# Leverage Dynamics over the Business Cycle *

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There remains broad disagreement about what the important drivers of capital structure dynamics are. This paper sheds new light on this question by studying the business cycle dynamics of leverage ratios, using a comprehensive sample of firms from 18 countries. We find strong evidence for active capital structure management - especially during expansions. During recessions, speeds of adjustments become significantly slower implying that leverage management becomes more passive. Estimated overall (unconditional) book and market target leverage ratios behave counter-cyclically, except for firms from common law countries and countries, in which debtholders and shareholder are equally well protected. Our empirical evidence is strongly inconsistent with a random leverage hypothesis and broadly consistent with demand-driven and supply-driven models.

**JEL Classifications:** G32, G15.
**Keywords:** Empirical corporate finance, capital structure dynamics, business cycle variation.

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# Leverage Dynamics over the Business Cycle

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There remains broad disagreement about what the important drivers of capital structure dynamics are. This paper sheds new light on this question by studying the business cycle dynamics of leverage ratios, using a comprehensive sample of firms from 18 countries. We find strong evidence for active capital structure management - especially during expansions. During recessions, speeds of adjustments become significantly slower implying that leverage management becomes more passive. Estimated overall (unconditional) book and market target leverage ratios behave counter-cyclically, except for firms from common law countries and countries, in which debtholders and shareholder are equally well protected. Our empirical evidence is strongly inconsistent with a random leverage hypothesis and broadly consistent with demand-driven and supply-driven models.

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# 1 Introduction

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? Are changing capital market conditions or investor sentiment driving capital structure? Or are leverage dynamics simply the result of passive or random policies?

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 natural experiments (see, e.g. Welch (2011)). Such natural experiments occur in periods in which certain candidate explanatory variables change significantly due to some exogenous event. One can then analyze how such events affect corporate capital structure choices.

In this paper we analyze capital structure dynamics by focussing on natural experiments provided by economic recessions. During recessions most of the main theoretical determinants of firms' financial structure experience significant shocks. For example, during recessions 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..

We first provide an overview of the main theories of dynamic capital structure choice and their implied empirical predictions. In this discussion we focus on the influence of the business cycle on firms' target capital structures, where the latter is defined as the capital structure that a firm would choose if it could move there costlessly. Because of transactions costs or other market frictions, firms will not always be right at their target leverage ratios but might only partially adjust towards their targets. This partial adjustment or, more specifically, the speed of adjustment represents another dimension of our analysis.

In our empirical study, we use stock prices and annual firm-level accounting data, combined with business cycle data for 18 countries. This design allows us to include a sufficiently large number of recession year observations.[1] When assigning reported balance sheet information to recessions we

[1]If our study focused on the US, we would only end up with 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

carefully take into account each firm's fiscal year. In addition to analyzing a large number of recessions, our data panel also allows us to identify country characteristics that influence differences in capital structure dynamics.

Our empirical results generate several insights. First, we find that both market and book target leverage ratios are generally counter-cyclical. This seems to contradict traditional tradeoff models (unless one introduces explicit business cycle effects), which predict constant target market ratios and therefore pro-cyclical book ratios (considering that the book value of assets is less affected by the business cycle than the market value). It also is at odds with models that focus on time-varying collateral values, which predict leverage to be pro-cyclical. Also, most supply side models predict that access to debt is easier during expansions and thus pro-cyclical leverage. In contrast, the counter-cyclicality is more in line with dynamic agency models and possibly with market timing. If we split our sample into subsamples, we do, however, find some heterogeneity in target leverage dynamics. For example, we find procyclical dynamics for firms from common law countries and for firms from countries in which debtholders and shareholders are equally well protected.

The notion of cyclicality itself, however, is not trivial. The above discussion looks at overall target leverage implied by our empirical models. This target leverage is also driven by changes in firm characteristics and changes in coefficients of these characteristics in the empirical model. A different view on the issue of cyclicality (and one that is closer to the theory) defines cyclicality independently from changing firm characteristics (and coefficients in the empirical model). One interpretation of this "conditional" cyclicality is that it captures supply side effects that are independent from firm characteristics. Empirically, we find, however, very little evidence for such conditional cyclicality. For the full sample, we find no effect for book leverage and conditional counter-cyclicality for market leverage. Interestingly, there are some subsamples of firms for which we observe significantly negative shocks to target leverage during recessions (i.e., conditional pro-cyclicality), namely financially constrained firms and firms from civil law countries.

We document that the speed of adjustment towards a target leverage is significantly lower during recessions than during expansions. This clearly points to the relevance of supply factors for leverage dynamics. Furthermore, we document that there is some heterogeneity in this decrease of speed of adjustment estimates across subsamples of firms. The decrease is more pronounced, for example, for firms from common law countries than from civil

and recessions using yearly balance sheet information would be very low.

law countries. This result is consistent with a debt renegotiation story. Similarly, the decrease is more pronounced for constrained firms implying that these firms are more affected by time-varying transaction costs or supply side effects.

There have only been few empirical studies on capital structure and macroeconomic determinants. Korajczyk and Levy (2003) find evidence that book and market target leverage are counter-cyclical for relatively unconstrained firms, but pro-cyclical for relatively constrained firms.[2] Our results are consistent with these conclusions. We extend their study by analyzing the business cycle dynamics of speed of adjustment estimates and of coefficients of firm characteristics. We also add another dimension by evaluating the influence of capital market characteristics on these dynamics. For example, we find that leverage dynamics differ across common law and civil law countries.

Few empirical papers have looked at the relationship between speed of adjustment to target leverage ratios and macroeconomic conditions. Consistent with our results, Cook and Tang (2009) find, using only US data, that the speed of adjustment towards target capital structures seems faster in booms than in recessions. Drobetz and Wanzenried (2006) find a similar result for 90 Swiss firms. We provide new and more detailed insights on the variation of the speed of adjustment over the business cycle by differentiating between firms in different institutional environments and facing different degrees of financial constraints.

The rest of the paper is organized as follows: Section 2 discusses four strands of theory that have predictions for leverage dynamics; Section 3 summarizes the data and our empirical design; Section 4 reports our empirical results. Section 5 concludes.

## 2 Literature

There exists a large literature on capital structure dynamics, and we do not attempt to give a complete overview here. Instead, our goal is to focus on few broad paradigms, which generate reasonably robust and consistent predictions regarding firms' capital structure dynamics. We classify the literature into four strands: issuer-driven tradeoff models, capital market-driven models, models driven by behavioral biases of investors and/or managers and irrelevance models.

[2] They proxy for business cycle variation using 2-year corporate profit growth, 2-year equity market return and commercial paper spread.

In this section we discuss these strands of literature and explain which empirical hypotheses regarding firms' capital structure dynamics over the business cycle they generate. In the following discussion we define leverage as pro-cyclical (counter-cyclical) if it increases (decreases) during economic expansions (contractions).

## 2.1 Issuer-driven leverage dynamics

The first strand of literature is by now well developed and focuses on capital structure dynamics determined by time-varying firm characteristics. The first advances were made by Merton (1974) and Black and Cox (1976) and extended by Kane, Marcus, and McDonald (1984) and Kane, Marcus, and McDonald (1985), and Leland (1994) to consider the tradeoff between a tax benefit of debt and costly bankruptcy in continuous-time. These models constitute an important first step towards accounting for dynamic aspects of capital structure choice by introducing a stochastic asset value process, but they do not allow firms to adjust their debt-level over time. The next generation of dynamic tradeoff models explicitly allows firms to increase or decrease leverage over time. The basic framework developed in Fischer, Heinkel, and Zechner (1989a) and Fischer, Heinkel, and Zechner (1989b) has been extended in several directions.[3]

There are other demand-side driven dynamic tradeoff theories of leverage. Levy and Hennessy (2007) model time varying agency costs and their effects on leverage dynamics. In this model an entrepreneur must hold a minimum share of the firm's equity and keep the firm's leverage below some critical upper bound to commit not to divert earnings and/or assets. In this setup firms are more highly equity financed during expansions and more levered during contractions. The model predicts that these counter-cyclical leverage swings are sharper for firms with good governance and for firms which are less financially constrained.

In a different vain, several models explore the effect of borrowers' deteriorating collateral values. In these papers firms' ability to obtain debt financing is limited by the amount of collateral they have. If a recession leads to a drop in the value of the assets which can be pledged as collat-

[3]For example, by modeling firm dynamics via stochastic cash flows rather than stochastic asset values (Goldstein, Ju, and Leland (2001), Dangl and Zechner (2004), and Strebulaev (2007)), and by allowing for investment (Mello and Parsons (1992), Mauer and Triantis (1994), Morellec (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)).

eral, this limits debt financing. Examples for models that explore this are Bernanke and Gertler (1989), Calomiris and Hubbard (1990), Gertler (1992), Greenwald and Stiglitz (1992), Kiyotaki and Moore (1997), and Shleifer and Vishny (1992).

Almost by definition, these issuer-driven models have the property, that, once one conditions on the relevant demand-side characteristics of the issuer, they predict constant conditional target market leverage ratios. This is true even in the presence of transactions costs. Thus, firms may not respond instantaneously to changes in their profitability or other changing characteristics due to transactions costs, but their target leverage should not change, irrespective of whether the majority of firms experiences increasing or decreasing profitability, or effective corporate tax rates etc. i.e. irrespective of the business cycle.[4]

Strictly interpreted, the models only make predictions about leverage dynamics expressed in market values, since they do not separately consider the evolution of book values of debt, equity, and assets. However, we know that market values of assets will generally fluctuate more than their book values. Thus, if one assumes that firms' asset book values move less than their market values over the business cycle, then the above models implicitly predict increasing (decreasing) book target leverage ratios during expansions (contractions), conditional on all issuer characteristics.

We should expect the observed pro-cyclicality of book leverage to differ across firms. Firms that face high transactions costs when tapping the market for external capital will not issue debt as actively in response to market value increases and will not retire debt as actively in response to a decrease in the market value of their assets. In fact, firms with high transactions costs of accessing markets for external capital may not find it optimal to respond to the business cycle by actively issuing debt or equity. Thus, these firms should exhibit less pro-cyclical or even counter-cyclical book target leverage and counter-cyclical market target leverage. We refer to such firms with restricted access to external capital as financially constrained. They are likely to be smaller firms, who may not even be able to fund all profitable investment projects, due to capital constraints. According to issuer-driven theories, we expect such firms to have less pro-cyclical conditional target book leverage than unconstrained firms.

Demand-side models also have implications for firms' propensity to move to the target leverage ratio. While equityholders have an incentive to call

[4]The relationship between firm profitability/cash flow and leverage dynamics in the presence of transactions costs is illustrated for simulated economies in Strebulaev (2007).

existing debt to subsequently issue a higher amount in response to, say, increased profitability, they are generally reluctant to call debt to reduce debt levels after decreasing profitability. This result is driven by the fact that calling debt after adverse changes in a firm's profitability will generally lead to wealth transfers from equity to debt holders. Many dynamic tradeoff models therefore imply that equityholders do not find it optimal to decrease leverage in response to decreasing profitability (see, for example, Dangl and Zechner (2004) and Dangl and Zechner (2007)).

Firms' reluctance to reduce debt in response to lower profitability can be mitigated in two ways. First, instead of considering only perpetual debt, as most of the models referred to above do, one can consider finite debt maturities. As shown by Dangl and Zechner (2007), firms may then decide not to roll over expiring short term debt in bad times, since this could be too expensive. Thus, short-term debt induces firms to effectively reduce leverage in bad times by not fully rolling over short term debt. Second, instead of calling debt at the call price, firms may be able to renegotiate debt after a drop in profitability. In the presence of bankruptcy costs, it may be rational for bondholders to accept equityholders' renegotiation offers, even if this implies partial debt forgiveness. This has been demonstrated, for example, by Mella-Barral and Perraudin (1997), Mella-Barral (1999), and Hege and Mella-Barral (2005). Such renegotiation offers may not be feasible if the debt is public and held by dispersed investors (for a discussion of related issues, see, for example, Gertner and Scharfstein (1991)). Thus, the lower speed of adjustment towards the target leverage during downturns can be mitigated by shorter debt maturities and if large blocks of debt are non-public.

The models discussed above all consider given dynamics of the issuer characteristics. Thus, in these models the business cycle does not directly affect the expected change or the volatility of, say, firm profitability etc. Recently, models have been extended to allow for the business cycle to affect the dynamics of issuer characteristics. For example, in Hackbarth, Miao, and Morellec (2006) the business cycle affects both the level and the drift of corporate cash flows. These effects on the model parameters influence firms' target leverage ratios. Hackbarth, Miao, and Morellec (2006)show that the present value of future cash-flows is pro-cyclical and that this effect dominates the pro-cyclical choice of debt, leading overall to counter-cyclical market target leverage ratios. By contrast, Bhamra, Kuehn, and Strebulaev (2009) show in a general equilibrium model that that target leverage ratios during expansions are higher for plausible model parameterizations. Thus, the prediction of these models regarding target leverage is ambiguous.

Finally, demand-driven models predict that leverage dynamics are also influenced by the institutional framework that firms face. In particular, bondholder protection will be relevant. Firms will find debt to be expensive when bondholder protection is low vis-a-vis shareholder protection. This will lower the optimal target leverage and will make it more expensive to manage debt actively. In particular, in an environment in which debtholders are poorly protected, firms will not find it optimal to adjust their debt level significantly in response to increased profitability, since bondholders anticipate that firms will be reluctant to reduce debt later, if profitability drops again.[5].

Summarizing, demand-driven capital structure models with given dynamics of issuer characteristics generally predict constant target market leverage ratios and pro-cyclical book leverage ratios, conditional on firm characteristics. Also, the speed of adjustment towards the target ratio is predicted to be higher during expansions and lower during contractions. The latter effect should be mitigated if corporate debt is short-term and if large blocks are non-public.

Finally, the pro-cyclicality of book leverage should be reduced for financially constrained firms, and for firms in environments where bondholders are poorly protected.

## 2.2 Capital market-driven capital structure dynamics

Another, somewhat less developed strand of literature focuses on capital market driven determinants of firms' financial structures.

There are at least two potential channels, through which such "supply-side" 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 or as market makers in the secondary market. Second, liquidity in the secondary markets for corporate securities may change over the business cycle and thus have an effect on firms capital structure choice. If the costs of intermediation and market illiquidity vary with the business cycle, then firms' leverage dynamics should reflect such variations.

The first supply side channel mentioned above has been explored by analyzing shocks to intermediaries' capital. If intermediaries' lending capacities are limited by the amount of capital, for example via regulation, then an

[5] This has been documented in dynamic tradeoff models that analyze the effect of covenants and/or other commitment devices (see, e.g.Fischer, Heinkel, and Zechner (1989a), Fischer, Heinkel, and Zechner (1989b), or Dangl and Zechner (2007)

adverse shock may have a direct effect on the amount of credit banks can supply to businesses. Holmstrom and Tirole (1997) develop a model, where intermediaries are exposed to capital shocks. They show that poorly capitalized firms that have limited access to the public debt and equity markets are affected most by adverse shocks to intermediaries' capital. Other analyses of this potential effect on capital structure are presented by Bernanke and Blinder (1992), Romer, Romer, Goldfeld, and Friedman (1990), or Kashyap, Stein, and Wilcox (1993).[6] To the extent that economic expansions are correlated with higher amounts of capital for financial intermediaries, this implies pro-cyclical leverage dynamics.

A young but growing literature explores time varying secondary market liquidity. Several recent papers provide models of secondary markets for corporate debt which are characterized by search costs. Examples are Ericsson and Renault (2006) and Duffie, Garleanu, and Pedersen (2007). In these models, search costs may increase during recessions. If the expected costs of trading in the secondary market is discounted in the issue price, then these models are consistent with lower leverage during contractions, i.e. procyclicality. Note that this only applies to firms borrowing via publicly held bonds, not bank debt.

Hennessy and Zechner (2011) show that secondary debt markets become particularly fragile during contractions. In such situations multiple equilibria arise where secondary debt markets may freeze. Hennessy and Zechner (2011) show that this leads to financing cycles, where firms use less debt during contractions.[7] Again this predicts pro-cyclical leverage for firms which rely on public debt.

Finally, capital market conditions will also influence more generally how actively firms can manage their capital structure. Thus, one should expect interactions between issuer-driven and capital-markets driven capital structure drivers. In particular, if financial market liquidity is low, then firms face high capital structure adjustment costs and thus will not find it optimal to make frequent leverage adjustments. We therefore expect that the speed of adjustment towards a target leverage should be lower when capital markets are illiquid, which is more likely during recessions.

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

[7] Bhamra, Kuehn, and Strebulaev (2009) also model exogenously varying debt market illiquidity during contractions. This leads to pro-cyclical leverage dynamics.

## 2.3 Market-timing driven capital structure dynamics

Deviations from fundamental valuations may also influence capital structure choices. 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. Specifically, firms time IPOs and seasoned stock offerings to take advantage of high market valuation levels and/or 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, corporate debt is 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).

According to this literature, firms should exhibit strongly counter-cyclical leverage ratios, both in terms of market values and in terms of book values. According to the market timing hypothesis firms should issue equity at the peak of an expansion, when equity valuation levels reach their highest levels, thereby reducing their leverage. At the trough of a contraction, equity valuations and interest rates are usually low, and firms would therefore prefer to issue debt, thus increasing their leverage further.[8]

## 2.4 Irrelevance-driven leverage dynamics

Of course the theories discussed above can be viewed against the alternative of capital structure irrelevance. According to Modigliani and Miller (58), firms' capital structure is irrelevant in frictionless markets. In this case it is natural to expect that a firm either randomly chooses a leverage ratio and then maintains this leverage across time, or firms randomly pick a leverage ratio in each period. Of course, if capital structure is considered irrelevant by managers, they may of course choose any random financing strategy. For

[8]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.

example, they may choose to hold an initial, randomly chosen debt level constant over time, or to hold an initial randomly chosen equity level constant over time. However, in all these cases we should neither expect to find a target leverage that is significantly related to issuer characteristics, nor should we expect the speed of adjustment towards a target to differ systematically over the business cycle. Thus, in the benchmark case of irrelevance, we would not expect to find significant relationships between changing firm and capital market characteristics and leverage, except possibly for a firm-fixed effects.

# 3 Data and Empirical Design

## 3.1 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[9].

We use Worldscope to obtain annual firm-level accounting data. Our sample period is from 1983 to 2009[10]. Variable definitions are given in Appendix A and summarized in Table 1. Table 2 provides the mean values of key firm level characteristics, classified by country.

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 such that either of the following conditions are met: (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

[9] 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.

[10] In our sample some countries have shorter period of data available than others. We don't have firms from all countries for all years between 1983 and 2009. However, our first observations are in 1983 and last observations are in 2009.

(vi) negative cash.

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, measured by net sales, of each firm. We then assign individual firms to being financially unconstrained (constrained) if their median sizes are in the top (bottom) twenty five percentiles of the size distribution of the country in which they domicile. In addition, for each individual firm we compute the ratio of the number of firm-year observations it pays out dividends to the total number of firm-year observations. We then sort firms by this ratio and assign to the financially unconstrained (constrained) sub-samples those firms in the top (bottom) twenty five percentiles of the standard uniform distribution.

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 *market value of assets* ratio.

We define that a firm year is in a recession if a firm's entire fiscal year overlaps with a recession.[11] 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 Expenditure* to *total assets* ratio *(capital expenditure)*. Last but not least, lagged leverage ratios are used to capture the persistence in leverage dynamics.

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.[12] 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 ratio at the 95%-level, profitability and tangibility at the 99%-level.

[11] 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.

[12] Net leverage ratio refers to the ratio of *total debt* less *cash* to book or market value of *total assets*.

### 3.2 Empirical Specification

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 our empirical analysis we capture this feature by following Flannery and Rangan (2006) and estimating a dynamic partial adjustment capital structure model (DPACS-Model) including year and firm fixed effects.[13] These models contemporaneously estimate time-varying target leverage ratios and estimates of 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) is given in the following two steps.

#### 3.2.1 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:

$$\mathbf{Tlr}_{j,i,t+1} = (\beta_0^{rec} + \beta^{rec}\mathbf{X}_{j,i,t+1})\,\mathbf{1}_{j,t+1}^{rec} + (\beta_0^{exp} + \beta^{exp}\mathbf{X}_{j,i,t+1})\,\mathbf{1}_{j,t+1}^{exp}, \quad (1)$$

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

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

of firm- and industry-level characteristics[14], i.e.

$$\mathbf{X} = \begin{bmatrix} \textit{sales} \\ \textit{market to book} \\ \textit{profitability} \\ \textit{tangibility} \\ \textit{industry mean} \\ \textit{capital expenditure} \end{bmatrix}. \tag{2}$$

The coefficients $\beta_0^{rec}$ and $\beta_0^{exp}$ capture the direct influence of the business cycle variable on target. The coefficient vectors $\beta^{rec}$ and $\beta^{exp}$ present the indirect impact of the business cycle and the above explanatory variables on target leverage. To see this, we can re-write equation (1) as

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

### 3.2.2 Partial Adjustment To Target

Transactions costs prevent firms from immediately adjust towards their targets. Such costs may have certain cyclical pattern that may lead to quite 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

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

[14] 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 with 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.

Substituting equation (1) into equation (4) yields

$$\begin{aligned}\mathbf{lr}_{j,i,t+1} - \mathbf{lr}_{j,i,t} = &\left(\alpha^{exp}\mathbf{1}^{exp}_{j,t+1} + \alpha^{rec}\mathbf{1}^{rec}_{j,t+1}\right)\\ &\times\left(\left(\beta^{rec}_0 + \beta^{rec}\mathbf{X}_{j,i,t+1}\right)\mathbf{1}^{rec}_{j,t+1} + \left(\beta^{exp}_0 + \beta^{exp}\mathbf{X}_{j,i,t+1}\right)\mathbf{1}^{exp}_{j,t+1} - \mathbf{lr}_{j,i,t}\right)\\ &+e_{j,i,t+1}.\end{aligned} \tag{5}$$

Rearranging and simplifying gives the model we need to estimate

$$\begin{aligned}\mathbf{lr}_{j,i,t+1} = &\left(1-\alpha^{exp}\right)\mathbf{lr}_t\mathbf{1}^{exp}_{j,t+1} + \left(1-\alpha^{rec}\right)\mathbf{lr}_t\mathbf{1}^{rec}_{j,t+1}\\ &+\alpha^{exp}\beta^{exp}_0\mathbf{1}^{exp}_{j,t+1} + \alpha^{rec}\beta^{rec}_0\mathbf{1}^{rec}_{j,t+1}\\ &+\beta^{exp}\alpha^{exp}\mathbf{X}_{j,i,t+1}\mathbf{1}^{exp}_{j,t+1} + \beta^{rec}\alpha^{rec}\mathbf{X}_{j,i,t+1}\mathbf{1}^{rec}_{j,t+1}\\ &+e_{j,i,t+1}.\end{aligned} \tag{6}$$

The speed of adjustment estimate (SOA-estimate) is defined as $\lambda^{rec} = 1 - \alpha^{rec}$ ($\lambda^{exp} = 1 - \alpha^{exp}$) during recessions (expansions). Given the above specification, $\lambda^{rec}$ ($\lambda^{exp}$) 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 $\alpha^{exp} = \alpha^{rec}$, $\beta^{exp}_0 = \beta^{rec}_0$, 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:

$$\begin{aligned}\mathbf{lr}_{j,i,t+1} = &\left(1-\alpha^{exp}\right)\mathbf{lr}_t\mathbf{1}^{exp}_{j,t+1} + \left(1-\alpha^{rec}\right)\mathbf{lr}_t\mathbf{1}^{rec}_{j,t+1}\\ &+\alpha^{exp}\beta^{exp}_0\mathbf{1}^{exp}_{j,t+1} + \alpha^{rec}\beta^{rec}_0\mathbf{1}^{rec}_{j,t+1}\\ &+\beta^{exp}\alpha^{exp}\mathbf{X}_{j,i,t+1} + e_{j,i,t+1}.\end{aligned} \tag{7}$$

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

# 4 Empirical Results

In this section, we present our empirical results concentrating on insights with regard to the relationship between business cycles and firms' target leverage ratios. First, we discuss 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.

### 4.1 Business Cycle Dynamics of Determinants of Target Leverage

Table 4 shows estimates of our DPACS model with time-varying coefficients for book leverage and market leverage.[15] 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. Second, the difference in coefficients across the business cycle (significant differences are highlighted via ***, ** and * next to the coefficient estimates during recessions).[16]

As far as the first dimension is concerned, our results are broadly speaking consistent with the existing literature: size, market to book and profitability affect target leverage in a negative way, tangibility and industry mean leverage in a positive way.[17] For the purpose of our study the second dimension is more interesting. For the full sample, we find that the impact of market to book, profitability, and capital expenditure varies significantly across the business cycle, for both book leverage and market leverage.

[15]Table 3 shows 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.

[16]As far as this difference in coefficients is concerned, one has to be careful. The regression estimates reported in the table include the coefficient estimate for target leverage and a term that depends on the speed of adjustment (see Equation 6). Thus, in order to test whether a specific firm characteristic affects target leverage differently during expansions than during recessions one has to extract the coefficients in the target leverage equations for recessions and expansions first. This procedure is done before significance of the differences is determined.

[17] In this section, we don't discuss the coefficients of lagged leverage and the constants, as they will be discussed in separate sections. The coefficients of lagged leverage include information on the speed of adjustment while the constant relate to issues of cyclicality of target leverage.

In the case of profitability we find that the negative impact of profitability on target leverage becomes much stronger during recessions. This result is consistent with a pecking-order oriented argument: in general, profitable firms seem to 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 during recessions profitable firms use retained earnings more aggressively to lower their leverage ratios.

In the case of capital expenditure, the pattern is slightly different. Our results imply that capital expenditure does not significantly influence target leverage ratios during expansions. In contrast, during recessions it becomes an important determinant such that firms with more capital expenditure have higher target leverage. One interpretation of this pattern is that during recessions equity financing becomes very costly and, thus, firms with large capital investments have to rely more on debt markets in those times. Another interpretation is that, in recessions, asset sales, i.e. divestiture, and leverage reductions are closely tied to each other.

In a next step, we split the sample into subgroups according to the following two dimensions: (i) financially constrained vs. unconstrained firms (see Table 5 for results), (ii) firms from capital-market oriented vs. bank-oriented countries[18] (see Table 6 for results) and (iii) firms from countries in which shareholder and debtholders are equally treated vs. firms from countries in which shareholders are better protected than debtholders.[19] (see Table 6 for results).

As far as the separation into financially constrained and unconstrained firms is concerned, we observe several interesting differences especially during expansions. For example, market to book affects the book target leverage of constrained firms negatively (and significantly) while it affects the book target leverage ratio of unconstrained firms positively (and significantly). However, as far as business cycle dynamics of coefficients are concerned, we observe no systematic differences. Similar to the full sample case, we find that the impact of profitability and capital expenditure varies significantly across the business cycle. This lack of systematic differences is somewhat surprising given that theoretical predictions and common intuition would

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

[19]The shareholder rights index (anti-self-dealing index) from Djankov, Porta, 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.

suggest that leverage dynamics of financially constrained and unconstrained firms vary differently across the business cycle.[20]

Another dimension that we use to split the sample is legal origin. Here the idea is that legal origin is 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. The pattern of capital expenditure, however, 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 expenditure is "unimportant" during expansions but very important during recessions; the coefficient increases dramatically over the business cycle. In the case of civil law countries, capital expenditure matters to a similar extent in both regimes, expansions and recessions. This evidence is consistent with the observation that in civil law countries equity market for start-up and high growth companies are less developed than in common law countries. Thus, in civil law countries, these firms that usually have a lot of capital expenditure 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 might be consistent with our interpretation that civil law countries are bank-oriented. The story is that banks require relatively little collateral (compared to public debtholders in common law countries) during expansions. In recessions, however, they might have to ask for more collateral explaining the significantly positive coefficient of tangibility during recessions.[21]

Finally, we split the sample by relative strength of shareholder protection and debtholder protection. Again, we observe the standard pattern for profitability. Capital expenditure, in contrast, shows some interesting differences across subsamples. For both groups of firms, capital expenditure is an important determinant of target leverage in recessions. On the other hand, the story is quite different in expansions when both external equity and debt markets are available. Capital expenditure loses its explanatory power for firms from countries where shareholders are better protected than debtholders (DiffSHDH) but stays an important determinant for firms from countries where these two groups of stakeholders are similarly protected

[20]Of course, our proxies for financial constraints are weak at best.

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

(EqSHDH). This is consistent with the conjecture that firms from *EqSHDH* countries rely more on external debt to finance their investment than those from *DiffSHDH* countries in economic booms.

## 4.2 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. The notion of cyclicality, however, has several dimensions and interpretations. To this end, we will explore to notions of cyclicality. First, we will use our empirical models to extract estimates of the overall, implied (unobserved) target leverage ratios (see equation 6). Then we will study the dynamics of these implied target leverage ratios over the business cycle for the median firm. We will call this notion of cyclicality "unconditional"cyclicality. Second, we will analyze the difference in constants across recessions and expansions; i.e., $(\beta_0^{rec} - \beta_0^{exp})$. This difference can be interpreted as a measure of the conditional impact (i.e., controlling for firm characteristics and time-varying coefficients) of recessions on target leverage ratios. If this difference is significantly negative (positive), we call the dynamics to be conditionally pro-cyclical (counter-cyclical).

As far as unconditional cyclicality is concerned, 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"in the graph) and for the two benchmark models. Furthermore, it also shows observed leverage. The most important observation is that our empirical model implies strongly counter-cyclical target leverage ratios. Interestingly, observed leverage shows the same dynamics although at much smaller levels. This is an indication of slower speed of adjustment towards target leverage in recessions as we will discuss in more detail in the next section.

If we compare the different models, we observe interesting differences. A static model that ignores any time-variation in speed-of-adjustment estimates or target leverage coefficients has comparatively conservative target leverage estimates and, even more interestingly, shows a slightly pro-cyclical pattern (this model is labeled "NoBC Target"in the graphs). These pronounced differences are not surprising, as this static model is driven by expansionary observations and, for example, dramatically overestimates the speed of adjustment during recessions (details on speed of adjustment estimates can be found in the next section). If we relax the assumption of a constant speed of adjustment across the business cycle, we observe the other extreme (this model is labeled “StaticBC Target” in the graphs): in this case, target leverage estimates become relatively large. 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 target leverage.

As a next step, we split the sample and study these dynamics for subsamples of financially constrained and unconstrained firms (see Figures 2 and 3). The results are mixed. If we separate firms based on size, we don't observe strong differences: again, target leverage ratios are strongly counter-cyclical. Very interesting dynamics are shown in the book target leverage graph of Figure 2. It shows very distinct patterns of target leverage for constrained and unconstrained firms. While the median unconstrained firm increases its target leverage from roughly 15% to about 31% in the recession and then decreases it back to 15% in the two years following the recession, financially constrained firms have a relatively stable target leverage ratio that consistently stays between 25% and 30%.

Our next prediction with respect to target leverage ratios addresses the influence of a country's legal origin on the leverage dynamics across the business cycle. The idea is that in common-law countries, owners of publicly traded stocks or bonds are better protected, and thus a larger fraction of firms' funding comes directly from the capital market rather than from banks. By contrast, in civil law countries a smaller fraction of corporate funding is obtained via issues of public equity and public corporate debt, and more funding occurs via bank loans. Standard dynamic tradeoff models suggest that firms in common law (civil law) countries exhibit more pro-cyclical (counter-cyclical) leverage dynamics. The unconditional dynamics of target leverage shown in Figure 4 are consistent with this prediction.

In addition we look at an additional dimension of country characteristics, namely the relative protection of shareholders and debtholders. Again, we find the same results (see Figure 5). In the case of firms from countries where shareholders and debtholders are equally well protected (i.e., countries in which public markets are well developed), unconditional dynamics of target leverage ratios are pro-cyclical. In contrast, in countries in which debtholders and shareholders have very different levels of protection, we find counter-cyclical dynamics.

The previous discussion focused on the cyclicality of overall target leverage. From a theoretical point of view, it's not obvious that this is the right measure to look at when analyzing leverage cyclicality. As discussed and pointed out in the theory section, theoretical models often make predictions conditional on firm characteristics not changing. In our graphs of overall target leverage, however, both firm characteristics and coefficients of these characteristics in our empirical model change with the business cycle. Thus, it's hard to assess the validity of individual theories using the graphs of overall target leverage. In order to get somewhat closer to what the theory predicts, we now focus on conditional cyclicality; i.e., we will compare the constant term in the target leverage equation across expansions and recessions.

In the case of the full sample (see Table 4), we find no conditional cyclicality in the case of book leverage and conditional counter-cyclicality in the case of market leverage.[22] Looking across our subsamples, we find that in most cases there is no evidence for significant, conditional cyclicality. One notable exception is, for example, the sample of financially constrained firms (using the dividend yield as proxy) in Table 5 in the case of book leverage. Here we find that even after controlling for varying firm characteristics and coefficients there is a significantly negative shock on book target leverage during recessions. This results could be interpreted as preliminary evidence of a supply shock for constrained firms during recessions.

Similarly, we find strong conditional procyclicality for book leverage for the sample of firms from civil law countries. This results could also be interpreted that in bank-oriented markets, one observes additional (i.e., not driven by varying firm characteristics and coefficients) negative shocks on target leverage during recessions. Again, this could indicate that supply effects are more prevalent during recessions in bank-oriented systems and that market-oriented economies can avoid those additional shocks.

### 4.3 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 a full adjustment towards the target capital structure occurs (see, e.g. Fischer, Heinkel, and Zechner (1989a)). 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)).

[22]Here are the details of the calculation for this result. In the case of book leverage, there are no stars next to *rec-cons*; i.e., $(\beta_0^{rec} - \beta_0^{exp})$ are not significantly different in this case. In the case of market leverage, this difference is significant and amounts to 0.91.

Flannery and Rangan (2006) show that even if firms' capital structure adjustments are lumpy, dynamic partial adjustment models can capture actual firm behavior quite well. 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 adjustments towards leverage targets. If transaction costs associated with capital structure adjustments are higher during recessions, we should therefore 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.[23] 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 boundary of the values reported in the above list. Every single estimate is positive, below 1 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 (i.e., coefficients in the regression are higher).[24] These differences are significant.

Of course, there is quite a bit of dispersion in the differences between SOA-estimates in recessions and expansions across samples and leverage variables. In the next few paragraphs we will discuss some of this variation in more detail. One source of variation is based on the theory of debt

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

[24]There is only one case (market leverage ratio of firms from common law countries) in which we observe the opposite effect, i.e. the SOA is faster during recessions.

renegotiations. According to this theory the difference between the speed of adjustment towards the target leverage ratio in expansions and in contractions should be larger for firms with large proportions of public debt. As before, we use the legal origin of a firm as a proxy for the proportion of public debt in its capital structure. The assumption is that firms from common law countries have more public debt on average than firms from civil law countries.

We find strong evidence for this hypothesis for book leverage (see Table 6 Panel A). The difference between the speed of adjustment towards the target leverage ratio in expansions and in contractions is considerably higher for firms from common law countries than for firms from civil law countries. In this case, the speed of adjustment is about 14.3% slower during recessions for firms from common law countries while it is only about 5.8% slower for firms from civil law countries.[25]

Another interesting observation is that, in general, the speed of adjustment is faster in common law countries than in civil law countries. The difference is huge during expansions but still sizeable during recessions.[26] This pronounced difference between firms from common law and civil law countries supports the interpretation that, in general, capital markets in common law countries provide firms with better opportunities to manage their capital structures. Further more, they 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 the firms' adjustments to their target ratios.

We also expect a more pronounced SOA-asymmetry for firms from countries where shareholders are relatively more protected than debtholders. Not surprisingly, in Table 6, we evidence that for both leverage measures speed of adjustment estimates decrease more during recessions for DiffSHDH firms than for 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. Our intuition would be that constrained firms are more affected by business cycle variation and, thus, that speed of adjustment decreases more during recessions for con-

[25]As mentioned before, in the market leverage case the pattern is reversed (see Table 6 Panel B). Firms from common (civil) law countries adjust their market leverage ratio towards their targets faster (more slowly) in recessions than in expansions. This is a potentially very interesting result that we will investigate in more detail in the future.

[26]In the case of market leverage, the difference is actually enormous during recessions.

strained than unconstrained firms. For both leverage measures and both financial constraints measures, our intuition is strongly confirmed, as business cycle related asymmetries in SOA-estimates are much more pronounced for constrained firms than for unconstrained firms.[27]

## 5 Conclusion

In this paper we shed 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 bondholder protection matter. Firms in common law countries and firms in countries where bondholder protection is high seem to manage their leverage ratios more actively (i.e., have higher speed of adjustments).

Overall, the findings regarding target leverage dynamics seem most consistent with issuer-driven models with explicit business cycle effects. However, our results related to the speed of adjustment indicate that capital markets driven models also have some explanatory power. Our results are clearly inconsistent with the hypothesis that capital structure is irrelevant, not managed at all or in a random way.

In future revisions we wish to extend our analysis in several directions. It would be interesting to analyze alternative definitions of the business cycle, such as corporate profits, stock market returns,etc. In addition, we would like to analyze whether recessions that are also associated with financial crises affect leverage dynamics in a different way.

[27] An interesting side result is that constrained firms (have to) adjust much faster than unconstrained firms during expansions. During recessions, however, the speed of adjustments are basically identical between constrained and unconstrained firms.

# A Variables Definitions

*Long Term Debt (lt_debt)* refers to all interest bearing financial obligations, excluding amounts due within one year. *Short Term Debt (st_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. *Total Debt (tt_debt)* is the sum of its long term debt and short term debt. *Net Sales* are gross sales and other operating revenue less discounts, returns and allowances. *Cash & Short Term Investments (cash)* represents the sum of cash and short term investments. *Market Capitalization (mc)* equals to the product of Market Price and Common Shares Outstanding. *Assets' market value (ma)* is the market capitalization of the firm plus its total debt. *Total Assets (ta)* are the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. *EBITDA* is the earnings of a company before interest expense, income taxes and depreciation. *PPE* is gross property, plant and equipment less accumulated reserves for depreciation, depletion and amortization. *Capital Expenditure* represents the funds used to acquire fixed assets other than those associated with acquisitions. *Dividend per Share* is the total dividends per share declared during the calendar year for US corporations and fiscal year for non-US firms. *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. *Industry Median Leverage Ratio (industry median)* is the median leverage ratio of an industry to which firms belong. *Recession dummy (Rec)* equals 1 if a firm's entire fiscal year overlaps with a recession and 0 otherwise. Countries in our sample are categorized to common-law or civil-law countries based on Treisman (2000) and grouped to developed (advanced) or developing economies according to IMF (2010). We summarize these variables in Table 1 on page 32. *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 (Bondholder) right index* is extracted from Djankov, La Porta, Lopez de Silanes, and Shleifer (2009) (Djankov, Hart, McLiesh, and Shleifer (2008)).

## References


Acharya, Viral V., Heitor Almeida, and Murillo Campello, 2007, Is cash negative debt? a hedging perspective on corporate financial policies, *Journal of Financial Intermediation* 16, 515–554.

Almeida, Heitor, Murillo Campello, and Michael S. Weisbach, 2004, The cash flow sensitivity of cash, *The Journal of Finance* 59, 1777–1804.

Baker, Malcolm, and Jeffrey Wurgler, 2002, Market timing and capital structure, *The Journal of Finance* 57, 1–32.

Bernanke, Ben, and Mark Gertler, 1989, Agency costs, net worth, and business fluctuations, *The American Economic Review* 79, 14–31.

Bernanke, Ben S., and Alan S. Blinder, 1992, The federal funds rate and the channels of monetary transmission, *The American Economic Review* 82, 901–921.

Bhamra, H. S., L.-A. Kuehn, and I. A. Strebulaev, 2009, The aggregate dynamics of capital structure and macroeconomic risk, forthcoming in the Review of Financial Studies.

Black, Fischer, and John C. Cox, 1976, Valuing corporate securities: Some effects of bond indenture provisions, *The Journal of Finance* 31, 351–367.

Blanchard, Olivier, Changyong Rhee, and Lawrence Summers, 1993, The stock market, profit, and investment, *The Quarterly Journal of Economics* 108, 115–136.

Blundell, R., and S. Bond, 1998, Initial conditions and moment restrictions in dynamic panel data models, *Journal of Econometrics* 87, 115–143.

Brennan, Michael J., and Eduardo S. Schwartz, 1984, Optimal financial policy and firm valuation, *The Journal of Finance* 39, 593–607.

Calomiris, Charles W., and R. Glenn Hubbard, 1990, Firm heterogeneity, internal finance, and 'credit rationing', *The Economic Journal* 100, 90–104.

Chang, Xin, and Sudipto Dasgupta, 2009, Target behavior and financing: How conclusive is the evidence, *The Journal of Finance* 64, 1767–1796.

Chen, Long, and Xinlei Zhao, 2007, Mechanical mean reversion of leverage ratios, *Economics Letters* 95, 223–229.

Childs, Paul D, David C Mauer, and Steven H Ott, 2005, Interactions of corporate financing and investment decisions: The effect of agency conflicts, *Journal of Financial Economics* 76, 667–690.

Cook, D. O., and T. Tang, 2009, Macroeconomic conditions and capital structure adjustment speed, forthcoming in the Journal of Corporate Finance.

Dangl, Thomas, and Josef Zechner, 2004, Credit risk and dynamic capital structure choice, *Journal of Financial Intermediation* 2, 183–204.

——— , 2007, Debt maturity and the dynamics of leverage, Working paper.

De Long, J Bradford, Andrei Shleifer, Lawrence H. Summers, and Robert J. Waldmann, 1990, Noise trader risk in financial markets, *The Journal of Political Economy* 98, 703–738.

DeAngelo, Harry, Linda DeAngelo, and Toni M Whited, 2010, Capital structure dynamics and transitory debt, *Journal of Financial Economics* 99, 235–261.

Djankov, Simeon, Oliver Hart, Caralee McLiesh, and Andrei Shleifer, 2008, Debt enforcement around the world, *Journal of Political Economy* 116, 1105–1149.

Djankov, Simeon, Rafael La Porta, Florencio Lopez de Silanes, and Andrei Shleifer, 2008, The law and economics of self-dealing, *Journal of Financial Economics* 88, 430–465.

Drobetz, W., and G. Wanzenried, 2006, What determines the speed of adjustment to the target capital structure?, *Applied Financial Economics* 16, 941–961.

Duffie, Darrell, Nicolae Garleanu, and Lasse Heje Pedersen, 2007, Valuation in over-the-counter markets, *Review of Financial Studies* 20, 1865–1900.

Ericsson, Jan, and Olivier Renault, 2006, Liquidity and credit risk, *The Journal of Finance* 61, 2219–2250.

Fama, E. F., and K. R. French, 2002, Testing trade-off and pecking order predictions about dividends and debt, *The Review of Financial Studies* 15, 1–33.

Fischer, Edwin O., Robert Heinkel, and Josef Zechner, 1989a, Dynamic capital structure choice: Theory and tests, *The Journal of Finance* 44, 19–40.

———, 1989b, Dynamic recapitalization policies and the role of call premia and issue discounts, *Journal of Financial and Quantitative Analysis* 24, 427–446.

Fischer, Stanley, and Robert Merton, 1984, Macroeconomics and finance: The role of the stock market, *Carnegie-Rochester Conference Series on Public Policy* 21, 57–108.

Flannery, M. J., and K. W. Hankins, 2010, Estimating dynamic panel models in corporate finance, Working Paper.

Flannery, M. J., and K. P. Rangan, 2006, Partial adjustment toward target capital structures, *Journal of Financial Economics* 79, 469–506.

Gamba, Andrea, and Alexander J Triantis, 2008, The value of financial flexibility, *The Journal of Finance* 63, 2263–2296.

Gertler, Mark, 1992, Financial capacity and output fluctuations in an economy with multi-period financial relationships, *The Review of Economics Studies* 59, 455–472.

Gertner, Robert, and David Scharfstein, 1991, A theory of workouts and the effects of reorganization law, *The Journal of Finance* 46, 1189–1222.

Goldstein, Robert, Nengjiu Ju, and Hayne Leland, 2001, An ebit-based model of dynamic captial structure, *The Journal of Business* 74, 483–512.

Graham, John R., and Campbell R. Harvey, 2001, The theory and practice of corporate finance: evidence from the field, *Journal of Financial Economics* 60, 187–243.

Greenwald, Bruce C., and Joseph E. Stiglitz, 1992, Financial market imperfections and business cycles, *The Quarterly Journal of Economics* 108, 77–114.

Hackbarth, D., J. Miao, and E. Morellec, 2006, Capital structure, credit risk, and macroeconomic conditions, *Journal of Financial Economics* 82, 519–550.

Hege, Ulrich, and Pierre Mella-Barral, 2005, Repeated dilution of diffusely held debt, *The Journal of Business* 78, 737–786.

Hennessy, Christopher A, and Toni M Whited, 2005, Debt dynamics, *The Journal of Finance* 60, 1129–1165.

——— , 2007, How costly is external finance?, *The Journal of Finance* 62, 1705–1745.

Hennessy, Christopher A., and Josef Zechner, 2011, A theory of debt market illiquidity and leverage cyclicality, forthcoming in the Review of Financial Studies.

Holmstrom, Bengt, and Jean Tirole, 1997, Financial intermediation, loanable funds, and the real sector, *The Quarterly Journal of Economics* 112, 663–691.

Huang, R., and J. R. Ritter, 2009, Testing theories of capital structure and estimating the speed of adjustment, *Journal of Financial and Quantitative Analysis* 44, 237–271.

Iliev, Peter, and Ivo Welch, 2010, *Reconciling Estimates of the Speed of Adjustment of Leverage Ratios*Working Paper.

IMF, 2010, *World Economic Outlook Database,*International Monetary Fund http://www.imf.org/external/pubs/ft/weo/2010/02/weodata/groups.htm.

Kane, Alex, Alan J. Marcus, and Robert L. McDonald, 1984, How big is the tax advantage of debt?, *The Journal of Finance* 39, 841–853.

——— , 1985, Debt policy and the rate of return premium to leverage, *Journal of Financial and Quantitative Analysis* 20, 479–499.

Kashyap, Anil K., Jeremy C. Stein, and David W. Wilcox, 1993, Monetary policy and credit conditions: Evidence from the composition of external finance, *The American Economic Review* 83, 78–98.

Kiyotaki, Nobuhiro, and John Moore, 1997, Credit cycles, *The Journal of Political Economy* 105, 211–248.

Korajczyk, R. A., and A. Levy, 2003, Capital structure choice: Macroeconomic conditions and financial constraints, *Journal of Financial Economics* 68, 75–109.

Leary, Mark T, 2009, Bank loan supply, lender choice, and corporate capital structure, *The Journal of Finance* 64, 1143–1185.

Leary, Mark T., and Michael R. Roberts, 2005, Do firms rebalance their capital structures?, *The Journal of Finance* 60, 2575–2619.

Leland, Hayne E, 1994, Corporate debt value, bond covenants, and optimal capital structure, *The Journal of Finance* 49, 1213–1252.

Lemmon, M. L., M. R. Roberts, and J. F. Zender, 2008, Back to the beginning: Persistence and the cross-section of corporate capital structure, *The Journal of Finance* 63, 1575–1608.

Levy, Amnon, and Christopher A. Hennessy, 2007, Why does capital structure choice vary with macroeconomic conditions, *Journal of Monetary Economics* 54, 1545–1564.

Mauer, David C, and Alexander J Triantis, 1994, Interactions of corporate financing and investment decisions: A dynamic framework, *The Journal of Finance* 49, 1253–1277.

Mella-Barral, Pierre, 1999, The dynamics of default and debt reorganization, *Review of Financial Studies* 12, 535–578.

——— , and William Perraudin, 1997, Strategic debt service, *The Journal of Finance* 52, 531–556.

Mello, Antonio S., and John E. Parsons, 1992, Measuing the agency cost of debt, *The Journal of Finance* 47, 1887–1904.

Merton, Robert C., 1974, On the pricing of corporate debt: the risk structure of interest rates, *The Journal of Finance* 29, 449–470.

Morck, Randall, Andrei Shleifer, and Robert W. Vishny, 1990, Do managerial objectives drive bad acquisitions?, *The Journal of Finance* 45, 31–48.

Morellec, Erwan, 2001, Asset liquidity, capital structure, and secured debt, *Journal of Financial Economics* 61, 173–206.

Moyen, Nathalie, 2004, Investment-cash flow sensitivities: Constrained versus unconstrained firms, *The Journal of Finance* 69, 2061–2092.

——— , 2007, How big is the debt overhang problem?, *Journal of Economic Dynamics and Control* 31, 433–472.

Pagano, Marco, Fabio Panetta, and Luigi Zingales, 1998, Why do companies go public? an empirical analysis, *The Journal of Finance* 53, 27–64.

Romer, Christina D., David H. Romer, Stephen M. Goldfeld, and Benjamin M. Friedman, 1990, New evidence on the monetary transmission mechanism, *Brookings Papers on Economic Activity* 1990, 149–213.

Roodman, D., 2006, How to do xtabond2: An introduction to "difference" and "system" gmm in stata, Working Paper 103 Center for Global Development Washington.

Shleifer, Andrei, and Robert W. Vishny, 1992, Liquidation values and debt capacity: A market equilibrium approach, *The Journal of Finance* 47, 1343–1366.

Shyam-Sunder, Lakshmi, and Stewart C. Myers, 1999, Testing static tradeoff against pecking order models of capital structure, *Journal of Financial Economics* 51, 219–244.

Stein, Jeremy C., 1996, Rational capital budgeting in an irrational world, *The Journal of Business* 69, 429–455.

Strebulaev, Ilya A., 2007, Do tests of capital structure theory mean what they say?, *The Journal of Finance* 62, 1747–1787.

Titman, Sheridan, and Sergey Tsyplakov, 2007, A dynamic model of optimal capital structure, *Review of Finance* 11, 401–451.

Treisman, Daniel, 2000, The causes of corruption: a cross-national study, *Journal of Public Economics* 76, 399–457.

Welch, I., 2004, Capital structure and stock returns, *Journal of Political Economy* 112, 106–131.

Welch, Ivo, 2011, A critique of recent quantitative and deep-structure modeling in capital structure research and beyond, Working Paper.

Table 1: Variables Definitions

| Variable | Definition | Source(Worldscope Code) |
|---|---|---|
| Long Term Debt | All interest bearing financial obligations, excluding amounts due within one year. | Worldscope(WC03251) |
| Short Term Debt | The portion of debt payable with one year including current portion of long term debt and sinking fund requirements of preferred stock or debentures. | Worldscope(WC03051) |
| Net Sales | Gross sales and other operating revenue less discounts, returns and allowances. | Worldscope(WC01001) |
| Cash & Short Term Investments | The sum of cash and short term investments. | Worldscope(WC02001) |
| Market Capitalization | Market Price $*$ Common Shares Outstanding | Worldscope(WC08001) |
| Total Assets | The sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. | Worldscope(WC02999) |
| EBITDA | The earnings of a company before interest expense, income taxes and depreciation. | Worldscope(WC18198) |
| PPE | Gross Property, Plant and Equipment less accumulated reserves for depreciation, depletion and amortization. | Worldscope(WC02501) |
| Capital Expenditure | The funds used to acquire fixed assets other than those associated with acquisitions. | Worldscope(WC04601) |
| Dividends per Share | The total dividends per share declared during the calendar year for US corporations and fiscal year for Non-US corporations. | Worldscope(WC05101) |
| Industry Group | A four digit numeric code assigned to the company to represent its industry group. | Worldscope(WC06011) |
| Recession | Recession dummy is set to 1 if for a given firm-fiscal-year observation all the past 12 fiscal months are in a recession and 0 otherwise. | Economic Cycel Research Institute |
| Common-law (Civil-law) | See Treisman (2000). | |
| Developed (Developing) | See IMF (2010). | |
| Shareholder Rights | Anti-self-dealing index (Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2008)). | |
| Debtholder Rights | Creditor rights index (Djankov, Hart, McLiesh, and Shleifer (2008)). | |

Table 2: **Average values of firm level characteristics by country:** This table provides the mean values of the firm level characteristics used in our empirical analysis. In particular, they are book leverage ratio, market leverage ratio, natural logarithm of net sales (in 2003 USD), market to book ratio, profitability, tangibility, dividend payout, and capital expenditure. Note that dividend payout is a dummy for a firm-year observation at which the firm pays out its dividends. Hence, the mean of such a variable gives the ratio of the number of firm-year observations when firms distribute dividends to the total number of firm-year observations. The last column reports the number of observations in each country. Variable definitions are given in Table 1.

| **Country** | **bl** | **ml** | **sales** | **mtb** | **profit** | **tang** | **capex** | **div** | **N** |
|---|---|---|---|---|---|---|---|---|---|
| Australia | 0.21 | 0.22 | 10.73 | 1.37 | 0.00 | 0.34 | 0.08 | 0.54 | 9096 |
| Austria | 0.26 | 0.34 | 12.35 | 0.91 | 0.10 | 0.33 | 0.07 | 0.72 | 1178 |
| Brazil | 0.27 | 0.43 | 12.09 | 0.79 | 0.13 | 0.40 | 0.06 | 0.63 | 2611 |
| Canada | 0.24 | 0.26 | 11.51 | 1.30 | 0.05 | 0.46 | 0.10 | 0.39 | 11556 |
| France | 0.24 | 0.32 | 12.48 | 1.01 | 0.11 | 0.20 | 0.07 | 0.66 | 10342 |
| Germany | 0.22 | 0.28 | 12.53 | 1.04 | 0.11 | 0.28 | 0.07 | 0.63 | 11425 |
| India | 0.32 | 0.40 | 10.74 | 1.18 | 0.13 | 0.39 | 0.09 | 0.68 | 10512 |
| Italy | 0.27 | 0.37 | 12.83 | 0.88 | 0.10 | 0.25 | 0.05 | 0.66 | 3298 |
| Japan | 0.27 | 0.36 | 12.94 | 0.90 | 0.07 | 0.31 | 0.04 | 0.84 | 45955 |
| Korea | 0.31 | 0.46 | 12.05 | 0.80 | 0.08 | 0.36 | 0.06 | 0.62 | 9497 |
| Mexico | 0.25 | 0.34 | 13.08 | 0.95 | 0.12 | 0.49 | 0.05 | 0.48 | 1453 |
| New Zealand | 0.26 | 0.26 | 11.37 | 1.32 | 0.09 | 0.40 | 0.06 | 0.74 | 1201 |
| Spain | 0.23 | 0.29 | 12.81 | 1.07 | 0.11 | 0.37 | 0.05 | 0.69 | 2012 |
| Sweden | 0.21 | 0.24 | 11.84 | 1.31 | 0.07 | 0.24 | 0.06 | 0.62 | 3909 |
| Switzerland | 0.26 | 0.30 | 12.98 | 1.15 | 0.11 | 0.35 | 0.06 | 0.74 | 2981 |
| Taiwan | 0.24 | 0.29 | 11.49 | 1.11 | 0.09 | 0.34 | 0.05 | 0.58 | 11051 |
| U.K. | 0.19 | 0.21 | 11.64 | 1.29 | 0.08 | 0.32 | 0.07 | 0.72 | 25817 |
| U.S.A. | 0.26 | 0.26 | 12.28 | 1.56 | 0.04 | 0.31 | 0.07 | 0.37 | 74099 |
| **All** | 0.25 | 0.30 | 12.16 | 1.21 | 0.07 | 0.32 | 0.07 | 0.59 | 237993 |

Table 3: **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., coefficients of the lagged dependent variable) and the constant are allowed to vary by the business cycle. 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. |
| lagged lev | 0.753 | 0.763 | | |
| | 0.000 | 0.000 | | |
| lag. lev.(exp) | | | 0.760 | 0.738 |
| | | | 0.000 | 0.000 |
| lag. lev.(rec) | | | 0.920*** | 0.906*** |
| | | | 0.000 | 0.000 |
| sales | 0.000 | -0.002 | 0.003 | 0.001 |
| | 0.917 | 0.113 | 0.001 | 0.179 |
| mtb | -0.004 | -0.014 | -0.003 | -0.019 |
| | 0.038 | 0.000 | 0.127 | 0.000 |
| profit | -0.136 | -0.127 | -0.150 | -0.147 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| tang | 0.042 | 0.052 | 0.037 | 0.047 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| ind. mean | 0.179 | 0.178 | 0.168 | 0.164 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| capex | 0.028 | 0.051 | 0.029 | 0.055 |
| | 0.214 | 0.208 | 0.212 | 0.205 |
| cons | 0.020 | 0.045 | | |
| | 0.104 | 0.000 | | |
| exp-cons | | | -0.010 | 0.024 |
| | | | 0.328 | 0.037 |
| rec-cons | | | -0.047*** | -0.004* |
| | | | 0.000 | 0.737 |
| Firm Years | 191457 | 191457 | 191457 | 191457 |
| Number of Firms | 26110 | 26110 | 26110 | 26110 |

Table 4: **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). 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. |
| lag. lev.(exp) | 0.793 | 0.771 |
| | 0.000 | 0.000 |
| lag. lev.(rec) | 0.928*** | 0.917*** |
| | 0.000 | 0.000 |
| sales (exp) | -0.001 | -0.001 |
| | 0.145 | 0.049 |
| sales (rec) | 0.000 | -0.004** |
| | 0.912 | 0.009 |
| mtb (exp) | -0.001 | -0.015 |
| | 0.297 | 0.000 |
| mtb (rec) | 0.007* | -0.030*** |
| | 0.118 | 0.000 |
| profit (exp) | -0.100 | -0.097 |
| | 0.000 | 0.000 |
| profit (rec) | -0.317*** | -0.280*** |
| | 0.000 | 0.000 |
| tang (exp) | 0.028 | 0.021 |
| | 0.000 | 0.004 |
| tang (rec) | 0.008 | -0.007 |
| | 0.379 | 0.531 |
| ind. mean (exp) | 0.126 | 0.138 |
| | 0.000 | 0.000 |
| ind. mean (rec) | -0.006 | 0.094* |
| | 0.895 | 0.000 |
| capex (exp) | 0.031 | 0.056 |
| | 0.186 | 0.184 |
| capex (rec) | 0.290*** | 0.513*** |
| | 0.000 | 0.000 |
| exp-cons | 0.028 | 0.051 |
| | 0.003 | 0.000 |
| rec-cons | 0.025 | 0.094*** |
| | 0.271 | 0.000 |
| Firm Years | 191457 | 191457 |
| Number of Firms | 26110 | 26110 |

Table 5: **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). 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** |
|---|---|---|---|---|
| lag. lev.(exp) | 0.721 | 0.859 | 0.738 | 0.841 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| lag. lev.(rec) | 0.928*** | 0.936*** | 0.905*** | 0.932*** |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| sales (exp) | 0.006 | 0.000 | 0.007 | -0.002 |
| | 0.000 | 0.982 | 0.000 | 0.054 |
| sales (rec) | 0.012** | 0.001 | 0.009 | 0.007*** |
| | 0.011 | 0.418 | 0.153 | 0.032 |
| mtb (exp) | -0.012 | 0.003 | -0.006 | 0.004 |
| | 0.000 | 0.016 | 0.032 | 0.038 |
| mtb (rec) | -0.001 | 0.009** | 0.020** | 0.001 |
| | 0.945 | 0.011 | 0.053 | 0.881 |
| profit (exp) | -0.131 | -0.054 | -0.125 | -0.107 |
| | 0.000 | 0.004 | 0.000 | 0.000 |
| profit (rec) | -0.435*** | -0.323*** | -0.234*** | -0.346*** |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| tang (exp) | 0.030 | 0.011 | 0.026 | 0.022 |
| | 0.000 | 0.061 | 0.003 | 0.008 |
| tang (rec) | -0.019 | 0.007 | 0.006 | 0.018 |
| | 0.558 | 0.369 | 0.771 | 0.131 |
| ind. mean (exp) | 0.313 | 0.098 | 0.199 | 0.138 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| ind. mean (rec) | 0.261 | -0.044** | 0.153 | -0.040*** |
| | 0.183 | 0.246 | 0.102 | 0.500 |
| capex (exp) | -0.002 | 0.103 | -0.001 | 0.088 |
| | 0.629 | 0.023 | 0.816 | 0.091 |
| capex (rec) | 0.427** | 0.429*** | 0.095 | 0.319*** |
| | 0.000 | 0.000 | 0.394 | 0.000 |
| exp-cons | -0.063 | 0.004 | -0.051 | 0.031 |
| | 0.002 | 0.609 | 0.031 | 0.124 |
| rec-cons | -0.197** | 0.025 | -0.117 | -0.054 |
| | 0.035 | 0.253 | 0.146 | 0.350 |
| Firm Years | 56044 | 98960 | 40300 | 51910 |
| Number of Firms | 10910 | 11044 | 8561 | 4684 |

**Panel B: Market Leverage**

| | **Div25** | **Div75** | **Size25** | **Size75** |
|---|---|---|---|---|
| lag. lev.(exp) | 0.710 | 0.808 | 0.711 | 0.781 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| lag. lev.(rec) | 0.835*** | 0.908*** | 0.905*** | 0.839*** |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| sales (exp) | 0.005 | -0.002 | 0.006 | -0.006 |
| | 0.001 | 0.001 | 0.001 | 0.000 |
| sales (rec) | 0.005 | -0.003 | 0.017* | 0.012*** |
| | 0.394 | 0.129 | 0.028 | 0.012 |
| mtb (exp) | -0.035 | -0.008 | -0.027 | -0.016 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| mtb (rec) | -0.104*** | 0.000 | -0.022 | -0.039*** |
| | 0.000 | 0.957 | 0.052 | 0.000 |
| profit (exp) | -0.091 | -0.146 | -0.091 | -0.178 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| profit (rec) | -0.261*** | -0.569*** | -0.223*** | -0.660*** |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| tang (exp) | 0.026 | 0.004 | 0.028 | 0.010 |
| | 0.003 | 0.589 | 0.002 | 0.248 |
| tang (rec) | -0.036 | -0.005 | 0.014 | 0.025 |
| | 0.389 | 0.673 | 0.539 | 0.173 |
| ind. mean (exp) | 0.241 | 0.081 | 0.158 | 0.090 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| ind. mean (rec) | 0.217 | 0.073 | 0.017 | 0.101 |
| | 0.020 | 0.005 | 0.719 | 0.003 |
| capex (exp) | 0.008 | 0.177 | 0.006 | 0.135 |
| | 0.485 | 0.004 | 0.585 | 0.015 |
| capex (rec) | 0.922*** | 0.657*** | 0.629*** | 0.430*** |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| exp-cons | -0.025 | 0.083 | 0.001 | 0.140 |
| | 0.197 | 0.000 | 0.951 | 0.000 |
| rec-cons | 0.010 | 0.100* | -0.127 | -0.092** |
| | 0.913 | 0.003 | 0.176 | 0.269 |
| Firm Years | 56044 | 98960 | 40300 | 51910 |
| Number of Firms | 10910 | 11044 | 8561 | 4684 |

Table 6: **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). 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** |
|---|---|---|---|---|
| lag. lev.(exp) | 0.741 | 0.873 | 0.785 | 0.797 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| lag. lev.(rec) | 0.884*** | 0.931*** | 0.880*** | 0.942*** |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| sales (exp) | 0.002 | -0.001 | 0.000 | -0.001 |
| | 0.014 | 0.009 | 0.911 | 0.346 |
| sales (rec) | 0.004 | 0.005*** | -0.002 | -0.001 |
| | 0.131 | 0.000 | 0.296 | 0.408 |
| mtb (exp) | -0.009 | 0.003 | -0.004 | -0.001 |
| | 0.000 | 0.082 | 0.045 | 0.400 |
| mtb (rec) | -0.007 | 0.019*** | -0.016 | 0.002 |
| | 0.660 | 0.000 | 0.083 | 0.721 |
| profit (exp) | -0.101 | -0.091 | -0.058 | -0.118 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| profit (rec) | -0.346*** | -0.331*** | -0.215*** | -0.290*** |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| tang (exp) | 0.027 | -0.004 | 0.004 | 0.030 |
| | 0.000 | 0.485 | 0.595 | 0.000 |
| tang (rec) | 0.005 | 0.014* | 0.010 | -0.001 |
| | 0.851 | 0.086 | 0.643 | 0.908 |
| ind. mean (exp) | 0.179 | 0.067 | 0.073 | 0.160 |
| | 0.000 | 0.003 | 0.049 | 0.000 |
| ind. mean (rec) | -0.036 | 0.119 | -0.121 | -0.020 |
| | 0.875 | 0.004 | 0.375 | 0.674 |
| capex (exp) | 0.017 | 0.180 | 0.122 | 0.029 |
| | 0.291 | 0.002 | 0.002 | 0.188 |
| capex (rec) | 0.382*** | 0.301 | 0.271 | 0.286*** |
| | 0.003 | 0.000 | 0.038 | 0.000 |
| exp-cons | 0.010 | 0.031 | 0.022 | 0.023 |
| | 0.411 | 0.004 | 0.127 | 0.038 |
| rec-cons | -0.002 | -0.072*** | 0.094 | 0.054 |
| | 0.986 | 0.001 | 0.111 | 0.068 |
| Firm Years | 109428 | 82029 | 53108 | 138349 |
| Number of Firms | 15794 | 10316 | 7081 | 19029 |

**Panel B: Market Leverage**

| | **Common** | **Civil** | **EqSHDH** | **DiffSHDH** |
|---|---|---|---|---|
| lag. lev.(exp) | 0.738 | 0.831 | 0.762 | 0.772 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| lag. lev.(rec) | 0.678*** | 0.914*** | 0.804* | 0.946*** |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| sales (exp) | -0.005 | -0.002 | 0.001 | -0.003 |
| | 0.000 | 0.035 | 0.557 | 0.000 |
| sales (rec) | 0.009 | 0.002*** | 0.003 | -0.010*** |
| | 0.004 | 0.182 | 0.257 | 0.000 |
| mtb (exp) | -0.036 | -0.008 | -0.028 | -0.018 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| mtb (rec) | -0.144 | -0.002*** | -0.034 | -0.041*** |
| | 0.000 | 0.684 | 0.004 | 0.000 |
| profit (exp) | -0.052 | -0.131 | -0.080 | -0.083 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| profit (rec) | -0.385*** | -0.447*** | -0.361*** | -0.218*** |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| tang (exp) | 0.016 | -0.023 | -0.007 | 0.024 |
| | 0.035 | 0.031 | 0.512 | 0.002 |
| tang (rec) | 0.043 | 0.011** | -0.018 | -0.034*** |
| | 0.311 | 0.330 | 0.434 | 0.006 |
| ind. mean (exp) | 0.105 | 0.095 | 0.068 | 0.152 |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| ind. mean (rec) | 0.379 | 0.106** | 0.355*** | -0.013** |
| | 0.001 | 0.000 | 0.000 | 0.577 |
| capex (exp) | 0.034 | 0.371 | 0.186 | 0.052 |
| | 0.248 | 0.002 | 0.002 | 0.191 |
| capex (rec) | 0.988*** | 0.426*** | 0.592*** | 0.628*** |
| | 0.000 | 0.000 | 0.000 | 0.000 |
| exp-cons | 0.159 | 0.028 | 0.032 | 0.085 |
| | 0.000 | 0.079 | 0.023 | 0.000 |
| rec-cons | -0.010 | -0.009*** | -0.086 | 0.220 |
| | 0.899 | 0.794 | 0.133 | 0.000 |
| Firm Years | 109428 | 82029 | 53108 | 138349 |
| Number of Firms | 15794 | 10316 | 7081 | 19029 |

Figure 1: **Target Leverage Estimates:** 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. The estimates are based on the specifications reported in the previous tables. The graphs also include observed leverage ratios.

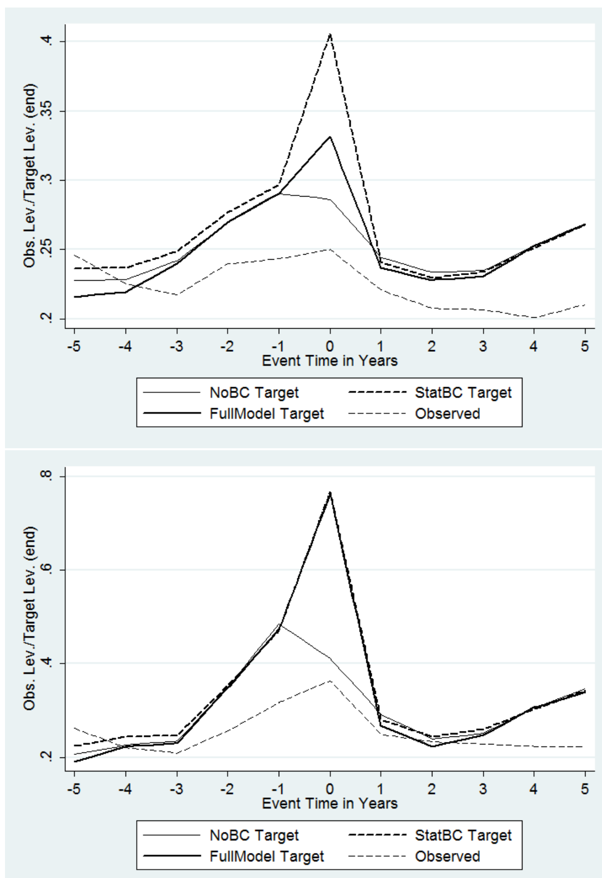

Figure 2: **Target Leverage Estimates: constrained vs. unconstrained (dividend based)** The graphs show the dynamics of target leverage estimates over the business cycle: the top picture looks at book leverage, the bottom one at market leverage.

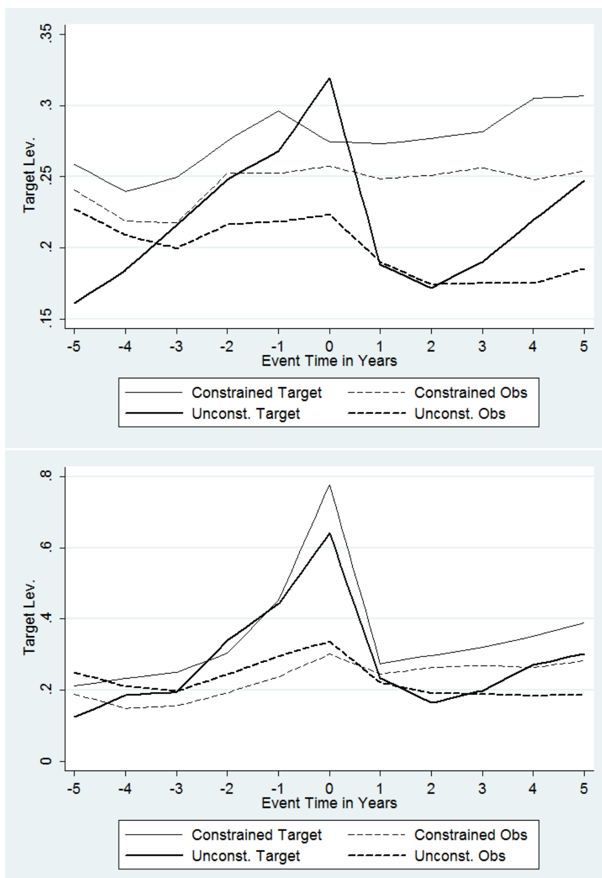

Figure 3: **Target Leverage Estimates: constrained vs. unconstrained (size based)** The graphs show the dynamics of target leverage estimates over the business cycle: the top picture looks at book leverage, the bottom one at market leverage.

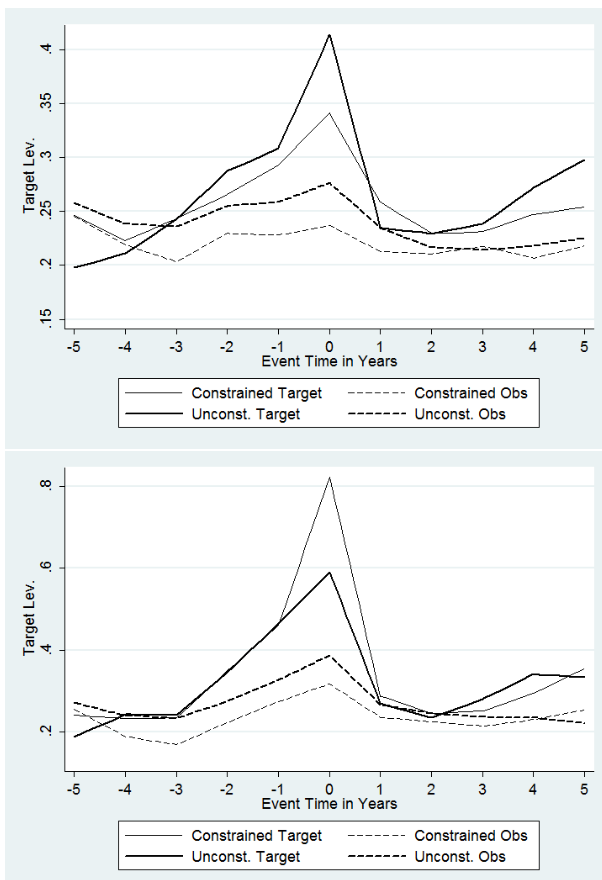

Figure 4: **Target Leverage Estimates: common law vs. civil law** The graphs show the dynamics of target leverage estimates over the business cycle: the top picture looks at book leverage, the bottom one at market leverage.

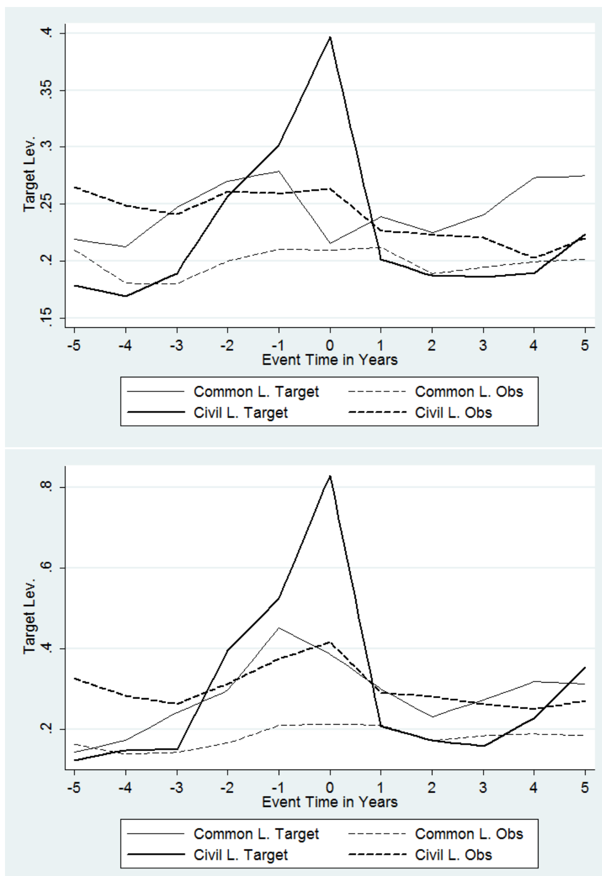

Figure 5: **Target Leverage Estimates: equal DHSH protection vs. different DHSH protection** The graphs show the dynamics of target leverage estimates over the business cycle: the top picture looks at book leverage, the bottom one at market leverage.