Capital structure determinants in Europe: The effect of profitability and the moderating role of firm size

Author: Daniel Mirza
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands
d.mirza@student.utwente.nl

ABSTRACT:

Background: A review of the literature indicates that the extant research generally focused on identifying which of the two main capital structure theories, the trade-off theory (TOT) or the pecking order theory (POT), performs best, with only few papers aiming to reconcile the two.

Purpose: This study seeks to assess the impact of size and profitability on capital structure, and to analyse the moderating role of size on the profitability–leverage relationship, in order to provide a means for reconciling POT and TOT.

Methodology: The impact of size and profitability on leverage was gauged through OLS regressions, on a sample of 10.688 firm-year observations from France, Germany and the United Kingdom during 2006–2013. The moderating role of size was analysed graphically, the coefficients being computed via the Johnson–Neyman technique.

Findings: In small and medium German and British firms profitability follows the predictions of TOT and has a positive effect on the debt level. Conversely, the effect of profitability in large firms is significant only in the British sample, and is negative, as predicted by POT. In French companies profitability negatively impacts leverage, which is consistent with POT. The effect, however, is significant only in the year 2006 and in the full period subsample, and only in medium and large companies. As regards firm size, the variable positively affects leverage across the studied years and countries, which is consistent with TOT.

Implications: The main implications of the findings are twofold. First, POT and TOT can and should be reconciled, rather than be viewed as competing capital structure models. Second, a new capital structure model should be developed, which would encompass existing theories and take into account firm size and country differences.

Supervisors: Dr. Samy Essa; Dr. Xiaohong Huang; Prof. Dr. Rezaul Kabir; Henry van Beusichem, MSc; Dr. Peter-Jan Engelen; Dr. George Iatridis.

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1. INTRODUCTION

A fundamental question in the field of finance, which has attracted considerable attention from scholars, is what determines the financial structure of a company. The interest in this issue is based on both practical and theoretical grounds. Practically, financing decisions are of interest because they are one of the most important decisions of a firm's management (Coricelli, Driffield, Pal & Roland, 2012). Theoretically, it is the paper of Modigliani and Miller (1958) which has motivated scholars to study the (determinants of) capital structure (Flannery & Rangan, 2006).

Several theories were developed in an attempt to explain the capital structure choice. The most influential of them are the pecking order theory (POT) and the static trade-off theory (TOT; de Jong, Verbeek & Verwijmeren, 2011). POT builds on the idea of asymmetric information between managers and outside investors (Chirinko & Singha, 2000). This implies the existence of certain preferences between means of financing, wherein firms opt to finance projects internally, while debt and equity (as a last resort) are the least preferred means (de Jong et al., 2011). Conversely, TOT posits that companies determine their capital structure based on the benefits and costs of debt, and increase their leverage ratio to the point where the marginal costs and benefits of debt are equal (Fama & French, 2002).

Despite extensive research on the two theories (de Jong et al., 2011), the results are still mixed (Dang, 2013) and partially support them both (Gonzalez & Gonzalez, 2012). Additionally, several academics highlighted the need for a model that combines elements of POT and TOT (Byoun, 2008; Fama & French, 2005). A step towards reconciling the contradictory predictions of the two theories is to consider potential interaction effects between capital structure determinants, which would allow for the applicability of one theory to vary across the values of a given determinant, such as size. However, researchers have generally not included, in their testing of POT and TOT, any interaction effects between the determinants of leverage (Gonzalez & Gonzalez, 2012; Vithessonthi & Tongurai, 2015).

There are, thus, only a limited number of scholars (e.g. Gonzalez & Gonzalez, 2012) who studied the moderating effects in financial structure determinants. Additionally, the extant studies have two main limitations. First, the moderating effects were measured using dummies, subsamples or simple interaction terms in tabulated form (e.g. in Gonzalez & Gonzalez, 2012; Vithessonthi & Tongurai, 2015). These approaches do not enhance the interpretability of the findings and may result in an inaccurate depiction of the nature of the relationship (Brambor, Clark & Golder, 2006). For example, the use of tabulated interaction terms obscures the *conditional* marginal effects of the moderating variable. Second, the previous studies covered only a limited number of countries (e.g. Spain, in Gonzalez & Gonzalez, 2012; Greece, in Voulgaris, Asteriou & Agiomirgianakis, 2004; Thailand, in Vithessonthi & Tongurai, 2015), and an either short or old time period.

Following the above-mentioned, the main objective of this paper is to extend the studies of Gonzalez and Gonzalez (2012), Vithessonthi and Tongurai (2015), and Voulgaris et al. (2004), by researching the moderating effect of size on the performance–leverage relationship in British, French and German firms between 2006–2013. The present paper employs the Johnson–Neyman (J–N) technique for computing the interaction coefficients (as suggested and explicated in Hayes & Matthes, 2009), and analyses the moderating effects graphically (following the recommendations of Brambor et al., 2006), which permits to maintain the continuous character of the moderating variable, thus addressing one of the drawbacks of the previous studies. As regards the study period, it was selected based on data availability, following a trade-off between the number of firms included in the study and the time-span.

This paper has several academic and practical benefits. With respect to the former, it contributes to the literature on capital structure determinants through a novel approach; namely, the paper investigates the moderating role of size on the performance–leverage relationship graphically and by maintaining the continuous character of firm size. Additionally, it indicates that POT and TOT can and should be combined in order to obtain a more complete capital structure theory, which supports the views of such authors as Fama and French (2005). As regards the practical benefit of the study, managers and consultants are provided with a better understanding of the linkage between profitability, company size and leverage, the findings thus supporting them in their capital structure decisions.

To conclude, the thesis aims to answer the following research question: How did the linkage between profitability, size and leverage of British, French and German firms change during the 2006–2013 period? The answer to this question was obtained by conducting several ordinary least squares (OLS) regression analyses. Since conventional, tabulated analyses of moderation effects only provide an incomplete picture (Brambor et al., 2006), the OLS regressions were complemented by a graphical inspection of the profitability–leverage relationship (size acting as a moderator).

The results indicate that the effects of profitability and size, as capital structure determinants, vary per country and year. Nonetheless, the following trends were observed. As regards profitability, in German and British firms it follows the predictions of TOT and has a positive and statistically significant effect on the debt level in small and medium firms. Conversely, in large companies the effect of profitability is significant only in the British sample, and is negative, as predicted by POT. Finally, in French companies leverage is negatively affected by profitability, which is consistent with POT. The effect, however, is significant only in the year 2006 and in the full period subsample, and only in medium and large companies. With regard to firm size, the variable consistently follows the predictions of TOT; i.e. it has a positive effect on the level of indebtedness.

The major implications of these findings are twofold. First, supporting the claims of such authors as Byoun (2008), POT and TOT can and should be converged, rather than be viewed as competing capital structure models. Second, building on the aforementioned, a new and more detailed theoretical model of financial structure should be developed, which would encompass existing theories (POT and TOT, among others) and take into account firm size and country differences.

The remainder of the paper is structured as follows. Section 2 offers a review of the literature on the effects of the two capital structure determinants (size and profitability); describes the conceptual framework of this paper; and lists the hypotheses derived from extant research. Section 3 discusses the data sources, the operationalisation of the variables, the treatment of the data, the summary statistics thereof, the multicollinearity issue, as well as the fulfilment of regression assumptions. In section 4 the results of the regression analyses are provided, along with the interpretation thereof. Section 5 concludes with a discussion on the gained insights and on the limitations of the paper, and provides suggestions for future research.

2. LITERATURE REVIEW

The capital structure literature has been dominated by two theories: POT and TOT (Fama & French, 2005). Some scholars (e.g. Dang, Kim & Shin, 2014) also acknowledge the emergence of a third influential lens through which to view the capital structure decisions of a company, namely the market timing hypothesis (Baker & Wurgler, 2002). The focus of this paper, however, is on POT and TOT.[1]

2.1 The trade-off theory

TOT posits that companies determine their capital structure based on the benefits and costs of debt, and increase their leverage ratio to the point where the marginal costs and benefits of debt are equal (Fama & French, 2002). The benefits and costs of debt are, among others, the reduction of tax liability and the increase in bankruptcy risk (as originally introduced to the corporate finance field by Kraus & Litzenberger, 1973), as well as the attenuation of the free cash-flow problem (Jensen, 1986) and the creation (or intensification) of shareholder and bondholder conflicts (Fama & French, 2005).

The reasoning behind TOT permits to make the following predictions. First, a positive relationship between profitability and leverage is expected, since debt enables firms to lower their tax expense and agency problems. Second, company size and leverage are also expected to be positively linked. The rationale is that larger firms are more diversified and thus less prone to bankruptcy (de Jong et al., 2011). Since size may be viewed as an inverse proxy for bankruptcy risk (de Jong, Kabir & Nguyen, 2008), larger firms have, consequently, a higher borrowing capacity and attempt to benefit from this. Additionally, smaller companies are able to borrow less because of higher agency costs (Dang, 2013). In view of the above, the following hypotheses are formulated:

> **H1a:** *Under TOT, the more profitable a company is, the higher its leverage ratio.*
>
> **H2a:** *The larger a company is, the higher its leverage ratio, following the arguments of TOT.*

2.2 The pecking order theory

POT explains capital structure decisions by focusing on the role of asymmetric information between a firm's managers and outside investors. Companies resort to internal financing in the first place, and if external funding is necessary, debt is preferred to equity, since the former is perceived as safer (Myers, 1984). The reason for this preference order resides in the cost associated with issuing securities: the actual costs of issuance, and the costs stemming from the managers' private knowledge of the firm's actual value (Fama & French, 2002).

Based on the POT arguments, the following predictions can be made regarding the effects of profitability and size on capital structure. First, more profitable firms are expected to be less leveraged, because their higher earnings enable them to avoid external financing (Dang, 2013). A negative relationship is expected between size and leverage as well, because larger firms are generally more profitable (Dang, Kim & Shin, 2012), have retained, over time, higher earnings (Frank & Goyal, 2009) and have, accordingly, a lower need for external financing. Thus, the following hypotheses are developed:

> **H1b:** *The more profitable a company is, the lower its leverage ratio, based on POT.*
>
> **H2b:** *Under POT, the larger a company is, the lower its leverage ratio.*

[1] The market timing hypothesis is excluded from the analyses because of limited data availability.

2.3 Empirical tests of the pecking order and trade-off theories

The evidence on the effects of profitability and size on leverage is mixed (Dang, 2013). To substantiate this, panel A of table A1 (see the appendix) provides a succinct overview of the findings of several studies on capital structure determinants.

With regard to profitability and leverage, several studies (e.g. Hovakimian, Hovakimian & Tehranian, 2004) found a positive relationship between the two, while others observed a negative link (e.g. Acedo-Ramirez & Ruiz-Cabestre, 2014; Booth, Aivazian, Demirguc-Kunt & Maksimovic, 2001). The literature also disagrees on how size affects capital structure. A number of papers reported a positive link between size and leverage (e.g. Fama & French, 2002), whereas others observed a negative (e.g. Faulkender & Petersen, 2006) or a statistically insignificant relationship (e.g. Acedo-Ramirez & Ruiz-Cabestre, 2014, in Spanish and Italian firms).

The sign and significance of the coefficients differ both between and within countries. The contradictory results between countries may be attributed to differences in institutional settings. On the other hand, the inconsistencies within countries (e.g. in Hovakimian et al., 2004; Fama & French, 2002) may be attributed to differences in operationalisation and methodology between studies. To illustrate, consider the findings of Faulkender and Petersen (2006), who report negative, positive and statistically insignificant coefficients for the effect of size on leverage, depending on how leverage is measured (through total or long-term debt), whether firms have credit ratings and whether zero-debt observations are included in the analysis.

2.4 Reconciling the trade-off and pecking order theories: The role of company size

The contradictions in the theoretical predictions of POT and TOT, as well as the mixed empirical results, highlight the need for a framework that reconciles the two theories (Byoun, 2008; Fama & French, 2005). As argued previously, introducing interaction effects in the discussion on capital structure determinants might provide the means to converge the two theories.

The literature has generally failed to consider the moderating role of some variables on the link between capital structure and its determinants. The studies that did include them, focused on the role of size and its influence on the performance–leverage relationship. Two competing perspectives exist on how size moderates the said relationship. The first viewpoint posits that there is a dynamic performance–leverage–performance link which varies in magnitude along the company size spectrum (Vithessonthi & Tongurai, 2015). The borrowing capacity grows with firm size, which enables companies to increase their leverage ratio and make more investments. This, in turn, increases profitability and firm size, thus establishing a positive link between financial performance and leverage. However, there are limited investment opportunities for large firms and a correspondingly lower necessity to borrow to finance projects. Hence, Vithessonthi and Tongurai (2015) claim that profitability and leverage are positively linked in small and medium companies, and negatively linked in large firms. This leads to the following hypothesis:

> **H3a:** *The moderating effect of size on the leverage–profitability relationship is positive (negative) in small (large) companies (Vithessonthi & Tongurai, 2015).*

The second perspective builds on the difference in information asymmetry between large and small firms. As such, Gonzalez and Gonzalez (2012) reach a different conclusion by arguing that in large firms information asymmetry is lower, therefore

the predictions of POT (TOT) are less (more) applicable. Thus, in smaller firms the profitability–leverage link is expected to be negative (following POT), while in larger firms the link is positive (following TOT). The strength of the relationship is deemed to increase as companies approach either end of the size spectrum, since the intensity of information asymmetry and size are directly proportional. Based on the arguments of Gonzalez and Gonzalez (2012), the hypothesis may be stated thusly:

> **H3b:** *The moderating effect of size on the leverage–profitability relationship is negative (positive) for small (large) companies (Gonzalez & Gonzalez, 2012).*

2.5 Evidence on the moderating role of size

The findings on the moderating role of size on the performance–leverage relationship are equally contradictory. Vithessonthi and Tongurai (2015), in a study of Thai firms, observed that the link between profitability and leverage is positive for small firms and negative for medium and large firms. The effect also strengthens at both ends of the size continuum: e.g. in large companies the negative link is stronger than in medium-sized companies. Conversely, Gonzalez and Gonzalez (2012) report negative coefficients across all company sizes (small, medium and large) in a sample of Spanish firms, with a significantly stronger effect being observed in smaller firms. Voulgaris et al. (2004), however, did not report any difference between small- and medium-sized enterprises and large firms, profitability being inversely related to leverage in all types of companies.

The difference in the results might be due to two factors. First, the three studies differ in the method through which size-based subsamples were created and the actual number thereof. While Vithessonthi and Tongurai (2015) based their subsampling method on asset size and divided the sample in six categories, Voulgaris et al. (2004) used employment as a selection criterion and conducted the analyses on two subsamples. Gonzalez and Gonzalez (2012), on the other hand, used both employment and turnover to differentiate between small, medium and large firms. Second, the difference in the findings may also be due, to a certain extent, to the fact that in Vithessonthi and Tongurai (2015) the moderating role of size was studied in models where leverage was the independent variable, whereas in Gonzalez and Gonzalez (2012) and Voulgaris et al. (2004) the effect of performance on leverage was analysed. In conclusion, the evidence on the moderating role of size is mixed, yet it indicates that in medium and large companies the performance–leverage relationship is negative.

2.6 Summary

This subsection provides a depiction (figure 1) of the reviewed factors that affect the financial structure of companies, based on POT, TOT and the interaction models, as well as the formulated hypotheses pertaining to each factor. A tabulated, concise summary of the reviewed papers is provided in the appendix (table A1), along with a graphical representation of the mechanisms underlying the linkage between size, profitability and capital structure (figure A1).

3. METHODOLOGY AND DATA

3.1 Focus variables

Following previous research on capital structure (e.g. Acedo-Ramirez & Ruiz-Cabestre, 2014; Brav, 2009; Gonzalez, 2013), leverage is operationalised as the ratio of book value of total debt to book value of total assets. It is customary in some studies for market leverage (book value of debt to market value of assets) to be employed in the analyses. However, book leverage was selected in order to maximise the sample size, since data for market value of assets was available for a limited number of firms and for a significantly shorter period of time. Additionally, the regression results are robust to differences in the operationalisation of leverage (Frank & Goyal, 2009).

The main independent variables of the present paper are firm size and profitability. The former is operationalised as the natural logarithm of total assets (Aggarwal & Zhao, 2007; Byoun, 2008; Chang, Chou & Huang, 2014). An alternative measure of size is the natural logarithm of total sales. However, this approach is forgone in order to maximise the sample size. The ratio of operating revenue to total assets is used as a measure of profitability (Byoun, 2008). In order to test the moderating role of size, an interaction term is also introduced, defined as the product of the variables *size* and *profitability*.

3.2 Control variables

3.2.1 Firm level

Following the literature on capital structure, a set of control variables are employed at the firm level: tangibility and liquidity. The former is defined as the ratio of fixed assets to total assets (Acedo-Ramirez & Ruiz-Cabestre, 2014; Antoniou, Guney & Paudyal, 2008; Dang, 2013) and the latter as the ratio of current assets to current liabilities (de Jong et al., 2008; Deesomsak, Paudyal & Peschetto, 2004).

With regard to tangibility, which Frank and Goyal (2009) classify as one of the core capital structure determinants, the rationale for including it is the following. Firms with more tangible assets are perceived as less risky, in view of the existing collaterals (Antoniou et al., 2008). Therefore, under TOT, more tangible firms would employ more debt in order to increase the debt benefits (Dang, 2013). POT, on the other hand, leads to a different conclusion, yet it still highlights the role of this variable as a capital structure determinant.

Liquidity is also deemed to influence the financing decision of

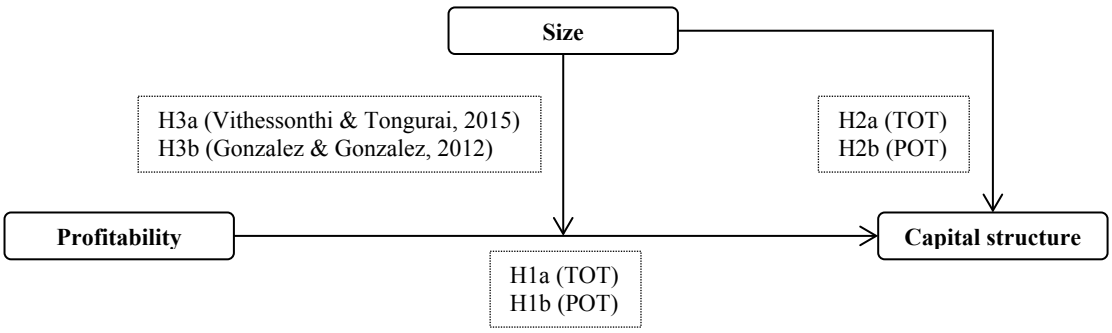


Figure 1. Overview of hypotheses and causal relationships

firms. Its significance can be illustrated under POT: more liquid companies are expected to borrow less, since their internal funds are larger (de Jong et al., 2008).

3.2.2 Industry level

Two controls are employed at the industry level. Several scholars (e.g. Aggarwal & Zhao, 2007; Hovakimian et al., 2004) employed median industry debt ratios to capture variance in leverage unaccounted for by firm-level variables (Chang et al., 2014). In fact, as argued in Frank and Goyal (2009), the industry effect is a robust and significant factor that influences capital structure. The median industry leverage is calculated for industries identified based on the two-digit SIC (Standard Industrial Classification) codes (Fan, Titman & Twite, 2012).

Second, following Chang, Lee and Lee (2009) and de Jong et al. (2008), an industry dummy is introduced to control for industry differences. Based on Chang et al. (2009), the machinery, equipment and other manufacturing industry (SIC 3400–3999) is selected as reference category. Chang et al. (2009) state that firms in this industry use less debt, their claim being based on Titman's (1984) argument that firms in the machinery and equipment production industry have higher liquidation costs.

3.3 Methodology

Several OLS regression analyses are conducted in order to test the hypotheses formulated in the previous section. The equations of the models are as follows:

$$(1)\ LEV_i = \beta_1*SIZE_i + \beta_2*PROF_i + \beta_3*SIZE\_PROF_i + \beta_4*TANG_i + \beta_5*LIQ_i + \beta_6*IND\_MED_i + \beta_7*IND\_DUMMY_i + \beta_0 + \varepsilon_i$$

$$(2)\ LEV_{it} = \beta_1*SIZE_{it} + \beta_2*PROF_{it} + \beta_3*SIZE\_PROF_{it} + \beta_4*TANG_{it} + \beta_5*LIQ_{it} + \beta_6*IND\_MED_{it} + \beta_7*IND\_DUMMY_{it} + \beta_8*YEAR\_DUMMY_{it} + \beta_0 + \varepsilon_{it}$$

The first four terms (LEV, SIZE, PROF and SIZE_PROF) represent the focus variables of this study: leverage, size, profitability and the interaction term, respectively. The interaction term, however, was only employed in the analyses of the moderating role of size. TANG and LIQ are the terms for tangibility and liquidity. The industry median, the industry dummy and the year dummy are represented by IND_MED, IND_DUMMY and YEAR_DUMMY, respectively. Finally, the intercept and the error term are denoted by β_0 and ε.

The first equation is employed for analysing the determinants of capital structure for each of the three countries per year, while the second equation represents the regression equation for the pooled model, wherein the capital structure determinants are tested across the entire 2006-2013 period.

The industry and year dummies require an elaboration. With regard to the former, the variable takes a value of 1 if the firm belongs to one of ten industry categories: agriculture, forestry, fishing and resources (SIC 0100–1499); construction (SIC 1500–1799); food (SIC 2000–2099); tobacco, textiles, wood and furniture (SIC 2100–2599); paper, printing and publishing (SIC 2600–2799); chemicals, pharmaceuticals, and petroleum (SIC 2800–2999); rubber, leather and stone (SIC 3000–3299); metallurgy (SIC 3300–3399); machinery, equipment and other manufacturing (SIC 3400–3999); transportation, trade and services (SIC 4000–9510). The categorisation is based on de Jong et al. (2008) and Chang et al. (2009).

The year dummy represents the variable employed in the pooled regressions to control for variation across years. Years 2006 and 2007 serve as reference categories, since in the subsequent period the European Union was affected by two crises: the global financial crisis (GFC), which started in 2008 (Beirne & Fratzscher, 2013), and the European debt crisis (EDC), which erupted in the year 2010 and ended in 2012 (de Grauwe & Ji, 2015). While the year 2013 is classified as the post-crisis period, it is not included in the reference period because the only the *acute* phase of the EDC ended in the previous year (Eichengreen, 2015).

The interaction term serves for capturing the moderating role of size on the profitability–leverage relationship. However, the analysis of moderation is incomplete and misleading when it is based on the conventional, tabulated results. To exemplify, if SIZE_PROF were statistically insignificant, this would not necessarily indicate that size does not have a moderating role, because the significance may vary across the values of the variable (Brambor et al., 2006). Therefore, following the suggestion of Brambor et al. (2006) and Hayes and Matthes (2009), the J–N method for probing interactions will be employed, with a graphical inspection of the results, in order to conduct a more thorough analysis.

3.4 Data source and selection criteria

The data was extracted from the Orbis database of Bureau van Dijk. The sample consists of 1.461 companies (388 French, 397 German, and 676 British firms) over the 2006-2013 period, with 10.688 firm-year observations (2.918 observations for German firms, 2.975 for French companies, and 4.795 for British firms).

The final sample was obtained after screening the data on several criteria. Following standard practice (Chang et al., 2014; Dang et al., 2014; Flannery & Rangan, 2006), financial and utility firms (SIC codes between 6000–6999 and 4900–4999, respectively) were excluded from the analysis due to the different regulatory and accounting practices they are subject to (Dang, 2013), as well as because their financial structure is different and signals different information than that of companies in other industries (Byoun, 2008).

In order to reduce noise in the sample, two additional restrictions were set. First, several of the employed variables were confined to specific intervals (Danis, Rettl & Whited, 2014). For example, leverage must lie in the closed interval between zero and unity (Alti, 2006; Baker & Wurgler, 2002; Hovakimian, 2006; Huang & Ritter, 2009). Second, as is customary in the literature, the influence of outliers was reduced by winsorising the variables at the 1st and 99th percentiles (Chang et al., 2014; Dang, 2011; Flannery & Rangan, 2006).

3.5 Summary statistics and multicollinearity

Table 1 contains the summary statistics and the correlations between the employed variables. As there are statistically significant correlations between several variables, the issue of multicollinearity was further analysed via the variance inflation factors (VIFs) specific to each variable, as reported in table 2.

The literature provides no formal thresholds for the VIFs, yet such cut-off values as 5 and 10 are commonly employed (Craney & Surles, 2002). The values are close to the minimum of 1 only for the variable SIZE, when the interaction term is not included. However, since the largest VIFs are below 5, it may be stated that the confidence intervals and the tests of statistical significant are likely to be unbiased (Berry & Feldman, 1985).

A seeming threat to the robustness of the results arises when the interaction term is included, which increases the inflation factors. The VIFs are still below the threshold of 5, with the exception of the interaction term and PROF. However, the high vari-

ance inflation factors do not indicate that the results are unreliable in the case of interaction models (Friedrich, 1982). Thus, including the multiplicative term does not influence the reliability of the results. Furthermore, multicollinearity is relatively irrelevant in this instance because the purpose of interaction models is to assess the conditional effect of the focus variable, rather than make general statements as to the impact of other variables (Brambor et al., 2006).

3.6 Regression assumptions

Before proceeding with the analyses, an investigation into the fulfilment of the linear regression assumptions was made. The linearity and homoscedasticity assumptions were tested by inspecting plots of standardised residual values against standardised fitted values (Osborne & Waters, 2002) per country, for each year in the 2006-2013 period. The results indicate that the linearity assumption is fulfilled, since the scatterplots do not exhibit signs of nonlinearity in the distribution of the residuals, yet they do indicate signs of heteroscedasticity (as an example, see figure A2 in the appendix) because the residuals are not equally spread across the mean of zero for the entire range of the standardised fitted values. Heteroscedasticity is milder in the case of British and German firms, and is more pronounced in the case of French firms. In order to alleviate this problem, heteroscedasticity-consistent standard error estimators will be employed, using Hayes and Cai's (2007) macros. The assumption of normality was tested both statistically, through Kolmogorov–Smirnov tests of normality (Osborne & Waters, 2002), and visually (see figure A3, as an example), by inspecting the histograms of the unstandardised residuals (Williams, Grajales & Kurkiewicz, 2013). The assumption was generally fulfilled, with few exceptions. However, since OLS regressions are robust to violation of this assumption (Osborne & Waters, 2002), the coefficients are unlikely to be biased. Finally, the assumption of independence of errors was tested with the Durbin–Watson test. The statistics are 1,388 (German sample), 1,584 (French sample) and 1,533 (British sample). Being between unity and two, the statistics indicate that while not a cause for concern (Field, 2009), autocorrelation might still affect the tests of significance in the full period subsamples by underestimating the standard deviation of the terms (Berry & Feldman, 1985).

Table 1. Correlations (two-tailed) and summary statistics

Panel A: British firms (Observations – 4795)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	Mean	Median	Standard deviation	Min.	Max.
LEV	(1)	1							0,50	0,50	0,20	0,08	0,98
PROF	(2)	0,38*	1						1,07	0,90	0,80	0	4,18
SIZE	(3)	0,31*	-0,10*	1					11,72	11,39	2,41	6,74	18,67
SIZE_PROF	(4)	0,44*	0,95*	0,15*	1				12,34	10,44	9,08	0	58,05
TANG	(5)	-0,07*	-0,51*	0,28*	-0,43*	1			0,54	0,56	0,24	0	1,00
LIQ	(6)	-0,55*	-0,14*	-0,16*	-0,18*	-0,45*	1		1,65	1,40	0,97	0,17	5,00
IND_MED	(7)	0,32*	0,22*	0,09*	0,25*	-0,11*	-0,17*	1	0,52	0,52	0,09	0,27	0,77

Panel B: French firms (Observations – 2975)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	Mean	Median	Standard deviation	Min.	Max.
LEV	(1)	1							0,58	0,59	0,17	0,08	0,98
PROF	(2)	0,19*	1						1,02	0,96	0,55	0,01	4,18
SIZE	(3)	0,26*	-0,16*	1					12,27	11,93	2,20	6,74	18,67
SIZE_PROF	(4)	0,25*	0,94*	0,15*	1				12,33	11,58	6,67	0,09	63,61
TANG	(5)	0,07*	-0,45*	0,43*	-0,32*	1			0,45	0,43	0,21	0	0,99
LIQ	(6)	-0,65*	-0,12*	-0,25*	-0,18*	-0,44*	1		1,59	1,38	0,82	0,17	4,98
IND_MED	(7)	0,26*	0,01	0,25*	0,08*	0,12*	-0,17*	1	0,54	0,52	0,08	0,27	0,77

Panel C: German firms (Observations – 2918)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	Mean	Median	Standard deviation	Min.	Max.
LEV	(1)	1							0,56	0,58	0,19	0,08	0,98
PROF	(2)	0,14*	1						1,20	1,11	0,66	0	4,18
SIZE	(3)	0,27*	-0,16*	1					12,26	12,01	2,33	6,74	18,67
SIZE_PROF	(4)	0,23*	0,92*	0,18*	1				14,52	13,42	7,69	0	56,02
TANG	(5)	0,06*	-0,49*	0,16*	-0,43*	1			0,49	0,47	0,20	0,02	1,00
LIQ	(6)	-0,53*	0,02	-0,19*	-0,04**	-0,45*	1		1,81	1,61	0,93	0,17	4,99
IND_MED	(7)	0,33*	0,03	0,13*	0,06*	0,12*	-0,19*	1	0,54	0,53	0,07	0,27	0,77

Note: Min. – minimum; Max. – maximum. For the definitions of the variables refer to section 3.3.
* and ** denote statistically significant correlations at the 1% and 5% level, respectively.

Table 2. Multicollinearity diagnosis: Variance inflation factors

	British sample		French sample		German sample	
	(1)	(2)	(1)	(2)	(1)	(2)
PROF	1,81	28,24	1,54	31,37	1,52	24,06
SIZE	1,18	3,00	1,35	4,26	1,21	3,93
SIZE_PROF		28,27		30,98		24,26
TANG	2,53	2,54	2,22	2,22	1,98	1,99
LIQ	1,72	1,72	1,57	1,59	1,47	1,47
IND_MED	2,41	2,42	1,88	1,88	1,80	1,81

Note: For the definitions of the variables refer to section 3.3.

4. RESULTS

4.1 Capital structure determinants

Several regression analyses were conducted, in order to test the previously-formulated hypotheses. To correct for heteroscedasticity, the standard errors were estimated using Cribari-Neto's (2004) heteroscedasticity-consistent estimator (HEC). As Hayes and Cai (2007) argue, this estimator is more robust to high-leverage observations, abnormally distributed errors and small samples than other commonly employed HECs, such as the one of White (1980; e.g. in de Jong et al., 2008).

Table 3 contains the outcome of the OLS regressions. While the results vary per time period and country, the models have statistically significant predictive capability for all countries, across all years. The variance in leverage explained by the models ranges from a minimum of 36,4% to a maximum of 56,9%.

With regard to profitability, the findings indicate that its effect on leverage depends on the country and time period under study. In the German sample, the coefficient of PROF is positive across all years, which leads to the rejection of H1b in favour of H1a. This is consistent with TOT, wherein debt is used to reduce tax expenses, within a trade-off between tax shield and bankruptcy risk. The effect, however, is statistically significant only in the three years of the 2009–2011 period and in the full period subsample. Profitability has a positive and statistically significant impact on leverage in British firms as well, across all studied periods, except in 2006, thus generally supporting the predictions of TOT. Conversely, in French companies the effect is consistently negative, yet it is significant only in the year 2006 and in the full period sample. This is consistent with POT, i.e. preference is given to internal financing rather than debt, due to information asymmetry.

Several conclusions may be drawn from the aforementioned. First, the results are mixed with regard to the effect of profitability on capital structure, the sign and significance of this variable being a function of time and country. Second, the prediction of TOT (H1a) is generally applicable in the case of British firms across all years; it is, however, only partially valid in the case of German companies, namely during the most critical moments of the crisis period (2009-2011). Thus, in the context of these two countries, the benefits and costs of debt are of importance when making capital structure decisions, rather than asymmetric information. Third, the pecking-order prediction is valid in French firms, yet only in two instances: before the onset of the crisis (2006), and in the full sample period. This indicates that capital structure decisions are influenced by concerns about information asymmetry, yet only in financially stable periods. A potential explanation for the observed statistical significance in the full sample is that the tests of significance were biased because of the autocorrelation of the error terms, which might have caused the confidence intervals to be too narrow (Berry & Feldman, 1985).

The findings pertaining to company size are consistent across time and countries. The coefficients are positive and statistically significant, which leads to the rejection of H2b and the failure to reject H2a. Hence, firm size positively affects capital structure, in a manner predicted by TOT, under the rationale that larger firms have a lower bankruptcy risk and can, therefore, reap greater benefits from debt.

4.2 The moderating role of company size

The moderating role of size on the profitability–leverage relationship was analysed graphically, using the J–N approach for probing interactions. Conventional OLS regressions (unreported) were conducted as well, yet these yielded inconsistent results, wherein the statistical significance and the sign of the effect of profitability on leverage varied highly both within (i.e. across years) and between countries. Additionally, tabulated results provide an incomplete picture of the actual relationship (Brambor et al., 2006). Hence, following the recommendation of Brambor et al. (2006), the interaction effects were assessed more thoroughly by visualising the computed coefficients of the focal predictor. The results are presented in figure 2. The solid lines indicate the marginal effect of profitability, whereas the dashed lines mark the 95% confidence interval. Statistical significance occurs in the areas where the confidence intervals do not include zero. The slopes and intercepts of the effects vary across countries and years, yet similar features persist, which led to the grouping of the results as indicated in figure 2.

In the case of the German sample, profitability exerts a positive and statistically significant effect on leverage only in the years 2009, 2011 and in the full period subsample. The impact is weaker in the year 2009 (figure 2.A) and stronger in the latter two subsamples (figure 2.B). In all three cases the effect weakens as firm size lowers and becomes insignificant upon reaching a certain threshold (81 million Euro in 2009, 273 million Euro in 2011, and 1741 million Euro in the full period subsample).

Table 3. Ordinary Least Squares regression results, with total debt ratio as dependent variable

	Germany								
	2006	2007	2008	2009	2010	2011	2012	2013	Full period
PROF	0,01	0,02	0,02	0,03**	0,03***	0,04**	0,03	0,02	0,02*
	0,50	*1,37*	*1,43*	*1,99*	*1,84*	*2,50*	*1,51*	*0,97*	*4,35*
SIZE	0,02*	0,02*	0,02*	0,01*	0,01*	0,01*	0,01*	0,01*	0,01*
	4,83	*4,96*	*5,17*	*3,49*	*3,34*	*3,30*	*2,73*	*2,72*	*11,04*
TANG	-0,21*	-0,17*	-0,13*	-0,16*	-0,25*	-0,18*	-0,15*	-0,26*	-0,19*
	-3,78	*-3,22*	*-2,70*	*-2,81*	*-4,24*	*-2,84*	*-2,59*	*-4,15*	*-9,56*
LIQ	-0,12*	-0,10*	-0,11*	-0,10*	-0,12*	-0,12*	-0,11*	-0,11*	-0,11*
	-9,54	*-8,65*	*-10,91*	*-8,35*	*-9,02*	*-7,96*	*-8,98*	*-9,26*	*-26,42*
IND_MED	0,58*	0,60*	0,65*	0,67*	0,70*	0,47*	0,68*	0,71*	0,64*
	4,75	*4,68*	*5,08*	3,71	*3,47*	*2,63*	*4,52*	*5,59*	*13,47*
Constant	0,35*	0,26*	0,23**	0,28**	0,32**	0,40*	0,30*	0,38*	0,31*
	3,76	*2,82*	*2,51*	2,34	*2,58*	*3,29*	*2,70*	*3,67*	*8,66*
Adjusted R^2	46,2%	42,8%	46,5%	37,3%	36,4%	39,7%	39,6%	38,7%	41,8%
F-statistic	28,71*	22,54*	29,83*	18,40*	17,27*	21,59*	19,43*	21,68*	124,99*
Observations	363	363	367	362	362	369	367	365	2918

Table 3 ***(continued)***

	France								
	2006	2007	2008	2009	2010	2011	2012	2013	Full period
PROF	-0,03***	-0,02	-0,01	-0,01	-0,02	-0,02	-0,00	0,01	-0,01**
	-1,80	*-1,54*	*-0,62*	*-0,58*	*-1,16*	*-1,38*	*-0,18*	*0,38*	*-2,53*
SIZE	0,01*	0,01*	0,02*	0,02*	0,02*	0,02*	0,01*	0,01*	0,02*
	2,92	*3,53*	*4,97*	*6,15*	*4,23*	*4,07*	*3,32*	*3,45*	*11,91*
TANG	-0,32*	-0,27*	-0,26*	-0,33*	-0,35*	-0,37*	-0,35*	-0,33*	-0,32*
	-5,13	*-5,15*	*-5,11*	*-7,00*	*-6,06*	*-6,04*	*-6,35*	*-6,09*	*-17,69*
LIQ	-0,18*	-0,16*	-0,15*	-0,15*	-0,16*	-0,16*	-0,18*	-0,17*	-0,16*
	-12,97	*-13,67*	*-11,18*	*-13,99*	*-12,66*	*-11,05*	*-13,44*	*-13,42*	*-39,11*
IND_MED	0,27**	0,18***	0,33**	0,37*	0,38**	0,39*	0,31*	0,36*	0,31*
	2,56	*1,69*	*2,52*	*2,61*	*2,46*	*2,65*	*2,59*	*3,22*	*7,58*
Constant	0,76*	0,72*	0,56*	0,53*	0,62*	0,62*	0,72*	0,65*	0,66*
	8,95	*9,55*	*6,25*	*6,16*	*6,34*	*6,58*	*8,55*	*8,78*	*23,04*
Adjusted R^2	54,4%	53,4%	54,8%	56,0%	53,8%	48,7%	55,0%	56,9%	54,9%
F-statistic	32,53*	29,45*	29,15*	33,39*	29,59*	19,42*	25,25*	28,42*	156,29*
Observations	370	375	379	372	371	372	369	367	2975
	United Kingdom								
	2006	2007	2008	2009	2010	2011	2012	2013	Full period
PROF	0,01	0,03*	0,03*	0,04*	0,03**	0,03*	0,02**	0,03*	0,26*
	1,25	*2,76*	*2,77*	*3,40*	*2,51*	*3,21*	*2,35*	*2,63*	*7,61*
SIZE	0,02*	0,03*	0,03*	0,03*	0,03*	0,03*	0,03*	0,03*	0,03*
	7,94	*9,52*	*11,18*	*9,80*	*9,35*	*9,01*	*9,54*	*9,97*	*27,35*
TANG	-0,38*	-0,31*	-0,30*	-0,29*	-0,34*	-0,32*	-0,37*	-0,37*	-0,33*
	-9,28	*-7,58*	*-7,76*	*-7,03*	*-8,22*	*-8,64*	*-11,08*	*-8,89*	*-23,98*
LIQ	-0,15*	-0,12*	-0,13*	-0,12*	-0,14*	-0,13*	-0,14*	-0,14*	-0,13*
	-16,26	*-15,17*	*-14,51*	*-12,97*	*-15,17*	*-14,87*	*-17,98*	*-14,25*	*-42,61*
IND_MED	0,32*	0,28*	0,26*	0,38*	0,48*	0,46*	0,45*	0,45*	0,37*
	3,73	*2,64*	*2,84*	*3,60*	*4,75*	*4,53*	*4,75*	*4,83*	*10,98*
Constant	0,50*	0,37*	0,36*	0,29*	0,33*	0,28*	0,35*	0,36*	0,37*
	7,71	*4,95*	*5,21*	*3,79*	*4,94*	*4,15*	*5,65*	*5,09*	*15,08*
Adjusted R^2	54,6%	53,1%	53,8%	49,7%	54,9%	55,5%	56,0%	55,2%	54,6%
F-statistic	48,85*	56,27*	48,28*	43,12*	45,82*	57,56*	61,53*	53,12*	278,27*
Observations	584	599	599	596	605	610	604	598	4795

Note: The coefficients for the yearly and full period models were computed following equations (1) and (2), respectively. The equations and the explanations of the variables are provided in section 3.3. All models include unreported industry dummies (as well as year dummies for the full period models). The reported t-statistics (italicised) and F-statistics were computed with Cribari-Neto's (2004) heteroscedasticity-consistent standard error estimator.
The 1%, 5% and 10% significance levels are flagged using *, ** and ***, respectively.

The results in the German context indicate that H3a and H3b should be rejected. Thus, they only partially support the claims of Vithessonthi and Tongurai (2015), and Gonzalez and Gonzalez (2012). Following the reasoning of the former authors, a positive and self-sustaining relationship exists between profitability and leverage in small and medium firms, in view of the growth opportunities these companies have. The reasoning of Gonzalez and Gonzalez (2012) finds confirmation only with regard to their claim that the effect strengthens as firm size decreases. However, the explanation of this effect may be different to theirs: the increase is not due to the intensification of information asymmetry issues, but to the higher growth opportunities of smaller firms. To conclude, by combining the findings and the theoretical arguments, it may be stated that profitability positively and more pronouncedly affects leverage in companies with higher growth (i.e. investment) opportunities, within a "growth opportunity–leverage–profitability" cycle.

In the case of French companies, profitability affects leverage negatively, the effect being statistically significant only in the full period subsample (figure 2.C), in companies with an asset base larger than 104 million Euro. Thus, the evidence leads to the rejection of H3a and H3b, and only partially supports the assertions of Vithessonthi and Tongurai (2015). Namely, profitability negatively impacts leverage within the "growth opportunity–leverage–performance" paradigm, because of the lower growth opportunities that large firms have. Yet the predictions with regard to small and medium firms are unsupported.

Profitability's influence is relatively erratic in the case of British companies, yet the effects may be categorised as follows. First, in the years 2008, 2009, 2011 and in the full period subsample (figures 2.D and 2.F) profitability positively impacts the leverage ratio of small and medium firms (i.e. with an asset base smaller than approximately 170 million Euro; in the full period the threshold is higher, at 585 million Euro), and negatively affects very large firms (i.e. total assets in the worth of billions of Euros). Second, the slope of the line that depicts the marginal effect of profitability on capital structure is steeper in the year 2009 (which may be viewed as the central year of the entire crisis period), and in the full period subsample, indicating a stronger effect. Third, consistent with the results in the previous subsection, profitability has no influence on the financing structure of firms in the year 2006 (unreported), irrespective of their size. Fourth, in the remaining years (figure 2.E), the coefficients of PROF are positive for small and medium firms (namely, fewer than approximately 160 million Euro in total assets), and are statistically insignificant for large firms. To

conclude, hypothesis H3b is rejected across all subsamples, whereas H3a is rejected in only several instances. Hence, the arguments of Vithessonthi and Tongurai (2015) generally find support in the British context: the influence of profitability as a function of firm size follows the prescriptions of their "growth opportunity–leverage–profitability" cycle, with the effect being stronger in small and large firms.

4.3 A summary of the results

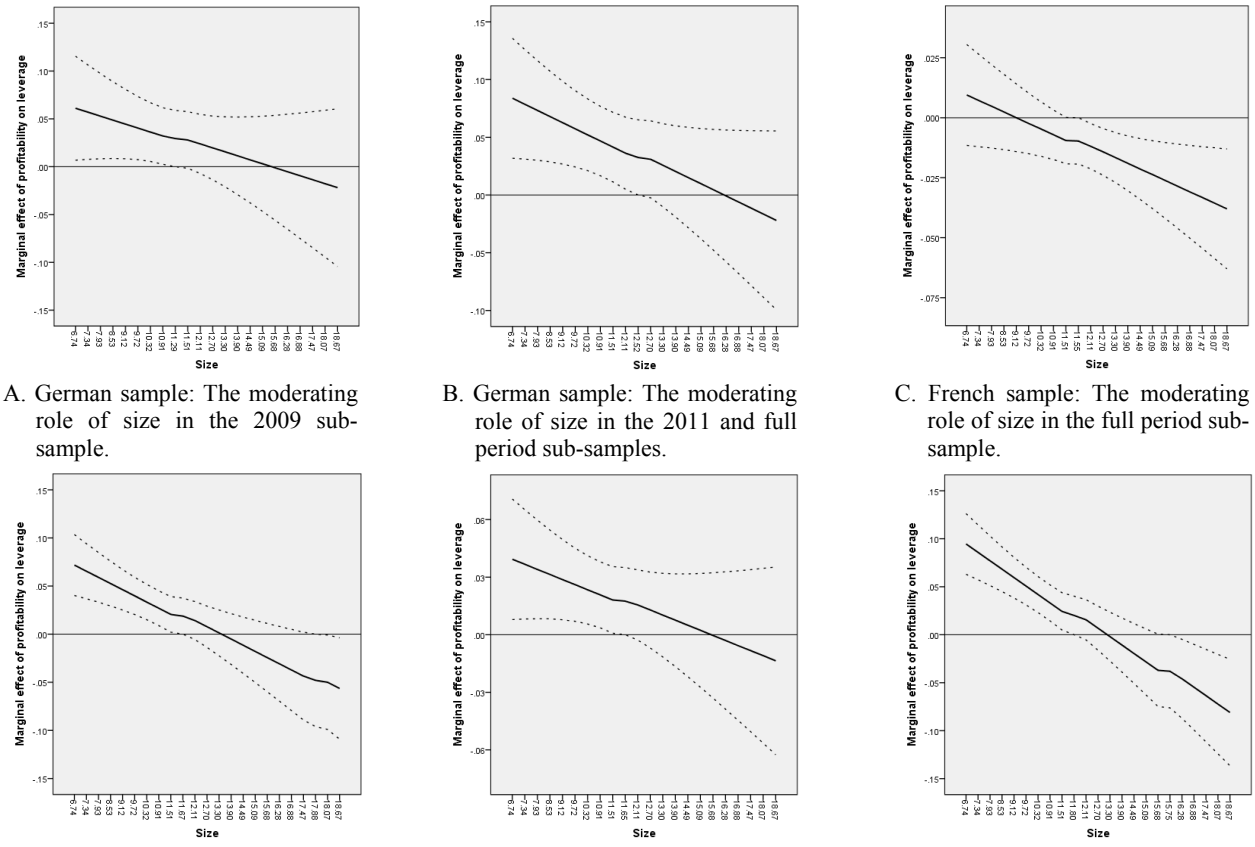
Several conclusions may be drawn from the discussed findings. First, a reliable factor in explaining capital structure decisions is company size, which positively affects leverage, irrespective of time period and country. Following the trade-off model, larger companies are able to borrow more and profit from greater benefits of debt, because of the lower bankruptcy risk they have compared to smaller firms.

Second, the influence of profitability is time- and country-specific and follows both TOT and POT. The TOT model may be used to describe the financing decisions in small and medium German and British firms. In the German case, however, the predictions are supported by the evidence only when economic distress is heightened, as it was in the years 2009 and 2011, at the peak of the two crises. Conversely, the POT model correctly describes the influence of profitability on leverage in large British firms, and in medium and large French companies. The predictions of the POT model, however, are only valid when the full French and British samples are analysed, correspondingly. Additionally, the model correctly predicts this determinant's influence in the case of British firms during the critical years of the GFC and the EDC.

It may be argued, therefore, that both POT and TOT have their merits in explaining capital structure decisions, and that both models are required to accurately describe the behaviour of leverage. Yet, not all factors under the two models are reliable. Size, tangibility, liquidity and the industry median debt ratio are consistently significant determinants (as evidenced by the invariant statistical significance and sign of the respective coefficients, reported in table 3). Profitability, however, is a less reliable predictor. This is contrary to previous research (e.g. Frank & Goyal, 2009) which categorised this variable as a reliable determinant.

5. CONCLUSION

Capital structure is a topic of interest to both academics and practitioners. Previous research generally focused on testing the two main capital structure theories, POT and TOT, separately, rather than acknowledging the merits of both and attempting to reconcile these competing models. Seeking to fill this gap in the literature, the present paper aimed to test and reconcile the POT and TOT theories by analysing the impact of two main capital structure determinants, profitability and size, and by investigating the moderating role of firm size.



A. German sample: The moderating role of size in the 2009 sub-sample.

B. German sample: The moderating role of size in the 2011 and full period sub-samples.

C. French sample: The moderating role of size in the full period sub-sample.

D. British sample: The moderating role of size in the 2008 and 2011 sub-samples.

E. British sample: The moderating role of size in the 2007, 2010, 2012 and 2013 sub-samples.

F. British sample: The moderating role of size in the 2009 and full period sub-samples.

Figure 2. The moderating effect of size on the profitability–leverage relationship

Note: The solid lines represent the marginal effect of profitability on leverage. The dashed lines represent the 95% confidence interval.

5.1 Review of the findings

The findings indicate that size is a reliable capital structure determinant, the impact of which follows the TOT model. Thus, size positively affects the debt level in British, German and French firms, irrespective of the studied time period, which is consistent with the majority of previous studies. With regard to profitability, the validity of POT and TOT's predictions as to this determinant's influence depends on the country and time periods that are studied. As such, in the German context the variable's impact is positive and extends solely to small and medium-sized firms, and only during the most critical periods of the financial crises. It may be stated, nonetheless, that TOT is generally applicable for German firms. In French companies, profitability exerts no statistically significant influence, apart from the case when a full period regression is conducted. The observed significance, however, may be due to autocorrelation. In the case of British companies, both POT and TOT are valid models which complement each other. Yet, profitability follows the POT predictions only in large companies, and only during the peaks of the financial crises.

The results are consistent with a growing number of studies (e.g. de Jong et al., 2008), which indicated that capital structure determinants affect firms to different degrees across countries. Adding to the literature, the present paper underscores that the methodology employed in testing financing structure models should be adapted so as to account for the influence of time-specific variables (e.g. financial crises). Using year-fixed effects in regressions might obfuscate the actual relationship between the studied variables, since the regression coefficients may vary highly when the analyses are conducted at *specific* time points, rather than in pooled samples.

5.2 Academic relevance

The academic relevance of the present study resides in the fact that it furthers the knowledge in the field of corporate finance, by studying several capital structure determinants in a European context, within a recent time period (specifically, 2006-2013). To this end, the study included moderating effects in its analyses, which permitted to obtain a better understanding of how the selected financial structure determinants interact with each other. Accordingly, the findings indicate that it is both possible and necessary to converge POT and TOT, and that their relevance in describing capital structure decisions depends not only on the studied time period, but also on the country. By the same token, the paper underscores the need to account for country differences when conducting cross-country research. Finally, it highlights the need to use more advanced methods for probing interactions than the conventional tabulated results.

5.3 Practical relevance

With respect to the practical implications of this paper, these are as follows. First, managers and consultants are provided with evidence on how profitability and size influence leverage, the findings on the moderating role of size permitting them to make better-informed decisions with regard to the financing structure of a firm. Furthermore, the importance of taking into consideration the role of country- and time-specific factors is also stressed. Finally, the importance of ensuring access to external financing for small and medium firms is emphasised, especially concerning German and British firms.

5.4 Limitations

Several limitations affect the results of this study. First, the findings may not be applicable to other countries and time periods, as indicated by the observed inconsistencies. The generalisability of the results is also limited because of the employed measures. Despite existing claims (e.g. Frank & Goyal, 2009) that regression results are robust to alternative operationalisations of leverage, this robustness may not apply, for example, to other measures of performance. Second, the paper employed a limited number of control variables, which does not permit to rule out the possibility of having observed a spurious relationship. Finally, the employed models explain only a moderate amount of the variance in debt ratio, indicating that significant predictors were omitted from the analyses.

5.5 Future research

The following avenues for future research are proposed. First, scholars may further analyse the moderating role of size on the profitability–leverage relationship by extending the extant studies to other countries and time periods. Second, the robustness of the present results should be verified, by resorting to alternative operationalisations of the employed variables. Third, more research may be conducted into the underlying mechanisms through which size influences the link between profitability and leverage. Namely, future research should investigate whether growth opportunities, bankruptcy risk or other factors underlie this relationship, by including these variables as controls and as moderators. Finally, a better, more complete theoretical framework should be developed, in order to fully account for the observed moderating role of size on the link between profitability and leverage.

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REFERENCES

Acedo-Ramirez, M. A., & Ruiz-Cabestre, F. J. (2014). Determinants of capital structure: United Kingdom versus continental European countries. *Journal of International Financial Management and Accounting, 25*(3), 237-270.

Aggarwal, R., & Zhao, X. (2007). The leverage–value relationship puzzle: An industry effects resolution. *Journal of Economics and Business, 59*(4), 286-297.

Alti, A. (2006). How persistent is the impact of market timing on capital structure? *The Journal of Finance, 61*(4), 1681-1710.

Antoniou, A., Guney, Y., & Paudyal, K. (2008). The determinants of capital structure: Capital market-oriented versus bank-oriented institutions. *Journal of Financial and Quantitative Analysis, 43*(1), 59-92.

Baker, M., & Wurgler, J. (2002). Market timing and capital structure. *The Journal of Finance 57*(1), 1-32.

Beirne, J., & Fratzscher, M. (2013). The pricing of sovereign risk and contagion during the European sovereign debt crisis. *Journal of International Money and Finance, 34*, 60-82.

Berry, W. D., & Feldman, S. (1985). *Multiple regression in practice*. Newbury Park, CA: Sage Publications.

Booth, L., Aivazian, V., Demirguc-Kunt, A., & Maksimovic, V. (2001). Capital structures in developing countries. *The Journal of Finance, 56*(1), 87-130.

Brambor, T., Clark, W. R., & Golder, M. (2006). Understanding interaction models: Improving empirical analyses. *Political Analysis, 14*(1), 63-82.

Brav, O. (2009). Access to capital, capital structure, and the funding of the firm. *The Journal of Finance, 64*(1), 263-308.

Byoun, S. (2008). How and when do firms adjust their capital structures toward targets? *The Journal of Finance, 63*(6), 3069-3096.

Chang, C., Lee, A. C., & Lee, C. F. (2009). Determinants of capital structure choice: A structural equation modeling approach. *The Quarterly Review of Economics and Finance, 49*(2), 197-213.

Chang, Y.-K., Chou, R. K., & Huang, T.-H. (2014). Corporate governance and the dynamics of capital structure: New evidence. *Journal of Banking and Finance, 48*, 374-385.

Chirinko, R. S., & Singha, A. R. (2000). Testing static tradeoff against pecking order models of capital structure: A critical comment. *Journal of Financial Economics, 58*(3), 417-425.

Coricelli, F., Driffield, N., Pal, S., & Roland, I. (2012). When does leverage hurt productivity growth? A firm-level analysis. *Journal of International Money and Finance, 31*(6), 1674-1694.

Cribari-Neto, F. (2004). Asymptotic inference under heteroskedasticity of unknown form. *Computational Statistics and Data Analysis, 45*(2), 215-233.

Craney, T. A., & Surles, J. G. (2002). Model-dependent variance inflation factor cutoff values. *Quality Engineering, 14*(3), 391-403.

Dang, V. A. (2011). Leverage, debt maturity and firm investment: An empirical analysis. *Journal of Business Finance and Accounting, 38*(1), 225-258.

Dang, V. A. (2013). Testing capital structure theories using error correction models: Evidence from the UK, France and Germany. *Applied Economics, 45*(2), 171-190.

Dang, V. A., Kim, M., & Shin, Y. (2012). Asymmetric capital structure adjustments: New evidence from dynamic panel threshold models. *Journal of Empirical Finance, 19*(4), 465-482.

Dang, V. A., Kim, M., & Shin, Y. (2014). Asymmetric adjustment toward optimal capital structure: Evidence from a crisis. *International Review of Financial Analysis, 33*, 226-242.

Danis, A., Rettl, D. A., & Whited, T. M. (2014). Refinancing, profitability, and capital structure. *Journal of Financial Economics, 114*(3), 424-443.

de Grauwe, P., & Ji, Y. (2015). Has the Eurozone become less fragile? Some empirical tests. *Journal of Policy Modeling, 37*(3), 404-414.

de Jong, A., Kabir, R., & Nguyen, T. T. (2008). Capital structure around the world: The roles of firm- and country-specific determinants. *Journal of Banking and Finance, 32*(9), 1954-1969.

de Jong, A., Verbeek, M., & Verwijmeren, P. (2011). Firms' debt–equity decisions when the static tradeoff theory and the pecking order theory disagree. *Journal of Banking and Finance, 35*(5), 1303-1314.

Deesomsak, R., Paudyal, K., & Peschetto, G. (2004). The determinants of capital structure: Evidence from the Asia Pacific region. *Journal of Multinational Financial Management, 14*(4-5), 387-405.

Eichengreen, B. (2015). How the euro crisis ends: Not with a bang but a whimper. *Journal of Policy Modeling, 37*(3), 415-422.

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

Fama, E. F., & French, K. R. (2005). Financing decisions: Who issues stock? *Journal of Financial Economics, 76*(3), 549-582.

Fan, J. P. H., Titman, S., & Twite, G. (2012). An international comparison of capital structure and debt maturity choices. *Journal of Financial and Quantitative Analysis, 47*(1), 23-56.

Faulkender, M., & Petersen, M. A. (2006). Does the source of capital affect capital structure? *The Review of Financial Studies, 19*(1), 45-79.

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London, UK: SAGE Publications.

Flannery, M. J., & Rangan, K. P. (2006). Partial adjustment toward target capital structures. *Journal of Financial Economics, 79*(3), 469-506.

Frank, M. Z., & Goyal, V. K. (2009). Capital structure decisions: Which factors are reliably important? *Financial Management, 38*(1), 1-37.

Friedrich, R. J. (1982). In defense of multiplicative terms in multiple regression equations. *American Journal of Political Science, 26*(4), 797-833.

Gonzalez, V. M. (2013). Leverage and corporate performance: International evidence. *International Review of Economics and Finance, 25*, 169-184.

Gonzalez, V. M., & Gonzalez, F. (2012). Firm size and capital structure: evidence using dynamic panel data. *Applied Economics, 44*(36), 4745-4754.

Hayes, A. F., & Cai, L. (2007). Using heteroskedasticity-consistent standard error estimators in OLS regression: An introduction and software implementation. *Behavior Research Methods, 39*(4), 709-722.

Hayes, A. F., & Matthes, J. (2009). Computational procedures for probing interactions in OLS and logistic regression: SPSS and SAS implementations. *Behavior Research Methods, 41*(3), 924-936.

Hovakimian, A. (2006). Are observed capital structures determined by equity market timing? *Journal of Financial and Quantitative Analysis, 41*(1), 221-243.

Hovakimian, A., Hovakimian, G., & Tehranian, H. (2004). Determinants of target capital structure: The case of dual debt and equity issues. *Journal of Financial Economics, 71*(3), 517-540.

Huang, R., & Ritter, J. R. (2009). Testing theories of capital structure and estimating the speed of adjustment. *Journal of Financial and Quantitative Analysis, 44*(2), 237-271.

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review, 76*(2), 323-329.

Kraus, A., & Litzenberger, R. H. (1973). A state-preference model of optimal financial leverage. *The Journal of Finance, 28*(4), 911-922.

Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review, 48*(3), 261-297.

Myers, S. C. (1984). The capital structure puzzle. *The Journal of Finance, 39*(3), 575-592.

Osborne, J., & Waters, E. (2002). Four assumptions of multiple regression that researchers should always test. *Practical Assessment, Research & Evaluation, 8*(2). Retrieved from http://pareonline.net/getvn.asp?n=2&v=8

Titman, S. (1984). The effect of capital structure on a firm's liquidation decision. *Journal of Financial Economics, 13*, 137-151.

Vithessonthi, C., & Tongurai, J. (2015). The effect of firm size on the leverage–performance relationship during the financial crisis of 2007–2009. *Journal of Multinational Financial Management, 29*, 1-29.

Voulgaris, F., Asteriou, D., & Agiomirgianakis, G. (2004). Size and determinants of capital structure in the Greek manufacturing sector. *International Review of Applied Economics, 18*(2), 247-262.

White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica, 48*(4), 817-838.

Williams, M. N., Grajales, C. A. G., & Kurkiewicz, D. (2013). Assumptions of multiple regression: Correcting two misconceptions. *Practical Assessment, Research & Evaluation, 18*(11). Retrieved from http://pareonline.net/getvn.asp?v=18&n=11

APPENDIX

Table A1. Review of empirical studies on factors affecting capital structure

Panel A: Empirical studies on the impact of profitability and size on leverage

Effect on leverage	Profitability	Size
Positive	Hovakimian et al., 2004; Antoniou et al., 2008 for JP firms, using market leverage	Antoniou et al., 2008 (excepting US firms); Byoun, 2008; Dang, 2013; Fama & French, 2002
Negative	Acedo-Ramirez & Ruiz-Cabestre, 2014; Booth et al., 2001; Byoun, 2008; Dang, 2013; Fama & French, 2002; Antoniou et al., 2008, for FR, DE, UK and US firms, using market leverage; Antoniou et al., 2008, for firms in G5 countries, using book leverage	Faulkender & Petersen, 2006
Statistically insignificant		Acedo-Ramirez & Ruiz-Cabestre, 2014, for SP and IT firms; Antoniou et al., 2008, for US firms

Panel B: The impact of profitability on leverage, as a function of firm size – evidence from empirical studies

Company size	Positive	Negative
Small	Vithessonthi & Tongurai, 2015	Gonzalez & Gonzalez, 2012 (stronger); Voulgaris et al., 2004
Medium		Gonzalez & Gonzalez, 2012; Voulgaris et al., 2004; Vithessonthi & Tongurai, 2015
Large		Gonzalez & Gonzalez, 2012 (weaker); Voulgaris et al., 2004; Vithessonthi & Tongurai, 2015 (stronger)

Note: DE – German; FR – French; IT – Italian; JP – Japanese; SP – Spanish; UK – British; US – American.

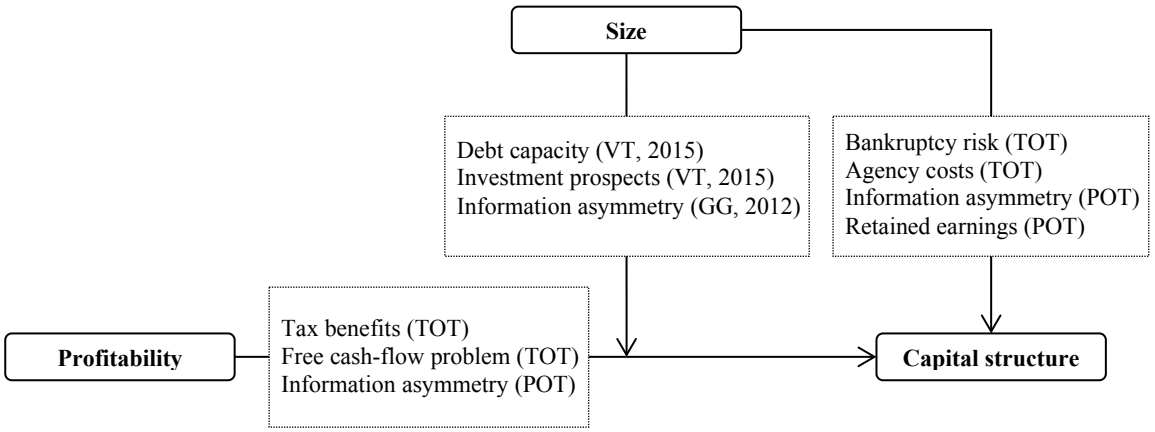

Figure A1. The mechanisms underlying the profitability, size and capital structure linkage

Note: GG – Gonzalez & Gonzalez (2012); POT – Pecking order theory; TOT – Trade-off theory; VT – Vithessonthi & Tongurai (2015).

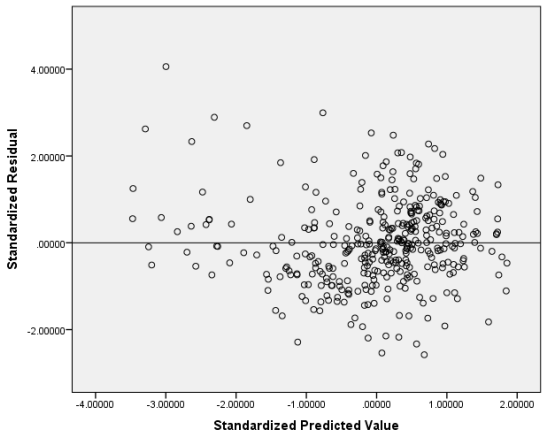

Figure A2. Illustration of the fulfilment of the heteroscedasticity and linearity assumptions (scatterplot based on the subsample of French firms in the year 2008)

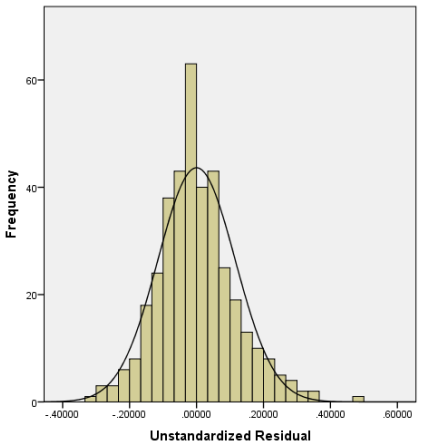

Figure A3. Illustration of the fulfilment of the normality assumption (histogram of unstandardised residuals for French firms in the year 2008)