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The dynamic adjustment towards target capital structures of firms in transition economies*

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Abstract

We examine the capital structure dynamics of Central and Eastern European firms to get a better understanding of the quantitative and qualitative development of the financial systems in this region. The dynamic model used endogenizes the target leverage as well as the adjustment speed. It is applied to microeconomic data for ten countries. We find that during the transition process, firms generally increased their leverage, lowering the gap between the actual and the target leverage. Profitability and age are the most robust determinants of capital structure targets. Although banking system development has in general enabled firms to get closer to their leverage targets, information asymmetries between firms and banks are still relatively large. As a result, firms prefer internal finance above bank debt and adjust leverage only slowly.

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1. Introduction

With the fall of the Berlin Wall in 1989, Central and Eastern European (CEE) countries began a process of profound economic transition. Whereas socialist institutions disappeared quickly, new capitalist-inspired institutions – such as appropriate legal systems – were introduced only gradually. Financial markets were virtually absent and the banking system was inefficient and almost entirely state owned. This created a hostile environment for new entrepreneurs, in which it was difficult to attract external finance and firms relied mainly on internal funds. At the same time, however, many large and often state-owned firms experienced soft budget constraints as they received too much bank credit – given their poor financial condition – from state-owned banks. Recently, the negative influence of such hostile business environments has received considerable attention, as a rapidly expanding empirical literature has shown that adequate and enforceable laws stimulate financial system development. In turn, financial development can increase the capital stock as well as productivity, thus speeding up economic development.[1] The banking systems in CEE countries have only recently started to perform this role. Whereas stock markets and corporate debt markets are still of negligible size (Reininger *et al.*, 2002), the local banking systems have gone through a remarkable transformation process, consisting of the breaking up of the socialist monobanks, creating free-standing statebanks, and finally privatizing these to (foreign) strategic investors. New banks were allowed as well. Transition countries have shown considerable divergence as regards their approaches and swiftness in creating market-oriented banking systems. As a result, cross-country differences remain as to how, and to what extent, banks fulfil the real economy's quantitative and qualitative financing needs.

In this paper, we ask to what extent the banking systems in Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia have assisted firms to reach their capital structure targets.[2] First, we ask to what extent firms' capital structure targets in different transition economies are driven by similar determinants. Are capital structure models 'portable' across countries? Second, we wish to know whether the gaps between actual and target capital ratios narrowed during the transition process. To the extent that firms have been able to close (part of) their capital structure gaps, we take this as evidence of qualitative financial development. Third, we focus on the speed of

[1] See La Porta *et al.* (1998), Levine (1999) and De Haas (2004) on the nexus between law, finance and economic growth and Almeida and Wolfenzon (2005) on the positive effect of external finance on the efficiency of capital allocation.

[2] Target capital structures are sometimes referred to as 'optimal capital structures'. We prefer the former term as it captures more accurately the idea that the 'optimum' in our model is actually a moving target rather than a 'fixed' one and because it emphasizes the fact that the target structure is the capital structure a firm is trying to reach.

adjustment to the target structures. The paper contributes to the literature on corporate finance in transition economies in three ways.[3] First, we use an extensive firm-level panel dataset for non-government-owned firms in ten countries during the 1990s. Second, we estimate a dynamic model that explicitly takes into account the fact that the actual and target capital structures of firms may differ. Third, we use a comprehensive set of variables which theory suggests determine firms' target capital structures.

The paper is structured as follows. Section 2 sets out the dynamic adjustment model of firms' capital structure. Section 3 then describes the variables that may affect the target capital structure and the adjustment speed, after which Section 4 explains the empirical results. Section 5 summarizes the argument and conclusions. Detailed information on the data is provided in the appendix.

2. Modelling capital structure dynamics

2.1 Theories of capital structure choice

The corporate finance literature offers two schools of thought explaining firms' capital structure choice. The first, trade-off theory, consists of several theorems that describe the forces underlying the trade-off between the advantageous and disadvantageous effects of debt financing on firm value. On the one hand, increasing leverage by taking on more debt means that the firm can profit more from debt tax shields, which will increase its value (Modigliani and Miller's (1963) Proposition I under corporate taxes). On the other hand, higher leverage leads to higher (expected) direct and indirect costs of financial distress, decreasing the firm's value. Direct costs include the legal and administrative costs of liquidation or reorganization. Indirect costs refer to the impaired ability to conduct business and to agency costs of debt that are specifically related to periods of high bankruptcy risk (such as the incentive for stockholders to select risky projects) (Ross *et al.*, 2002).[4]

The second line of reasoning with regard to firms' capital structure choice is the pecking order hypothesis. It argues that, due to asymmetric information between managers and investors, firms prefer internal financing to debt financing and debt financing to issuing shares (Donaldson, 1961; Myers, 1984). In its pure form, the pecking order hypothesis does not mention a target leverage as such.

[3] We know of three papers that estimate a firm-level capital structure model for transition economies. Klapper *et al.* (2002) focus on a broad set of transition countries, but use only data for 1999 in their static model. Cornelli *et al.* (1996) only look at Hungary and Poland and use a static model for 1992. Nivorozhkin (2004) uses a dynamic model, but only for five countries during 1997–2001. In addition, Booth *et al.* (2001), using a static model, study the capital structure choice of firms in ten non-transition developing countries.
[4] At the same time, a debt increase *lowers* the agency costs associated with equity financing, such as shirking.

Instead, current leverage mainly reflects firms' historical profitability and the need for additional investment funds at some point in time.

Trade-off behaviour and pecking order considerations need not be mutually exclusive. Interview studies for the Netherlands show for instance that, while most firms have a target capital ratio, they follow the pecking order to reach this target (De Haan *et al*., 1994). De Haan and Hinloopen (2003) find that both theories are of empirical importance when explaining the financing choices of Dutch firms more broadly. Additional empirical studies show that, although trade-off considerations may be important in the longer term, pecking order behaviour may matter or even dominate in the short term (Hovakimian *et al*., 2001; Kayhan and Titman, 2004; Mayer and Sussman, 2004; Remolona, 1990). Firms that judge their leverage as too low may nevertheless decide not to adjust debt levels immediately, but to only incrementally increase leverage if and when internal funds are insufficient to finance investments. Similarly, overleveraged firms may bring down debt and/or increase equity only gradually through increasing retained earnings (changing dividend policy), rather than through immediate financial restructuring. Influenced by these and other empirical results, Titman and Tsyplakov (2004) developed a dynamic model in which firm value is endogenously determined by investment and financing choices. They show that whereas pecking order behaviour influences capital structure development, firms also move towards a *moving* target leverage, which is determined by trade-off considerations.

In light of the above, this section presents a dynamic capital structure model mainly along the lines of Banerjee, Heshmati and Wihlborg (2000) (BHW).[5] Trade-off theory provides the underlying framework of this model, as we assume that a firm dynamically adjusts its capital structure to a specific, but moving target. Thus, the actual capital structure of a firm at a particular time does not necessarily equal its target capital structure.[6] This target is not observed, but is specified and estimated. Moreover, by relating the adjustment parameter to firm- and time-specific variables, we allow individual firms to control the speed of adjustment in attaining their target capital structure. Sub-section 3.2 briefly returns to the relationship between trade-off and pecking order considerations in our model.

[5] See Heshmati (2002), Kumbhakar *et al.* (2002), and Lööf (2003) for empirical applications of this model to the UK, United States, and Sweden, respectively. Other recent contributions that take a dynamic approach to modelling capital structures include Frank and Goyal (2000), Roberts (2002) and Titman and Tsyplakov (2004).

[6] Capital structure theory generally aims to explain target capital structures, not observed capital structures. Empirical studies usually assume that target capital structures can be reasonably proxied by observed capital structures, which may not be the case if adjustment costs are important. For empirical evidence on such adjustment costs the reader is referred to Fischer *et al.* (1989), Ju *et al.* (2003) and Mauer and Triantis (1994).

2.2 The target capital structure

One of the first papers to model and estimate a financial ratio adjustment process was Lev (1969). He assumes that firms' target capital structure equals the (past) industry-wide average capital structure. In a transition context, Konings and Vandenbussche (2004) use this model to study the behaviour of financial ratios in Bulgaria. The authors find, however, that although firms adjust towards target financial ratios, these targets differ from the industry means. They therefore conclude that '*in a transition country, past industry means are not considered as the best target to adjust to*' (p. 5). We therefore let the target leverage depend on firm-specific variables. This target leverage ratio for each firm is not observed, but is assumed to be a function F of several (observable) determinants, that is:

$$L^*_{it} = F(Y_{it}, Y_i, Y_t) \tag{1}$$

where L^*_{it} is the target leverage ratio for firm i at time t, Y_{it} is a vector of firm- and time-specific determinants, and Y_i and Y_t are firm- and time-specific determinants, respectively. For each firm the target leverage may thus change over time, reflecting changes in its determinants.

2.3 The adjustment process towards the target capital structure

In the optimum, the leverage of a firm equals its target leverage. In practice, however, a firm may choose not to adjust its leverage immediately to the target. This will be the case when adjustment costs are high or when the financial system is simply not able to cater to the financing needs of firms. Actual leverage may then be adjusted only partially to the target leverage:

$$L_{it} - L_{it-1} = \delta_{it}(L^*_{it-1} - L_{it-1}) \tag{2a}$$

or

$$L_{it} = (1 - \delta_{it})L_{it-1} + \delta_{it}L^*_{it-1} \tag{2b}$$

where δ_{it} is the adjustment parameter representing the magnitude of adjustment during one period (also termed the adjustment speed). If $\delta_{it} = 1$, full adjustment is achieved within one period and actual leverage at the end of the period will equal the target as set at the beginning of that period.[7] The adjustment parameter provides a proxy for the adjustment costs that the firm faces. Note that, in this

[7] The pecking order hypothesis predicts δ_{it} to be zero, whereas according to the trade-off model the speed of adjustment should lie between zero and one (Fama and French, 2002).

model, the adjustment during the current period is made on the basis of L^*_{it-1} rather than L^*_{it} as is the case in the original BHW model.[8] We adapt the BHW model for two reasons. First, we think this specification better captures actual firm behaviour. Because balance sheet and P&L data are used, the t subscripts refer to end-of-year values. As an example, assume that t equals 31 December 2003, so that $t - 1$ refers to 31 December 2002. According to (2a) the change in leverage during 2003 will then be a certain percentage (δ_{it}) of the difference between the target leverage as calculated at the beginning of 2003 and the actual leverage at that same moment. Also note that, according to (1), the target at the beginning of the year is calculated on the basis of the information that is available at that moment. Specifying L^*_{it} rather than L^*_{it-1} would imply that the adjustment process during 2003 would be based on information that would effectively only become available at the end of 2003 when closing the books. It is, therefore, assumed that the adjustment during the year is made on the basis of beginning-of-year firm characteristics and that targets are not being revised during the year.[9] Second, from an econometric perspective, our specification reduces the potential for simultaneity bias since all determinants are included with a one-year lag in the estimations.

2.4 The speed of adjustment and the general functional relationships

The speed of adjustment δ_{it} is specified as a function G of underlying variables affecting adjustment costs, that is:

$$\delta_{it} = G(Z_{it}, Z_i, Z_t) \tag{3}$$

where Z_{it} is a vector of time- and firm-specific explanatory variables, and Z_i and Z_t are firm-specific and time-specific effects, respectively. The most important element of Z_{it} is the distance variable that is measured as the distance between the target leverage and the actual leverage at the beginning of the year, that is, $L^*_{it-1} - L_{it-1}$. This variable allows the estimation of the (potentially asymmetric) influence the deviation between the desired and the actual leverage has on the speed of adjustment (cf. Section 3.3). Equations (1) and (3) are specified linearly as:

$$L^*_{it} = \alpha_0 + \sum_{j=1}^{k} \alpha_j Y_{j,it} + \sum_{j=k+1}^{l} \alpha_j Y_{j,i} + \sum_{j=l+1}^{m} \alpha_j Y_{j,t} \tag{4}$$

[8] Here we follow Flannery and Rangan (2005). Regressions were also estimated using the BHW-specification, which yielded qualitatively similar results. See Section 4.1 for more details.

[9] We think this assumption to be more realistic and consistent than the one in BHW because in their model it is implicitly assumed that firms can perfectly forecast the determinants of the target capital structure within a 1-year timescale, although they cannot forecast at all beyond this horizon.

$$\delta_{it} = \beta_0 + \sum_{j=1}^{p} \beta_j Z_{j,it} + \sum_{j=p+1}^{q} \beta_j Z_{j,i} + \sum_{j=q+1}^{r} \beta_j Z_{j,t} \tag{5}$$

where α and β are parameters to be estimated.

2.5 The estimation strategy

The model to be estimated is (2b):

$$L_{it} = (1 - \delta_{it})L_{it-1} + \delta_{it}L^*_{it-1} + \varepsilon_{it} \tag{6}$$

where L^*_{it} and δ_{it} are unobserved and specified according to (4) and (5) and ε_{it} is an error term. The result is a non-linear equation in the parameters as well as in the variables:

$$L_{it} = \left[1 - \left(\beta_0 + \sum_{j=1}^{p} \beta_j Z_{j,it} + \sum_{j=p+1}^{q} \beta_j Z_{j,i} + \sum_{j=q+1}^{r} \beta_j Z_{j,t}\right)\right] L_{it-1} +$$

$$\left(\beta_0 + \sum_{j=1}^{p} \beta_j Z_{j,it} + \sum_{j=p+1}^{q} \beta_j Z_{j,i} + \sum_{j=q+1}^{r} \beta_j Z_{j,t}\right)\left(\alpha_0 + \sum_{j=1}^{k} \alpha_j Y_{j,it-1} + \sum_{j=k+1}^{l} \alpha_j Y_{j,i} + \sum_{j=l+1}^{m} \alpha_j Y_{j,t-1}\right) + \varepsilon_{it} \tag{7}$$

which is estimated by non-linear ordinary least squares. The most complicating factor in the estimation process is the inclusion of the distance variable mentioned in Section 2.4. The inclusion of this variable makes the adjustment speed as specified in (5) dependent on the target leverage as specified in (4). As a result, there is an internal iterative process where initial parameters are employed as starting values and that stops iterating when the additional reduction in the sum of squared errors and the change in the parameters are sufficiently small.

Estimation is carried out for each country as well as for the total sample and consists of four consecutive steps. First, we estimate a static model (4) in which the dependent variable is the actual rather than the target leverage. Second, we estimate the dynamic equation (2b) – using the estimated parameters from the first step as starting values – but keep the adjustment speed fixed across firms and over time. Third, we estimate (2b) again, but this time we keep L^*_{it} fixed (at the estimated values of step two) and specify the adjustment speed equation as in (5). And fourth, we estimate the complete dynamic model with the target leverage as specified in (4) and the adjustment speed as specified in (5). As starting values, we use the estimated parameters in the second and third steps.

In this complete dynamic model both L_{it}^{*} and the adjustment speed are thus flexible.[10]

Because the high level of macroeconomic instability during the beginning of the 1990s may distort the estimation results, the years 1993–95 are excluded when running the regressions. The coefficients obtained for the sample period 1996–2001 are then combined with the data for the years 1993–95 so that target leverages and adjustment speeds are calculated for the entire 1993–2001 period. We compare the observed capital structures with the target capital structures as calculated on the basis of the estimated parameters. We are particularly interested in finding out whether the gap between them has narrowed during the transition process. If firms have been able to close part of their capital structure gaps, we take this as indirect proof of qualitative financial development.

When estimating the complete dynamic model, we apply a general-to-specific (GTS) approach starting with a relatively broad set of explanatory variables and subsequently eliminating, one at a time, the variable with the least significant coefficient, stopping at the 10 percent level of significance. The intercepts are kept in the specifications independent of the significance of their coefficients.[11] We thus do not impose one particular set of variables on all countries, but allow the determinants of capital structure to differ. (In addition, the same procedure is applied to the whole dataset, in other words, all ten countries, in order to create a benchmark regression.)[12] There are two main reasons why GTS is used here. First, from an econometric point of view, there is a need to limit the number of variables that enter the final specification because of the many non-linearities that would otherwise unduly complicate the estimation process (see Roberts, 2002, p. 6). Second, and more importantly, we think the GTS approach is appropriate from a methodological point of view. As will be shown in Section 3.2, the theoretical corporate finance literature has identified a broad set of potential determinants of target

[10] As we use predicted values from the second and third steps as regressors in the final model 'generated regressor bias' (Pagan, 1984) could have posed a problem. However, rather than using a 2SLS approach, we use the initial predictions only as starting values in a non-linear, iterative estimation procedure. As Oxley and McAleer (1993) point out, such a strategy – although computationally more cumbersome to implement – leads to consistent standard error estimates.

[11] In the initial set of potential determinants, sector dummies are also included. These were created by allocating each firm, based on its ISIC code, to one of ten sector groups. Inclusion of sector dummies is important as they capture any sector-specific but time-invariant determinants of capital structure (fixed effects) that are not detected by the firm-specific variables. Note that firm-specific dummies are not included, nor are firm-level fixed effects estimated. As De Haan and Hinloopen (2003, p. 680) explain, firm dummies would capture firm-specific information that for our purposes should be fully included in the residual (since target leverage is defined as the predicted value in a regression explaining actual leverage). This could lead to a situation in which a move towards a firm's target could wrongly be interpreted as a move from its target.

[12] There exists a long-standing debate in the econometrics literature on the advantages and disadvantages of the GTS approach. For a review of the disadvantages see http://www.stata.com/support/faqs/stat/stepwise.html, and for counterarguments http://www.pcgive.com/pcgets/gtscrits.html.

capital structures. At this juncture, there is not a single specific theoretical model that commands *a priori* which variables should be included in the empirical model. This leaves the empirical researcher with the task of disentangling which variables matter in practice and which do not.[13]

3. The capital structure measure and the explanatory variables

3.1 The capital structure measure

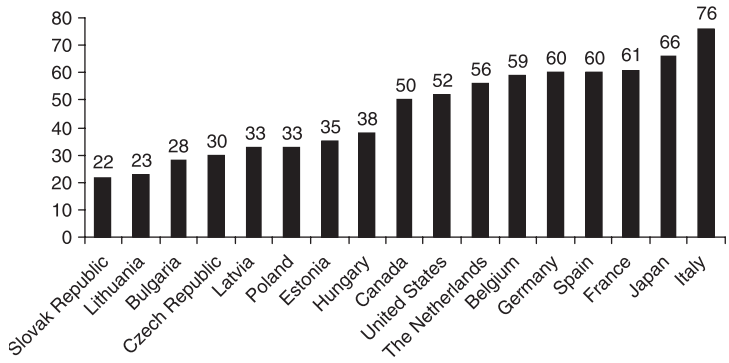
We take firm-level data (1993–2001) from Bureau van Dijk's AMADEUS 'Top 200,000' database. Annual balance sheet data and profit and loss account details are included for firms that have either more than 100 employees, more than €10 million operating revenue or more than €20 million total assets in one of the years available. Our dataset thus comprises only the larger firms in each country. The database is intended to cover only privately owned, not state-owned, firms (Klapper *et al.*, 2002). Bureau van Dijk guarantees that 95 percent of all companies in each country complying with one of these criteria is included. The appendix provides a detailed description of the data, including summary statistics and selection criteria.

Our dependent variable is the leverage ratio, expressed in percentages, defined as 100 * debt / (debt + equity). For both debt and equity, 'backward-looking' book values are used rather than 'forward-looking' market values, as only the former are included in the AMADEUS database.[14] Note that the assumption that the value of firms' debt and equity would be determined by forward-looking capital markets, would be inconsistent with the theoretical model in which firm management itself is backward-looking. From a more practical point of view, it should be noted that market values of traded equity often turn out to be excessively volatile, leading to severe measurement problems. Calculating market values of debt, which is in most cases non-traded, may be even more challenging. Finally, and reassuringly, comparable studies for non-transition countries, like BHW (2000), Hovakimian *et al.* (2001) and Roberts (2002), find that the choice between book and market value does

[13] Booth *et al.* (2001) and Beck *et al.* (2005a) test which firm characteristics influence their financing structure in practice. In line with our results, they find that only a very limited set of variables is able to explain the financing choices of firms consistently across countries.

[14] Differences in leverage ratios between countries may partly reflect disparities between national accounting standards. However, listed companies in all of the countries in the sample were required to adopt International Financial Reporting Standards (IFRS) upon accession to the European Union, which has led to a convergence process with regard to accounting frameworks. Also note that Bureau van Dijk formats all companies uniformly to allow cross-country analysis. According to Jelic *et al.* (1999) differences between CEE and OECD accounting standards do exist, but the amounts involved are minimal and do not have a significant effect when making cross-country comparisons of firm leverage using AMADEUS.

Figure 1. Debt to total value non-financial firms in percent (all book value)



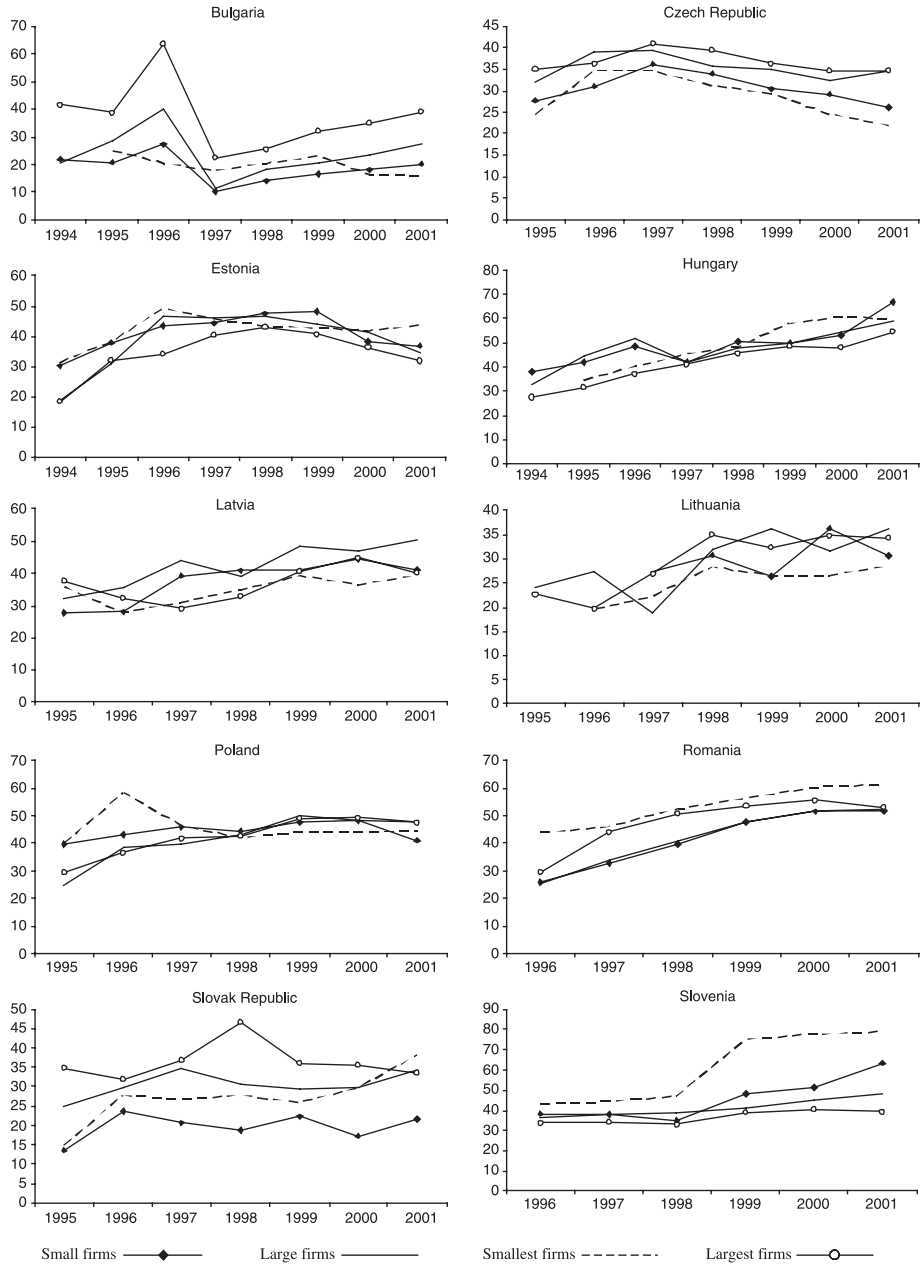
***Definition*:** Debt is short-term debt plus long-term debt. Total value is debt plus equity.
***Sources*:** Market economies: OECD financial statistics for 1994 (as more recent comparable OECD statistics are not available). Transition economies: authors' own calculations based on AMADEUS dataset (1995). For Romania and Slovenia insufficient 1995 data were available.

not influence results significantly. Bowman (1980) shows that the correlation between the book and market values of debt is very large.

Figure 1 shows that while in market economies book value capital ratios generally lie between 50 and 80 percent, capital ratios in transition economies ranged between only 20 and 40 percent in 1995. Figure 2 summarizes the development of firm leverage for the sample of CEE countries since 1995. For each country, the sample was split into four size categories, each thus representing 25 percent of the observations, and the median firm leverage in each category was subsequently calculated. CEE firms' leverage ratios turn out to be mostly considerably below Western standards and ranged between 26 percent in Bulgaria and 60 percent in Hungary in 2001. In that year, Estonia, Bulgaria, the Czech Republic, Latvia, Lithuania, the Slovak Republic and Poland had median leverage ratios below 50 percent. In most CEE countries an upward trend in the leverage ratio is observed during the transition process. The gradual development of the financial system has enabled firms, of all size categories, to reach higher debt levels in Bulgaria, Hungary, Latvia, Lithuania, Poland, Romania and Slovenia.[15] However, in the Czech Republic and Estonia there is a significant downward trend (at a 5 percent significance level from the correlation statistics), whereas no correlation is found in the Slovak Republic. In Estonia, leverage started to decline after the 1998 Russian crisis, which led to a crisis in the Estonian banking system and, ultimately, to the

[15] In these countries there is a positive and significant (5 percent level) bivariate correlation between a time trend and our leverage measure.

Figure 2. Development of actual leverage ratios of CEB firms (in percent)



***Source*:** AMADEUS dataset, author's own calculations.

takeover of the largest Estonian banks by Swedish and Finnish banking groups. Similarly, the 1997 Czech currency crisis and the ensuing credit crunch, aggravated by stricter loan classification and provisioning rules as well as a restrictive monetary policy, led to reduced firm leverage. Also in Bulgaria, a sharp reduction in firms' leverage ratios is observed immediately after the 1996–97 banking and currency crises, probably reflecting the sudden reduction in the supply of bank credit.[16] Whereas Bulgarian firms have gradually recovered from the significant drop in leverage ratios, Czech firms have not been able to reverse the trend of declining leverage. Only in 2001 did the largest firms in the sample slowly start to leverage up again.

With regard to the relationship between size and leverage, it is found that in Estonia, Hungary and Latvia, large firms are, on average, significantly less leveraged (5 percent level). Interestingly, only in Bulgaria and Romania is there a significant positive bivariate relationship between size and leverage (5 percent level).[17] This is in line with earlier empirical results showing that, especially in these countries, the problem of soft budget constraints for large state-owned companies has been persistent.[18] In all other countries, no significant bivariate relationship is found between size and actual leverage.

3.2 The determinants of the target capital structure

In this section, a set of variables is listed which theory suggests should be included in our analysis.[19] We briefly describe the relationship we expect with firms' target capital structures and explain how we operationalize the particular variable. We also discuss whether the idiosyncrasies of the transition process warrant different priors compared to those based on mainstream finance theory. Table 1 summarizes these theoretical priors. Under the pecking order theory, firms basically choose the cheapest form of finance, given the information asymmetries vis-à-vis external financiers, whenever additional funds are needed. However, firms that target a certain capital structure also take into account the costs of different funding sources. In other words, the relevance of information asymmetry costs is not confined to firms that exhibit pure pecking order behaviour, but is applicable more broadly.

[16] Except for the smallest firms in the sample.

[17] Note that notwithstanding the positive bivariate relationship between size and leverage in Romania, it is actually the size category containing the smallest 25 percent of firms that has the highest median leverage, yet closely followed by the largest 25 percent of firms. Klapper *et al.* (2002) find a negative relationship between size and actual leverage for *all* countries they study, including Bulgaria and Romania. However, the authors only use 1999 data, whereas we use data for the 1993–2001 period.

[18] Budina *et al.* (2000), Everaert and Hildebrandt (2003), Konings *et al.* (2003) and Konings and Vandenbussche (2004).

[19] See also Harris and Raviv (1991).

The difference is that, in a 'trade-off world', information asymmetry costs are one of many factors that influence firms' capital structure decisions, whereas in a 'pecking order world' these costs are basically the only determinant.[20]

3.2.1 Size

Large firms tend to be more diversified and, therefore, have a lower risk of bankruptcy costs. Also, for large firms, fixed direct bankruptcy costs constitute a smaller portion of firm value, leading to relatively lower costs of leverage (Titman and Wessels, 1988). For both of these reasons large firms will demand more debt. In a transition context, firm size may also be an indicator of a firm's bargaining power vis-à-vis the government, increasing the likelihood of being bailed out by the government and thus lowering expected costs of bankruptcy.

To the extent that large firms are more transparent to investors, problems of information asymmetry will be less severe. Large firms will then – *ceteris paribus* – have a higher preference for external financing, either through bank debt or through issuing bonds or equity. In case of bank debt or bond financing, the relationship between size and leverage will be positive. In case of equity financing, it will be negative. Given the underdeveloped CEE countries' stock and corporate bond markets, this would imply that large, transparent firms are able to obtain more bank credit, whereas small firms are 'forced' to rely on internal financing.[21] The relationship between size and target leverage will then be positive. Size is measured as the log of total assets.

3.2.2 Growth opportunities

Agency costs of debt are greater in fast-growing firms, as shareholders have more flexibility to choose investments and thus to expropriate wealth from banks and bondholders (Titman and Wessels, 1988). This implies a negative relationship between growth opportunities and leverage. However, given profitability, firms with (high) growth opportunities that cannot be fully financed by retained earnings will try to increase their leverage. This mechanism will lead to a positive relationship between growth opportunities and target leverage.[22] Growth

[20] Leary and Roberts (2004) show that, although information asymmetry is an important determinant of capital structure, it does not need to generate a pecking order of financing decisions. Leary and Roberts (2005) find that information asymmetry costs are an important determinant in the financing decision of firms that follow a dynamic rebalancing strategy.

[21] However, large and transparent firms may raise equity finance on foreign stock markets, for example, through depository receipts, thus weakening the positive link between size and leverage even when local stock markets are relatively small. According to the Corporation of London (2003), somewhat more than 35 percent of all listings in the CEE new EU member states are cross-listed, mostly in London and New York.

[22] Here it is assumed that, especially in a transition context, fast-growing firms will not be able to use (private) equity. However, also for a broad set of developed countries, Rajan and Zingales (1995) find a positive relationship between firm growth and (actual) leverage.

opportunities are proxied by the percentage change in total assets from the previous to the current year.

3.2.3 Tangibility of assets

The tangibility of a firm's assets may affect its target capital structure in two antithetical ways, depending on the exact type of tangible assets. Some tangible fixed assets are, to a large extent, firm-specific (such as special machines and transport vehicles). Investments in such specific assets are 'sunk' and have a low liquidation value (Worthington, 1995). Firms generally prefer to finance them internally and/or through long-term debt. Pure internal financing would lead to a negative relationship between asset tangibility and target leverage. In the case of (partial) financing with long-term debt, this negative relationship may be weakened or even turn into a positive one. However, since long-term credit is still rather scarce in CEE countries, firms with many firm-specific tangible assets are expected to finance these mainly internally.[23] This will result in a negative relationship between tangibility and target leverage.[24]

In contrast, other types of tangible fixed assets are less specific (general buildings, cars) and, therefore, easily pledgeable. This category of tangible assets is also easier to liquidate in case of bankruptcy, reducing the costs of financial distress (Jensen and Meckling, 1976). Owing to both reasons, one would expect a positive relationship with firms' target leverage. However, to the extent that legal deficiencies make such general fixed assets less valuable as collateral in transition economies, this positive relationship may be less strong. Tangibility is measured as the ratio between tangible fixed assets and total fixed assets.

3.2.4 Profitability

A more profitable (pre-tax) firm will demand more debt to serve as a tax shield. Moreover, external shareholders may force management to leverage up in order to reduce the free cash flow from which managers may appropriate perquisites (Jensen, 1986).[25] This results in a positive relationship between profitability and target leverage. However, this story may be incomplete if there exist large information asymmetries between firms and banks. Banks, having difficulties with distinguishing good firms from bad, may then increase their interest rates. Profitable firms with internal sources of finance will prefer to use these and demand less credit, since the external finance premium is relatively high. Less profitable firms

[23] Booth *et al.* (2001) and Demirgüç-Kunt and Maksimovic (1999) show that firms in developing countries generally have substantially lower amounts of long-term debt than in developed countries.

[24] Booth *et al.* (2001) find evidence of such a negative relationship between tangibility and leverage for a sample of firms in developing countries and Jelic *et al.* (1999) find similar evidence for Czech and Hungarian companies.

[25] To the extent that external ownership of shares is limited, as is the case in most CEE countries, this mechanism will be less important.

will use more bank debt, since they lack internal alternatives. This leads to a negative relationship between profitability and target leverage. Profitability is measured as pre-tax operating profit (or loss) to total assets.[26]

3.2.5 Non-debt tax shield

Higher non-debt tax shields, such as depreciation, make the (tax shield) advantage of debt financing partly redundant. Hence, a negative association between non-debt tax shields and target leverage is expected (DeAngelo and Masulis, 1980). Non-debt tax shields are proxied as the ratio between depreciation and total assets.

3.2.6 Income variability

Higher income variability increases the risk that a firm may not be able to cover its interest payments, leading to higher expected costs of financial distress. This implies a negative relationship between income variability and target leverage. At the same time, higher income volatility will make Myers's (1977) underinvestment problem less severe, lowering the related agency costs of debt. If this latter effect dominates, there will be a positive relationship between income volatility and leverage (Cools, 1993, p. 223). Income variability is measured as the standard deviation of each firm's turnover over the sample period and is thus time-invariant.

3.2.7 Trade credit

Since creditors are excluded from our leverage measure, trade credit can be included as an explanatory variable. Trade credit may be an important alternative financing source for firms that are confronted with a prohibitive external financing premium in case of the usual sources of external finance. To the extent that trade credit substitutes for 'normal' debt, it is expected that a negative relationship will be found between the trade credit variable and target leverage. Trade credit is measured as the ratio between total credit by creditors and total assets (the latter decreased by total credit by creditors).

3.2.8 Age

It is expected that older firms will, all else being equal, have a higher target leverage ratio. Older firms have a longer track record and have had more time to build up relationships with suppliers of finance (Gertler, 1988). Because of the resulting smaller information asymmetries and their larger reputational value, older firms

[26] One could argue that profitability ('operating profit to total assets') and growth opportunities ('change in total assets') may be highly correlated. However, profit is measured pre-tax and pre-dividend. A profitable firm without any positive net present value projects in which to invest, may pay out all profit as dividends without adding any retained earnings to its balance sheet. Our profitability measure thus proxies for the 'cash flow generating' ability of the firm, whereas actual firm growth captures whether the firm can find new profitable investment and expansion opportunities *holding constant the level of profitability*. The correlation between total asset growth and profitability is low and ranges between –2 percent and 23 percent.

Table 1. Firm-specific variables and expected relationship with target leverage ratio

Variable	Proxy	Expected sign	Expected sign in transition economy
Size	ln total assets	±	+
Growth opportunities	% change total assets	±	±
Tangibility	tangible fixed assets/total fixed assets	±	–
Profitability	pre-tax operating profit to total assets	±	±
Non-debt tax shield	depreciation/total assets	–	–
Income variability	standard deviation turnover	±	±
Trade credit	creditors/(total assets – creditors)	–	–
Age	years since incorporation	+	+
Firm-specific interest rate	100 * interest paid/ (long-term debt + loans)	–	–
Legal form	public versus other firms	–	–

Note: –/+/± indicates a negative/positive/undecided expected correlation with the target leverage ratio.

face a lower external financing premium on debt. Age is measured as the number of years since incorporation.

3.2.9 Firm-specific interest rate

Firms that have to pay relatively high interest rates will, all else being equal, demand fewer loans than the average firm. This interest rate variable thus is intended to proxy for the external finance premium firms are facing.[27] The interest rate is calculated here as [100 * total interest paid/(long-term debt plus loans)].[28]

3.2.10 Legal form

We control for legal form by using a dummy variable, which is one for public firms and zero for all other firms (private companies, partnerships, sole proprietorships, co-operatives).[29] Public (private) firms' capital is divided into shares that can

[27] Here it is assumed that the interest rate charged to firms mainly reflects risk and return characteristics related to the asset side of their balance sheet. To the extent that interest rates would to a large extent reflect the current financial structure of firms – that is, the liability side of their balance sheet – this would imply that firm-specific interest rates and firms' leverage are determined simultaneously. We would like to thank an anonymous referee for pointing this out to us.

[28] In AMADEUS, 'long-term debt' and 'loans' are mutually exclusive liability categories.

[29] AMADEUS does not cover state-owned firms.

(cannot) be offered to the general public and the minimum share capital is higher for public than for private firms. As reporting and disclosure requirements are more extensive for public companies, these will generally be more transparent to outside investors. To the extent that this enables public firms to issue additional shares more easily, the relationship between the legal dummy and target leverage is expected to be negative.

3.3 The determinants of the adjustment speed

As potential determinants of the firm-specific adjustment speed, we consider the distance from the target, income variability, and macroeconomic and other country-specific variables. The choice for this particular subset of potential determinants is based on the separate, static regressions explaining adjustment speed that were performed prior to estimating the complete dynamic model.

3.3.1 Distance from target

Distance from target is measured as the distance between the target leverage and the actual leverage at the beginning of the year. We explicitly allow for asymmetries in the adjustment process by creating two separate distance variables: one for firms with a positive distance ($L^*_{it-1} > L_{it-1}$), which are thus underleveraged, and one for firms with a negative or no distance ($L^*_{it-1} \leq L_{it-1}$), which are thus overleveraged or exactly on target.[30] On the one hand, overleveraged firms may be expected to reach their targets faster if they can easily pay off debt, whereas underleveraged firms have more trouble in raising additional debt. On the other hand, it may be the case that it is easier for underleveraged firms to assume additional debt, whereas overleveraged firms may actually have difficulties in reducing their debt burden because of liquidity constraints. For both distance variables, a positive association with the adjustment speed will exist if firms that are further away from their target adjust faster than firms that are close to their target.[31] Firms then only adjust – for example, through some form of financial restructuring – when they have reached a substantial deviation from their target capital structure. Firms that are near their target do not close the remaining gap because the costs of incremental adjustments are prohibitive. On the contrary, a negative correlation would indicate that firms that are close to their target adjust quickly to reach this nearby target. Firms that

[30] Both variables are expressed in absolute terms. The initial distance variables, which are used as independent variables in the dynamic model, are the (absolute) residuals generated by the first (static) step of the estimation strategy (cf. Section 2.5).

[31] This specification assumes that the adjustment speed is linearly dependent on the distance from the target. Alternative specifications could introduce threshold effects or convex adjustment costs, which is left for further research. Note, however, that in our (non-linear) final specification the distance variable in effect already enters the leverage equation in a quadratic form. This can be demonstrated by rewriting (2a) as $L_{it} = L_{it-1} + \delta_{it}(L^*_{it-1} - L_{it-1})$. Since δ_{it} is dependent on distance itself, a quadratic distance term enters the leverage equation.

are far away from their target then adjust only incrementally. A positive coefficient thus indicates a situation in which gradual adjustment costs are high relative to one-off financial restructuring costs, whereas a negative coefficient indicates a situation in which gradual adjustment costs are relatively low when compared to those of one-off financial restructuring operations.

3.3.2 Income variability

Income variability – measured as the standard deviation of turnover – signals uncertainty about a firm's future incoming cash flows. Especially for firms with high-income uncertainty, it will be important to stay close to their leverage target. A positive relationship is thus expected.

3.3.3 Macroeconomic and other country-specific variables

The effect of time-varying macrofactors is captured as follows. First, GDP growth is included to determine whether adjustment speeds differ on average between high- and low-growth economic environments. It is expected that firms may find it easier to adjust their capital structures during economic booms rather than during economic downturns. Second, inflation is included. Higher inflation may make it easier for firms to adjust book-value financial ratios (based on nominal figures). Third, in addition to the firm-specific interest rate, the three-month money market interest rate is included as a proxy for the average (non-agency) cost of borrowing. A negative relationship is expected between the money market interest rate and the adjustment speed. Fourth, foreign bank penetration is included as a proxy for qualitative banking development (see Appendix for details). It is expected that a more developed banking system will make it easier for firms to adjust their capital structures towards their targets.

4. Empirical results

4.1 Determinants of the target capital structure and the adjustment speed

Table 2 presents the regression results for the dynamic model. Profitability and age are found to be the most robust determinants of target capital structures across countries. There is a significant negative relationship between profitability and target leverage in the total sample regression, as well as in 6 out of 10 country regressions. The coefficient is –0.10 for the total sample, which means that an increase in profitability of 10 percentage points leads to a decrease in the target leverage ratio of about 1 percentage point.[32] This result is in line with Booth *et al.*

[32] Cornelli *et al.* (1996) find negative coefficients for Hungary and Poland as well.

Table 2. Regression results dynamic adjustment model

	Total sample	Bulgaria	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovak Republic	Slovenia
Dependent variable	**L***	L*	L*	L*	L*	L*	L*	L*	L*	L*	L*
Explanatory variables											
Growth total assets						0.01**	0.08***				
Tangibility		–0.18***			–0.00**				–0.12***		
Profitability	**−0.10*****				–0.05***	–0.02*	–0.21**	–0.67***	–0.14***		–1.56***
Income variability							0.14***				
Age	**0.02*****	0.02***	0.02***	0.02***	0.03***	0.02***	0.02***	0.03***	0.05***	0.02***	0.03***
Firm-specific interest rate		–0.01***									
Legal form					–10.65***	–9.20***					
Dependent variable	***δ***	***δ***	***δ***	***δ***	***δ***	***δ***	***δ***	***δ***	***δ***	***δ***	***δ***
Explanatory variables†											
Distance from optimum (+)	**0.13*****	0.64***	0.07***			0.89***	0.37***	0.23***	0.15***		
Distance from optimum (–)	**0.14*****	0.19***	0.14***	0.32***	0.15***	0.39***	0.49***	0.29***	0.14***	0.14*	–0.03*
Income variability					0.04***	0.75***				1.68***	
GDP growth		0.72***		0.75**			0.86**		–38.28***		
Inflation	**0.08*****	0.08***							1.35***		
Three-month interest rate										–0.59**	
Foreign bank penetration					–0.03**				0.00*	–0.68***	
R^2_{adj}	**0.74**	0.78	0.62	0.91	0.93	0.90	0.91	0.91	0.70	0.92	0.97
R^2_{adj} (dynamic, δ fixed)	**0.69**	0.76	0.20	0.90	0.92	0.89	0.90	0.90	0.64	0.76	0.96
R^2_{adj} (AR(1))	**0.31**	0.46	0.20	0.62	0.59	0.63	0.71	0.62	0.23	0.79	0.82
R^2_{adj} (static model)	**0.09**	0.04	0.05	0.06	0.14	0.07	0.20	0.06	0.13	0.08	0.37
Number of observations	**67,125**	11,065	12,525	1,697	3,806	1,715	879	8,428	24,005	953	1,949

***Notes*:** †The coefficients for the variables explaining δ are multiplied by 100 for presentational purposes. Intercept and sector dummies – and in total sample regression: country dummies – not shown.

***,**,* denote significance at the 1%, 5%, and 10% levels, respectively.

(2001) who find for their set of developing countries that, although capital structure determinants diverge considerably between countries, '*the most successful of the independent variables is profitability, as it is consistently negative and highly significant*' (p. 105). As discussed in Section 3.2, the negative coefficients point to information asymmetries and substantial external financing premiums.[33]

A second very robust cross-country result is found for age. In the overall regression, as well as in all individual country regressions, age enters positively and significantly. Again, this is consistent with the literature (for example, Beck *et al.*, 2005b; Fan *et al.*, 2003; Rajan and Zingales, 1995). Older firms have better reputations and can thus more easily convince banks to grant them credit. Longer track records make firms more transparent and reduce information asymmetries. The coefficient lies between 0.02 and 0.05 for all countries and is 0.02 in the total sample. For each extra year since incorporation, a firm's target leverage is thus approximately 0.02 percentage points higher. The robust results for both profitability and age confirm those of Nivorozhkin (2004), who finds that, in his sample of five transition countries, the only variables with a uniform effect on the target leverage across countries are profitability (–) and age (+).

Regarding the more country-specific determinants, an interesting result is that legal form appears to be important only in Hungary and Latvia, where public firms target a leverage ratio that is about 10 percentage points lower than that of private firms. Thus, in Hungary and – somewhat surprisingly – Latvia, public firms in particular are able to finance investments through issuing (additional) shares. These findings are in line with Volz (2004), who uses survey data on financing conditions of a large number of CEE firms and finds that only in Hungary and Latvia does equity financing through issuing shares play a considerable role.

Interestingly, a negative relationship is found between tangibility and leverage targets for Bulgaria, Hungary and Romania (although for Hungary the coefficient is very small). First, this may indicate that, in these countries, many tangible assets are firm-specific and thus not easy to liquidate, so that firms prefer to finance them internally. Second, Claessens and Laeven (2003) show that, in countries with weak law and order, firms have much lower ratios of long-term debt to fixed capital because the collateralizable value of fixed assets is lower. Also, according to Nivorozhkin (2004), collateral does not as a matter of course pose an effective guarantee against bankruptcy in transition countries. On the contrary, firms with many tangible assets have lower debt targets. This is likely to apply to Bulgaria and Romania, where the transition process in general – and legal system development in particular – has lagged behind compared to other CEE countries (for example,

[33] Fries *et al.* (2003) find that transition countries with less efficient banks tend to have greater proportions of internal financing for new investments than countries with more efficient banking systems. Still, note that, also in developed countries, profitable firms have, on average, less debt (for example, Bevan and Danbolt, 2000; Fan *et al.*, 2003; Rajan and Zingales, 1995).

EBRD, 2004). It is found that firm growth has a positive and significant coefficient in two countries only (Latvia and Lithuania). Apparently, firms with high growth opportunities do not always increase their target leverage (and through that actual leverage) in order to exploit these opportunities. A strong effect of the firm-specific interest rate on the target debt level of firms is not detected here. Only in Bulgaria is a significant though very small, negative effect detected. Income variability is only (positively) significant in Lithuania. Firm size does not influence target leverage ratios in any of the countries studied. The bivariate relationship between size and actual leverage found for some countries (see Section 3.1) apparently mainly reflects third factors, rather than size as such. Finally, we do not find evidence of firms increasing their target leverage because of corporate taxes, as our non-debt tax shield variable enters none of the regressions significantly. There is also no significant evidence of trade credit influencing target capital ratios.

With regard to the determinants of the adjustment speed, the most important finding is that, in general, the distance from the optimum is positively related to the adjustment speed (except for Slovenia). Firms that are far away from their target capital structure tend to adjust more rapidly compared to firms that are close to their target. Apparently, gradual adjustment costs are high relative to one-off financial restructuring costs and this holds in most countries for both underleveraged and overleveraged firms. However, in several countries, either the distance variable is significant only for overleveraged firms (Estonia, Hungary, the Slovak Republic) or the coefficient for overleveraged firms is higher than for underleveraged firms (the Czech Republic, Lithuania, Poland and the complete sample). The distance-to-target effect on adjustment speed thus tends to be somewhat more important for overleveraged firms. This shows that especially for firms with 'too much' bank credit it is not worthwhile to incrementally decrease their debt burden when they are already close to their target. In contrast, firms that are significantly overleveraged find this suboptimal situation costly enough to take measures to reduce debt towards their target.

Our results are in line with those of Fischer *et al.* (1989), Ju *et al.* (2003) and Mauer and Triantis (1994), all of whom find that the costs of moderate deviations from target capital structures – in terms of the negative effect on firm value – are relatively low when compared to the (fixed) transaction costs involved, making frequent incremental leverage adjustments less likely.

We find for Hungary, Latvia and the Slovak Republic the expected positive relationship between income volatility and adjustment speed. Higher GDP growth increases the adjustment speed in Bulgaria, Estonia and Lithuania, but lowers it in Romania. Higher inflation has a positive influence on the adjustment speed in the total sample, Bulgaria and Romania. Finally, it is interesting to note that foreign bank penetration has a negative effect on the average adjustment speed in both Hungary and the Slovak Republic. This counterintuitive finding may result from the fact that an important influence of foreign banks has been to harden budget constraints and to cut off loss-making firms from additional credits, decreasing the ease with which such firms could adjust their capital structures. The last rows in

Table 2 provide information about the explanatory power of the dynamic model. The first row of R^2s shows that this model generally explains between 62 percent and 96 percent of the within-country variation in target leverage. The explanatory power in the overall dataset is 74 percent. Comparing this with the second row, the effect of allowing the adjustment parameter to be both time- and firm-specific (rather than fixed per country) becomes clear. For some countries – the Czech and Slovak Republics, Romania – this adds some explanatory power, whereas for others the effect is marginal. Allowing for firm heterogeneity in the adjustment parameter is for some countries thus more important than for others. The next row of R^2s shows the explanatory power of a 'naïve' model in which a firm's capital structure is only explained by the one period lagged capital structure (and a constant). In some cases, such as Lithuania, the Slovak Republic and Slovenia, this extremely parsimonious model performs quite well. However, it becomes clear that, in most countries, adding additional explanatory variables improves the explanatory power considerably. Finally, the last row of R^2s shows the explained variation by a static model. This is rather low for all countries, except Slovenia. All in all, it is concluded that using a dynamic model rather than a static one significantly increases the explanatory power. Making the adjustment speed firm- and time-specific adds further power to the model, although the importance of this step differs across countries.

As mentioned in Footnote 8, similar regressions are estimated for a model in which the adjustment during the current period is made on the basis of L^*_{it} rather than L^*_{it-1}.[34] However, such an approach, as taken by BHW, for example, possibly introduces a simultaneity bias in the reduced form equation that is finally estimated. In general, very similar estimation results are found: age and profitability are the most robust determinants of target capital structures. Profitability is even significantly negative in 9 out of 10 countries. Importantly, in these regressions also the growth in total assets appears to be a particularly important determinant; a positive and significant coefficient is found in 7 out of 10 countries (instead of two in the regressions with a lagged target). Note, however, that the asset growth variable may be especially liable to endogeneity problems as net investments will often be related to financing changes in the same year. We thus conclude that the model specification here has improved the results by diminishing the potential for simultaneity bias, especially with regard to the growth variable.

In sum, Table 2 shows that profitability and age are the most robust determinants of the target capital structures of CEE firms. However, differences between countries with respect to additional explanatory variables are large, confirming the observation by Booth *et al.* (2001) that capital structure models are only to a limited extent 'portable' across countries. Country-specific circumstances, such as the quality of the legal system and the stock market, also guide the financing behaviour of

[34] Including this lag in the regressions as reported in Table 2 led to a data loss of on average 16 percent per country.

Table 3. Average target leverage (L*) and actual leverage (L) in 2000–2001

Country	(L*/L)†	L*	L	Country	(L*/L)†	L*	L
1. Latvia	**0.90**	38.7	43.0	6. Poland	**1.25**	58.0	46.4
2. Slovenia	**0.97**	50.6	55.6	7. Lithuania	**1.51**	48.3	32.3
3. Hungary	**1.01**	57.4	57.1	8. Czech Republic	**1.53**	44.6	29.7
4. Estonia	**1.08**	40.7	38.0	9. Romania	**1.64**	89.2	54.7
5. Bulgaria	**1.12**	25.4	24.3	10. Slovak Republic	**1.70**	47.3	30.0

***Notes*: †**The ratio is calculated as the mean of the median ratio within each size quartile in both 2000 and 2001. This may lead to small deviations from the ratio that would result from simply dividing the values for L* and L as shown in the following two columns. A higher ratio means that firms are relatively severely underleveraged.

firms. Finally, it was found that firms that are further away from their target adjust faster than firms that are very near their target, both in the case of underleveraged and overleveraged firms.

4.2 The ratio between the target capital structure and the actual capital structure

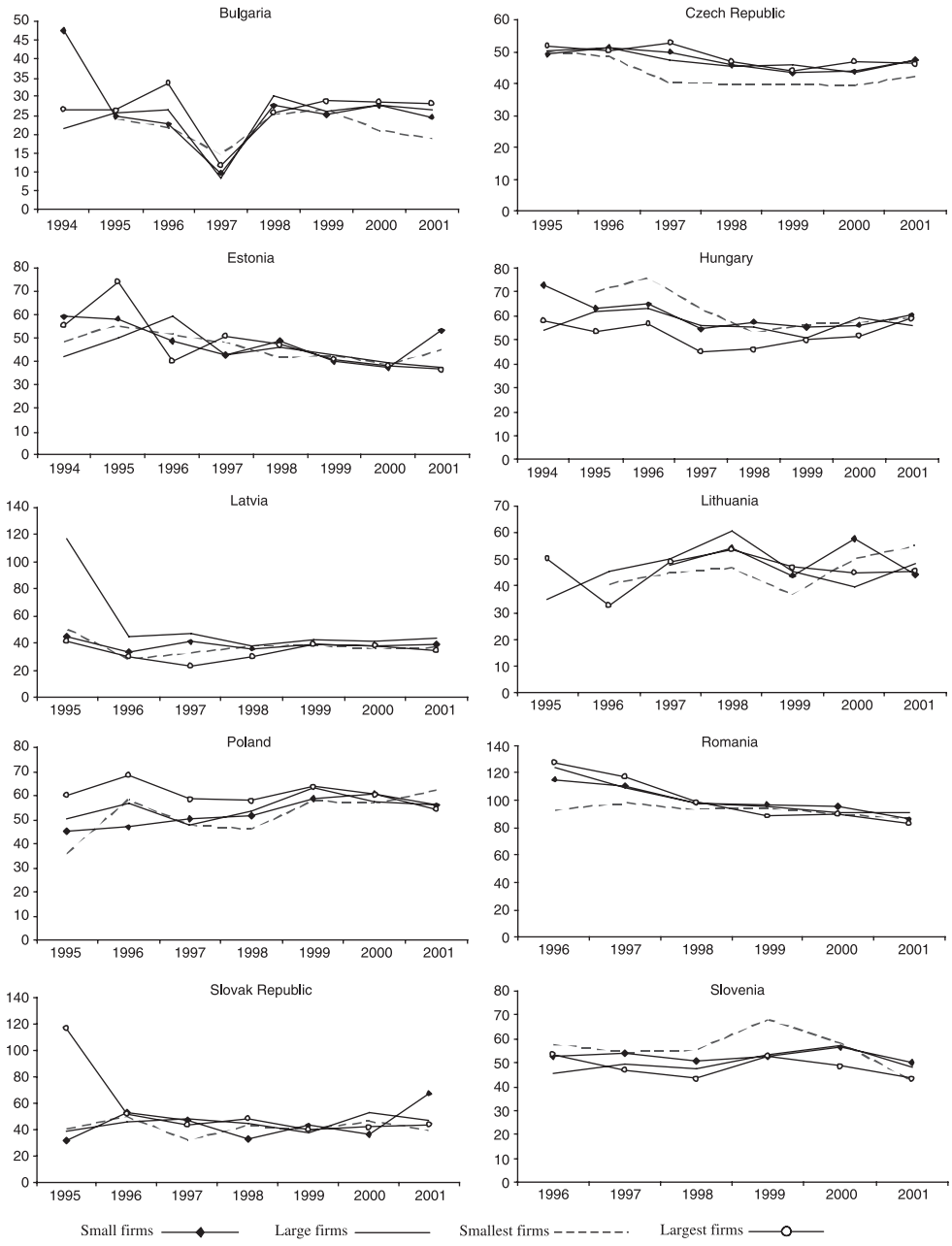
Figure 3 shows the development of the average target leverage.[35] Per country, all observations were divided into four quartiles and the median target leverage calculated. In 2000/2001, the average target leverage was between 40 percent and 50 percent in most countries, though lower in Bulgaria and higher in Poland, Hungary and Romania. To put these figures in perspective, Figure 4 shows the development of the ratio between the target leverage and the observed leverage.[36] Again, all observations were divided into four quartiles and the median ratio calculated for each. In most countries and size categories, it was found that the median firm is still underleveraged. However, in 2000 and 2001, firms were, on average, close to their target leverage in Estonia, Hungary, Latvia and Slovenia (see also Table 3).[37]

[35] At the very beginning of the transition process, some firms may have reported with a lot of errors. For this reason, the years 1993–95 were dropped during the estimation phase. The parameters that were estimated on the basis of this reduced sample were used – in combination with the 1993–95 data that were omitted when estimating – to calculate the target leverage for 1993–95. In spite of the loss of information, we think that this improves the reliability of our overall results. However, it also implies that the – in some cases rather high – target leverage calculations for the years 1993–95 may be less reliable than those for the later period.

[36] At the individual firm level, the actual leverage equals the firms' target if the ratio is one. If the ratio is greater (less) than one, this indicates that firms are underleveraged (overleveraged). For our complete database we find that about 70 percent of the observations concern underleveraged firms, whereas 30 percent concern overleveraged firms. This is a first indication that most CEE firms have less debt than they would like to have.

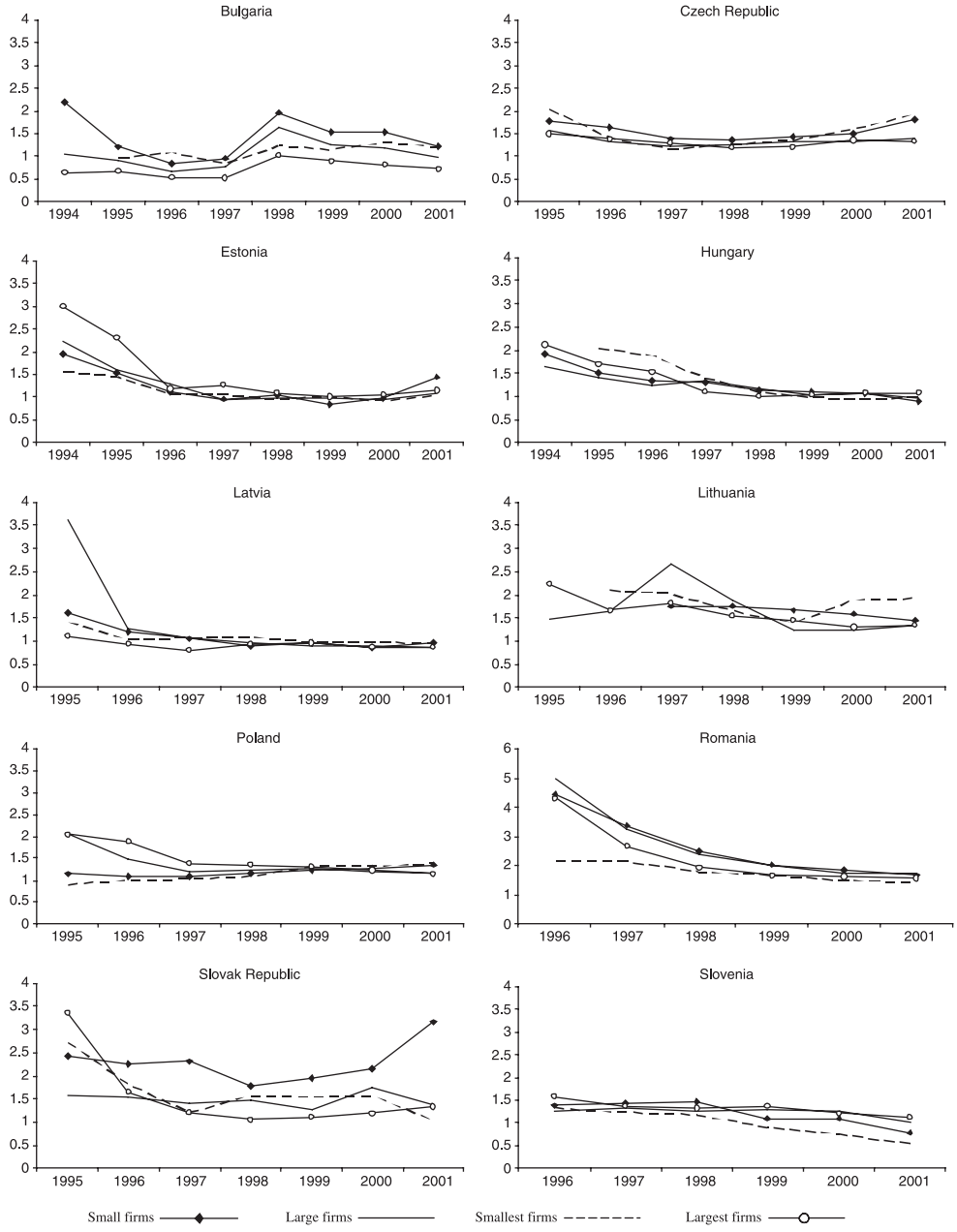
[37] The smallest Slovenian firms have even become somewhat overleveraged.

Figure 3. Development of target leverage ratios of CEE firms (in %)



***Source*:** AMADEUS dataset, author's own calculations.

Figure 4. Ratio between target leverage to actual leverage (L*/L) of CEE firms



***Source*:** AMADEUS dataset, author's own calculations.

In line with this finding, Fries *et al.* (2003) argue that Estonia, Latvia and Slovenia are the transition countries with the lowest transaction costs in bank lending.

During the transition process, firms in all size categories in Estonia, Hungary, Latvia, Lithuania, Romania and Slovenia have gradually been able to bring their actual leverage closer to their targets.[38] However, in the Slovak Republic especially, small firms became severely underleveraged after 1998. Also, in the Czech Republic, particularly the smallest firms have become more underleveraged since 1998, whereas this trend had been less pronounced for the largest firms in the sample.[39] In Poland, the smallest firms have gradually become somewhat more underleveraged, whereas the largest firms have conversely become less underleveraged.[40] Bulgarian firms have become gradually less underleveraged since the beginning of the transition period and even became somewhat overleveraged in 1997. However, since then, very small firms have become increasingly underleveraged. In the case of the smallest size quartile, there was also a reduction in actual leverage. At the same time, however, large firms have gradually returned to their optimal leverage, whereas the largest firms gradually became overleveraged again. During the entire sample period, the largest Bulgarian firms have been persistently overleveraged, which is in line with other empirical studies that document widespread soft budget constrains for the largest Bulgarian enterprises (see Footnote 18).

Finally, the ownership information in AMADEUS is used to differentiate between domestic and foreign firms.[41] Although, in general, no important differences are found between domestic and foreign firms with regard to actual and target leverage or adjustment speeds, it is found that in the Czech and the Slovak

[38] The declining discrepancy between firms' actual and target leverage may not only be caused by increasing actual leverage ratios, but also by an overall decrease in target ratios. This could reflect, for instance, a decrease in the average firm's risk appetite, or that firms have simply become more realistic about their chances of obtaining finance. Note that such arguments boil down to the question of whether such possible shifts in the average firm's target leverage can be accurately captured. Basically, firms' average preferences for leverage should be reflected in the constants in our regressions. We do not attempt to estimate possible changes in these average preferences. However, we also estimated regressions in which we also included a set of macroeconomic variables as potential target capital structure determinants. Any shifts in firms' leverage preferences may then at least partly be captured by these time-varying country-level variables. Our results did not change with regard to statistical or economic significance. As a result, we are reasonably confident that the target leverage ratios that we calculate form a good approximation of the true leverage that firms regard as optimal at a certain moment in time, given both their own characteristics and the economic environment in which they operate.

[39] Lízal and Svejnar (2002) show on the basis of firm-level data from the Czech Statistical Office that in the Czech Republic cooperatives and small private firms have been credit rationed.

[40] Volz (2004) shows on the basis of the EBRD/World Bank Business Environment and Enterprise Performance Survey (BEEPS) that businesses in all new EU member states, except Poland, are of the opinion that their financing conditions improved between 1999 and 2002. However, small firms experience greater obstacles when trying to obtain finance than medium and large firms. This goes for bank credit as well as other sources of finance. Beck *et al.* (2005a), on the basis of the same dataset, conclude the same for a broader set of countries.

[41] A foreign firm is defined as a firm that had a majority of foreign owners in 2001. All other firms were considered to be domestically owned.

Republics especially, foreign firms have become more leveraged and closer to their targets than domestic firms. Domestic firms have – conversely – become more underleveraged. Apparently, foreign firms have been better able to circumvent the credit crunch by domestic banks, either due to better characteristics or because of closer relationships with foreign banks.[42] In a similar vein, Hungarian and Latvian domestic firms have gradually almost reached their target leverage, whereas foreign firms are overshooting their targets and have become consistently overleveraged (see Table A2 in the appendix for exact figures).[43]

In sum, we find that CEE firms have generally been able to bring actual leverage ratios more in line with their internal targets. However, a majority of firms is still underleveraged and in some countries, the smallest firms especially have become more underleveraged after the financial crises of the second half of the 1990s. In several countries, foreign firms have been able to get closer to their targets, or to even overshoot them, whereas domestic firms remained underleveraged or became even more underleveraged.

4.3 The speed of adjustment

Table 4 provides an insight into the development of the adjustment speed. Clearly, adjustment speeds are positive, supporting our claim that firms adjust towards a target capital structure. Differences between size groups are in most countries marginal. Yet, when correlating firms' size with their adjustment speeds, a positive and significant (5 percent level) correlation is found in Hungary, Latvia, Poland and the Slovak Republic. Similarly, when correlating firms' yearly adjustment speeds with a time dummy, a tendency (5 percent level) for firms to decrease their adjustment speeds over time is found in Bulgaria, Estonia, Hungary, Latvia and the Slovak Republic. Table 4 shows that, in 2000–2001, the average adjustment speed was between 7 percent (Slovenia) and 17 percent (Bulgaria and Estonia). On average, firms adjust about 12 percent of the gap between their actual and desired leverage ratio, which means it will take almost 5.5 years to close half of the leverage gap.

These adjustment speeds are significantly lower than those for the United States (between 27 percent and 30 percent) and the UK (28 percent), and more in line

[42] Similarly, Hussain and Nivorozhkin (1997) find that in Poland during the early transition years (1991–94), foreign firms were much more leveraged than domestic firms. Using data from a large cross-country survey of enterprises – including transition countries – Clarke *et al.* (2001) show that foreign-owned enterprises rate access to long-term loans as less severe constraints than domestic enterprises. On the basis of similar data, Beck *et al.* (2004; 2005b) also find that foreign-owned firms face fewer financing obstacles.

[43] The fact that foreign firms have in some countries become overleveraged may be related to the fact that their capital structure decisions are not only based on their own characteristics, but could to some extent also be influenced by their parent companies, which may, for instance, operate a central treasury department that grants loans to its subsidiaries abroad.

Table 4. Average adjustment speed (in percent)

	Bulgaria	Czech Rep.	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovak Rep.	Slovenia
1996	7	16	15	15	15	n.a.	10	11	25	7
1997	49	16	20	15	14	n.a.	10	15	9	7
1998	17	16	16	14	17	15	11	12	9	7
1999	14	16	12	14	15	12	11	10	4	7
2000	18	16	18	14	14	4	10	9	11	7
2001	16	16	16	13	14	12	11	7	7	7

***Note*:** Calculated as the mean of the median δ for each size quartile in each year.

with, for example, Sweden and the Netherlands (10 percent in both countries).[44] It is interesting to note that we find that firms slowly adjust their capital structure to a moving target – which supports the trade-off framework – while a very robust negative relationship is also found between profitability and the target leverage.[45] Note that a negative correlation between profitability and actual leverage ratios is typically regarded as indicating pecking order behaviour. How can these findings be reconciled? First, the negative relationship between profitability and target leverage reflects that CEE firms that become (persistently) more profitable start to target lower leverage ratios because of the high external financing premiums associated with bank credit. We thus find that within the trade-off framework, information asymmetry costs play an important role, although they do not lead to pure pecking order behaviour (see Footnote 20). Second, Fama and French (2002) note that the negative relationship between profitability and target leverage may actually also partly result from short-term variation in actual leverage rather than variation in target leverage. Such short-term variation results from high adjustment costs that prevent firms from frequently adjusting towards their target leverage (see Leary and Roberts, 2004). In between such refinancing points, highly profitable firms will see their retained earnings and book capital expand, 'automatically' lowering their leverage.[46] Only when the (agency) costs of this increasing deviation from their target become large enough, firms react by increasing debt in the direction of their target structure. This is also consistent with the finding here that adjustment speeds are relatively low and that firms adjust faster when they are further away from their target.[47]

5. Summary and conclusions

A dynamic capital structure model is used to study the adjustment process of firms towards their target capital structures. We endogenize both the target leverage

[44] UK: Heshmati (2002); US: Kumbhakar *et al.* (2002) and Flannery and Rangan (2005), respectively; Sweden: Lööf (2003), sample period averages. For the Netherlands, we estimated a dynamic adjustment model and found an average adjustment speed of 10 percent. Wanzenried (2002) also finds that UK firms have a significantly higher adjustment speed.

[45] Roberts (2002) and Frank and Goyal (2000) also find strong evidence of mean reversion in leverage, and take this as evidence against the pecking order hypothesis.

[46] Strebulaev (2003) uses a calibrated dynamic trade-off model to demonstrate, through simulation, how adjustment costs may lead to a negative relationship between profitability and leverage even when the behaviour of firms is completely determined by trade-off considerations (but adjustments are infrequent because of high transaction costs).

[47] A potential complication when comparing adjustment speeds across countries is that different countries may experience different macroeconomic shocks. Hence, in some countries, firms are, *on average*, further away from their targets than in other, more stable, countries. Adjustment speed differences would then not only reflect, for example, differences in the financial system, but also differences with regard to the challenges that firms are confronted with when trying to reach internal targets. We aim to control for such different macroeconomic environments by including a number of macroeconomic determinants in the adjustment speed specification.

ratio and the adjustment speed and apply the model to microdata for ten CEE countries (1993–2001). The results show that the gradual development of the financial systems in this region has enabled firms to reach higher debt levels and to bring their actual capital structure closer to their own target structures. In Estonia, Hungary, Latvia and Slovenia most firms have even been able to close the gap between actual and target leverage for the greater part. However, in the other countries, most firms are still underleveraged. In Bulgaria, the Czech and Slovak Republics and Poland, the smallest firms particularly have become more underleveraged after the financial crises during the second half of the 1990s. In several countries, foreign firms have been able to attain their target capital structures, whereas domestic firms remained underleveraged. In general, adjustment speeds are relatively low, indicating market frictions that are still significant compared to more developed economies. Firms that are not too far away from their target leverage do not find it worthwhile to get back on track immediately, as the costs of doing so outweigh the benefits. Only when firms become too heavily underleveraged or overleveraged do they resort to some kind of financial restructuring to get back on target. Finally, it is also found that differences between countries are large with regard to the determinants of firms' target leverage. This implies, in line with earlier research results, that capital structure models are only to a limited extent 'portable' across countries. However, two characteristics turn out to robustly influence leverage targets: profitability (negatively) and age (positively).

From a policy perspective, these results imply that there is still ample room in CEE countries to further deepen financial systems, both quantitatively and qualitatively. This will not only increase the value of firms, but will also stimulate real economic development in the region. Future research may also apply dynamic capital structure models to a wider range of Western (European) countries, so that more definite conclusions can be drawn about the relative merits of different financial systems in allowing firms to optimize their value by staying close to their internal leverage targets.

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Appendix

Data sources and construction

Stylized balance sheet of an individual firm in AMADEUS (variable names in upper case)

Fixed assets	FIAS	Shareholder funds	SHFD
– Intangible	IFAS	– Capital	CAPI
– Tangible	TFAS	– Other	OSFD
– Other	OFAS	Non-current liabilities	NCLI
Current assets	CUAS	– Long-term debt	LTDB
– Stock	STOK	– Other	ONCL
– Debtors	DEBT	Current liabilities	CULI
– Other	OCAS	– Loans	LOAN
– Cash & cash equivalent	CASH	– Creditors	CRED
		– Other	OCLI
Total assets	TOAS	Total liabilities	TOAS

Information on GDP growth and interest rates is taken from the IMF's International Financial Statistics (IFS). The variable 'foreign bank penetration' was constructed by subtracting column J (cross-border claims with head offices outside the country) from the sum of column A (cross-border claims in all currencies and local claims in non-local currencies) and L (local currency claims on local residents)

as taken from the BIS Consolidated Banking Statistics Databank Block M and dividing the result by line 32 ('domestic credit') from the IFS (in US dollars).[48]

All data are expressed as millions of euros. Leverage (LEV) is calculated as

$$100 * \frac{\textit{non-current and current liabilities} - \textit{creditors}}{\textit{non-current and current liabilities} - \textit{creditors} + \textit{shareholder funds}}.$$

One may expect LEV to be between zero and 100 as both total debt (in the nominator and denominator NCLI + CULI – CRED) and shareholder funds (SHFD in the denominator) should be zero or positive. Under exceptional circumstances, however, LEV may be less than 0 or higher than 100. The first holds if SHFD is negative and its absolute value even exceeds total debt. Total assets are in this case negative, which will be highly unlikely. The latter holds if SHFD is negative but does not exceed debt in absolute value. The firm is then theoretically bankrupt, but may be kept operational by creditors, either because discounted expected profits exceed the current equity gap, or because (state-owned) creditors have goals other than profit maximization. In both cases, creditors may decide to keep funding bankrupt firms (in the latter case the firm has a soft budget constraint). As Table A1 makes clear, negative values for LEV were in most countries almost completely absent, whereas values greater than 100 were present in all countries but not of significant importance. Also note that since the dynamic model is estimated unrestrictedly, a number of calculated optimal leverage values might be negative or greater than 100 whereas the actual leverage value lies between zero and 100. In practice, the model performed very well in this regard: the percentage observations (not presented in Table A1) where $L \in [0,1] \wedge L^* \in <\leftarrow,0>$ was zero in all countries, except for Bulgaria, Hungary and Latvia, where it was 0.1 percent. Similarly, the percentage observations where $L \in [0,1] \wedge L^* \in <1,\rightarrow>$ was zero in all countries except for Lithuania and Poland (0.1 percent) and Slovenia (0.8 percent).

The variable VARTURN is constructed as the standard deviation of turnover over time, so it is firm-specific. For some countries operating revenue is taken instead of turnover for reasons of data availability. The variable PROFITS is defined as profit or loss as a percentage of total assets. Depending on availability per country, profit or loss was calculated before or after taxation.

Data selection

We carefully checked for outliers and observations were also dropped if: (1) non-current and current liabilities did not exceed the creditors, i.e., the nominator of LEV was negative; (2) capital (CAPI) was negative; or (3) the annual growth of total assets exceeded 1000%. A firm was only dropped in the year where one or more of the above-mentioned characteristics held. For Slovenia CRED was excluded as

[48] See De Haas and Van Lelyveld (2004) for more details on this foreign bank penetration measure.

data for this variable was missing for several years. Following these selections, the number of consecutive years of observation was counted for each firm. Only those firms for which there are at least three consecutive observations are included in our sample. At the beginning of the transition process, some firms may have reported their balance sheet and profit and loss account figures with a lot of errors. For this reason, the years 1993, 1994 and 1995 were dropped during the estimation phase. In spite of the loss of information, we think that this improves the reliability of our estimates. The parameters that were estimated on the basis of this reduced sample were used – in combination with the 1993–95 data that were omitted when estimating – to calculate the target leverage and speed of adjustment for 1993–95 as well.

Table A1. Summary statistics

	Estonia	Slovenia	Latvia	Lithuania	Slovak Rep.	Bulgaria	Hungary	Czech Rep.	Romania	Poland
No. of inhabitants (mln.)	1.4	2.0	2.4	3.6	5.4	7.7	10.1	10.2	22.5	38.6
Median total assets (mln €)	2.0	13.2	2.3	4.4	4.7	0.8	4.9	4.8	1.3	5.6
Median shareholder funds/total assets	45.7	54.4	41.4	54.5	47.8	56.5	45.5	44.2	44.2	41.6
Median non-current liabilities/total assets	5.7	3.5	5.7	3.3	6.6	0.1	1.4	8.5	0.4	3.1
Median current liabilities/total assets	38.5	33.4	37.6	32.0	35.7	33.8	46.2	37.1	44.3	46.4
Median age in 2000 (years)	8	10	7	7	8	30	8	8	9	11
Median profitability (%)	6.7	1.0	6.3	4.3	3.6	2.9	6.7	4.5	8.4	7.1
% observations with LEV < 0	0	0	0	0	0.1	0.6	0	0.6	0.2	0.1
% observations with LEV > 100	0.8	1.9	2.0	0.2	1.5	1.5	1.9	3.4	4.5	3.3
No. of observations in regression	1,697	2,052	1,715	879	953	11,065	3,806	12,525	24,005	8,428

Table A2. L^*/L of domestic and foreign firms in selected countries (median ratio)

	Czech Republic		Hungary		Latvia		Slovak Republic	
	Domestic firms	*Foreign firms*	*Domestic firms*	*Foreign firms*	*Domestic firms*	*Foreign firms*	*Domestic firms*	*Foreign firms*
1995	1.68	1.57	1.65	n.a.	1.39	1.33	2.28	n/a
1996	1.50	1.36	1.39	2.20	1.14	0.92	1.73	n/a
1997	1.34	1.19	1.30	1.20	1.11	0.94	1.43	2.49
1998	1.47	1.15	1.15	1.03	1.11	0.90	1.44	3.00
1999	1.64	1.15	1.11	0.92	1.03	0.87	1.37	1.13
2000	1.84	1.19	1.10	0.98	0.99	0.82	1.59	0.96
2001	1.90	1.38	1.12	0.94	0.94	0.86	1.54	0.92