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Taxes, Mobile Capital, and Economic Dynamics in a Globalising World

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Abstract

This contribution provides evidence for the hypothesis that trade increases growth through its curbing effect on capital taxes. The analysed trade-growth channel includes a negative impact of openness on corporate taxes and a negative effect of taxes on growth. The paper explores the two steps theoretically and empirically, taking into account the different theories and estimation problems involved. Simultaneous estimations with panel data for a sample of 12 OECD countries in the period 1965-1999 confirm a significant and robust impact of trade on growth through corporate taxes.

Keywords: Trade and Growth, Tax Competition, Capital Taxes and Mobility, OECD Countries

JEL Classification: F43, 040, H71

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1 Introduction

Capital is internationally mobile and, at the same time, crucial for economic dynamics. More mobility does not necessarily result in more growth, however. The growth rate depends on accumulation incentives, which can increase or decrease with globalisation, see Grossman and Helpman (1991). But goods and factor trade may entail additional mechanisms which unambiguously enhance the accumulation of new capital. According to theory, productivity, competition, market size, and resource reallocation mechanisms can be considered, see Ventura (2005). In the empirical work, various additional channels of government policies and technology diffusion have been tested by Wacziarg (2001). This paper argues that one of the prominent but still neglected channels is the effect operating through capital taxes. Tax competition theory predicts that increasing globalisation forces governments to reduce taxes on more mobile assets, which - under fairly general conditions - increases growth. Thus the connection is readily given: the pressure on exactly those taxes that seem to be crucial for the growth rate is able to provide a direct link between trade and growth.

The underlying model for the capital tax mechanism can be derived from first principles. Tax competition theory argues that, in equilibrium, marginal benefits of public activities correspond to marginal costs of taxation. In an open economy, any increase in the tax rate of capital causes a capital outflow to other economies, which is a fiscal externality. Costs for capital holders to shift capital abroad fall with lower capital trade restrictions and/or with increasing openness of the economy, see Bucovetsky (1991) and Wilson (1991). Thus rising openness increases the externality and decreases capital tax rates. The impact from capital taxes on growth is given by the effect on the private return on investment. Easterly and Rebelo (1993) point out that "it is hard to think of an influence on the private rate of return and on the growth rate that is more direct than that of income taxes. If these do not affect the rate of growth, what does?"

The two relationships of the tax channel mechanism appear to be very intuitive. However, there are additional and possibly conflicting effects in reality, which pose an additional challenge for the present study. Regarding globalisation, Rodrik (1998) argues that more open economies need a larger stabilising role for governments to cope with the increased uncertainty due to international shocks. Accordingly, early empirical studies such as Garrett (1995), Quinn (1997) and Swank (1998) do not find that increasing globalisation decreases the tax rates. On the theoretical level, Uhlig and Yanagawa (1996) show that, in an overlapping generations economy, lower capital taxes may decrease the growth rate. This can happen because taxing capital relieves the tax burden on the young generation which enables it to save more. Wacziarg (2001) concludes that openness increases

government efficiency and, finally, Barro (1990) derives that the relationship between tax rates and growth is non-monotonic but hump-shaped, assuming the government provides productive services. We incorporate all these different effects to enrich our dynamic tax competition model and subsequent estimations. By using a general model and appropriate data we will find that, for developed countries, the hypothesis of capital taxes as a link between trade and growth can be confirmed. We take into account that the interpretation of growth regressions with purposeful policies as explanatory variables is problematic, see Rodrik (2005). Tax competition does not assume purposeful tax changes, but policy changes that are enforced by globalisation, that is by outside forces, which cannot be changed by the government.

The openness-tax-growth relationship is inherently multidimensional. Accordingly, single observations and case studies are not necessarily helpful to gain intuition. To motivate the study we thus present some first empirical evidence. Figure 1 shows, on the left hand side, the combination of openness of the economies across time (within 5 years subperiods) and the residuals resulting from a basic regression for corporate tax determination, as explained in section 4, see specifically (4) in table 3, for 12 OECD countries. The negative slope of the fitted regression line between openness and corporate taxes is statistically significant across a large set of empirical specifications.

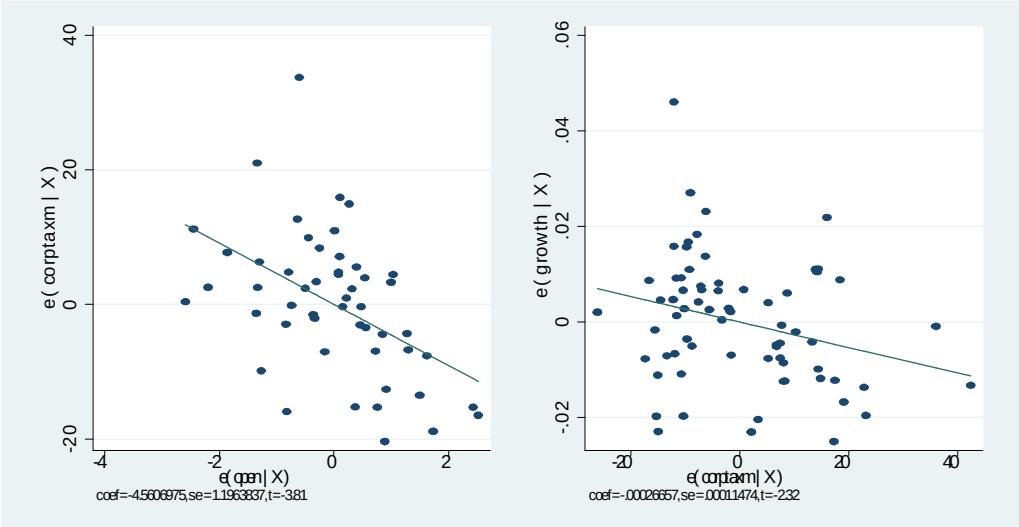

Figure 1: The effect of openness on corporate tax rates (left) and of corporate taxes on growth (right).

On the right hand side, the figure shows the relationship between corporate taxes and the growth residuals, resulting from a basic growth regression. Again,

the negative slope of the fitted regression line between corporate taxes and growth is significant across a large set of empirical specifications. This piece of evidence points to the fact that the specific tax mechanism through which openness fosters economic growth is present in developed countries.

The search for robust channels in the trade-growth relationship makes a contribution to a central but controversial issue in the current macroeconomic debate. Michaely (1977), Dollar (1992), Sachs and Warner (1995) and Edwards (1992) find a positive impact of trade and open trade policies on the growth rate, while recent papers do not come to unanimous conclusions. Edwards (1998) confirms the earlier results but Rodriguez and Rodrik (2001) remain very skeptical regarding the general validity of the positive connection. Levine and Renelt (1992) and Temple (1999) emphasise that various traditional cross-country studies suffer from methodological problems. Wacziarg and Welch (2003) confirm the low robustness of the nexus for cross-sectional studies but find new evidence when focusing on within-country growth. Frankel and Romer (1999) comment that, in their opinion, trade is a "very noisy proxy for income-promoting interactions". Reconsidering several important studies, Rodriguez and Rodrik (2001) conclude that open trade policies are not significantly associated with economic growth, once other relevant country characteristics are controlled for. They suspect that the relationship between trade and growth depends on additional characteristics and argue that "scrutinizing the channels through which trade policies influence economic performance is likely to be more productive" before they conclude that "the challenge of identifying the connections between trade policy and economic growth" is crucial for any further research in this field.

This paper adds to the literature in several respects. First, taking the critique of Rodriguez and Rodrik (2001) seriously, it identifies and explores the trade-tax-growth channel both theoretically and empirically. Second, empirical estimations take recently discussed econometric problems into account. By concentrating on OECD countries the contribution avoids estimation problems of large cross-country samples. The 12 leading OECD countries considered are quite similar, e.g. regarding factor endowments, market structures, and institutions, so that the aim of identifying and separating the tax effects seems to be promising. The time period under study covers a sufficiently long horizon and the use of five-year intervals helps to minimise business cycle effects. Third, the paper sheds a light specifically on the relationship between institutions and growth, with the tax-setting government in a globalising world as an institutional actor. In particular, it adds knowledge on developed countries, while many other studies concentrate on less developed economies or mixed samples. The characteristics of richer countries will also lead to a particular view on the different channels under debate. Finally, for the empirical estimation of the tax channel, the paper applies the

method of Tavares and Wacziarg (2001) and Wacziarg (2001) to the tax competition literature. We estimate the equations jointly using three-stage least squares, so that consistency is achieved by instrumentation and efficiency is reached by appropriate weighting using the covariance matrix from the second stage of the procedure.

Of course, the specific channel between trade and growth in this paper has to be seen as a complement to other possible links like scale, accumulation and productivity effects, treated in Rivera-Batiz and Romer (1991), Eaton and Kortum (2001), Keller (2002), Baldwin (2003), Lee, Ricci, and Rigobon (2004), and Alcala and Ciccone (2004), for the effects on the tax-mix and labour taxation see Bretschger and Hettich (2002); related policy and institutional issues are dealt with in Kneller, Bleany and Gemmell (1999), Tavares and Wacziarg (2001), Dollar and Kraay (2003), Yanikkaya (2003), Dalgaard, Hansen, and Tarp (2004), and Winters (2004), who convincingly argues that openness is not a substitute for a comprehensive development strategy. We will relate the importance of our findings to the other channels of the literature at the end of the paper.

The remainder of the paper is organised as follows. Section 2 presents a simple model which is the basis for empirical estimations. In Section 3, the estimation method and the data are discussed. Section 4 provides empirical evidence for the capital tax channel in OECD countries. Finally, section 5 concludes.

2 The theoretical framework

Following the causal chain from trade to capital taxes to growth, the theoretical approach presented here necessarily includes the formulation of two relationships: the first is the impact of trade and trade policy on capital taxes, the second the effect of capital taxes on growth. Let us present a simple approach to formalise the basic idea. For simplicity, we assume that the government levies a capital income tax with a proportional tax rate τ to finance public services, used either for consumption or for production. In a closed economy without distortions, the government chooses an optimal tax rate τ^* such that the marginal benefit of the public services MB equals the marginal costs MC (Samuelson rule), see Bucovetsky (1991) and Wilson (1991). MB depends on individual utility of the public good and the productivity of public services. In addition, it hinges on the ideological preferences of the government, the parliament, and the electorate. It is normally postulated that conservative governments favour a lower level of public activities and a lower capital taxation, while leftist governments favour redistribution and a higher capital taxation. Provided that more open economies need a larger stabilising role for governments, MB rises with increasing globalisation.

MC contains two parts in an open economy. On the one hand, it reflects marginal individual costs of taxation MC^{priv}. On the other hand, an increase in τ leads to a capital outflow, decreasing the home tax base and increasing marginal cost of taxation by MC^{outfl}. The more open the economy the larger is the capital outflow. Accordingly, we may write for the open economy:

$$MB = MC^{priv} + MC^{outfl} \tag{1}$$

$$with\ \tau < \tau^*,\ MB = MB(gov, open),\ MC^{outfl} = MC^{outfl}(open)$$

gov denotes the preferences of political actors and *open* is a measure of the openness of the economy. There are two opposing effects of globalisation on capital taxes. With a more open economy and/or lower restrictions on international capital markets, capital taxes are predicted to be lower according to the cost effect (on MC) and higher according to the demand effect (on MB). Tax competition theory claims that the cost effect dominates which will be tested in section 4. Using a simple production function with productive public spending, we may write:

$$Y = AK^{\alpha}L^{1-\alpha}Q^{\mu} \tag{2}$$

with Y denoting output, A total factor productivity, K (private) capital, L labour, and Q productive public services, assuming $0 < \alpha, \mu < 1$ and $\alpha + \mu < 1$. We then obtain the private marginal product of capital MPK_P as:

$$MPK_p = (1-\tau)\alpha D^{\frac{1}{\alpha}} y^{\frac{\alpha-1}{\alpha}} \tag{3}$$

with $D = AQ^{\mu}$ and y denoting per capita income. When ξ reflects the share of tax revenues (i.e. the revenues of the proportional tax with rate τ on capital income αY) for productive spending we have $Q = \xi\tau\alpha Y$ so that $D = A(\alpha\xi\tau Y)^{\mu} = \tilde{D}(\tau y)^{\mu}$ with $\tilde{D} = A(\alpha\xi L)^{\mu}$; L depicts a scale effect which is only valid when governmental services have the properties of pure public goods. Inserting (3) into the Keynes-Ramsey rule for intertemporal optimisation of infinitely lived households yields the per capita growth rate g according to:

$$g = \frac{1}{\eta}\left[\alpha\tilde{D}^{\frac{1}{\alpha}}(1-\tau)\tau^{\frac{\mu}{\alpha}} y^{\frac{\alpha+\mu-1}{\alpha}} - (\delta + g_L + g_A)\right] \tag{4}$$

where $1/\eta$ is the intertemporal elasticity of substitution, δ the depreciation rate, g_L population growth, and g_A technical progress. According to (3) and (4), we see that there are two opposing effects of τ on MPK_P and the growth rate

g: a tax increase lowers the private capital return, which decreases investments but raises productive public services, which in turn supports private returns on capital. Thus, the resulting relationship is found to be hump-shaped, which is in accordance with Barro (1990). In the introduction it was suggested that the negative impact of capital taxes on growth (through the term 1-τ) dominates in the present set of countries but, again, this will be tested in the empirical estimations.

From (1) we obtain the first and from (4) the second estimation equation, according to:

$$\tau_i = \beta_0 + \beta_1 open_i + \beta_2 gov_i + \beta_3 Z_i' + \epsilon_{i\tau} \tag{5}$$

$$g_i = \gamma_0 + \gamma_1 \tau_i + \gamma_2 \; ln \; y_{i0} + \gamma_3 X_i' + \epsilon_{ig} \tag{6}$$

i is a country index while Z' and X' are vectors of control variables; ϵ_τ and ϵ_g denote the error terms. β_2 as well as γ_2 are expected to have a negative sign (a very conservative government represents a high value of gov). The signs of β_1 and γ_1 are ambiguous according to theory. β_1 hinges on the relative importance of the cost and the demand effect in (1); γ_1 depends on the countries' current tax rate compared with the growth-maximising tax rate. Equation (5) describes the impact of globalisation on the channel variable, which is the capital tax rate; equation (6) reflects the effect of the channel variable on economic growth. To supplement the picture in the empirical part below, we will add an additional channel in the openness-growth nexus through government spending.

According to (5) and (6), the endogenous variables of the system are the tax rate and the per capita growth rate. As right-hand variables we introduce openness captured by capital and current account restrictions as well as trade measures, the ideology of the government, financial depth, the log of initial income, initial human capital, the investment share, population growth and the country size.

3 Estimation Method and Data

3.1 Econometric issues

In cross-country studies on trade and growth, econometric problems such as simultaneity, parameter heterogeneity and missing variables have to be especially considered, see Temple (1999). Simultaneity arises because "countries whose incomes are high for reasons other than trade may trade more" (Frankel and Romer

1999, p. 379). These authors use geographical variables as instruments to correct for this bias. We will proceed similarly by introducing the average distance to trade partners and the land area as instruments.

A second econometric problem is the pervasive parameter heterogeneity, which especially arises from the use of large samples including very different countries. Problems of data quality and outliers are well known and can be addressed with appropriate sensitivity tests. But there are good reasons to believe that the mechanisms transmitting the impact of trade on growth vary when we compare different countries, notably LDCs and leading economies. Whereas for developing countries, the strengthening of market forces might be a main channel in the trade-growth nexus, this effect seems to be less important for industrialised countries. In addition, the growth effects of trade depend on comparative advantage, see Grossman and Helpman (1991), which varies strongly between very different countries. If theory is richer than is expressed in the current empirical studies, the problem of omitted variables is also a serious obstacle for good estimation results. By restricting our analysis to 12 highly developed economies with similar factor endowments and institutional background, using appropriate instruments and adopting a simultaneous estimation approach, we aim to reduce the econometric problems raised as far as possible.

3.2 Estimation procedure

In the present paper, the system consisting of equations (5) and (6) is estimated jointly using three-stage least squares. The procedure follows Tavares and Wacziarg (2001) and Wacziarg (2001). The advantage of this estimation method (e.g. compared to a dynamic GMM) is its ability to take care of the various cross-equation restrictions which appear to be highly important in the context of trade and growth. In the first step, for each of the two equations, a reduced-form coefficient matrix is estimated using OLS. In the second step, 2SLS is adopted to estimate the structural model. Finally, in the third step, the estimated covariance matrix from step 2 and the fitted values of the endogenous variables of step 1 are used for an IV-GLS estimation applied to the stacked structural model. By applying this estimation procedure, consistency is achieved by instrumentation while efficiency is reached by appropriate weighting when using the covariance matrix from the second stage. As in Tavares and Wacziarg (2001), we restrict all non-contemporary coefficients to zero.

By using a sufficient number of exogenous variables and instruments, we aim at reducing the scope for omitted variable bias. As instruments we use a variety of predetermined demographic and geographic variables. Specifically, we introduce in all equations the logarithm of population, the average distance to trade

partners, the land area, the age dependency ratio, the share of arable land, and life expectancy; distance to trade partners and land area are, as noticed, good instruments for openness.

3.3 The data

To measure capital mobility and openness we combine two types of information. We follow Dreher and Siemers (2005) by using binary data from the International Monetary Fund's annual report including (i) restrictions on payments for capital account transactions, (ii) separate exchange rate(s) for some or all capital transactions and/or some or all invisibles, (iii) surrender requirements for proceeds from exports and/or invisible transactions and (iv) restrictions for payments on current transactions, see also Gruben and McLeod (2001) and Bai and Wei (2001). While (i)-(iii) represent different forms of capital control, (iv) is included because current transactions can be used to circumvent restrictions on the capital account, see Milesi-Ferretti (1998). The subindex aggregating (i) - (iv) takes the value 4 for fully restricted capital accounts and 0 if no restrictions are in place. It needs to be supplemented for two reasons. First, capital markets were almost fully liberalised in Europe in the 1990s so that the variation becomes comparatively low in that period, although perceived capital mobility still changed (i.e. increased). Moreover, countries like the US, Canada and Germany have no variation in openness although it is conceivable that capital trade has been further liberalised. Second, qualitative measures can be rendered more precisely when adding information on quantitative trade flows. This holds true because policy indicators suffer from several drawbacks. A common variable used in empirical studies is the sum of imports and exports as a percentage of GDP, which we use as second subindex. We normalise both subindices by dividing the data values by the mean and the standard deviation of the series to give them equal weight. We then use the sum of the (negative) value of the first subindex and the second subindex for our capital openness index *open* so that a higher value of the index means a more open economy.

The effective tax burden of firms is determined not only by the statutory tax rate but also by the determination of the legal tax base, which differs due to complex national differences in tax credits, tax exemptions and tax deductions for identical operating surpluses. Capital tax revenue as a share of GDP was used by Garrett (1995), Quinn (1997) and Swank (1998). But since capital tax revenue as percent of GDP equals capital tax rates times the capital base divided by total income, the observed relationship is not necessarily incompatible with greater openness reducing the tax rate. If, at the same time, openness raises the capital/output ratio and, especially, if it does so by means of lower tax rates,

a positive impact of globalisation on tax revenue can be expected, according to theory. Therefore, effective tax rates are used for the estimations below. These rates are calculated by dividing total tax revenues from corporate taxation by the operating surplus of corporate enterprises, according to the methodology proposed in Mendoza, Razin and Tesar (1994). As effective capital tax rates incorporate taxes on immovable properties with a very inelastic tax base, corporate taxes are better suited for testing the theoretical predictions of the tax competition model. A large share of corporate capital belongs to multinational firms and is thus especially mobile. Qualitatively, the tax competition results in this paper is compatible with the outcome in Rodrik (1997) and Bretschger and Hettich (2002), where, however, annual data are used for single equation estimations, which does not allow the channel and the endogenous growth perspective taken here.

Table 1: Data

Used variables and sources

Variable	Description	Source
corptax	effective corporate tax rate	OECD (1998a,b), (2005)
open	index of capcontrol and opentrade	IMF, PWT 6.1
capcontrol	index of restrictions for capital mobility	IMF
opentrade	(exports+imports)/GDP	PWT 6.1
growth	real per capita GDP growth, const. prices, chain series	PWT 6.1
gov	center of political gravity: government, cabinet, and electorate	Cusack (1997), Cusack and Engelhardt (2002)
logincome	log of initial GDP per capita	PWT 6.1
human	initial years of average schooling	Barro/Lee (2000)
invest	average investment share	PWT 6.1
pop	population size	PWT 6.1
popgrowth	population growth	PWT 6.1
logpop	log of population	PWT 6.1
forinvest	foreign direct investment, net inflows (% of GDP)	WDI (2005)
dist	average distance to trading partners	Barro/Lee (1994)
liqliab	financial capital (M3/GDP)	WDI (2005)
agriland	share of land area that is arable	WDI (2005)
lifeexp	life expectancy at birth	WDI (2005)
agedep	ratio of dependents; people (<15 + >64)/others	WDI (2005)
area	land area	WDI (2005)
govspend	government final consumption expenditure (% of GDP)	WDI (2005)

Effective corporate tax rates are calculated with OECD tax data as the sum of tax revenues of corporate taxation plus tax revenues on companies' assets, both

taken from the revenue statistics (OECD 1998b), divided by net operating surplus of corporations, taken from the national accounts (OECD 1998a). Data for 1997-99 are calculated by using OECD (2005). The other data sources are described in table 1. PWT 6.1 refers to the Penn Word Table, see Heston, Summers and Aten (2002).

The sample covers the 12 OECD countries with adequate tax data (Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, Switzerland, UK and USA) and ranges from 1965 to 1999, divided into five year periods as follows: 1965-69, 1970-74, 1975-79, 1980-84, 1985-1989, 1990-94 and 1995-99. For some countries, tax data are not available from the beginning, so that the panel is unbalanced. The summarising description of the series is given in table 2.

Table 2: Description of variables

Variable	Obs.	Mean	Std.dev.	Min	Max
corptax	70	36.88	14.02	13.20	78.19
gov	84	9.28	1.06	7.14	11.09
open	84	1.12	1.39	–2.42	4.62
opentrade	83	57.84	30.15	10.11	141.73
capcontrol	77	0.87	1.09	0	4
liqliab	64	79.99	35.31	45.03	190.51
pop	84	54580	62533	3724	263073
popgrowth	83	0.005	0.004	-0.002	0.017
logpop	84	4.45	0.53	3.57	5.42
forinvest	66	1.46	2.32	0.009	15.975
invest	83	26.05	5.01	16.99	37.87
growth	83	2.43	1.61	-1.61	10.44
logincome	84	9.71	0.28	8.83	10.25
area	84	1830	3535	31	9976
dist	84	3.19	2.14	1.27	8.79
human	84	8.43	1.82	3.31	11.89
agriland	84	19.90	11.50	2.59	42.58
lifeexp	80	74.75	2.29	70.17	79.54
agedep	84	0.53	0.05	0.44	0.69
govspend	82	18.79	4.55	8.34	29.81

4 Empirical Evidence for OECD Countries

The two equations derived from theory are directly used for the simultaneous empirical estimation of the tax channel mechanism. The results are presented in several steps. In all cases we depart from the core model for the tax and the growth equations given by equations (5) and (6). The first equation gives the impact of trade on the channel variable *corptax*, which appears in the second equation as an explanatory variable of the growth rate of the economy. We will also discuss the importance of additional channels at the end of the section.

In table 3, several control variables are added to the trade-tax relationship. Additional control variables for the tax-growth relationship are introduced in table 4. This provides information about the robustness of the central trade-tax-growth nexus under various specifications. The role of different openness measures is presented in table 5. In table 6, the equations of table 3 are presented using SUR estimates to check the sensitivity regarding the estimation method. Finally, table 7 reports the results of simultaneously estimating three equations, introducing the additional channel of government spending.

In table 3, we see that the variable *open* is significant at the 5 % level in the first specification and at the 1 % level in all the others; it shows the predicted negative impact on the corporate tax rate throughout. The estimated parameter values vary relatively little between the different equations. The impact of the political variable *gov* is also highly significant, confirming that more right-wing governments and voters have strong preferences for lower capital taxes. Financial depth, represented by the ratio of M3 to GDP *liqliab*, exerts a positive and highly significant effect on corporate tax rates. Countries with a larger distance to trade partners *dist* tend to have a higher tax rate; the effect is not significant in (3), but it is in (4) where we use a dummy variable for all non-EU countries. Foreign direct investment as an alternative measure of openness is shown to have no impact on corporate taxes in (5). Regarding the determination of growth, the log of initial income *logincome* is highly significant and negative, as expected in this kind of regression. The variable for corporate taxation *corptax* is negative, provided that the tax effect dominates the public spending effect. Indeed, the estimated parameter values turn out to be negative and significant; moreover, they do not vary much between the different equations.

Table 4 extends the specification of the growth equation, leaving the four significant variables and the non-EU dummies in the tax regression equation as in (4). Still, in the tax equation the variable *open* behaves as predicted and is highly significant. Also, *gov*, *liqliab* and *dist* have the same effects as in the previous table. In the growth regression, the impact of *logincome* and *corptax* remains stable under the various specifications. The estimated parameter value for the

tax rate is a bit lower than in the first table. The impact of initial human capital *human* is significant in three specifications, while the investment rate *invest* is not significant for the sample of developed countries. In (7), population growth is added but it is not significant. However, the size of the economy *pop* has a positive and significant effect on growth as seen in specification (9). These results are not too surprising for a data set including the leading OECD countries, where the growth engines (partially) differ from less developed countries countries. Various sensitivity checks with subsets of data support these results but are not reported here.

Specification (9) can be seen as successful regarding the explanatory power. Calculating the elasticities related to the mean for the estimated parameter values, we obtain an elasticity of -0.12 for the impact of trade openness on the corporate tax rate and -0.42 for the effect of the corporate tax rate on growth. Although highly significant according to the estimations, this effect can be seen as not exorbitantly high in terms of the elasticities. It might be that, in the longer run, the quantitative effect is stronger, as investors need a certain time to adjust to an altered tax environment.

As the measurement of openness is an important issue in this kind of study, table 5 presents basic results for two alternative measures which are the components of the openness index *open*. In equations (10) and (11), the index of capital and current account restrictions is used in its original form, i.e. it takes the value 4 for fully restricted and 0 for fully liberalised. The positive impact of restrictions on tax rates is according to expectations. The following two equations concern the same specification using the measure for trade openness. The negative and significant impact provides further evidence for the dampening effect of openness on corporate taxes.

Table 6 presents the results of table 3 using the alternative estimation technique of seemingly unrelated regressions (SUR). Specifications (1') through (5') have the same structure as (1) to (5). When running the model without instrumenting for the endogenous variables, inconsistent estimates might be the result. Nevertheless, it is useful to see whether large differences in results are observed when adopting the SUR procedure. One can easily check that this is not the case here. The general quality of the regressions remain unchanged and the signs and the significance of the key variables remain the same. The impact of trade openness on the tax rate is of the same size, the effect of the tax on growth is also similar to 3SLS estimations but shows a higher significance. The same holds true for the SUR estimations of specifications in table 4, which are not reported here.

Table 7 introduces an additional channel for the impact of globalisation on growth. It has been argued in the literature that increasing openness fosters the quantity and/or the quality of government expenditures, which also might

affect growth. Corporate taxes and government final consumption expenditures are distinct because of government investment, non-capital taxation and public debt. The results of the simultaneous system including both the capital tax and the spending channel are presented in table 7. As becomes evident, the impact of openness on corporate taxes remains basically unchanged. The impact of openness on government spending is found to be positive, as suggested in the literature. The impact is robust when varying the specification and significant at the 1% level throughout. The growth equation provides a mixed picture. Corporate taxes still have a negative impact on growth; the significance is at the 10% level. However, government spending turns out to have no significant effect on growth, so that the second part of this channel effect is non-existent in our sample. This seems conceivable, as with regard to growth, quantity and quality of spending might work in different directions. We thus conclude that only the channel working through corporate taxes adds to the explanation of the globalisation-growth nexus in this country sample.

We finally aim at answering the question of what the importance of other possible channels is. To find out about the exhaustiveness of the tax channel we follow the procedure of Wacziarg (2001) and regress the system estimates of the growth regression on our variable of openness. When the residual effect of openness on growth is significant, additional channels are effective. Using specification (9) and the two estimation methods 3SLS and SUR, the impact of globalisation on the growth residual turns out to be positive but far from being significant; the z-value in both cases is 0.69. We thus conclude that for developed countries the tax channel is indeed of special importance for the openness-growth relationship.

Table 3: Estimation results I
Endogenous variables: corptax and growth; 3SLS (IV-GLS)
corptax specification

Variable	(1)	(2)	(3)	(4)	(5)
corptax				non-EU dum	
open	-2.175**	-4.568***	-4.306***	-3.906***	-4.452***
	(1.10)	(1.15)	(1.22)	(1.34)	(1.61)
gov	-4.135***	-8.171***	-8.353***	-5.650***	-4.235***
	(1.31)	(1.16)	(1.19)	(2.01)	(1.43)
liqliab		0.149***	0.133***	0.243***	
		(0.039)	(0.044)	(0.081)	
dist			0.522	13.90**	
			(0.70)	(6.81)	
forinvest					-0.911
					(7829)
constant	77.51***	105.0***	105.7***	42.97	81.37***
	(12.6)	(10.6)	(10.6)	(32.0)	(12.8)
growth					
logincome	-4.17***	-4.40***	-4.38***	-4.43***	-3.07***
	(0.60)	(0.67)	(0.67)	(0.67)	(0.88)
corptax	-0.0560***	-0.0317*	-0.0307*	-0.0392**	-0.0285*
	(0.018)	(0.016)	(0.016)	(0.016)	(0.017)
constant	45.0***	46.5***	46.3***	47.0***	33.2***
	(6.0)	(6.6)	(6.6)	(6.6)	(9.0)
observations	69	51	51	51	61
R^2 corptax	0.14	0.52	0.53	0.58	0.25
R^2 growth	0.34	0.48	0.48	0.48	0.18
χ^2 corptax	11.98	56.24	57.13	69.64	20.51
χ^2 growth	51.79	44.62	44.11	46.94	12.17

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Estimation results II
Endogenous variables: corptax and growth; 3SLS (IV-GLS)
growth specification

Variable	(6)	(7)	(8)	(9)
corptax				
open	-3.913***	-3.868***	-3.881***	-3.979***
	(1.34)	(1.34)	(1.34)	(1.34)
gov	-5.658***	-5.638***	-5.645***	-5.707***
	(2.01)	(2.01)	(2.01)	(2.01)
liqliab	0.242***	0.241***	0.242***	0.241***
	(0.081)	(0.081)	(0.081)	(0.081)
dist	13.94**	13.94**	13.95**	14.05**
	(6.81)	(6.81)	(6.81)	(6.81)
constant	42.96	42.82	42.84	43.21
	(32.0)	(32.0)	(32.0)	(32.0)
growth				
logincome	-5.90***	-5.82***	-6.21***	-5.81***
	(0.97)	(0.97)	(0.01.0)	(0.00.91)
corptax	-0.0288*	-0.0291*	-0.0326*	-0.0277*
	(0.017)	(0.016)	(0.019)	(0.016)
human	0.329**	0.357**	0.379**	0.251
	(0.17)	(0.17)	(0.17)	(0.16)
invest		0.0305		
		(0.039)		
popgrowth			-39.0	
			(51.1)	
pop (10e-5)				0.594***
				(0.23)
constant	58.1***	56.3***	61.0***	57.4***
	(8.2)	(8.5)	(8.8)	(7.8)
observations	51	51	51	51
R^2 corptax	0.58	0.58	0.58	0.58
R^2 growth	0.53	0.53	0.53	0.59
χ^2 corptax	69.73	69.46	69.59	70.88
χ^2 growth	59.65	61.15	60.09	74.12

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Estimation results III
Endogenous variables: corptax and growth; 3 SLS (IV-GLS);
openness measures

Variable	(10)	(11)	(12)	(13)
corptax				
capcontrol	2.258*	2.425*		
	(1.37)	(1.33)		
opentrade			-0.305***	-0.377***
			(0.062)	(0.082)
gov	-6.817***	-7.501***	-9.881***	-9.999***
	(1.24)	(1.27)	(1.24)	(1.22)
liqliab	0.150***	0.107**	0.128***	0.162***
	(0.043)	(0.047)	(0.037)	(0.043)
dist		1.425**		-1.219
		(0.71)		(0.83)
constant	86.19***	90.23***	132.7***	139.4***
	(11.1)	(11.1)	(13.1)	(13.7)
growth				
logincome	-4.40***	-4.40***	-4.41***	-4.41***
	(0.67)	(0.67)	(0.67)	(0.67)
corptax	-0.0363**	-0.0313*	-0.0309*	-0.0320*
	(0.016)	(0.016)	(0.017)	(0.017)
constant	46.7***	46.5***	46.5***	46.6***
	(6.6)	(6.6)	(6.6)	(6.6)
observations	51	51	51	51
R^2 corptax	0.41	0.45	0.57	0.58
R^2 corptax	0.48	0.48	0.48	0.48
χ^2 growth	36.20	41.57	67.07	71.78
χ^2 growth	45.67	44.56	44.88	44.75

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Estimations results IV
Endogenous variables: corptax, growth
Alternative estimation method SURE

Variable	(1')	(2')	(3')	(4')	(5')
corptax					
open	-2.343**	-4.546***	-4.303***	-3.922***	-4.538***
	(1.11)	(1.15)	(1.22)	(1.34)	(1.61)
gov	-4.006***	-8.181***	-8.355***	-5.664***	-4.216***
	(1.33)	(1.16)	(1.19)	(2.01)	(1.43)
liqliab		0.149***	0.134***	0.240***	
		(0.039)	(0.044)	(0.081)	
dist			0.493	13.98**	0.543
			(0.70)	(6.81)	(0.84)
forinvest					0.073
					(0.78)
constant	76.50***	105.1***	105.7***	42.98	80.93***
	(12.7)	(10.6)	(10.6)	(32.0)	(12.77)
growth					
logincome	-4.02***	-4.42***	-4.39***	-4.42***	-2.9***
	(0.60)	(0.67)	(0.67)	(0.67)	(0.8)
corptax	-0.0315***	-0.0344***	-0.0321**	-0.0327**	-0.0211*
	(0.011)	(0.013)	(0.013)	(0.013)	(0.011)
constant	42.6***	46.8***	46.4***	46.7***	31.7***
	(5.9)	(6.6)	(6.6)	(6.6)	(8.1)
observations	69	51	51	51	61
R^2	0.14	0.52	0.53	0.58	0.25
R^2	0.40	0.48	0.48	0.48	0.18
χ^2	11.62	56.26	57.14	69.78	20.65
χ^2	49.24	47.78	46.58	47.15	13.52

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Estimation results V
Endogenous variables: corptax, govspend, growth; 3SLS (IV-GLS)
Additional channel

Variable	(14)	(15)	(16)	(17)
corptax				
open	-3.976***	-3.971***	-3.976***	-3.971***
	(1.34)	(1.34)	(1.34)	(1.34)
gov	-5.739***	-5.742***	-5.744***	-5.703***
	(2.01)	(2.01)	(2.01)	(2.01)
liqliab	0.241***	0.239***	0.240***	0.242***
	(0.081)	(0.081)	(0.081)	(0.081)
dist	13.98**	13.92**	13.89**	14.08**
	(6.81)	(6.81)	(6.81)	(6.81)
constant	43.64	43.94	44.04	43.08
	(32.0)	(32.0)	(32.0)	(32.0)
govspend				
open	1.189***	1.282***	1.146***	1.357***
	(0.41)	(0.33)	(0.35)	(0.30)
gov	-1.874***	-1.259***	-1.156***	0.292
	(0.39)	(0.34)	(0.34)	(0.45)
liqliab		-0.0573***	-0.0499***	0.0113
		(0.011)	(0.013)	(0.018)
dist			-0.240	5.698***
			(0.20)	(1.53)
constant	35.84***	34.48***	34.01***	3.357
	(3.79)	(3.09)	(3.07)	(7.16)

cont. next page

Table 7: Estimation results V (cont.)
Endogenous variables: corptax, govspend, growth

growth				
ilevel	-5.76***	-5.67***	-5.73***	-5.78***
	(0.90)	(0.90)	(0.90)	(0.90)
corptax	-0.0292*	-0.0277*	-0.0269*	-0.0289*
	(0.016)	(0.016)	(0.016)	(0.015)
govspend	-0.0158	-0.0218	-0.0237	-0.0219
	(0.045)	(0.045)	(0.045)	(0.045)
human	0.251	0.245	0.257	0.255
	(0.16)	(0.16)	(0.16)	(0.16)
pop (10e-5)	0.524*	0.499*	0.504*	0.493*
	(0.27)	(0.27)	(0.27)	(0.27)
constant	57.3***	56.6***	57.1***	57.7***
	(7.6)	(7.6)	(7.7)	(7.6)
observations	51	51	51	51
R^2 corptax	0.58	0.58	0.58	0.58
R^2 govspend	0.46	0.65	0.65	0.81
R^2 growth	0.59	0.59	0.59	0.59
χ^2 corptax	71.01	70.65	70.63	70.86
χ^2 govspend	43.27	91.61	95.82	216.91
χ^2 growth	76.98	74.89	75.56	77.58

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5 Conclusions

According to our empirical results, trade fosters growth through its moderating impact on corporate taxes. The concurrence of two crucial attributes, mobility and accumulation capability of one single input factor - capital - drives the main result. The outcome is in line with earlier studies finding a positive relationship between an increasingly globalised environment and the development of a single country. The paper adds to our understanding by identifying one significant channel transmitting the impulses from trade to growth. Other channels have not become evident in the regression analysis of this paper.

Of course, the analysed impact on growth is only effective when trade volumes are increasing and/or trade restrictions are decreasing. That means the phenomenon vanishes in the (very) long run, assuming that international integration gradually continues and then comes to an end in the future. But this is not a special attribute of capital taxes; it corresponds to all potential mechanisms like

international knowledge transmission, competition and institutional effects.

A topic for further research would be the dynamic impact of skilled labour mobility, which is still quite low but will most probably increase in the time to come. It would also be interesting to know whether globalisation has similar effects on the behaviour of governments in areas where the government affects the levels (not the growth) of activities or income distribution. This could be analysed with a similar methodology as used here and is left for future research.

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