Leverage Dynamics over the Business Cycle *

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ABSTRACT

This paper analyzes the business cycle dynamics of leverage using a comprehensive, international sample. For the full sample, target leverage ratios increase and speeds of adjustment towards the target decrease during recessions. These effects vary substantially across institutional settings. Firms in common law countries and with relatively high debtholder protection exhibit decreasing target leverage and a much smaller drop in the speed of adjustment in recessions. Leverage dynamics are largely not caused by changing firm characteristics but by their changing effects on firm policies. The results document that both demand and supply effects are important for capital structure.

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There is an ongoing debate on what the main determinants of corporate capital structure dynamics are. Are they driven by changing firm characteristics and if yes, which ones? Or are changing capital market conditions or investor sentiment driving capital structure? Even more fundamentally, there is controversy whether firms manage leverage towards a target at all (Graham and Leary (2011)).

Empirical examinations of firms' dynamic capital structure behavior face significant challenges. For example, existing tests have recently been criticized for ignoring the effects of transactions costs, for selection and survivorship biases and for simply documenting mechanical mean reversion in leverage ratios (see, for example, Strebulaev (2007), Leary and Roberts (2005), Chang and Dasgupta (2009), or Shyam-Sunder and Myers (1999) and Chen and Zhao (2007)). One possible remedy for these challenges is to exploit periods in which certain candidate explanatory variables change significantly due to some exogenous events. One can then analyze how such events affect corporate capital structure choices.

During recessions most of the main theoretical determinants of firms' financial structure experience significant shocks. For example, corporate cash flows drop for many firms, equity capital of financial intermediaries is reduced, equity valuation levels and the term-structure of interest rates usually change etc.. In this paper we therefore explore capital structure dynamics over the business cycle. In particular, we analyze the influence of the business cycle on firms' target capital structures and on the speed with which firms move towards these targets. We model firm leverage using a dynamic partial adjustment framework (see, for example, Fama and French (2002)), in which we allow coefficients to vary across the business cycle. We hereby use stock prices, accounting data and business cycle data from 18 countries. This design allows us to include a sufficiently large number of recession years to study capital structure dynamics over the business cycle.[1]

The international sample also allows us to study the influence of country characteristics such as the institutional environment on leverage *dynamics*. There is ample empirical evidence linking such characteristics to the supply of external capital (e.g., La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997) and La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997)). We use this additional layer of cross-sectional variation of our data to shed more light on supply

[1]Relying on US data only, we would end up with only 5 recessions after 1975. Three of these recessions are less than 12 months long: 1/1980 to 7/1980, 7/90 to 3/91 and 3/2001 to 11/2001. Thus, the statistical power to discriminate between expansions and recessions using yearly balance sheet information would be very low.

effects on leverage dynamics. This also helps econometrically because macro-level country characteristics, such as legal and institutional settings are arguably out of the control of corporate managers and hence exogenous to their corporate decision processes.

Our empirical results generate several novel and robust insights. First, we find that over the entire sample estimated market and book target leverage ratios are counter-cyclical, i.e. decrease during expansions and increase during recessions. These counter-cyclical dynamics can emerge through two different channels: (i) explanatory variables, such as firms' profitability, may change in a particular fashion over the business cycle and (ii) the explanatory variables may affect firms' capital structure policies differently in different phases of the business cycle, i.e. the regression coefficients may change over the business cycle. Simple calculations show that the variation in model parameters is the dominant source of counter-cyclicality. Holding all firm characteristics at their unconditional means, target book (market) leverage ratios are 20 percentage points (41 percentage points) higher during recessions than during expansions. In contrast, if we use static, non-varying coefficient estimates but allow explanatory variables to vary over the business cycle, we find that target book (market) leverage is only 2 percentage points (3 percentage points) higher during recessions than during expansions.

Second, we document that the speed of adjustment towards target leverage is significantly lower during recessions than during expansions. While an average firm closes about 20% of the gap between its target and actual leverage ratio per year during expansions, it reduces the gap only by around 5% per year during recessions. Consistent with this apparent increase in capital market frictions during recessions, we also find that the impact of profitability (negative) and capital expenditures (positive) on target leverage are much stronger during recessions than during expansions.

Third, we find significant differences in capital structure dynamics across firms with different characteristics or institutional environments. For firms from common law countries and for firms from countries in which debtholders and shareholders are equally well protected, we find procyclical rather than counter-cyclical dynamics. Similarly, we find that there is cross-sample heterogeneity in the magnitude of the decrease in the speed of adjustment during recessions. The decrease is, for example, much more pronounced for financially constrained firms whose speed of adjustment estimates drop by around 20 percentage points during recessions, approximately twice the drop experienced by financially unconstrained firms. A similarly pronounced slowdown in the speed of adjustment during recessions (around 15 to 20 percentage points) is observed for the subsample of firms from countries in which bondholders are relatively poorly protected.

This evidence is consistent with firms actively managing leverage towards a target and is difficult to reconcile with the hypothesis that leverage is managed passively or randomly. The results of several robustness tests do not provide any evidence that the findings are driven by mechanical mean reversion. Furthermore, several of our results — i.e., the strong impact of recessions on the parameters of the empirical model and the significant differences across subsamples of firms — indicate that demand-driven *and* supply-driven effects are important determinants of leverage dynamics.

The importance of supply-driven effects is further emphasized when we split business cycle recessions into those that were accompanied by contemporaneous banking crises and those that were not. In particular, the incremental effects of recessions that are also banking crises are much stronger for firms from civil law countries, where bank financing plays a dominant role. More generally, our results suggest that leverage dynamics over the business cycle depend on the development of capital markets and corporate governance standards. Specifically, the financing strategies of firms in common law countries and in countries, in which debt and equity holders are equally well protected, seem to be less affected by business cycle shocks.

We are not aware of studies that have analyzed the dynamics of leverage for a broad sample of firms over the business cycle. Korajczyk and Levy (2003) are closest to this research objective but they restrict their analysis to a panel of US firms which actively change their capital structure. Specifically,Korajczyk and Levy (2003) only include firms that issue or repurchase equity and/or increase or reduce debt by at least 5% of their asset values, resulting in a reduced sample of 5,623 firm quarter observations. Their main finding is that leverage of financially unconstrained firms varies countercyclically with macroeconomic conditions while the one of constrained firms shows procyclical dynamics.[2]

To obtain a full picture of the effect of the business cycle on leverage, it is important

[2]In addition to the sample selection there are other differences in the empirical design between Korajczyk and Levy (2003) and our study. Most importantly, we model partial adjustment towards target leverage and allow coefficient estimates of the econometric model to vary across the business cycle.

to consider not only firms with significant debt or equity issuances or repurchases. We therefore focus on a multi-country sample that consists of all firms, resulting in a sample with 193,643 firm year observations. For this comprehensive sample we find substantial heterogeneity in leverage dynamics. While the full sample shows counter-cyclical leverage dynamics, firms from common-law countries and firms in countries, in which debtholders and equityholders are equally well protected, exhibit procyclical dynamics. In contrast to Korajczyk and Levy (2003), we do not identify significant differences in cyclicality between constrained and unconstrained firms.

A few single country studies have documented that the speed of adjustment (SOA) towards target capital structures seems faster in booms than in recessions (see, for example, Cook and Tang (2009) and Drobetz and Wanzenried (2006)). These studies only allow the speed-of-adjustment estimate to vary with the business cycle but keep all other parameters, such as the target leverage, constant. In contrast, our empirical design allows the coefficients in the target leverage regression to vary across the business cycle. This additional flexibility of the model reflects that firms can adjust their speed-of-adjustment as well as their target leverage in response to business cycle variation. Furthermore, our empirical design allows us to document considerable heterogeneity in SOA-dynamics. Financially constrained firms, for example, show a much more pronounced slowdown of their adjustment speed than unconstrained firms. Finally, we also shed new light on the importance of supply-side effects to explain SOA-dynamics.

Our paper also relates more generally to the literature studying leverage dynamics. While the predominant view in the literature is that leverage is rather stable and driven mostly by time-invariant determinants (see, for example, Lemmon, Roberts, and Zender (2008)), more recent studies challenge this view (e.g., DeAngelo and Roll (2011)). We contribute to this discussion in two ways. First, we show substantial variation of target leverage ratios over the business cycle. Second, we document variation in the parameters governing leverage dynamics, i.e. variation in the SOA-estimates and in the coefficients measuring the impact of firm characteristics on target leverage.

Finally, several papers analyze security issuance choices and macroeconomic conditions. Recently, this literature has also focused on disentangling capital supply from demand effects. Erel, Julio, Kim, and Weisbach (2011) find that the business cycle affects the choice of debt versus equity capital, the structure of debt contracts, and the usage of capital. They find that these effects differ across investment-grade and non-investment grade borrowers and conclude that supply effects play a dominant role. Similarly, Becker and Ivashina (2011) show a strong substitution from loans to bonds during economic downturns and associate this with supply effects. Our work complements this literature by providing evidence on capital structure dynamics over the business cycle rather than issuance of corporate securities.

The rest of the paper is organized as follows: Section I describes the empirical strategy and the data; Section II reports our empirical results; Section III discusses these results in the light of dynamic tradeoff models of optimal capital structure. Section IV concludes.

I. Empirical Design and Data

A. Empirical Specification

There is agreement among practitioners and academics that optimizing capital structure in the presence of market frictions must be viewed as a dynamic problem. Our empirical specification is therefore motivated by dynamic tradeoff theories where firms have target leverage ratios at which the marginal costs of leverage equal its marginal benefits.

In the literature, dynamic capital structure adjustments have been captured in different ways. Several dynamic tradeoff models require firms to buy back all existing debt, before new debt can be issued, usually at some proportional issue cost. This introduces a fixed-cost element for recapitalizations and — due to proportional transactions costs – also implies that firms do not move all the way to their target ratios, even right after a recapitalization. Other models, such as in Brennan and Schwartz (1984), model capital structure as an impulse control problem, where firms can issue or retire debt at some maximum rate to adjust leverage. Other models assume fixed and proportional transactions costs associated with capital structure adjustments (see Strebulaev (2007)). All these models have in common that firms are usually not at their target leverage ratio and that recapitalizations move firms towards their target, but not all the way.

In accordance with these views, our econometric setup allows for firms to only partially adjust towards their target capital structures over time. Especially if variable transactions costs are increasing disproportionately with the adjustment, as seems plausible, then firms will find it optimal to engage in "partial adjustment" towards a target ratio.[3]

In our empirical analysis we capture this feature by following Fama and French (2002) and estimating a dynamic partial adjustment capital structure model (DPACS-Model) including year and firm fixed effects.[4] A DPACS-Model contemporaneously estimates time-varying target leverage ratios and the speed of adjustment with which actual leverage ratios move towards target leverage ratios. In this research we focus on the effect of business cycles on a firm's target leverage ratio as well as its speed of adjustment towards the target. Specifically, our dynamic partial adjustment capital structure model (DPACS-model) consists of the following two components.

A.1. Target Leverage

Let $\mathbf{lr} \in \{bl, ml\}$ denote a firm's actual book or market leverage ratio. In order to model time-varying and cycle-dependent leverage targets, we specify a firm's target leverage ratio, $\mathbf{Tlr}$, as follows:

$$\mathbf{Tlr}_{j,i,t+1} = \sum_{s} \left(\beta_0^s + \beta^s \mathbf{X}_{j,i,t+1} \right) \mathbf{1}_{j,t+1}^s, \quad s \in S \equiv \{rec, exp\}, \tag{1}$$

where $\mathbf{1}_{j,t}^{rec}(\mathbf{1}_{j,t}^{exp})$ is a dummy variable that equals 1 when firm i from country j is in a recession (an expansion) at time t and 0 otherwise, $\mathbf{X}_{j,i,t}$ is a vector of firm- and industry-

[3]Many dynamic theories involve passive capital structure policies until a boundary is hit, at which time a large, discrete adjustment occurs. This is largely the result of the specification of transactions costs, which is frequently restricted by tractability considerations. Transactions costs are usually assumed to be a constant proportion of the capital structure adjustment. In addition a fixed cost element is introduced by forcing the firm to revert to an all equity firm before re-issuing the new level of debt. As argued above, however, transactions costs are likely to be non-linear in the size of the adjustment. I.e. in every period, small adjustments towards a target leverage ratio may involve only moderate transactions costs, whereas the costs of large issues are likely to increase disproportionately with the amount of capital that needs to be raised and/or retired.

[4]See Chang and Dasgupta (2009) and Iliev and Welch (2010) for critical discussions of these models.

level characteristics[5], i.e.

$$\mathbf{X} = [\textit{sales}, \textit{market to book}, \ \textit{profitability}, \textit{tangibility}, \textit{industry mean}, \textit{capital expenditures}]' \,. \tag{2}$$

Our model specification allows us to study the business cycle effect on target leverage through two channels. First, the coefficients β_0^{rec} and β_0^{exp} capture the direct influence of the business cycle variable on target, i.e. a parallel shift. Second, the coefficient vectors β^{rec} and β^{exp} present the indirect impact of the business cycle on target leverage, through their interactions with the above firm characteristics, which are time-varying. To see this, we can re-write equation (1) as

$$\mathbf{Tlr}_{j,i,t+1} = \beta_0^{exp} + \beta^{exp}\mathbf{X}_{j,i,t+1} + \left[\left(\beta_0^{rec} - \beta_0^{exp}\right) + \left(\beta^{rec} - \beta^{exp}\right)\mathbf{X}_{j,i,t+1}\right]\mathbf{1}_{j,t+1}^{rec}. \tag{3}$$

A.2. Partial Adjustment To Target

Transactions costs prevent firms from immediately adjusting towards their targets. These costs may have a cyclical pattern that may lead to different speeds of mean reversion of leverage dynamics over the business cycle. We estimate a dynamic partial adjustment capital structure model (DPACS-model) that allows firms to partially move towards their targets.

A DPACS-model that permits cycle-varying speed of adjustment is given by

$$\mathbf{lr}_{j,i,t+1} - \mathbf{lr}_{j,i,t} = \sum_s \alpha^s \mathbf{1}_{j,t+1}^s \left(\mathbf{Tlr}_{j,i,t+1} - \mathbf{lr}_{j,i,t}\right) + e_{j,i,t+1}. \tag{4}$$

Substituting equation (1) into equation (4) yields

$$\mathbf{lr}_{j,i,t+1} - \mathbf{lr}_{j,i,t} = \sum_s \alpha^s \mathbf{1}_{j,t+1}^s \left(\sum_s \left(\beta_0^s + \beta^s \mathbf{X}_{j,i,t+1}\right)\mathbf{1}_{j,t+1}^s - \mathbf{lr}_{j,i,t}\right) + e_{j,i,t+1}. \tag{5}$$

[5]The choice of contemporaneous firm characteristics is somewhat unusual — the empirical capital structure literature usually uses lagged firm-characteristics in the regressions. The problem is that contemporaneous firm characteristics are endogenous but we will address this issue in our econometric setup. Econometrically, we will use System GMM (see Blundell and Bond (1998) for details and Roodman (2006) for an introduction to the estimation) to estimate the dynamic panel model with fixed effects. Flannery and Hankins (2010) evaluate different techniques in this context and conclude that System GMM performs well.The System GMM estimator is able to accommodate endogenous variables by constructing instruments from the provided sample. For robustness reasons, we re-estimate all our specifications with lagged firm characteristics treating them as predetermined variables. Our results are unaffected by this change.

Rearranging and simplifying gives the model we need to estimate

$$\mathbf{lr}_{j,i,t+1} = \sum_{s} \left[(1-\alpha^s)\, \mathbf{lr}_{j,i,t} + \alpha^s \beta_0^s + \alpha^s \beta^s \mathbf{X}_{j,i,t+1} \right] \mathbf{1}_{j,t+1}^s + e_{j,i,t+1}. \tag{6}$$

The speed of adjustment estimate (SOA-estimate) is defined as α^{rec} (α^{exp}) during recessions (expansions). Given the above specification, α^{rec} (α^{exp}) measures the fraction of the difference between a firm's actual and its target leverage ratios, both of which are time-varying, that has been closed during recessions (expansions).

Our DPACS-model nests several existing partial adjustment models, e.g. Flannery and Rangan (2006), in the literature, in which authors assume $\alpha^{exp} = \alpha^{rec}$, $\beta_0^{exp} = \beta_0^{rec}$, and $\beta^{exp}\alpha^{exp} = \beta^{rec}\alpha^{rec}$. To concentrate on the direct effect of macroeconomic conditions on firms' leverage dynamics, we also estimate a simplified model where we assume $\beta^{exp}\alpha^{exp} = \beta^{rec}\alpha^{rec}$ as follows:

$$\mathbf{lr}_{j,i,t+1} = \sum_{s} \left[(1-\alpha^s)\, \mathbf{lr}_{j,i,t} + \alpha^s \beta_0^s \right] \mathbf{1}_{j,t+1}^s + \alpha^{exp} \beta^{exp} \mathbf{X}_{j,i,t+1} + e_{j,i,t+1}. \tag{7}$$

In the subsequent sections, we call equation (6) the "Dynamic (time-varying) Coefficient DPACS" model or "full model" interchangeably and equation (7) the "Static Coefficient DPACS" model.

B. *Data and Sample*

Our source of business cycle data is Economic Cycle Research Institute (ECRI)'s international cycle dates. We use the business cycle chronologies file, which includes countries from America, Europe, Asia Pacific, Africa, and Middle East regions. In order to have information on both business cycle dates and firm-level variables, we end up with 18 countries, ranging from developing to developed economies and from common-law to civil-law countries. Specifically, these countries are: Australia, Austria, Brazil, Canada, France, Germany, India, Italy, Japan, Korea, Mexico, New Zealand, Spain, Sweden, Switzerland, Taiwan, UK, and USA.[6]

We use Worldscope to obtain annual firm-level accounting data. Our sample period is from 1983 to 2009.[7] Variable definitions are given in Appendix A.

[6] Our business cycle data covers China. However, in our subsequent analysis, we remove China from our database because there are no recessions during the sample period.

[7] In our sample some countries have shorter period of data available than others. We don't have firms

Financial firms and utility firms are usually regulated and hence their leverage choices ought to be quite different from other industrial firms. For this reason and following the literature, we remove all financial firms and utility firms, i.e. all firms with *WSIC* between 4300 and 4400 and between 8200 and 8300 are deleted from our sample. We also drop firm-year observations that meet any of the following conditions: (i) zero total assets value, (ii) zero market capitalization, (iii) total debt greater than total asset, (iv) market asset less than cash, (v) total asset less than cash, and (vi) negative cash.

In our empirical analysis, we consider either book or market leverage ratio as a dependent variable. *Book leverage ratio (bl)* is the *Total Debt* to *Total Assets* ratio. *Market leverage ratio (ml)* is the *Total Debt* to *Assets' Market Value* ratio.

We define that a firm year is in a recession if a firm's entire fiscal year overlaps with a recession.[8] We also control for other variables, which have been widely used in the literature, including the logarithm of *Net Sales (sales)*, market to book ratio *(market to book)*, *EBITDA* to *total assets* ratio *(profitability)*, *PPE* to *total assets* ratio *(tangibility)*, industry mean leverage ratio *(industry mean)*, *Capital Expenditures* to *total assets* ratio *(capital expenditures)*.

We further drop observations with (i) negative *Net Sales*, (ii) *Book Net Leverage Ratio* of less than -1, and (iii) *Market Net Leverage Ratio* of less than -1.[9] We do allow firms, at some point in time, to be cash savers, i.e. carrying a negative net leverage ratio, rather than borrowers. However, we remove firm-year observations with net leverage ratios less than -1 because such firms hold a tremendous amount of cash relative to their other type of assets and hence are unlikely to be normal industrial firms. Finally, we winsorize the *market to book* at the 95%-level, *profitability* and *tangibility* at the 99%-level.

Following Almeida, Campello, and Weisbach (2004) and Acharya, Almeida, and Campello (2007), we categorize firms to be financially constrained or unconstrained based on their sizes or dividend payout policies. Specifically, we determined the (time series) median size,

from all countries for all years between 1983 and 2009. However, our first observations are in 1983 and last observations are in 2009.

[8]This definition is a relatively conservative way of identifying recessions. There are, however, two advantages: (i) the definition is most precise in aligning yearly firm data with recession information, and (ii) the definition requires that recessions last for at least 12 months and, thus, filters out "less severe" recessions.

[9]Net leverage ratio refers to the ratio of *Total Debt* less *Cash & Short Term Investments* to book or market value of assets.

measured by the logarithm of *Net Sales*, of each firm. We then assign individual firms to being financially unconstrained (constrained) if their median sizes are in the top (bottom) quartiles of the size distribution of the country in which they domicile. In addition, for each individual firm we compute the (time series) median payout ratio, measured by the ratio of *Dividend per Share* to *Earnings per Share.* We then sort firms by this ratio and assign to the financially unconstrained (constrained) sub-samples those firms in the top (bottom) quartiles of the payout distribution of the country in which they domicile.[10]

Table I summarizes the descriptive statistics of our key firm characteristics for the full sample and all subsamples of interest. We split firm year observations into recessions (Panel A) and expansions (Panel B). In the full sample, it is evident that firm characteristics are significantly different across the business cycle. In particular, both book leverage and market leverage are, on average, counter-cyclical. Financially constrained firms are identified according to their payout policy (Div25) or their size (Size25). Compared with unconstrained firms (Div75 or Size75), constrained firms tend to have high growth opportunities, measured by market to book, to be less profitable, and to have a smaller portion of tangible assets. Counter-cyclical leverage ratios are found for both constrained and unconstrained firms.

Next, mean book leverage is not sensitive to the business cycle for firms from common law countries but mean market leverage of those firms is counter-cyclical. Firms from civil law countries have, on average, counter-cyclical leverage ratios. As another country characteristic, we use the Shareholder Right Index from Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008) and Debtholder Right Index from Djankov, Hart, McLiesh, and Shleifer (2008). Using these indices we identify countries in which shareholders and debtholders are equally well treated (EqDHSH) and countries in which shareholders are better protected than debtholders (DiffDHSH). As for the full sample, average book and market leverage ratios are counter-cyclical for firms from both subsamples.

[10]One implication of this procedure to identify constrained and unconstrained firms is that we permanently assign a firm to being constrained or unconstrained; i.e., firms do not switch between these groups. We decided to do this for econometric reasons given that our empirical analysis relies on a dynamic panel model that uses lags as instruments. Another implication of this procedure is that the number of firms in each group is the same but the number of firm-year observations per group is not.

II. Empirical Results

In this section, we present our empirical results. First, we summarize how coefficient estimates in our empirical model vary across the business cycle, i.e., we describe how the influence of individual firm characteristics on firms' target leverage ratios varies over the business cycle. Second, we address the question whether target leverage is pro-cyclical or counter-cyclical. Third, we show results with respect to the firms' speed of adjustment towards these target leverage ratios. The final subsection reports results from an extension of our empirical model in which we distinguish two types of business cycle recessions — one with contemporaneous banking crises and one without. The results from this extension provide additional evidence on the distinction between demand and supply effects. A detailed discussion of these results, in the light of dynamic optimal capital structure theory, follows in section 4.

A. Business Cycle Dynamics of Determinants of Target Leverage

Table III shows estimates of the DPACS model with time-varying coefficients for book leverage and market leverage.[11] These results have two important dimensions: first, the signs of individual coefficients (significance is included in the table via p-values below the coefficient estimates) in order to understand the direction of the relationship between a specific firm characteristic and target leverage; and second, the difference in coefficients across the business cycle (significant differences are highlighted via ***, ** and * next to the coefficient estimates during recessions).[12]

As far as the first dimension is concerned, our results show that size, market to book and profitability affect target leverage in a negative way, tangibility, capital expenditures and industry mean leverage in a positive way.[13] These firm characteristics are almost al-

[11] Table II reports results of simpler benchmark models for robustness and consistency purposes. It includes (i) a standard DPACS model without any business cycle effects and (ii) a simplified DPACS model with business cycle effects in which only SOA-estimates and constants in the target leverage equation are allowed to vary over the business cycle. The benchmark results of the standard partial adjustment model are very similar to the ones found in the literature (see, for example, Flannery and Rangan (2006) and Lemmon, Roberts, and Zender (2008)). The second benchmark model is interesting as it already incorporates some aspect of business cycle variation without allowing fully time-varying coefficients. We will refer back to this model later on in the paper.

[12] Whenever we distinguish coefficients for expansions and recessions, the reported coefficients of firm characteristics except lagged leverage directly reflect estimates of β^s in equation 6 and not estimates of $\alpha^s\beta^s$. We perform this transformation for improved readability and because we care about the influence of firm characteristics on target leverage.

[13] In this section, we don't discuss the coefficients of lagged leverage. These coefficients include information

ways statistically significant and support the view that demand driven factors are important determinants of target capital structure.

Possibly even more interesting for the purpose of our study is the question whether the business cycle affects the relationship between demand driven characteristics and capital structure. We find strong evidence that this is in fact the case. For the full sample, we find that the coefficients for market to book, profitability, and capital expenditures vary significantly across the business cycle, for both book leverage and market leverage. The negative impact of profitability on target leverage becomes much stronger during recessions. In general, profitable firms have less debt (i.e., use internal funds to finance projects or reduce debt); but much more so during recessions. One interpretation of this pattern is that it becomes more costly for firms to raise external capital during recessions. Therefore firms use retained earnings more aggressively to finance their investment and profitability therefore becomes a more significant driver of firms' financial structures.

The coefficients of capital expenditure also exhibits interesting business cycle variation. Table III reveals that the level of capital expenditures do not significantly influence target leverage ratios during expansions. In contrast, during recessions it becomes an important determinant such that firms with more capital expenditures have higher target leverage. One interpretation of this result is that during recessions equity financing becomes very costly and, thus, firms with large capital investments have to rely more on debt markets during these times.

In a next step, we split the sample into subgroups according to the following two dimensions: (i) financially constrained vs. unconstrained firms (see Table IV for results), (ii) firms from capital-market oriented vs. bank-oriented countries[14] (see Table V for results) and (iii) firms from countries in which shareholders and debtholders are equally well protected vs. firms from countries in which debtholders are less protected than shareholders.[15] (see Table V for results).

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on the speed of adjustment and will be discussed in a separate section.

[14]We use the legal origin (common law vs. civil law) as our proxy.

[15]The shareholder rights index (anti-self-dealing index) from Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008) and the creditor rights index from Djankov, Hart, McLiesh, and Shleifer (2008) are used to construct our proxy. A firm is in the high corporate governance difference (DiffSHDH) subsample if it is in a country where shareholder rights index minus creditor rights index is (strictly) greater than 1 and in the low corporate governance difference (EqSHDH) subsample otherwise.

Splitting the sample into financially constrained versus unconstrained firms largely confirms the results above. Similar to the full sample case, we find that the impact of profitability and capital expenditures varies significantly across the business cycle. This lack of systematic differences across the two subsamples is somewhat surprising given that theoretical predictions and common intuition would suggest that leverage dynamics of financially constrained and unconstrained firms vary differently across the business cycle.[16]

We also split the sample according to legal origin. Legal origin is used as a proxy for capital market development and bank-oriented financing. As in the cases before, we observe that the coefficient of profitability varies significantly over the business cycle for both subsamples. It decreases, however, much more for firms in civil law countries. This is in accordance with the notion that external debt markets are less developed and more affected by recessions in civil law countries. Thus, firms in such countries tend to rely more heavily on internal financing during recessions. The pattern of capital expenditures also varies considerably across the sample of firms from common law countries and civil law countries. In the first case, we observe the pattern from before: capital expenditures are an economically much less significant explanatory variable during expansions but are very important during recessions; the coefficient increases dramatically over the business cycle. In the case of civil law countries, capital expenditures matter significantly in both regimes, expansions and recessions. This evidence is consistent with the interpretation that in civil law countries equity markets are less equipped to deal with informational asymmetries associated with capital expenditures. Thus, in civil law countries, firms that have large capital expenditures need to rely more on debt markets even during expansions.

Another interesting result is that tangibility has no significant influence on book target leverage during expansions but a significantly positive impact during recessions in the case of firms from civil law countries. This pattern is consistent with the view that civil law countries are bank-oriented and that banks require relatively little collateral (compared to public debtholders in common law countries) during expansions. In recessions, however, they may be more risk averse and require more collateral explaining the significantly positive coefficient of tangibility during recessions.[17]

[16] Of course, our proxies for financial constraints may be noisy.

[17] There are several other interesting patterns across these subsamples during expansions (see, for example, the coefficient estimates of size and market to book).

Finally, splitting the sample by relative strength of shareholder protection and debtholder protection largely confirms the results for the full sample. It is, however, noteworthy that the negative relation between profitability and target leverage during recessions is much more pronounced in countries with weaker debtholder protection. This result again suggests that firms in such countries tend to rely more heavily on internal financing during recessions. In sum, our results show that the impact of economic downturns on firms' financing decisions is amplified in civil law countries and in countries with relative poor debtholder protection.

B. Target Leverage Cyclicality

An important goal of our study is to assess the dynamics of target leverage — pro-cyclicality vs. counter-cyclicality — over the business cycle. For this purpose, we will use our empirical models to extract estimates of the overall, implied (unobserved) target leverage ratios (see equation 6) as well as observed realized leverage ratios.

Figure 1 shows the pattern of book (top picture) and market (bottom picture) target leverage around recessions (event time $t = 0$ is a recession; all other dates are expansion observations). The graphs plot the implied target leverage ratios for our main DPACS-Model (called "FullModel Target"in the graph) and the two simpler benchmark models (called "NoBC Target"and "StatBC Target"in the graph). Furthermore, it also shows observed leverage. The most important observation is that the DPACS-Model implies strongly counter-cyclical target leverage ratios. Interestingly, observed leverage shows the same dynamics although at much smaller variability. This may be related to the slower speed of adjustment towards target leverage in recessions as we will discuss in more detail in the next section.

An important question is what drives the counter-cyclicality of target leverage. There are two potential sources: (i) the time-variation in the parameters of the model (recall that our main DPACS-specifications allows the coefficients of the model to vary across the business cycle) and (ii) the time-variation in firm characteristics. In order to address this question and to measure the importance of these two sources of variation we perform several tests.

In a first analysis, we eliminate variation in firm characteristics by holding them constant at their overall sample means. Then we use the coefficient estimates of the main DPACS-model to calculate target book (market) leverage ratios during expansions and recessions (see Table III). Using this setup we find that target leverage is strongly counter-cyclical: target book (market) leverage is 20 percentage points (41 percentage points) higher during recessions than during expansions. If we reverse the experiment — allow the firm characteristics to vary across the business cycle but fix the coefficients (i.e., use the coefficients estimates of the Standard-DPACS model reported in Table II) — we find that target leverage is almost constant across the business cycle: target book (market) leverage is only 2 percentage points (3 percentage points) higher during recessions than during expansions.

This latter result is also consistent with the patterns shown in Figure 1. While we observe a strong counter-cyclical pattern for target leverage implied by the main DPACS-Model, a static model that ignores any time-variation in model parameters has comparatively conservative target leverage estimates and even shows a slightly pro-cyclical pattern if we look at a 5-year window around recessions (this model is labeled "NoBC Target"in the graphs). Thus, the counter-cyclical dynamics of target leverage seem to be largely driven by variation in the parameters of the empirical model.[18]

Overall, the comparisons across different empirical specifications of firm leverage emphasize the importance of of time-varying model parameters, i.e. speed-of-adjustment estimates and coefficients in the target leverage regression. This result is consistent with the presence of supply effects, such as a freezing of primary equity markets during a recession.

As a next step, we split the sample and study leverage dynamics for subsamples of financially constrained and unconstrained firms (see Figures 2 and 3). In the case of book leverage, we observe that unconstrained firms tend to have target ratios that are more responsive to the business cycle than the target ratios of constrained firms. This pattern is reversed for market leverage ratios. One interpretation of these results is that the lack of financial flexibility of constrained firms prevents them from absorbing the negative shocks of recessions, i.e. equity markets may essentially become inaccessible for these firms. Together with the fact that market values of constrained firms are likely to be more pro-cyclical than market values of unconstrained firms this can explain their more volatile estimated targets

[18]To provide more evidence on whether the counter-cyclical pattern is largely driven by business cycle variation of the betas, i.e. the effect of firm characteristics on target leverage, or by business cycle variation of the alpha, i.e. the speed of adjustment, we estimate a second benchmark model, labeled "StatBC Target". There we let the speed of adjustment vary across the business cycle, but keep the target leverage coefficients constant across business cycles. For this model, Figure 1 shows that target leverage estimates become very large during recessions. Thus, it seems that by forcing the coefficients of firm characteristics in the target leverage equation to be the same in expansions and recessions, one amplifies the counter-cyclicality of implied target leverage.

for market leverage.

Next we focus on the influence of a country's legal origin on the leverage dynamics across the business cycle. If investors are better protected and equity markets freeze to a lesser extent during recessions in common law countries than in civil law countries, then we would expect leverage to behave less countercyclically or even pro-cyclically in the former countries. Specifically, firms in common law countries may issue debt more aggressively during expansions, since investors anticipate lower distress costs during future downturns. The dynamics of target leverage shown in Figure 4 are consistent with this interpretation.

We also look at an additional dimension of country characteristics, namely the relative protection of shareholders to debtholders (see Figure 5). In the case of firms from countries where shareholders and debtholders are equally well protected, target leverage ratios are pro-cyclical. By contrast, in countries where debtholders are relatively poorly protected compared to shareholders, we find counter-cyclical dynamics. An intuition similar to the one provided in the discussion of common law versus civil law countries applies here as well. We expect that firms in countries where debtholders are well protected are better able to take on debt during expansions, as debtholders are better protected during downturns and thus expected bankruptcy costs are mitigated.

C. Speed of Adjustment Estimates

In the presence of transactions costs, firms are usually not at their optimal target leverage ratios at any given point in time. In several dynamic capital structure models capital structure adjustments are lumpy in the sense that firms do not adjust until a boundary is reached, at which point an adjustment towards the target capital structure occurs (see, e.g. Fischer, Heinkel, and Zechner (1989a)). However, given the presence of proportional transactions costs, firms do not fully adjust to the target ratio, defined as the leverage ratio to which a firm would optimally move in the absence of transactions costs. In other dynamic models, partial adjustments also occur, for example when firms choose the financing of new investments such that they move towards their target capital structure (e.g. DeAngelo, DeAngelo, and Whited (2010)).

Flannery and Rangan (2006) show that even if firms' capital structure adjustments are lumpy, dynamic partial adjustment models can capture actual firm behavior. A high speed of adjustment implies that firms do not allow their actual leverage ratios to wander far from its target before they make adjustments. Thus, an interesting question is whether the business cycle affects the speed of adjustment towards leverage targets. If transaction costs associated with capital structure changes are higher during recessions, we expect the empirical estimates of the speed of adjustment to be lower. We will also explore whether the relationship between the business cycle and the speed of adjustment depends on whether firms are financially constrained, whether firms are located in common law or civil law countries and whether they are from countries with equal or different shareholder and debtholder protection.

Empirically, we focus our attention on the coefficient of the lagged leverage ratios, which we estimate separately for recessions and expansions. Subtracting each of these coefficients from 1 yields the appropriate speed of adjustment estimates (SOA-estimates) during recessions and expansions, respectively. Economically, these SOA estimates can be translated into half-lives of the influence of a shock.[19] In the literature there is some controversy about US-based SOA-estimates (see Iliev and Welch (2010) for a summary): Flannery and Rangan (2006) report 34%, Lemmon, Roberts, and Zender (2008) find 25%, Huang and Ritter (2009) document 23%, Fama and French (2002) estimate SOAs within the range of 7 to 18%, and Welch (2004), finally, argues that there is no adjustment.

Our SOA-estimates vary considerably across leverage ratio definitions and firm samples but, overall, tend towards the upper bound of the values reported in the above list. Every single estimate is positive, below one and statistically significantly different from zero. Our most important result is that, across all specifications, all measures of leverage and all samples we find very strong evidence that the speed of adjustment estimates are lower during recessions. These differences are significant.

There is substantial dispersion in the SOA-estimates in different subsamples and also in the differences between SOA-estimates during expansions and recessions. The institutional setting is likely to influence the cost of capital structure adjustments and thus SOA-estimates. In general we expect that more developed capital markets with high levels of investor protection to exhibit lower adjustment costs and thus a higher SOA.

We find strong evidence for this hypothesis. In general, the speed of adjustment is higher in common law countries than in civil law countries. This difference is particularly large dur-

[19] A SOA-estimate of $x\%$ corresponds to a half-life of $log(0.5)/log(1-x)$.

ing expansions but still sizable during recessions.[20] Thus, it seems that, in general, common law countries provide firms with better opportunities to manage their capital structures than civil law countries. Furthermore, capital markets in common law countries seem to be more robust during recessions and freeze to a lesser extent, thus enabling firms to consistently adjust their leverage to appropriate target levels. In contrast, in civil law countries, increased transactions costs, or market freezes during recessions seem to significantly slow down firms' adjustments to their target ratios.

We next turn to the subsamples of firms from countries where debtholders are less protected than shareholders (DiffSHDH-firms). For these countries we expect potential conflicts of interest between these two groups of investors to increase more during recessions, presumably making it more difficult to adjust leverage. Indeed Table V reveals that for both leverage measures speed of adjustment estimates decrease more during recessions for DiffSHDH-firms than for firms from countries in which debtholders and equityholders are equally well protected (EqSHDH-firms). Moreover, the levels of SOA-estimates are consistently lower for DiffSHDH-firms than for EqSHDH-firms.

Finally, we look into differences of SOA-estimates across the business cycle for financially constrained and unconstrained firms. We would expect that constrained firms are more affected by business cycle variation and, thus, that speed of adjustment decreases more during recessions for constrained than unconstrained firms. For both leverage measures and both financial constraints measures, our intuition is confirmed, as business cycle related asymmetries in SOA-estimates are much more pronounced for constrained firms than for unconstrained firms. It is interesting to note that constrained firms (have to) adjust faster than unconstrained firms during expansions.

D. Extension: Financial vs. Non-Financial Recessions

In this section we extend our main empirical model to account for three possible states of the world — expansions, business cycle recessions that were also banking crises (*BankC-BC*) and business cycle recessions that were not banking crises (*BC-only*). The information on banking crises is taken from Carmen Reinhart's webpage (Reinhart and Rogoff (2010)). The goal of this extension is to sharpen the distinction between supply and demand effects on leverage

[20] In the case of market leverage, the difference is particularly large during recessions.

dynamics. The identification strategy is that, compared to the *BC-only* state, supply effects are amplified during the *BankC-BC* state while demand effects are comparatively unaffected. Thus, any differences in results across these two states can be attributed to supply effects.

Table VI summarizes the results of the extended model for the full sample for book leverage and market leverage. There are several interesting patterns. First, we observe significant differences in the coefficients of tangibility for both book leverage and market leverage: if there is a banking crises during the recession, tangibility affects target leverage positively and significantly; if there is no banking crises during the business cycle recession, tangibility does not seem to play a role. Thus, the importance of tangibility for target leverage during recessions seems to be supply-driven. For all other coefficients the differences between *BankC-BC* states and *BC-only* states are insignificant in the case of book leverage and market leverage (except for the market-to-book ratio and the mean industry leverage). Our main results from before, namely that profitability and capital expenditures affect target leverage significantly differently during recessions, also hold in this framework.

Next, we turn to the analysis of SOA-estimates. Interestingly, we do not observe significant differences in SOA-estimates between *BankC-BC* periods and *BC-only* periods. In both cases, as before, the SOA-estimates are significantly lower than during expansions. This is surprising, as we would have expected that especially SOA-estimates should also reflect supply effects. Our results imply that the increase in frictions and transaction costs that slows down firms' adjustment towards target leverage ratios during recessions is strong even in the absence of a banking crisis, as defined by Reinhart.

We also estimated the extended model for all sub-samples considered before. Across these sub-samples the basic patterns observed for the full sample generally hold as well. In the interest of space and readability we focus on a selection of subsample results in the paper that yield additional insights for the distinction between demand and supply effects. Table VII shows book leverage results for financially constrained vs. unconstrained firms (based on the payout ratio) and for firms from common law vs. civil law countries.[21] For financially constrained firms, we would expect that supply effects play a more important role than in the case of unconstrained firms. This is precisely what we find. In the case of constrained firms, the *BankC-BC* coefficients of size (more positive), profitability (more negative) and

[21] Market leverage results are qualitatively similar.

the state-specific constant (more negative) are significantly different from the corresponding coefficient estimates during *BC-only* states. In the case of unconstrained firms, we observe no significant differences in coefficient estimates.

We next discuss our findings regarding the differential effect of banking crises on firms in countries with different legal origin. In many studies the legal origin is used as a proxy for capital market development. The usual interpretation is that in common law countries public markets are more developed while in civil law countries banks play a more dominant role. Thus, we expect that firms from civil law countries should be more affected by banking crises than firms from common law countries. Again, our results are consistent with this expectation. In the case of common law countries we find no differences in coefficient estimates between *BankC-BC* states and *BC-only* states. In contrast, firms in civil law countries seem to be affected in a very different way during *BankC-BC* states: size (more positive), market to book (more positive), tangibility (more positive), industry leverage (more positive) and the state-specific constant (more negative) are all significantly different across the two recession states. These results reveal that the target leverage of firms in civil law countries is significantly affected by the supply (i.e., bank) side.

III. Discussion of results

A. Tradeoff theory vs. random financing (mechanical mean reversion)

We now relate the empirical results of section II to capital structure theory. We organize the discussion by distinguishing between two broad theoretical paradigms. In the first paradigm, tradeoffs between benefits and costs of various sources of capital imply the existence of a target capital structure and firms actively manage their financial structures towards these targets.

Early contributions to this paradigm include Merton (1974) and Black and Cox (1976) who analyze the tradeoff between a tax benefit and costly bankruptcy for a fixed debt level. Models that explicitly allow firms to increase or decrease leverage over time were developed in Fischer, Heinkel, and Zechner (1989a) and Fischer, Heinkel, and Zechner (1989b) and Goldstein, Ju, and Leland (2001) and have been extended in several directions.[22] In a different vain, Levy

[22]For example, by allowing for investment (Mello and Parsons (1992), Mauer and Triantis (1994), Morellec

and Hennessy (2007) consider the dynamic tradeoff between debt and equity in the presence of time varying agency costs. Some papers consider a reduced form of tradeoff by assuming that debt dominates equity, but only as long as it is protected by a sufficient amount of collateral. Thus, the amount of collateral determines the feasible amount of leverage (e.g. Bernanke and Gertler (1989), Calomiris and Hubbard (1990), Gertler (1992), Greenwald and Stiglitz (1992), Kiyotaki and Moore (1997), and Shleifer and Vishny (1992)).

Tradeoff models all imply the existence of an optimal target leverage ratio. Moreover, since most of these models feature proportional transactions costs, firms do not adjust their capital structure all the way to the target, defined as the leverage ratio that maximizes total firm value if one could move there costlessly. In general, how aggressively firms adjust their leverage ratio towards the target in a given period, i.e. the speed of adjustment (SOA) depends on the benefits and costs of deviating from the target and on the size and form of the transactions costs, which should again be a function of firm characteristics.[23]

The tradeoff literature can be contrasted with a paradigm in which firms do not have target capital structures.[24] In this case firms may choose their leverage, for example, by holding an initial, randomly chosen debt or equity level constant over time, or they may simply randomly select a leverage ratio each period.

Our setup may be utilized to distinguish between these alternative paradigms because they have different predictions for the dynamics of leverage across the business cycle. A model, in which capital structure decisions are made randomly each period, implies acyclical (constant) dynamics of (book) target leverage, as (book) target leverage itself is determined randomly. This prediction, however, receives no support in the data. In contrast, we find strongly counter-cyclical target leverage dynamics for both book and market leverage.

(2001), Moyen (2004), Childs, Mauer, and Ott (2005),Hennessy and Whited (2005), Hennessy and Whited (2007), Moyen (2007), Titman and Tsyplakov (2007), and Gamba and Triantis (2008)); by allowing for renegotiation (e.g. Mella-Barral and Perraudin (1997), Mella-Barral (1999), and Hege and Mella-Barral (2005)); by analyzing capital structure dynamics in simulated economies (e.g.Strebulaev (2007)); or by explicitly allowing the business cycle to affect the state variable process (e.g.Hackbarth, Miao, and Morellec (2006) and Bhamra, Kuehn, and Strebulaev (2009)).

[23]If variable transactions costs are increasing disproportionately with the size of the capital structure adjustment, then firms will find it optimal to engage in sequential, partial adjustment towards a target ratio. Flannery and Rangan (2006) show that, even if transactions costs are linear, the resulting capital structure adjustments can be captured by a partial adjustment model.

[24]There is potentially another, behaviorally based channel of demand driven capital structure dynamics. This occurs when managers go through sentiment waves. I.e. sometimes they are overconfident, and issue debt. At other times they issue equity. One could even think of sun spot equilibria, where managers want to behave in a way that is similar to their peers. I.e. if some firms issue debt, other firms follow to imitate them.

Furthermore, in the benchmark case of irrelevance, one would not expect that the target depends significantly on firm characteristics and that these relations change over the business cycle.[25] We, however, find that firm characteristics, such as size, profitability, tangibility and industry leverage, are systematically related to target leverage ratios. Even more importantly, we find that the impact of profitability and capital expenditure varies significantly and considerably across the business cycle.

An important point that is stressed by Chang and Dasgupta (2009), among others, is that partial adjustment models are not easily able to distinguish between the tradeoff theory and the irrelevance paradigm because of mechanical mean reversion effects that are caused by the fact that leverage ratios are bounded between 0 and 100%. In order to address this concern we perform two robustness tests.

In the first robustness test we eliminate all firms from the sample whose leverage ratios at some point in time get close to 0% or 100%. For this purpose, we first find each firm's minimum and maximum observed leverage ratio over time. Then we look at the distributions of these values in the cross-section and select only those firms whose time-series minimum leverage ratios are above the cross-sectional median and whose time-series maximum leverage ratios are below the 90%-percentile of the cross-section. We do this separately for book and market leverage. Given this selection criteria, we limit our sample to firms whose book (market) leverage is always between 7% (4%) and 68% (64%). This sample should be significantly less affected by mechanical mean reversion. As a second robustness test we apply a logit transformation to leverage ratios (see Lemmon, Roberts, and Zender (2008)).[26] This transformation ensures that the transformed variables have no boundaries.

Table VIII summarizes the results of the robustness tests for the full sample. All our main results survive — SOA-estimates decrease during recessions, several firm characteristics significantly affect target leverage and, in particular, the impact of profitability and capital

[25] Chang and Dasgupta (2009) argue that target leverage might depend on firm characteristics even if there is random financing. In their setup, however, there is no economic link between firm characteristics and target leverage. Empirically, the relationship arises in their simulated data only because firm characteristics potentially affect financing deficits and, as a consequence, SOA-estimates.

[26] The logit transformation of variable X is $\ln\left(\frac{X}{1-X}\right)$. This transformation is not defined if $X = 0$ or $X = 1$. While we already remove observations with 100% leverage through our standard data filters described in section 2.2, we do have firm year observations with 0% leverage in our sample. To deal with these cases, we follow Lemmon, Roberts, and Zender (2008) and distinguish two cases. In the first case, we just eliminate those firms from the sample. In the second case, we add 0.001 to the observations with zero leverage.

expenditure, respectively, become much more pronounced during recessions.[27] Note also that all SOA-estimates (for book/market leverage ratios and during expansions/recessions) increase in all robustness tests compared to our full sample results. If the main results were driven by mechanical mean reversion one would expect the opposite, i.e. a decrease in SOA-estimates.

Together these robustness tests indicate that our findings regarding the dynamics of leverage across the business cycle are not driven by mechanical mean reversion. Thus, our empirical results provide strong evidence against the random financing hypothesis. It is, however, important to stress that the speed of adjustment towards the target is much higher during expansions than during recessions (during recessions the speed of adjustment drops to less than 10 percent and less than 5 percent in some cases). The latter result suggests that during recessions adjustment to target ratios becomes much more costly and, thus, target ratios become less important.

B. Supply effects on capital structure dynamics: full sample results

Strictly interpreted, tradeoff models imply that, controlling for all relevant firm characteristics, no other explanatory variable, such as the business cycle or capital market supply effects should have explanatory power for capital structure dynamics. However, capital market supply effects are likely to influence the way firm characteristics map into capital structure dynamics. For example, transactions costs associated with issuing debt or equity may vary with capital market conditions. In such a broader interpretation of the tradeoff paradigm, target capital structures and the speed of adjustment result from an interplay between firm characteristics and capital market supply effects.

There are at least two potential channels, through which such "supply" effects can arise. First, raising external capital requires the services of intermediaries, either by directly relying on funding via bank loans, private debt placements, private equity, etc. or by relying on intermediaries as underwriters in the primary market for corporate securities. The intermediaries' ability to provide these services may vary over time, for example due to shocks that affect their capitalization. Such supply effects on the provision of debt capital have been explored,

[27] We also looked at aggregate target leverage dynamics over the business cycle and found strongly countercyclical patterns. For reasons of brevity, these results are not included in the paper and are available from the authors upon request.

for example, by Holmstrom and Tirole (1997), Bernanke and Blinder (1992), Romer, Romer, Goldfeld, and Friedman (1990), or Kashyap, Stein, and Wilcox (1993).[28]

Second, liquidity in the secondary markets for corporate securities may also change over the business cycle and thus have an effect on firms capital structure choice. Changing liquidity of secondary debt markets has been explored, for example, by Ericsson and Renault (2006) and Duffie, Garleanu, and Pedersen (2007) and Hennessy and Zechner (2011). Of course, the cost of issuing equity also relies on intermediation and on secondary market liquidity, which may vary over the business cycle. How the illiquidity in the primary and secondary markets during recessions influences the relative cost of debt versus equity therefore remains largely an empirical question.

Interpreted more broadly, capital market supply effects may include deviations of stock and bond prices from fundamental valuations. For example, Graham and Harvey (2001) find in a survey that the majority of CFOs state that the amount by which their stock is over- or undervalued plays an important role when deciding whether to issue equity or not. The effect of investors with limited rationality on financial markets has been analyzed theoretically, for example, by Fischer and Merton (1984), De Long, Shleifer, Summers, and Waldmann (1990), Morck, Shleifer, and Vishny (1990), and Blanchard, Rhee, and Summers (1993), and Stein (1996).

According to this literature, firms can actively exploit misvaluations by timing their equity and debt issues. In a tradeoff setting, this means that firms' target leverage would be lower when equity market valuation levels are generally high and/or after a run-up in their stock price (for some empirical evidence on such timing, see, for example, Pagano, Panetta, and Zingales (1998)). Furthermore, according to this literature, more corporate debt would be issued when equity valuation levels are low and/or interest rates are low (see, for example, Baker and Wurgler (2002) for empirical evidence on the market timing view of capital structure dynamics).

Summarizing, capital market supply effects may interact with issuer driven tradeoff models. Clear hypotheses emerge regarding the effect of capital market supply effects on the speed at which firms adjust their capital structures. If financial market liquidity is low, then firms face high capital structure adjustment costs and thus will not find it optimal to make

[28] For an interesting empirical study of this channel, see Leary (2009).

frequent and large leverage adjustments. We therefore expect that the speed of adjustment towards a target leverage is lower when capital markets are illiquid, which is more likely during recessions. This expectation is clearly supported by the data: speed of adjustment estimates decrease by roughly 10 to 15 percentage points during recessions. When we split business cycle recessions into those with and without contemporaneous banking crises, we do not observe significant differences in speed of adjustments. Thus, it seems that supply effects through bank financing do not drive the decrease in speed of adjustments during recessions.[29]

The influence of supply effects on the dynamics of target leverage ratios over the business cycle is less clear. If primary and secondary market liquidity freezes more for equity than for debt markets and if equity is more likely to be overvalued (undervalued) during expansions (contractions), then we should expect counter-cyclical effects on target leverage ratios. In contrast, if the issuance costs of debt increase disproportionately, we should expect to observe pro-cyclical dynamics.

Overall, our estimated target leverage ratios show counter-cyclical dynamics. These dynamics might, however, be driven by variation in firm characteristics over the business cycle. In order to remove this effect we run the following simple analysis: we fix the firm characteristics at their overall means and then compute target ratios using the coefficient estimates of the full sample models reported in Table III. Doing this we find that both book and market target leverage ratios are still strongly counter-cyclical; i.e., the dynamics implied by the estimated coefficients themselves are countercyclical. Specifically, the target book (market) leverage of this "average"firm is 25% (21%) during expansions and increases to 45% (62%) during recessions. We interpret this result as evidence that the dynamics are significantly affected by capital market supply effects.

Our results further document large differences in estimated coefficients across the business cycle. The coefficient on profitability, for example, is significantly more negative for recessions than during expansions. This finding is consistent with a supply effect which makes external capital expensive during recessions, so that firms retain earnings much more aggressively. Similarly, the coefficient on capital expenditures is significantly different, more positive, in recessions than in expansions. One interpretation of this result is that during recessions

[29] We will discuss in more detail in the next subsection how this result differs for firms from civil law (bank-oriented) and common law (market-oriented) countries.

equity financing becomes very costly and, thus, firms with capital expenditures have to rely more on debt markets in those times. Alternatively, given that capital expenditures can also be negative in the case of asset sales, this result is also consistent with the explanation that firms, which divest during recessions, are using the proceeds more aggressively for debt reductions. A third interpretation is that asymmetric information and adverse selection problems are more severe during recessions, making equity financing of capital expenditures disproportionately more expensive (see, for example, Choe, Masulis, and Nanda (1993) for empirical evidence and Eisfeldt (2004) for theoretical justification of counter-cyclical adverse selection costs).

By further splitting business cycle recessions into those with and without contemporaneous banking crises, we can shed more light on the role of supply effects, in particular on the effect of shocks to the capital of financial firms. The results of this extension further support the expectation that supply effects play an important role. Although we don't observe significant differences in the coefficients of profitability and capital expenditures between the two types of business cycle recessions, we observe significant differences for other variables. For example, the impact of tangibility on target leverage ratios seems to be particularly sensitive to supply effects. While tangibility does not affect target leverage significantly during business cycle recessions without banking crises, it does so in a positive way during the ones with a contemporaneous banking crises.

To conclude, although the empirical separation of demand and supply effects is challenging, we find several results that imply a strong impact of supply effects on target leverage dynamics. In particular, several of our empirical results seem to indicate that especially equity capital becomes relatively more expensive during recessions: during recessions, firms have higher target leverage ratios, they finance capital expenditures mostly with debt and they use retained earnings more aggressively to build up equity or repay debt.

C. Supply effects on capital structure dynamics: subsample results

Capital market supply effects on leverage dynamics are likely to differ across firms. If financial intermediaries face adverse shocks to their capital, as is likely during economic downturns, they may prefer to lend to large, less risky firms. This may for example be due to regulatory capital requirements which are more stringent for risky loans. In general, these firms that have easy access to capital supply, even in adverse conditions, are considered to be financially unconstrained. In contrast, financially constrained firms, such as small firms, face significant informational asymmetries and are, therefore, much more likely to be adversely affected by limited access to external capital during recessions. For the latter sample we, therefore, expect more pronounced business cycle effects on their capital structures dynamics.

This expectation is partly confirmed by our empirical results. Constrained firms, for example, exhibit particularly pronounced differences in SOA estimates during expansions and recessions. For constrained firms, we also find that the influence of profitability on target leverage is very different across business cycles with and without banking crises. In the first case, we find a strong negative coefficient implying that constrained firms retain earnings more aggressively when the supply of bank capital experiences a negative shock. In contrast, in "pure"business cycle recessions we don't observe this pattern. Thus, it seems that whether constrained firms retain earnings or not depends strongly on the supply of external capital.

Another dimension that we consider in our subsample analysis captures the institutional framework via the legal origin of a country. Supply effects on firms' financial structure dynamics are very likely to be influenced by the institutional framework they face. In particular, firms in countries with more highly developed capital markets (common law countries according to La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997) and La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998)) may generally be better able to manage their capital structure more actively, due to reduced transactions costs (Oeztekin and Flannery (2012), for example, find that trading costs are lower in countries with stronger investor protection). Thus, they may exhibit higher SOAs. Also, their leverage may be less affected by their capital expenditures, since they may be better able to raise capital for their investment in the desired form, including equity, at least during expansions. By contrast, firms in countries with weaker institutions and less developed capital markets may have to rely on debt to fund capital expenditures.

We find strong empirical evidence supporting these expectations. Firms in common law countries seem to manage their capital structures more actively than firms in civil law countries, as seen from their SOA-estimates. Furthermore, for firms in common law countries, capital expenditures do not have a significant effect on leverage during expansions whereas they do for firms in civil law countries. Consistent with our conjecture, during expansions, firms in common law countries do not need to rely largely on debt markets to fund their capital expenditures. This is only the case during recessions implying that even in these countries equity capital becomes disproportionately expensive during recessions. In contrast, in civil law countries capital expenditures have a positive effect on leverage in all phases of the business cycle. This is consistent with the interpretation that firms in common law countries can overcome informational asymmetries at least during expansions, i.e. the pecking order arguments are less relevant. Finally, we also find several, significant differences between these subsamples in our extension with banking crises. As one would expect, a negative shock to bank capital supply affects several coefficients of our empirical model significantly in the case of firms from civil law countries but does not significantly affect a single coefficient for firms from common law countries.

Similarly, we expect supply effects to vary with the degree of investor protection. When debtholder protection is low, this will make it more difficult to manage leverage actively during recessions. First, it will be expensive to issue more debt, and second, if debtholders are poorly protected, this may make it less desirable for firms to raise more equity during recessions, since it would transfer wealth to debtholders. Again, this should lead to particularly low SOA during recessions for firms in countries with poor debtholder protection. Again, we find evidence for these conjectures. Firms tend to manage their capital structures more actively (i.e., faster SOAs) when creditors are well protected and this difference is more pronounced during recessions suggesting an important role for supply effects.

To conclude, our subsample results further suggest that supply effects play an important role for firms' leverage dynamics. We observe several significant differences across subsamples, especially if we split the sample by legal origin. Since there is no reason to suspect that firm characteristics are affected differently by the business cycle in the two groups of countries, these results are only consistent with supply effects and suggest interesting differences in capital supply across the samples.

IV. Conclusion

This paper sheds new light on firms' intertemporal capital structure decisions by exploring the effect of business cycles, using a comprehensive sample of firms from 18 countries. We find strong evidence for active capital structure management. First, we document that target leverage ratios are significantly related to firm characteristics and the business cycle. Target leverage ratios show counter-cyclical dynamics although there is some heterogeneity — firms from common law countries, for example, show procyclical dynamics. Furthermore, the speed of adjustment towards a target ratio is significantly lower in recessions than in expansions.

We also find that leverage dynamics are different for financially constrained and unconstrained firms and that a country's legal origin and the degree of debtholder protection matter. Firms in common law countries and firms in countries where debtholder protection is high seem to manage their leverage ratios more actively, i.e., have higher speeds of adjustments.

Overall, these findings are difficult to reconcile with the hypothesis that capital structure is irrelevant or managed passively. Several of our empirical results together — such as the strong impact of recessions on the parameters of our empirical model, the significant differences across subsamples of firms and results from an extension in which we split business cycle recessions into those that are accompanied by banking crises and those that are not — imply an important role for supply effects, in addition to demand effects, in explaining leverage dynamics.

Appendix A. Variables Definitions

- Firm Characteristics
  - *Long Term Debt* refers to all interest bearing financial obligations, excluding amounts due within one year (WC03251).
  - *Short Term Debt* is the portion of debt payable with one year including current portion of long term debt and sinking fund requirements of preferred stock or debentures (WC03051).
  - *Total Debt* is the sum of long term debt and short term debt.
  - *Net Sales* are gross sales and other operating revenue less discounts, returns and allowances (WC01001).
  - *Cash & Short Term Investments* represents the sum of cash and short term investments (WC02001).
  - *Common Equity* represents common shareholders' investment in a company (WC03501).
  - *Market Capitalization* equals to the product of market price and common shares outstanding (WC08001).
  - *Total Assets* are the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets (WC02999).
  - *Assets' Market Value* is *Total Assets* less *Common Equity* and plus *Market Capitalization* of equity.
  - *EBITDA* is the earnings of a company before interest expense, income taxes and depreciation (WC18198).
  - *PPE* is gross property, plant and equipment less accumulated reserves for depreciation, depletion and amortization (WC02501).
  - *Capital Expenditures* represent the funds used to acquire fixed assets other than those associated with acquisitions (WC04601).
  - *Dividend per Share* is the total dividends per share declared during the calendar year for US corporations and fiscal year for non-US firms (WC05101).

- *Earnings per Share* represents the earnings for the 12 months ended the last calendar quarter of the year for US corporations and fiscal year for non-US firms (WC05201).
- *Payout Ratio* is the *Dividend per Share* to *Earnings per Share* ratio.

- Industry Characteristics
  - *Industry Group (WSIC)* is a four digit numeric code assigned to the company to represent its industry group. We use the first two digits to classify firms to different industry groups (WC06011).

- Country Characteristics
  - *Common-law Dummy (Common Law)* equals 1 if a country is classified as a common-law country and 0 otherwise. *Developed dummy (Developed)* is 1 if a country is a developed one and 0 otherwise.
  - *Sharedholder (Debtholder) Right Index* is extracted from Djankov, La Porta, Lopez de Silanes, and Shleifer (2009) (Djankov, Hart, McLiesh, and Shleifer (2008)).

- Leverage Ratios
  - *ml* is the *Total Debt* to *Assets' Market Value* ratio.
  - *bl* is the *Total Debt* to *Total Assets* ratio.

- Independent Variables
  - *sales* is the logarithm of *Net Sales*.
  - *market to book* is the *Total Assets* to *Assets' Market Value* ratio.
  - *profitability* is the *EBITDA* to *Total Assets* ratio.
  - *tangibility* is the *PPE* to *Total Assets* ratio.
  - *capital expenditure* is the *Capital Expenditure* to *Total Assets* ratio.
  - *industry mean* is the mean leverage ratio of an industry to which firms belong.
  - *rec* equals 1 if a firm's entire fiscal year overlaps with a recession and 0 otherwise.
  - *exp* equals 1 less *rec*.

– *brec* equals 1 if a banking crisis occurs in a recession year.

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Table I: **Summary statistics**: This table reports summary statistics of our variables of interest for the full subsample and all sub-samples of interest. ****, ** or * next to the means during recessions indicate that the mean of this variable is significantly different from the one during expansions.*

Panel A: Recession				Panel B: Expansion			
Variable	**Mean**	**Std. Dev.**	**N**	**Variable**	**Mean**	**Std. Dev.**	**N**
				Full Sample			
bl	0.261***	0.200	23305	bl	0.245	0.191	216178
ml	0.252***	0.199	23305	ml	0.202	0.179	216178
sales	12.477***	1.984	23305	sales	12.115	2.231	216178
mtb	1.203***	0.650	23305	mtb	1.538	0.830	216178
profit	0.051***	0.176	23305	profit	0.073	0.211	216178
tang	0.323***	0.201	23305	tang	0.317	0.219	216178
capex	0.051***	0.065	20412	capex	0.066	0.235	206377
				Div25			
bl	0.310***	0.234	6830	bl	0.267	0.220	88489
ml	0.281***	0.226	6830	ml	0.213	0.199	88489
sales	11.427***	2.262	6830	sales	11.047	2.284	88489
mtb	1.383***	0.835	6830	mtb	1.679	0.960	88489
profit	-0.025***	0.278	6830	profit	-0.004	0.293	88489
tang	0.307***	0.238	6830	tang	0.296	0.241	88489
capex	0.055***	0.087	6234	capex	0.070	0.300	86112
				Div75			
bl	0.265***	0.189	3452	bl	0.232	0.167	41391
ml	0.263***	0.197	3452	ml	0.192	0.158	41391
sales	12.689***	1.823	3452	sales	13.072	1.974	41391
mtb	1.156***	0.552	3452	mtb	1.490	0.734	41391
profit	0.081***	0.106	3452	profit	0.135	0.099	41391
tang	0.352	0.203	3452	tang	0.350	0.210	41391
capex	0.052***	0.058	3014	capex	0.061	0.070	40089
				Size25			
bl	0.257***	0.218	6089	bl	0.225	0.213	51345
ml	0.242***	0.210	6089	ml	0.171	0.182	51345
sales	10.347***	1.627	6089	sales	9.531	1.804	51345
mtb	1.310***	0.850	6089	mtb	1.739	1.036	51345
profit	-0.021***	0.279	6089	profit	-0.054	0.344	51345
tang	0.317***	0.233	6089	tang	0.292	0.246	51345
capex	0.050***	0.087	5060	capex	0.067	0.379	48749
				Size75			
bl	0.281***	0.188	5525	bl	0.269	0.168	54186
ml	0.262***	0.186	5525	ml	0.219	0.163	54186
sales	14.803***	1.209	5525	sales	14.607	1.338	54186
mtb	1.212***	0.514	5525	mtb	1.480	0.683	54186
profit	0.086***	0.088	5525	profit	0.124	0.090	54186
tang	0.324***	0.180	5525	tang	0.338	0.198	54186
capex	0.053***	0.050	5217	capex	0.063	0.068	52529

Panel A: Recession				Panel B: Expansion			
Variable	**Mean**	**Std. Dev.**	**N**	**Variable**	**Mean**	**Std. Dev.**	**N**
			Common Law				
bl	0.239	0.205	5477	bl	0.242	0.197	125713
ml	0.197***	0.190	5477	ml	0.189	0.178	125713
sales	11.788	2.652	5477	sales	11.838	2.443	125713
mtb	1.528***	0.871	5477	mtb	1.68	0.910	125713
profit	0.015***	0.303	5477	profit	0.064	0.256	125713
tang	0.318***	0.251	5477	tang	0.33	0.238	125713
capex	0.067**	0.091	5461	capex	0.074	0.242	125318
			Civil Law				
bl	0.268***	0.198	17828	bl	0.249	0.182	90465
ml	0.269***	0.199	17828	ml	0.222	0.178	90465
sales	12.688***	1.671	17828	sales	12.500	1.831	90465
mtb	1.103***	0.526	17828	mtb	1.339	0.654	90465
profit	0.062***	0.108	17828	profit	0.086	0.124	90465
tang	0.325***	0.183	17828	tang	0.299	0.189	90465
capex	0.045***	0.051	14951	capex	0.054	0.224	81059
			EqDHSH				
bl	0.221***	0.176	4560	bl	0.212	0.172	58788
ml	0.197***	0.173	4560	ml	0.173	0.160	58788
sales	11.885***	2.210	4560	sales	11.677	2.234	58788
mtb	1.362***	0.653	4560	mtb	1.543	0.790	58788
profit	0.072	0.191	4560	profit	0.076	0.208	58788
tang	0.311	0.214	4560	tang	0.315	0.226	58788
capex	0.063	0.072	4525	capex	0.067	0.168	58344
			DiffDHSH				
bl	0.271***	0.204	18745	bl	0.257	0.196	157390
ml	0.266***	0.203	18745	ml	0.213	0.184	157390
sales	12.621***	1.897	18745	sales	12.279	2.208	157390
mtb	1.164***	0.643	18745	mtb	1.535	0.844	157390
profit	0.046***	0.171	18745	profit	0.072	0.213	157390
tang	0.326***	0.197	18745	tang	0.318	0.217	157390
capex	0.048***	0.062	15887	capex	0.066	0.257	148033

Table II: **Benchmark Models**: This table reports results from two benchmark models. Columns 2 and 3 show results of a standard dynamic partial adjustment model with no business cycle effects. Columns 4 and 5 show results from a dynamic partial adjustment model with business cycle effects in which only SOA-estimates (i.e., one minus coefficients of the lagged dependent variable) and the constant are allowed to vary by the business cycle. The state-specific constants in Columns 4 and 5 reflect estimates of β_0^s in equation 6 and not estimates of $\alpha^s\beta_0^s$. All models are estimated via System GMM (using STATA routine xtabond2). The lagged dependent variable (leverage) is modeled to be predetermined. Contemporaneous firm-specific variables are considered to be endogenous (we use lags 2 and 3 as instruments). All specifications include year fixed effects that are treated as fully exogenous variables in the level equation. Standard errors are adjusted for heteroscedasticity. ****, ** or * next to coefficients during recessions (rec) indicate that the coefficient of this variable is significantly different from the one during expansions.*

	Standard-DPACS		**Static Coeff. DPACS**	
	Book Lev.	Market Lev.	Book Lev.	Market Lev.
SOA	0.243	0.230		
	(0.000)	(0.000)		
SOA (exp)			0.234	0.248
			(0.000)	(0.000)
SOA (rec)			0.071***	0.065***
			(0.000)	(0.000)
sales	0.001	-0.002	0.003	0.000
	(0.379)	(0.009)	(0.000)	(0.859)
mtb	-0.002	-0.009	-0.002	-0.012
	(0.156)	(0.000)	(0.297)	(0.000)
profit	-0.128	-0.058	-0.139	-0.072
	(0.000)	(0.000)	(0.000)	(0.000)
tang	0.045	0.036	0.040	0.031
	(0.000)	(0.000)	(0.000)	(0.000)
ind. mean	0.148	0.149	0.137	0.139
	(0.000)	(0.000)	(0.000)	(0.000)
capex	0.028	0.046	0.029	0.050
	(0.209)	(0.194)	(0.206)	(0.190)
cons	0.013	0.046		
	(0.279)	(0.000)		
exp-cons			-0.064	0.118
			(0.151)	(0.001)
rec-cons			-0.729***	0.083
			(0.000)	(0.546)
Firm Years	193643	193643	193643	193643
Number of Firms	26280	26280	26280	26280

Table III: **Business Cycle Model with Time-Varying Coefficients**: This table reports results from a dynamic partial adjustment model with business cycle effects in which all coefficients are allowed to vary by the business cycle. The model also includes a business cycle dummy (REC). The coefficients of firm characteristics except lagged leverage directly reflect estimates of β^s in equation 6 and not estimates of $\alpha^s\beta^s$. We also report the speed-of-adjustment estimates in the table rather than the coefficients of lagged leverage. All specifications are estimated via System GMM (using STATA routine xtabond2). The lagged dependent variables (leverage) are modeled to be predetermined. Contemporaneous firm-specific variables are considered to be endogenous (we use lags 2 and 3 as instruments). All specifications include year fixed effects that are treated as fully exogenous variables in the level equation. Standard errors are adjusted for heteroscedasticity. ****, ** or * next to coefficients during recessions (rec) indicate that the coefficient is significantly different from the one during expansions.*

	Full Sample	
	Book Lev.	Market Lev.
SOA (exp)	0.196	0.208
	(0.000)	(0.000)
SOA (rec)	0.064***	0.049***
	(0.000)	(0.000)
sales (exp)	-0.004	-0.010
	(0.102)	(0.000)
sales (rec)	0.018	-0.007
	(0.270)	(0.770)
mtb (exp)	0.001	-0.030
	(0.853)	(0.000)
mtb (rec)	0.175**	-0.039
	(0.025)	(0.677)
profit (exp)	-0.469	-0.171
	(0.000)	(0.000)
profit (rec)	-4.369****	-3.246***
	(0.000)	(0.000)
tang (exp)	0.164	0.107
	(0.000)	(0.001)
tang (rec)	0.257	0.197
	(0.070)	(0.395)
ind. mean (exp)	0.491	0.479
	(0.000)	(0.000)
ind. mean (rec)	0.049	1.999***
	(0.940)	(0.000)
capex (exp)	0.170	0.250
	(0.178)	(0.168)
capex (rec)	3.918***	6.951***
	(0.000)	(0.000)
exp-cons	0.148	0.228
	(0.001)	(0.000)
rec-cons	-0.066	0.079
	(0.857)	(0.867)
Firm Years	193643	193643
Number of Firms	26280	26280

Table IV: **Constrained vs. Unconstrained Firms**: This table reports results from a dynamic partial adjustment model with business cycle effects in which all coefficients are allowed to vary by the business cycle. The model also includes a business cycle dummy (REC). The coefficients of firm characteristics except lagged leverage directly reflect estimates of β^s in equation 6 and not estimates of $\alpha^s\beta^s$. We also report the speed-of-adjustment estimates in the table rather than the coefficients of lagged leverage. All specifications are estimated via System GMM (using STATA routine xtabond2). The lagged dependent variables (leverage) are modeled to be predetermined. Contemporaneous firm-specific variables are considered to be endogenous (we use lags 2 and 3 as instruments). All specifications include year fixed effects that are treated as fully exogenous variables in the level equation. Standard errors are adjusted for heteroscedasticity. ****, ** or * next to coefficients during recessions (rec) indicate that the coefficient is significantly different from the one during expansions.*

Panel A: Book Leverage

	Div25	**Div75**	**Size25**	**Size75**
SOA (exp)	0.262	0.173	0.245	0.152
	(0.000)	(0.000)	(0.000)	(0.000)
SOA (rec)	0.082***	0.053***	0.093***	0.056***
	(0.000)	(0.000)	(0.000)	(0.000)
sales (exp)	0.021	0.007	0.032	-0.016
	(0.000)	(0.109)	(0.000)	(0.027)
sales (rec)	0.118***	0.020	0.127	0.126***
	(0.003)	(0.579)	(0.057)	(0.019)
mtb (exp)	-0.034	0.049	-0.005	0.017
	(0.000)	(0.001)	(0.633)	(0.219)
mtb (rec)	0.176	0.561**	0.266**	-0.059
	(0.231)	(0.003)	(0.019)	(0.527)
profit (exp)	-0.489	-0.810	-0.519	-0.526
	(0.000)	(0.000)	(0.000)	(0.000)
profit (rec)	-4.302***	-7.469***	-2.238***	-5.351***
	(0.000)	(0.000)	(0.000)	(0.000)
tang (exp)	0.136	0.155	0.127	0.151
	(0.000)	(0.000)	(0.000)	(0.008)
tang (rec)	-0.064	0.186	0.101	0.396
	(0.807)	(0.505)	(0.631)	(0.058)
ind. mean (exp)	0.894	0.569	0.691	0.728
	(0.000)	(0.003)	(0.000)	(0.000)
ind. mean (rec)	3.919**	-2.217	2.363*	-1.490*
	(0.003)	(0.223)	(0.012)	(0.159)
capex (exp)	-0.001	0.371	0.001	0.602
	(0.937)	(0.098)	(0.950)	(0.099)
capex (rec)	4.094***	7.708**	1.308	5.478***
	(0.000)	(0.001)	(0.279)	(0.000)
exp-cons	-0.180	-0.058	-0.253	0.246
	(0.007)	(0.418)	(0.007)	(0.061)
rec-cons	-2.322***	0.274	-1.895**	-0.990
	(0.003)	(0.738)	(0.029)	(0.328)
Firm Years	73797	38190	41200	52347
Number of Firms	12867	4235	8567	4766

Panel B: Market Leverage

	Div25	Div75	Size25	Size75
SOA (exp)	0.274	0.188	0.249	0.191
	(0.000)	(0.000)	(0.000)	(0.000)
SOA (rec)	0.071***	0.071***	0.064***	0.101***
	(0.000)	(0.000)	(0.000)	(0.000)
sales (exp)	0.009	-0.005	0.013	-0.024
	(0.003)	(0.102)	(0.009)	(0.000)
sales (rec)	0.001	0.024	0.281***	0.103***
	(0.975)	(0.445)	(0.002)	(0.003)
mtb (exp)	-0.064	-0.025	-0.046	-0.060
	(0.000)	(0.026)	(0.000)	(0.000)
mtb (rec)	-0.281	0.373**	0.132	-0.169*
	(0.035)	(0.014)	(0.359)	(0.002)
profit (exp)	-0.162	-0.529	-0.188	-0.228
	(0.000)	(0.000)	(0.000)	(0.030)
profit (rec)	-1.557**	-7.499***	-1.805**	-3.565***
	(0.003)	(0.000)	(0.001)	(0.000)
tang (exp)	0.100	0.068	0.107	0.042
	(0.000)	(0.066)	(0.000)	(0.282)
tang (rec)	-0.238	0.380	0.246	0.309**
	(0.412)	(0.109)	(0.476)	(0.026)
ind. mean (exp)	0.685	0.253	0.456	0.325
	(0.000)	(0.022)	(0.000)	(0.000)
ind. mean (rec)	2.350*	0.609	0.762	0.769
	(0.008)	(0.511)	(0.362)	(0.062)
capex (exp)	0.032	0.506	0.030	0.604
	(0.382)	(0.011)	(0.422)	(0.018)
capex (rec)	7.967***	7.902***	5.141*	3.241***
	(0.000)	(0.000)	(0.031)	(0.000)
exp-cons	-0.009	0.227	0.017	0.520
	(0.842)	(0.000)	(0.789)	(0.000)
rec-cons	-0.057	-0.314	-2.905**	-1.167***
	(0.937)	(0.573)	(0.009)	(0.052)
Firm Years	73797	38190	41200	52347
Number of Firms	12867	4235	8567	4766

Table V: **Country Characteristics**: This table reports results from a dynamic partial adjustment model with business cycle effects in which all coefficients are allowed to vary by the business cycle. The model also includes a business cycle dummy (REC). The coefficients of firm characteristics except lagged leverage directly reflect estimates of β^s in equation 6 and not estimates of $\alpha^s\beta^s$. We also report the speed-of-adjustment estimates in the table rather than the coefficients of lagged leverage. All specifications are estimated via System GMM (using STATA routine xtabond2). The lagged dependent variables (leverage) are modeled to be predetermined. Contemporaneous firm-specific variables are considered to be endogenous (we use lags 2 and 3 as instruments). All specifications include year fixed effects that are treated as fully exogenous variables in the level equation. Standard errors are adjusted for heteroscedasticity. ****, ** or * next to coefficients during recessions (rec) indicate that the coefficient is significantly different from the one during expansions.*

Panel A: Book Leverage

	Common	**Civil**	**EqSHDH**	**DiffSHDH**
SOA (exp)	0.255	0.117	0.206	0.192
	(0.000)	(0.000)	(0.000)	(0.000)
SOA (rec)	0.121***	0.056***	0.118***	0.050***
	(0.000)	(0.000)	(0.000)	(0.000)
sales (exp)	0.009	-0.016	-0.001	-0.002
	(0.001)	(0.001)	(0.811)	(0.419)
sales (rec)	0.060**	0.074***	-0.012	-0.001
	(0.010)	(0.000)	(0.446)	(0.971)
mtb (exp)	-0.028	0.029	-0.024	0.006
	(0.000)	(0.089)	(0.032)	(0.435)
mtb (rec)	0.013	0.313***	-0.110	0.097
	(0.919)	(0.001)	(0.161)	(0.331)
profit (exp)	-0.380	-0.537	-0.193	-0.597
	(0.000)	(0.004)	(0.007)	(0.000)
profit (rec)	-2.847***	-4.750***	-1.695***	-5.102***
	(0.000)	(0.000)	(0.000)	(0.000)
tang (exp)	0.111	0.027	0.029	0.181
	(0.000)	(0.647)	(0.481)	(0.000)
tang (rec)	0.043	0.463***	0.111	0.178
	(0.857)	(0.002)	(0.518)	(0.318)
ind. mean (exp)	0.612	0.356	0.360	0.700
	(0.000)	(0.049)	(0.037)	(0.000)
ind. mean (rec)	1.870	1.056	-0.587	-0.471
	(0.340)	(0.143)	(0.589)	(0.613)
capex (exp)	0.063	1.245	0.603	0.170
	(0.292)	(0.015)	(0.001)	(0.177)
capex (rec)	2.845**	3.833**	1.962	5.091***
	(0.004)	(0.002)	(0.044)	(0.000)
exp-cons	0.026	0.307	0.106	0.105
	(0.602)	(0.001)	(0.115)	(0.064)
rec-cons	-0.930	-1.116***	0.604	0.578
	(0.243)	(0.005)	(0.203)	(0.315)
Firm Years	108788	84855	53681	139962
Number of Firms	15793	10487	7141	19139

Panel B: Market Leverage

	Common	**Civil**	**EqSHDH**	**DiffSHDH**
SOA (exp)	0.250	0.151	0.225	0.203
	(0.000)	(0.000)	(0.000)	(0.000)
SOA (rec)	0.186***	0.059***	0.156***	0.022***
	(0.000)	(0.000)	(0.000)	(0.000)
sales (exp)	-0.011	-0.019	-0.003	-0.013
	(0.000)	(0.000)	(0.184)	(0.000)
sales (rec)	0.045***	0.065***	0.004	-0.183*
	(0.004)	(0.001)	(0.752)	(0.003)
mtb (exp)	-0.085	-0.018	-0.073	-0.034
	(0.000)	(0.084)	(0.000)	(0.000)
mtb (rec)	-0.258**	0.199***	-0.123	-0.320
	(0.002)	(0.006)	(0.039)	(0.085)
profit (exp)	-0.064	-0.188	-0.137	-0.147
	(0.044)	(0.214)	(0.005)	(0.001)
profit (rec)	-1.385***	-3.587***	-1.309***	-5.199***
	(0.000)	(0.000)	(0.000)	(0.000)
tang (exp)	0.065	-0.003	0.018	0.116
	(0.008)	(0.954)	(0.586)	(0.000)
tang (rec)	0.233	0.525***	-0.018	-0.421
	(0.292)	(0.001)	(0.907)	(0.323)
ind. mean (exp)	0.388	0.210	0.346	0.544
	(0.000)	(0.045)	(0.000)	(0.000)
ind. mean (rec)	2.271**	2.212***	0.937	0.579
	(0.003)	(0.000)	(0.100)	(0.627)
capex (exp)	0.113	1.319	0.556	0.240
	(0.240)	(0.011)	(0.001)	(0.172)
capex (rec)	3.272***	2.849	1.656	20.008***
	(0.001)	(0.026)	(0.051)	(0.000)
exp-cons	0.410	0.300	0.130	0.312
	(0.000)	(0.000)	(0.003)	(0.000)
rec-cons	-0.585**	-1.132***	0.013	3.707*
	(0.159)	(0.002)	(0.967)	(0.001)
Firm Years	108788	84855	53681	139962
Number of Firms	15793	10487	7141	19139

Table VI: **Banking Crises Extension - Business Cycle Model with Time-Varying Coefficients**: In this extension we split business cycle recessions into the ones with contemporaneous banking crises (*brec*) and those without banking crises (*rec*). All other definitions are as in Table III. The coefficients of firm characteristics except lagged leverage directly reflect estimates of β^s in equation 6 and not estimates of $\alpha^s\beta^s$. We also report the speed-of-adjustment estimates in the table rather than the coefficients of lagged leverage. Standard errors are adjusted for heteroscedasticity. ****, ** or * next to coefficients during recessions (rec or brec) indicate that the coefficient is significantly different from the one during expansions.* **Bold** coefficients of business cycle recessions with banking crises (*brec*) indicate that these coefficients are significantly different (at least at the 10% level) from the corresponding coefficients during recessions without banking crises (*rec*).

	Full Sample	
	Book Lev.	Market Lev.
SOA (exp)	0.179	0.202
	(0.000)	(0.000)
SOA (rec)	0.052***	0.057***
	(0.000)	(0.000)
SOA (brec)	0.072***	0.067***
	(0.000)	(0.000)
sales (exp)	-0.007	-0.013
	(0.007)	(0.000)
sales (rec)	0.014	0.158***
	(0.671)	(0.000)
sales (brec)	0.063***	0.104***
	(0.001)	(0.000)
mtb (exp)	-0.003	-0.048
	(0.655)	(0.000)
mtb (rec)	-0.115	0.190**
	(0.439)	(0.104)
mtb (brec)	0.064	**-0.057**
	(0.423)	(0.506)
profit (exp)	-0.448	-0.116
	(0.000)	(0.003)
profit (rec)	-4.622****	-3.823***
	(0.000)	(0.000)
profit (brec)	-3.966***	-3.349***
	(0.000)	(0.000)
tang (exp)	0.170	0.119
	(0.000)	(0.001)
tang (rec)	-0.132*	-0.139
	(0.430)	(0.441)
tang (brec)	**0.426**	**0.569***
	(0.019)	(0.073)
ind. mean (exp)	0.396	0.362
	(0.000)	(0.000)
ind. mean (rec)	-1.143	4.137***
	(0.389)	(0.000)
ind. mean (brec)	1.146	**2.107*****
	(0.126)	(0.000)

	Full Sample	
	Book Lev.	Market Lev.
capex (exp)	0.219	0.314
	(0.166)	(0.158)
capex (rec)	7.264***	6.714***
	(0.000)	(0.000)
capex (brec)	3.797***	8.649***
	(0.002)	(0.000)
exp-cons	0.162	0.174
	(0.001)	(0.000)
rec-cons	0.581	-2.949***
	(0.468)	(0.000)
brec-cons	**-1.072*****	-2.255***
	(0.012)	(0.000)
Firm Years	197576	197576
Number of Firms	26372	26372

Table VII: **Banking Crises Extensions: selection of subsample results**: In this extension we split business cycle recessions into the ones with contemporaneous banking crises (*brec*) and those without banking crises (*rec*). All other definitions are as in Table III. The coefficients of firm characteristics except lagged leverage directly reflect estimates of β^s in equation 6 and not estimates of $\alpha^s\beta^s$. We also report the speed-of-adjustment estimates in the table rather than the coefficients of lagged leverage. Standard errors are adjusted for heteroscedasticity. ****, ** or * next to coefficients during recessions (rec or brec) indicate that the coefficient is significantly different from the one during expansions.* **Bold** coefficients of business cycle recessions with banking crises (*brec*) indicate that these coefficients are significantly different (at least at the 10% level) from the corresponding coefficients during recessions without banking crises (*rec*).

	Book Leverage			
	Div25	**Div75**	**Common**	**Civil**
SOA (exp)	0.254	0.156	0.254	0.110
	(0.000)	(0.000)	(0.000)	(0.000)
SOA (rec)	0.088***	0.046***	0.178	0.042***
	(0.000)	(0.015)	(0.000)	(0.000)
SOA (brec)	0.091***	0.058***	0.128***	0.044***
	(0.000)	(0.083)	(0.000)	(0.000)
sales (exp)	0.017	0.006	0.007	-0.015
	(0.000)	(0.141)	(0.006)	(0.001)
sales (rec)	-0.016	0.028	0.074**	-0.005
	(0.725)	(0.655)	(0.092)	(0.878)
sales (brec)	**0.156*****	0.047	0.055**	**0.188*****
	(0.002)	(0.380)	(0.038)	(0.000)
mtb (exp)	-0.037	0.045	-0.033	0.031
	(0.000)	(0.005)	(0.000)	(0.080)
mtb (rec)	-0.238	0.717**	0.007	-0.196
	(0.220)	(0.002)	(0.959)	(0.243)
mtb (brec)	-0.040	0.281	-0.023	**0.483*****
	(0.840)	(0.275)	(0.873)	(0.003)
profit (exp)	-0.478	-0.770	-0.362	-0.543
	(0.000)	(0.000)	(0.000)	(0.005)
profit (rec)	-1.314	-9.220**	-2.328***	-3.922***
	(0.133)	(0.000)	(0.000)	(0.000)
profit (brec)	**-4.575*****	-6.130**	-2.802***	-4.810**
	(0.000)	(0.004)	(0.000)	(0.037)
tang (exp)	0.136	0.162	0.114	0.035
	(0.000)	(0.001)	(0.000)	(0.548)
tang (rec)	-0.168	0.046	0.079	-0.107
	(0.503)	(0.891)	(0.769)	(0.565)
tang (brec)	0.092	0.082	-0.058	**0.623***
	(0.790)	(0.834)	(0.845)	(0.085)
ind. mean (exp)	0.914	0.517	0.620	0.323
	(0.000)	(0.012)	(0.000)	(0.086)
ind. mean (rec)	0.085	-3.685	2.698	-2.280*
	(0.954)	(0.162)	(0.179)	(0.089)
ind. mean.(brec)	3.363*	-1.474	2.431	**4.904*****
	(0.034)	(0.545)	(0.303)	(0.001)

	Book Leverage			
	Div25	**Div75**	**Common**	**Civil**
capex (exp)	0.008	0.429	0.071	1.369
	(0.700)	(0.108)	(0.281)	(0.012)
capex (rec)	3.382**	6.807*	3.710**	7.467***
	(0.006)	(0.001)	(0.003)	(0.000)
capex (brec)	3.408**	10.099	2.913**	2.793
	(0.005)	(0.000)	(0.007)	(0.513)
exp-cons	-0.112	-0.060	0.045	0.246
	(0.091)	(0.438)	(0.359)	(0.009)
rec-cons	0.851	0.721	-1.376*	1.247
	(0.361)	(0.599)	(0.129)	(0.121)
brec-cons	**-2.397****	-0.276	-0.968	**-4.108*****
	(0.023)	(0.809)	(0.307)	(0.000)
Firm Years	74607	38475	110379	87197
Number of Firms	12921	4217	15859	10513

Table VIII: **Mechanical Mean Reversion**: This table reports results from a dynamic partial adjustment model with business cycle effects in which all coefficients are allowed to vary by the business cycle. In Panel A we only include firms whose book (market) leverage ratios are always between an upper and lower boundary stated in the header of each column. The upper boundary represents the 90-percentile of the cross-section of firms' time-series maximum book (market) leverage ratios, while the lower boundary is the cross-sectional median of firms' time-series minimum book (market) leverage ratios. In Panel B we apply the logit transformation to book (market) leverage ratios. We distinguish two different ways to deal with firms whose leverage ratios are zero (there are no observations with leverage ratios equal to one in our sample): transformation A excludes observations with zero leverage and transformation B adds 0.001 to these observations. Each model also includes a business cycle dummy (REC). The coefficients of firm characteristics except lagged leverage directly reflect estimates of β^s in equation 6 and not estimates of $\alpha^s\beta^s$. We also report the speed-of-adjustment estimates in the table rather than the coefficients of lagged leverage. All specifications are estimated via System GMM (using STATA routine xtabond2). The lagged dependent variables (leverage) are modeled to be predetermined. Contemporaneous firm-specific variables are considered to be endogenous (we use lags 2 and 3 as instruments). All specifications include year fixed effects that are treated as fully exogenous variables in the level equation. Standard errors are adjusted for heteroscedasticity. ***, ** or * next to coefficients during recessions (rec) indicate that the coefficient is significantly different from the one during expansions.

Panel A: Intermediate-Leverage Samples

	Book Lev. (0.071, 0.685)	Market Lev. (0.041, 0.644)
SOA (exp)	0.248	0.313
	(0.000)	(0.000)
SOA (rec)	0.098***	0.136***
	(0.000)	(0.000)
sales (exp)	-0.013	-0.016
	(0.000)	(0.000)
sales (rec)	-0.027	-0.022
	(0.010)	(0.019)
mtb (exp)	0.019	-0.070
	(0.019)	(0.000)
mtb (rec)	-0.004	0.020
	(0.963)	(0.759)
profit (exp)	-0.494	-0.249
	(0.000)	(0.000)
profit (rec)	-2.573****	-1.631***
	(0.000)	(0.000)
tang (exp)	0.056	0.012
	(0.020)	(0.619)
tang (rec)	0.174	0.098
	(0.071)	(0.226)
ind. mean (exp)	0.161	0.148
	(0.054)	(0.004)
ind. mean (rec)	-1.977***	0.319
	(0.000)	(0.187)
capex (exp)	0.335	0.416
	(0.015)	(0.004)
capex (rec)	2.495***	2.088***
	(0.000)	(0.000)
exp-cons	0.418	0.524
	(0.000)	(0.000)
rec-cons	1.302***	0.648
	(0.000)	(0.001)
Firm Years	83403	81022
Number of Firms	11685	11355

Panel B: Logit Transformations

	Transformation A		**Transformation B**	
	Book Lev.	Market Lev.	Book Lev.	Market Lev.
SOA (exp)	0.232	0.253	0.240	0.241
	(0.000)	(0.000)	(0.000)	(0.000)
SOA (rec)	0.136***	0.150***	0.144***	0.142***
	(0.000)	(0.000)	(0.000)	(0.000)
sales (exp)	-0.101	-0.149	0.063	-0.011
	(0.000)	(0.000)	(0.012)	(0.651)
sales (rec)	0.564***	0.127***	0.479***	0.342***
	(0.000)	(0.186)	(0.000)	(0.004)
mtb (exp)	0.028	-0.450	-0.041	-0.386
	(0.644)	(0.000)	(0.532)	(0.000)
mtb (rec)	1.100***	-0.096	0.742**	-0.283
	(0.004)	(0.780)	(0.050)	(0.473)
profit (exp)	-3.931	-1.866	-3.659	-1.547
	(0.000)	(0.000)	(0.000)	(0.000)
profit (rec)	-21.958***	-13.614***	-20.635***	-13.314***
	(0.000)	(0.000)	(0.000)	(0.000)
tang (exp)	1.127	0.915	1.996	1.544
	(0.000)	(0.000)	(0.000)	(0.000)
tang (rec)	5.070***	1.987	4.378***	3.587**
	(0.000)	(0.007)	(0.000)	(0.000)
ind. mean (exp)	0.993	0.585	0.414	0.447
	(0.000)	(0.000)	(0.000)	(0.000)
ind. mean (rec)	-2.522***	0.109**	-0.681***	-0.369***
	(0.000)	(0.626)	(0.106)	(0.104)
capex (exp)	1.420	1.863	1.510	2.225
	(0.215)	(0.205)	(0.209)	(0.196)
capex (rec)	17.571***	16.219***	20.029***	19.019***
	(0.000)	(0.000)	(0.000)	(0.000)
exp-cons	0.967	1.292	-2.203	-1.043
	(0.020)	(0.000)	(0.000)	(0.007)
rec-cons	-14.266***	-2.976**	-10.688***	-7.193***
	(0.000)	(0.096)	(0.000)	(0.001)
Firm Years	178258	178258	193643	193643
Number of Firms	24815	24815	26280	26280

Figure 1: **Target Leverage Estimates:** The graphs show the dynamics of target leverage estimates over the business cycle for the full sample: the top picture looks at book leverage, the bottom one at market leverage. The estimates are based on the specifications reported in the previous tables. Only in these graphs we distinguish target leverage ratios from three different models. A static model that ignores any time-variation in speed-of-adjustment estimates or target leverage coefficients (*NoBC Target*). A model that allows speed-of-adjustment estimates to vary over the business cycle (*StatBC Target*). And, finally, the full model that allows speed-of-adjustment estimates and target leverage coefficients to vary over the business cycle (*Fullmodel Target*). The graphs also include observed leverage ratios.

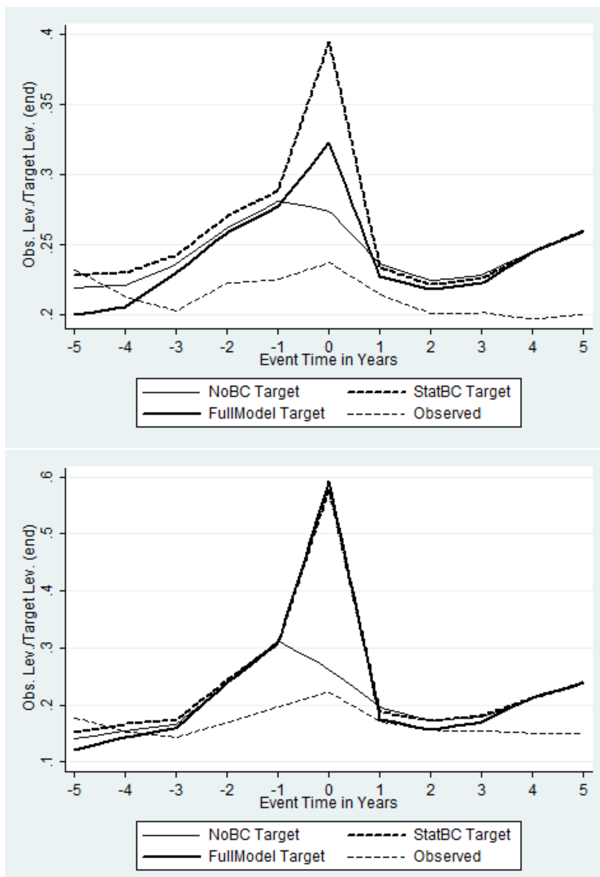

Figure 2: **Target Leverage Estimates: constrained vs. unconstrained (dividend based)** The graphs show the dynamics of target leverage estimates over the business cycle: the top picture looks at book leverage, the bottom one at market leverage. Target leverage is derived from our main DPACS-Model that allows speed-of-adjustment estimates and target leverage coefficients to vary over the business cycle. The graphs also include observed leverage ratios.

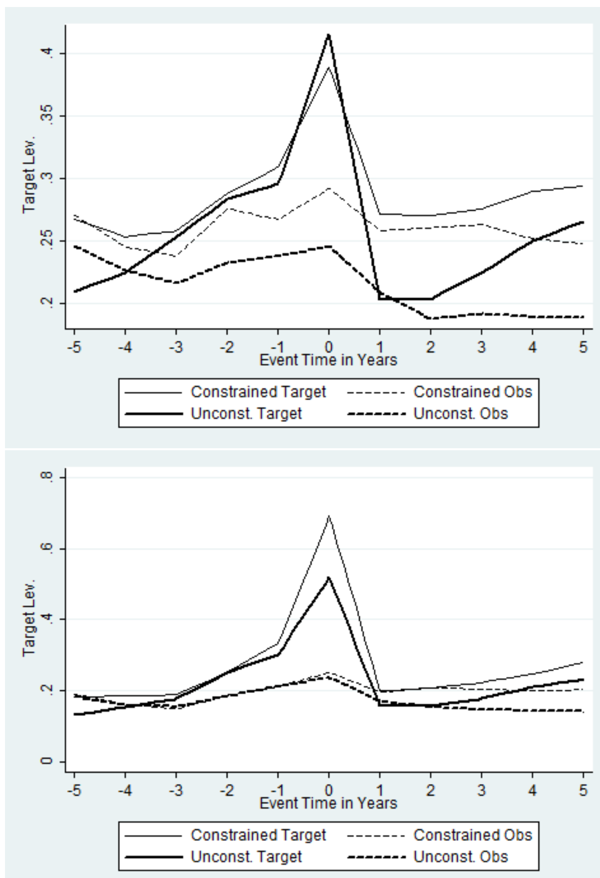

Figure 3: **Target Leverage Estimates: constrained vs. unconstrained (size based)** The graphs show the dynamics of target leverage estimates over the business cycle: the top picture looks at book leverage, the bottom one at market leverage. Target leverage is derived from our main DPACS-Model that allows speed-of-adjustment estimates and target leverage coefficients to vary over the business cycle. The graphs also include observed leverage ratios.

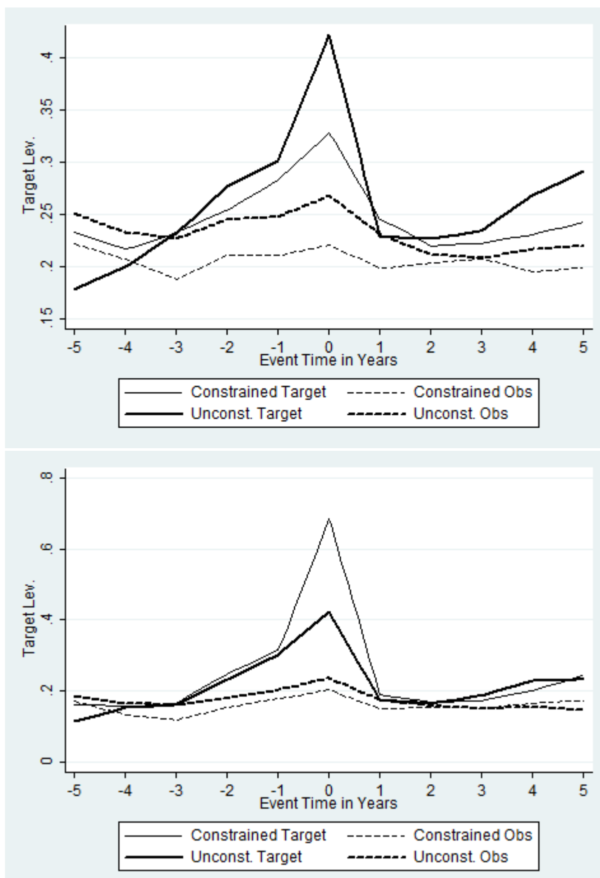

Figure 4: **Target Leverage Estimates: common law vs. civil law** The graphs show the dynamics of target leverage estimates over the business cycle: the top picture looks at book leverage, the bottom one at market leverage. Target leverage is derived from our main DPACS-Model that allows speed-of-adjustment estimates and target leverage coefficients to vary over the business cycle. The graphs also include observed leverage ratios.

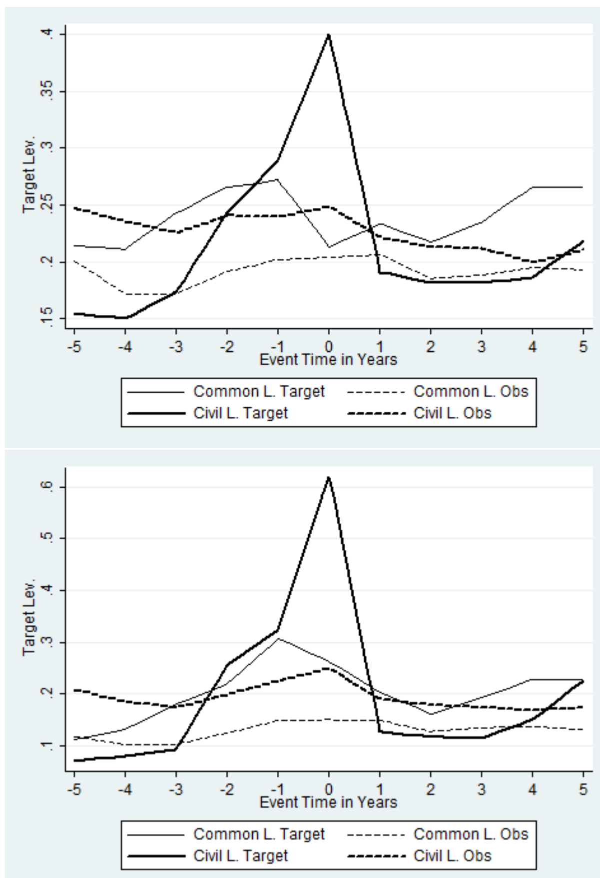

Figure 5: **Target Leverage Estimates: equal DHSH protection vs. different DHSH protection** The graphs show the dynamics of target leverage estimates over the business cycle: the top picture looks at book leverage, the bottom one at market leverage. Target leverage is derived from our main DPACS-Model that allows speed-of-adjustment estimates and target leverage coefficients to vary over the business cycle. The graphs also include observed leverage ratios.