity consistent. ***, **, and * denote statistical significance at the 1%, the 5% and the 10% level, respectively.

	(OLS)	(FE)	(AB)	(BB)	(DPF)	(LD4)	(LD)
Dependent variable: Book leverage							
Book leverage$_{t-1}$	0.887***	0.619***	0.730***	0.818***	0.750***	0.770***	0.776***
	(0.002)	(0.004)	(0.011)	(0.007)	(0.003)	(0.004)	(0.008)
Speed of adjustment (%)	11.3%	38.1%	27.0%	18.2%	25.0%	23.0%	22.4%
Profitability	-0.122***	-0.194***	-0.058***	-0.076***	-0.208***	-0.185***	-0.122***
	(0.003)	(0.004)	(0.015)	(0.011)	(0.003)	(0.006)	(0.007)
Market-to-book	0.000**	-0.004***	-0.001	0.002**	-0.004***	-0.002***	0.002***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Depreciation	-0.096***	-0.404***	-0.282***	-0.116***	-0.425***	-0.447***	-0.068*
	(0.011)	(0.022)	(0.060)	(0.044)	(0.015)	(0.025)	(0.035)
Size	0.003***	0.017***	0.015***	0.005***	0.017***	0.015***	0.003***
	(0.000)	(0.001)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)
Tangibility	0.029***	0.085***	0.199***	0.082***	0.100***	0.076***	0.011*
	(0.002)	(0.007)	(0.026)	(0.010)	(0.004)	(0.007)	(0.006)
No-R&D	0.003***	-0.000	-0.001	0.008***	-0.002	-0.001	-0.000
	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.002)
R&D	-0.088***	-0.153***	-0.197**	0.016	-0.153***	-0.151***	-0.049**
	(0.007)	(0.017)	(0.078)	(0.028)	(0.011)	(0.020)	(0.020)

(continued)

Table A.I - continued

Industry book leverage	0.024***	0.133***	0.196***	0.019	0.117***	0.099***	-0.013
	(0.004)	(0.012)	(0.019)	(0.013)	(0.010)	(0.013)	(0.015)
Dependent variable: Market leverage							
Market leverage$_{t-1}$	0.860***	0.580***	0.686***	0.794***	0.688***	0.705***	0.771***
	(0.002)	(0.004)	(0.010)	(0.006)	(0.003)	(0.004)	(0.008)
Speed of adjustment (%)	14.0%	42.0%	31.4%	20.6%	31.2%	29.5%	22.9%
Profitability	-0.095***	-0.162***	-0.050***	-0.078***	-0.170***	-0.154***	-0.086***
	(0.003)	(0.004)	(0.013)	(0.009)	(0.003)	(0.005)	(0.007)
Market-to-book	-0.007***	-0.015***	-0.002**	-0.000	-0.017***	-0.012***	-0.004***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Depreciation	-0.125***	-0.389***	-0.178***	-0.202***	-0.411***	-0.416***	-0.029
	(0.010)	(0.019)	(0.053)	(0.038)	(0.014)	(0.022)	(0.033)
Size	0.002***	0.018***	0.019***	0.003***	0.019***	0.019***	0.003***
	(0.000)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)
Tangibility	0.028***	0.080***	0.093***	0.050***	0.093***	0.069***	0.007
	(0.002)	(0.006)	(0.024)	(0.009)	(0.004)	(0.006)	(0.006)
No-R&D	0.005***	0.000	0.000	0.005***	0.000	-0.000	0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)
R&D	-0.061***	-0.134***	-0.155***	-0.086***	-0.136***	-0.132***	0.011
	(0.005)	(0.012)	(0.052)	(0.022)	(0.011)	(0.013)	(0.017)
Industry market leverage	0.027***	0.199***	0.378***	0.077***	0.177***	0.178***	-0.030**
	(0.004)	(0.012)	(0.018)	(0.010)	(0.009)	(0.013)	(0.014)
Observations	104,764	104,764	93,991	104,764	104,764	64,019	73,232