



Do corporate tax cuts boost economic growth?

Sebastian Gechert ^{a,*}, Philipp Heimberger ^b

^a Chemnitz University of Technology, Germany

^b Vienna Institute for International Economic Studies (wiiw), Austria

ARTICLE INFO

JEL classification:

E60
H25
O40

Keywords:

Corporate income taxes
Economic growth
Meta-analysis

ABSTRACT

The empirical literature on the impact of corporate taxes on economic growth reaches ambiguous conclusions: corporate tax cuts increase, reduce, or do not significantly affect growth. We apply meta-regression methods to a novel data set with 441 estimates from 42 primary studies. There is evidence for publication selectivity in favour of reporting growth-enhancing effects of corporate tax cuts. Correcting for this bias, we cannot reject the hypothesis of a zero effect of corporate taxes on growth. Several factors influence reported estimates, including researcher choices concerning the measurement of growth and corporate taxes, and controlling for other budgetary components.

1. Introduction

For decades, the economic growth effects of changes in corporate income taxation² have stirred debate in both academic and policy circles. Those in favour of corporate tax cuts have argued that lower tax rates boost growth. Others have raised doubts that substantial growth-enhancing impacts of corporate tax reductions would materialise. While there have been swings in economic growth rates, recent decades have been characterised by falling statutory corporate income tax rates (see Fig. 1) and a rise in corporate tax bases around the globe, yet to various extents across countries (e.g. Devereux et al., 2008; Asen, 2020; Heimberger, 2021). Empirical studies have examined the growth effects of corporate taxation in different country groups and periods, utilising various data sets and econometric methods. A careful reading suggests that the reported findings vary considerably: While some studies, in particular OECD (2010), point to substantial and robust positive growth effects of corporate tax cuts (e.g. Arnold et al., 2011; Lee and Gordon, 2005; Mertens and Ravn, 2013), other studies report significantly negative, insignificant or at least mixed results (e.g. Angelopoulos et al., 2007; Widmalm, 2001; Gale et al., 2015; TenKate and Milionis, 2019). Researchers and policymakers interested in learning about the cumulative quantitative evidence on the corporate tax and economic growth nexus may therefore find it challenging to draw valid conclusions from the literature.

This paper contributes to this literature by providing the first comprehensive quantitative survey of the existing econometric literature concerning the impact of corporate taxation on economic growth. In doing so, we compile and analyse a novel data set consisting of 441 estimates from 42 primary studies. We answer two main research questions: First, what can we learn from the econometric evidence about the average effect size if we consider each relevant estimate as one piece of information that fits into a larger statistical picture? Second, what factors contribute to explaining variation in reported effects of corporate taxes on economic growth? In addressing these questions simultaneously, the paper uses the toolbox of meta-analysis and meta-regression methods (e.g.

* Corresponding author.

E-mail addresses: sebastian.gechert@wiiw.tu-chemnitz.de (S. Gechert), heimberger@wiiw.ac.at (P. Heimberger).

¹ FMM Fellow.

² In what follows, we use the term “corporate taxes” for brevity.

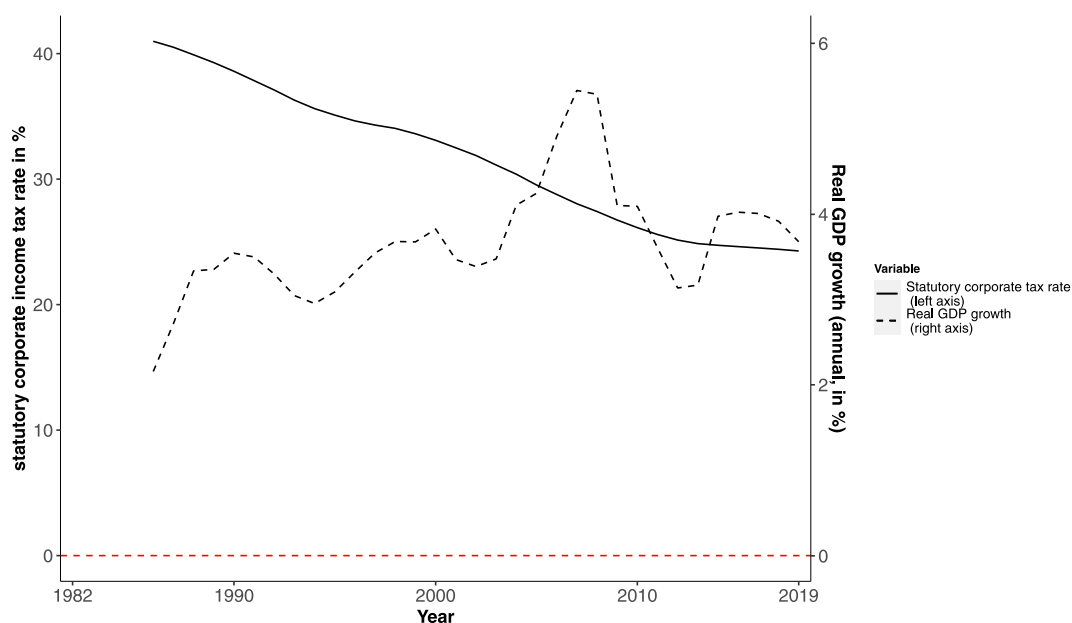


Fig. 1. 5-year moving world average of statutory corporate tax rates and real GDP growth rates (1982–2019).

Notes: 5-year moving average of 176 countries (with GDP weights).

Source: Tax Foundation, World Bank; own calculations.

Stanley and Doucouliagos, 2012), allowing us to make model-based predictions about the growth effects of corporate taxes given different data and specification choices.³

According to the unweighted average of all estimates in our data set, a cut in the corporate tax rate by 10 percentage points would increase annual GDP growth rates by about 0.2 percentage points. However, we find evidence for publication selectivity in favour of reporting growth-enhancing effects of corporate tax cuts. Correcting for this bias, we cannot reject the hypothesis that the effect of corporate taxes on growth is zero. We show that this finding holds when we account for potential endogeneity issues between corporate taxes and growth. It must be noted, however, that the zero effect is an average assessment. Given the variance, there may be cases with positive or negative growth effects. The finding of an insignificant average effect with some variance resembles well the nuances in the more recent growth literature that discusses both positive, negative and neutral channels of corporate tax changes on growth, referring to knock-on effects on competition, labour supply, R&D incentives or tax structures and government budget compositions (Suzuki, 2022; Ferraro et al., 2020; Peretto, 2011; Aghion et al., 2013, 2016).

When it comes to explaining the variance in our data set, several factors influence the reported effect size. Most important are the measurement of corporate tax rates (e.g. statutory vs. effective average tax rates) and the economic growth variable (in per capita terms or not), the time horizon of the GDP response (short-term vs. long-term effects), accounting for other budgetary components (government spending and other taxes), and also publication characteristics. While studies using effective average tax rates more often find growth-enhancing effects of corporate tax cuts, they tend to be outliers as compared to the rest of the literature using effective marginal tax rates, corporate tax shares in GDP or statutory tax rates, and the result is not entirely robust to using different meta-regression approaches. Focusing on a short-term horizon of the GDP response makes corporate tax cuts even less growth-enhancing. In line with theoretical arguments (Aghion et al., 2013; Jones et al., 1993), when government spending and other taxes are fixed, a corporate tax hike has more negative growth effects, which implies that using the additional revenues from corporate taxes for spending increases or cuts to other taxes instead of fiscal consolidation would be more beneficial to growth. Interestingly, more recent empirical studies tend to find less growth-enhancing effects of corporate tax cuts, in line with recent theoretical contributions.

The rest of the paper is structured as follows. Section 2 discusses theoretical channels of the impact of corporate taxes on economic growth and highlights essential characteristics of the empirical literature by providing a qualitative review. Section 3 explains how

³ There is a large set of meta analyses related to fiscal policy issues: Heimberger (2021), Feld and Heckemeyer (2011) and de Mooij and Ederveen (2003) analyse relations of corporate tax competition and foreign direct investments (FDI). Knaisch and Pöschel (2021) study the incidence of corporate taxes on wages. Phillips and Goss (1995) focus on the effects of state and local taxes on economic development. Gechert (2015) and Gechert and Rannenberg (2018) compare fiscal multiplier effects of several tax and spending measures, while Nijkamp and Poot (2004) consider the long-run effects in comparison, and Bom and Ligthart (2014) focus on the productivity of public capital. Just recently, Neisser (2021) studies the elasticity of taxable income with respect to tax rate changes. Further examples of meta-analysis in macroeconomic contexts are Havránek et al. (2017), Balima et al. (2020), Lichter et al. (2015), Imai et al. (2021). Gechert (2022) provides a survey of meta-analyses in macroeconomics.

we constructed the data set. Section 4 investigates the question of whether reported findings are influenced by publication selection bias. Section 5 presents the meta-regression analysis, investigating factors of heterogeneity of reported results. The final section provides a discussion of our findings and concludes.

2. Theory and empirical approaches

2.1. Theoretical literature

An in-depth treatment of the theoretical literature concerning the corporate tax and economic growth nexus would be beyond the scope of this paper. In what follows, we present a broad outline of theoretical arguments that have motivated and guided the relevant empirical literature.

Large parts of the literature on how capital taxation affects growth originate from Judd (1985) and Chamley (1986), who demonstrate within standard neoclassical growth models that taxation of capital has substantial negative effects on the accumulation of capital and ultimately on output. A main theoretical concern that has guided hypothesis testing in the empirical literature is that corporate taxes can distort factor prices (raising the cost of capital and reducing after-tax returns) and lead to efficiency losses in the allocation of resources. This may reduce overall capital accumulation and growth of total factor productivity (TFP) (e.g. Ferede and Dahlby, 2012; Shevlin et al., 2019). The traditional literature on optimal taxation has therefore come to the conclusion that the corporate tax rate should be zero (Atkeson et al., 1999). However, Straub and Werning (2020) revisit the Chamley–Judd result and conclude that for realistic parameterisations, the original models imply non-zero capital taxes.

Endogenous growth theory has linked market structures and choices by individual economic actors (e.g. regarding education or R&D spending) to aggregate economic growth, and these choices may be influenced by tax policies (Aghion and Howitt, 2008). Higher taxes may adversely affect entrepreneurial activities, thereby curbing TFP growth (e.g. Djankov et al., 2010). Baseline Schumpeterian growth theory predicts that higher tax rates may discourage R&D investment and, thereby, reduce economic growth (e.g. Ohn, 2018).

However, Chen et al. (2017) use an R&D-based growth model to argue that the short-run and long-run growth effects of capital taxation need to be distinguished: in the short-run, the impact of higher capital taxation is negative due to a consumption effect, but it is positive in the long-run because of tax-shifting effects of technology and output. In a different dimension, Schumpeterian endogenous growth models with an endogenous market structure can result in an inverted U-shaped relation between corporate tax rates and growth, as lower corporate taxes initially increase after-tax profits and thus investment, but foster competition by entrant firms (diminishing profits) and raise the relative costs of R&D efforts due to increasing labour costs. Thus, at already low rates, corporate tax cuts would harm growth (Suzuki, 2022). Likewise, Ferraro et al. (2020) investigate the mechanisms of product variety (entrants) vs. product quality (incumbents) innovations and also point to negative long-run growth effects of corporate tax cuts that increase competition and product variety but reduce R&D incentives of incumbents, reducing quality improvements and GDP growth.

Under budget balancing conditions, tax structures and the relation between tax revenues and government spending matter as well. If corporate tax cuts entail tax hikes elsewhere or cuts to government spending, the overall effect is a priori ambiguous. Aghion et al. (2013) use an innovation-based growth model to show that capital taxation can promote economic growth by shifting the tax burden away from labour taxation. Ferraro et al. (2020), however, point out that endogenous market structures and firm sizes sterilise positive effects from labour tax cuts. Instead, they point to differences between capital gains taxation (negative growth effects) vs. corporate and dividend taxation (positive growth effects), which were studied earlier by Peretto (2003, 2007, 2011). Jones et al. (1993) and Aghion et al. (2016) demonstrate that capital taxation may spur growth if tax revenues are used for higher productive public expenditures. As a mirror image, if tax cuts “starve the beast” (Fuest et al., 2019), they may eventually lead to lower provision of productive public capital.

Finally, governments can influence both the rate and the base of corporate taxation. This may affect investment and location incentives of firms differently. Summers (1981) points to the role of tax exemptions for depreciation, which can imply a positive effect of statutory tax rate hikes, but negative effects of base-broadening. Furno (2021) shows that corporate tax rate cuts will have small effects on investment if exemptions for depreciation are generous. Devereux et al. (2008) thus point out that the measurement of corporate tax changes is a relevant factor in empirically estimating its impact on economic growth. While statutory tax rates reflect pure rate changes, effective average tax rates consider rate and base changes relevant for location decisions, and effective marginal tax rates are relevant for incremental investment decisions.

In summary, various model setups in the endogenous growth literature may lead to different conclusions regarding the aggregate growth impact of corporate taxation. Yet, the dominant theoretical prediction that has guided large parts of empirical testing is that increased corporate taxes reduce growth and, vice versa, corporate tax cuts may help spur growth through various channels.⁴ This theoretical literature survey, however, has also suggested: (a) that it can be useful to distinguish between short-run and long-run growth effects; (b) that the growth effects may depend on how corporate taxes are measured; and (c) that corporate tax changes may be related to adjustments in other revenue components and public spending decisions. In our meta-analytical assessment of the relevant econometric literature, we will come back to these important theoretical considerations.

⁴ We are not able to test for all potentially relevant channels in the meta-regression analysis, because the empirical studies covered are usually reduced-form assessments. In the concluding section, we discuss where future work could contribute to improving our understanding of the mechanisms through which corporate taxes affect growth.

2.2. Empirical literature

This section provides a qualitative, non-exhaustive overview of the econometric evidence by highlighting some important data and study dimensions. In a seminal paper, [Lee and Gordon \(2005\)](#) assess how tax policy affects economic growth by using cross-sectional data for a group of 70 advanced and developing countries over the time period 1970–1997. The authors focus on the link between (corporate) tax rates and growth over a longer period because they argue that this allows for averaging out short-run effects. Their preferred estimation method is Ordinary Least Squares (OLS), but they also point out that corporate tax rates might be endogenous to economic growth, i.e. changes in corporate taxes may not fully capture exogenous variation in tax policy but may depend on the growth process itself or third factors that affect both. Therefore, some of their robustness checks use the weighted average of corporate tax rates in other countries as an instrument for domestic corporate taxation. [Lee and Gordon \(2005\)](#) report that statutory corporate tax rates are significantly negatively related to cross-sectional differences in economic growth rates while controlling for other determinants.

In another often-cited paper, [Arnold et al. \(2011\)](#) conclude that an increase in corporate income taxes has a stronger negative impact on economic growth than a similar increase in personal income taxes. For the estimations, [Arnold et al. \(2011\)](#) use a dynamic panel data model and a Pooled Mean Group (PMG) estimator based on annual data for 21 OECD countries from 1971 to 2004. They measure corporate taxes as the share of corporate income tax revenues in total tax revenues. However, [Xing \(2012\)](#) argues that the PMG results reported in [Arnold et al. \(2011\)](#) may not be robust once the long-run coefficients in the dynamic growth model are allowed to take different values for each country. Furthermore, employing the same definition of the corporate tax variable as in [Arnold et al. \(2011\)](#), and also using an OECD panel sample, [Widmalm \(2001\)](#) reports a positive, though fragile, correlation with economic growth. Similar results are reported by [Angelopoulos et al. \(2007\)](#) who estimate panel data models for 23 OECD countries over 1970–2000.

The empirical literature related to [Arnold et al. \(2011\)](#), which stresses the role of tax structures, points out that corporate tax changes may not be considered in isolation, but should be viewed with respect to changes in other tax components or government spending through the budget constraint. If total tax revenues are controlled for in the underlying regression, a corporate tax cut is assumed to be counterbalanced by additional revenues from other tax components. If government spending is controlled for, a corporate tax cut is assumed not to be accompanied by spending changes.

As a related aspect, several studies consider differences between advanced and developing economies. According to [TenKate and Milionis \(2019\)](#), higher corporate taxes may foster growth in advanced economies at the technology frontier since higher corporate taxes may incentivise private innovation activities and may raise revenues for productive public spending. On the other hand, lagging economies that are more focused on technology imitation may face a stronger negative relation between corporate tax rates and growth because they need to attract foreign capital by lower tax wedges. [Lee and Gordon \(2005\)](#) find differences in the impact of corporate taxes on growth in OECD and non-OECD countries, but the differences are not robustly significant.

All the papers surveyed above use data sets for groups of several countries, albeit with partly different country compositions. Other studies, however, use intra-national instead of inter-national data, suggesting that the identification of growth effects of corporate taxation may be less polluted by institutional or geographical influences when using data variation across states within the same country. Most of the intra-national studies use data for US states; but like the inter-national studies, they reach heterogeneous conclusions concerning the impact of corporate taxes on economic growth. [Alm and Rogers \(2011\)](#) base their estimates on data for 48 US states from 1959 to 1997; they find evidence for a positive association between corporate taxation and state economic growth, but also report that results are sensitive to choices regarding the set of control variables and the time period. [Prillaman and Meier \(2014\)](#) exploit panel data for 50 US states over 1977 to 2005 and a large set of tax, expenditure and political control variables. However, they find that corporate tax cuts have little to no positive impact on state economic growth. [Suárez Serrato and Zidar \(2018\)](#) consider data over the period 1980–2010 and report a negative association between corporate taxation and state level economic growth — which does, however, lack statistical significance. [Gale et al. \(2015\)](#) use data at the state-level in the US over 1977–2006; they report that the effects of state corporate tax policy in the US are inconsistent with claims that tax cuts will generate growth.

In summary, the existing empirical literature reports inconclusive findings on the impact of corporate taxation on economic growth. The heterogeneity in results may, however, be influenced by different data and method choices as well as publication characteristics. The underlying country sample, the publication year of the paper (which influences data availability), choices in measuring the corporate tax variable as well as different approaches in dealing with potential endogeneity and reverse causality issues may have a significant impact on the reported results, respectively. Therefore, we will now turn to systematically synthesising and exploring the literature on corporate taxes and economic growth in quantitative terms.

3. Constructing the data set

3.1. Data collection

Our search strategies, the process of collecting the data, and the approach to reporting the results meet the guidelines for conducting meta-analyses ([Havránek et al., 2020](#)). A list of studies and a summary of their main characteristics is provided in Online Appendix A. Details concerning the criteria for the search process and for including primary studies in the database can be found in Online Appendix B. As a central condition for being included in our data set, papers used a measure of economic growth

as the dependent variable and a measure of corporate taxes as an explanatory variable. To be included, studies had to report results from some variant of the following generic econometric model (note that we ignore subscripts for brevity):

$$g = \alpha_0 + \alpha_1 T + \alpha_3 Z + u \quad (1)$$

where the dependent variable g is a measure of economic growth, T measures corporate taxes, Z is a vector of other explanatory variables, and u is the error term.

The primary studies in our data set use various scales of the growth and corporate tax variables, so that reported effect sizes are often not directly comparable. We transformed estimates where necessary such that the coefficient of interest α_1 is standardised to reflect that a one percentage point increase in the (statutory) corporate tax rate is associated with an x percentage point change in the rate of economic growth. We will denote the standardised version of α_1 as SC in the following. There are some studies that regress the (logarithm) of per capita GDP on the level of corporate tax and then estimate the model in first differences (e.g. [TenKate and Milionis, 2019](#)). We also included such estimates, which make up about 28.5% of our total sample, but transform them to make them comparable with the other estimates.⁵ Furthermore, we estimate a meta-regression specification in which we directly control for differences in the transformation of the data, and find that different transformations do not affect our findings significantly.

To check whether our results are affected by our choice for standardising effect sizes, we alternatively use the partial correlation coefficient (PCC) as a standardised effect size. Partial correlations can be directly calculated from the regression results reported in primary studies based solely on the t -statistics and degrees of freedom (df) of the respective estimate.⁶ The PCC is calculated as

$$PCC = \frac{t}{\sqrt{t^2 + df}}, \quad PCC \in [-1, 1]. \quad (2)$$

3.2. Variables in the meta-regression data set

In what follows, we introduce the meta-regression variables obtained from the 42 primary studies. [Table 1](#) gives an overview of all variables, including their sample mean and standard deviation. Many of the reported variables are categorical dummy variables that mutually belong to a certain group — such as the different measures of the corporate tax variables. For dummy variables, the mean can be interpreted as the share of observations belonging to a certain characteristic in such a group.

Our central variable of interest is the standardised coefficient SC . To test for publication selection, we also collect the standard error of this coefficient. As explained above, alternatively, we consider the PCC (together with its standard error).

Measures of the corporate tax variable: The empirical literature essentially uses five different approaches to measuring tax changes. (i) estimates that use the statutory corporate income tax rate (STR), (ii) the Effective Average Tax Rate (EATR), (iii) the Effective Marginal Tax Rate (EMTR), (iv) the Average Tax Rate (ATR), and (v) the share of corporate tax revenues in total tax revenues (CTTR). Nearly half of all estimates in our data set (46.3%) use the STR approach; EATR, EMTR, ATR and CTTR account for 8.2%, 10.4%, 17.0% and 18.1%, respectively. In the following, we offer a brief description of the calculation and characteristics of these concepts:

The STR is a very simple concept that focuses on the tax rate only. Data are widely available for a large number of countries and years, which might explain its dominant role in the literature. Adversely, STR data cannot measure base changes to corporate taxation, thus ignoring an important element of tax policy.

The ATR is a quite simple approach to accounting for tax rate and tax base characteristics. Essentially, it is a backward-looking, purely data-driven concept that calculates the ratio of corporate tax revenues to the operating surplus, either at the firm level or as derived from national accounts data. Figures are widely available, but may lack precision and comparability among countries and over time. As ATR are calculated from realised revenues, they may pick up endogenous responses of the economy to tax legislation, questioning the exogeneity assumption in standard regressions.

A related approach, sharing similar pros and cons, is the CTTR concept that determines the share of corporate tax revenues in total tax revenues. In order to allow for a comparison with the other approaches, studies should control for the share of total tax revenues in GDP. Indeed, all CTTR studies in our database do so.

The EMTR is a forward-looking measure that proxies the marginal tax burden on investment for international comparisons of *effective* tax rates. It takes into account statutory tax rates and the broadness of the tax base, considering exemptions, depreciation rules, loss compensation, the relation to profit taxation at the shareholder level, etc. The EMTR considers the additional taxes due to a *marginal* investment decision. Essentially it is calculated as the hypothetical pre-tax minus the post-tax return of this marginal investment divided by the pre-tax return. The marginal investment project has a rate of return that is just as high as the market interest rate and thus just earns the costs of capital. It is an artificial tax rate, usually based on the model of [King and Fullerton \(1984\)](#) of a competitive capital market equilibrium and is suited for evaluating the allocative efficiency of tax systems and the incentives for additional investments at a chosen location ([Devereux et al., 2008](#)).

⁵ When a study (e.g. [Arnold et al., 2011](#)) calculates the effect of corporate taxation on the long-run level of GDP instead of the GDP growth rate, we transform the estimate into a growth rate by assuming a conservatively short 10-year transition period to the new steady state. Further details and standardisation steps are available in Online Appendix B.

⁶ The PCC signals the strength of the statistical significance of the coefficient of interest ([Stanley and Doucouliagos, 2012](#)). A major drawback is that the partial correlation does not allow for an economically intuitive and meaningful interpretation of the effect size. That is why the standardised estimates as described above serve as our preferred estimates.

Table 1

Variables used in the meta-regression analysis.

Variable name	Description	Mean (N = 441)	S.D.
SC	Standardised coefficient based on taking the steps explained in section 3.1; interpretation: a 1 percentage point increase in corporate taxes is associated with an x percentage point change in economic growth	−0.019	0.077
SE	Standard error of SC	0.045	0.07
PCC	Partial correlation coefficient of economic growth with corporate tax rates	−0.05	0.202
SEPC	Standard error of PCC	0.082	0.054
<i>Corporate tax variables</i>			
STR (reference)	BD = 1: Statutory Tax Rate	0.463	0.5
EATR	BD = 1: Effective Average Tax Rate	0.082	0.274
EMTR	BD = 1: Effective Marginal Tax Rate	0.104	0.306
ATR	BD = 1: Average tax rate	0.17	0.376
CTTR	BD = 1: Corporate tax revenues in % of total tax revenues	0.182	0.386
<i>Country composition</i>			
OECD (reference)	BD = 1: Only OECD countries included in the data	0.667	0.472
NonOECD	BD = 1: Only non-OECD countries included in the data	0.068	0.252
MixCountries	BD = 1: Mix of OECD and non-OECD countries included in the data	0.265	0.442
<i>Data and estimation details</i>			
LongRun	BD = 1: Estimate explicitly looks at long-run effects of tax changes on growth. E.g. via ECM/PMG models or multi-year averages	0.605	0.489
ShortRun	BD = 1: Estimate explicitly looks at short-run effects of tax changes on growth. E.g. via ECM/PMG models or ARDL models	0.075	0.263
HorizonOther(reference)	BD = 1: Study does not clearly state the horizon of the underlying estimate or horizon remains ambiguous	0.32	0.467
TotalTaxRev	BD = 1: total tax revenues is included as control	0.331	0.471
GovSpend	BD = 1: Government spending variable is included as control	0.327	0.469
NoOtherTaxVar	BD = 1: no other tax variable (e.g. sales taxes, property taxes, personal income taxes) is used as control	0.51	0.5
TopPIT	BD = 1: Top marginal personal income tax included as control	0.217	0.413
AveragePIT	BD = 1: Average personal income taxes included as control	0.253	0.435
SalesTax	BD = 1: Sales taxes included as control	0.179	0.384
PropertyTax	BD = 1: Property taxes as control	0.108	0.310
CapitalTax	BD = 1: Capital income taxes as control	0.031	0.175
CrossSection	BD = 1: Cross sectional data used	0.041	0.198
IntraNational	BD = 1: Data only includes one country	0.220	0.415
USAonly	BD = 1: Data are only based on US observations	0.163	0.37
NotPerCapita	BD = 1: Dependent variable (economic growth) not in per capita terms	0.306	0.459
GDPlevel	BD = 1: (log)-level of GDP (per capita) as dependent	0.285	0.452
CountryFE	BD = 1: Country fixed-effects included	0.56	0.497
OLS (reference)	BD = 1: Ordinary Least Squares estimation used	0.585	0.493
PMG	BD = 1: Pooled Mean Group estimation used	0.098	0.297
SURE	BD = 1: Seemingly Unrelated Regression estimation used	0.025	0.156
GMM	BD = 1: Generalised Method of Moments estimation used	0.043	0.203
IV	BD = 1: Instrumental Variable estimation used	0.079	0.271
OtherEst	BD = 1: Estimator other than OLS, PMG, SURE, GMM or IV used	0.17	0.376
Endogeneity	BD = 1: Econometric approach tries to address endogeneity issues	0.141	0.348
<i>Publication characteristics</i>			
PubYear	Publication year of the study minus sample average publication year	−0.038	4.532
Citations	Logarithm of the number of citations	3.053	1.542
ImpactFactor	Journal impact factor normalised to a range between 0 and 1	0.226	0.277
AuthorOECD	BD = 1: At least one author is affiliated with the OECD	0.104	0.306
Preferred	Categorical variable capturing whether study authors mark an estimate as preferred (= 1), inferior (= −1) or neither (= 0).	0.168	0.494

Notes: BD = binary dummy, which takes the value of 1 if the condition is fulfilled and 0 otherwise.

The EATR, like the EMTR, also takes into account tax base characteristics for international comparisons of effective tax burdens. As opposed to the EMTR, the EATR is calculated as the present value of future tax liabilities divided by the present value of pre-tax profits over the expected lifetime of competing and mutually exclusive investment projects that earn a profit *above* the market rate. The EATR is the more suitable concept when evaluating tax systems for location or production technology decisions. Both EMTR and EATR are more elaborate concepts as compared to STR, ATR and CTTR. In comparison to STR data, EMTR and EATR take into account changes to tax base legislation. As opposed to ATR and CTTR, they are not prone to the described endogeneity issues. However, calculations hinge on a number of critical assumptions and require more institutional details of the tax system at hand.

Consequently, there is no universal measure and data availability is more limited than for the STR, ATR and CTTR. A more extensive discussion of the different concepts can be found in [Devereux et al. \(2002\)](#) or [Steinmüller et al. \(2019\)](#).⁷

Country composition: The impact of corporate taxes on economic growth could be influenced by the underlying country sample. We thus control for whether an estimate uses a data sample of OECD countries, non-OECD countries or a mix of countries. The underlying country sample serves as a proxy for the level of economic development, with OECD countries mostly consisting of advanced countries. Non-OECD countries comprise mostly developing countries, and the mixed country group combine advanced and developing countries.

Data and estimation details: As a central characteristic, we categorise the time horizon of the estimates. Did the study clearly state whether the reported estimate implies a long-run or short-run effect? To answer this question, we code three exclusive but mutually exhaustive dummy variables: LongRun refers to reported long-run effects of corporate taxes on growth (e.g. via long-run coefficients in Error Correction models or Pooled Mean Group models or by using multi-year averages of the data to filter out short-run fluctuations); ShortRun is about short-run effects (e.g. via short-run coefficients in dynamic models); and HorizonOther covers estimates that are unspecific concerning the time horizon (which we use as our agnostic reference value).

As explained above, controlling for total tax revenues and government spending could have an impact on the estimated effect of corporate taxes on growth via the budget constraint. We therefore code dummy variables that take the value of one when total tax revenues or government spending are controlled for, respectively. The literature has further suggested that controlling for other tax variables (e.g. personal income taxes or sales taxes) in addition to corporate taxes can make a difference for the obtained regression results (e.g. [Myles, 2009](#)). Therefore, we code a dummy variable that takes the value of one if no other tax variable was included. In order to consider this issue in more detail, we consider explicit control variables for specific tax components as suggested by the endogenous growth literature (e.g. [Peretto, 2007](#); [Aghion et al., 2013](#); [Ferraro et al., 2020](#)). In particular, we code dummy variables for whether the primary studies control for top marginal personal income taxes, average personal income taxes, sales taxes, property taxes and capital income taxes, respectively.

We consider whether a study used cross-sectional data instead of panel data, which is the case for only 4% of all estimates. We also check whether data from only one country were used, so that the focus of the empirical analysis was intra-national instead of inter-national. The reason for considering this aspect is that some studies have argued that it may be easier to identify effects of corporate taxes on growth because states within a country are more similar than different countries (e.g. [Gale et al., 2015](#)). We also code a dummy variable that is set to one if only US data are used – which we find to be the case for 16.8% of all estimates – since discussions in the literature about the growth effects of corporate taxation have been particularly intense in the US (e.g. [Alm and Rogers, 2011](#); [Prillaman and Meier, 2014](#); [Suárez Serrato and Zidar, 2018](#)). We check whether the dependent variable was not calculated in per capita terms and we consider differences in the transformation of the underlying data by coding a dummy variable that we set to one when the regression specification uses the (logarithm) of the level of GDP (per capita) as the dependent variable (instead of the growth rate).

In addition to these data characteristics, we cover details of the estimation approach. We consider the use of different estimators by checking whether the reported coefficient in our data set is based on applying OLS, PMG, SURE, GMM, IV or some other estimator. Moreover, we code a variable that is set to one if the econometric approach in the respective study accounts for potential endogeneity issues.

Publication characteristics: We account for various dimensions of the publication process. This includes the year in which the paper was published to see whether estimates have changed over time; the number of citations; the impact factor of the journal in which the paper was published⁸; whether one or more of the authors are affiliated with the OECD, since there is a cluster of studies from such authors in our sample; and whether the authors of the primary studies consider an estimate in their study as preferred or inferior.

4. Testing for publication selection bias

This section investigates whether the literature on the impact of corporate taxes on economic growth is fraught with publication selection bias. Publication selection is a process where results are chosen for their statistical significance or for their consistency with theoretical predictions or previous findings (e.g. [Andrews and Kasy, 2019](#)). Both authors and journal editors may have a preference for reporting and publishing mostly those results that show statistical significance; researchers may be more willing to accept the presence of a statistically significant effect in line with theoretical predictions; and there may be a general predisposition for treating statistically significant results more favourably than ‘insignificant’ evidence. All of this can lead to a biased picture of the empirical relationship of interest. A central scope of meta analysis, therefore, is the detection and correction of such publication selection bias.

[Fig. 2](#) shows information concerning the distribution of the estimates obtained from the primary literature. This “funnel plot” ([Stanley and Doucouliagos, 2012](#)) consists of all standardised econometric estimates of the corporate tax-economic growth relationship that we included in the data set (on the horizontal axis) and the precision of these estimates, where precision is calculated as the inverse of the standard errors of the coefficients (on the vertical axis).⁹

⁷ Note that definitions and exemptions of corporate tax rates and bases among different countries are much more granular than our five broad categories. Two tax systems with similar EMTRs might still provide very different incentives for innovations or investments. However, most of the primary studies in our data set do not go into these details either, limiting our scope for a more in-depth assessment. Such unnoticed differences will be reflected in the standard errors of the coefficients.

⁸ For studies that have not been published in a peer-reviewed journal, we code a value of 0.01.

⁹ Note that we winsorised the collected estimates and their standard errors at the 2nd and 98th percentile to reduce the impact of potentially spurious outliers ([Zigraiova et al., 2021](#)). Our main findings, however, are not affected by the choice of winsorising as we will show by conducting various robustness checks in later sections.

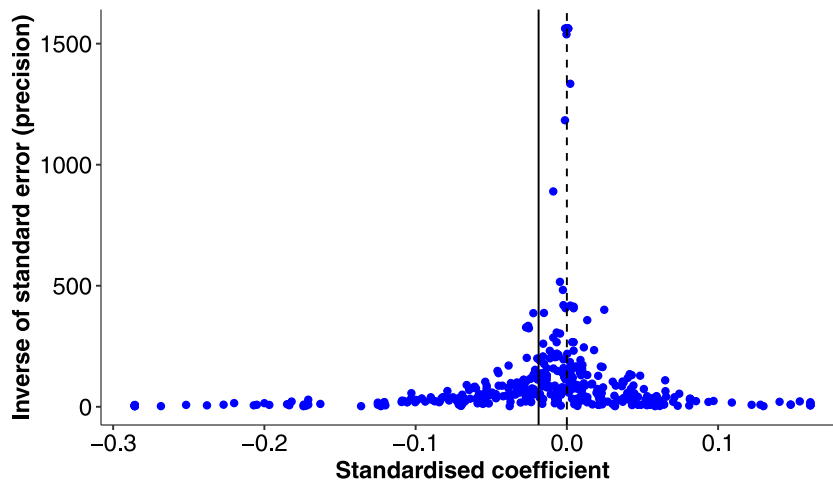


Fig. 2. Funnel plot of effect size and precision of estimates.

Notes: The figure plots estimates ($N = 441$, winsorised at the 2nd and 98th percentiles) of the standardised coefficient of the corporate-tax-growth nexus against the inverse of the corresponding standard error. Without publication bias the figure should resemble an inverted symmetrical funnel around the most precise estimates. The dotted vertical line is the zero effect line. The solid vertical line shows the unweighted mean of the standardised coefficient. Negative standardised coefficients indicate a positive impact of corporate tax cuts on growth, and vice versa.

Econometric theory holds that under standard assumptions, (i) point estimates with smaller standard errors should be closer to the true underlying effect, (ii) less precise estimates should be dispersed more widely and (iii) point estimates of coefficients and their standard errors should be essentially uncorrelated. This implies that the funnel plot should ideally be A-shaped and symmetric around the most precise estimates. Publication selection can lead to asymmetric funnels when insignificant or theory-inconsistent results are underreported (see for example the Monte-Carlo simulation exercise in Gechert et al. (2021)).

The unweighted sample mean of all standardised coefficients amounts to -0.02 . Fig. 2, however, reveals that there is considerable dispersion in the results: the minimum standardised coefficient is -0.29 and the maximum is 0.16 ; the standard deviation is 0.08 . The funnel has a familiar shape, often found in the literature: the most precise estimates, which can be seen at the top of the funnel plot, are close to the vertical zero effect line. Moreover, the bottom of the funnel is somewhat asymmetric with a stronger mass of imprecise estimates located on the left side (representing the common-sense growth-enhancing effects of corporate tax cuts), which could be an indication for publication selection bias.

Visual inspection of funnel asymmetry can be misleading. Thus, in the following we employ formal tests for detecting publication selection bias, based on investigating the relationship between the estimated standardised coefficients and their standard errors. Table 2 shows the results of various testing procedures for publication selection bias. To set the stage for these tests column (1) presents a t -test of the unweighted mean of the coefficient against zero. Such a naïve vote counting results in a statistically significant positive effect of corporate tax cuts on economic growth, implying that a ten percentage points reduction in corporate taxes is associated with an increase in growth by 0.2 percentage points. Overall, the unweighted mean supports the main theoretical predictions discussed in Section 2.

Column (2) performs the Funnel-Asymmetry Precision-Effect test (FAT-PET), which allows us to formally assess the presence of publication selection bias (e.g. Stanley and Jarrell, 2005). We run the following model:

$$SC_{ij} = \beta_0 + \beta_1 SE_{ij} + v_{ij} \quad (3)$$

where SC_{ij} is the estimated standardised coefficient i from study j , SE_{ij} is its standard error, and v_{ij} is a random sampling error. The term $\beta_1 SE_{ij}$ controls for publication selection bias. The hypothesis test of $H_0 : \beta_1 = 0$ is called the Funnel Asymmetry Test (FAT) (Stanley and Doucouliagos, 2012). If $\beta_1 = 0$, we could conclude that there is no evidence for publication selection bias. At the same time, investigating the hypothesis that $\beta_0 = 0$ (referred to as the Precision-Effect Test, PET) allows us to test whether there remains an empirical effect after accounting for publication selection.¹⁰

Column (2) of Table 2 provides first evidence for the presence of publication selection bias: the association between the standardised coefficients and their standard errors is negative and statistically significant at the 5% level. This implies a bias in

¹⁰ The reported empirical estimates were derived from different data sets with various sources of heteroskedasticity. To address this issue, Eq. (3) is estimated by Weighted Least Squares (WLS) with the inverse of the coefficient variances as weights. Stanley and Doucouliagos (2017) show that WLS is preferable in comparison with other meta-regression estimators, since the estimates of interest do not have equal variances. It is also important to assign more weight to those estimates that come with higher precision, because the information provided by more precise estimates is arguably more valuable. The inverse of the variances of the standardised coefficients are the optimal weights (Cooper and Hedges, 1994). One additional complication arises because of the presence of multiple estimates per study. It is too restrictive to assume that pairs of standardised coefficients and their corresponding standard errors are independent within studies. We account for potential within-study dependence by clustering the standard errors at the study level.

Table 2
Linear funnel asymmetry and precision effect tests.

	(1) Unw. avg.	(2) WLS base	(3) median	(4) IV	(5) PCC
β_1 [publication bias]	–	–0.665** (0.325)	–1.268*** (0.414)	–0.541* (0.296)	–1.197** (0.498)
β_0 [mean beyond bias]	–0.019** (0.010)	0.0001 (0.0004)	0.0002 (0.001)	–0.002 (0.012)	0.033 (0.029)
N	441	441	42	441	446
Adjusted R ²	0.077	0.061	0.148	0.203	0.059

Notes: The table reports several test results for publication selection bias and underlying effects beyond such a bias, referring to Eq. (3). β_1 tests for the presence of publication selection bias. β_0 estimates the average effect of corporate taxes on economic growth after correcting for publication selection bias. In columns (1)–(4), the dependent variable is the standardised coefficient of the effect of corporate taxes on economic growth rates. All results except for column (1) were obtained by using Weighted Least Squares (weights based on the inverse of the variances). Column (1) serves as a comparison and shows the unweighted average (Unw. Avg) of the standardised coefficient, tested against zero. Column (2) refers to the baseline WLS results according to Eq. (3). In column (3), we used the median estimates of the 42 underlying primary studies. Column (4) refers to instrumental variable estimation (using the inverse of the square root of the degrees of freedom as an instrument for the standard error). Column (5) uses the PCC of Eq. (2) as the dependent variable. Standard errors (clustered at the study level) in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

favour of reporting growth-enhancing effects of reductions in corporate taxes. In other words: researchers report positive and/or insignificant estimates less often than one would expect from econometric theory. The PET results in column (2) suggest that the average effect of corporate taxes on economic growth cannot be distinguished from zero once we correct for publication selectivity.

Columns (3) to (5) of Table 2 then report results from various robustness checks. Column (3) considers a vastly reduced sample, focussing only on the median estimate from each study. Column (4) addresses the potential endogeneity problem that the standard error could be correlated with the error term via the choice of estimation techniques in the primary studies, leading to a biased estimate of β_1 . We tackle this by an IV estimation, exploiting that studies based on larger data sets tend to be more precise than those based on smaller samples, while the number of observations should be rather uncorrelated with methodological choices. In particular, we calculate the inverse of the square root of the number of degrees of freedom, an estimate that is proportional to the standard error (Havránek, 2015) and use this as an instrument for the standard error. Column (5) reports FAT-PET results when we use an alternative standardised effect size, namely the partial correlation coefficient (PCC).¹¹ Here, the quantities of the coefficients are not directly comparable to columns (1)–(5), but the signs and notions of statistical significance have a similar interpretation.

To check the robustness of the linear tests for publication selection bias, Table 3 reports results based on applying various recently developed non-linear methods. Again, column (1) repeats the unweighted average to facilitate comparison. Column (2) provides an alternative estimate of the mean beyond publication selection bias from the non-parametric approach of Andrews and Kasy (2019). Essentially, the method calculates conditional publication probabilities for conventional critical limits of the p -value of the estimates in the primary studies and points to irregular heaps of results just below the typical thresholds. Applying the method to our sample, we conclude that reporting a negative and statistically significant growth effect of a corporate tax hike (at the 5 or 10% level of significance) is about four to five times more likely than reporting an insignificant effect, and about three times more likely than reporting a positive and statistically significant effect. The details can be found in Online Appendix C. Correcting for this irregularity would result in a small and insignificant negative coefficient.

Column (3) of Table 3 is based on the method developed in Bom and Rachinger (2019), who introduce an “endogenous kink” technique. The intuition behind this approach is that, similar to Andrews and Kasy (2019), results are more likely to be published when they pass a certain significance threshold. The method determines this threshold endogenously according to the data set at hand, and then detects increased publication probabilities beyond the threshold. The findings are again very much in line with our traditional parametric FAT-PET estimates. Furthermore, column (4) shows non-parametric results that are robust to various assumptions regarding the functional form of publication selection bias and the underlying distribution of the true effect of corporate taxes on growth. They are based on Furukawa (2021), who uses only a sub-sample of the most precise estimates — the so-called stem of the funnel plot. This sub-sample is determined by minimising the trade-off between variance per observation (which shrinks with an increasing sample) and publication bias (which rises with a larger sample). The Furukawa (2021) approach is agnostic with respect to the form of publication bias, as the latter can be driven by imprecise results, or close-to-zero results, or both. Likewise, column (5) uses an approach suggested by Ioannidis et al. (2017), focussing only on the top 10% of estimates with the smallest standard error and reporting the weighted average from this subsample. Thus, the approach is robust to asymmetric tails of the funnel plot, which mostly show results with low power.

The results from all the tests discussed above point to publication bias in favour of reporting a significant growth-enhancing impact of corporate tax cuts. Once we account for publication bias, we are unable to detect an average effect of corporate taxes on

¹¹ Note that we can include one additional study (Suárez Serrato and Zidar, 2018) and 5 additional observations when we use the partial correlation coefficient; therefore, our PCC sample includes 446 observations from 43 primary studies compared to 441 observations from 42 primary studies when using the preferred standardised coefficient.

Table 3
Non-linear tests of publication selection bias.

	(1) Unw. avg.	(2) Andrews–Kasy	(3) Bom–Rachinger	(4) Furukawa	(5) Ioannidis et al.
Mean beyond bias	−0.019** (0.010)	−0.001 (0.001)	−0.001 (0.001)	0.001 (0.002)	−0.001 (0.001)
N	441	441	441	21	48

Notes: The table reports the resulting mean beyond bias of several non-linear approaches to detecting publication bias. The dependent variable is the standardised coefficient of the effect of corporate taxes on economic growth rates. Column (1) serves as a comparison and shows the unweighted average (Unw. Avg) of the standardised coefficient, tested against zero. Column (2) refers to the estimates of the bias-corrected mean effect based on the non-parametric test for publication selection introduced by Andrews and Kasy (2019). Column (3) refers to the “endogenous kink” method developed in Bom and Rachinger (2019). Column (4) employs the “stem” method proposed in Furukawa (2021). Column (5) focuses on the top 10% of observations with the smallest standard error as suggested by Ioannidis et al. (2017). Standard errors in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

growth that is statistically different from zero. The simple bivariate tests, however, do not tell us whether method and data choices might be correlated with the magnitude of publication selection bias or with the underlying effect, as covered in Section 5.

5. Explaining heterogeneity in reported results

This section addresses the question: what factors contribute to explaining the heterogeneity in the reported results on the corporate tax and economic growth relationship?

In line with standard meta-regression analysis, we make the assumption that the i th estimate of the standardised tax-growth coefficient from study j , denoted SC_{ij} , is not only influenced by sampling error v_{ij} , but by a vector of variables X_{ij} consisting of study characteristics (such as data, model specification and estimation approach) that capture differences in the underlying impact of corporate taxes on economic growth. The meta-regression model can thus be written as follows:

$$SC_{ij} = \beta_0 + \beta_1 SE_{ij} + \beta_2 X_{ij} + v_{ij} \quad (4)$$

By estimating Eq. (4), we can simultaneously account for publication selection bias and control for factors that might explain excess heterogeneity. In line with the bivariate case in Eq. (3), we estimate Eq. (4) via WLS with the inverse of the variances as optimal weights and with standard errors clustered at the study level. The moderator variables included in vector X were already introduced in Table 1.

Before we present the multivariate meta-regression results, some notes are in order. The meta-regression models always omit one category (the reference category) from each group of mutually exclusive and jointly exhaustive dummy variables (corporate tax variables, composition of the country sample, estimator used, and time horizon of the effect) due to perfect multicollinearity. This implies, however, that the constant β_0 cannot be interpreted as the ‘true’ effect of corporate taxes on economic growth, because it depends on the choice of reference groups. Reference categories are chosen based on standard choices and best practices in the literature or reflect a middle-of-the-road choice when there is no clear favourite. Our reference specification is an estimate of the impact of statutory corporate taxes on economic growth for an average of OECD countries and when the primary study does not clearly specify whether the coefficient refers to a long-run or short-run effect of corporate taxes on growth. Notably, our choice of the omitted dummy variable does not influence any of the other estimated coefficients; it only shifts the reference value of the constant β_0 (Heimberger, 2020).

Table 4 shows the meta-regression results based on Eq. (4). Our preferred specification is column (1), which focuses on the main factors that have been discussed in the related literature in terms of having an impact on the effect of corporate taxes on growth. These include the way corporate tax rates are measured, the state of economic development of the countries under investigation, the time horizon of the considered growth effects and the recognition of other budgetary components.

Some central robust findings stand out: (i) irrespective of the inclusion of the explanatory factors X , the reference specification represented by the constant – based on best practices as described above – again points to a zero average effect of corporate taxes on growth in line with Tables 2 and 3. The standard error still has a negative sign but is not robustly statistically significant any more when accounting for heterogeneous study characteristics. Regarding the different approaches to measuring corporate tax rates, only the EATR coefficient is highly statistically significant with a negative coefficient of −0.03. This indicates that – compared to estimates that use statutory corporate income tax rates (excluded as the reference category in the group of corporate tax variables) – estimates that measure corporate taxes as the EATR report more growth-enhancing effects of corporate tax cuts. However, it should be noted that the EATR results tend to be outliers compared to the rest of the literature measuring corporate taxation as effective marginal tax rates (EMTR), corporate tax revenue shares (ATR and CTTR) or statutory corporate income tax rates (STR), respectively: using any of the latter measures suggests that we cannot reject the hypothesis of a zero effect of corporate taxes on growth.

The results in the baseline specification of column (1) further indicate that, on average, the impact of corporate taxes in OECD countries is not significantly different from the effect in non-OECD countries or mixed country groups. This finding may be surprising in light of theoretical arguments pointing to more negative effects of high corporate tax rates in developing countries that need to

Table 4
Multivariate meta regression: main results.

	(1) base	(2) + data + est	(3) tax	(4) pub. char.	(5) median	(6) PCC
Constant	0.001 (0.001)	−0.0001 (0.003)	0.001 (0.002)	0.006 (0.005)	0.005 (0.007)	−0.028 (0.023)
SE	−0.238 (0.279)	−0.437* (0.249)	−0.216 (0.278)	−0.330 (0.247)	−0.366 (0.410)	−0.261 (0.373)
EATR	−0.033*** (0.005)	−0.036*** (0.008)	−0.033*** (0.005)	−0.025*** (0.005)	−0.031*** (0.006)	−0.088* (0.045)
EMTR	−0.004 (0.004)	−0.001 (0.003)	−0.004 (0.004)	0.019*** (0.006)	0.020 (0.012)	0.002 (0.039)
ATR	0.002 (0.002)	0.014*** (0.002)	0.002 (0.002)	0.003 (0.002)	−0.003 (0.007)	0.094*** (0.021)
CTTR	0.003 (0.007)	0.011 (0.010)	0.003 (0.002)	0.019** (0.008)	0.005 (0.010)	0.083** (0.036)
NonOECD	0.005 (0.006)	−0.004 (0.006)	0.005 (0.006)	−0.003 (0.007)	0.030*** (0.010)	0.002 (0.040)
MixCountries	−0.005 (0.008)	−0.006 (0.008)	−0.005 (0.008)	−0.008 (0.006)	0.007 (0.017)	0.007 (0.039)
LongRun	−0.001 (0.001)	−0.001** (0.001)	−0.001 (0.001)	−0.002* (0.001)	−0.005 (0.007)	−0.028 (0.030)
ShortRun	0.055*** (0.009)	0.054*** (0.011)	0.055*** (0.010)	0.054*** (0.019)	0.026 (0.016)	0.024 (0.035)
TotalTaxRev	−0.007 (0.006)	−0.008 (0.006)	−0.006 (0.006)	−0.007 (0.006)	−0.027** (0.012)	−0.012 (0.023)
GovSpend	−0.010*** (0.004)	−0.014*** (0.003)	−0.008** (0.004)	−0.007*** (0.002)	−0.010 (0.006)	−0.040* (0.020)
PMG		−0.002 (0.002)				
SURE		0.011 (0.007)				
GMM		0.023*** (0.008)				
IV		0.004 (0.006)				
OtherEst		−0.0002 (0.001)				
Endogeneity		−0.009 (0.007)				
CountryFE		−0.0002 (0.001)				
CrossSection		−0.011** (0.005)				
USAonly		−0.0004 (0.0004)				
IntraNational		−0.002 (0.003)				
NotPerCapita		0.016*** (0.003)				
NoOtherTaxVar		0.003 (0.003)				
TopPIT			0.001 (0.001)			
AveragePIT			−0.001 (0.004)			
SalesTax			−0.003 (0.004)			
PropertyTax			−0.001 (−0.001)			
CapitalTax			−0.005 (0.004)			
PubYear				0.001*** (0.0003)		
Citations				−0.001 (0.001)		

(continued on next page)

Table 4 (continued).

	(1) base	(2) + data + est	(3) tax	(4) pub. char.	(5) median	(6) PCC
ImpactFactor				−0.016* (0.009)		
AuthorOECD				−0.028*** (0.008)		
Observations	441	441	441	441	42	446
Adjusted R ²	0.245	0.317	0.240	0.380	0.296	0.209

Notes: The table reports results from various specifications of Eq. (4). See Table 1 for description of variables. All results were obtained by using Weighted Least Squares (weights based on the inverse of the variances). In columns (1)–(5), the dependent variable is the standardised coefficient. Column (1) shows our preferred baseline specification (base). Column (2) additionally controls for estimation and data details. Column (4) includes other tax controls. Column (4) controls for publication characteristics. Column (5) considers a subsample of only the median estimate from the 42 primary studies. Column (6) uses the partial correlation coefficient (PCC) as the alternative effect size. Standard errors (clustered at the study level) in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

attract FDI. It can be rationalised by considering that recent decades have been characterised by substantial cuts in corporate tax rates in both OECD and non-OECD countries (e.g. Asen, 2020; Heimberger, 2021). In an environment characterised by simultaneous competitive tax cuts, the growth benefits for non-OECD countries from reductions in corporate tax rates may be lower, so that a robustly significant difference to OECD countries in the growth impact of corporate tax cuts is missing.

The results in column (1) further suggest that the short-run response of GDP to a cut in corporate taxes is even less growth enhancing than for estimates that do not explicitly identify the time horizon. At the same time, we do not find that the long-run growth impact of corporate tax cuts is significantly more positive than for the unspecific reference category. Finally, our baseline results show that when government spending is held constant (i.e. when the underlying primary study controls for public expenditures), a corporate tax cut has more positive growth effects. This finding is consistent with endogenous growth theory where using revenues from corporate income taxation for boosting (productive) government spending can have positive effects on growth (Jones et al., 1993) and with the empirical literature that finds positive productivity effects of expanding the public capital stock (Bom and Ligthart, 2014).

Column (2) of Table 4 includes additional moderator variables capturing estimation and data details that could explain further heterogeneity in reported results. In general, by adding these variables, we confirm the robustness of the baseline meta-regression findings discussed above. More specifically, we find that using GMM instead of OLS as the preferred estimation approach leads to less positive growth effects of corporate tax cuts. At the same time, the variable Endogeneity is not significant. This suggests that our finding that the hypothesis of a zero effect of corporate taxes on growth cannot be rejected is not driven by a failure to account for potential endogeneity between corporate taxes and growth.

Using cross-sectional data (instead of panel data) delivers slightly more growth enhancing effects of cuts in corporate taxes. It should be noted, however, that only 4.1% of all our estimates are based on cross-sectional data, and the growth enhancing effect is still small when we add the −0.011 CrossSection coefficient to the constant. Interestingly, using intra-national instead of inter-national data does not yield relevant differences. Even if intra-national data are considered to be less polluted by unobserved heterogeneity, they do not systematically change our main results. We do find, however, that the measurement of the growth variable matters: primary studies that do not measure growth in per capita terms report significantly less favourable growth impacts of cuts in corporate taxation. Finally, irrespective of whether the underlying studies control for other tax variables (e.g. personal income taxes) or not, this does not significantly alter the reported effect size of corporate taxes on growth.

Column (3) in Table 4 considers the previous issue in more detail. It captures specific controls for other tax variables (top marginal personal income taxes, sales taxes, property taxes etc.) in the underlying studies. None of these additional tax controls turns out to be significant. This suggests that our main findings with regard to the effect of corporate tax changes on growth are robust to considering whether the underlying primary studies control for other explicit types of taxation.

Column (4) in Table 4 reports further extensions to the baseline model by including various publication characteristics. The publication year is positively associated with the reported results, implying that the growth enhancing effects of cuts in corporate taxation reported in the literature have declined over time — in line with the emergence of endogenous growth models that provide more nuanced transmission channels of corporate taxes on growth. We also find some (weakly statistically significant) evidence that papers published in journals with a higher impact factor report more favourable growth effects of corporate taxes, which can be seen as an alternative indication for publication selectivity (e.g. Andrews and Kasy, 2019). Finally, our results suggest that the growth effects of corporate tax cuts are reported to be significantly more positive when at least one author is affiliated with the OECD. While controlling for other potential sources of heterogeneity, our findings suggest that accounting for this affiliation is important, which could be due to publication selection bias in favour of “common-sense” corporate tax-economic growth results.

Table 4 provides two additional robustness checks for the baseline results. Column (5) shows meta-regression results when we restrict our sample to only the median estimates from the 42 primary studies. By this we can test whether our main results are driven by giving an undue weight to studies with many estimates. Given that the number of observations is now less than one tenth of the full sample, it is reassuring that the estimated coefficients of the moderator variables are quite robust in terms of their size, sign and significance. Finally, column (6) uses the partial correlation coefficient as an alternative effect size compared to the standardised coefficient in our preferred specifications. While using the partial correlation coefficient does not allow for an interpretation of the economic relevance of the coefficients, column (5) broadly confirms our main qualitative findings: a statistically insignificant

underlying effect; statistical significance of the choice of the corporate tax variable; and holding government spending constant leads to more positive growth effects of cuts in corporate taxes.

We estimated a broad set of additional model specifications to test the robustness of our main meta-regression findings. Detailed results are available in Online Appendix D. In particular, in Table D1 we test our sample choice. We present results without winsorising the most extreme values, and we use different cut-offs for the winsorising. The baseline results reported in column (1) of Table 4 remain very robust in qualitative and quantitative terms. In addition, in Table D1 we introduce a categorical variable for estimates that are preferred by authors of the respective primary studies in our baseline specification, considered as inferior or seen as neither preferred nor inferior. We estimate a model with preferred estimates only; and we drop estimates that are deemed inferior in the original studies. However, we do not find evidence that distinguishing between preferred and other estimates matters for the overall results, which prove strikingly robust.

Table D2 in the online appendix reconsiders choices of our estimation specification. First, we confirm the robustness of our baseline findings when we exclude the moderator variable capturing whether the underlying model specification controls for total tax revenues. Second, we show that different data transformations of the GDP data used in the underlying study do not significantly affect our results. We do so by including a moderator variable capturing whether the dependent variable was measured as the (log) level of output (compared to the growth rate).

As additional robustness checks in Table D2, we include study fixed effects or random effects respectively. The results are remarkably similar to our baseline WLS findings. In the random effects estimation, we find that the negative coefficient of the effective average tax rate is no longer significant, while the coefficient of the average tax rate turns positive and significant. Finally, we estimate our baseline model by using OLS instead of WLS, and the results again suggest that EATR loses significance, while other corporate tax type variables turn positive and significant. This suggests that the finding of more growth enhancing effects of corporate tax cuts when primary studies use EATR is not entirely robust to variations in the meta-regression estimation technique. The overall finding of an insignificant effect of corporate tax cuts on growth is supported by all robustness checks reported in Online Appendix D.

6. Discussion and conclusions

This paper addressed the question as to whether corporate taxes affect economic growth. We applied meta-regression methods to a novel data set consisting of 441 relevant estimates from 42 primary studies. The evidence leads us to two central conclusions:

- (1) The literature on corporate taxes and growth has been biased towards over-reporting results according to which corporate tax cuts boost growth rates. We have shown that it is about 2.7 to 3 times more likely to publish a result showing a statistically significant positive impact of corporate tax cuts on growth compared to a significant negative result.
- (2) After correcting for this bias and taking heterogeneity across studies into account, we cannot reject the hypothesis that corporate tax changes have, on average, no economically relevant or statistically significant effect on economic growth. This is confirmed after accounting for potential endogeneity issues between corporate taxes and growth. While this result invites caution concerning claims of substantial across-the-board growth effects as found in some prominent studies (e.g. OECD, 2010), there may be cases with positive or negative growth effects given the variance in the results. Our finding that the average effect of corporate tax cuts on growth is zero with some variance for individual cases is broadly consistent with the nuanced recent theoretical growth literature, which stresses that there are various (partly competing) channels – such as knock-on effects on R&D incentives or labour supply – through which corporate tax changes can affect growth both positively and negatively (Suzuki, 2022; Ferraro et al., 2020; Aghion et al., 2013, 2016).

When analysing the heterogeneity of reported effects across studies in more detail, we obtain the following main results: First, corporate tax cuts tend to be even less growth friendly when considering a short time horizon. Second, considering both rate and base changes by looking at an effective average corporate tax rate may lead to slightly more positive growth rates in response to tax cuts. However, this is an outlier as compared to the rest of the literature using effective marginal tax rates, corporate tax shares in GDP or statutory tax rates, and the result is also not entirely robust to variations in the meta-regression estimator. Third, there does not seem to be a substantial difference between OECD and non-OECD countries regarding the growth effects of corporate tax changes. Fourth, explicitly controlling for other types of taxation (personal income taxes, capital income taxes, property taxes, sale taxes) does not affect our main findings. Fifth, more recent studies tend to find less growth enhancing effects of corporate tax cuts. Finally, it matters what happens to other budgetary components in conjunction with a corporate tax change: if we hold government spending fixed, a corporate tax hike will be slightly more detrimental to growth, implying that using the additional revenues for government spending instead of fiscal consolidation may foster growth, in line with theoretical arguments from endogenous growth models (Jones et al., 1993) and empirical evidence on substantial productivity of public capital (Bom and Ligthart, 2014).

Where do the results from our meta-analysis point to regarding future research avenues? First, since it is challenging to properly identify the impact of exogenous changes in corporate taxes on growth at the macro level, studies with a causal study design that exploit new micro data could shed more light on the effects of corporate tax cuts (e.g. Akcigit et al., 2022; Furno, 2021).¹²

¹² Akcigit et al. (2022) present evidence from US data according to which corporate taxes have negative effects on the quantity of innovation and location decisions, though not on the quality of innovations. They note that mobility responses predominantly drive the effects, which are more likely to be zero-sum across states.

Similarly, future empirical research could focus more on the mechanisms through which corporate taxes impact growth. Do corporate taxes affect growth through their impact on innovative activities? Do R&D tax credits moderate the impact of corporate tax cuts on growth?¹³

Finally, future research may analyse the growth impact of corporate taxation in relation to corporate tax competition, where existing evidence strongly suggests that international competitive pressures have significantly contributed to reducing corporate tax rates over recent decades (Devereux et al., 2008; Heimberger, 2021), although there is also some contrary evidence for US states (Chirinko and Wilson, 2017). Have the growth effects of corporate tax cuts been weaker due to simultaneous competitive tax reductions by other governments? While these important questions demand more research efforts, our results suggest that the attention that corporate taxation has received in debates on structural reforms as a source of economic growth has often been exaggerated.

Acknowledgements

Heimberger gratefully acknowledges financial support from the Macroeconomic Policy Institute, Germany. No further declarations of interest. We thank Dominika Ehrenbergerova, Tomas Havranek, Zuzana Irsova, Maximilian Kasy, Christoph Paetz, Tom Stanley and two anonymous reviewers for helpful suggestions. All remaining errors are ours.

Supplementary material

All appendices, data and replication codes are available at <https://doi.org/10.1016/j.euroecorev.2022.104157> or at <https://github.com/heimbergecon/corptax-growth>.

References

- Aghion, P., Akcigit, U., Cagé, J., Kerr, W.R., 2016. Taxation, corruption, and growth. *Eur. Econ. Rev.* 86, 24–51.
- Aghion, P., Akcigit, U., Fernandez-Villaverde, J., 2013. Optimal capital versus labor taxation with innovation-led growth.
- Aghion, P., Howitt, P., 2008. *The Economics of Growth*. MIT Press, Cambridge, MA.
- Akcigit, U., Grisby, J., Nicholas, T., Stantcheva, S., 2022. Taxation and innovation in the twentieth century. *Q. J. Econ.* 137 (1), 329–385.
- Alm, J., Rogers, J., 2011. Do state fiscal policies affect state economic growth? *Public Finance Rev.* 39 (4), 483–526.
- Andrews, I., Kasy, M., 2019. Identification of and correction for publication bias. *Am. Econ. Rev.* 109 (8), 2766–2794.
- Angelopoulos, K., Economides, G., Kammass, P., 2007. Tax-spending policies and economic growth: Theoretical predictions and evidence from the OECD. *Eur. J. Polit. Econ.* 23 (4), 885–902.
- Arnold, J.M., Brys, B., Heady, C., Johansson, Å., Schwellnus, C., Vartia, L., 2011. Tax policy for economic recovery and growth. *Econ. J.* 121 (550), F59–F80.
- Asen, E., 2020. Corporate tax rates around the world.
- Atkeson, A., Chari, V.V., Kehoe, P.J., 1999. Taxing capital income: A bad idea. *Federal Reserve Bank Minneap. Q. Rev.* 23 (3), 3–17.
- Balima, H.W., Kilama, E.G., Tapsoba, R., 2020. Inflation targeting: Genuine effects or publication selection bias? *Eur. Econ. Rev.* 128 (4–5), 103520.
- Bom, P.R., Ligthart, J.E., 2014. What have we learned from three decades of research on the productivity of public capital? *J. Econ. Surv.* 28 (5), 889–916.
- Bom, P.R.D., Rachinger, H., 2019. A kinked meta-regression model for publication bias correction. *Res. Synthesis Methods* 10 (4), 497–514.
- Castellacci, F., Mee Lie, C., 2015. Do the effects of R&D tax credits vary across industries? A meta-regression analysis. *Res. Policy* 44 (4), 819–832.
- Chamley, C., 1986. Optimal taxation of capital income in general equilibrium with infinite lives. *Econometrica* 54 (3), 607.
- Chen, P.-h., Chu, A., Chu, H., Lai, C.-c., 2017. Short-run and long-run effects of capital taxation on innovation and economic growth. *J. Macroecon.* 53 (3), 607.
- Chirinko, R.S., Wilson, D.J., 2017. Tax competition among U.S. states: Racing to the bottom or riding on a seesaw? *J. Public Econ.* 155, 147–163.
- Cooper, H.M., Hedges, L.V., 1994. *The Handbook of Research Synthesis*. Russell Sage Foundation, New York.
- de Mooij, R.A., Ederveen, S., 2003. Taxation and foreign direct investment: A synthesis of empirical research. *Int. Tax Public Finance* 10 (6), 673–693.
- Devereux, M.P., Griffith, R., Klemm, A., 2002. Corporate income tax reforms and international tax competition. *Econ. Policy* 17 (35), 449–495.
- Devereux, M.B., Lockwood, B., Redoano, M., 2008. Do countries compete over corporate tax rates? *J. Public Econ.* 92, 1210–1235.
- Djankov, S., Ganser, T., McLiesh, C., Ramalho, R., Shleifer, A., 2010. The effect of corporate taxes on investment and entrepreneurship. *Am. Econ. J.: Macroecon.* 2 (3), 31–64.
- Feld, L.P., Heckemeyer, J.H., 2011. FDI and taxation: A meta-study. *J. Econ. Surv.* 25 (2), 233–272.
- Ferede, E., Dahlby, B., 2012. The impact of tax cuts on economic growth: evidence from the Canadian provinces. *National Tax J.* 65 (3), 563–594.
- Ferraro, D., Ghazi, S., Peretto, P.F., 2020. Implications of tax policy for innovation and aggregate productivity growth. *Eur. Econ. Rev.* 130, 103590.
- Fuest, C., Neumeier, F., Stöhlker, D., 2019. Tax cuts starve the beast! evidence from Germany.
- Furno, F., 2021. The macroeconomic effects of corporate tax reforms.
- Furukawa, C., 2021. Publication bias under aggregation frictions: Theory, evidence, and a new correction method.
- Gale, W.G., Krupkin, A., Rueben, K., 2015. The relationship between taxes and growth at the state level: new evidence. *National Tax J.* 68 (4), 919–941.
- Gechert, S., 2015. What fiscal policy is most effective? A meta-regression analysis. *Oxford Econ. Pap.* 67 (3), 553–580.
- Gechert, S., 2022. Reconsidering macroeconomic policy prescriptions with meta-analysis. *Ind. Corp. Change* 31 (2), 576–590.
- Gechert, S., Havránek, T., Irsova, Z., Kolcunova, D., 2021. Measuring capital-labor substitution: The importance of method choices and publication bias.
- Gechert, S., Rannenberg, A., 2018. Which fiscal multipliers are regime-dependent? A meta-regression analysis. *J. Econ. Surv.* 32 (4), 1160–1182.
- Havránek, T., 2015. Measuring intertemporal substitution: The importance of method choices and selective reporting. *J. Eur. Econ. Assoc.* 13 (6), 1180–1204.
- Havránek, T., Rusnák, M., Sokolova, A., 2017. Habit formation in consumption: A meta-analysis. *Eur. Econ. Rev.* 95 (3), 142–167.
- Havránek, T., Stanley, T.D., Doucouliagos, H., Bom, P.R., Geyer-Klingeborg, J., Iwasaki, I., Reed, W.R., Rost, K., Aert, R.C.M., 2020. Reporting guidelines for meta-analysis in economics. *J. Econ. Surv.* 34 (3), 469–475.
- Heimberger, P., 2020. Does economic globalisation affect income inequality? A meta-analysis. *World Econ.* 43 (11), 2960–2982.
- Heimberger, P., 2021. Corporate tax competition: A meta-analysis. *Eur. J. Polit. Econ.* 133 (3), 102002.

¹³ There is a growing literature on R&D tax credits and its potential impacts on growth (e.g. Castellacci and Mee Lie, 2015). However, there is a gap in the literature in terms of analysing the interaction with corporate taxation at the macro level.

- Imai, T., Rutter, T.A., Camerer, C.F., 2021. Meta-analysis of present-bias estimation using convex time budgets. *Econ. J.* 131 (636), 1788–1814.
- Ioannidis, J.P.A., Stanley, T.D., Doucouliagos, H., 2017. The power of bias in economics research. *Econ. J.* 127 (605), 236–265.
- Jones, L.E., Manuelli, R.E., Rossi, P.E., 1993. Optimal taxation in models of endogenous growth. *J. Polit. Econ.* 101 (3), 485–517.
- Judd, K.L., 1985. Redistributive taxation in a simple perfect foresight model. *J. Public Econ.* 28 (1), 59–83.
- King, M.A., Fullerton, D., 1984. The Taxation of Income from Capital: A Comparative Study of the United States, the United Kingdom, Sweden, and West Germany. In: A National Bureau of Economic Research monograph, University of Chicago Press, Chicago.
- Knaisch, J., Pöschel, C., 2021. Corporate income tax and wages: A meta-regression analysis.
- Lee, Y., Gordon, R.H., 2005. Tax structure and economic growth. *J. Public Econ.* 89 (5–6), 1027–1043.
- Lichter, A., Peichl, A., Siegloch, S., 2015. The own-wage elasticity of labor demand: A meta-regression analysis. *Eur. Econ. Rev.* 80 (4), 94–119.
- Mertens, K., Ravn, M.O., 2013. The dynamic effects of personal and corporate income tax changes in the United States. *Am. Econ. Rev.* 103 (4), 1212–1247.
- Myles, G., 2009. Economic growth and the role of taxation - disaggregate data.
- Neisser, C., 2021. The elasticity of taxable income: A meta-regression analysis. *Econ. J.* 131 (640), 3365–3391.
- Nijkamp, P., Poot, J., 2004. Meta-analysis of the effect of fiscal policies on long-run growth. *Eur. J. Polit. Econ.* 20, 91–124.
- OECD, 2010. Tax Policy Reform and Economic Growth. In: OECD tax policy studies, Vol. 20, OECD, Paris.
- Ohrn, E., 2018. The effect of corporate taxation on investment and financial policy: Evidence from the DPAD. *Am. Econ. J.: Econ. Policy* 10 (2), 272–301.
- Peretto, P.F., 2003. Fiscal policy and long-run growth in r&d-based models with endogenous market structure. *J. Econ. Growth* 8 (3), 325–347.
- Peretto, P.F., 2007. Corporate taxes, growth and welfare in a Schumpeterian economy. *J. Econ. Theory* 137 (1), 353–382.
- Peretto, P.F., 2011. The growth and welfare effects of deficit-financed dividend tax cuts. *J. Money, Credit Banking* 43 (5), 835–869.
- Phillips, J.M., Goss, E.P., 1995. The effect of state and local taxes on economic development: A meta-analysis. *Southern Econ. J.* 62 (2), 320.
- Prillaman, S.A., Meier, K.J., 2014. Taxes, incentives, and economic growth: Assessing the impact of pro-business taxes on U.S. state economies. *J. Polit.* 76 (2), 364–379.
- Shevlin, T., Shivakumar, L., Urcan, O., 2019. Macroeconomic effects of corporate tax policy. *J. Account. Econ.* 68 (1), 101233.
- Stanley, T.D., Doucouliagos, H., 2012. Meta Regression Analysis in Economics and Business. Routledge, New York.
- Stanley, T.D., Doucouliagos, H., 2017. Neither fixed nor random: weighted least squares meta-regression. *Res. Synthesis Methods* 8 (1), 19–42.
- Stanley, T.D., Jarrell, S.B., 2005. Meta-regression analysis: A quantitative method of literature surveys. *J. Econ. Surv.* 19 (3), 299–308.
- Steinmüller, E., Thuncke, G.U., Wamser, G., 2019. Corporate income taxes around the world: a survey on forward-looking tax measures and two applications. *Int. Tax Public Finance* 26 (2), 418–456.
- Straub, L., Werning, I., 2020. Positive long-run capital taxation: Champey-Judd revisited. *Am. Econ. Rev.* 110 (1), 86–119.
- Suárez Serrato, J.C., Zidar, O., 2018. The structure of state corporate taxation and its impact on state tax revenues and economic activity. *J. Public Econ.* 167 (12), 158–176.
- Summers, L.H., 1981. Taxation and corporate investment. a q-theory approach. *Brookings Papers Econ. Activity* 1981 (1), 67–127.
- Suzuki, K., 2022. Corporate tax cuts in a Schumpeterian growth model with an endogenous market structure. *J. Public Econ. Theory* 24 (2), 324–347.
- TenKate, F., Millionis, P., 2019. Is capital taxation always harmful for economic growth? *Int. Tax Public Finance* 26 (4), 758–805.
- Widmalm, F., 2001. Tax structure and growth: Are some taxes better than others? *Public Choice* 107 (3/4), 199–219.
- Xing, J., 2012. Tax structure and growth: How robust is the empirical evidence? *Econ. Lett.* 117 (1), 379–382.
- Zigraiova, D., Havránek, T., Irsova, Z., Novak, J., 2021. How puzzling is the forward premium puzzle? A meta-analysis. *Eur. Econ. Rev.* 134 (5), 103714.