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An empirical analysis of Dutch SMEs

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Abstract

This paper presents empirical evidence of both the determinants and the adjustment speed of capital structure of small and medium-sized enterprises (SMEs) in the Netherlands. Using an administrative panel data set of the period 2000-2014, containing 153,923 firms, we estimate a partial adjustment model through system GMM. The results show that firm size and profitability reduce debt to assets ratios, while tangible assets, depreciation, and marginal taxes increase them. Growth of assets is either statistically or economically insignificant. The estimated adjustment speed parameter is 0.748, indicating that the adjustment process is particularly slow in the Netherlands.

Keywords: Leverage, debt to assets, dynamic panel, SMEs

1. Introduction

Explaining the capital structure of firms is a particularly difficult matter. In the corporate finance literature two theories dominate: trade-off theory (TOT) and pecking order theory (POT). TOT explains that tax advantages (tax shield of debt) provide incentives for debt financing, while costs of financial distress provide incentives for equity financing (Modigliani and Miller, 1963). In other words, firms face a trade-off in choosing between debt and equity financing. POT predicts that due to adverse selection firms prefer retained earnings to debt, while debt is preferred to equity (Myers, 1984). Frank and Goyal (2008), among others, have made it clear that the theories are not necessarily conflicting. They advocate that both considerations, the

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focus on rational optimizing behavior (TOT) and the dominance of retained earnings over debt and equity (POT), have their merits.

Recognizing that there is no single theory that can explain the capital structure of firms, explaining the financing choice has become primarily an empirical matter (Gaud et al., 2005). At least two questions are of special interest in this empirical literature. What firm characteristics drive the capital structure of firms? And, how fast do firms adjust their capital structure in response to policy changes or (firm) characteristics that influence the debt/equity mix?

We will study both questions using a sample of small and medium-sized enterprises (SMEs) in the Netherlands. Our administrative data set from Statistics Netherlands (CBS) covers the period 2000-2014 and includes all Dutch firms liable to corporate income tax (CIT). Most importantly, the data set includes information from balance sheets and income and loss statements. Besides that, we obtained information on the industry in which the firm is active and we are able to construct the marginal tax rate by combining balance sheet data and historical tax rate changes. The final data set includes over 150,000 unique firms.

This study contributes in at least two ways to the corporate finance literature, both related to the data. First, our data set is unique because the administrative nature ensures that we have representative information for a wide range of CIT-liable firms in the Netherlands, both in terms of size and industries. Previous empirical studies often rely on small data samples from large and/or publicly listed firms (e.g. Gaud et al., 2005; Ozkan, 2001). Second, our data allow us to estimate a partial adjustment model for Dutch SMEs. Although we are not the first to estimate a dynamic panel data model for SMEs (e.g. Aybar-Arias et al., 2012), the richness of our data allow us to check heterogeneity in the adjustment speed between industries and size classes.

The structure of this paper is as follows. In section 2 we discuss the relevant literature and our contribution. Section 3 describes the data. Section 4 discusses the empirical model and the estimation strategy. Section 5 provides the estimation results. Section 6 offers robustness checks and section 7 summarizes and concludes.

2. Literature

Multiple factors have been named in relation to the capital structure of firms. Nevertheless, the effects of these factors on firm leverage are not always obvious; predictions regularly differ between TOT and POT, and between different interpretations within each theory. Moreover, firm characteristics included in leverage regressions are often proxies for unobserved determinants. In this section we first discuss the most important firm characteristics that, according to theory, are related to the capital structure of firms. Thereafter, we briefly discuss the recent empirical literature, with a special focus on dynamic panel data models and, related to that, estimates of adjustment speed.

2.1. Determinants

Firm size – If firm size is interpreted as a proxy for the volatility of earnings both TOT and POT predict a positive relationship between firm size and leverage; more diversified firms have less volatile earnings and lower default probabilities. Firms with less volatile earnings face lower borrowing costs leading to higher leverage. Size, however, might also proxy for other factors (Fama and French, 2002). For instance, large firms are better known and thus face lower adverse selection, making it easier to issue equity in comparison to smaller firms. POT is therefore often interpreted as predicting a negative effect of size on leverage, making the POT predictions ambiguous (Frank and Goyal, 2008).

Tangible assets – The relative amount of tangible (or fixed) assets is typically associated with higher levels of debt (e.g. Frank and Goyal, 2008, 2003). In TOT the argument is that fixed assets are a proxy for the amount of collateral, which reduces the cost of financial distress. Tangible assets are thus positively related to leverage. Collateral also mitigates information asymmetry problems, which reduces borrowing costs, implying that POT also predicts a positive relationship between tangible assets and leverage (e.g. Degryse et al., 2012). Most studies indeed find a positive relationship between tangible assets and leverage (Frank and Goyal, 2008).

Growth opportunities – TOT predicts that firms with high growth potential prefer less debt financing, because the costs of financial distress are higher for these firms. On the other hand, POT predicts a positive relationship between growth and leverage, since growing firms need more debt to finance their investments, holding profits constant (e.g. Frank and Goyal, 2009).

Profitability – According to TOT more profitable firms have higher debt to assets ratios. The explanation is twofold. First, more profitable firms have lower expected bankruptcy costs. Second, the interest tax shield is more valuable for firms with higher profits (Frank and Goyal, 2008). POT predicts exactly the opposite: firms prefer internal finance over external finance, which implies that more profitable firms have lower debt to assets ratios. This negative effect of profits is found in most empirical studies (Frank and Goyal, 2008).

Depreciation – Depreciation is mostly included in leverage regressions as a proxy for non-debt tax shields. The argument is that larger non-debt tax shields imply lower taxable profits and, holding everything else constant, a lower payoff from interest tax shields (e.g. Fama and French, 2002). Following this line of reasoning depreciations should be negatively related to leverage according to TOT.

Tax rate – The main argument of TOT is that tax shields of debt provide incentives for debt financing. The obvious consequence is that higher (marginal) tax rates provide stronger incentives for debt financing. In other words, TOT predicts that higher tax rates lead to higher debt to assets ratios. In their meta-study Feld et al. (2013) conclude that higher tax rates are in general associated with higher leverage. However, the effects that are found depend to a large extent on how the tax rate is defined. The positive effect of tax rate on debt financing is most evident when marginal tax rates are used.[1]

2.2. Empirical studies

The empirical literature on the relationship between firm characteristics and leverage is very broad. Most empirical studies estimate equations with debt to assets ratio on the left-hand side and firm characteristics on the right-hand side. In recent years, more advanced econometric models have been used to study the relationship between firm characteristics and leverage. In particular, it has become more common to acknowledge the dynamic nature of capital structure. The dynamic process is estimated through panel data models with a lagged dependent variable. In what follows we briefly discuss some of these more advanced studies focusing on the adjustment speed of capital structure.

Ozkan (2001) estimates a partial adjustment model based on a sample of 390 large UK companies. His preferred estimation method makes use of the Arellano-Bond estimator (difference GMM), where the explanatory variables are treated as endogenous. The coefficient of the lagged leverage variable is estimated to be 0.431 (0 indicates instant adjustment, while 1 indicates no adjustment), indicating that firms adjust their leverage relatively quickly to reach their target debt to assets ratios. The author contributes this finding to the trade-off between the costs of being "off-target" and the costs of leverage adjustment.

Gaud et al. (2005) estimate a dynamic panel model using the Arellano-Bond (two-step) GMM estimator to explain the capital structure of 104 publicly listed Swiss companies. They treat all explanatory variables as endogenous since they are all based upon simultaneously determined accounting variables. They find an

[1]For a discussion on the disadvantages of using the average corporate tax rate instead of the marginal corporate tax rate see Graham (2003).

adjustment coefficient in the range of 0.613-0.860 and conclude that adjustment in Switzerland is relatively slow compared to other countries.[2] Two possible explanations for the slow adjustment of Swiss companies are provided by the authors. First, stock prices were high during the sample period, which leads (by mechanics) to lower debt to assets ratios. Second, some of the firms benefited from the relatively loose credit conditions during the sample period to finance their business, leading to above target debt to assets ratios.

Aybar-Arias et al. (2012) analyze the speed of adjustment to target debt ratios using a sample of 947 Spanish SMEs. Their preferred specification is a dynamic panel model estimated using the Blundell-Bond two-step system GMM estimator. As in Gaud et al. (2005) all explanatory variables are considered to be endogenous. The adjustment coefficient of 0.539 cannot be interpreted on its own since the model includes interaction terms between the lagged dependent variable and firm growth, firm size, distance to target leverage, and financial flexibility. The coefficients on the interaction terms show that larger firms, with a more flexible financial structure, and higher growth prospects adjust faster to their target debt ratio. The same holds for firms that are relatively close to their target leverage.

3. Data

3.1. Data set

The microdata, covering the period 2000-2014, are obtained from Statistics Netherlands (CBS). The firm level data combine information from the Business Register (ABR, *Algemeen Bedrijven Register*) and Non-Financial Firms (NFO, *Statistiek Financiën van niet-financiële ondernemingen*). The latter data originate from the Ministry of Finance, which has a data base containing corporate tax declarations as provided to the tax authorities (Statistics Netherlands, 2015).[3] The matched microdata include annual balance sheets, profit and loss statements, and corporate taxes paid (or received). The data thus provide measures and/or proxies of the firm characteristics of Dutch SMEs.

[2]Note that the different adjustments speeds found in different countries could very well be related to differences in the underlying samples used in the studies mentioned in this section. These are small samples and the studies do, for instance, not estimate adjustment speeds per industry, which would make it more easy to compare adjustment speeds in different countries.

[3]Note that the sample of firms is limited to those firms paying CIT, meaning that sole proprietorships and partnerships (in Dutch: *vennootschap onder firma*) who pay personal income tax are not included in our data.

SMEs are selected based upon the definition that is used by the European Commission (2015). That is, enterprises should have an annual balance sheet total not exceeding 43 million euros and less than 250 employees (annual work units).[4] SMEs are divided into three categories: micro-enterprises, small enterprises, and medium-sized enterprises. Micro-enterprises have at most 10 employees and an annual balance sheet total of no more than 2 million euros. Small enterprises have at most 50 employees and an annual balance sheet total that does not exceed 10 million euros. The remaining enterprises are defined as medium-sized enterprises.

We have an unbalanced panel data set as new enterprises start while others end. The data set does not contain gaps as firms with missing data have been eliminated. The remaining data set contains 745,640 observations of 153,923 unique firms. Extreme values are dealt with by winsorization (e.g. Frank and Goyal, 2008); that is, values smaller than the 1st percentile or larger than the 99th percentile are replaced with the value of the 1st and 99th percentile respectively. Apart from that firms with debt to assets ratios larger than one have been dropped as this implies the existence of negative shareholder equity, which is considered unlikely for healthy firms.

3.2. Variables and summary statistics

The debt to assets ratio is defined as the sum of short-term debt (debt payable within 1 year), long-term debt (obligations lasting over 1 year), and trade payables divided by the annual balance sheet total. Trade payables are included in our definition as prior to 2005 only current liabilities are observed, which do include trade payables. Similarly, short-term debt to assets is defined as short-term debt and trade payables over the balance sheet total. Long-term debt to assets uses only long-term debt in the numerator. Short-term debt makes up over seventy percent of the total debt as illustrated by the average short-term and long-term debt to assets ratios, 0.254 and 0.108 respectively.

Our set of explanatory variables includes proxies for the theoretical determinants of capital structure discussed in subsection 2.1. The size of the company is measured as the logarithm of the balance sheet total. Following the conventions in the literature tangible assets and depreciation are expressed as ratios, meaning that they too are divided by the annual balance sheet total. The return on assets (ROA), indicating firm profitability, is defined as the net profit after taxes divided by the balance

[4] The definition allows for the use of annual turnover instead of annual balance sheet total too. The maximum of the annual turnover is set at 50 million euros. We will consistently use annual balance sheet total.

Table 1: Summary statistics of firm characteristics

	Mean	Std.dev.	Min	Max
Debt to assets ratio	0.362	0.274	0.001	1
Short-term debt to assets ratio	0.254	0.221	0	1
Long-term debt to assets ratio	0.108	0.177	0	1
Balance sheet total (in thousands of euros)	1,184.555	2,027.620	4	22,969
Log(balance sheet total)	6.198	1.340	1.386	10.042
Number of employees	6.703	13.952	0	219
Tangible assets*	0.175	0.219	0	0.951
Depreciation*	0.036	0.044	0	0.381
Return on assets	0.063	0.880	-108.269	153
Growth of assets	0.063	0.507	-0.973	12
Average tax rate	0.149	0.106	0	0.892
Marginal tax rate	0.177	0.092	0	0.345
Medium-sized firm (1 = yes)	0.028	0.164	0	1
Small firm (1 = yes)	0.206	0.405	0	1
Micro firm (1 = yes)	0.766	0.423	0	1
Duration (in years)	4.844	3.682	1	13
Observations	153,923			

Notes: The means are based on firm averages in order to include firms only once. The sample thus consist of 153,923 unique firms. Following the convention both tangible assets and depreciation are scaled to total assets, as is the case with the debt to assets ratios.

sheet total (multiplied by 100 to get a percentage). Growth of assets measures the enterprise's expansion compared to the previous year, indicating particularly growth opportunities. It is important to note that total assets or balance sheet total are included in most of these measures, one way or another.

The corporate taxes paid are used to determine the average and marginal tax rates. The average tax rate is defined as taxes paid divided by the profit before taxes; that is, we have not accounted for fiscal opportunities of carryback and carry forward of losses. Average tax rate is censored at zero as tax refunds do not truly imply negative tax rates. The profit before taxes is used as a measure of taxable income and determines the marginal tax rate. The corporate tax brackets between 2001 and 2014, determining the marginal tax rates, are given in table 2. Vrijburg (2013) thoroughly discusses carry back and carry forward of losses in the Netherlands and treats the assumptions under which he can take them into account in the marginal tax rate. We also obtained marginal tax rates by applying the carry back and carry forward rules. In the majority of cases the corrected marginal tax rate equals the naive marginal tax rate obtained by not taking carry back and carry forward into account. We include the naive marginal tax rate in our models, but the results are robust to including the corrected marginal tax rate.

Table 2: Corporate tax brackets in the Netherlands (2001-2014)

Year	Taxable income	Tax rate	Taxable income	Tax rate	Taxable income	Tax rate
2001	0-22,689	30.0			>22,689	35.0
2002	0-22,689	29.0			>22,689	34.5
2003	0-22,689	29.0			>22,689	34.5
2004	0-22,689	29.0			>22,689	34.5
2005	0-22,689	27.0			>22,689	31.5
2006	0-22,689	25.5			>22,689	29.6
2007	0-25,000	20.0	25,000-60,000	0.235	>60,000	25.5
2008	0-275,000	20.0			>275,000	25.5
2009	0-200,000	20.0			>200,000	25.5
2010	0-200,000	20.0			>200,000	25.5
2011	0-200,000	20.0			>200,000	25.0
2012	0-200,000	20.0			>200,000	25.0
2013	0-200,000	20.0			>200,000	25.0
2014	0-200,000	20.0			>200,000	25.0

Notes: Taxable income is measured in euros. Tax rate is given as a percentage. In 2008 new brackets were implemented during the year. We use the regulations that were in force at the end of the year as firms likely optimized their tax declarations based on the final regulations.[5]

4. Empirical model

4.1. Dynamic model

In order to study the capital structure of SMEs we model leverage, the ratio of debt and total assets, as a function of firm characteristics. In equilibrium, that is, when firms are at their targeted debt ratio, a static panel approach can be used. However, adjustment costs may prevent firms from immediately adjusting to its ideal debt to assets ratio. The existence of a target debt ratio would imply the use of a dynamic panel model.[6]

To start with, we model target leverage as a function of firm characteristics where target ratios can differ between firms and over time.

$$y^*_{i,t+1} = x'_{it}\delta \tag{1}$$

where subscript i identifies the firm and subscript t identifies the year. The target debt to assets ratio is given by y^*, while the vector of firm characteristics determining the optimal capital structure is defined as x'_{it}. Note that the target and the firm characteristics are defined at time $t+1$ and time t respectively.[7]

The adjustment process is modeled with a partial adjustment model (e.g. Flannery and Rangan, 2006; De Jong et al., 2011).

$$y_{i,t+1} - y_{it} = (1-\lambda)(y^*_{i,t+1} - y_{it}) + \alpha_i + \epsilon_{i,t+1} \tag{2}$$

Debt to assets ratio and its target are given by y and y^* respectively. The term α_i is a time-invariant unobserved firm effect and $\epsilon_{i,t+1}$ is an error term. The speed of adjustment to the target is given by the term $(1-\lambda)$. In a frictionless world λ equals zero, implying that adjustment is instant; higher values of λ imply slower adjustment.

Substituting equation (1) into equation (2) and shifting from time $t+1$ to time t leads to:

$$y_{i,t} = \alpha_i + \lambda(y_{i,t-1}) + (x'_{i,t-1})\beta + \epsilon_{i,t} \tag{3}$$

[5]Vrijburg (2013) does not include the late change in regulation. In his view the late policy change would have functioned as a lump-sum subsidy instead, thereby not changing firm behavior. The choice to include or exclude the late regulation changes does not affect our results.

[6]Furthermore, the tax code also contains "important dynamic aspects that cannot be properly represented in a single-period model" (Frank and Goyal, 2008, p. 142).

[7]We have defined the target at time $t+1$ and the firm characteristics at time t, as is done by most scholars making use of a dynamic panel model (e.g. Flannery and Rangan, 2006). Others, for instance Gaud et al. (2005), define the target and firm characteristics in the same time period. It should be noted that the difference between both approaches is not eliminated by instrumenting the firm characteristics with the lagged values in the estimation process.

where $\beta = (1-\lambda)\delta$. In other words, debt to assets ratio is a function of its lag, the lagged firm characteristics, and a time-invariant firm fixed effect.

The vector x'_{it} in equation (3) includes a variety of firm characteristics that proxy for the theoretical determinants of firm capital structure (see section 2). In virtually all empirical studies on corporate capital structure the dependent variable and several independent variables are scaled to total assets; that is, profits, tangible assets, R&D expenditures, and depreciation (e.g. Flannery and Rangan, 2006; Hovakimian, 2006; Gaud et al., 2005; Degryse et al., 2012). However, scaling dependent and independent variables to total assets creates ratios that have a common denominator. These ratios are correlated even if the numerators are not; after all, an increase in total assets decreases all these ratios (e.g. Neyman, 1952; Firebaugh and Gibbs, 1985; Kronmal, 1993). It is for this reason that we will treat our explanatory variables as endogenous.[8]

4.2. Estimation strategy

Frank and Goyal (2008) identify three strategies that have been used for the estimation of dynamic panels. In early studies the long-term average is used as the target ratio. Later studies use a twostep procedure; that is, firm characteristics are used to estimate the target, after which the estimated target is substituted into the adjustment equation. More recently, scholars have started to substitute the target equation into the adjustment equation (see above). Through the use of dynamic panel estimators the model can be estimated in a single regression. We will apply the latter approach.

The estimator that we use is determined by the particularities of our model and data set. Our model suggests the inclusion of fixed individual effects, a lagged dependent variable, and regressors that are endogenous. The inclusion of endogenous covariates is important as it allows us to deal with the previously mentioned scaling problems.[9] The data set implies the use of an estimator that is consistent for panels with few time periods and many individuals, a 'small T and large N'. The small time dimension would lead to dynamic panel bias when Fixed Effects (FE) or Least Squares Dummy Variables (LSDV) are used for estimation. While the bias disappears when T approaches infinity, the Nickell bias, as it is generally called, can be severe when T is small (Nickell, 1981).

[8]Ozkan (2001), Gaud et al. (2005), and Aybar-Arias et al. (2012) apply similar approaches.

[9]For critical remarks on the use of lagged endogenous variables in corporate finance applications, see Roberts and Whited (2013) and Atanasov and Black (2017). Both studies argue that it is often hard to justify their use.

Generalized Method of Moments (GMM) provides two estimators that fit the particularities of our data set and model: difference GMM and system GMM, also known as the Arellano-Bond and Blundell-Bond estimator respectively (Arellano and Bond, 1991; Blundell and Bond, 1998). Both are designed for panels with small T and large N. They allow for a lagged dependent variable, endogenous regressors, and fixed individual effects. Difference GMM and system GMM are particularly useful when all available instruments are 'internal', that is, when they are based on lags of the instrumented variables (Roodman, 2009a). Difference GMM uses the set of available lags as instruments; system GMM extends the set of instruments with the lagged differences. System GMM is therefore more efficient. As external instruments are not available internal instruments are used to deal with the endogeneity due to scaling the dependent and (several) independent variables by total assets.

Flannery and Hankins (2013) evaluate the performance of various dynamic panel estimators with simulated corporate finance data. In their simulations Kiviet's (1995) Least Squares Dummy Variable Correction (LSDVC) performs best overall, whereas the Blundell-Bond (system GMM) estimator "appears to be the best choice in the presence of endogeneity". This is due to the fact that LSDVC, contrary to system GMM, assumes exogeneity of the regressors. The simulation results of Flannery and Hankins (2013) thus corroborate system GMM as our preferred estimator.

5. Results

5.1. Dynamic panel estimates

The first two columns of table 3 present the estimated coefficients of equation (3) when, respectively, OLS and FE are used for estimation. While it is well-established that these estimators are biased for dynamic panels, they provide a likely upper and lower bound for the coefficient of the lagged dependent variable. Due to the positive correlation between the lagged dependent variable and the error the OLS results are likely to be biased upwards. The FE estimator, on the contrary, is likely to be biased downwards. In FE estimation demeaning introduces correlation between the demeaned lagged dependent variable and the demeaned error term when T is small. Nickell (1981) and Bond (2002) demonstrate that the negative bias dominates. It follows, therefore, that the true parameter of the lagged dependent variable should be larger than 0.462 yet smaller than 0.890. This indicates that the true parameter falls within the range of dynamic stability.

Column 3 presents the results of the (two-step) system GMM estimation in which, apart from the lagged dependent variable, the regressors have been assumed exogenous. It should be noted, as we have discussed before, that this is a very strong

Table 3: Dynamic panel estimates

	(1) OLS	(2) FE	(3) SysGMM (exo)	(4) SysGMM (endo)
Lag debt to assets	0.890***	0.462***	0.770***	0.748***
	(0.001)	(0.002)	(0.004)	(0.003)
Lag log(size)	0.002***	-0.015***	-0.001***	-0.024***
	(0.000)	(0.001)	(0.000)	(0.001)
Lag tangible assets	0.026***	0.064***	0.056***	0.169***
	(0.001)	(0.002)	(0.002)	(0.004)
Lag growth assets	-0.001***	0.002***	-0.004***	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
Lag depreciation	0.066***	-0.001	0.181***	0.042***
	(0.004)	(0.008)	(0.006)	(0.012)
Lag ROA	-0.015***	-0.024***	0.033***	-0.058***
	(0.001)	(0.002)	(0.002)	(0.003)
Lag marginal tax rate	-0.030***	-0.030***	-0.004*	0.103***
	(0.002)	(0.002)	(0.002)	(0.003)
Year fixed effects	Yes	Yes	Yes	Yes
Hansen df			10	70
Hansen J stat			487.2	1406.8
Hansen p-value			0.000	0.000
AB test AR(2) z stat			7.90	8.82
AR(2) test p-value			0.000	0.000
Adj. R-sq	0.818	0.277		
Observations	745,640	745,640	745,640	745,640

Notes: Dependent variable is debt to assets. Significance in columns 3 and 4 is based on Windmeijer corrected standard errors. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

assumption. The estimated coefficient of the lagged dependent variable is 0.770, indicating that adjustment towards the target is relatively slow. The estimates indicate a statistically significant negative effect of size, which however bears no economic significance. Growth of assets also seems to have a very small negative effect. The results indicate that tangible assets, depreciation, and return on assets have positive effects on debt to assets. Marginal tax rate has a negative sign, even though it is barely significant.

The results of the two-step system GMM estimation with endogenous regressors, our preferred specification, are shown in column 4 of table 3. Firm size, tangible assets, growth of assets, and depreciation are treated as endogenous as they are defined in terms of balance sheet total. Marginal tax rate is assumed to be an exogenous regressor as balance sheet total is not directly related to it.[10] The coefficient of the lagged dependent variable is 0.748, which is well within the range we expect. The remaining regressors do show important differences compared to the exogenous estimation results. The negative effect of firm size remains but it becomes larger in magnitude, although the effect is still relatively small in economic terms. Tangible assets and depreciation continue to have positive effects, even though the magnitudes differ. In the endogenous specification the coefficient of growth of assets has become insignificant. The results indicate that profitability (return on assets) does not have a positive but a negative effect on debt to assets ratio. Furthermore, the effect of marginal tax rate has become positive in the endogenous specification, which in fact corresponds to theory.[11]

A potential cause for concern regarding our system GMM estimates comes from the large set of (internal) instruments that is used (see Roodman, 2009a,b; Bowsher, 2002). Thus, even though the "minimally arbitrary rule of thumb" (Roodman, 2009a, p. 99), which specifies that the set of instruments should never be larger than the number of individual units, is met – given the 153,923 unique firms in our data – we have reduced the set of instruments by 'collapsing' them (Roodman, 2009a,b), i.e. we have made them linear in T instead of quadratic. After all, the use of numerous instruments may bias "coefficient estimates towards those from non-instrumenting estimators" (Roodman, 2009b, p. 139). Furthermore, we have looked into reducing

[10] It could be argued that tax rate is not strictly exogenous either. However, Graham (2003) demonstrates that endogeneity is most likely to bias results when the average tax rate is used. It is for that reason that we prefer the use of the marginal tax rate.

[11] The estimates where the average tax rate is used instead of the marginal tax rate are shown in the appendix (see table A.8). The effect of average tax rate is significant and positive even though the magnitude is smaller. In addition, using the average instead of the marginal tax rate does not alter any of the conclusions.

the number of instruments by restricting the lag length (see Roodman, 2009a,b; Bowsher, 2002). Overall these latter estimates are similar to the estimates presented here.

A weak Hansen test of instrument validity might be a symptom of instrument proliferation; that is, having too many instruments could lead to implausible high p-values for the Hansen J test for overidentifying restrictions (Roodman, 2009b). In other words, the rejection of the null hypothesis of the instruments being valid might be an indication that there being too many instruments is not our main concern. It is problematic, on the contrary, that the Hansen J statistic at the bottom of column 4 (Hansen J 1406.8, p-value 0.000) indicates that the null hypothesis of the overidentification restrictions being valid is rejected.[12] Autocorrelation across individuals is another reason to treat the estimates cautiously. While time dummies have been included in the specifications in order to reduce contemporaneous autocorrelation, the Arellano-Bond test statistics for second order autocorrelation, 7.90 in the exogenous specification and 8.82 in the endogenous specification, indicate that the instruments are not necessarily valid (Roodman, 2009a).

5.2. Adjustment speeds

To investigate whether the adjustment speed differs between micro, small, and medium-sized firms we estimate separate regressions per firm type. Micro-enterprises are the smallest firms, while medium-sized enterprises are the largest of the SMEs (see section 3). Table 4 shows that micro-enterprises, making up about 75% of our sample, have the highest adjustment speed (lambda is 0.724). Nevertheless, medium-sized enterprises adjust quicker than small enterprises (lambda is 0.796 and 0.814 respectively). Thus even though micro firms have the highest adjustment speed, the observation that larger SMEs adjust slower is not supported by the estimated coefficients in the groups of small and medium-sized firms. Regarding the remaining variables only minor differences exist; that is, the coefficients of depreciation for the micro-enterprises and tangible assets and depreciation for the medium-sized enterprises are insignificant.

Table 5 provides the estimates of adjustment speeds for the six industries with the largest number of firms in our data set: manufacturing, construction, wholesale, retail, information and communication (IC), and consultancy, research and other specialized business services (Consultancy). The latter two sectors seem to adjust the quickest to the target with lambdas of 0.660 and 0.685 respectively. Retail is the

[12]The results and conclusions of the Sargan test are identical to those of the Hansen test. This holds for all test statistics throughout the paper.

Table 4: Estimates for micro, small, and medium-sized firms

	(1) Micro	(2) Small	(3) Medium
Lag debt to assets	0.724***	0.814***	0.796***
	(0.004)	(0.007)	(0.020)
Lag log(size)	-0.022***	-0.014***	0.011
	(0.001)	(0.002)	(0.008)
Lag tangible assets	0.161***	0.156***	0.100***
	(0.005)	(0.009)	(0.026)
Lag growth assets	-0.000	-0.000	-0.003
	(0.000)	(0.001)	(0.002)
Lag depreciation	0.022	0.111***	0.040
	(0.014)	(0.024)	(0.056)
Lag ROA	-0.043***	-0.074***	-0.069***
	(0.003)	(0.007)	(0.019)
Lag marginal tax rate	0.080***	0.099***	0.045**
	(0.003)	(0.006)	(0.014)
Year fixed effects	Yes	Yes	Yes
Hansen df	70	70	70
Hansen J stat	1091.3	425.9	101.1
Hansen p-value	0.000	0.000	0.009
AB test AR(2) z stat	7.88	4.53	-0.36
AR(2) test p-value	0.000	0.000	0.718
Observations	555,745	168,574	21,321

Notes: Dependent variable is debt to assets. Significance is based on Windmeijer corrected standard errors. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

sector with the slowest adjustment with a lambda of 0.849. All in all, the variation in adjustment speeds between sectors seems to be larger than between micro, small, and medium-sized enterprises.

As before the remaining results remain mostly the same: size and return on assets have negative effects for all sectors, tangible assets and marginal tax rate always have positive effects. Growth of assets remains insignificant. Depreciation, however, shows some variation: the estimates show positive effects for construction and retail but are insignificant for the remaining sectors. Besides, second order autocorrelation does not seem to be a problem for the estimates of manufacturing and retail.

Table 5: Estimates for different sectors

	(1) Manufacturing	(2) Construction	(3) Wholesale	(4) Retail	(5) IC	(6) Consultancy
Lag debt to assets	0.792***	0.727***	0.771***	0.849***	0.660***	0.685***
	(0.012)	(0.011)	(0.009)	(0.013)	(0.014)	(0.007)
Lag log(size)	-0.017***	-0.028***	-0.033***	-0.016***	-0.023***	-0.029***
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.002)
Lag tangible assets	0.156***	0.179***	0.185***	0.092***	0.182***	0.142***
	(0.013)	(0.012)	(0.012)	(0.014)	(0.021)	(0.009)
Lag growth assets	-0.001	-0.001	-0.001	-0.000	-0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Lag depreciation	0.052	0.138***	0.045	0.103*	-0.008	-0.009
	(0.035)	(0.038)	(0.036)	(0.050)	(0.050)	(0.024)
Lag ROA	-0.081***	-0.072***	-0.063***	-0.093***	-0.057***	-0.046***
	(0.012)	(0.010)	(0.009)	(0.014)	(0.010)	(0.004)
Lag marginal tax rate	0.102***	0.121***	0.128***	0.086***	0.122***	0.097***
	(0.011)	(0.010)	(0.010)	(0.011)	(0.016)	(0.006)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Hansen df	70	70	70	70	70	70
Hansen J stat	188.5	218.1	282.2	228.4	145.0	364.2
Hansen p-value	0.000	0.000	0.000	0.000	0.000	0.000
AB test AR(2) z stat	1.74	3.02	3.11	1.43	4.23	4.32
AR(2) test p-value	0.081	0.003	0.002	0.153	0.000	0.000
Observations	63,087	66,147	109,683	50,871	41,280	225,159

Notes: Dependent variable is debt to assets ratio. Significance is based on Windmeijer corrected standard errors. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

5.3. Short-term debt

The short-term debt to assets ratio is expected to be easier adjustable than the total debt to assets ratio. After all, the shorter maturity of short-term debt implies that adjustment towards the target should be quicker when long-term debt is not taken into account. Table 6 provides the (endogenous) two-step system GMM estimates where the short-term debt to assets ratio has been used instead of total debt to assets. The coefficient of the lagged dependent variable is 0.620, showing that the short debt to assets ratio indeed adjusts quicker towards the target. Apart from that the results are exactly the same. Size and profitability have negative effects. Tangible assets, depreciation, and tax rate have positive effects, while growth of assets remains insignificant.

Table 6: Estimates with short-term debt to assets ratio

	Short-term debt
Lag short-term debt to assets	0.620***
	(0.004)
Lag log(size)	-0.029***
	(0.001)
Lag tangible assets	0.061***
	(0.004)
Lag growth assets	-0.000
	(0.000)
Lag depreciation	0.136***
	(0.011)
Lag ROA	-0.040***
	(0.002)
Lag marginal tax rate	0.064***
	(0.003)
Year fixed effects	Yes
Hansen df	70
Hansen J stat	1389.2
Hansen p-value	0.000
AB test AR(2) z stat	14.00
AR(2) test p-value	0.000
Observations	745,640

Notes: Dependent variable is short-term debt to assets. Significance is based on Windmeijer corrected standard errors. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

6. Robustness

In order to investigate the robustness of our results we look into the observed duration of firms, i.e. the number of times that a firm is observed in our data set. In the previous section we used all firms in our unbalanced panel, i.e. only firms with gaps between the observations have been excluded. Table 7 presents the results of the estimation of equation (3) where the required minimum number of observations per firm increases from two in column 1 to thirteen in column 12.[13] The latter column thus presents the results for firms observed in all years, making it a balanced panel.

The coefficient of the lagged dependent variable seems to be exceptionally stable for all observed duration lengths: the coefficient ranges from 0.736 to 0.752. The results suggest that attrition bias or selection bias is not a problem in our study. Looking at the lambdas in more detail suggests that the estimated coefficient decreases up to a minimum observed duration of seven years and starts to increase afterwards, even though the differences are minimal. The results regarding the remaining explanatory variables are almost identical to those presented before too, even though some interesting patterns do occur: the effect of tangible assets decreases with the observed duration, while the negative effect of profitability increases with the minimum duration requirement. It is likely that these results are in fact age effects. Besides, size and depreciation exhibit an n-shape and u-shape pattern respectively.

7. Conclusions

This paper presents empirical evidence of both the determinants and the adjustment speed of capital structure of small and medium-sized enterprises (SMEs) in the Netherlands. The unbalanced panel data set, covering the period 2000-2014, contains 745,640 observations of 153,923 firms. We use two-step system GMM to estimate a partial adjustment model, where we treat the explanatory variables as endogenous.

The results show that firm size and profitability lead to lower debt to assets ratios. Tangible assets lead to higher debt to assets ratios, while growth of assets is either statistically or economically insignificant. Depreciation has a positive sign in most of the regressions. Nevertheless, it is insignificant in some of the estimations. Marginal tax rate is consistently found to have a positive effect. The results provide mixed evidence for the most dominant theories explaining the capital structure of firms, trade-off theory and pecking order theory. The negative effect of profitability is evidence in favor of POT and against TOT, while the lack of an effect of growth

[13]Note that we need a minimum number of consecutive observations, because we first-difference and use lagged variables as instruments. A firm is included in the balanced panel if we have data available for the years 2002-2014. A firm is included in the baseline sample if we have data for at least three consecutive years, e.g. 2000-2002.

Table 7: Estimates for different duration lengths (unbalanced and balanced panels)

	(1) Length≥2	(2) Length≥3	(3) Length≥4	(4) Length≥5	(5) Length≥6	(6) Length≥7	(7) Length≥8	(8) Length≥9	(9) Length ≥ 10	(10) Length≥11	(11) Length≥12	(12) Balanced
Lag debt to assets	0.746***	0.745***	0.744***	0.739***	0.738***	0.736***	0.737***	0.744***	0.746***	0.745***	0.749***	0.752***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
Lag log(size)	-0.023***	-0.023***	-0.022***	-0.022***	-0.022***	-0.021***	-0.020***	-0.021***	-0.021***	-0.024***	-0.024***	-0.024***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Lag tangible assets	0.170***	0.171***	0.170***	0.169***	0.167***	0.162***	0.157***	0.154***	0.150***	0.150***	0.145***	0.135***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.007)
Lag growth assets	-0.001*	-0.001***	-0.001***	-0.001***	-0.001*	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Lag depreciation	0.045***	0.050***	0.058***	0.059***	0.045***	0.039**	0.041**	0.039*	0.032	0.005	0.006	-0.003
	(0.012)	(0.012)	(0.012)	(0.013)	(0.013)	(0.014)	(0.015)	(0.016)	(0.017)	(0.018)	(0.020)	(0.023)
Lag ROA	-0.057***	-0.060***	-0.064***	-0.069***	-0.070***	-0.069***	-0.073***	-0.076***	-0.079***	-0.085***	-0.083***	-0.087***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
Lag marginal tax rate	0.101***	0.103***	0.102***	0.103***	0.097***	0.091***	0.090***	0.091***	0.091***	0.095***	0.091***	0.090***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hansen df	70	70	70	70	70	70	70	70	70	70	70	70
Hansen J stat	1402.2	1413.4	1518.5	1506.8	1402.8	1330.4	1189.9	1106.2	971.7	835.8	710.7	612.2
Hansen p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AB test AR(2) z stat	8.85	8.92	9.10	9.32	9.35	9.16	9.48	8.63	8.22	7.14	5.90	4.38
AR(2) test p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	715,937	665,441	611,156	550,428	489,948	428,742	343,566	301,694	267,584	231,414	193,200	153,660

Notes: Dependent variable is debt to assets ratio. Significance is based on Windmeijer corrected standard errors. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

does not provide evidence for either theory. The positive effect of taxes is evidence in favor of TOT. This paper thus corroborates that both theories have their merits without clearly favoring one theory over the other.

The dynamic analysis provides evidence of a relatively slow adjustment process of Dutch SMEs: the estimated coefficient is about 0.748, while 0 indicates instant adjustment. This is similar to the "very slow" adjustment of publicly listed Swiss companies, which is in the range of 0.613-0.860 (Gaud et al., 2005). The coefficient that we find is, for instance, much larger than the one Ozkan (2001) finds for large UK companies (0.431). We find no clear pattern in adjustment speeds based on the size of SMEs: micro-enterprises have the highest adjustment speed (0.724), but small enterprises adjust slower (0.814) than medium-sized enterprises (0.796).

The adjustment speeds of the six largest sectors range between 0.660-0.849. Consultancy, research and other specialized business services shows the highest adjustment speed, retail the lowest. Adjustment speeds thus seem to differ more between sectors than between size categories. Further evidence shows that, as expected, the short-term debt to assets ratio adjusts quicker (0.620) than the total debt to assets ratio. The slow adjustment speed of capital structure suggests limitations of policy makers to coerce short-term changes.

It remains important to realize that our estimates should be interpreted with caution as overidentification is a problem in our estimates. Similarly, the existence of second order autocorrelation, which is present in most of our regressions, also indicates limitations to the choice of our empirical approach.

Regarding the slow adjustment speed of capital structure the question remains why Dutch SMEs are relatively slow in their adjustments compared to firms in other European countries. Future research could provide policy makers with important insights into the reasons.

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Appendix A.

Table A.8: Estimates for average tax rate

	Average tax rate
Lag debt to assets	0.743***
	(0.003)
Lag log(size)	-0.024***
	(0.001)
Lag tangible assets	0.165***
	(0.004)
Lag growth assets	-0.000
	(0.000)
Lag depreciation	0.024*
	(0.012)
Lag ROA	-0.021***
	(0.002)
Lag average tax rate	0.034***
	(0.002)
Year fixed effects	Yes
Hansen df	70
Hansen J stat	1418.2
Hansen p-value	0.000
AB test AR(2) z stat	9.46
AR(2) test p-value	0.000
Observations	745,640

Notes: Dependent variable is debt to assets ratio. Significance is based on Windmeijer corrected standard errors. * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

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