European Bank
for Reconstruction and Development

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

Ralph de Haas and Marga Peeters

Abstract

This paper studies the capital structure dynamics of central and eastern European firms to better understand the quantitative and qualitative development of financial systems in this region. The dynamic model used endogenises the target leverage as well as the adjustment speed towards these targets. It is applied to microeconomic data for 10 countries. We find that during the transition process firms generally increased their leverage, lowering the gap between actual and target leverage. Profitability and age of firms are the most robust determinants of their capital structure targets. Older firms attract more bank debt, whereas profitability decreases firms' leverage targets. While banking system development has in general enabled firms to get closer to their leverage targets, information asymmetries between firms and banks are still important. As a result, firms prefer internal finance above bank debt (pecking order behaviour) and adjust leverage only slowly.

Keywords: capital structure dynamics, transition economies, financial system development

JEL Classification Number: C23, G32, O57

Address for Correspondence: European Bank for Reconstruction and Development, One Exchange Square, London EC2A 2JN, UK.

Phone: +44 20 7338 6158; Fax: +44 20 7338 6111;

E-mail: dehaasr@ebrd.com; h.m.m.peeters@dnb.nl

Ralph de Haas is an Economist at the EBRD and Marga Peeters is an Economist at De Nederlandsche Bank.

The views and opinions expressed are those of the authors. They do not necessarily represent the views and opinions of the European Bank for Reconstruction and Development or De Nederlandsche Bank. The authors would like to thank Allard Bruinshoofd, Bob Chirinko, Harry Garretsen, Leo de Haan, Peter Sanfey, Job Swank, Annemarie van der Zwet, participants of the DNB lunch seminar (16-12-2003), and participants of the EBRD Brown Bag Seminar (15-06-2004) for useful comments and Rob Vet for statistical assistance.

Working paper No. 87	**Prepared in June 2004**

INTRODUCTION

With the fall of the Berlin Wall in 1989, central and eastern European (CEE) countries began a process of profound economic transition. Socialist institutions disappeared, whereas new capitalist-inspired institutions – such as well-functioning legal systems – were introduced later. Moreover, financial markets were virtually absent initially and the banking system was inefficient and almost entirely state-owned. This created a hostile environment for new entrepreneurs, in which it was potentially difficult to attract external financing and firms mainly relied on internal funds. Recently, the negative influence of such hostile business environments has received considerable attention, as rapidly expanding empirical literature has shown that adequate and enforceable laws stimulate financial system development. Banks that are backed-up by appropriate laws are, for instance, better able to screen firms, pick the most profitable ones, provide them with funds, and monitor their managers. In this way, financial intermediaries boost the capital stock as well as productivity, thus speeding up economic development.[1] The banking systems in CEE have only recently started to perform this role. While stock markets and corporate debt markets are still of negligible size, 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 privatising 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. Cross-country differences remain as to how much the banking system fulfils the real economy's quantitative and qualitative financing needs.

In this paper, we ask to what extent the financial systems in Bulgaria, the Czech Republic, Estonia, Hungary, Poland, Romania, the Slovak Republic, Slovenia, Latvia, and Lithuania[2] have facilitated firms to reach their capital structure targets.[3] First, we ask ourselves to what extent capital structure targets of firms in different transition economies are driven by similar determinants. Are capital structure models "portable" across different financial and economic systems? Second, we want to know whether the gaps between actual and target capital ratios have narrowed during the transition process. Third, we focus on the speed of adjustment to the target structures. 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. The paper contributes to the literature on corporate finance in transition economies in three ways.[4] First, we use an extensive firm-level panel dataset for ten countries during the 1990s. Second, we estimate a dynamic model that explicitly takes into account the fact that firms' actual and target capital structures may differ. Third, we use a comprehensive set of variables for which theory suggests that they determine a firm's target capital structure.

[1] See La Porta *et al.* (1998), Levine (1999), and De Haas (2004) on the nexus between law, finance, and economic growth.

[2] These countries, with the exception of Bulgaria and Romania, joined the European Union in May 2004. As they have made most progress as regards the general transition from a plan to a market economy, we include them in our sample of countries for which we analyse the specific progress in the transition of the financial system.

[3] Target capital structures are sometimes referred to as optimal capital structures. We prefer the former term since it better captures the idea that the "optimum" in our model is actually a moving target rather than a "fixed" one and since it better expresses the fact that the target structure is the capital structure a firm is trying to reach.

[4] We know of three papers that estimate a firm-level capital structure model for transition economies. Klapper *et al.* (2002) focused on a broad set of transition countries, but only used data for 1999 in their static model. Cornelli *et al.* (1996) only looked at Hungary and Poland and used a static model for 1992. Nivorozhkin (2003) used a dynamic model, but only for the Czech Republic and Bulgaria during 1993-97. In addition, Booth *et al.* (2001), using a static model, studied firms' capital structure choice in ten non-transition developing countries.

The paper is structured as follows. Section 1 sets out the dynamic adjustment model of firms' capital structure. Section 2 then describes the variables that may affect the target capital structure and the adjustment speed, after which section 3 explains our empirical results. Section 4 concludes. Detailed information on the data is given in the appendix.

1 MODELLING CAPITAL STRUCTURE DYNAMICS

1.1 INTRODUCTION

According to trade-off theory, firms optimise their capital structure because they face a trade-off between the advantageous and disadvantageous effects of debt 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 reorganisation. 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).[5]

This section presents a dynamic capital structure model mainly along the lines of Banerjee, Heshmati, and Wihlborg (2000), henceforth BHW.[6] The model presumes that the actual capital structure of a firm at a particular time does not necessarily equal the target capital structure of that firm.[7] Instead, it assumes that a firm dynamically adjusts its capital structure to a *moving* target. 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.

1.2 THE TARGET CAPITAL STRUCTURE

We define the (target) leverage of a firm as the (desired) ratio, expressed in percentages, between total debt and the sum of total debt and equity: 100 * debt / (debt + equity). This target leverage ratio for each firm is not observed, but is assumed to be a function F of several (observable) determinants, i.e.

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

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 effects respectively. For each firm the target leverage may thus change over time, reflecting changes in its determinants.

1.3 THE ADJUSTMENT TOWARDS THE TARGET CAPITAL STRUCTURE

In the optimum, the leverage of a firm will equal 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

[5] At the same time, a debt increase *lowers* the agency costs associated with equity financing, such as shirking.

[6] See Heshmati (2002), Kumbhakar *et al.* (2002), and Lööf (2003) for empirical applications of this model to the UK, US, and Sweden, respectively.

[7] 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.

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

where δ_{it} is the adjustment parameter representing the magnitude of adjustment during one period (also termed the adjustment speed). If δ_{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. Note that in our 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. Since we use balance sheet and P&L-data, the *t* subscripts refer to end 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. We therefore assume 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] Secondly, from an econometric perspective, our specification reduces the potential for simultaneity bias since all determinants are included with a one year lag in the estimated regressions.

1.4 THE SPEED OF ADJUSTMENT

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

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

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 absolute distance between the target leverage and the actual leverage at the beginning of the year, i.e. $|L^{*}_{it-1} - L_{it-1}|$. This variable allows us to estimate the influence the magnitude of the deviation between the desired and the actual leverage has on the speed of adjustment.

1.5 THE GENERAL FUNCTIONAL RELATIONSHIPS

Equations (1) and (3) are specified linearly as

[8] Here we follow Flannery and Rangan (2003). We also estimated regressions using the BHW-specification, which yielded qualitatively similar results (available on request from the authors). See section 3.1 for more details.

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

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

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

where the α's and β's are parameters to be estimated.

1.6 THE ESTIMATION STRATEGY

The model to be estimated is (2b) where L_{it}^{*} and δ_{it} are unobserved and specified according to (4) and (5). The result is a non-linear equation in the parameters as well as in the variables, which we estimate by Non-Linear Ordinary Least Squares. The most complicating factor in the estimation process is the inclusion of the distance variable mentioned in sub-section 1.4. 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 we employ initial parameters as starting values and which stops iterating when the additional reduction in the sum of squared errors and the change in the parameters is sufficiently small.

Estimation is carried out for each country and consists of four consecutive steps. First, we estimate a static model (4), where 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 step. In this complete dynamic model, both L_{it}^{*} and the adjustment speed are thus flexible.[10] Since the high level of macroeconomic instability during the beginning of the 1990s may distort the estimation results, we exclude the years 1993-95 when running the regressions. The coefficients obtained for the sample period 1996-2001 are then afterwards combined with the data for the years 1993-95 so that the target leverages and adjustment speeds are calculated for the whole 1993-2001 period.

When estimating the complete dynamic model, we apply to each country a general-to-simple approach starting with a broad set of explanatory variables and subsequently eliminating one at a time the variable with the least significant coefficient, stopping at the 10 per cent level of significance (except for intercepts which are kept in the specifications independent of the significance of their coefficients).[11] We thus do not impose one particular set of variables on

[10] As we use predicted values from the second and third step 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 – will lead to consistent standard error estimates.

[11] In the initial set of potential determinants we also include sector dummies. These have been created by allocating each firm, based on its ISIC code, to one of ten sector groups. Inclusion of sector dummies is important as they can capture any sector-specific but time-invariant determinants of capital structure (fixed effects) which are not picked up by our firm-specific variables. Note that we do not include firm-specific dummies, nor do we estimate firm level fixed effects. 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 ratios are defined as the predicted values 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.

all countries, but allow the determinants of capital structure to differ. (In addition, we apply the same procedure to the whole dataset, i.e. all 10 countries, in order to create a benchmark regression.) We can then compare the observed capital structures with the target capital structures as calculated on the basis of the estimated parameters. We are particularly interested to find out whether the gap between them has 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 indirect proof of qualitative financial development.

2. CAPITAL STRUCTURE MEASURE AND EXPLANATORY VARIABLES

2.1 THE CAPITAL STRUCTURE MEASURE

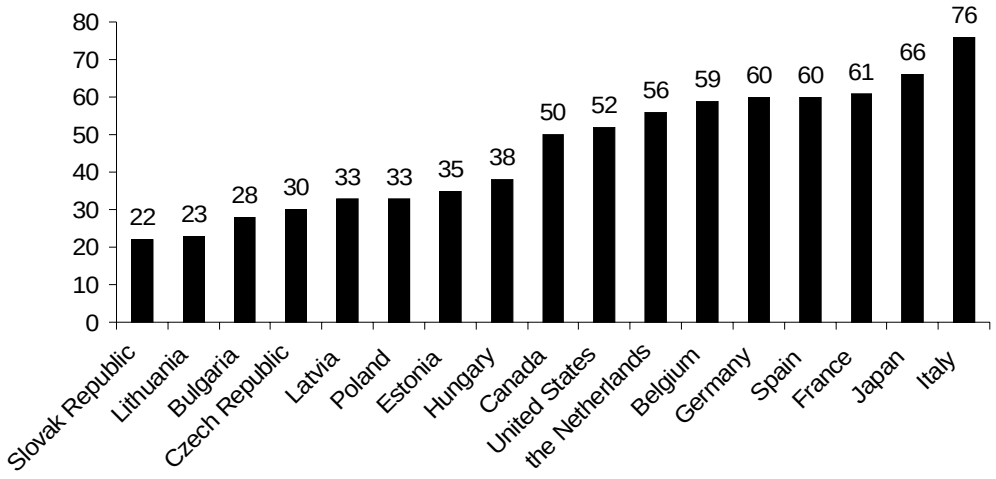
We take firm-level data (1993-2001) from Bureau van Dijk's AMADEUS "top 200,000" database. Annual balance sheet data and profit and loss account details are included for firms that have either more than 100 employees, more than €10 million operating revenue, or more than €20 million total assets in one of the years available. The database is intended to cover only privately owned, not state-owned firms (Klapper *et al.*, 2002). Bureau van Dijk guarantees that 95 per cent of all companies in each country complying with one of these criteria, is included.[12]

As explained in section 1.2, our dependent variable is the leverage ratio, which we define as 100 * debt / (debt + equity). For both debt and equity, we use "backward looking" book values rather than "forward looking" market values, as only the former are included in the AMADEUS database.[13] However, using book values rather than market values has some advantages. From a theoretical perspective, the book value of debt is a better measure of the liability of debt-holders in case of bankruptcy. Also, when a firm has issued debt, changes in the market value of this debt will not influence the cash savings due to the interest tax shield. It is these cash savings that may influence the decision to issue debt in the first place (Heshmati, 2002). Also note that the assumption that the value of firms' debt and equity would be determined by forward looking capital markets, would be inconsistent with our 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, p. 2;10) and Hovakimian *et al.* (2001, p. 5) find that the choice between book and market value does not influence results significantly. Bowman (1980) shows that the correlation between the book and market values of debt is very large.

[12] The appendix gives a more detailed description of the data, including summary statistics and selection criteria.

[13] Differences in leverage ratios between countries may partly reflect disparities between national accounting standards. However, listed companies in all of the countries in our sample are required to adopt International Financial Reporting Standards (IFRS) at accession to the European Union, which has led to a convergence process as regards accounting frameworks. Also note that Bureau van Dijk formats all companies uniformly to allow between-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 between-country comparisons of firm leverage using AMADEUS.

Figure 1 Debt to total value non-financial firms in per cent (all book value)



Definition: Debt is short-term debt plus long-term debt. Total value is debt plus equity

Sources: Industrialised countries: OECD financial statistics for 1994 (more recent comparable OECD statistics not available); Transition economies: authors' own calculations based on AMADEUS dataset (1995). For Romania and Slovenia insufficient 1995 data were available.

Figure 1 shows that while in industrialised countries book value capital ratios generally lie between 50 per cent and 80 per cent, capital ratios in transition economies ranged between only 20 per cent and 40 per cent in 1995. Figure 2 summarises the development of firm leverage for our sample of CEE countries since then. For each country, we split the sample in four size categories, each representing 25 per cent of the observations. The median firm leverage in each size category is then calculated. CEE leverage ratios turn out to be mostly (considerably) below Western standards and ranged between 26 per cent in Bulgaria and 60 per cent 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 per cent. In most CEE countries, we observe an upward trend in the leverage ratio during the transition process. The gradual development of the financial system has enabled firms, of all size categories, to reach higher debt levels in Latvia, Lithuania, Slovenia, Hungary, Romania, Bulgaria, and Poland.[14] However, in Estonia and the Czech Republic there is a significant downward trend (at a 5 per cent significance level from the correlation statistics), while we find no correlation 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 take-over 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 we observe a sharp reduction in firms' leverage ratios immediately after the 1996 banking and currency crises, probably reflecting the sudden reduction in the supply of bank credit.[15] Whereas Bulgarian firms have gradually recovered from the large drop in leverage ratios, Czech firms have not been able to reverse the trend of declining leverage. Only in 2001 did (very) large firms slowly start to leverage up again.

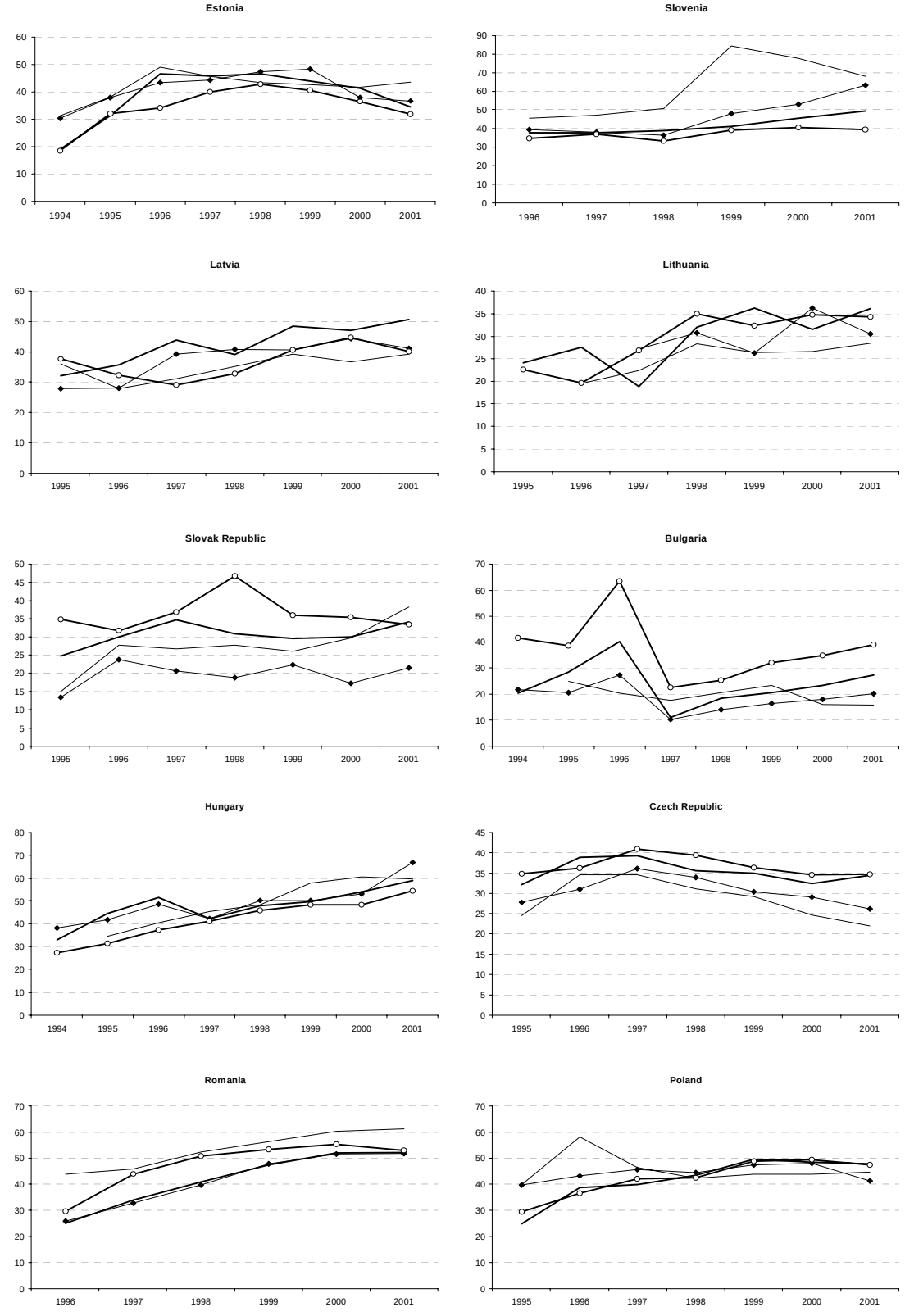
As regards the relationship between size and leverage, we find that in Estonia, Latvia, and Hungary large firms are on average significantly less leveraged (5 per cent level). Interestingly, we find that only in Romania and Bulgaria there is a significant positive

[14] In these countries there is a positive and significant (5 per cent level) bivariate correlation between a time trend and our leverage measure.
[15] Except for the very small firms.

bivariate relationship between size and leverage (5 per cent level).[16] 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 (e.g. Budina *et al.* (2002), Everaert and Hildebrandt (2001), Konings *et al.* (2003)). In all other countries we find no significant bivariate relationship between size and actual leverage.

[16] Note that notwithstanding the positive bivariate relationship between size and leverage in Romania, it is actually the size category containing the smallest 25 per cent of firms that has the highest median leverage, yet closely followed by the largest 25 per cent 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.

Figure 2 Development of CEE firms' actual leverage ratios (in per cent)



Source: AMADEUS dataset, authors' own calculations

2.2 THE DETERMINANTS OF THE TARGET CAPITAL STRUCTURE

As described in section 1.1, trade-off theory provides the main underlying framework of our theoretical model, as we assume that firms aim at a specific, but changing, target capital structure. However, an important rival capital structure theory is the pecking order hypothesis, which argues that due to asymmetric information between managers and investors, firms that need additional financing prefer internal financing to debt financing and debt financing to issuing shares (Donaldson, 1961; Myers, 1984). In its pure form, the pecking order hypothesis implies that firms do not have a target leverage as such. Instead, current leverage mainly reflects firms' historical profitability and their need for additional investment funds. In practice, firms' leverage ratios may be explained by both trade-off and pecking order theory. De Haan and Hinloopen (2003) show for instance that both types of processes are of empirical importance in explaining the financing choices of Dutch firms. And whereas trade-off considerations may be important in the long run, pecking order considerations may matter in the short run (Hovakimian *et al.*, 2001; Remolona, 1990).

Below we discuss a broad set of variables for which one or both theories suggest that they should be included in our analysis.[17] We briefly describe the relationship we expect with firms' target capital structure and whether this relationship is based on trade-off or pecking order considerations. We also explain how we operationalise the particular variable and whether the idiosyncrasies of the transition process warrant different a priori expectations about the economic relationships we study compared to those based on mainstream finance theory. Table 1 provides a summary of these theoretical priors.

Size

Large firms tend to be more diversified and will 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 trade-off theory related reasons, large firms will demand more debt. Pecking order theory stresses that large firms are generally more transparent to investors, so that 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 stock and corporate bond markets, pecking order considerations in a transition context would basically mean that large, transparent firms are able to get more bank credit, whereas small firms are "forced" to rely on internal financing.[18] The relationship between size and target leverage will then be positive, reinforcing the prediction of trade-off theory. We measure size as the log of total assets.

Growth opportunities

According to trade-off theory, agency costs of debt are higher in fast growing firms, as shareholders have more flexibility to pick investments and thus to expropriate wealth from banks and bondholders (Titman and Wessels, 1988). This implies a negative relationship between growth opportunities and leverage. On the other hand it can be argued that in case of increased competition in the banking sector, firms with high growth opportunities will be confronted with a decreasing external finance premium on bank credit (cf. Jayarante and

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

[18] However, large and transparent firms may raise equity finance on foreign stock markets e.g. through depository receipts, 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 per cent of all listings in the CEE EU acceding countries, representing more than two-thirds of market capitalisation, are cross-listed, mostly in New York and London.

Strahan, 1996). This pecking order related mechanism will lead to a positive relationship between growth opportunities and target leverage. We proxy growth opportunities by the percentage change in total assets from the previous to the current year.

Tangibility of assets

According to trade-off theory, tangible assets are easier to liquidate in case of bankruptcy, reducing the costs of financial distress (Jensen and Meckling, 1976). Pecking order theory would stress that, since tangible assets can be used as collateral, they will make the potential consequences of informational asymmetries less severe for credit suppliers. In both lines of reasoning there will be a positive relationship between tangibility and target leverage. However, this may not apply to (some) CEE countries. From a trade-off point of view, it can be argued that firms which mainly have (tangible) long-term assets may want to match these with long-term financing only, which is, however, relatively scarce in most transition countries.[19] Firms with many tangible assets will then use more long-term debt, but may nevertheless be less leveraged overall: the substitution of long-term debt for short-term debt is less than one. This will result in no or even a negative relationship between tangibility and target leverage.[20] Pecking order mechanisms may also weaken or neutralise the positive effect of tangibility on leverage. This will be the case if asset tangibility does not alleviate the potential negative consequences of informational asymmetries. This may be due to an ineffective legal system or to the fact that tangible assets are mostly very specific assets and thus "sunk" (Worthington, 1995). We measure tangibility as the ratio between tangible fixed assets and total fixed assets.

Profitability

According to trade-off theory, 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).[21] 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 from bad firms, 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. Such pecking order behaviour leads to a negative relationship between profitability and target leverage.

A positive profitability coefficient thus points to a situation in which external shareholders of especially profitable firms face an incentive to demand bank debt as a means to shield profits from tax authorities or grabbing managers. Banks are happy to supply as long as they can easily discriminate between good and bad firms. A negative profitability coefficient exists if information asymmetries lead to a large external financing premium, so that profitable firms will prefer to use their cheap internal financing. Not so profitable firms will use more bank debt, since they lack internal alternatives. Apparently, banks cannot adequately discriminate between good and bad firms. (This information asymmetry is the cause of the high external

[19] 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 industrialised countries.

[20] Booth *et al.* (2001) find evidence of such a negative relationship between tangibility and the total debt ratio for a sample of firms in developing countries and Jelic *et al.* (1999) for Czech and Hungarian companies. As the former authors find a positive relationship between tangibility and a long-term debt ratio, they take this combined result as evidence of matching behaviour by firms.

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

finance premium in the first place.) We measure profitability as pre-tax operating profit (or loss) to total assets.[22]

Non-tax debt shield

According to trade-off theory, higher non-tax debt shields, such as depreciation, make the (tax shield) advantage of debt financing partly redundant. Hence, we expect a negative association between non-debt tax shields and target leverage (DeAngelo and Masulis, 1980). We proxy non-debt tax shields as the ratio between depreciation and total assets.

Income variability

Trade-off theory suggests that 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 Myer'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 turn-over over the sample period and is thus time-invariant.

Trade credit

Since we exclude creditors from our leverage measure, we can include trade credit as an explanatory variable. Trade credit may be an important alternative external 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, we expect to find a negative relationship between the trade credit variable and target leverage. We measure trade credit as the ratio between total credit by creditors and total assets (the latter decreased by total credit by creditors).

Age

Older firms have a longer track record and thus a higher reputational value. We therefore expect that older firms will, all else equal, have a higher target leverage ratio since they face a lower external financing premium on debt. Age is measured as the number of years since incorporation.

Firm-specific interest rate

Firms that have to pay relatively high interest rates will, all else equal, demand fewer loans than the average firm. This interest rate variable thus intends to proxy for the external finance premium firms are facing. We calculate the interest rate as [100* total interest paid / (long term debt plus loans)].[23]

---

[22] One could argue that profitability ("operating profit to total assets") and growth opportunities ("change in total assets") may be highly correlated. However, note that we measure profit pre-tax and pre-dividend. A profitable firm without any positive net present value projects to invest in, 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 per cent and 23 per cent.

[23] In AMADEUS "long term debt" and "loans" are mutually exclusive liability categories.

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).[24] Public (private) firms' capital is divided into shares which can (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, we expect the relationship between the legal dummy and target leverage to be negative.

Macroeconomic and other country specific variables

We capture the effect of time-varying macrofactors as follows. First, we include GDP growth as a proxy for financing needs. According to Wanzenried (2002) we should thus expect a positive association with target leverage. Yet, new investments may just as well be financed by issuing equity or out of retained earnings, which will generally increase as well during an economic upswing. The effect of GDP growth on firm leverage and adjustment speed is thus ambiguous. It is still included to see whether on average firms' leverage differs between high and low growth economic environments.

Second, we include HICP-inflation to control for the influence of a high inflation environment on book value leverage. This influence may be either negative or positive. In the first case, high inflation – which often equals more volatile inflation – makes it more costly to contract and thus decreases firms' appetite for debt financing. Inflation will also decrease leverage ratios if it mainly leads to higher nominal profits, higher nominal retained earnings, and thus higher nominal additions to equity. Yet, these negative effects may be countered by the positive effect of inflation on total debt, which due to refinancing may inflate faster than equity.

Third, in addition to the firm-specific interest rate, we include the 3-month money market interest rate as a proxy for the average (non-agency) cost of borrowing. Higher interest rates make debt more expensive or even unattainable. We, therefore, expect a negative relationship between the money market interest rate and both target leverage and the adjustment speed.

Fourth, we include foreign bank penetration as a proxy for qualitative banking development (see appendix for details). We expect that a more developed banking system will make external financing available for more firms, especially smaller ones (which may suffer disproportionately from information asymmetries). We thus expect a positive coefficient between foreign bank penetration and both target leverage and the adjustment speed.

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

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	TO: + PO: ±	TO: + PO: +
Growth opportunities	% change total assets	TO: - PO: +	TO: - PO: +
Tangibility	tangible fixed assets / total fixed assets	TO: + PO: +	TO: . / - PO: .
Profitability	pre-tax operating profit to total assets	TO: + PO: -	TO: + PO: -
Non-tax debt shield	depreciation / total assets	TO: - PO: .	TO: - PO: .
Income variability	standard deviation turn-over	TO: ± PO: .	TO: ± PO: .
Trade credit	creditors / (total assets – creditors)	TO: . PO: -	TO: . PO: -
Age	years since incorporation	TO: . PO: +	TO: . PO: +
Firm-specific interest rate	100 * interest paid / (long term debt + loans)	TO: . PO: -	TO: . PO: -

TO: Trade-off theory, PO: Pecking order theory. -/+ indicates a negative/positive expected correlation with the target leverage ratio. A dot indicates that the particular theory yields no prediction or – in case there is a prediction for industrialised countries – that there are a priori reasons to expect that the effect for industrialised economies will not materialise in a transition context. ± indicates that the particular theory yields an inconclusive prediction.

2.3 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 before estimating the complete dynamic model.

Distance from target

Distance from target is measured as the absolute 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.[25] 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 getting additional debt. On the other hand, it may be the case that it is easier for underleveraged firms to take on additional debt, whereas overleveraged firms may actually have difficulties in reducing their debt burden due to 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

[25] Both variables are expressed in absolute terms. The initial distance variables, which we use as independent variables in the dynamic model, are the (absolute) residuals generated by the first (static) step of our estimation strategy (cf. section 1.6).

close to their target.[26] In that case, firms only adjust – e.g. through some form of financial restructuring – when they have reached a substantial deviation from their target capital structure. Firms that are close to their target do not close the remaining gap because the costs of incremental adjustment 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. Yet, firms that are far away from their target, adjust only very incrementally. A positive coefficient thus points to a situation in which gradual adjustment costs are high relative to one-time financial restructuring costs, whereas a negative coefficient points to a situation in which gradual adjustment costs are relatively low when compared to those of one-time financial restructuring operations.

Income variability

Income variability – measured as the standard deviation of turn-over – 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. We thus expect a positive relationship.

Macro- economic and other country specific variables

For GDP growth, inflation, the 3-month interest rate, and foreign bank penetration we expect an ambiguous, ambiguous, negative, and positive relationship, respectively (cf. section 2.2).

[26] Our specification assumes that the adjustment speed is linearly dependent on the absolute distance from the target. Alternative specifications could introduce threshold effects or convex adjustment costs. We leave this 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 easily be seen by rewriting (2a) as $L_{it} = L_{it-1} + \delta_{it}\left(L^{*}_{it-1} - L_{it-1}\right)$. Since δ_{it} is dependent on distance itself, a quadratic distance term enters the leverage equation.

3. EMPIRICAL RESULTS

3.1 DETERMINANTS OF THE TARGET CAPITAL STRUCTURE AND THE ADJUSTMENT SPEED

The regression results for our dynamic model are shown in Table 2. We find that profitability and age are 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 six out of ten country regressions. The coefficient ranges between -0.03 and -0.67 and is -0.10 for the total sample. This last figure implies that an increase in profitability of 10 percentage points leads to a decrease in the target leverage ratio of about 1 percentage point.[27] Our finding is in line with Booth *et al.* (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 2.2, the negative coefficients point to information asymmetries which lead to higher external financing premiums and pecking order behaviour. Still, such a situation may be either largely supply or demand driven. Negative profitability coefficients as such should thus not be seen as evidence of pure supply side credit crunching by banks. Cornelli *et al.* (1996) argue that the fact that profitable CEE firms use retained earnings should be considered as a bad signal, as it shows that firms cannot achieve their target capital structure due to credit rationing. We disagree with this interpretation since it depends on the assumption that more profitable firms always *demand* more debt, for instance to increase their tax shield. However, empirical studies show that also in developed countries profitable firms have on average less debt. Whereas CEE financial systems may thus still be characterised by important information asymmetries, this is not a transition-specific phenomenon. The negative coefficients we find most likely reflect "normal" pecking order behaviour, rather than a bank credit crunch.[28]

We find a second very robust cross-country result for age. In the overall regression, as well as in all individual country regressions, age enters positively and significantly. Apparently, older firms are better able to 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. Therefore, each extra year since incorporation, a firm's target leverage will be approximately 0.02 percentage points higher.[29]

Firm growth has a positive and significant coefficient in three countries and is insignificant in the others and in the overall specification. Apparently, firms with high growth opportunities do not always increase their target leverage (and through that actual leverage) in order to exploit these opportunities; the role of bank debt in financing firm growth remains limited.

Interestingly, we find a negative relationship between tangibility and debt targets in Bulgaria, Hungary, and Romania. Apparently, and in line with Nivorozhkin (2003) and the empirical research cited in that paper, collateral does not pose an effective guarantee against bankruptcy in these countries. On the contrary, firms with many tangible assets have lower debt targets. Possibly these firms try to match the maturity structure of their assets and liabilities. In that case, firms with many tangible assets may demand long-term financing, which banks in CEE are still very reluctant to provide (cf. footnote 20). For creditors we find only in the overall regression a significant and positive coefficient. Apparently, on the individual country level the role of creditors is not important enough to show up significantly. The positive sign of the coefficient implies that trade credit is a supplement rather than a substitute for "formal" types of credit. We do not find an effect of the firm-specific interest rate on the target debt level of firms. Only in Bulgaria do we find a significant, though very small negative effect. Income

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

[28] Similarly, Booth *et al.* (2001) interpret the consistent negative relationship between profitability and leverage in their set of 10 developing countries as being consistent with pecking order behaviour.

[29] Klapper *et al.* (2002) find a negative relationship between age and leverage, but only use cross-section data for the year 1999.

variability is only (positively) significant in Lithuania. Legal form appears to be important only in Latvia and Hungary, where public firms are significantly less leveraged compared to private and "other" firms. Firm size does not influence target leverage ratios in any of the countries we study. The bivariate relationship between size and actual leverage we find for some countries (cf. section 2.1) apparently mainly reflects third factors rather than size as such. As a result, size does not enter our target leverage regressions as a separate significant variable. Finally, we do not find evidence of an incentive to increase leverage because of corporate taxes, as our non-debt tax shield variable enters none of the regressions significantly.

Besides these firm-specific explanatory variables, we also use a set of macro-variables. GDP growth never enters significantly, probably reflecting the fact that we already take into account investment opportunities at the firm level through firm growth. Inflation has a small negative effect in the whole sample, but never enters the individual country regressions significantly. The three month interest rate is only significant in Estonia, though with a counter-intuitive positive coefficient.

Interestingly, for Latvia and Romania we find a positive influence on target debt levels of an increasing relative importance of foreign banks. However, this effect appears to be negative in Bulgaria. This last result is consistent with the fact that whereas foreign bank presence may in some countries decrease problems of asymmetric information, making it possible for firms to increase their debt levels, this may not have been the main effect in Bulgaria. In this country, soft budget constraint problems have been protracted and foreign banks entered only later in the transition process, so that until now their main influence may have been to harden budget constraints and to cut off loss making firms from additional credits.

As regards the determinants of the adjustment speed, our most important finding is that in general the distance from the optimum is positively related to the adjustment speed. 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-time financial restructuring costs and this holds in most countries for both underleveraged and overleveraged firms. However, in several countries the distance variable is either only significant for overleveraged firms (Estonia, the Slovak Republic, Hungary), or the coefficient for overleveraged firms is higher than for underleveraged firms (Slovenia, Lithuania, the Czech Republic, Poland, and the complete sample). The distance-to-target effect on adjustment speed thus tends to be somewhat more important for overleveraged firms.

Table 2 Regression results dynamic adjustment model

	Total sample	***Estonia***	***Slovenia***	***Latvia***	***Lithuania***	***Slovak Republic***	***Bulgaria***	***Hungary***	***Czech Republic***	***Romania***	***Poland***
Dependent variable	**L***	**L***	**L***	**L***	**L***	**L***	**L***	**L***	**L***	**L***	**L***
Explanatory variables											
Growth total assets			0.01**	0.01**	0.08***						
Tangibility							-0.16***	-0.00**		-0.06***	
Profitability	**-0.10*****		-0.47***	-0.03***	-0.21**			-0.05***		-0.14***	-0.67***
Income variability					0.14***						
Creditors	**0.13*****										
Age	**0.02*****	0.02***	0.04***	0.02***	0.02***	0.02***	0.05***	0.03***	0.02***	0.04***	0.03***
Firm-specific interest rate							-0.01***				
Legal form				-9.20***				-10.65***			
Inflation	**-0.05*****										
3 month interest rate		1.59***									
Foreign bank penetration				0.02***			-0.75***			0.12***	
Dependent variable	δ	δ	δ	δ	δ	δ	δ	δ	δ	δ	δ
Explanatory variables†											
Distance from optimum (+)	**0.13*****		0.06***	0.82***	0.37***		-0.04**		0.07***	0.14***	0.23***
Distance from optimum (-)	**0.14*****	0.27***	2.11***	0.42***	0.49***	0.14*	0.18***	0.15***	0.14***	0.12***	0.29***
Income variability				0.80***		1.68***		0.04***			
GDP growth		0.82**			0.86**		0.39***			-111.16**	
Inflation	**0.06*****						0.05***			-12.90***	
3 month interest rate						-0.59**					
Foreign bank penetration						-0.68***		-0.03**		0.00*	
R^2_{adj}	**0.74**	0.91	0.96	0.90	0.91	0.92	0.79	0.93	0.62	0.71	0.91
R^2_{adj} (dynamic, δ fixed)	**0.70**	0.90	0.95	0.89	0.90	0.76	0.76	0.92	0.20	0.64	0.90
R^2_{adj} (AR(1))	**0.31**	0.62	0.82	0.63	0.71	0.79	0.46	0.59	0.20	0.23	0.62
R^2_{adj} (static model)	**0.09**	0.06	0.44	0.07	0.20	0.08	0.04	0.14	0.05	0.13	0.06
Number of observations	**67,125**	1,697	2,052	1,715	879	953	11,065	3,806	12,525	24,005	8,428

†: The coefficients for the variables explaining δ are multiplied by 100 for presentational purposes.

Intercept and sector dummies –in total sample regression: country dummies – not shown.

***, **, * denote significance at the 1 per cent, 5 per cent, and 10 per cent respectively.

This shows that especially for firms with "too much" bank credit it is not worthwhile to incrementally decrease their debt burden, as the costs associated with too much leverage are apparently very low. Our results are in line with those of Ju *et al.* (2003) who find that the costs of moderate deviations from target capital structures – in terms of the negative effect on firm value – are relatively small when compared to the transaction costs involved, making frequent incremental leverage adjustments less likely. Finally, for Latvia, the Slovak Republic, and Hungary we find the expected positive relationship between income volatility and adjustment speed. Higher GDP growth increases the adjustment speed in Estonia, Lithuania, and Bulgaria, but lowers it in Romania, while higher inflation has a positive influence on the adjustment speed in the total sample (and Bulgaria), but again lowers it in Romania.

The last rows in Table 2 give more information as to how the explanatory power of our dynamic capital structure model is built up. The first row of R^2s shows that our dynamic model generally explains between 62 per cent and 96 per cent of the within-country variation in target capital structures. The explanatory power in the overall dataset is 74 per cent. Comparing this first row with the second one, the effect of allowing the adjustment parameter to be both time and firm specific (rather than fixed per country) becomes clear. For some countries, such as the Slovak Republic, the Czech Republic, and Romania, this adds quite some explanatory power, whereas for others the effect is only 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 Slovenia and the Slovak Republic, 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, we conclude that using a dynamic model rather than a static one increases the explanatory power significantly. 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, we also estimated similar regressions for a model in which the adjustment during the current period is made on the basis of L_{it}^{*} rather than L_{it-1}^{*}.[30] However, such an approach, as taken by for example BHW, possibly introduces a potential for simultaneity bias in the reduced form equation that is finally estimated. We find in general very similar estimation results: age and profitability are the most robust determinants of target capital structures. Profitability is even significantly negative in nine out of ten countries. Importantly, in these regressions also the growth in total assets appears to be a particularly important determinant, as we find a positive and significant coefficient in seven out of ten countries (rather than three in the regressions with a lagged target). Note, however, that especially the asset growth variable may be liable to endogeneity problems as net investments will often be related to financing changes in the same year. We thus conclude that our model specification has improved our results by diminishing the potential for simultaneity bias, especially as regards the growth variable.

In sum, Table 2 shows that profitability and age are the most robust determinants of CEE firms' target capital structures and that the signs of the coefficients points to pecking order behaviour. However, differences between countries as regards additional explanatory

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

variables are large, confirming the observation by Booth *et al.* (2001) that capital structure models are only to a limited extent "portable" across countries. Finally, we find 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.

3.2 THE RATIO BETWEEN THE TARGET CAPITAL STRUCTURE AND THE ACTUAL CAPITAL STRUCTURE

Using the estimated coefficients as summarised in Table 2, we calculate the target capital structures as well as the speed of adjustment towards these targets. Figure 3 shows the development of the ratio between the target leverage and observed leverage. At the individual firm level the actual leverage equals the firms' target if the ratio is one. If the ratio is larger (smaller) than one, this indicates that firms are underleveraged (overleveraged). For our complete database we find that of a total of 69,841 observations – 48,358 observations (69 per cent) concern underleveraged firms, whereas 21,483 observations (31 per cent) concern overleveraged firms. This is a first indication that most CEE firms have less debt than they would like to have. To gain more insight, we again divide all observations in four quartiles and calculate the median ratio for each of these. For instance, if the ratio for large firms is higher than one this implies that the median large firm is underleveraged, i.e. more than 50 per cent of all large firms are underleveraged. We find that in all countries and in almost all size categories the median firm is still underleveraged.[31] In 2000 and 2001 the problem of underleveraged firms was most severe in Bulgaria, Slovenia, and the Slovak Republic, whereas firms were closest to their leverage targets in Latvia, Hungary, and Estonia (Table 3). Here especially the difference between Hungary and Slovenia is striking. In 2000-01 the average actual leverage was among the highest in these two countries: 57 per cent and 55 per cent, respectively. However, whereas these high actual leverage levels allowed the Hungarian firms to reach their capital structure targets, they are apparently still not sufficient for the Slovenian firms.

[31] Exceptions are (very) large Latvian firms and the smallest Hungarian firms which have become somewhat overleveraged.

Table 3 Average ratio target leverage (L*) to actual leverage (L) 2000-01

Country	(L* / L)	Country	(L* / L)
1. Latvia	0.96	6. Lithuania	1.51
2. Hungary	1.01	7. Czech Republic	1.53
3. Estonia	1.05	8.Slovak Republic	1.70
4. Poland	1.25	9. Slovenia	1.75
5. Romania	1.49	10. Bulgaria	2.20

A higher ratio means that firms are relatively severely underleveraged. The ratio is calculated as the mean of the median ratio for each size quartile in both 2000 and 2001.

Still, we find that over time firms in all size categories in Estonia, Slovenia, Latvia, Lithuania, Hungary, and Romania have gradually been able to bring their actual leverage closer to their targets.[32] This trend is also observable in the Slovak Republic, except for small firms which have become severely underleveraged after 1998. Also in the Czech Republic particularly small and very small firms have become more underleveraged since 1998, while this trend had been less pronounced for large and very large firms.[33] In Poland very small and small firms have gradually become somewhat (more) underleveraged, whereas large and very large firms have on the contrary become less underleveraged. Bulgarian firms became gradually less underleveraged since the beginning of the transition period and got even somewhat overleveraged in 1997. Although actual leverage has gradually increased after the crisis period, Bulgarian firms appear to have become chronically underleveraged, even the largest firms. Finally, we use the ownership information in AMADEUS to differentiate between domestic and foreign firms.[34] Although we find in general no important differences between domestic and foreign firms as regards actual and target leverage or adjustment speeds, we do find that especially in the Slovak Republic and the Czech Republic foreign firms have become more leveraged and closer to their targets than domestic firms. Domestic firms have – on the contrary – become (more) underleveraged. Apparently, foreign firms have been better able to circumvent the credit crunch by domestic banks, either because of better characteristics or

[32] One could argue that the declining discrepancy between firms' actual and target leverage ratios 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 (not) getting finance, thus decreasing their targets. Note that such arguments basically boil down to the question whether we can accurately capture such possible shifts in the average firm's target leverage. Basically, firms' average preferences for leverage should be reflected in the constants in our regressions. While not attempting to estimate possible changes in these average preferences directly, any such shifts are likely to be at least partly captured by our time-varying, country-level variables. As a result, we can be reasonably sure that the target leverage ratios we calculate form a good approximation of the true leverage firms regard as optimal at a certain moment in time, given both their own characteristics and the economic environment they operate in.

[33] This is in line with Lízal and Svejnar (2002) who show on the basis of firm level data from the Czech Statistical Office that in the Czech Republic co-operatives and small private firms have been credit rationed.

[34] We define a foreign firm as a firm which had a majority of foreign owners in 2001. All other firms were considered to be domestically owned.

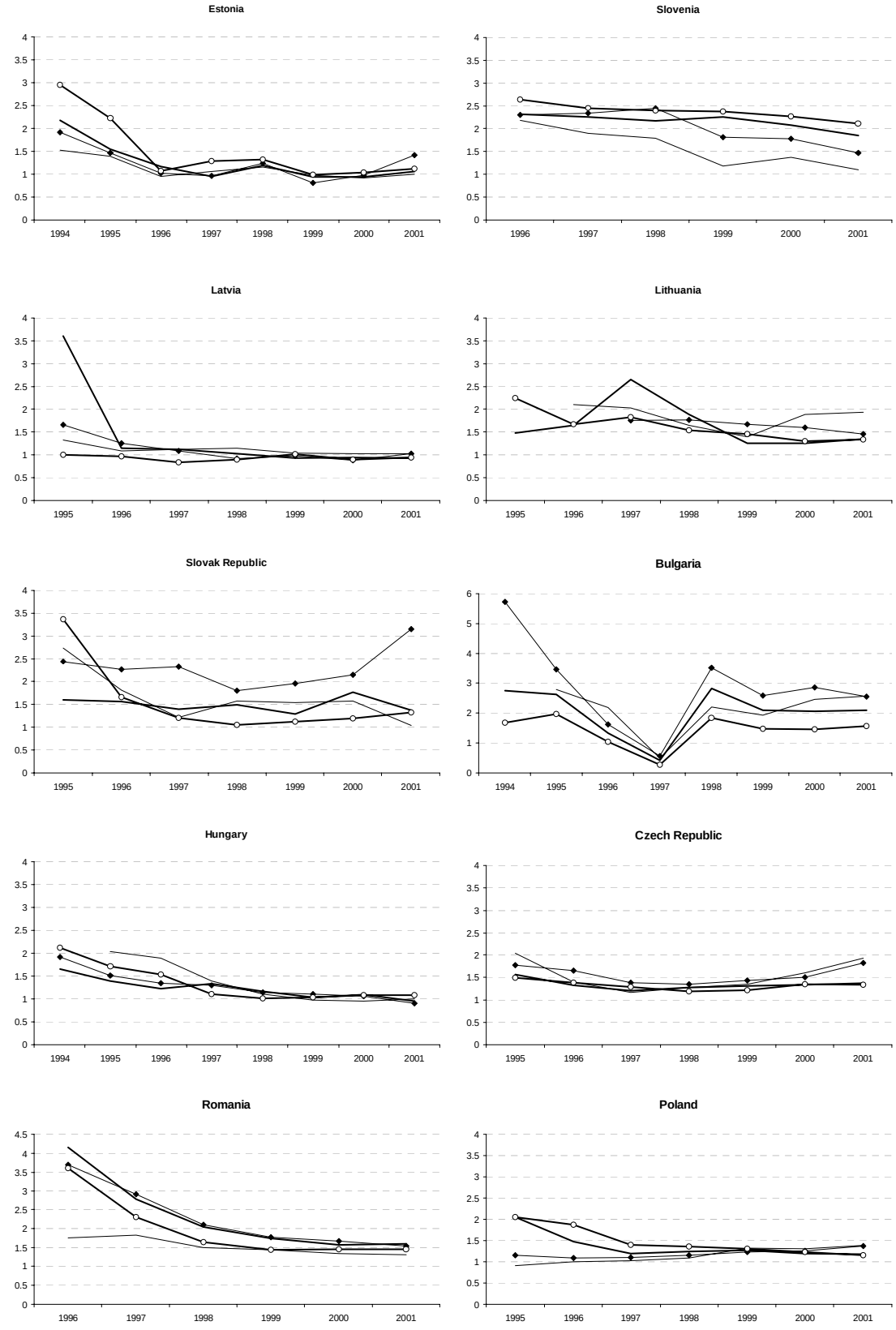
because of closer relationships with (foreign) banks.[35] In a similar vein, Latvian and Hungarian domestic firms have gradually (almost) reached their target leverage, whereas foreign firms are overshooting their targets and have become consistently overleveraged (see Table A2 in the appendix for exact figures).[36]

In summary, 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 especially small and very small firms have become more underleveraged after the financial crises during the second half of the 1990's. In several countries foreign firms have been able to get closer to their targets, or to even overshoot them, whereas domestic firms stayed underleveraged or became even more underleveraged.

[35] 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.

[36] 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 may 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.

Figure 3 Ratio target leverage to actual leverage (L* / L) of CEE firms



Source: AMADEUS dataset, authors' own calculations.

3.3 THE SPEED OF ADJUSTMENT

Figure 4 depicts the development of the adjustment speed. Differences between size groups are in most countries marginal. Yet, when we correlate firms' size with their adjustment speeds, we find a positive and significant (5 per cent level) correlation in Latvia, Hungary, the Slovak Republic, and Poland. Similarly, when we correlate firms' yearly adjustment speeds with a time dummy, we find a tendency (5 per cent level) for firms to decrease their adjustment speeds over time in Estonia, Latvia, the Slovak Republic, Bulgaria, and Hungary.

Table 4 Average adjustment speed 2000-01 in percentages

Country	δ	Country	δ
1. Bulgaria	19	6. Latvia	13
2. Estonia	17	7. Lithuania	12
3. Czech Republic	16	8. Poland	11
4. Romania	14	9. Slovak Republic	9
5. Hungary	13	10. Slovenia	2

Calculated as the mean of the median δ for each size quartile in both 2000 and 2001.

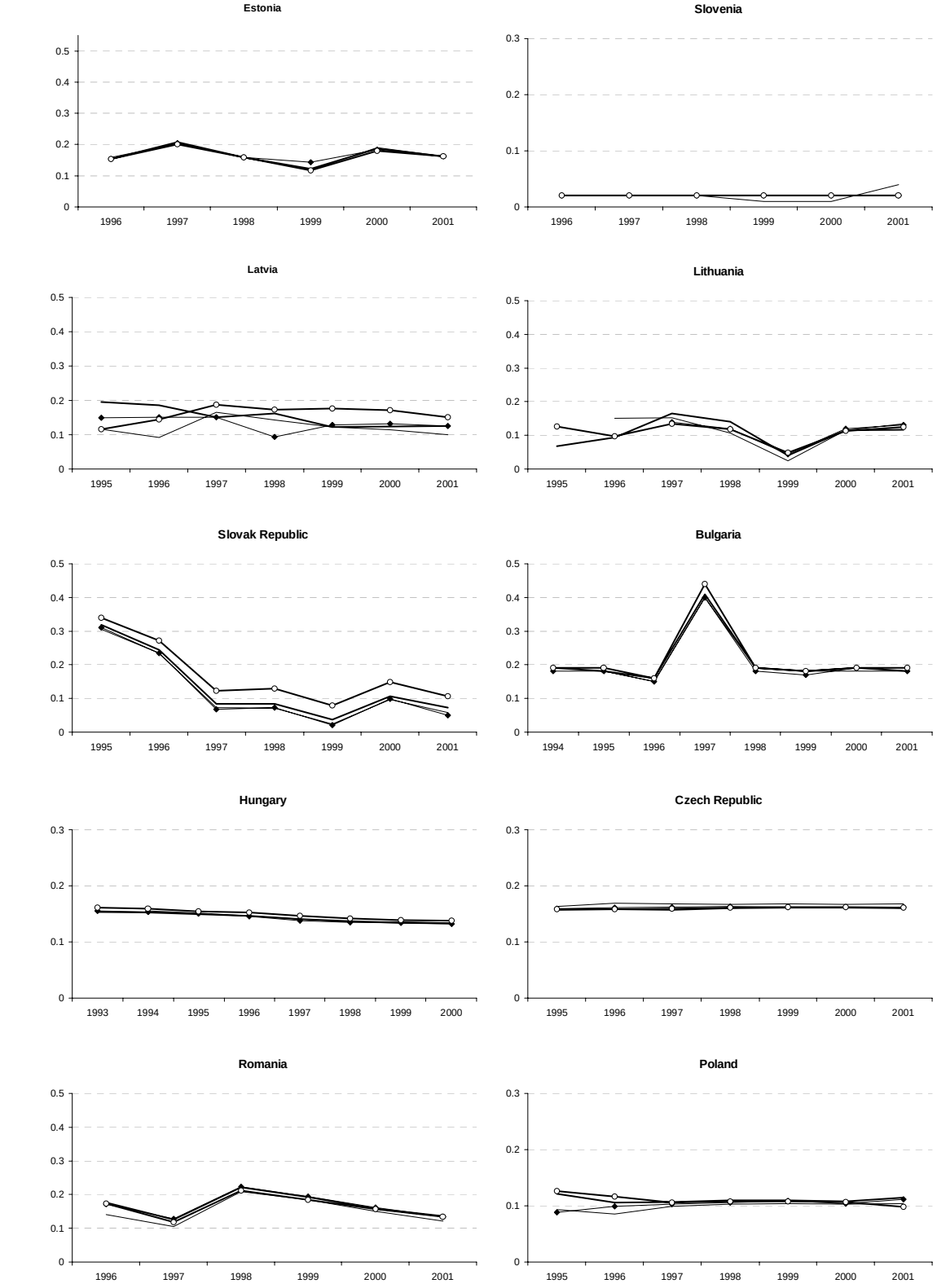
Table 4 shows that in 2000 and 2001 the average adjustment speed was between 2 per cent (Slovenia) and 19 per cent (Bulgaria).[37] On average, firms adjust about 13 per cent of the gap between their actual and desired leverage ratio, which means it will take five years to close half of the leverage gap. These adjustment speeds are significantly lower than those for the US (27 per cent) and the UK (28 per cent), and more in line with for instance Sweden and the Netherlands (10 per cent in both countries).[38] The lower adjustment speeds in CEE (and Western Europe) when compared to the UK and the US may point to pecking order behaviour, as firms adjust their capital structure slowly, e.g. only in case additional investment financing is necessary.[39]

[37] Nivorozhkin (2003) finds for the Czech Republic an average adjustment speed of 15 per cent for the 1994-97 period (we: 16 per cent for 1995-97) and for Bulgaria 43 per cent (we: 27 per cent same period).

[38] Sweden: Lööf (2003), sample period averages. For the Netherlands, we estimated a dynamic adjustment model and found an average adjustment speed of 10 per cent. Wanzenried (2002) also finds that UK firms have a significantly higher adjustment speed.

[39] 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 as regards the challenges 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 (besides firm level explanatory variables such as the *firm specific* distance from the target).

Figure 4 CEE firms' average adjustment speed (δ)



Source: AMADEUS dataset, authors' own calculations

4. SUMMARY AND CONCLUSIONS

We use a dynamic capital structure model to study the adjustment process of firms towards their target capital structures. We endogenise both the target leverage ratio and the adjustment speed and apply the model to microdata for 10 CEE countries (1993-2001). Compared to a static capital structure model, our dynamic model increases the explanatory power significantly. Generalising the adjustment speed by making it firm- and time-specific adds further power, but the importance of this differs across countries.

Our data show that actual CEE leverage ratio's are mostly still (considerably) below Western standards, although there is a clear upward trend in firms' leverage in almost all countries. The gradual development of the financial system has enabled firms to reach higher debt levels. Based on our estimations we show that in most countries there is also a tendency for firms to gradually bring their actual leverage closer to their internal targets, although adjustment speeds are relatively low. Yet, across the board firms are still underleveraged and in some countries especially small and very small firms have become more underleveraged after the financial crises during the second half of the 1990's. We also find that in several countries foreign firms have been able to get closer to their targets, or even overshoot them, whereas domestic firms stayed underleveraged.

As regards the determinants of firms' leverage, we find that differences between countries as regards explanatory variables are large, implying that capital structure models are only to a limited extent "portable" across countries. Nevertheless, we find that profitability and age are very robust determinants of target capital structures. These results contribute to our understanding of the role that credit markets are currently playing in CEE. In particular we find that (1) firms' leverage targets are negatively influenced by their profitability and positively by their age, (2) that adjustment speeds are relatively low, and that (3) firms that are further away from their leverage target adjust faster than firms that are already close to their target. All three findings point to the importance of information asymmetries between firms and banks, by far the main suppliers of external finance in CEE. As a result, external finance premiums are relatively high, making it rational for especially profitable firms to rely on internal financing. At the same time, such pecking order behaviour means that capital structure adjustments are only slowly implemented. Also, firms that are not too far away from their leverage target do not find it worthwhile to get back on track immediately, probably because the costs of doing so outweigh the benefits. Only when firms get too under- or overleveraged do they resort to some kind of financial restructuring to get back to their target leverage.

Although the development of the CEE banking systems has enabled firms to reach higher debt levels, bringing them closer to their own targets, the costs associated with external funding are still relatively high. From a policy perspective this means that there seems to be ample room in CEE to further deepen, both quantitatively and qualitatively, the financial systems. This will not only increase the value of firms, but will also stimulate real economic development in these countries. Future research may apply dynamic capital structure models to a wider range of Western (European) countries as well, so that more definite conclusions can be drawn about the relative merits of different financial systems in allowing firms to optimise their value by staying close to their internal leverage targets.

REFERENCES

S. Banerjee, A. Heshmati, C. Wihlborg, (2000), "The dynamics of capital structure," SSE/EFI Working Paper Series in Economics and Finance, No. 333.

L. Booth, V. Aivazian, A. Demirgüç-Kunt, V. Maksimovic, (2001), "Capital structures in developing countries," *Journal of Finance*, 56, pp. 87-130.

R.G. Bowman, (1980), "The importance of a market value measurement of debt in assessing leverage," *Journal of Accounting Research*, 18, pp. 242-254.

N. Budina, H. Garretsen, E De Jong, (2000), "Liquidity constraints and investment in transition economies. The case of Bulgaria," *Economics of Transition*, 8, pp.453-475.

K. Cools, (1993), "Capital structure choice. Confronting (meta)theory, empirical tests and executive opinion", PhD-thesis, Tilburg University.

F. Cornelli, R. Portes, Richard, M.E. Schaffer, (1996), "The capital structure of firms in Central and Eastern Europe," Discussion Paper No. 1392, Centre for Economic Policy Research (CEPR), London.

Corporation of London, (2003), "The future of stock exchanges in European Union accession countries," London. Available at http://www.cityoflondon.gov.uk/media_centre/files/future_stock_exchanges.htm

H. DeAngelo, R.W Masulis, (1980), "Optimal capital structure under corporate and personal taxation," *Journal of Financial Economics*, 8, pp. 3-29.

L. De Haan, J. Hinloopen, (2003), "Preference hierarchies for internal finance, bank loans, bond, and share issues: Evidence for Dutch firms", *Journal of Empirical Finance*, 10, pp. 661-681.

R.T. De Haas, (2004), "Law, finance, and growth during transition: a survey," *De Economist*, 152(3), pp. 1-28.

R.T. De Haas, I.P. Van Lelyveld, (2004), "Foreign bank penetration and private sector credit in Central and Eastern Europe," *Journal of Emerging Market Finance*, 3(2), pp. 125-151.

A. Demirgüç-Kunt, V. Maksimovic, (1999), "Institutions, financial markets, and firm debt maturity," *Journal of Financial Economics*, 54, pp. 295-336.

G. Donaldson, (1961), *Corporate debt capacity: A study of corporate debt policy and the determination of corporate debt capacity*. Harvard Business School, Division of Research, Harvard University.

G.M. Everaert, A Hildebrandt, (2001), "On the causes of soft budget constraints: firm-level evidence from Bulgaria and Romania," LICOS Discussion Paper, No. 10901, LICOS Center for Transition Economics, Catholic University of Leuven.

M.J. Flannery, K. Rangan, (2003), Partial adjustment toward target capital structures, mimeo.

M. Harris, A. Raviv, (1991), "The theory of capital structure," *Journal of Finance*, 46, pp. 297-355.

A. Heshmati, (2002), "The dynamics of capital structure: evidence from Swedish micro and small firms," *Research in Banking and Finance*, Vol. 2, Elsevier Sciences, pp. 199-241.

A. Hovakimian, T. Opler, S. Titman, (2001), "The debt-equity choice," *Journal of Financial and Quantitative Analysis*, 36, pp. 1-24.

Q. Hussain, E. Nivorozhkin, (1997), "The capital structure of listed companies in Poland," IMF Working Paper, No. 175, Washington D.C.

J. Jayarante, P.E. Strahan, (1996), "The finance-growth nexus: evidence from bank branch deregulation," *Quarterly Journal of Economics*, 11, pp. 639-670.

R. Jelic, R.J. Ranko, Briston, C. Mallin, (1999), "Gambling banks and firm financing in transition economies," *Multinational Finance Journal*, 3, pp. 253-282.

M.C. Jensen, (1986), "Agency costs of free cash flow, corporate finance and takeovers," *American Economic Review*, 76, pp. 323-329.

M.C. Jensen, W.H. Meckling, (1976), "Theory of the firm: managerial behaviour, agency costs and ownership structure," *Journal of Financial Economics*, 3, pp. 305-360.

N. Ju, R. Parrino, A.M. Poteshman, M.S. Weisbach, (2003), "Horses and rabbits? Optimal dynamic capital structure from shareholder and manager perspectives," mimeo.

L.F. Klapper, V. Sarria-Allende, V. Sulla, (2002), "Small- and medium-size enterprise financing in Eastern Europe," World Bank Policy Research Paper, No. 2933, Washington D.C.

J.R. Konings, M. Rizov, H. Vandenbussche, (2003), "Investment and financial constraints in transition economies: micro evidence from Poland, the Czech Republic, Bulgaria, and Romania," Economics Letters, 78, pp. 253-258.

S.C. Kumbhakar, A. Hesmati, L. Hjalmarsson, (2002), "How fast do banks adjust? A dynamic model of labor-use with an application to Swedish banks," *Journal of Productivity Analysis*, 18, pp. 79-102.

R. La-Porta, F. Lopez-De-Silanes, A. Shleifer, R.W. Vishny, (1998), "Law and finance," *Journal of Political Economy*, 106, pp. 1,113-1,155.

R. Levine, (1999), "Law, finance, and economic growth," *Journal of Financial Intermediation*, 8, pp. 8-35.

L. Lízal, J. Svejnar, (2002), "Investment, credit rationing, and the soft budget constraint: evidence from Czech panel data," *The Review of Economics and Statistics*, 84, pp. 353-370.

H. Lööf, 2003, "Dynamic optimal capital structure and technological change," Working Paper No. 2,003-23. Swedish Institute for Studies in Education and Research (SISTER), Stockholm.

S.C. Myers, (1977), "Determinants of corporate borrowing," *Journal of Financial Economics*, 5, pp. 147-175.

S.C. Myers, (1984), "The capital structure puzzle," *Journal of Finance*, 39, pp. 575-592.

S.C. Myers, N.S. Majluf, (1984), "Corporate financing and investment decisions when firms have information that investors do not have," *Journal of Financial Economics*, 13, pp. 187-222.

F. Modigliani, M.H. Miller, (1963), "Corporate income taxes and the cost of capital: a correction," *American Economic Review*, 53, pp. 433-443.

E. Nivorozhkin, (2003), “The dynamics of capital structure in transition economies,” BOFIT Discussion Paper No. 2, Bank of Finland Institute for Economies in Transition (BOFIT), Helsiniki.

Organisation for Economic Co-operation and Development (OECD), (1995), Financial Statistics Part 3, Non-Financial Enterprises Financial Statements, OECD, Paris.

L. Oxley, Les, M. McAleer, (1993), “Econometric issues in macroeconomic models with generated regressors,” *Journal of Economic Surveys*, 7, pp. 1-40.

A. Pagan, (1984), “Econometric issues in the analysis of regressions with generated regressors,” *International Economic Review*, 25, PP. 221-245.

R.G. Rajan, L. Zingales, (1995), “What do we know about capital structure? Some evidence from international data,” *Journal of Finance*, 50, pp. 1,421-1,460.

E.M. Remolona, (1990), “Understanding international differences in leverage trends,” *Federal Reserve Bank of New York Quarterly Review*, spring issue, pp. 31-42.

S.A. Ross, R. Westerfield, J. Jaffe, (2002), *Corporate Finance*. McGraw-Hill, New York, 6th edition.

S. Titman, R. Wessels, (1988), “The determinants of capital structure choice,” *Journal of Finance*, 42, pp. 1-19.

G. Wanzenried, (2002), “Capital structure dynamics in UK and continental Europe,” Diskussionsschriften No. 02-09, Volkswirtschaftliches Institut Universität Bern, Bern.

P.R. Worthington, (1995), “Investment, cash flow, and sunk costs,” *Journal of Industrial Economics*, 43, pp. 49-61.

APPENDIX

Data sources

Stylised balance sheet of an individual firm in AMADEUS

(Variable names in capitals)

Fixed assets	*FIAS*	*Shareholder funds*	*SHFD*
Intangible	IFAS	Capital	CAPI
Tangible	TFAS	Other	OSFD
Other	OFAS		
		Non-current liabilities	*NCLI*
Current assets		Long-term debt	LTDB
CUAS		Other	ONCL
Stock	STOK		
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 was 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).[40]

DATA CONSTRUCTION

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

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

One may expect LEV to be between 0 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 lower than 0 or higher than 100. The first holds if SHFD is negative and its absolute value even exceeds total debt. Total assets is then negative. This case will be highly unlikely. The latter holds in case

[40] For more details on the construction of the foreign bank penetration measure see De Haas and Lelyveld (2004)

SHFD is negative but does in absolute value not exceed debt. In that case, the firm is theoretically bankrupt, but may be kept alive by creditors, either because discounted expected future profits exceed the current equity gap, or because creditors (such as state-owned banks) have goals other than profit maximisation. In both cases, creditors may decide to keep funding bankrupt firms (in the latter case the firm has a soft budget constraint). As the descriptive statistics in Table A1 make clear, negative values for LEV were in most countries (almost) completely absent, whereas values larger 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 actually be negative or larger than 100 whereas the actual leverage value lies between zero and 100. In practice, the model performed very well in this regards: the percentage observations (not noted in Table A1) where $L \in [0,1] \wedge L^* \in \langle \leftarrow, 0 \rangle$ was zero in all countries, except for Latvia, Bulgaria, and Hungary where it was 0.1 per cent. Similarly, the percentage observations where $L \in [0,1] \wedge L^* \in \langle 1, \rightarrow \rangle$ was zero in all countries except for Poland and Lithuania (0.1 per cent) and Slovenia (0.8 per cent).

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 dropped observations 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 1,000 per cent. A firm was only dropped in the year where one or more of the above mentioned characteristics held. For Slovenia, we excluded CRED since data for this variable were missing for several years. After these selections, the number of consecutive years of observation was counted for each firm. We only included those firms in our sample for which we have at least three consecutive observations. 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 noise. For this reason we dropped the years 1993, 1994 and 1995 during the estimation phase. In spite of the loss of information, we think that this improves the reliability of our estimates. We use the parameters that were estimated on the basis of this reduced sample to calculate – in combination with the 1993-95 data that were left out when estimating – the target leverage and speed of adjustment for 1993-95 as well.

Table A1 Summary statistics (in order of increasing population size)

	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 TOAS (€ mln)	2.0	13.2	2.3	4.4	4.7	0.8	4.9	4.8	1.3	5.6
Median SHFD/TOAS	45.7	54.4	41.4	54.5	47.8	56.5	45.5	44.2	44.2	41.6
Median NCLI/TOAS	5.7	3.5	5.7	3.3	6.6	0.1	1.4	8.5	0.4	3.1
Median CULI/TOAS	38.5	33.4	37.6	32.0	35.7	33.8	46.2	37.1	44.3	46.4
% 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
Total no. of observations	2,099	2,052	1,763	881	985	12,437	3,870	13,257	24,007	8,490

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

	Slovak Republic		**Czech Republic**		**Latvia**		**Hungary**	
	Domestic firms	*Foreign firms*	*Domestic firms*	*Foreign firms*	*Domestic firms*	*Foreign firms*	*Domestic firms*	*Foreign firms*
1995	2.28	n/a	1.68	1.57	1.18	1.37	1.65	n/a
1996	1.73	n/a	1.50	1.36	1.16	0.95	1.39	2.20
1997	1.43	2.49	1.34	1.19	1.16	0.95	1.30	1.20
1998	1.44	3.00	1.47	1.15	1.13	0.92	1.15	1.03
1999	1.37	1.13	1.64	1.15	1.03	0.92	1.11	0.92
2000	1.59	0.96	1.84	1.19	1.03	0.85	1.10	0.98
2001	1.54	0.92	1.90	1.38	1.01	0.89	1.12	0.94