# FISCAL INTERACTIONS AMONG EUROPEAN COUNTRIES: DOES THE EU MATTER?

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**Abstract:**
We use a panel of European countries to investigate whether or not governments interact with their neighbours when they decide their fiscal policy; we consider both taxes and expenditures, at aggregate and as separate aspects of policy. We analyse possible different competitive behaviours and find evidence of fiscal interdependencies consistent with the literature on tax and yardstick competition. For corporate taxes, the regression results suggest that European countries follow large countries in order to attract capital; for income taxes and public expenditures, instead, fiscal interactions exist but they are mainly due to yardstick competition. Finally, we have found the countries are interdependent with each other before joining the EU, and that, once they are in, they become more independent.

**Keywords:**
Spatial correlation, Yardstick competition, Tax competition, Intergovernmental Relations, International fiscal issues, Regionalisation

JEL Classification: H2, H77, H87, D7

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## 1. Introduction

Do countries compete with each others in order to attract tax bases? Do voters care about foreign policy makers' fiscal choices when they make their voting decisions? Do policy makers respond to foreign fiscal policies? All these questions are related by the idea that state's fiscal policies are dependent on their neighbours' policies and the common view is that the ongoing process of globalisation has contributed to these interdependencies in several ways. First, in more open economies, capital and investment are more free to move internationally, and this is making governments more responsive to other governments actions in order to attract tax base; second, more circulation of information and ideas has made it easier for people to compare different countries performaces and to get "the full picture" both with respect to the "strength" of their domestic policies and to the possibility of developing their business plans abroad. Moreover, as a consequence of globalisation, countries' national borders are becoming weaker and less defined;[1] as a result, in order to survive and preserve their interests, countries are getting together to sign agreements of mutual cooperation and form unions. The case of Europe and the European Union is an interesting example of the phenomena, and it is also the subject of this paper. In particular, we address the question whether or not European governments influence each other in determining their fiscal choices, and whether or not there is a role played by the EU as an institution in affecting the level of fiscal interactions.

There are three main theoretical explanations why countries should be affected by their "neighbours" when they determine their policy choices; all these rely on the common assumption that countries behave strategically with each others.

The first explanation is based on the idea that there exist expenditure externalities among jurisdictions and therefore state policy choices are not independent from each other. An example of these type of externalities is the amount of public investments in infrastructures in a country (such as roads, airports, rail-tracks) whose benefits spill over in neighboring countries, and lower the level of investments in the latter countries,

[1] There is a widespread ideas of retreat of States. Among them :"Where states were once the masters of markets, now it is the markets which ....are masters over the governments of states" (Susan Strange, The Retreat of the State, 1996), "The glue holding nation-states together, at least in economic terms, has begun to dissolve". (Kenichi Ohmae, The End of the Nation State, 1996); "Foreign trade and investment have now become the ultimate yardsticks for evaluating government actions..(there is) a remarkable consensus on the imperative of global economic integration." (Dani Rodrik, Trading in Illusions, Foreign Policy magazine, 2001).

because of free riding behavior.

The second type of interdependence is based on the idea that citizens can evaluate the performances of their policy makers by comparing the same policy choices taken by the neighboring countries' policy makers. In the case domestic policy makers perform worse than foreigners, citizens "punish" them by not voting for them the next election. Policy makers anticipate voters behavior and "follow" their neighbouring colleagues' choices. This idea of "yardstick" competition has been initially explored by Besley and Case (1995), who also confirm the theory by finding evidence for this using data from the U.S.. More recent works include Besley and Smart (2003), Bordignon, Cerniglia and Revelli (2003, 2004).

The third type of explanation why fiscal choices are not independent is based on the tax competition literature: countries compete with their neighbors in order to attract tax bases. The theoretical literature on tax competition is now voluminous, an important branch of it develops the well-known Zodrow-Mieszkowski-Wilson (ZMW) model (Zodrow and Mieszkowski, (1986), Wilson, (1986)) of tax setting with mobile capital in various directions (see Wilson, (1999) for a survey).

Alternative to these theories of strategic interactions; Manski (1993) suggests that fiscal choices appear to be interdependent not because countries behave strategically but because they actually follow a "common intellectual trend" that drives fiscal choices in the same directions. A situation like this occurs for example because policy makers meet at various international meetings,[2] and they are able to discuss and share views on fiscal policies, or, alternatively, an influential international organization or a famous economist has expressed their opinions or recommendations about policy issues.

However, even if there are various theories of fiscal policy interdependencies, when we want to empirically test the theory, for all these cases the common way to proceed is to estimate "fiscal reaction functions", i.e. parameters which indicate whether any particular fiscal authority will change a tax rate or an expenditure level in response to changes in the same variable by other authorities. This empirical literature was initiated by a pioneering study by Case, Hines and Rosen (1993), who estimate an empirical model of strategic interaction in expenditures among state governments in the US. Our paper is a contribution to this literature; we estimate fiscal reaction functions for European states fiscal policies; we think that our study is distinctive in several ways.

[2]Like various G7, G8 meetings or the Finance Ministers of the EU members meet regularly in the ECOfin Councils.

First, to our knowledge, it is the only paper investigating together both taxes and public expenditures, and not only at aggregates but at separate aspects of policy. This is a an important issue that has not received enough attention (see Wildasin (2004) ) for a discussion). Second, this is the first paper in this branch of the literature using the all set of western European countries.[3] Specifically, on public expenditures side, existing studies are so far based on US States datasets; we have the already mentioned Case, Hines and Rosen (1993) and Baicker (2005) who basically replicates Case, Hines and Rosen's paper using different econometric techniques. On tax side, most of the existing empirical works on tax reaction functions has employed data on local (business) property tax rates (Brueckner, 1998, Brett and Pinkse, 2000, Heyndels and Vuchelen, 1998), or on local or state income taxes (Besley and Case, 1995, Heyndels and Vuchelen, 1998). The only exceptions are Besley, Griffith and Klemm (2001) and Devereux, Lockwood and Redoano (2002) who estimate reaction functions for OECD countries and Altshuler and Goodspeed (2004) who study reactions functions for a subset of European countries. More in detail, we estimate reaction functions for taxes, on income and capital, and public expenditures, both aggregated and disaggregated (education, health and defence), using a dataset on western European countries for the period 1970-99. The aim of the analysis is three-fold. First,we test whether or not fiscal choices are independent among European countries (i.e. if the coefficient in the reaction function is non zero).

Second, we extend the analysis to determine whether these interdependencies are due to strategic interactions (tax, yardstick competition, fiscal externalities) or just a common trend; this is mainly based on the distinction between the characteristics of the different fiscal choices, the responsiveness to them by voters and the type of neighbours with whom to interact. To anticipate the flavour of the analysis that will be developed in detail in the next section; corporate taxes mainly affect firms' location and investments[4] but only a minority of voters, therefore any strategic behavior by governments should be related to tax competition to attract tax bases rather than to yardstick competition to please voters. Income taxes, instead, hit income from labour, the less mobile factor, and are of

[3]with the exception of Altshuler and Goodspeed (2004) -who use a dataset on Western European countries to investigate the existence of fiscal interdependenciesHowever, they consider only a subset of EU Countries and study only capital and labour taxes.Moreover their paper also differs in the way taxes are calculated, they use a backward measure of taxes based on the ratio between tax revenue and GDP, while we use instead directly the tax rates set by governments and we consider also public expenditures

[4]See Devereux, Lockwood and Redoano (2002) for a discussion about that.

interest for most voters; therefore any kind of interdependence should be linked to yardstick competition. If governments behave strategically toward their voters in order to be reelected, we should especially find positive sloped reaction functions for those expenditures which are most visible to voters such as education and health. Governments could also try to compete with other countries, in order to attract investments and therefore tax base, by undertaking investments in infrastructures (see on this topic Wooders and Zissimos (2001)). All these type of interdependencies imply that the reaction functions are positively sloped; but if, instead, they are related to positive fiscal externalities between countries we should expect a negatively sloped reaction function. This could be the case, for example, for expenditures in defence of friendly countries.

Finally, we investigates whether or not there is an "EU effect", in other words, if being a member of the European Union may determine a different level of fiscal interactions. For example, if countries join the EU to lower the competitive pressure from a more and more globalised world and operate in a more protected environment, on one hand, this should lower the level of fiscal interactions due to a competitive behavior; but, on the other hand, since there are less competitive barriers among members, this should also increase interactions between member states. Similarly countries outside the EU should have higher level of interactions because they operate in a more open environment and also may want to follow EU states in order to be accepted in the EU.

The results support the idea that states act interdependently when they take their policy decisions both with respect to expenditures and taxes; however, with different motivations. For corporate taxes, for example, consistently with the previous empirical studies on tax competition, the regression results suggest that European countries compete with each other in order to attract capital and, in particular, following big countries. For income taxes and public expenditures, instead, we have found that fiscal interactions exist but are mainly due to yardstick competition, mainly with respect geographical neighbor and "leader" countries. Moreover, consistently with our expectations, the results for disaggregated public expenditures suggest that governments behave strategically only with respect to those expenditures which are more directly comparable such as expenditures in education.

Finally, we have found the countries are more interdependent with each other before they join the EU, and that, once they are in, they become more independent. This behavior is possibly due to the fact that countries who want to join the EU want to show to other EU members that they share similar policies in order to be accepted and also

because the EU provides a safer environment where countries need to compete less with the outside world but interact more among themselves.

The remainder of the paper is organized as follows. The next section discusses how we can distinguish different competitive behaviors based on the analysis of types of choices, neighbors and responsiveness by citizens. Section 3 presents the empirical methodology, section 4 the data and, section 5 the results. Discussion and conclusions are in the last part of the paper.

## 2. Testing the theories

As mentioned in the introduction, when we want to test empirically different models of fiscal interactions, the common way to proceed is to estimate fiscal reaction functions. However, as it stands, it is not possible to distinguish the true nature of these interdependencies. In this section we explore how we can overcome this problem by extending the analysis to take into account different types of fiscal choices and neighbors, and responsiveness by citizens to policies. We use Table 1 to make our point.

In the columns we distinguish between the four theoretical explanations of fiscal policy dependencies: yardstick competition, tax competition, positive externality and common trends. The first three are due to a strategic behavior by governments while the latter is due to a common "intellectual trend". We analyze them in turn in relation to four characteristics: i) the expected sign of the reaction functions' coefficients, ii) the type of fiscal choices relative to the degree of interest by voters, the mobility of the tax base and the possibility of spillovers, iii) the type of neighbors with whom it is likely to interact and, finally, iv) the timing of the interactions.

Yardstick competition occurs when policy makers in one jurisdiction adjust their policies in response to neighboring jurisdictions' policy changes because citizens make their voting decisions based on the comparison between domestic and foreign policies. Voters do not cast their vote for the incumbent if they think she has not performed well enough. So, anticipating their behavior, policy makers will cut (raise) taxes or expenditures if neighbors cut (raise) theirs; this implies that the sign of the reaction function's coefficient has to be positive under this hypothesis. Moreover, it is more likely that yardstick competition occurs with respect to those policies whose voters care most, like, for example, expenditures in education or income taxes, rather than capital taxes. To give an idea, it

Table 1. Characteristics of different types of interactions

| | **Yardstick competition** | **Tax Competition** | **Positive Externality** | **Common Trend** |
|---|---|---|---|---|
| **Coefficient Sign** | Positive | Positive | Negative | Positive |
| **Type of fiscal choice** | Voters care about: Health , Education. | Mobile Tax Base: Capital Tax | Expenditures spill over in other jurisdictions | |
| **Neighbours** | -Jurisdictions with similar characteristics (GDP distance)<br>-Big and important jurisdictions (GDP-EU)<br>-Geo. close jurisdictions | -Open Jurisdictions (Trade)<br><br>-Big and important jurisdictions (GDP-EU) | -Geo. close jurisdictions | -No specific neighbour (uniform) |
| **Timing** | More in election year | Not specific | Not specific | Not specific |

Figure 2.1:

is useful to think about the victory in the UK general elections of the Labour Party over the Conservative Party after over twenty years. One of the keys of the success of Tony Blair's political campaign has been recognized to be the stress put on service delivery, like the famous slogan "Education, Education, Education". It is also likely that policy comparisons mainly occur with respect to geographically close countries or countries with similar characteristic or important and big countries. Finally, another characteristic of yardstick competition, not in common with the other types of interactions, is that it is very likely that interaction will be higher in the period of elections when voters make their final voting decisions.

Like for yardstick competition, the coefficient of the reaction function in the case of tax competition has to be positive. However, the main feature is that the tax base has to be mobile, and this is clearly the case for capital taxes, which hit firms and investments which are highly mobile across countries, especially in more open economies. The countries with whom it is more likely to engage competition to attract tax bases are more open countries, or leader countries. We do not expect, in principle, any different strategic behavior in the period of election, since, also, capital taxes are not usually of interest to voters.

The main difference between the case of (positive) externality and all the other behav-

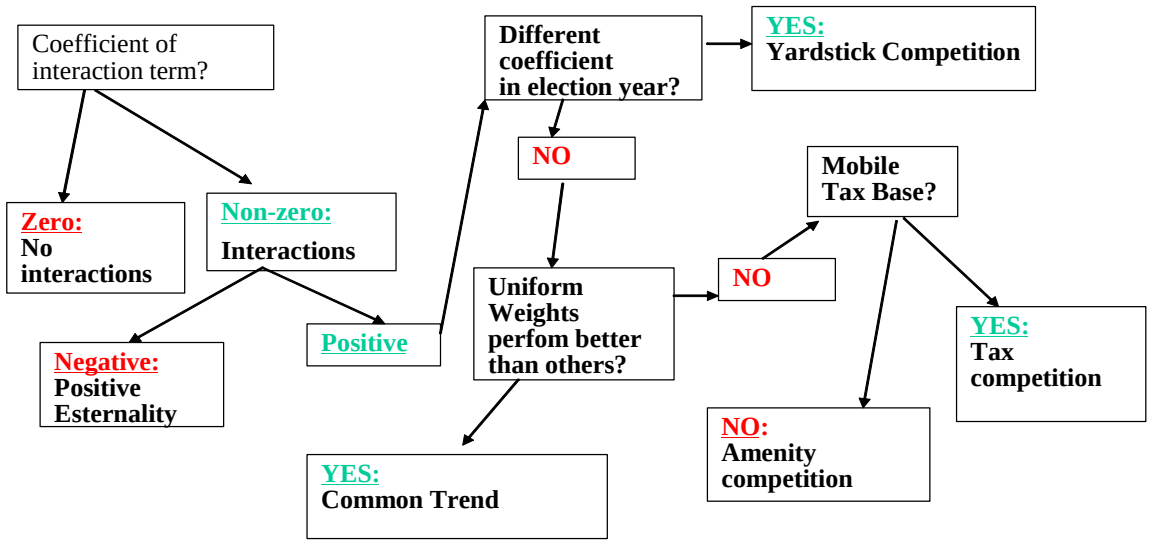


Figure 1. About the Nature of Interactions

iors is that the expected coefficient of the reaction function has to be negative; because of free riding behavior. Also, it will mainly occur with respect to geographically close countries and, elections should not interfere with the level of interactions.

Finally, if it is only a common trend that drives countries policies in the same direction, we should expect a positive sign of the interaction coefficient, but not a specific pattern in the type of countries with whom to interact and, no different interactions because of elections.

Now, with the help of Figure 1, we illustrate how we proceed in the analysis. We begin with the estimation of the fiscal reaction functions, and we check if the interactions coefficient is significantly non-zero, in that case, trivially, there are no interactions. If the coefficient is negative, it is the case of positive fiscal externality, if it is positive, instead, we proceed further by checking if there is a higher level of interaction in the period of elections. If this is the case, it almost certainly the case for yardstick competition. If it is not the case, and, in addition, there is not a specific pattern in the type of state which whom the interactions occur, the most likely explanation is a common trend. If countries react more with their neighbors or with leader countries and the tax base is mobile, the main explanation is tax competition; alternatively, if the tax base is not mobile, we are

possibly in the presence of amenity competition.

## 3. Empirical Specification

As discussed in the previous sections, all theoretical models of strategic interactions have the same empirical predictions that state $i$ fiscal choices (either public expenditures or level of taxation) in year $t$, $E_{it}$, are a function of its' neighbors same fiscal choices , $E_{jt}$.In practice, we allow $E_{it}$ to depend on a vector of state specific controls $X_{it}$, and, since we estimate using pooled cross-sectional time series data, we include a state fixed effect $\alpha_i$.

This gives a specification in the most general form of

$$E_{it} = \alpha_i + \sum_{j \neq i} \theta_{ij} E_{jt} + X_{it}\beta + u_{it}$$

where $i = 1, ...n$ denotes a state, and $t = 1, ...T$ a time period, $\alpha, \beta$ , and $\theta$ are unknown parameters, and $u_{it}$ is a random error.

However, this cannot be estimated as it stands, as there are too many parameters $\theta_{ij}$ to be estimated. The usual procedure in this case is to estimate

$$E_{it} = \alpha_i + \theta' A_{it} + X_{it}\beta + t_{it}\gamma + u_{it} \tag{3.1}$$

where $A_{it}$ is the weighted average of other states' fiscal choices

$$A_{it} = \sum_{j \neq i} w_{ijt} E_{jt}$$

and $w_{ij}$ are exogenously chose weights, normalized so that $\sum_{j \neq i} w_{ijt} = 1$,and $w_{ijt} = 0$ if state $j$ is not a "neighbor" or if $j = i$ .

We consider six possible weighting schemes for (3.1), based on the analysis developed in the previous section. The first is very simple, weights are assumed to be *uniform*, i.e. $w_{ij}^U = \frac{1}{n-1}$,all $i, j$. This will give us an useful benchmark and, in the case it works well, will be in support of the hypothesis of "common intellectual trend", since, under this hypothesis there should not be any difference in the degree of country neighborliness.

The second set of weights are constructed to support the hypothesis of strategic interactions (either tax or yardstick competitions) and they are based on different concepts of neigborliness: they are *geographical distance, GDP per capita distance weights, GDP and*

*EU* weights. The first two are based on the idea that countries follows countries close to them either geographically or with similar economic structure; the latter two introduce the concept of following a leader, which is represented either by the biggest countries or by the EU as a whole.

For *geographical distance* weights the element of our weighting matrix are constructed such that

$$w_{ij}^{D} = \frac{1}{d_{ij}} / \sum_{j} \frac{1}{d_{ij}}$$

where $d_{ij}$ is the geographical distance between the capital of state $i$ and state $j$. In the case competition occurs between states with similar economic or demographic characteristics, we construct a weighting matrix based on the *inverse of the distance between GDP per capita*, where each element is constructed as follow:

$$w_{ijt}^{GD} = \frac{\frac{1}{|GDPpc_{it} - GDPpc_{jt}|}}{\sum_{j} \frac{1}{|GDPpc_{it} - GDPpc_{jt}|}}, \text{with } j \neq i;$$

note that contrary to most of the previous studies we allow the matrices to be time variant.[5]

If countries follow a "leader" or a group of them, the weighting schemes that should work better are respectively the one assigning higher weights to countries with higher GDP,

$$w_{ijt}^{G} = \frac{GDP_{jt}}{\sum_{j} GDP_{jt}}, \text{with } j \neq i,$$

or calculated as GDP weighted average of EU members,

$$w_{ijt}^{EU} = \begin{cases} \frac{GDP_{jt}}{\sum_{j \in EU_t} GDP_{jt}} & \text{if } j \in EU_t,\ j \neq i \\ 0 & \text{if } j \notin EU_t,\ j \neq i \end{cases},$$

where $\text{EU}_t$ is the set of states that are EU members at time $t$.

Finally, we use another set of weights that are merely designed to represent tax competition behavior, with these weights we assign higher values to countries that have more open economies and, therefore, should be the main competitors in the race for attracting tax bases. In this setting, they are based on *country openness* (here as trade as proportion of GDP),[6] in order to overcome the problem of temporary fluctuation and endogeneity

[5] Previous studies like Case, Hines and Rosen used matrices based on the average of a variables over time.

[6] We have tried FDI/GDP weights with similar results and therefore we have omitted them.

of this variable we average three years together and then we lagged the resulting set of weight of three years, more formally our last set of weight is

$$w_{ijt}^{O} = \frac{\sum_{s} TRGDP_{jt-s}}{\sum_{j}\sum_{s} TRGDP_{jt-s}}, \text{with } s = 3, 4, 5, \text{and } j \neq i.$$

In summary, the *a priori* choice of the weights is arbitrary, however after the estimations are carried out it is possible to assess their goodness by selecting the regressions that produces higher and more significant coefficients and, in this way, understand better the nature of these interdependencies.

Moreover there are two econometric issues determined by the presence on the RHS of the equation (3.1) of the dependent variable. First, if states do react to each others' fiscal choices, then $A_{it}$ is endogenous and correlated with the error term $u_{it}$, we therefore we use an IV approach. For this purpose and we need some source of variation correlated with neighbors' fiscal choices but uncorrelated with the error term. One potential source of variation is neighbor $X$s. So we create neighbor values for these variables multiplying them by the same weights used for weighting the fiscal variables and we use the weighted average of neighbors' control variables as instruments. We test the validity of the instrument set using the Hansen test of overidentifying restrictions.[7]

Second, if neighbors are subject to correlated random shocks, this determines a correlation between states' fiscal choices, which can be erroneously interpreted as causal influence. So if we omit in the regressions variables that are spatially dependent, these variables enter in the error term, and this complicates the estimation of (3.1). However Kelejian and Prucha (1998) have demonstrated that even in the presence of spatial error dependence, the IV method yields a consistent estimation of $\theta$.[8]

Moreover, while we would like to include time dummies, to capture shocks in each period which are common to all countries, this is not generally feasible (see Devereux,

[7] This is carried out using ivreg2 in Stata.

[8] If we do not take into account spatial error dependence in equation (3.1), this would not bias the estimation of $\theta$ but it would reduce the efficiency of the estimation and produced biased standard errors. There are two more ways in addition to IV method to deal with this. One approach is to use maximum likelihood to estimate (3.1) taking into account of the error structure, this methodology has been explored by Case et al. (1993). The other way is to estimate (3.1) by ML under the hypothesis of error independence and rely on hypothesis tests to verify the absence of spatial correlation. Examples of this approach can be found in Brueckner (1998), Saavedra (2000) and Brueckner and Saavedra (2001). Anselin et al (1996) suggest a robust test that can be employed to detect the presence of spatial error dependance, which is based on the analysis of the residual generated by regressing the dependent variables on the exogenous variables using OLS.

Lockwood and Redoano, 2002, for an explanation). However, we do allow for unobserved factors varying over time as far as possible by also including country-specific time trend in all our regressions.

Another issue is that, in practice, our fiscal choices are serially correlated, perhaps because abrupt changes in the system are likely to be costly to governments, either because of adjustment costs, or because such changes my be blocked at the political level by interest groups. We therefore present t-statistics based on standard errors clustered by country which are robust to heteroskedasticity and serial correlation (Bertrand, Duflo and Mullainathan, 2004).

Finally, we also present dynamic versions of model (3.1) by adding the lagged dependent variable, $E_{it-1}$.

$$E_{it} = \alpha_i + \delta E_{it-1} + \theta A_{it} + X_{it}\beta + t_{it}\gamma + u_{it} \tag{3.2}$$

The present of the lagged depend variable together with fixed effect generate another additional methodological problem. In short panels, the *Within Group* estimator is biased downward[9]. To deal with this problem we employ the GMM estimator developed by Arellano and Bond in addition to the IV estimator of the interaction term, $A_{it}$. The GMM estimator first-differences the estimating equation and uses lags of the dependent variable from at least two periods earlier as well as lags of the RHS variables as instruments.[10]

## 4. The Data

We use annual data on the Western European states[11] over the period 1970 -1999. We consider several specifications of the model, where the variable $E_{it}$ takes in turn the aggregated and disaggregated level of per capita public expenditures, and income and capital tax rates.

[9] Under the *within group* transformation, the lagged dependent varibale becomes $E^*_{i,t-1} = E_{i,t-1} - \frac{1}{T-1}(E_{i,2} + .. + E_{iT})$. So if T were large enoght the bias above would be insignificant and the problem disappear (see also Roodman, 2006).

[10] This is implemented in Stata using xtabond2.

[11] We consider Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweeden, Switzerland and United Kingdom.

On the expenditures side we use aggregated and disaggregated public expenditure both per capita and as a proportion of GDP.[12] In particular we consider *total public expenditures* ($TOT_{it}$), public expenditures in *education* ($EDU_{it}$), *health* ($HEA_{it}$) and, *defence* ($DEF_{it}$). These data have been collected from IFS- Government Finance Statistics Yearbook. *Table 2* and *3* present summary statistics for these variables. In particular, if we disaggregate the figures by countries (*table 3*), we observe that despite there being a lot of variation among countries on the level of public expenditure, which depends mainly on country-specific characteristics, they all seem to follow a quite similar pattern as shown in *graphs 1* and *2*.

About the nature of possible interactions of states' public expenditures, we expect that their existence is mainly due to yardstick competition, rather than to tax competition; since interstate mobility of residents in Europe is quite low and it mainly based on the labour market conditions rather than provision of public goods. Another possible explanation of public expenditures interdependencies among states could be also related not to strategic interactions but to a common "intellectual" trend, as suggested by Manski (1993), that drives countries fiscal choices in the same directions. *A priori* we can predict that yardstick competition occurs with respect to those expenditure which are more observable and more of interest to voters, like Health or Education. Moreover, with respect to the weight matrix, if a common intellectual trend rather than strategic interactions are the reason for expenditure interdependences, we should expect that the coefficient of the interaction term in the case of the unweighted matrix is not performing any worse than the other alternative settings.

On the side of the tax variables, we use measures of income and capital taxes. These two taxes are both important, they overall account for more than 40% of the tax revenue. The tax base, in the first case, is represented by the income of companies and it is highly mobile across countries, in the second case, by the income of residents and is less mobile but hits the majority of citizens. Therefore if there exist strategic interactions in corporate taxes these should be mainly due to competitive behavior by governments in order to expand their tax bases. Again, it is not possible to rule out *a priori* the hypothesis of a common trend; but we have to rely on the comparison of performances of the different weighting matrices. Any strategic interactions in income taxes, instead, should mainly

[12] We only report result for *per capita* expenditures: the results are better, and, also, this measure is not afectted by GDP variation across countries which may determine variations in expenditures not due to policy making decisions.

be related to government behavior trying to persuade their voters about the goodness of their actions. So, if governments are concerned about tax competition, we should expect a higher interaction of the factor more mobile, the capital, compared to the less mobile, labour, as pointed out by Besley, Griffith and Klemm (2001). If governments are, instead, more concerned about possible yardstick competition, we would expect higher interactions with respect to the taxation of the factor owned by the majority of voters. In this case income taxes should be more interdependent than corporate taxes. If, again, the hypothesis of a common intellectual trend is the correct one, we should not expect a worse performance by the uniform weights compared to the other specifications. For the income tax we use the *top income marginal rate* ($TIN_{it}$); for the capital tax we use the *statutory corporate tax rate* ($CAPTAX_{it}$).[13] The main source for statutory tax rates is the Price Waterhouse -Corporate Taxes - A Worldwide Summary, and, for income taxes, we use the top income rate, from Price Waterhouse - Individual Taxes- A Worldwide Summary. We can observe that for most of the countries there has been a decrease in both statutory and income tax rates.[14]

Moreover we use a set of time varying variables $X_{it}$ which are conventionally assumed to affect the determination of the above fiscal choices. For descriptive statistics refer to *table 2* in the Appendix.These variables include:

1. *Socio-demographic characteristics*: total population ($POPUL_{it}$), proportion of population less than 14 years old and over 65 ($PYOUNG_{it}$ and $POLD_{it}$ respectively), population density ($PDENS_{it}$), proportion of women ($PFEM_{it}$).

2. *Economic variables*: GDP per capita ($GDPPC_{it}$), and, finally, two measures of country openness: foreign direct investment ($FDIGDP_{it}$) and total trade ($TRADEGDP_{it}$) as a proportion of GDP.

[13] An alternative measure of capital taxes is proposed by Mendoza et al (1994), and it is based on the ratio of tax payments to a measure of the operating surplus of the economy. This approach is not ideal for analyzing the competition between jurisdictions over taxes on corporate income because, it does not necessarily reflect the impact of taxes on the incentive to invest in a particular location, because tax revenues depend on the history of past investment and profit and losses of a firm, and also the aggregation of firms in different tax positions, and also, this measure can vary considerably according to underlying economic conditions, even when tax regimes do not change; the variation is therefore due to factors outside the immediate control of the government (see more on this in Devereux, Lockwood and Redoano (2002)).

[14] For a possible explanation see Devereux, Lockwood and Redoano (2002).

3. *Political variables.* $\text{EU}_{it}$, is equal to 1 if the country is member of EU and 0 otherwise, $GOVPARTY_{it}$ measures Cabinet composition in term of left parties in percentage of total cabinet post, $WOMENPARL_{it}$ measures the composition of women in the parliament, finally $ELECT_{it}$ is equal to 1 if there is and election in that year (both executive or legislative). Political variables in this dataset come from two sources: *Comparative Political Dataset* [15] and *Database of Political Institutions.*[16]

## 5. Results

We estimate several versions of models (3.1) and (3.2), which represent the reaction functions of one country's fiscal choices to other countries decisions. We summarize our results in six sets of tables, one for each type of fiscal choices; moreover each set of tables is formed by three tables. Tables denoted with letter *a* present regression results for the static model in (3.1); the results for the dynamic version of the model (3.2) are in tables denoted with letters *b* and *c*. In tables *c*s the lagged dependent variable ($A_{it-1}$) is estimated using a GMM estimator. In all our specifications, since the interaction term $A_{it}$, appearing on the RHS of (3.1) and (3.2), is endogenous and correlated with the error term, we instrument it by creating the weighted average of the controls variables $X_{it}$, using the same weights employed for weighting the fiscal variables.

The fiscal choices taken into account ($E_{it}$) are the aggregated and disaggregated (Health, Education and Defence) level of public expenditures per capita and two different types of taxes: corporate taxes and income taxes. In all our specifications we condition on year dummies, and country-specific linear time trend ($t_{it}$). In the first case we want to control for unchanging characteristics of a state that may have an impact on policy choices, in the second case we want to control for macroeconomic shocks.

*Tables 4* report the regression results for the aggregated public expenditure. In table *4a*, we present the results for the static model, (3.1). The coefficients of the neighbor average aggregated public expenditures ($A_{it}$) are always very significant and positive for all our different weights. The weights that perform better are GDP (0.970) and uniform weights (0.899), the worst is Openness. The controls do not perform particularly well in the regressions, the $p$ values in most of the cases are below the threshold. It seems that

[15] Available at http://www.ipw.unibe.ch/mitarbeiter/ru_armingeon/CPD_Set_en.asp
[16] Available at http://www.worldbank.org/research/bios/pkeefer.htm

being a member of the EU, having an high proportion of women in Parliament and being ruled by a left wing party determine higher public expenditures. Moreover the composition of population affects the level of public expenditure, having a higher proportion of old and young people lowers (surprisingly) the level of expenditure (possibly because of income constraint); large countries have higher public expenditure per capita, possibly determined by diseconomies of scale. Finally, more open countries have smaller governments. One possible explanation is because they may have to compete more internationally and therefore lower their taxes (for more about that see the "efficiency hypothesis" in Garret and Mitchell (2001)[17]). Table *4b* presents the result for the dynamic version of the model. The interaction coefficients become, as expected, much lower and less significant, but still always positive. GDP and uniform weights are still the ones with better results, but now the coefficients are respectively 0.438 and 0.424. The lagged dependent variables is always significant and positive, in all our specifications the coefficients are in the neighborhood of 0.7. The control variables are overall slightly more significant than in the previous set of equations and still present the same signs. Surprisingly the coefficient of GDP per capita is negative and significant. This can be related with efficiency hypothesis, where in order to compete and attract tax base countries have to lower taxes and public expenditures. Table *4c* reports the results for the dynamic model using the Arellano-Bond GMM estimator. Comparing table *4b* and *4c*, we note that the coefficients of the lagged dependent variable are higher in table *4c*, as we expected. The interaction coefficients are also higher and always significant, and also it is confirmed that GDP and Uniform weights are the ones that perform better. The coefficients of the controls variables present the same trend as in the previous tables. So, in principle, this seems to suggest the idea that either there is a common trend driving public expenditures in the same direction or, alternatively, policy makers follow big countries' behaviors when they decide their public expenditure setting, possibly because of yardstick competition. However we need additional tests for confirming the hypothesis. These will be the subject of our next section.

*Table 5* presents regression results for public expenditure in Defence, an *a priori* analysis of the characteristics of these type of expenditure suggests that it very unlikely that we are in the presence of expenditure competition hypothesis; the more likely strategic

[17]Garrett and Mitchell (2001) find a negative relationship between government spending and openess to trade in OECD countries. One possible explanation for this result is the so called "efficiency effect": high taxation (especially of capital income) reduces the competitiveness of national firms in international markets and returns to investors so that there is an incentive for goverment to lower taxes and public expenditures (also because of internal and external pressures).

behavior could be either due to yardstick competition or driven by fiscal externality, unless it is just a common trend. Since in the period taken into account all the countries in the sample were "friends" the possible externality would have to be a positive one, so the regression coefficients should be negative; i.e. if neighbors higher expenditures in defence a state can lower its expenditures because it is protected by its "friend", and it can free ride. However, as we can see from the tables, this is not our case: the coefficient of the interaction terms are always positive and significant in all our specifications. Table *5a* present the static version of the model, the coefficient of the interaction terms are always very high (higher than the same model in table 1). The weights that presents better results are *Openness* (0.819) and *Uniform* (0.777). The demographic controls suggest that expenditures are lower when the proportion of young people is high, this may reflect the preference of this group of people toward this type of expenditures, and in large countries, probably because of economies of scale. The set of political variables weakly suggests that the proportion of women in parliament lower these expenditures, elections instead have opposite results. Being an EU member also increases public expenditures in defence. Finally, countries with higher GDP and more open have higher expenditure in defence.

Tables *5b* and *5c* present the dynamic version of the model. As expected the lagged dependent variables is always positive and significant, but lower than the equivalent table *4b*. The interaction terms are always significant and positive; the sets of weights producing better results are as above *Openness* (0.41 in table *2b* and 0.37 in table *2c)* and *Uniform* (0.38 in table *2b* and 0.46 in table *2c).*

The results for public expenditures in Health are reported in *tables 6*. In the static version of the model there is weak evidence of fiscal interactions in public expenditure on health in European countries. The only set of weights that presents some significant results is GDP distance (coefficient of interaction term is 0.75). The control variables suggest, predictably, on one hand, that being large and rich, a member of EU and ruled by the left wing party determines higher expenditures in health. On the other hand that having a high proportion of women in Parliament and an open economy have a negative impact on Health expenditures. The dynamic version of the model presented in table *6b*, confirms and strengthens the suggestion that there are not many interdependencies on health expenditures going on. The lagged dependent variable is always significant and around 0.64 in all our specifications. The control variables present generally the same trend as in the previous set of tables. Similar commments apply to table *6c*, where the

GMM estimation is applied; the main difference is that, as expected, the lagged dependent variables have here higher coefficients and the interaction terms lower coefficients than in the corresponding regressions presented in table *6b*.

Public expenditures in Education are in *tables 7*. The static version is in table *7a* . Here the interaction terms are positive but not very significant, the weights that perform better are geographical distance, GDP and uniform; in the first two cases the coefficient is even bigger than 1. Open countries and EU members have lower expenditures in education, while countries ruled by left wing parties higher. The dynamic versions of the model are in table *7b* (IV estimation) and *7c* (GMM estimation), where the lagged dependent variable is always positive and very significant and the coefficient is always well above 0.7. The interactions term present positive coefficients but significant only for the case of GDP distance in table *7b*, better results instead are presented in table *7c* where the interaction term is significant in most of the cases (apart from GDP and EU). The control variables behave in the same way as presented in table *7a*.

Tables 1 to 4 have presented preliminary results for aggregated and disaggregated public expenditures, in all our specifications moving from the static version to the dynamic version of the model we improve the estimation because the lagged dependent variable is always very significant and positive, confirming that, like the theory suggests, public expenditure decisions are greatly based on previous years decisions. We also have presented two versions of model (3.2) using different econometric techniques, in both cases the results are quite comparable, and, as we expected, the lagged dependent variables are in most cases higher when GMM estimator is applied. In general GDP, geographical distance and uniform weights are the ones that present better results. This could, in the first instance, suggest a possible presence of yardstick completion, but further analysis will be developed in the next session.

The results for the statutory corporate tax rate are summarized in *table 8*. For each of the weights we find that the coefficient of the average tax rate of the neighboring countries is always positive and significant and always above 1, which means that if neighbors lower their taxes by 1 point countries react by lowering it more than 1. However the introduction of the lagged dependent variables, presented in tables 5b and 5c, lowers dramatically the interaction coefficient in all our specifications, where the coefficients are in all cases below 0.4, but still significant in all our specifications. The weights that perform better are GDP (coefficient equal to 0.38) Openness (coefficient equal to 0.31), EU (coefficient equal to 0.32) and Uniform (coefficient equal to 0.32). The lagged dependent variable is positive

and significant in all our specifications and it lies between 0.68 and 0.70 in table *8b,* and between 0.61 and 0.75 in table *8c*. The demographic variables are the ones that are more significant and suggest, surprisingly, that larger countries have lower taxes, and a higher proportion of young people higher taxes.

Finally, *table 9* presents results for *income tax rate*; the results are very similar to the previous set of tables, where the coefficients of the interaction term are positive, very high and always significant in the static model, and they become much lower in the dynamic version of the model (in this case however the results in tables *9b* and *9c* differ more). The weights that work better are GDP (0.355), Uniform (0.267) and Openness (0.24) ,but in tables *6b* they are respectively 0.35, 0.26 and 0.24, while in tables *9c* they are higher and equal to 0.74, 0.52 and 0.59.

In summary, we can observe that for all the fiscal choices taken into account, the dynamic specification seem to represent reality better and the interaction terms are always positive and in most of the cases significant. In the next session we carried out additional tests to investigate further the nature of these fiscal interactions.

### 5.1. Yardstick competition vs other theories

In this section we investigate further interdependences in fiscal choices in order to distinguish different competitive behavior. We try to do this by exploiting the definition of yardstick competition. As we said earlier, yardstick competition occurs when citizens make their voting decisions based on the comparisons of fiscal policies between domestic and neighbor policy makers' choices. Policy-makers anticipate voters behavior and move their policy decisions in the same directions as their neighboring policy makers. If this is the case, policy-makers should be particularly concerned about their neighbor colleagues' actions in the period of elections. A straightforward way of testing for this is to interact the variable $A_{it}$ with the election dummy $elect_{it}$, and estimate two different interaction coefficients, one for the year of election ($elect_{it} * A_{it}$) and one for all the other period ($(1 - elect_{it}) * A_{it}$).[18]

[18] Another possibilities that have been explored but not reported in this paper, is to use instead of election-year dummy the year-before-election dummy, or two run two separate regressions, one for the election years, and the other for the other years. In the first case the results where better using election year interaction, and in the second case we did not want to allow all the other coefficient to vary because we wanted to foucus on the interaction coefficient.

So if the hypothesis of yardstick competition were true we should observe the coefficient of $elect_{it} * A_{it}$, being higher and more significant than the coefficient of $(1 - elect_{it}) * A_{it}$. There should not be instead any different behavior in election time for the other type of fiscal interdependences.

The results for this version of the model are reported in *table 10*. We present the results using the dynamic version of the model because it is the one that better represents reality, we report the regression results only for the IV estimation. We note that the coefficient of the lagged dependent variable is always positive and significant in all our specifications. We focus our analysis on the comparison of the interaction term coefficients. If we look at *table 7* we can clearly see that the coefficient of $elect_{it} * A_{it}$ for aggregated public expenditure is always much higher and more significant that the one of $(1 - elect_{it}) * A_{it}$. So public expenditures setting is much more dependent on neighbors in the period of election, in particular with respect to GDP (coefficient equal 0.66) and geographical distance weights (coefficient equal 0.63). This is a clear indication of yardstick competition that occurs mainly with respect to important and geographically close countries, which is still consistent with the theory of yardstick competition because it is easier for people to compare the fiscal choice of countries for whom information are more widespread. If we look at the results for disaggregated public expenditures we can see that this result is weakly confirmed for expenditures in Education and Defence, where the $eA_{it}$ coefficients are higher than $neA_{it}$ but their significance is generally lower. There is no sign of of yardstick competition for expenditure in Health, a common intellectual trend seems to be the most likely explanation.

On the tax side, the interaction coefficients for statutory taxes do not present a clear pattern, as we expected *a priori*, so we can clearly reject the yardstick competition hypothesis, the most likely explanation is tax competition, which is driven by leader countries, since the weight that performs better is GDP weight. For income taxes, for which there a theoretical possibility of yardstick competition, given the nature of these taxes, the results are not completely clear, they weakly support the hypothesis of yardstick competition. The election year interaction coefficients are much higher than the non-election ones, but they are not statistically highly significant. The weight that performs better is the GDP weight (coefficient equal to 1.83), but we cannot rule completely out the hypothesis of common trends.

### 5.2. Does the EU matter?

Finally, our last task is to investigate whether or not being a member of the European Union has an effect on government behavior, either in the sense of making fiscal choices more or less interdependent on other partners. Note that in our dataset at the beginning of the period only six[19] countries out of seventeen were EU members and at the end they all had joined the EU but Switzerland and Norway.

In the first instance, one may think that it more likely that EU members are more interdependent because they move in a similar competitive and institutional environment and are subject to similar budget and political constraints, moreover policy makers have more occasions to meet and discuss formally or informally their plans. However it is also possible that the opposite can occur, EU non-members are less "protected" than their EU partners and have to operate in a more open and competitive environment, and therefore it is possible that they engage in a more competitive behavior than their EU counterparts. Another possibility is that they may try to mimic EU states behavior because they want to join the EU and therefore they want to convince EU states to accept them.

To test this hypothesis of different competitive behavior between EU members and non-members we proceed similarly as in the previous session, we multiply the $EU_{it}$ dummy by the variable ($A_{it}$) and we estimate two different coefficients for EU ($EU_{it} * A_{it}$) and non-EU countries ($(1 - EU_{it}) * A_{it}$). The results are reported in *table 11.*

Interactions in disaggregated public expenditures present a very different pattern depending on whether or not a state is member of the European Union: EU states follow mainly "leader" countries and other EU states (which is to some extent overlapping since the largest countries in the sample have been members of the EU since the beginning of the period taken into account), while non-EU states appear to follow mainly more open countries. Moreover, the coefficients of the interaction terms for non-EU states is generally higher than for EU states. This is an indication that non EU states "compete" more with the outside world especially with more globalized partners and then, once they are in the EU, interact less with the outside world but more among each other, even if the level of interaction is lower. So in other words, it seems that the "EU" effect is to lower the level of interaction- competition and redirect it toward other EU members. This is broadly confirmed by expenditures in defence. Public expenditures in education and health present a different pattern; there seem to be an high interdependencies among

[19] They were France, Germany, Italy, Belgium, Luxembourg and the Netherlands.

EU members but no interdependence at all among non-members, the coefficient are not, however, very significant. Corporate taxes present similar results to aggregated public expenditure where competition is usually higher among non-EU countries especially toward more globalized countries, while EU members compete mainly among themselves but with less intensity, which makes the EU a kind of "safer" environment for countries to compete. A different picture emerges instead from the results for income taxes, there is a very low interaction among EU members and very high among non EU; this could work like a way for future EU members to signal that they are ready to join because their fiscal policy are very aligned with the EU, and once they are in, they behave more freely.

## 6. Summary and Conclusion

In this paper we have estimated reaction functions for a set of fiscal variables, both on the expenditure and tax side. The aim of the paper was three-fold; first to determine whether or not these reaction functions have a non-zero slope, second to investigate their nature (in case they exist), third to examine if there is an EU effect.

The theory mainly distinguishes between four theoretical models of competitive behavior which generate similar empirical specifications. In order to assess whether these interactions exist because governments try to attract tax bases (tax competition), to please voters (yardstick competition), or because there exist fiscal externalities, or just because of a common trend. We have relied on *a priori* hypothesis based on the characteristics of the above mentioned fiscal choices and then carried out some additional estimations.

First, with respect to corporate taxes, consistently with the previous empirical studies on tax competition, we have found that the slope of the reaction function is generally positive and significant. In particular, the regression results suggest that tax competition occurs in Europe mainly with respect to big "leader" countries.

Second, we have found evidence of a similar governments' behavior in income taxes' setting and public expenditures' decisions. In both cases the reaction functions are always positively sloped and the weights that perform better are those based on GDP and geographical distance; in addition to this, if we interact $A_{it}$ with the election dummy and we re-estimated the model, this coefficient is always higher and more significant than the one interacted with the non-election dummy, this is especially true for aggregated public expenditures. This seems to confirm our *a priori* hypotheses about a possible existence

of yardstick competition among European countries, with respect to geographically close and "leader" countries. Moreover, consistently with our expectations, the results for disaggregated public expenditures suggest that governments behave strategically mainly with respect to those expenditures which are more directly comparable with, such as expenditures in education.

Finally, interesting and surprisingly, we have found the countries are interdependent with each other before they join the EU, and that, once they are in, they behave more independently. This behavior is possibly due to the fact that countries who want to join the EU want to show to other EU members that they have "aligned" policies for being accepted and also because the EU as an institution provides a safer environment where countries need to compete less with the outside and more among themselves.

## References


[1] Anselin, L. (1988) Spatial Econometrics: Methods and Models, Kluwer Academic Publishers, Dordrecht.

[2] Anselin, L., Bera, K., Florax, R., Yoon, M. (1996) "Simple diagnostic tests for spatial dependence," Regional Science and Urban Economics, 26, 77-104.

[3] Baicker, K. (2005) "The spillover effect of state spending", Journal of Public Economics, 89, n.2-3.

[4] Besley, T., Case, A. (1995) "Incumbent behavior: vote seeking, tax setting and yardstick competition," American Economic Review, 85, 25-45.

[5] Besley T., R. Griffith, A. Klemm (2001), "Empirical Evidence on Fiscal Interdependence in OECD Countries ", mimeo.

[6] Besley, T., M. Smart (2003), "Fiscal Restraints and Voter Welfare", mimeo.

[7] Bivand, R., Szymanski, S. (1997) "Spatial dependence through local yardstick competition: theory and testing," Economics Letters, 55, 257-265.

[8] Bordignon, M., F. Cerniglia, F. Revelli (2003) "In search for yardstick competition: property tax rates and electoral behavior in Italian Cities" , Journal of Urban Economics, 54, 199-217.

[9] Bordignon, M., F. Cerniglia, F. Revelli (2004) "Yardstick competition: theory and empirical prediction", Economic Letters, 83, 325-333.

[10] Breton, A. (1998) Competitive Governments, Cambridge University Press, Cambridge.

[11] Brett, C., Pinkse, J. (2000) "The determinants of municipal tax rates in British Columbia," Canadian Journal of Economics, 33, 695-714.

[12] Brueckner, J. (1998) "Testing for strategic interaction among local governments: the case of growth controls," Journal of Urban Economics, 44, 438-467.

[13] Brueckner, J., Saavedra, L. (2001) "Do local governments engage in strategic property tax competition?" National Tax Journal, 54, 203-229.

[14] Buettner, T. (2001) "Local business taxation and competition for capital: the choice of tax rate," Regional Science and Urban Economics, 31, 215-245.

[15] Case, A., Hines, J., Rosen, H. (1993) "Budget spillovers and fiscal policy interdependence," Journal of Public Economics, 52, 285-307.

[16] Devereux, M. P; Lockwood, B.; Redoano, M. (2002) "Do Countries Compete over Corporate Tax Rates? ", C.E.P.R. Discussion Papers, 3400.

[17] Figlio, D., Kolpin, V., Reid, W. (1999) "Do states play welfare games?" Journal of Urban Economics, 46, 437-454.

[18] Garrett, G., Mitchell, D. (2001) "Globalization, government spending and taxation in the OECD", European Journal of Political Research, 39, 145-177.

[19] Goodspeed , T., R. Altshuler (2004) "Follow the Leader? Evidence on European and U.S. Tax Competition" mimeo.

[20] Heyndels, B., Vuchelen, J. (1998) "Tax mimicking among Belgian municipalities," National Tax Journal, 60, 89-101.

[21] Kelejian, H., Robinson, D. (1993) "A suggested method of estimation for spatial interdependent models with autocorrelated errors, and an application to a county expenditure model," Papers in Regional Science, 72, 297-312.

[22] Ladd, H. (1992) "Mimicking of local tax burdens among neighboring counties," Public Finance Quarterly, 20, 450-467.

[23] Manski, C. (1993) "Identification of Endogenous Social Effects: The Reflection Problem", Review of Economic Studies v60, n3 (July 1993): 531-42.

[24] Mendoza, E.G, Razin, A. and Tesar, L.L. (1994) "Effective tax rates in macroeconomics: cross country estimates of tax rates on factor incomes and consumption", Journal of Monetary Economics, 34, 297-323.

[25] Ohmae, K., (1996) The End of the Nation State, Touchstone Books.

[26] Revelli, F. (2001) "Spatial patterns in local taxation: tax mimicking or error mimicking?" Applied Economics, 33, 1101-1107.

[27] Roodman, D. (2006) "How to do xtabond2: an Introduction to "Difference" and "System" GMM in Stata, wp 103, Center for Global Development.

[28] Rodrik, D., (2001), "Trading in Illusions", Foreign Policy magazine, March/April.

[29] Saavedra, L. (2001) "A model of welfare competition with evidence from AFDC," Journal of Urban Economics, 47, 248-279.

[30] Shroder, M. (1995) "Games the states don't play: welfare benefits and the theory of fiscal federalism," The Review of Economics and Statistics, 77, 183-191.

[31] Solè Ollè A. (2003) "Tax mimicking and electoral control: an empirical analysis of local tax setting in Spain", European Journal of Political Economy, 19/4, 685-713.

[32] Strange S. (1996) "The Retreat of the State. The Diffusion of Power in the World Economy", CUP, Cambridge.

[33] Wildasin, D. (1986) Urban Public Finance, Harwood Academic Publishers, New York.

[34] Wildasin, D. ( 2005) "Fiscal Competition," Working Papers 2005-05, University of Kentucky, Institute for Federalism and Intergovernmental Relations.

[35] Wilson, J. (1999) "Theories of tax competition," National Tax Journal, 53, 269-304.

[36] Wilson, J. D. (1986) "A Theory of Interregional Tax Competition", Journal of Urban Economics v19, n3, 296-315.

[37] Wooders, M., Zissimos, B.; Dhillon, A. , (2001), Tax Competition Reconsidered, The Warwick Economics Research Paper Series (TWERPS).

[38] Wrede, M. (2001) "Yardstick competition to tame the Leviathan," European Journal of Political Economy, 17, 705-721.

[39] Zodrow, G.R.; Mieszkowski, (1986) "P., Pigou, Tiebout, Property Taxation, and the Underprovision of Local Public Goods" , Journal of Urban Economics, v19, n3, 356-70.

# Appendix

**Table 2. Summary Statistics and Data Sources.**

| Variable | Definition | Source | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|---|---|
| $TOT^*_{it}$ | Per Capita Aggregated Public Expenditure | IMF- GFS | 510 | 7765.738 | 3510.021 | 1454.487 | 17815.45 |
| $DEF^*_{it}$ | Per Capita Public Expenditures in Defense | IMF- GFS | 510 | 453.2789 | 218.6797 | 94.99315 | 950.9248 |
| $EDU^*_{it}$ | Per Capita Public Expenditures in Education | IMF- GFS | 510 | 673.6145 | 431.9319 | 42.18002 | 1744.896 |
| $HEA^*_{it}$ | Per Capita Public Expenditures in Health | IMF- GFS | 510 | 692.8419 | 578.5732 | 14.13589 | 2611.358 |
| $CAPTAX_{it}$ | Statutory Corporate Tax rate | OTPR at otpr.org | 510 | 0.5633353 | 0.1633065 | 0.115 | 0.91 |
| $TIN_{it}$ | Top Income Tax rate | OTPR at otpr.org | 510 | 0.3711412 | 0.1144252 | 0.03 | 0.56 |
| $TRADEGDP_{it}$ | Total Trade as proportion of GDP | WB-WDI | 510 | 74.77028 | 42.36072 | 26.1591 | 258.9947 |
| $FDIGDP_{it}$ | FDI inflows as proportion of GDP | WB-WDI | 418 | 1.539613 | 3.458893 | -.6727549 | 56.86825 |
| $PYOUNG_{it}$ | Proportion of population less than 14 yrs old | WB-WDI | 510 | 20.819 | 3.555802 | 14.37633 | 31.32965 |
| $POLD_{it}$ | Proportion of population more than 65 yrs old | WB-WDI | 510 | 13.767 | 1.880502 | 9.161963 | 17.89806 |
| $PDENS_{it}$ | Population Density | WB-WDI | 510 | 131.2181 | 111.6224 | 11.88694 | 466.4994 |
| $PFEM_{it}$ | Proportion of women | WB-WDI | 510 | 51.09029 | 0.6623244 | 49.7279 | 52.8862 |
| $POPUL_{it}$ | Total population | WB-WDI | 510 | 21,800,000.00 | 24,100,000.00 | 339,800.00 | 82,100,000.00 |
| $GDPPC^*_{it}$ | GDP per capita | WB-WDI | 509 | 21700.75 | 9900.295 | 5947.931 | 71575.19 |
| $GOVPARTY_{it}$ | Left party members in the Government (from 0 to 5) | CPD | 491 | 2.610 | 1.413 | 1 | 5 |
| $ELECT_{it}$ | Election year Dummy | CPD | 510 | .282 | .450 | 0 | 1 |

* Variables are expressed at prices 95.

**Table 3. Summary Statistics of Fiscal Variables: mean by Countries.**

| State | $TOT^*_{it}$ | $DEF^*_{it}$ | $EDU^*_{it}$ | $HEA^*_{it}$ | $CAPTAX_{it}$ | $TIN_{it}$ |
|---|---|---|---|---|---|---|
| AUT | 8926.44 | 238.934 | 851.7853 | 1118.16 | 0.58 | 0.45 |
| BEL | 10789.4 | 544.9941 | 1395.03 | 184.3257 | 0.64 | 0.42 |
| CHE | 8840.73 | 765.1275 | 268.4094 | 1441.846 | 0.25 | 0.11 |
| DEU | 7033.48 | 523.1541 | 52.79612 | 1296.287 | 0.55 | 0.50 |
| DNK | 11099.6 | 608.4646 | 1183.706 | 238.782 | 0.56 | 0.39 |
| ESP | 3532.13 | 155.4136 | 196.6576 | 209.1964 | 0.60 | 0.34 |
| FIN | 7075.57 | 335.3861 | 929.0599 | 527.0771 | 0.50 | 0.36 |
| FRA | 9369.96 | 604.835 | 745.8128 | 1651.906 | 0.59 | 0.44 |
| GBR | 6060.55 | 698.9667 | 175.8224 | 813.8511 | 0.61 | 0.43 |
| GRC | 3471.73 | 380.0008 | 314.9144 | 292.8287 | 0.56 | 0.42 |
| IRL | 4906.49 | 185.3613 | 688.9524 | 792.3411 | 0.61 | 0.42 |
| ITA | 6792.71 | 247.9011 | 590.5705 | 734.663 | 0.62 | 0.30 |
| LUX | 11511.5 | 245.1886 | 1061.874 | 287.7775 | 0.55 | 0.37 |
| NLD | 10782.6 | 575.3349 | 1289.345 | 1340.934 | 0.64 | 0.42 |
| NOR | 9473.67 | 734.8749 | 605.7893 | 500.7318 | 0.45 | 0.28 |
| PRT | 2965.88 | 203.3218 | 261.4009 | 208.2823 | 0.64 | 0.28 |
| SWE | 9385.03 | 658.4817 | 839.5212 | 139.3221 | 0.63 | 0.38 |

## Table 4. Aggregated public expenditures

**Table 4a. Static Model: all sample**
**(IV Estimation*)**

| *Hypotheses* | *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|---|
| *Weights* | *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| $E_{it-1}$ | | | | | | |
| $A_{it}$ | 0.899 | 0.797 | 0.777 | 0.97 | 0.582 | 0.569 |
| | [3.52]*** | [2.94]*** | [2.85]** | [3.16]*** | [3.23]*** | [3.27]*** |
| $elect_{it}$ | -51.313 | -41.917 | -49.358 | -45.702 | -36.095 | -49.707 |
| | [0.51] | [0.42] | [0.47] | [0.45] | [0.36] | [0.49] |
| $womenparl_{it}$ | 25.376 | 25.443 | 27.076 | 25.809 | 16.817 | 23.308 |
| | [1.04] | [1.04] | [1.02] | [1.08] | [0.67] | [1.01] |
| $govparty_{it}$ | 45.57 | 46.727 | 47.221 | 47.742 | 37.344 | 42.93 |
| | [1.22] | [1.27] | [1.22] | [1.40] | [0.95] | [1.18] |
| $EU_{it}$ | 256.998 | 216.812 | 320.231 | 268.78 | 249.732 | 243.196 |
| | [1.17] | [0.97] | [1.24] | [1.18] | [1.07] | [1.09] |
| $gdppc_{it}$ | -0.108 | -0.099 | -0.128 | -0.113 | -0.125 | -0.118 |
| | [1.47] | [1.15] | [1.78]* | [1.40] | [1.40] | [1.55] |
| $tradegdpi_{t-1}$ | -15.987 | -16.482 | -21.68 | -19.638 | -31.349 | -15.615 |
| | [0.90] | [0.91] | [1.22] | [1.09] | [1.75] | [0.86] |
| $pyoung_{it}$ | -161.237 | -172.125 | -104.924 | -268.21 | -365.894 | -208.562 |
| | [1.06] | [1.16] | [0.61] | [1.68] | [2.42]** | [1.40] |
| $pold_{it}$ | -140.047 | -161.451 | -59.301 | -191.812 | -297.172 | -160.741 |
| | [0.78] | [0.83] | [0.30] | [1.03] | [1.47] | [0.86] |
| $popul_{it}*10^3$ | 0.423 | 0.442 | 0.354 | 0.551 | 0.542 | 0.441 |
| | [1.88]* | [2.06]* | [1.54] | [2.54]** | [2.70]** | [2.07]* |
| Observations | 470 | 470 | 470 | 470 | 470 | 470 |
| R-squared | 0.96 | 0.96 | 0.95 | 0.96 | 0.96 | 0.96 |
| AR(1) (p>z) | | | | | | |
| AR(2) (p>z) | | | | | | |
| Hansen p-value | | | | | | |

**Table 4b. Dynamic Model: all sample**
**(LSDV-IV Estimation*)**

| *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.697 | 0.717 | 0.722 | 0.711 | 0.736 | 0.705 |
| [10.62]*** | [12.03]*** | [11.64]*** | [10.97]*** | [13.52]*** | [11.38]*** |
| 0.424 | 0.318 | 0.259 | 0.438 | 0.199 | 0.285 |
| [2.25]** | [2.07]* | [1.77]* | [1.86]* | [2.18]** | [2.00]* |
| -48.576 | -44.492 | -47.292 | -45.967 | -42.771 | -47.903 |
| [0.44] | [0.41] | [0.42] | [0.42] | [0.38] | [0.43] |
| 9.169 | 7.79 | 7.255 | 8.973 | 3.741 | 8.545 |
| [0.54] | [0.48] | [0.45] | [0.58] | [0.22] | [0.54] |
| 46.422 | 46.317 | 45.693 | 47.344 | 42.573 | 45.499 |
| [1.39] | [1.42] | [1.36] | [1.43] | [1.34] | [1.37] |
| 100.858 | 78.592 | 111.907 | 103.974 | 85.996 | 94.698 |
| [1.00] | [0.87] | [1.09] | [1.05] | [1.01] | [0.94] |
| -0.118 | -0.12 | -0.137 | -0.121 | -0.134 | -0.119 |
| [5.89]*** | [5.26]*** | [6.67]*** | [4.80]*** | [5.67]*** | [5.58]*** |
| -13.398 | -14.108 | -16.42 | -15.084 | -19.537 | -12.83 |
| [1.24] | [1.29] | [1.45] | [1.38] | [1.66] | [1.22] |
| -130.6 | -149.572 | -142.816 | -181.644 | -225.765 | -145.571 |
| [1.97]* | [2.22]** | [1.97]* | [2.60]** | [2.97]*** | [2.31]** |
| -80.643 | -88.994 | -55.253 | -102.822 | -134.145 | -89.131 |
| [0.81] | [0.87] | [0.59] | [1.00] | [1.30] | [0.87] |
| 0.251 | 0.264 | 0.244 | 0.309 | 0.301 | 0.253 |
| [2.27]** | [2.37]** | [2.06]* | [2.71]** | [2.44]** | [2.29]** |
| 470 | 470 | 470 | 470 | 470 | 470 |
| 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |

**Table 4c. Dynamic Model: all sample**
**(GMM Estimation*)**

| *Common Trend* | *stick competition nditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographica Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.822 | 0.791 | 0.785 | 0.873 | 0.967 | 0.921 |
| [9.81]*** | [10.25]*** | [7.98]*** | [19.03]*** | [14.33]*** | [18.75]*** |
| 0.610 | 0.624 | 0.466 | 0.606 | 0.223 | 0.295 |
| [2.05]** | [2.08]** | [2.04]** | [2.61]*** | [2.16]** | [2.07]** |
| -18.212 | -38.253 | -26.296 | -23.946 | -22.886 | -37.248 |
| [0.19] | [0.38] | [0.29] | [0.27] | [0.25] | [0.35] |
| 41.842 | 10.127 | -12.121 | 21.732 | 10.755 | 36.615 |
| [1.57] | [0.43] | [0.50] | [1.06] | [0.36] | [1.73]* |
| 37.606 | 4.611 | 25.298 | 16.310 | 25.215 | 21.063 |
| [0.85] | [0.18] | [0.68] | [0.55] | [0.68] | [0.79] |
| 254.751 | 379.126 | 277.501 | 200.068 | 63.175 | 281.659 |
| [0.78] | [1.11] | [0.99] | [0.81] | [0.36] | [0.86] |
| -0.072 | 0.008 | -0.054 | -0.062 | -0.138 | -0.044 |
| [1.57] | [0.24] | [0.90] | [1.48] | [3.18]*** | [1.91]* |
| -6.997 | -8.703 | -8.644 | -11.118 | -22.054 | -13.666 |
| [0.86] | [1.15] | [1.24] | [1.49] | [2.02]** | [1.34] |
| 31.688 | 22.262 | 4.548 | -34.731 | -8.731 | -57.727 |
| [0.75] | [0.81] | [0.16] | [0.99] | [0.23] | [1.08] |
| -170.166 | 6.688 | 30.993 | -122.880 | -145.334 | -180.735 |
| [0.89] | [0.08] | [0.73] | [1.26] | [1.19] | [0.84] |
| 0.032 | 0.073 | 0.113 | 0.136 | -0.138 | 0.123 |
| [0.29] | [0.88] | [0.95] | [2.07]** | [1.41] | [0.85] |
| 470 | 470 | 470 | 470 | 470 | 470 |
| | | | | | |
| 0.01 | 0.009 | 0.013 | 0.027 | 0.22 | 0.018 |
| 0.067 | 0.065 | 0.097 | 0.069 | 0.069 | 0.5 |
| 1 | 1 | 1 | 1 | 1 | 1 |

Robust t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 5. Public Expenditures in Defence

**Table 5a. Static Model: all sample (IV Estimation*)**

| *Hypotheses* | *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|---|
| *Weights* | *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| $A_{it-1}$ | | | | | | |
| $WA_{it}$ | 0.777 | 0.640 | 0.623 | 0.580 | 0.425 | 0.819 |
| | [5.26]*** | [6.17]*** | [5.63]*** | [5.33]*** | [3.91]*** | [5.58]*** |
| $elect_{it}$ | 1.152 | 1.285 | 0.842 | 1.351 | 2.402 | 1.448 |
| | [0.72] | [0.78] | [0.44] | [0.81] | [1.35] | [0.90] |
| $womenparl_{it}$ | -1.072 | -1.406 | -1.898 | -1.230 | -1.157 | -1.198 |
| | [0.54] | [0.66] | [0.87] | [0.62] | [0.47] | [0.57] |
| $govparty_{it}$ | 1.946 | 2.134 | 2.159 | 1.627 | 1.712 | 1.855 |
| | [0.68] | [0.75] | [0.76] | [0.59] | [0.65] | [0.66] |
| $EU_{it}$ | 16.797 | 17.748 | 22.936 | 16.297 | 17.112 | 16.603 |
| | [1.45] | [1.45] | [1.75]* | [1.52] | [1.57] | [1.50] |
| $gdppc_{it}$ | 0.007 | 0.007 | 0.006 | 0.007 | 0.007 | 0.007 |
| | [1.53] | [1.65] | [1.38] | [1.65] | [1.35] | [1.41] |
| $tradegdpi_{t-1}$ | -0.331 | -0.388 | -0.363 | -0.446 | -0.752 | -0.635 |
| | [0.92] | [1.08] | [1.02] | [1.13] | [1.49] | [1.63] |
| $pyoung_{it}$ | -16.418 | -18.692 | -18.540 | -14.846 | -29.116 | -18.593 |
| | [2.20]** | [2.52]** | [2.44]** | [2.10]* | [3.58]*** | [2.43]** |
| $pold_{it}$ | 14.248 | 12.044 | 14.747 | 14.953 | 2.354 | 11.466 |
| | [1.43] | [1.25] | [1.44] | [1.52] | [0.23] | [1.15] |
| $popul_{it}*10^4$ | -0.302 | -0.281 | -0.293 | -0.340 | -0.255 | -0.285 |
| | [3.25]*** | [3.10]*** | [2.73]** | [3.81]*** | [2.82]** | [3.02]*** |
| Observations | 470 | 470 | 470 | 470 | 470 | 470 |
| R-squared | 0.96 | 0.96 | 0.95 | 0.96 | 0.96 | 0.96 |
| AR(1) (p>z) | | | | | | |
| AR(2) (p>z) | | | | | | |
| Hansen p-value | | | | | | |

**Table 5b. Dynamic Model: all sample (LSDV-IV Estimation*)**

| *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.532 | 0.551 | 0.571 | 0.534 | 0.582 | 0.540 |
| [6.41]*** | [6.65]*** | [6.78]*** | [6.42]*** | [7.22]*** | [6.58]*** |
| 0.386 | 0.295 | 0.272 | 0.277 | 0.202 | 0.416 |
| [4.44]*** | [4.93]*** | [3.84]*** | [4.95]*** | [4.06]*** | [5.09]*** |
| 3.152 | 3.299 | 3.183 | 3.269 | 3.911 | 3.315 |
| [1.41] | [1.44] | [1.32] | [1.45] | [1.64] | [1.48] |
| -0.328 | -0.443 | -0.628 | -0.388 | -0.298 | -0.378 |
| [0.27] | [0.36] | [0.51] | [0.32] | [0.22] | [0.31] |
| 1.035 | 1.079 | 1.052 | 0.868 | 0.846 | 0.980 |
| [0.63] | [0.67] | [0.65] | [0.55] | [0.57] | [0.61] |
| 7.620 | 7.821 | 9.706 | 7.457 | 6.821 | 7.328 |
| [1.35] | [1.38] | [1.58] | [1.50] | [1.39] | [1.40] |
| 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 |
| [1.92]* | [2.01]* | [1.76]* | [2.07]* | [1.78]* | [1.82]* |
| 0.126 | 0.126 | 0.158 | 0.082 | -0.041 | -0.029 |
| [0.69] | [0.73] | [1.02] | [0.44] | [0.16] | [0.15] |
| -5.816 | -6.910 | -6.483 | -5.450 | -10.354 | -6.396 |
| [1.29] | [1.58] | [1.50] | [1.28] | [2.31]** | [1.37] |
| 13.048 | 11.753 | 12.908 | 13.156 | 7.518 | 11.782 |
| [2.03]* | [1.92]* | [2.12]* | [2.12]* | [1.30] | [1.88]* |
| -0.158 | -0.141 | -0.141 | -0.174 | -0.125 | -0.149 |
| [2.83]** | [2.59]** | [2.37]** | [3.17]*** | [2.38]** | [2.66]** |
| 470 | 470 | 470 | 470 | 470 | 470 |
| 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 |

**Table 5c. Dynamic Model: all sample (GMM Estimation*)**

| *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.566 | 0.725 | 0.707 | 0.671 | 0.750 | 0.683 |
| [5.40]*** | [10.20]*** | [10.59]*** | [8.38]*** | [9.11]*** | [8.37]*** |
| 0.462 | 0.261 | 0.241 | 0.271 | 0.220 | 0.375 |
| [4.24]*** | [4.95]*** | [3.30]*** | [4.10]*** | [5.20]*** | [5.78]*** |
| 3.855 | 3.946 | 4.179 | 4.779 | 4.868 | 4.246 |
| [1.31] | [1.32] | [1.38] | [1.62] | [1.78]* | [1.55] |
| 1.775 | 0.249 | 0.393 | 0.013 | 0.346 | 0.936 |
| [0.90] | [0.21] | [0.28] | [0.01] | [0.30] | [0.67] |
| 1.960 | 0.748 | 1.370 | 1.564 | 1.322 | 1.716 |
| [1.25] | [0.65] | [1.15] | [1.30] | [1.05] | [1.43] |
| -9.961 | 1.396 | -4.125 | -12.946 | -9.752 | -10.981 |
| [0.62] | [0.17] | [0.60] | [1.17] | [0.98] | [1.11] |
| 0.006 | 0.004 | 0.005 | 0.004 | 0.005 | 0.006 |
| [3.23]*** | [2.75]*** | [3.02]*** | [2.47]** | [3.07]*** | [6.29]*** |
| 1.026 | 0.805 | 0.732 | 0.859 | 0.317 | 0.561 |
| [3.37]*** | [2.97]*** | [2.73]*** | [2.81]*** | [1.22] | [2.45]** |
| 0.418 | 1.481 | -1.569 | 2.586 | -0.415 | 0.696 |
| [0.12] | [0.60] | [0.60] | [0.98] | [0.22] | [0.29] |
| 20.387 | 16.153 | 14.921 | 21.745 | 15.368 | 19.405 |
| [3.05]*** | [4.48]*** | [2.19]** | [3.56]*** | [4.40]*** | [3.47]*** |
| -0.022 | -0.014 | -0.011 | -0.011 | -0.014 | -0.017 |
| [1.70]* | [0.95] | [1.14] | [1.23] | [1.38] | [1.53] |
| 470 | 470 | 470 | 470 | 470 | 470 |
| | | | | | |
| 0.008 | 0.013 | 0.014 | 0.013 | 0.011 | 0.012 |
| 0.322 | 0.226 | 0.232 | 0.271 | 0.233 | 0.265 |
| 1 | 1 | 1 | 1 | 1 | 1 |

Robust t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 6. Public Expenditures in Health

**Table 6a. Static Model: all sample (IV Estimation*)**

| *Hypotheses* | *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|---|
| *Weights* | *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| $E_{it-1}$ | | | | | | |
| $A_{it}$ | 0.805 | 0.811 | 0.745 | 0.311 | 0.477 | 0.895 |
| | [1.20] | [1.50] | [2.39]** | [0.93] | [1.76]* | [1.19] |
| $elect_{it}$ | 3.882 | 3.179 | 6.227 | 4.138 | 6.119 | 4.653 |
| | [0.47] | [0.39] | [0.67] | [0.53] | [0.75] | [0.55] |
| $womenparl_{it}$ | -15.026 | -14.628 | -12.881 | -14.195 | -13.397 | -14.732 |
| | [2.34]** | [2.31]** | [2.03]* | [2.30]** | [2.26]** | [2.33]** |
| $govparty_{it}$ | 18.048 | 16.264 | 20.712 | 17.190 | 17.282 | 18.701 |
| | [1.94]* | [1.68] | [2.45]** | [1.82]* | [1.85]* | [2.02]* |
| $EU_{it}$ | 48.053 | 48.223 | 36.844 | 49.362 | 49.224 | 50.411 |
| | [0.73] | [0.71] | [0.58] | [0.72] | [0.74] | [0.73] |
| $gdppc_{it}$ | 0.044 | 0.045 | 0.053 | 0.044 | 0.046 | 0.043 |
| | [1.86]* | [1.90]* | [2.19]** | [2.12]* | [2.46]** | [1.90]* |
| $fdigdpi_{t-1}$ | -36.834 | -38.997 | -33.911 | -38.981 | -39.888 | -41.116 |
| | [1.88]* | [1.81]* | [1.57] | [1.86]* | [1.84]* | [1.85]* |
| $pyoung_{it}$ | -15.382 | -22.520 | -26.717 | -23.737 | -17.557 | -24.280 |
| | [0.72] | [1.03] | [1.15] | [1.20] | [0.85] | [1.16] |
| $pold_{it}$ | -23.570 | -29.764 | -30.814 | -27.676 | -26.846 | -36.241 |
| | [0.69] | [0.82] | [0.88] | [0.86] | [0.84] | [1.04] |
| $popul_{it}*10^4$ | 0.962 | 0.895 | 0.865 | 0.996 | 0.908 | 0.970 |
| | [3.71]*** | [3.23]*** | [3.05]*** | [4.06]*** | [3.30]*** | [3.63]*** |
| Observations | 470 | 470 | 470 | 470 | 470 | 470 |
| R-squared | 0.96 | 0.96 | 0.95 | 0.96 | 0.96 | 0.96 |
| AR(1) (p>z) | | | | | | |
| AR(2) (p>z) | | | | | | |
| Hansen p-value | | | | | | |

**Table 6b. Dynamic Model: all sample (IV Estimation*)**

| *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.649 | 0.648 | 0.638 | 0.641 | 0.640 | 0.651 |
| [14.54]*** | [14.62]*** | [14.12]*** | [14.13]*** | [13.96]*** | [15.27]*** |
| 0.391 | 0.272 | 0.216 | 0.140 | 0.290 | 0.631 |
| [0.86] | [0.88] | [1.13] | [0.84] | [1.19] | [1.15] |
| 1.864 | 1.487 | 2.382 | 1.945 | 3.321 | 2.556 |
| [0.30] | [0.25] | [0.40] | [0.32] | [0.50] | [0.38] |
| -9.904 | -9.778 | -9.394 | -9.606 | -8.995 | -9.680 |
| [2.67]** | [2.73]** | [2.63]** | [2.75]** | [2.56]** | [2.59]** |
| 10.603 | 9.934 | 11.396 | 10.297 | 10.319 | 11.179 |
| [2.32]** | [2.28]** | [2.61]** | [2.33]** | [2.39]** | [2.42]** |
| 42.248 | 40.893 | 37.216 | 42.590 | 44.301 | 46.224 |
| [1.15] | [1.14] | [1.08] | [1.19] | [1.27] | [1.15] |
| 0.017 | 0.016 | 0.018 | 0.017 | 0.019 | 0.018 |
| [1.38] | [1.40] | [1.55] | [1.51] | [2.00]* | [1.50] |
| -32.873 | -34.203 | -32.881 | -34.032 | -34.329 | -34.997 |
| [1.69] | [1.67] | [1.54] | [1.66] | [1.63] | [1.63] |
| -13.989 | -16.680 | -17.723 | -17.918 | -15.213 | -19.923 |
| [1.29] | [1.42] | [1.58] | [1.47] | [1.35] | [1.50] |
| -10.128 | -12.673 | -12.862 | -12.226 | -12.030 | -18.485 |
| [0.61] | [0.83] | [0.80] | [0.81] | [0.79] | [1.15] |
| 0.709 | 0.686 | 0.686 | 0.728 | 0.681 | 0.714 |
| [4.22]*** | [4.43]*** | [4.53]*** | [4.16]*** | [4.09]*** | [4.10]*** |
| 470 | 470 | 470 | 470 | 470 | 470 |
| 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 |

**Table 6c. Dynamic Model: all sample (GMM Estimation*)**

| *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.806 | 0.707 | 0.737 | 0.744 | 0.754 | 0.762 |
| [18.88]*** | [7.98]*** | [7.54]*** | [7.59]*** | [7.87]*** | [8.86]*** |
| 0.167 | 0.082 | 0.196 | 0.128 | 0.218 | 0.239 |
| [0.70] | [0.20] | [0.72] | [0.50] | [0.56] | [0.56] |
| 1.320 | 0.184 | -0.504 | 1.976 | 2.566 | 1.328 |
| [0.12] | [0.03] | [0.08] | [0.29] | [0.35] | [0.21] |
| -5.151 | -13.119 | -17.448 | -9.789 | -10.562 | -12.900 |
| [2.72]*** | [3.04]*** | [2.74]*** | [1.46] | [1.64] | [2.46]** |
| 5.669 | 4.076 | 4.761 | 8.258 | 7.638 | 5.856 |
| [1.43] | [1.03] | [0.99] | [1.49] | [1.41] | [1.13] |
| 28.587 | 57.693 | 164.563 | 104.718 | 114.875 | 95.447 |
| [1.19] | [1.18] | [1.27] | [0.87] | [1.00] | [1.20] |
| 0.011 | 0.018 | 0.033 | 0.032 | 0.033 | 0.020 |
| [2.09]** | [2.26]** | [2.15]** | [1.57] | [1.72]* | [1.70]* |
| -33.483 | -49.880 | -54.555 | -49.977 | -49.846 | -47.205 |
| [6.37]*** | [2.36]** | [2.10]** | [1.79]* | [1.77]* | [1.97]** |
| 1.482 | 20.114 | 33.102 | 9.154 | 12.229 | 10.771 |
| [0.28] | [1.47] | [1.86]* | [0.64] | [0.98] | [1.15] |
| -18.468 | -32.749 | -49.241 | -36.362 | -36.590 | -37.998 |
| [1.78]* | [1.51] | [1.21] | [1.41] | [1.41] | [1.55] |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| [3.66]*** | [1.16] | [1.00] | [1.52] | [1.46] | [1.39] |
| 470 | 470 | 470 | 470 | 470 | 470 |
| 0.002 | 0.029 | 0.052 | 0.047 | 0.053 | 0.045 |
| 0.361 | 0.28 | 0.233 | 0.246 | 0.236 | 0.258 |
| 1 | 1 | 1 | 1 | 1 | 1 |

Robust t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 7. Public Expenditures in Education

**Table 7a. Static Model: all sample (IV Estimation*)**

| *Hypotheses* | *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|---|
| *Weights* | *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| $E_{it-1}$ | | | | | | |
| $A_{it}$ | 0.876 | 1.176 | 0.752 | 1.791 | 0.549 | 0.587 |
| | [2.87]** | [2.33]** | [1.59] | [1.79]* | [1.66] | [2.57]** |
| $elect_{it}$ | -3.997 | -2.520 | -2.543 | -3.781 | -3.190 | -4.057 |
| | [0.55] | [0.34] | [0.30] | [0.52] | [0.41] | [0.56] |
| $womenparl_{it}$ | 0.130 | -0.166 | 1.284 | 0.836 | -0.399 | 0.064 |
| | [0.02] | [0.03] | [0.22] | [0.15] | [0.08] | [0.01] |
| $govparty_{it}$ | 8.386 | 8.198 | 8.498 | 8.778 | 7.153 | 7.815 |
| | [1.45] | [1.43] | [1.49] | [1.55] | [1.14] | [1.36] |
| $EU_{it}$ | -110.967 | -113.662 | -81.542 | -108.785 | -105.788 | -108.377 |
| | [1.92]* | [1.98]* | [1.37] | [1.86]* | [1.68] | [1.88]* |
| $gdppc_{it}$ | 0.007 | 0.012 | 0.004 | 0.008 | 0.005 | 0.008 |
| | [1.54] | [1.69] | [0.98] | [1.42] | [0.91] | [1.52] |
| $tradegdpi_{t-1}$ | -2.046 | -1.549 | -2.598 | -2.375 | -3.246 | -2.118 |
| | [1.64] | [1.01] | [1.88]* | [1.86]* | [2.67]** | [1.70] |
| $pyoung_{it}$ | -12.043 | -9.350 | -3.279 | -15.695 | -31.414 | -15.106 |
| | [0.73] | [0.57] | [0.22] | [0.96] | [1.50] | [0.89] |
| $pold_{it}$ | -31.986 | -36.948 | -27.145 | -38.498 | -42.985 | -33.279 |
| | [0.87] | [0.85] | [0.74] | [1.01] | [1.03] | [0.90] |
| $popul_{it}*10^3$ | -0.247 | -1.350 | -1.715 | -0.892 | 0.769 | 0.039 |
| | [0.10] | [0.52] | [0.76] | [0.40] | [0.32] | [0.02] |
| Observations | 470 | 470 | 470 | 470 | 470 | 470 |
| R-squared | 0.96 | 0.96 | 0.95 | 0.96 | 0.96 | 0.96 |
| AR(1) (p>z) | | | | | | |
| AR(2) (p>z) | | | | | | |
| Hansen p-value | | | | | | |

**Table 7b. Dynamic Model: all sample (IV Estimation*)**

| *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.794 | 0.792 | 0.780 | 0.793 | 0.791 | 0.792 |
| [12.85]*** | [12.68]*** | [11.98]*** | [12.83]*** | [12.81]*** | [12.58]*** |
| 0.263 | 0.143 | 0.129 | 0.307 | 0.068 | 0.235 |
| [1.31] | [0.97] | [1.94]* | [1.23] | [0.67] | [1.36] |
| -2.105 | -2.100 | -2.022 | -2.195 | -2.181 | -2.044 |
| [0.32] | [0.32] | [0.30] | [0.33] | [0.33] | [0.31] |
| 0.516 | 0.338 | 0.602 | 0.535 | 0.313 | 0.559 |
| [0.21] | [0.14] | [0.24] | [0.22] | [0.13] | [0.23] |
| 5.961 | 5.757 | 5.875 | 5.897 | 5.630 | 5.839 |
| [2.26]** | [2.29]** | [2.25]** | [2.25]** | [2.24]** | [2.27]** |
| -14.836 | -14.153 | -10.438 | -13.739 | -13.269 | -14.856 |
| [0.72] | [0.69] | [0.53] | [0.68] | [0.66] | [0.73] |
| -0.002 | -0.002 | -0.003 | -0.002 | -0.003 | -0.001 |
| [0.50] | [0.52] | [0.75] | [0.57] | [0.64] | [0.36] |
| -1.862 | -1.957 | -2.081 | -2.031 | -2.165 | -1.809 |
| [3.08]*** | [3.02]*** | [2.87]** | [2.94]*** | [2.87]** | [3.10]*** |
| -14.535 | -15.549 | -14.044 | -16.137 | -18.277 | -15.014 |
| [1.84]* | [1.87]* | [1.83]* | [1.94]* | [2.05]* | [1.86]* |
| -12.298 | -11.767 | -10.888 | -12.589 | -12.561 | -13.529 |
| [1.06] | [1.03] | [0.98] | [1.13] | [1.08] | [1.11] |
| 0.796 | 0.846 | 0.669 | 0.822 | 0.110 | 0.811 |
| [0.69] | [0.70] | [0.61] | [0.69] | [0.86] | [0.70] |
| 470 | 470 | 470 | 470 | 470 | 470 |
| 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |

**Table 7c. Dynamic Model: all sample (GMM Estimation*)**

| *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.735 | 0.808 | 0.811 | 0.869 | 0.885 | 0.793 |
| [9.54]*** | [10.65]*** | [18.64]*** | [10.64]*** | [13.13]*** | [13.12]*** |
| 0.615 | 0.703 | 0.461 | 1.109 | 0.209 | 0.599 |
| [1.82]* | [1.97]** | [2.05]** | [1.32] | [1.32] | [1.82]* |
| -0.831 | 0.475 | -0.540 | -1.559 | -0.977 | -1.235 |
| [0.13] | [0.08] | [0.09] | [0.27] | [0.17] | [0.20] |
| -1.103 | 0.663 | -0.247 | 1.284 | 3.022 | 3.619 |
| [0.21] | [0.20] | [0.04] | [0.30] | [0.82] | [0.58] |
| 4.734 | 7.274 | 4.475 | 3.781 | 4.734 | 2.641 |
| [1.70]* | [1.59] | [1.21] | [1.42] | [1.94]* | [0.65] |
| -27.396 | -2.990 | 22.150 | 26.891 | 12.939 | 28.669 |
| [0.73] | [0.09] | [0.58] | [0.49] | [0.29] | [0.53] |
| 0.013 | 0.016 | 0.008 | 0.008 | 0.007 | 0.015 |
| [2.40]** | [2.40]** | [1.51] | [1.21] | [1.29] | [2.40]** |
| -1.271 | -2.211 | -3.260 | -2.676 | -2.809 | -1.632 |
| [1.73]* | [2.34]** | [2.76]*** | [2.71]*** | [2.48]** | [1.79]* |
| -16.788 | -31.341 | -22.708 | -26.385 | -30.786 | -30.422 |
| [1.74]* | [1.96]* | [1.71]* | [2.45]** | [2.43]** | [2.63]*** |
| -23.518 | -25.378 | -41.205 | -24.922 | -30.465 | -48.753 |
| [0.77] | [1.21] | [1.22] | [0.76] | [0.83] | [1.04] |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| [1.28] | [0.36] | [0.62] | [0.79] | [0.96] | [0.03] |
| 470 | 470 | 470 | 470 | 470 | 470 |
| | | | | | |
| 0.079 | 0.052 | 0.068 | 0.063 | 0.07 | 0.09 |
| 0.315 | 0.245 | 0.279 | 0.277 | 0.331 | 0.287 |
| 1 | 1 | 1 | 1 | 1 | 1 |

Robust t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 8. Stautory Tax Rates

**Table 8a. Static Model: all sample (IV Estimation*)**

| *Hypotheses* | *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|---|
| *Weights* | *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| $E_{it-1}$ | | | | | | |
| $A_{it}$ | 1.113 | 1.063 | 1.065 | 1.283 | 1.124 | 1.154 |
| | [5.40]*** | [4.20]*** | [4.11]*** | [6.24]*** | [5.35]*** | [5.24]*** |
| $elect_{it}$ | 0.001 | 0.001 | 0.000 | 0.001 | 0.001 | 0.001 |
| | [0.26] | [0.29] | [0.01] | [0.19] | [0.42] | [0.26] |
| $womenparl_{it}*1$ | 0.244 | 0.217 | 1.309 | 0.712 | 0.856 | 0.287 |
| | [0.13] | [0.11] | [0.63] | [0.33] | [0.44] | [0.15] |
| $govparty_{it}$ | -0.001 | -0.001 | -0.002 | 0.000 | 0.000 | -0.001 |
| | [0.15] | [0.41] | [0.54] | [0.02] | [0.14] | [0.16] |
| $EU_{it}$ | 0.001 | 0.003 | 0.000 | 0.001 | -0.001 | 0.000 |
| | [0.07] | [0.12] | [0.02] | [0.06] | [0.07] | [0.01] |
| $gdppc_{it}10^5$ | 0.034 | -0.079 | 0.065 | 0.193 | 0.128 | 0.106 |
| | [0.10] | [0.20] | [0.17] | [0.59] | [0.38] | [0.30] |
| $tradegdpi_{t-1}*10$ | 0.064 | 0.271 | -0.195 | 0.361 | 0.271 | 0.000 |
| | [0.09] | [0.30] | [0.24] | [0.51] | [0.38] | [0.00] |
| $pyoung_{it}$ | 0.014 | 0.011 | 0.011 | 0.018 | 0.015 | 0.013 |
| | [1.77]* | [1.31] | [1.25] | [2.35]** | [1.82]* | [1.54] |
| $pold_{it}$ | 0.004 | -0.001 | -0.007 | 0.002 | -0.001 | 0.001 |
| | [0.41] | [0.08] | [0.90] | [0.20] | [0.09] | [0.14] |
| $popul_{it}*10^7$ | -0.389 | -0.374 | -0.397 | -0.510 | -0.436 | -0.385 |
| | [4.28]*** | [3.50]*** | [3.43]*** | [5.07]*** | [4.22]*** | [4.00]*** |
| Observations | 470 | 470 | 470 | 470 | 470 | 470 |
| R-squared | 0.96 | 0.96 | 0.95 | 0.96 | 0.96 | 0.96 |

**Table 8b. Dynamic Model: all sample (IV Estimation*)**

| *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.685 | 0.703 | 0.698 | 0.684 | 0.689 | 0.693 |
| [19.46]*** | [23.78]*** | [20.76]*** | [19.33]*** | [21.46]*** | [20.99]*** |
| 0.329 | 0.265 | 0.274 | 0.378 | 0.321 | 0.310 |
| [3.32]*** | [2.97]*** | [2.60]** | [3.63]*** | [3.79]*** | [3.20]*** |
| -0.002 | -0.002 | -0.003 | -0.002 | -0.002 | -0.002 |
| [0.75] | [0.75] | [0.83] | [0.76] | [0.69] | [0.75] |
| 0.235 | 0.238 | 0.519 | 0.380 | 0.416 | 0.255 |
| [0.39] | [0.42] | [0.79] | [0.57] | [0.67] | [0.44] |
| 0.001 | 0.001 | 0.000 | 0.001 | 0.001 | 0.001 |
| [0.56] | [0.45] | [0.28] | [0.63] | [0.56] | [0.56] |
| 0.005 | 0.005 | 0.005 | 0.005 | 0.004 | 0.005 |
| [0.55] | [0.64] | [0.52] | [0.55] | [0.49] | [0.57] |
| -0.129 | -0.177 | -0.137 | -0.824 | -0.106 | -0.121 |
| [1.14] | [1.52] | [1.12] | [0.68] | [0.98] | [1.05] |
| 0.198 | 0.301 | 0.176 | 0.287 | 0.267 | 0.215 |
| [0.59] | [0.85] | [0.53] | [0.91] | [0.82] | [0.63] |
| 0.009 | 0.008 | 0.008 | 0.010 | 0.009 | 0.008 |
| [3.49]*** | [2.93]*** | [2.65]** | [3.75]*** | [3.19]*** | [3.13]*** |
| 0.005 | 0.003 | 0.002 | 0.004 | 0.003 | 0.004 |
| [0.96] | [0.67] | [0.43] | [0.86] | [0.66] | [0.80] |
| -0.195 | -0.184 | -0.191 | -0.230 | -0.206 | -0.190 |
| [5.54]*** | [5.25]*** | [5.67]*** | [5.88]*** | [5.18]*** | [5.17]*** |
| 470 | 470 | 470 | 470 | 470 | 470 |
| 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |

**Table 8c. Dynamic Model: all sample (GMM Estimation*)**

| *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.616 | 0.749 | 0.699 | 0.716 | 0.711 | 0.635 |
| [5.63]*** | [12.91]*** | [8.47]*** | [9.46]*** | [10.18]*** | [7.50]*** |
| 0.371 | 0.231 | 0.274 | 0.207 | 0.247 | 0.345 |
| [2.34]** | [2.07]** | [1.95]* | [1.56] | [1.84]* | [1.97]** |
| -0.003 | -0.003 | -0.003 | -0.003 | -0.002 | -0.003 |
| [0.91] | [0.76] | [0.77] | [0.69] | [0.70] | [0.76] |
| 0.000 | -0.001 | 0.001 | 0.000 | -0.001 | 0.000 |
| [0.08] | [1.01] | [0.59] | [0.24] | [0.37] | [0.03] |
| 0.000 | 0.000 | 0.000 | 0.000 | -0.001 | -0.001 |
| [0.16] | [0.31] | [0.10] | [0.34] | [0.53] | [0.58] |
| 0.059 | 0.018 | 0.012 | 0.045 | 0.028 | 0.040 |
| [1.24] | [1.53] | [1.18] | [1.51] | [1.50] | [1.35] |
| 0.002 | 0.001 | 0.000 | 0.000 | 0.003 | 0.002 |
| [0.78] | [0.41] | [0.05] | [0.01] | [0.81] | [0.58] |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| [0.98] | [0.23] | [0.36] | [0.25] | [0.97] | [0.63] |
| 0.003 | 0.004 | 0.004 | 0.001 | 0.002 | 0.001 |
| [0.55] | [0.92] | [0.86] | [0.29] | [0.46] | [0.22] |
| 0.005 | 0.007 | 0.012 | 0.004 | 0.006 | 0.008 |
| [0.37] | [1.36] | [1.82]* | [0.43] | [0.74] | [0.73] |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| [0.22] | [2.07]** | [1.15] | [1.08] | [1.74]* | [0.73] |
| 470 | 470 | 470 | 470 | 470 | 470 |
| | | | | | |
| 0.1 | 0.004 | 0.005 | 0.007 | 0.006 | 0.009 |
| 0.51 | 0.598 | 0.612 | 0.504 | 0.596 | 0.597 |
| 1 | 1 | 1 | 1 | 1 | 1 |

Robust t statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 9. Income Tax Rates

**Table 9a. Static Model: all sample (IV Estimation*)**

| *Hypotheses* | *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|---|
| *Weights* | *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| $E_{it-1}$ | | | | | | |
| $A_{it}$ | 0.958 | 0.824 | 0.576 | 1.188 | 0.834 | 1.015 |
| | [2.69]** | [2.63]** | [2.39]** | [3.06]*** | [2.83]** | [2.62]** |
| $elect_{it}$ | -0.003 | -0.003 | -0.004 | -0.004 | -0.003 | -0.003 |
| | [0.82] | [0.87] | [1.48] | [1.31] | [0.82] | [0.83] |
| $womenparl_{it}$ | 0.001 | 0.001 | 0.002 | 0.002 | 0.002 | 0.001 |
| | [0.19] | [0.21] | [0.53] | [0.38] | [0.38] | [0.17] |
| $govparty_{it}$ | 0.008 | 0.008 | 0.006 | 0.007 | 0.008 | 0.008 |
| | [1.54] | [1.55] | [1.22] | [1.45] | [1.55] | [1.52] |
| $EU_{it}$ | -0.036 | -0.038 | -0.022 | -0.030 | -0.039 | -0.038 |
| | [1.25] | [1.23] | [0.86] | [1.14] | [1.44] | [1.33] |
| $gdppc_{it}10^5$ | -0.065 | -0.138 | -0.154 | 0.135 | 0.095 | -0.004 |
| | [0.12] | [0.26] | [0.26] | [0.23] | [0.16] | [0.01] |
| $tradegdpi_{t-1}*10$ | 0.297 | 0.596 | 0.974 | 0.513 | 0.961 | 0.214 |
| | [0.23] | [0.41] | [0.78] | [0.46] | [0.81] | [0.19] |
| $pyoung_{it}$ | -0.004 | 0.000 | 0.005 | -0.002 | 0.006 | -0.001 |
| | [0.24] | [0.02] | [0.31] | [0.14] | [0.39] | [0.05] |
| $pold_{it}$ | -0.013 | -0.011 | -0.001 | -0.009 | -0.009 | -0.013 |
| | [0.37] | [0.31] | [0.05] | [0.28] | [0.30] | [0.40] |
| $popul_{it}*10^8$ | 0.740 | 0.400 | 0.460 | 0.940 | -0.060 | 0.670 |
| | [0.40] | [0.22] | [0.26] | [0.49] | [0.03] | [0.36] |
| Observations | 470 | 470 | 470 | 470 | 470 | 470 |
| R-squared | 0.96 | 0.96 | 0.95 | 0.96 | 0.96 | 0.96 |
| AR(1) (p>z) | | | | | | |
| AR(2) (p>z) | | | | | | |
| Hansen p-value | | | | | | |

**Table 9b. Dynamic Model: all sample (LSDV-IV Estimation*)**

| *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.708 | 0.715 | 0.709 | 0.705 | 0.710 | 0.710 |
| [15.27]*** | [14.58]*** | [15.01]*** | [16.47]*** | [15.28]*** | [15.36]*** |
| 0.267 | 0.182 | 0.141 | 0.355 | 0.220 | 0.238 |
| [2.36]** | [2.22]** | [2.01]* | [2.48]** | [1.92]* | [2.08]* |
| -0.004 | -0.004 | -0.005 | -0.005 | -0.004 | -0.004 |
| [0.86] | [0.87] | [0.95] | [0.94] | [0.84] | [0.86] |
| 0.183 | 0.210 | 0.551 | 0.409 | 0.387 | 0.173 |
| [0.12] | [0.13] | [0.34] | [0.25] | [0.24] | [0.11] |
| 0.004 | 0.004 | 0.003 | 0.003 | 0.004 | 0.004 |
| [1.68] | [1.68] | [1.43] | [1.58] | [1.69] | [1.65] |
| -0.006 | -0.005 | -0.002 | -0.004 | -0.006 | -0.006 |
| [0.65] | [0.62] | [0.22] | [0.48] | [0.81] | [0.67] |
| 0.206 | -0.144 | -0.145 | 0.845 | 0.574 | 0.184 |
| [0.12] | [0.08] | [0.07] | [0.43] | [0.28] | [0.10] |
| 0.249 | 1.898 | 2.554 | 0.564 | 2.249 | 0.909 |
| [0.04] | [0.32] | [0.46] | [0.12] | [0.41] | [0.17] |
| 0.004 | 0.005 | 0.006 | 0.005 | 0.007 | 0.005 |
| [0.70] | [0.89] | [1.10] | [0.76] | [1.13] | [0.85] |
| -0.007 | -0.005 | -0.003 | -0.006 | -0.005 | -0.006 |
| [0.62] | [0.47] | [0.31] | [0.57] | [0.52] | [0.56] |
| -0.031 | -0.044 | -0.041 | -0.024 | -0.054 | -0.036 |
| [0.54] | [0.77] | [0.72] | [0.41] | [0.91] | [0.63] |
| 470 | 470 | 470 | 470 | 470 | 470 |
| 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |

**Table 9c. Dynamic Model: all sample (GMM Estimation*)**

| *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|
| *Uniform* | *Geographi Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| 0.530 | 0.667 | 0.615 | 0.434 | 0.490 | 0.543 |
| [4.06]*** | [7.73]*** | [5.22]*** | [3.67]*** | [2.95]*** | [5.57]*** |
| 0.529 | 0.336 | 0.333 | 0.746 | 0.383 | 0.594 |
| [2.97]*** | [2.65]*** | [2.20]** | [3.16]*** | [2.02]** | [3.72]*** |
| -0.006 | -0.008 | -0.008 | -0.008 | -0.007 | -0.003 |
| [1.22] | [1.40] | [1.51] | [1.97]** | [1.76]* | [0.51] |
| 0.008 | -0.001 | 0.002 | 0.009 | 0.007 | 0.005 |
| [1.50] | [0.44] | [0.35] | [1.64] | [1.53] | [1.33] |
| 0.003 | 0.004 | 0.001 | -0.003 | -0.002 | 0.002 |
| [0.64] | [0.85] | [0.16] | [0.49] | [0.30] | [0.78] |
| -0.074 | -0.025 | -0.037 | -0.031 | -0.030 | -0.037 |
| [1.16] | [0.69] | [1.18] | [0.60] | [0.57] | [0.99] |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| [0.75] | [0.37] | [0.98] | [0.86] | [0.09] | [0.96] |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 |
| [0.12] | [0.62] | [0.39] | [0.33] | [1.12] | [0.16] |
| -0.004 | 0.006 | -0.006 | 0.006 | 0.015 | -0.011 |
| [0.40] | [1.11] | [0.44] | [0.46] | [1.49] | [1.01] |
| -0.015 | -0.005 | -0.018 | -0.013 | -0.004 | -0.033 |
| [0.87] | [0.77] | [0.72] | [0.64] | [0.20] | [2.77]*** |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| [0.48] | [0.61] | [0.57] | [0.11] | [0.53] | [1.14] |
| 470 | 470 | 470 | 470 | 470 | 470 |
| 0.01 | 0.012 | 0.007 | 0.015 | 0.016 | 0.017 |
| 0.067 | 0.065 | 0.097 | 0.069 | 0.069 | 0.5 |
| 1 | 1 | 1 | 1 | 1 | 1 |

Robust t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 10. Dynamic Model: testing for Yardstick Competition
**(IV Estimation*)**

| *Fiscal* Choices | *Hypotheses* | *Common Trend* | *Yardstick competition Tax/Expenditure Competition Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|---|---|
| | *Weights* | *Uniform* | *Geographica Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| **TOT** | $E_{it-1}$ | 0.572 | 0.598 | 0.673 | 0.697 | 0.717 | 0.692 |
| | | [9.13]*** | [10.36]*** | [6.69]*** | [10.06]*** | [10.59]*** | [10.90]*** |
| | $elect_{it}*A_{it}$ | 0.552 | 0.635 | 0.584 | 0.666 | 0.545 | 0.373 |
| | | [2.43]** | [2.27]** | [0.83] | [1.98]* | [2.78]** | [1.76]* |
| | $(1-elect_{it})*A_{it}$ | 0.279 | 0.021 | 0.320 | 0.326 | 0.126 | 0.295 |
| | | [2.38]** | [0.08] | [0.92] | [0.96] | [1.03] | [1.11] |
| **DEF** | $E_{it-1}$ | 0.497 | 0.536 | 0.507 | 0.565 | 0.580 | 0.533 |
| | | [4.47]*** | [4.59]*** | [3.76]*** | [6.16]*** | [6.83]*** | [6.10]*** |
| | $elect_{it}*A_{it}$ | 0.723 | 0.651 | 0.983 | 0.525 | 0.342 | 0.787 |
| | | [1.43] | [1.05] | [1.52] | [0.94] | [1.20] | [1.33] |
| | $(1-elect_{it})*A_{it}$ | 0.213 | 0.129 | 0.009 | 0.203 | 0.160 | 0.233 |
| | | [0.83] | [0.41] | [0.04] | [1.02] | [1.38] | [0.88] |
| **HEA** | $E_{it-1}$ | 0.650 | 0.656 | 0.709 | 0.728 | 0.713 | 0.725 |
| | | [14.73]*** | [14.19]*** | [21.22]*** | [15.56]*** | [18.49]*** | [16.24]*** |
| | $elect_{it}*A_{it}$ | 0.403 | 0.674 | 0.362 | 0.593 | 0.655 | 0.944 |
| | | [0.36] | [1.49] | [0.73] | [1.21] | [1.25] | [1.01] |
| | $(1-elect_{it})*A_{it}$ | 0.537 | 0.583 | 0.463 | -0.092 | 0.076 | 0.336 |
| | | [0.75] | [1.00] | [0.94] | [0.49] | [0.27] | [0.46] |
| **EDU** | $E_{it-1}$ | 0.776 | 0.790 | 0.757 | 0.779 | 0.811 | 0.763 |
| | | [14.51]*** | [11.45]*** | [12.37]*** | [14.42]*** | [17.75]*** | [13.93]*** |
| | $elect_{it}*A_{it}$ | 0.663 | 0.344 | 0.574 | 0.886 | 0.019 | 0.569 |
| | | [1.55] | [0.20] | [0.94] | [1.08] | [0.09] | [0.96] |
| | $(1-elect_{it})*A_{it}$ | 0.278 | 0.285 | 0.022 | 0.336 | 0.083 | 0.020 |
| | | [1.44] | [0.29] | [0.12] | [0.81] | [0.30] | [0.06] |
| **CAPTAX** | $E_{it-1}$ | 0.657 | 0.658 | 0.665 | 0.684 | 0.661 | 0.685 |
| | | [13.49]*** | [14.44]*** | [15.27]*** | [19.33]*** | [12.80]*** | [18.64]*** |
| | $elect_{it}*A_{it}$ | -0.182 | -0.768 | -0.430 | 0.007 | 1.288 | -0.239 |
| | | [0.15] | [0.82] | [0.48] | [0.01] | [1.40] | [0.12] |
| | $(1-elect_{it})*A_{it}$ | 0.720 | 0.955 | 0.674 | 0.544 | 0.074 | 0.589 |
| | | [1.28] | [2.12]* | [1.83]* | [1.42] | [0.24] | [0.73] |
| **TIN** | $E_{it-1}$ | 0.617 | 0.663 | 0.714 | 0.679 | 0.694 | 0.673 |
| | | [7.56]*** | [10.92]*** | [10.29]*** | [9.90]*** | [13.55]*** | [9.58]*** |
| | $elect_{it}*A_{it}$ | 1.414 | 0.063 | 0.144 | 1.838 | 0.875 | 1.445 |
| | | [1.70] | [0.08] | [0.14] | [1.24] | [1.03] | [1.40] |
| | $(1-elect_{it})*A_{it}$ | 0.344 | 0.466 | 0.092 | -0.206 | 0.035 | -0.030 |
| | | [0.87] | [0.79] | [0.25] | [0.38] | [0.10] | [0.10] |

Robust t statistics in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 11. Dynamic Model: testing for EU effect

**(IV Estimation*)**

| *Fiscal* Choices | *Hypotheses* | *Common Trend* | *Yardstick competition* *Tax/Expenditure Competition* *Esternality* | | | | *Tax/Expenditure Competition* |
|---|---|---|---|---|---|---|---|
| | *Weights* | *Uniform* | *Geographica Distance* | *GDP Distance* | *GDP* | *EU* | *Openess* |
| | $E_{it-1}$ | 0.637 | 0.663 | 0.670 | 0.680 | 0.674 | 0.678 |
| | | [10.83]*** | [14.80]*** | [12.12]*** | [20.04]*** | [17.19]*** | [13.34]*** |
| **TOT** | $EU_{it}*A_{it}$ | 0.279 | 0.517 | 0.165 | 0.436 | 0.370 | 0.191 |
| | | [1.27] | [1.88]* | [0.66] | [3.22]*** | [3.04]*** | [1.16] |
| | $(1-EU_{it})*A_{it}$ | 0.935 | 0.375 | 0.615 | 0.290 | 0.410 | 0.710 |
| | | [2.73]** | [0.66] | [1.76]* | [0.96] | [2.34]** | [2.01]* |
| | $E_{it-1}$ | 0.505 | 0.525 | 0.556 | 0.556 | 0.572 | 0.543 |
| | | [4.59]*** | [4.54]*** | [6.40]*** | [6.40]*** | [6.84]*** | [6.63]*** |
| **DEF** | $EU_{it}*A_{it}$ | 0.240 | 0.296 | 0.024 | 0.024 | 0.267 | 0.267 |
| | | [1.20] | [2.48]** | [0.10] | [0.10] | [3.58]*** | [2.15]** |
| | $(1-EU_{it})*A_{it}$ | 0.585 | 0.281 | 0.529 | 0.529 | 0.133 | 0.588 |
| | | [2.09]* | [1.60] | [1.52] | [1.52] | [1.77]* | [2.50]** |
| | $E_{it-1}$ | 0.670 | 0.661 | 0.738 | 0.697 | 0.718 | 0.706 |
| | | [10.05]*** | [13.12]*** | [12.87]*** | [16.51]*** | [19.06]*** | [16.74]*** |
| **HEA** | $EU_{it}*A_{it}$ | 0.568 | 0.717 | 0.744 | 0.118 | 0.444 | 0.481 |
| | | [0.74] | [1.08] | [1.08] | [0.67] | [1.30] | [0.85] |
| | $(1-EU_{it})*A_{it}$ | 0.285 | 0.394 | 0.530 | 0.256 | 0.107 | 0.756 |
| | | [0.49] | [1.17] | [1.58] | [1.23] | [0.54] | [1.16] |
| | $E_{it-1}$ | 0.840 | 0.781 | 0.796 | 0.795 | 0.802 | 0.788 |
| | | [9.48]*** | [9.51]*** | [8.34]*** | [10.65]*** | [12.35]*** | [10.01]*** |
| **EDU** | $EU_{it}*A_{it}$ | 0.540 | 0.273 | 0.122 | 0.477 | 0.158 | 0.263 |
| | | [1.55] | [1.30] | [0.80] | [0.97] | [1.14] | [1.01] |
| | $(1-EU_{it})*A_{it}$ | -0.063 | 0.356 | 0.059 | 0.401 | -0.134 | 0.291 |
| | | [0.10] | [1.32] | [0.27] | [0.64] | [1.40] | [1.33] |
| | $E_{it-1}$ | 0.637 | 0.663 | 0.670 | 0.680 | 0.674 | 0.678 |
| | | [10.83]*** | [14.80]*** | [12.12]*** | [20.04]*** | [17.19]*** | [13.34]*** |
| **CAPTAX** | $EU_{it}*A_{it}$ | 0.279 | 0.517 | 0.165 | 0.436 | 0.370 | 0.191 |
| | | [1.27] | [1.88]* | [0.66] | [3.22]*** | [3.04]*** | [1.16] |
| | $(1-EU_{it})*A_{it}$ | 0.935 | 0.375 | 0.615 | 0.290 | 0.410 | 0.710 |
| | | [2.73]** | [0.66] | [1.76]* | [0.96] | [2.34]** | [2.01]* |
| | $E_{it-1}$ | 0.634 | 0.668 | 0.718 | 0.709 | 0.709 | 0.706 |
| | | [10.45]*** | [11.11]*** | [14.70]*** | [15.66]*** | [16.43]*** | [15.29]*** |
| **TIN** | $EU_{it}*A_{it}$ | 0.465 | 0.148 | 0.040 | 0.218 | 0.166 | 0.128 |
| | | [1.94]* | [0.40] | [0.28] | [1.52] | [1.34] | [0.81] |
| | $(1-EU_{it})*A_{it}$ | 0.828 | 0.510 | 0.247 | 0.601 | 0.338 | 0.767 |
| | | [2.92]** | [1.86]* | [1.20] | [1.82]* | [2.04]* | [2.23]** |

Robust t statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

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