Capital structure choice and company taxation: A meta-study

Lars P. Feld [a,*], Jost H. Heckemeyer [b], Michael Overesch [c]

[a] University of Freiburg, Walter Eucken Institute, Goethestrasse 10, 79100 Freiburg, Germany
[b] University of Mannheim, Business School, Schloss, 68131 Mannheim, Germany
[c] University of Cologne, Department of Management and Economics, Albertus Magnus Platz, 50923 Cologne, Germany

A B S T R A C T

This paper provides a quantitative review of the empirical literature on the tax impact on corporate debt financing. Synthesizing the evidence from 48 previous studies, we find that this impact is substantial. In particular, the tax rate proxy determines the outcome of primary analyses. Measures like the simulated marginal tax rate (Graham, 1996) avoid a downward bias in estimates for the debt response to tax. Moreover, econometric specifications and the set of control-variables affect tax effects. Accounting for misspecification biases by means of meta-regressions, we predict a marginal tax effect on the debt ratio of about 0.27.

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1. Introduction

In light of the 2008 financial and economic crisis, corporate tax distortions favoring the use of debt financing have become a key concern. The International Monetary Fund (IMF, 2009: 12) concludes:

"*Given the large potential macroeconomic damage from excess leverage [. . .], it is hard to see why – as now is often the case – debt finance should be systematically tax favored.*"

There are indeed strong theoretical arguments for expecting a positive tax impact on leverage. In most tax systems, interest expenses are deductible from corporate taxable income while equity payouts are not. The value of the implied tax shield from interest deductions, and thus the incentive to finance with debt rather than equity, grows with the marginal tax rate (Modigliani and Miller, 1963). When it comes to the quantification of the effect, however, empirical findings have for years been rather weak. Only 13 years ago, Parrino and Weisbach (1999: 39) concluded:

"*Despite over 40 years of research, we still know surprisingly little about the determinants of capital structure. There is general agreement that debt has a tax advantage over equity, but disagreement*

over the magnitude of this tax advantage and the relative importance of the costs of debt that offset this tax advantage at the margin."

In the following years studies on capital structure have been surging. But still, the empirical evidence remains quite ambiguous even today. Many studies report positive tax effects on the level of debt financing but the identified magnitude of the effect varies substantially. A number of studies even find robust evidence suggesting a *negative* effect of taxes on leverage (e.g., Booth et al., 2001; Huang and Ritter, 2009). This is confusing. Even more so, it is unsatisfactory – given that robust knowledge about the size of the tax distortion to corporate debt policies is the foundation of any policy advice on the tax treatment of debt and equity. To quantitatively examine the factors which drive the variation in the empirical evidence, we conduct a meta-analysis of the marginal tax effect on the corporate debt ratio. To the best of our knowledge, our study covers the complete empirical literature produced over the past 25 years.

After constructing a database of 1144 estimates from 48 studies, we find that the tax influence on corporate debt policy is indeed substantial. The literature commonly refers to the marginal tax effect on the debt ratio as measure of effect size. It indicates the percentage point change of the debt ratio in response to a one percentage point change in the tax rate. Using meta-regression analysis, we find that the employed tax rate proxy, the econometric specification, the set of control variables, and publication selection in primary studies

* Corresponding author. Tel.: +49 761 79097 0; fax: +49 761 79097 97.
E-mail addresses: lars.feld@walter-eucken-institut.de (L.P. Feld), heckemeyer@uni-mannheim.de (J.H. Heckemeyer), overesch@wiso.uni-koeln.de (M. Overesch).

significantly drive the estimated tax effects. Accounting for all potential misspecification biases, we predict a positive marginal tax effect on the debt ratio of about 0.27.

Our results show that very refined tax measures like the simulated marginal tax rate suggested by Graham (1996, 1999) avoid a significant downward bias in the estimated debt response to tax. Generally, a careful consideration of the firm-specific tax status raises the magnitude of the identified tax effects on corporate debt policy. Moreover, the choice of control variables is crucial given that omitted variable biases are found to be statistically and quantitatively significant. Additional analyses suggest that an empirical analysis of multinational debt financing must carefully model the additional tax incentives arising from cross-border profit-shifting opportunities.

Our contribution is useful in several ways. The meta-regression analysis can guide future empirical research. It uncovers potential sources of bias by showing which study characteristics determine empirical results. Future improvements in estimation techniques could be evaluated against the benchmark provided by the meta-regression results. Notably, the effect size derived from a meta-regression can be interpreted as a sort of "consensus" estimate (Florax et al., 2002) which combines all available information on the empirical relationship at stake, conditional on state-of-the-art study design. Such a "consensus" can improve the calibration of policy models because it reflects the complete knowledge contained in the abundant empirical literature. Policy analyses based on meta-regression results avoid highly selective and arbitrary uses of model parameters considered a traditional weakness of many empirical models (Steiner, 2008). Finally, summary information on the empirical relationship between the corporate debt ratio and tax is of high policy interest. As a consequence, the results obtained from a comprehensive meta-regression are highly relevant and insightful for empirical researchers and decision-makers in tax policy.

The remainder of the paper is organized as follows. In Section 2, a description of the meta-regression approach is provided. Thereafter, in Section 3 the meta-variables are described. The results of the meta-regressions are presented in Section 4. Section 5 concludes.

2. Methodology and data

2.1. The meta-regression approach

Meta-regression analysis is a statistical approach to synthesize the central tendency of a strand of literature and to identify the determinants of variation in reported empirical findings. As such, it is extremely valuable in offering reasons why the evidence on a certain question strongly varies or is even contradictory (Stanley, 2001; Disdier and Head, 2008). To this aim, the effects reported in the primary literature are regressed on a set of variables which quantify differences in method, design, and data used. Meta-analysis has been increasingly employed to generalize results from the literature in economics, e.g., in the field of exchange rate economics by Égert and Halpern (2006), in international economics by Havranek and Irsova (2011) or Disdier and Head (2008), in international taxation by Feld and Heckemeyer (2011) or De Mooij and Ederveen (2003), in labor economics by Card et al. (2010), and in health economics by Doucouliagos et al. (2012).

For every meta-regression analysis, it is crucial that the effects reported in the relevant literature are comparable across studies. Fortunately, this requirement is clearly met in research dealing with the tax influence on corporate capital structure. The effect size index commonly referred to is the *marginal tax effect on the corporate debt ratio*. It represents the percentage point change of the debt ratio in response to a one percentage point change in the tax rate. The literature on capital structure and tax generally estimates linear specifications in levels. Studies thus provide point estimates of the marginal tax effect which are directly comparable. To identify the sources of variation in the reported marginal effects, we estimate the linear meta-regression model depicted in Eq. (1), where y corresponds to the vector of estimated marginal tax effects drawn from primary analyses and X is a matrix of predominantly dummy variables that reflect various study or model characteristics.

$$y = X\beta + \varepsilon \tag{1}$$

The coefficients for each dummy variable reflect the average impact on reported tax effects if the study design deviates from the benchmark in that specific aspect, all other things being equal.

Since y includes estimated coefficients which are mainly derived from classical linear models, the meta-regression errors ε will be normally distributed. However, ε is clearly heteroskedastic because the precision of primary effect estimates $Var(y|X)$ varies with the realizations of X, i.e. the attributes of the primary studies. As a consequence, ordinary least squares could be extremely inefficient (Greene, 2003: 226). The model in (1) will therefore be estimated with weighted least squares (WLS) which is the standard procedure employed to obtain efficient meta-regression estimates (Stanley, 2008). The observation weights are the inverse standard errors of the primary effect estimates. In other words, reliable estimates of the marginal tax effect are given a larger weight in the meta-regression estimation than those which are imprecisely estimated.

2.2. The marginal tax effects data set

We construct a database from 48 primary studies. Relevant studies were identified by comprehensively searching the EconLit database for empirical literature on the tax sensitivity of corporate capital structure choices. More specifically, we searched the database for the central keywords "Capital Structure" and "Tax". Furthermore, we conducted additional internet searches and scanned relevant journals as well as working paper series. We particularly searched through the Journal of Finance, Journal of Financial Economics, Review of Financial Studies, Journal of Banking and Finance, Journal of Financial and Quantitative Analysis, Journal of Public Economics, Journal of Corporate Finance, Journal of Empirical Finance, Financial Management, European Financial Management, National Tax Journal, International Tax and Public Finance, and the SSRN working paper database.

Following a standard convention in the meta-analysis literature (Disdier and Head, 2008; Havranek and Irsova, 2011), we sample all tax effect estimates reported in these studies.[1] Discarding information would be inefficient. In particular, selecting one single estimate from each study would require predefined and objective sampling rules, which can hardly be justified. Moreover, the heterogeneity obtained from considering all robustness checks reported in a study is welcome in statistical meta-analyses. After all, the assembled meta-database includes 1144 point estimates of the marginal tax effect on the corporate debt ratio, which are obtained from 48 primary studies. To the best of our knowledge, we cover the complete empirical evidence produced within the past 25 years and thus go far beyond the scope of any other survey (e.g. Graham, 2003, 2008; De Mooij, 2011).

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[1] An exemption is the study by De Jong et al. (2008) where only 15 out of 42 estimates could be integrated into our meta-sample. For this study, we inferred t-values from indicated two-tailed p-values. If reported tax coefficients showed non-zero values, standard errors could be inferred. In some cases, however, reported tax coefficients, expressed to four decimal places, were zero and thus the standard errors remain unknown.