

The Political Economy of Capital Taxation: How Constraining Are Interest Rates?

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Abstract

Previous empirical studies have shown that left-wing governments are commonly expected to be associated with lower interest rates and higher tax rates on capital than their rightist counterparts. The importance of interest rates in shaping the variation in tax policies of OECD countries, where they have been dominated by leftist governments, offers an interesting topic for research. Using data for up to 20 OECD countries in the period of 1966-2000, this paper tries to investigate a hypothesis that challenges the partisan theories of economic growth. We argue that the strategic nature of tax competition is not the sole factor in determining a country's choice of taxation policy, and that other factors, notably interest rates, play an important role as well. We find that left-wing governments tend to lower capital taxes as a consequence of increased interest rates, which is consistent with the predictions of international tax competition theories, but in contrast to the partisan theories of economic growth presented in this paper.

Keywords: Tax Competition, Capital Taxation, Government Partisanship, Interest Rates, Spatial Models.

JEL classification: C21, H23, H87, E52, P16.

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1. Introduction

In this paper, we investigate the relationship between capital taxation and interest rates, exploring how (country-specific) interest rates affect a country's decisions regarding capital taxation. The importance of interest rates in shaping the variation in tax policies of OECD countries, where they have been dominated by leftist governments, offers an interesting topic for research. Although much of the recent literature in political science has explored the political economic determinants of capital taxation, such as the consequences of economic openness on a government's choice of taxation policy (Jensen 2012; Garrett and Mitchell 2001; Swank and Steinmo 2000; Swank 1998 and 2002), diffusion of capital tax policy across borders (Jensen and Lindstaedt 2012; Cao 2010; Franzese and Hays 2008) and the political and institutional constraints on capital taxation (Pluemper, Troeger and Winner 2009; Basinger and Hallerberg 2004; Hays 2003), the effect of monetary policy on capital taxation and, in particular, the impact of interest rates, have been widely neglected in the comparative political economy literature. We argue that the strategic nature of tax competition is not the sole factor in determining a country's choice of taxation policy, and that other factors, notably interest rates, play an important role as well.¹

This paper highlights the impact of government partisanship and interest rates on capital taxation. The relationship between taxes on capital and interest rates is puzzling. We argue that when analyzing tax policy, the effects of government partisanship on policy are contingent on interest rates. The starting point is the assumption that government partisanship affects capital tax policy. More specifically, the argument rests on the assumption that left-wing governments favour progressive capital taxation. Following Belke and Potrafke (2012), Fowler (2006) and, Quinn and Shapiro (1991), among others, we assume that the objectives of left-wing parties are best served by pursuing expansionary policies that stimulate employment and, at the same time, by pursuing redistribution on the revenue side through their increasing reliance on progressive capital taxes. In this context, left-wing governments tend to promote the interest of labour, while right-wing governments tend to promote the interest of capital owners. The countries more often led by leftist parties are also characterised by the lowest levels of interest rates and the highest level of capital taxation, and the opposite holds

1. According to recent tax competition literature, international capital mobility creates substantial pressures on governments to lower tax rates on mobile capital. The reason for this reduction is that the mobility of capital across jurisdictions induces capital flight from a high-tax jurisdiction to a low-tax jurisdiction. This seems to suggest that with a perfectly mobile capital basis, capital owners and investors will move their capital across national borders in search of higher returns and lower costs. In short, high taxes on capital reduce firms' and investors' net profits, thereby depressing investment, and consequently declining competitiveness.

for rightist parties. The intuitive reasoning is that high levels of interest rates are harmful to domestic employment, which, in turn, damages the left's core constituencies. How do interest rates affect the level of capital taxation?

The globalisation of the economy, such as increased international financial integration and international capital mobility, has made it increasingly difficult for governments to rely exclusively on taxes on mobile capital. The reason is that the threat of capital flight creates powerful incentives for governments to keep their capital tax rates close to those in other countries. This explains why governments, no matter what their political orientation, use their tax policy to compete for mobile capital. Moving to monetary policy, interest rates directly influence the rate of return on capital. This means, of course, a firm's profitability is mainly driven by interest rates.¹

As already mentioned, capital flows greatly depend on a country's capital tax rate. This is particularly important as the investment decisions of capital owners depend on both interest rates and capital tax rates. Because all of these factors, along with interest rates and capital taxation, induce rather different effects on firms' decision making (i.e. their profitability and cost structure), it is only sensible to expect that governments implement policies that encourage investors to invest their capital in the domestic economy (e.g. offering lower tax rates on capital) and offset the reverse impact of interest rates on investment. The reason for this is that an increase in the profitability of investment resulting from low tax rates on capital is likely to compensate for the greater cost of capital resulting from high interest rates. To be precise, a country lowering its tax rate attracts an inflow of capital, which at least in the short-run increases the tax base of the capital importing country on the one hand, and offsets some of the direct cost of interest rates to investors and business firms on the other. We would therefore expect the strategic nature of tax competition as well as interest rates to create strong incentives for policymakers to lower their tax rates on mobile capital to attract foreign capital and avoid capital outflows. Our final assumption is that governments have little autonomy in setting interest rate policy.

This paper is arranged as follows: In the next section, we present a theoretical framework. Section 3 describes the method of estimation. In section 4, we provide an overview of the data. The fifth section presents and discusses the empirical findings. Section 6 concludes.

¹ The general line of argument here is that higher levels of interest rates are associated with higher costs of borrowing, which in turn are associated with declining profits. More specifically, investors and firms will face declining profits when they pay higher interest rates on loans.

2. Theoretical framework

While the connection between interest rates and capital taxation provides an intuitive explanation for why they seem to be inversely related, this intuition needs to be validated theoretically. Furthermore, the empirical literature on international tax competition does not deliver clear predictions about the potential influence of interest rates on governments' tax policies, especially in countries with relatively open economies. To account for the effect of interest rates, we rely on a small theoretical model of tax competition, outlined in section 2.1. In section 2.2, we describe the specific application of the model to government partisanship and discuss ideology in capital tax policy.

2.1. The model

Going back to the initial theoretical claims that motivated this study, it is necessary to mention that the provision of welfare state benefits represents an important way in which left-wing governments may influence tax policy. In what follows, we construct a simple model of tax competition along the lines of that developed by Wilson (1999). The model allows us to vary the following parameters: the mobility of capital given the interest rates; the relationship between capital taxation and interest rates. While the theory of international tax competition suggests countries spatially depend on each other in their tax policy choices, some authors contend that under conditions of capital mobility, there is no race to the bottom in capital taxation and countries compete, to some extent, for a common capital tax base (Pluemper, Troeger and Winner 2009; Basinger and Hallerberg 2004; Hays 2003 and Quinn 1997). In this context, a number of studies of the tax policies of OECD countries suggest that the outcome of tax competition tends to cause capital tax reductions leading to improved international price competitiveness (Swank, 1998), but it also produces "revenue winners and losers" among competitor countries (for example see Hays (2003 and 2009)).¹

As mentioned above, theories of tax competition argue that when capital is internationally mobile, it will move to markets that provide the highest returns and, *ceteris paribus*, the lowest tax rates on capital. In an open economy, reductions in capital tax rates induce negative fiscal externalities in other economies (Wildasin 1989). The implication of our model is that left-wing governments will not necessarily be associated with higher levels of capital taxation. As we have argued above, the effect of government partisanship is contingent on the level of interest rates. For the reasons presented, we anticipate left-wing governments to be associated with

1. Hays (2003) argues that average effective tax rates on capital converge to a mean tax rate rather than zero indicating that there is not any race to the bottom in capital taxation.

declining capital taxation only when the level of interest rates is high. It is reasonable to assume that if left-wing governments favor middle class incomes over investors, they will do so by pursuing redistribution through a combination of welfare state and tax policies.

To begin with, let us present a simple approach to formalise the basic idea. The model described in the following is based on Zodrow and Mieszkovsky (1986), Wilson (1986), Bretschger and Hettich (2002). The key change in the model is a modification to the way in which capital is a decreasing function of interest rates. Consider a static model of n identical countries consisting of a government, many identical households or representative consumers and a large number of identical firms with production function¹

$$Y = F(K) \quad (1)$$

The domestic residents also own all of the domestic capital stock (fixed endowments of capital). Free to leave the national market, capital owners (residents) are free to invest their capital wherever they want. Once production (investment) has taken place, the output is sold to the domestic households (residents) as a “final consumption good” and to the domestic government as an “intermediate good”, which it then transforms into a public good (See Wilson (1999)). The problem confronting a policymaker is to choose an optimal tax rate on capital, τ , to maximise the utility of the representative household, $U(C, G)$ which depends positively on private consumption, (C), and the domestic public good, (G).

Suppose that the government raises taxes on capital and spends the resulting revenue on public good provision. In this case, capital is the only factor of production in the economy that can be taxed. Inspired by Bretschger and Hettich (2002), the provision of public good and the tax rate on capital are determined in an efficient manner by the government so as to maximise the utility of a representative resident, $U(C, G)$. This maximization problem is subject to the budget constraint

$$G = \tau K(r) \quad (2)$$

where G is the supply of the public good, τ is a source-based unit tax on capital and is proportional to G , and $K(r)$ is the region's total capital stock. Notice that $K(r)$ is a decreasing function of r , the interest rate. Each country contains a perfectly competitive industry, which is composed of a large number of identical firms producing a single homogenous output good

1. where Y is output and K is capital. For convenience, we do not assume that output is given by the aggregate production function $Y=F(K, EL)$. It is clear that if we exclude the level of labour supply from the model, then it does not allow for computing the steady-state capital to effective labour ratio. In this model, F is continuously differentiable and is strictly increasing in capital but subject to diminishing marginal productivity: $F'(K) > 0$ and $F''(K) < 0$.

using capital. The government would implement the social optimum, if it optimally sets the proportional capital tax rate τ at the level at which

$$MB^{optimum} = MC^{optimum} \quad (3)$$

where the marginal benefit of G or the sum of the marginal benefits of additional unit of G for the households is $MB^{optimum}$ and $MC^{optimum}$ is the marginal resource cost of an additional unit of G . If we totally differentiate the budget constraint with respect to τ and $K(r)$ respectively, then we obtain the components of marginal cost

$$dG = \underbrace{d\tau \cdot K(r) + \tau \cdot dK(r)}_{\text{Marginal costs}} \quad (4)$$

where dG refers to the social marginal benefit. Consider now the two terms on the right hand side of the equation. The first one represents the marginal cost of capital taxation: the government raises the tax revenue from capital taxation to finance an additional unit of public good supply, dG . In other words, a balanced budget requires that τ (tax rate on capital) be raised by $d\tau$. Then, $d\tau \cdot K(r)$ is defined as the marginal cost of taxation for capital holders (the residents), $MC^{residents}$. The second term, $\tau \cdot dK(r)$, is the marginal cost of higher taxes resulting in capital outflow, $MC^{capital\ outflow}$.

We first focus on the case of a closed economy, where $dK(r)$ disappears from the model. This condition means that no capital flow takes place, $dK(r) = 0$, and the equation reduces to

$$dG = d\tau \cdot K(r) \quad (5)$$

Thus for the closed economy, the outcome is efficient, in the sense that public goods are provided according to the Samuelson rule in the following efficiency condition

$$MB^{optimum} = MC^{residents} \quad (6)$$

It is easily shown that the social optimum in this economy, with $G = G^{optimum}$, is to set $\tau = \tau^{optimum}$. We call this equilibrium the “first best.” To see why the first best is achievable, first assume that the interest rate is constant. For a given domestic capital stock, an increase in the domestic public good provision increases the marginal cost of taxation for the residents. Again, the expression in (6) allows for assumptions, the closed economy and the constant interest rate. In this case, the government does not have any incentive to spend or to tax in excess of the optimum rate. Now consider the case in which the interest rate is allowed to vary, but there is no arbitrage between domestic and foreign financial markets. As already mentioned, capital is a decreasing function of interest rate. A higher value of the domestic interest rate means that borrowing from domestic sources

becomes costly resulting in less investment. If this is the case, a relatively high domestic interest rate would then produce a large drop in tax revenues due to the depreciation of capital. The reason is that at the social optimum level the government does not overtax, $\tau > \tau^{optimum}$, in order to finance the provision of public goods. The equilibrium outcome of tax rates on capital in the closed economy depends only on the relative size of the tax bases. The government is more likely to lower tax rates on capital to encourage investment and to extract revenues from an alternative source. Thus, the government is expected to offer lower tax rates on capital when the domestic interest rate rises.

Consider now an open economy with perfect, or partial, capital mobility where $dK(r)$ is not equal to zero, $dK(r) \neq 0$. Clearly, if $dK(r) > 0$ ($dK(r) < 0$), this is the capital inflow (outflow) that the government experiences. In this case, the government has no incentive to raise the public good supply, G , in accordance with the Samuelson rule obtained above, $MB^{optimum} = MC^{residents}$, given the costs of higher taxes on capital associated with the resulting capital outflow to other economies. This means that the tax base effect, $\tau \cdot dK(r)$, creates fiscal externalities due to international differences in tax rates on mobile capital. Thus, for the open economy, the modified Samuelson rule for efficient public good provision is determined as follows:

$$MC^{optimum} = MC^{residents} + MC^{capital\ outflow} \quad (7)$$

where $MC^{residents}$ is $d\tau \cdot K(r)$ and $MC^{capital\ outflow}$ is $\tau \cdot dK(r)$. When capital is internationally mobile, the government sets the tax rate on capital and the supply of public goods at inefficiently low levels, with $G < G^{optimum}$ and $\tau < \tau^{optimum}$, in order to encourage (discourage) capital inflow (outflow). Because the tax rate, τ , and the provision of the public good, G , are lower in the open economy relative to the closed economy, the economy reaches a second-best, not a first-best, allocation. Obviously international differences in tax rates are certainly not the only determinants of capital location. As argued earlier, the variation in the short-term interest rate directly affects the cost of capital to investors, implying that a rise in interest rates will lead to a reduction in investment. Hence we expect governments to compensate for the greater cost of capital resulting from high interest rates by reducing their tax rate on mobile capital. This leads to our first testable hypothesis.

Hypothesis 1: Higher interest rates lead to lower taxes on capital.

Test of hypothesis 1: Interest Rates should have a negative coefficient.

2.2. Ideology in capital tax policy

In this section, we demonstrate that a full understanding of the links between monetary policy (interest rates) and fiscal policy (capital taxation) is impossible without a closer look at government partisanship. There is a great deal of literature which suggests that the partisan composition of governments matters to taxation outcomes. To understand our argument, it is helpful to focus on two models of economic growth—a consumption-driven model (neo-Keynesian) and an investment-driven model (neo-classical) - with the aim of exploring the dynamic between partisanship and macroeconomic policies in OECD countries. In summary, proponents of the consumption-driven model seek to increase capital tax rates and to reduce interest rates, while proponents of the investment-driven model seek to reduce capital tax rates and to increase interest rates.¹

To begin with, consider two governing parties, the left and the right, with their particular policy preferences and economic outcomes. Left-wing governments are more likely to appeal to the labour base, whereas rightist governments are more likely to appeal to capital owners (see, for example, Belke and Potrafke 2012). There is the expectation that left-wing governments will be associated with more expansionary policies that stimulate employment than their rightist counterparts. Rightist governments, in contrast to leftist governments are more likely to pursue restrictive and less inflationary policies (see, for example, Fowler 2006). It is quite sensible to expect that left-wing governments are typically associated with lower interest rates than their rightist counterparts. The intuitive reasoning is that high interest rates would depress investment and promote unemployment, which would be detrimental to the left's core constituencies (Alexiadou 2012; Alesina et al. 1997; Quinn and Shapiro 1991). If this is the case, under what conditions are left-wing governments more likely to adopt the reverse of those policies? It is really impossible to answer this question without a closer look at the links between government partisanship and economic growth strategies.

In theory, left-wing governments are commonly expected to be associated with lower interest rates and higher tax rates on capital (neo-Keynesian). Right-wing governments would follow the reverse policies (neo-Classical): higher interest rates and lower tax rates on capital (see, for example, Garrett 1995).² In reality, although governing parties do not share the same policy preferences, parties on the left are expected to implement tax policies that are more favourable towards business under certain economic conditions. This is, of course, inconsistent with their partisan view of growth strategies.

1. For an excellent defence of this argument, see Quinn and Shapiro (1991).

2. Right-wing policymakers have an incentive to promote income levels in order to stimulate expenditure on investment and consumption through tax cuts on mobile capital.

Our argument contends that in an open economy where capital is internationally mobile, left-wing governments are not able to pursue their partisan-preferred policies: higher capital tax rates and lower interest rates. This can be also seen clearly in interest rate policies that run counter to fiscal policy. Thus, the effect should be more pronounced when interest rates are relatively high. The only possible course of action available to left-wing governments would be to cut taxes on capital to offset the negative effects of interest rates. We therefore expect high levels of interest rates to inhibit the positive relationship between left governments and capital taxation. Hence we test the following hypothesis:

Hypothesis 2: *Left-wing governments choose to implement tax cuts when interest rates increase.*

*Test of hypothesis 2: The interaction term (Interest rates*Left government) should have a negative sign.*

3. Empirical model

In this section we test our hypotheses empirically using data from twenty OECD countries between 1966 and 2000. We account for the strategic nature of capital tax competition, which is essential for performing an accurate assessment of the determinants of capital tax rates, in a spatial panel-data model. In our model, monetary constraints determine a country's response to international tax competition. We employ Franzese and Hays (2008) proposed method for estimating, the Spatio-Temporal Autoregressive (STAR) model, which can be written in the following form:¹

$$\tau_t = \varphi\tau_{t-1} + X_t\beta + \rho W\tau_t + \varepsilon_t$$

Where τ_t , the dependent variable, denotes average effective tax rates on capital, and is an $NT \times I$ vector of observations stacked by unit over time. We also included the Time-lagged dependent variable τ_{t-1} to capture persistence in capital tax rates over time.² $W\tau_t$ is the spatial lag, where ρ is the spatial autoregressive coefficient that gives the impact of the spatial lag on τ_t and W , the connectivity matrix, is an $NT \times NT$ block-diagonal spatial weighting matrix. We use a standardised binary contiguity-weights matrix³, which codes $W_{ij}=(1, 0)$ for whether units i and j border,⁴ because the row-standardised matrix gives the average of capital taxes in neighbouring countries. β is a $K \times I$ vector of coefficients on X containing NT observations

1. Spatio-Temporal Autoregressive (STAR) regress the dependent variable τ_t on the spatially lagged dependent variable $W\tau_t$ - that is, on the weighted values of the same dependent variable in all other units (Pluempner and Neumayer 2010).

2. The lagged dependent variable can capture common trends in tax policy and accounts for temporal dynamics.

3. Franzese, Hays and Schaeffer (2010).

4. $W_{ij}= 0$ denotes i and j states did not share a border. $W_{ij}= 1$ denotes i and j states shared a border.

on K independent variables. ε , the residual vector, is an $NT \times I$ vector of stochastic components.

To account for heterogeneity and fixed units, we include year and country dummies in the regressions.¹ As noted above, X denotes the vector of the independent variables of interest, i.e., interest rates and government partisanship. We estimate the presented model using the Franzese and Hays (2007) modelling strategy to deal with simultaneous biases. In the case where $W\tau$ is endogenous, Spatial Ordinary Least Squares (S-OLS) will suffer biases simultaneously. Their analytic and experimental explorations suggest that the Spatial Maximum Likelihood estimator is a good strategy for obtaining consistent estimates of ρ and β in the model, including the interdependence pattern.

We use Hays' (2003 and 2009) model of spatial dependence in international capital tax competition for replication purposes. There are two main reasons for this. First, in his landmark analysis of capital taxation, Hays convincingly argues that applying the Spatial-maximum likelihood estimator and using contemporaneous binary contiguity spatial lag provide strong evidence of within-period, and positive, spatial interdependence in capital tax rates.² Secondly, the inclusion of the main variables of interest allows us to assess the effects of government partisanship and interest rates on the strategic interdependence that exists between the governments' choice of taxation policies.³

4. Data

To test more systematically how interest rates in advanced industrial democracies matter for capital taxation outcomes, we examine a sample of twenty Organization for Economic Cooperation and Development (OECD) countries over the 1966-2000 period using country-year observations ($N=412$). The OECD panel includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States. The panel is unbalanced where the length of the time series varies slightly across countries.⁴ Table 1 presents the

1. The inclusion of the period fixed effects can capture common trends and control for common shocks (Pluemper, Troeger and Manow 2005).

2. Franzese and Hays (2008) replicate and extend the non-spatial analysis of international tax competition from Swank and Steinmo (2002), estimating by S-ML the spatial-temporal lag model and taking strategic tax policy interdependence across units into account.

3. The main implication of Hays' (2003) argument is that increased international capital mobility limits the ability of governments to tax capital. In the model of international tax competition the capital mobility measures interacted with several political economy variables such as Capital endowment, Consensus democracy, Union density, Left government and European Union membership.

4. This is due to the fact that not all countries have data for all the years.

definitions, summary statistics and sources for all the variables used in this paper's analysis.

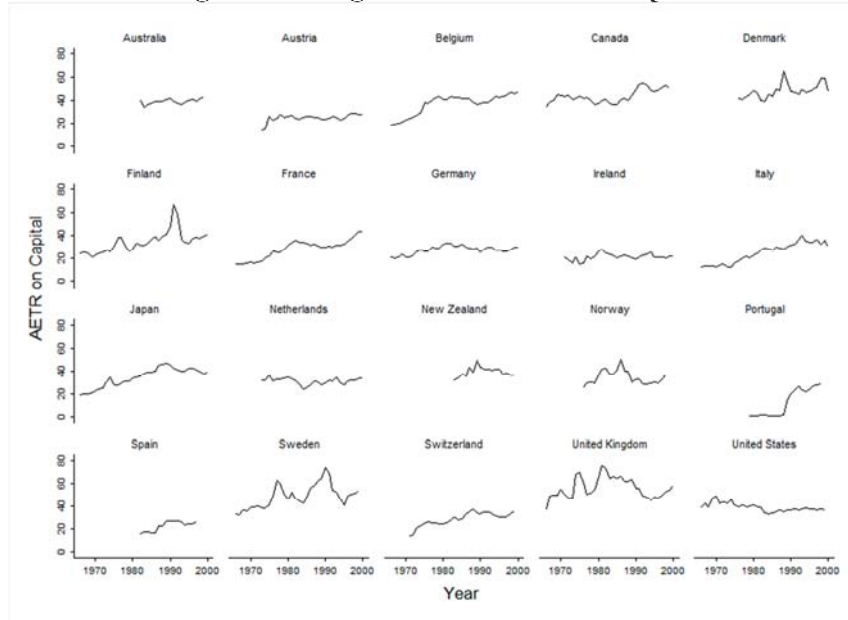
Table 1. Data sources and descriptive statistics.

Variable	Description	Mean	Std. Dev.	Min	Max	Source
AETR	Average effective tax rates on capital	34.44	12.34	1	75.5	Mendoza, Razin, and Tesar (1994).
Interest Rates	Nominal interest rates minus inflation	3.82	2.70	-5.97	11.26	IMF.
Left government (D)	Percentage of cabinet seats held by leftist parties.	0.24	0.43	0	1	Duane Swank (2002).

We employ average effective tax rates (AETR) on capital as our dependent variable. "Average effective tax rates (AETR), which are defined as the actual revenue of taxes on factor income and consumption related to the relevant tax base" are widely used in most of the empirical research on tax competition (Winner 2005:671).¹ We replicate the work of Hays (2009), employing average effective tax rates on capital according to Mendoza, Razin, and Tesar (1994) and the extensions in Volkerink and Haan (2001) for direct comparing of our empirical results with past studies of tax competition. Figure 1 illustrates average effective tax rates on capital for the countries included in the sample.

Average effective tax rates on capital have been high in countries such as Australia (36.64), Belgium (42.86), Canada (42.65), Japan (34.62), the United Kingdom (43.52) and the United States (40.39) and low in countries such as Austria (16.03), Finland (14.21), Ireland (14.57), Italy (16.92), Portugal (14.23) and Spain (17.88). Average effective tax rates on capital were generally low at the beginning of the 1970s (average effective tax rates on capital had a mean value of 24.31), and they increased till the mid 1990s. At the end of our observation period, in 2000, average effective tax rates on capital had a mean value of 35.02. Table 2 presents descriptive statistics for average effective tax rates on capital.

1. Garrett 1998; Gelleny and McCoy 2001; Garrett and Mitchell 2001; Hays 2003; Basinger and Hallerberg 2004; Bretschger and Hettich 2002; Swank and Steinmo 2002; Winner 2005; Ganghof 2007; Franzese and Hays 2008; Pluemper, Troeger and Winner 2009; Pluemper and Numayer 2010; Jensen 2011.

Figure 1. Average effective tax rates on capital**Table 2. Descriptive Statistics, Average Effective Tax Rates on Capital**

Country	Mean	St.Dev.	N
Australia	39.43	2.31	18
Austria	25.22	3.38	28
Belgium	37.21	8.82	35
Canada	44.11	5.58	34
Denmark	48.81	6.21	25
Finland	34.51	9.66	35
France	28.23	8.31	35
Germany	27.35	3.58	35
Ireland	21.41	2.81	30
Italy	24.82	8.78	35
Japan	34.72	8.29	35
Netherlands	31.3	2.83	28
New Zealand	39.45	4.19	17
Norway	34.56	5.97	23
Portugal	12.42	11.98	20
Spain	22.3	4.37	16
Sweden	48.5	10.38	34
Switzerland	28.34	5.85	29
United Kingdom	55.94	8.97	35
United States	38.73	3.7	34

The OECD interest rates data are available only in terms of individual interest rates and not in any other form, such as covered and uncovered interest rates taking into account changes in exchange rates as well as changes in monetary regimes. For the purposes of our empirical analysis, we measure the nominal short-term interest rate adjusted for inflation for all 20 countries in our sample. The measure is calculated in the following way:

$$r_k = (i - \pi)$$

where r_k is the interest rate measure, i is the nominal interest rate and π is the growth of the consumer price index. The great advantage of using inflation in the measure of interest rates is that it allows us to take into consideration the positive effects of inflation on the cost of capital to business firms. The data is available from the International Financial Statistics (IFS) from the IMF. *Left government* is a dummy variable which takes the value of 1 for a gain of 50 per cent of cabinet seats by the leftist party, and 0 otherwise.

Table 3. Interest Rates and Left Government

country	Interest rates (average 1966–2000)	Left government (average 1966–2000)
Australia	5.594682	0.7222222
Austria	3.270147	0.5357143
Belgium	3.115601	0
Canada	3.24137	0
Denmark	4.638039	0.56
Finland	4.919224	0.0285714
France	2.666819	0.2285714
Germany	2.998196	0.3714286
Ireland	5.432237	0
Italy	4.154608	0
Japan	.	0
Netherlands	3.742679	0
New Zealand	6.542248	0.3529412
Norway	5.048361	0.7391304
Portugal	4.535621	0.15
Spain	5.677061	0.8125
Sweden	4.71679	0.7352941
Switzerland	1.381759	0
United Kingdom	4.442856	0.3714286
United States	2.261992	0

Table 3 provides an illustration of the values for Interest rates and Left government. The columns reflect the average values for the period 1966 to 2000 for all countries included in our sample. This table makes clear the extensive cross-national variation in terms of *interest rates* and *Left government*. As Table 3 demonstrated, *Left government* were significant in this period. While countries like Australia, Denmark, Finland, Ireland, Italy, New Zealand, Norway, Portugal, Spain, Sweden and the United Kingdom had high levels of interest rates, those displayed by countries such as Austria, Belgium, Canada, France, Germany, the Netherlands, Switzerland and the United States were relatively low. More importantly, Table 3 also makes clear that *interest rates* and *left government* are quite distinct and not always correlated with each other.

5. Findings

In this section, we empirically assess the impact of government partisanship and interest rate changes on capital taxation in OECD countries. The estimation results for capital taxes are reported in Table 4. The sample includes 20 OECD countries and spans from 1966 to 2000. We replicate the work of Hays (2009), using a Spatio-Temporal Autoregressive (STAR) model. As explained above, our dependent variable is *AETR* on capital. We present the estimates of temporal and spatial lags for the dependent variable in the first two rows of Table 4. Then we report the estimates for the rest of the independent variables. The reported empirical results (all regressions in Table 4) support our hypotheses derived from our theoretical model that a country's capital tax rate and interest rates are inversely related.

In Model 1, *AETR* is regressed on *interest rates* and *left government* as well as *the temporal lag* and *the spatial lag*. Model 1 tests for unconditional effects of *interest rates* and *left government*, thus it excludes the interaction term. As can be seen, the coefficient on *interest rate* bears a negative sign and is statistically significant at the level of 90 per cent. This result is in agreement with our theoretical prediction: higher interest rates lead to lower taxes on capital. The optimal response for fiscal policymakers is to reduce the rate of capital taxation in an attempt to offset some of the negative consequences of interest rates. The impact of *left government* on *AETR* is significantly positive, as expected. *Ceteris paribus*, left-wing governments have strong incentives to pursue redistribution through progressive forms of taxation, most notably by increasing their reliance on capital taxation.

Table 4. Maximum Likelihood estimates for Spatial Models of Effective Capital Tax Rates

Dependent variable	Model 1	Model 2	Model 3	Model 4
Temporal lag	0.802 (0.028)***	0.799 (0.028)***	0.793 (0.028)***	0.803 (0.028)***
Spatial lag	0.030 (0.007)***	0.035 (0.010)***	0.017 (0.002)***	0.022 (0.012)*
Interest rates	-0.160 (0.095)*	-0.111 (0.102)	-0.101 (0.101)	-0.130 (0.101)
Left government	1.079 (0.498)**	1.979 (0.826)**	2.066 (0.823)**	1.906 (0.824)**
Interest rates*Left government		-0.214 (0.157)	-0.233 (0.156)	-0.182 (0.156)
Unit fixed effects	Yes	Yes	Yes	Yes
Period fixed effects	Yes	Yes	Yes	Yes
W row-standardised	Yes	Yes	No	Yes
Weight	Contiguity	Contiguity	Contiguity	1/ln(distance)
N	412	412	412	412

Notes: Numbers in bold are estimated coefficients; Parentheses contain standard errors. *** statistically significant at 0.01, ** statistically significant at 0.05, * statistically significant at 0.1.

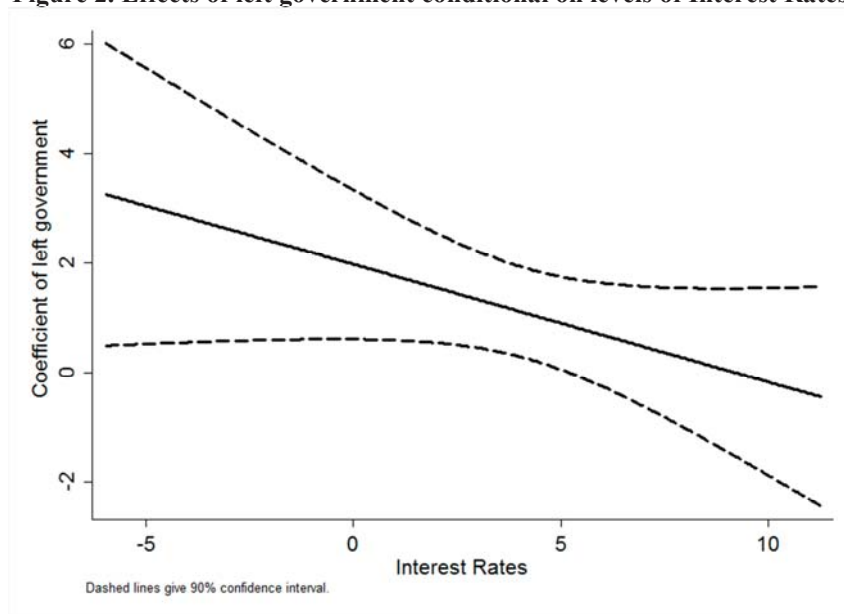
The coefficient on the temporal lag, which is a one-period lag of the dependent variable *AETR on capital*, is large and statistically significant. The positive and significant coefficient on the temporal lag (0.802) reflects the fact that the average effective tax rate on capital has a tendency to persist. According to the theory of international tax competition, countries spatially depend on each other in their tax policy choices. Thus, we would expect the coefficient of the spatial lag variable of AETR on capital to be positive. Consistent with our theoretical expectations, the positive and significant coefficient on the spatial lag (at the 99 per cent confidence level) implies the existence of spatial interdependencies in capital tax policy in OECD countries.

Model 2 tests the second hypothesis that the impact of government partisanship on capital tax rates is conditional on the level of interest rates. The relationship between *left government* and *Interest rate* is captured by these variables themselves, (for which the theory suggests positive and negative coefficients for left government and interest rates, respectively) and by their interaction, *Interest rates*Left government* (with an expected negative coefficient). The marginal effects of left government have to be interpreted conditionally on the interaction with the *interest rates* variable. To test our second hypothesis we employ a two-way interaction model, where the marginal effect of a one-unit change in the *left government* variable on *ATER* is conditional on the level of *interest rates*. Hypothesis 2

suggests that left-wing governments choose to implement tax cuts when interest rates increase. The results confirm our theoretical predictions. Testing the second hypothesis requires assessing the effects of *left government* at different levels of *interest rates*. As discussed in the previous sections, we expect *left government* to be associated with high capital taxation when *interest rate* is low and to reduce the rate of capital taxation as a way to offset the direct costs of interest rates on businesses' profitability only in a context dominated by high interest rates.

We can use the results in Model 2 to calculate the conditional effects of *left government* given different levels of *interest rates*. In Table 1 (containing the summary statistics for all the variables in our analysis), we showed that the variable of *interest rates* ranges from -5.97 to 11.26 in the countries in our sample. To illustrate the relationship between these two variables, we can calculate the effects of *left government* for four different values of *interest rates*: -5, 0, 5 and 10. Figure 2 presents the coefficients and the upper and lower bounds of 90 per cent confidence intervals for the effects of *left government* conditional on these different levels of *Interest Rates, ceteris paribus*.

Figure 2 presents a good amount of support for our claims. The figure makes clear that left-wing governments rely most heavily on capital taxation when interest rates are low. The coefficient for *left government* is positive and significant (as indicated by the fact that the bounds of the 90 percent confidence intervals are both above zero) when the variable of *interest rates* is between -5 and almost 5. Also as hypothesized, the results in Figure 2 indicate that when *interest rates* increase, left-wing governments choose to implement tax cuts. The coefficient becomes negative but the bounds of 90 percent confidence intervals indicate that the relationship is no longer statistically significant. We believe that one reason for this is that, left-wing governments, when interest rates are high, end up reducing tax rates on capital more than we would expect.

Figure 2. Effects of left government conditional on levels of Interest Rates.

In an open economy where capital can move across countries, left-wing governments are not able to pursue their partisan-preferred policies: higher capital tax rates and lower interest rates (neo-Keynesian). This can be also seen very clearly in interest rate policies that run counter to fiscal policy, thus high interest rates appear to limit the policy choices of left-wing governments regarding capital tax policies. Consistent with our theoretical expectations, *Left government* will be associated with declining capital taxation in order to avoid capital outflows and reduce the cost of investment for investors when interest rates increase.

Finally, we show analytically that small changes to the model specification could have different effects on the spatial effect estimates. To address this issue, Pluempfer and Neumayer (2010) demonstrate the consequences of modification of the model specification on the estimation results for the spatial effect. We take a similar approach in the analysis of spatial dependence.¹ In Model 2, the degree of spatial dependence is 0.035, indicating that lower tax rates in contiguous countries reduce the domestic tax rate on capital (vice versa for higher capital tax rates). Such a result supports the theory of international tax competition. Now, we discuss whether the specification of the weighting matrix should be row-standardized. To illustrate the effect of row standardisation on the results, we present Model 3 without row standardization and compare it with Model 2.

1. For this purpose, we have replicated the work of Pluempfer and Neumayer (2010).

To do so, the weighting matrix is row standardized by dividing each cell in a row by that row's sum so that the weights in each row of the matrix should add up to one (see Franzese and Hays 2009). By row standardizing the spatial weights matrices, it allows us to check on the spatio-temporal stationarity: it requires $\varphi + \rho < 1$ or the sum of the coefficients size of the temporal and spatial lags should be less than one (Franzese and Hays 2008). One advantage of this method is that row standardization makes the spatial lag have the same units or metric as the dependent variable itself (Ward and Gleditsch 2008:80).

In Model 3, the spatial lag is still positive and the value of spatial dependence is 0.017, which is slightly lower than the degree of spatial dependence in Model 2, which was 0.035. The positive spatial lag demonstrates that spatial dependence exists. Pluempfer and Neumayer (2010) argue that, by changing the relative weight of units from being row standardized to not row standardized, all contiguous countries exert the same influence no matter how many neighbours each country has. In summary, they assert that row standardization is not substantively neutral on model specification in the analysis of spatial dependence. Clearly, there is strong evidence to believe that typically, capital tax rates in one country are affected by capital tax policies in others.

There are two basic types of spatial weights matrices: contiguity-based and distance-based: A binary contiguity matrix based on shared borders or units that are closer than a certain specified threshold with values of one for contiguous units and zero otherwise, and a contiguous or geographical distance measure for a spatial relationship based on the distance between two units (Beck, Gleditsch and Beardsley 2006). In Model 4, geographical distance as the measure of connectivity between two countries is used instead of a contiguity measure for the weighting matrix. We expect that the spatial dependence from neighbouring countries should be stronger than the dependence from geographical distance. Pluempfer and Neumayer (2010) use $1/\ln d = (\ln d)^{-1}$ in the weighting matrix, which gives more distant units a relatively higher weight, where d is distance in kilometres between countries. The coefficient of the spatial lag is positive and statistically significant. The positive coefficient on the spatial lag may actually suggest, interestingly, that lower taxes in other countries with respect to geographical distance, particularly more proximate or neighbouring countries, reduce the domestic capital tax rate. Thus, the positive estimated coefficient of the spatial effect variable may support early models of tax competition predicting a race to the bottom in capital taxation.

6. Concluding remarks

The primary objective of this study is to determine whether interest rates and capital tax rates are inversely related, and if so, under what conditions the impact is greatest. This paper explains how international tax competition is not the sole factor determining a government's choice of taxation policy. An analysis of the role that interest rates play in the politics of capital taxation is, however, missing. The relevance of monetary policy has been widely neglected in the comparative political economy literature -but interest rates matter for capital taxation, as our theoretical and empirical models have shown. To illustrate the theoretical foundation of the relationship between interest rates and capital taxation, we rely on a small theoretical model of international tax competition. Our empirical results confirm the theoretical predictions of a negative effect of interest rates on capital taxation. Our argument is straightforward: we propose that in a world of capital mobility, governments attempt to improve international competitiveness by neutralizing the impact of interest rates on firms' profitability and domestic investors, through capital tax reductions.

To address the relationship between interest rates and capital taxation, we argue that a distinction should be drawn between monetary constraints (represented by interest rates) and political agency (represented by government partisanship). We find that left-wing governments tend to lower capital taxes as a consequence of increased interest rates, which is consistent with the predictions of international tax competition theories, but in contrast to the partisan theories of economic growth presented in this paper.

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