FISCAL STRATEGIC INTERACTIONS AND INCUMBENCY ADVANTAGE *

Catarina Alvarez
University of Barcelona and IEB

Susana Peralta
Nova School of Business and Economics

June 2014

Abstract

This paper provides empirical evidence for the impact of incumbency advantage on the degree of fiscal interaction among local governments. Our main hypothesis is that mayors who enjoy an electoral incumbency advantage are less politically sensitive to how fiscal policy is set in neighboring jurisdictions. In the Portuguese local elections, the majority of incumbents are always able to be reelected. Moreover, until 2013, mayors were not facing binding term limits, providing us an excellent experimental setting to test our hypothesis empirically. We study property tax-setting decisions of 278 Portuguese municipalities during the period 2003-2011 and we identify a larger interaction effect in municipalities governed by mayors in their first term in office than in those where mayors are already in their second or higher term.

*Preliminary and incomplete: Please do not quote.

1 Introduction

Strategic interaction among governments has become a relevant issue in public economics, particularly in local governance, and it can be explained expenditures spillovers, tax or welfare competition, or yardstick competition. In general, when the degree of interaction between local governments does not depend on the political process, the reason is related with expenditure spillovers or with tax/welfare competition. In contrast, yardstick competition results when incumbents are politically sensitive to their neighbors' fiscal policy decisions. Besley and Case (1995) apply the concept of yardstick competition to a political economy model where voters choose whether or not to reelect incumbents based on their performance while in office, which is evaluated using information about neighboring jurisdictions. The theoretical prediction is that the reelection outcome is affected both by the jurisdiction's own tax policy and by that of its neighbors. Moreover, incumbents who face binding term limits or who are relatively more confident about their chances of reelection, would enjoy more freedom when setting their fiscal policies, not being concerned about their neighbors' decisions. The hypothesis of yardstick competition has been widely tested empirically either by evaluating the impact on local elections of fiscal policy decisions in both own and neighboring jurisdictions, or by analyzing whether the degree of interaction among governments is significantly greater for those where the incumbent is politically sensitive to fiscal policy changes than for those where she is not. In general, an incumbent politician is defined as being less politically sensitive if she is facing a binding term limit or has the support of a large majority. However, no study has yet explored the impact of incumbency advantage on the degree of fiscal interaction among local governments. Thus, our main hypothesis is that an incumbent who enjoys some incumbency advantage, should also be less politically sensitive to how fiscal policy is set neighboring jurisdictions. In the Portuguese local elections, the majority of incumbents are always able to be reelected. Moreover, until 2013, mayors were not facing binding term limits and could be elected to be in office indefinitely. Consequently, in 2013, some Portuguese mayors were in office for twenty or thirty years, or even some since the first local elections in 1976. This provides us a great empirical setting to test the impact of incumbency advantage on fiscal strategic interaction that has never been studied. Hence, we aim to provide empirical support for yardstick competition among Portuguese municipalities, under the hypothesis that an incumbent who is in office for a large number of terms would be less politically sensitive to fiscal decisions in neighboring jurisdictions than those that are in their first term. For that, we exploit a panel data set consisting of 278 Portuguese municipalities (in Mainland Portugal) over the period 2003 to 2011 to investigate whether there is strategic interaction in the property tax setting decisions and how the degree of interaction is affected by incumbency advantage. Inspired in Elhorst and Fréret (2009), we build a two-regime spatial Durbin model with fixed effects with an innovative classification of the two political regimes based on mayors' political tenure in office. We identify a larger interaction effect in municipalities where mayors are in office for the first term than in those governed by mayors in their second or higher term, providing strong empirical support of yardstick competition among Portuguese municipalities. The remainder of this work is organized as follows. Section 2, reviews both the theoretical and empirical literature on yardstick competition. In section 3, we explain the Portuguese local finance. In section 4, we present our data and the empirical analysis, where we first estimate our model by maximum likelihood finding empirical evidence for strategic interaction and then the two-regime spatial Durbin model based on incumbency advantage, finding empirical evidence of yardstick competition among local governments in Portugal. Section 5 concludes.

2 Literature Review

Strategic interaction among governments has become a relevant issue in public economics, particularly in local governance. In the past years, this literature has experienced a significant development both at the theoretical and empirical level, becoming a crucial subject to analyze when studying the functioning of local governments. Brueckner (2003) reviews the different models of strategic interaction, which have different structures and present different justifications for the interdependence; however, all generate a jurisdictional reaction function that can be estimated empirically. Local governments may interact strategically when setting their fiscal policies mainly due to expenditures spillovers, tax or welfare competition, or due to yardstick competition. Firstly, expenditure spillovers across jurisdictions may happen when residents in one jurisdiction effectively consume public goods provided by their own government along with those provided by their neighboring jurisdictions. Secondly, strategic interaction is also explained by welfare competition (Wildasin, 1991; Brueckner, 2000) or tax competition [Wilson (1999) surveys this literature]. However, the latter models are the most common and relevant in the literature, where local governments use a tax on mobile capital to finance public spending, creating "capital fights" and, consequently, under-provision of public goods. Finally, other important models of strategic interaction are those of yardstick competition, which involve information spillovers across jurisdictions. Besley and Case (1995) apply the concept of yardstick competition to the political economy of tax setting in a multijurisdictional world by presenting a model of tax competition where voters choose whether or not to reelect incumbents based on their performance while in office, which is evaluated using information about neighboring jurisdictions. Their main assumption is that voters make comparisons between states and that incumbents may set taxes taking into account the behavior of other neighboring states. It is a model of asymmetric information between voters and politicians: politicians are assumed to know more about cost of providing public services than the voters and differ in their type. Good politicians do not rent-seek, contrarily to bad politicians, who finance their selves at the expenses of the taxpayers. However, voters are not able to distinguish between the two. The authors show that if correlated shocks affect neighboring jurisdictions, then it is reasonable for voters to evaluate comparatively their incumbent's performance. The theoretical prediction is then for the reelection performance to be affected both by the jurisdiction's own tax policy and by that of its neighbors. Moreover, incumbents who face binding term limits or who are relatively more confident about their chances of reelection, would enjoy more freedom when setting their fiscal policies, not being concerned about their neighbors' decisions. Empirically, the hypothesis of yardstick competition can be corroborated either by evaluating the impact on local elections of fiscal policy changes in both own and neighboring jurisdictions (Besley and Case, 1995; Revelli, 2002) or by analyzing whether the degree of interaction among governments is significantly greater for those where the incumbent is politically sensitive to fiscal policy changes than for those where she is not. This hypothesis has been widely studied empirically, applying diverse approaches and for different countries. Elhorst and Fréret (2009) provide significant empirical support of yardstick competition in France, using data on welfare spending by 93 French departments during 1992-2000 and developing an original econometric design. They also review previous related empirical studies, presenting the strengths and weakness of the different modeling approaches. The first approach mentioned is that used, for example, by Besley and Case (1995) or Revelli (2006), which consists of a two-equation spatial lag model and tests whether the degree of interaction differs significantly in both equations. The second approach is a spatial lag model, where only one equation is estimated, including cross-product variables between the spatially lagged dependent variable and the political variables and testing whether their coefficients are significant (Case, 1993; Schaltegger and Küttel, 2002; Solé-Ollé, 2003). Lastly, the third approach is based on a two-regime spatial lag model and tests whether there is significant difference between the degree of interaction in a regime where the incumbent is politically sensitive to fiscal policy changes and a regime where she is not (Allers and Elhorst, 2005; Bordignon et al., 2003). Elhorst and Fréret (2009) point the latter approach as the strongest, given its estimation method based on maximum likelihood, but consider as its weakness the fact that existing studies are based on cross-sectional data, providing possible biased estimators because they cannot control for spatial and time-period fixed effects (Baltagi, 2005). In response to this weakness, the authors present a two-regime spatial Durbin model including both types of fixed effects. In general, empirical studies of yardstick competition based on the differences in the degree of interaction between two political regimes define an incumbent as being less politically sensitive if she is facing a binding term limit or has the support of a large majority. However, given that in most countries mayors face term limits, no study has yet analyzed the impact of political seniority on the degree of fiscal interaction among local governments. Thus, our paper aims to contribute to literature by studying exactly that and taking advantage of the fact that in Portugal, until 2013, mayors were not facing binding term limits and could run for office countless times.

3 Portuguese Local Finance

Portugal is in a progress of decentralization since the reestablishment of democracy, in April of 1974, but it can still be considered among the most centralized countries in the European Union (EU). Portuguese local governments have control over their budget - subject to common laws and regulations - but they do not have much leeway to influence the amount of their revenue. The local revenue sources consist essentially of local taxes, transfers from the central and regional governments, and transfers from the EU. Regarding local taxes, the majority of the revenues come from: the tax on transfers of real estate (IMT – *Imposto Municipal sobre as Transmissões Onerosas de Imóveis*); the local property tax (IMI — *Imposto Municipal sobre Imóveis*); the personal income tax (IRS – *Imposto sobre o Rendimento de pessoas Singulares*); and a municipal surcharge on corporate income tax (*Derrama*). Table 1 presents the main components of the current revenues of the Portuguese local governments (Mainland) in 2011 and we can observe that transfers from central government and EU (local funds) and the revenues of the property tax (IMI) present the highest shares (very similar in value), both significantly greater than the share of any other local source of revenue.

Table 1: Current Revenues of Local Governments in Mainland Portugal, 2011

Main Components	TEUR	Share (%)
Local Funds	1 191 155	22.03
Property Tax (IMI)	1 135 799	21.01
Local Fees	659 484	12.20
Onerous Transfer Tax (IMT)	484 880	8.97
Personal Income Tax	363 066	6.71
Local Surcharge	248 897	4.60
Circulation Tax	176 620	3.27

Source: INE Regional Statistical Yearbook of 2012.

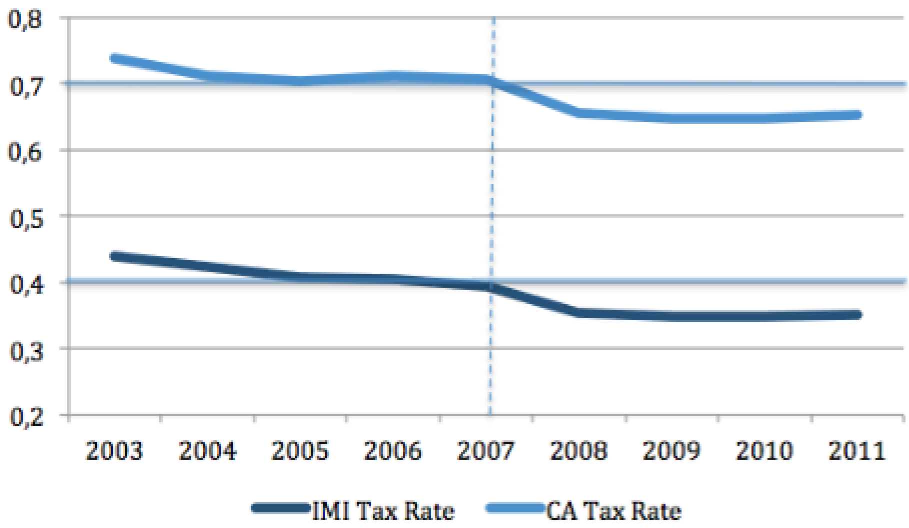
The major source of revenues at the local level are the transfers received form the central government or from the EU, but over which local authorities have limited discretion since the amount received is decided by rules and parameters not influenced by the local authorities. The other important component of receipts of the Portuguese local governments is the property tax (IMI) and since it was implemented, 2003, it has represented a significant share of the local current receipts. The current property tax, IMI, was introduced as a result of a general reform of the Portuguese tax system. It substituted the previous property tax, *Contribuição Autárquica* (CA), implemented in 1989, and implied the implementation of a new evaluation code to compute the buildings' assessed value – *Código do IMI* (CIMI). After its introduction, it was established that by 2013 every real estate property had to be evaluated according to the CIMI and it was automatically applied to every real estate property not already evaluated by the previous code. For the other cases, the value would be gradually updated through a monetary correction and different tax rate is applied. Therefore, with this reform three different property tax rates were set depending on the type of building: for rural property (Rural), to urban buildings non-evaluated (CA[1]), and to urban buildings already evaluated according to the new code (IMI). Local authorities have some discretionary power over the property tax and every year they set tax rate within an interval common to every municipality. However, it is the Portuguese parliament that sets the official rules regarding the property tax system, including the minimum and the maximum bounding the tax rates. Table 2 presents the minimum and maximum values for these tax rates since 2003.

Table 2: Property Tax Rates: Minimum and Maximum Values

Year	IMI		CA		Rural
	Min	Max	Min	Max	
Before 2003	-	-	0.70%	1.30%	0.80%
2003-2007	0.20%	0.50%	0.40%	0.80%	0.80%
2008-2011	0.20%	0.40%	0.40%	0.70%	0.80%

In 2007, there was a reform in the local finance law and it was established a decrease one percentage point in the maximum boundary of the urban property tax, for both evaluated and non-evaluated buildings, as it is illustrated in Table 2. Figure 1 displays the evolution of the average of both property tax rates, IMI and CA, since 2003 until 2011 and we can observe that, on average, the tax rates are set above their minimum and very close to its maximum. For the purpose of this study, mainly for simplicity sake, we will focus just on the new property tax (IMI) on evaluated builds, given its greater importance and the redundancy of the analysis of the tax on non-evaluated buildings whose evolution mimics the evolution of IMI, as we can observe in Figure 1.

[1] Since these buildings were still assessed according to evaluation code of the previous property tax, *Contribuição Autárquica* (CA).



Source: INE Regional Statistical Yearbooks of 2004-2011.

Figure 1: Evolution of the property tax rates: IMI and CA[2]

Table 3 shows the variation of the property tax rates, indicating for each year the number of municipalities that kept the tax rate constant and those that changed, increased or decreased, and the average change for each case. We can notice a significant variation of the tax rates every year and since this property tax was implemented, suggesting it as relevant instrument of local fiscal policy and, particularly, for political competition.

Table 3: Variation in the Property Tax Rates (IMI)

Year	No Change	Change				
		Decreased		Increased		Average
		Number	Average	Number	Average	
2004	220	45	-0.144	13	0.131	-0.0828
2005	197	63	-0.113	18	0.144	-0.0562
2006	231	32	-0.068	15	0.123	-0.0069
2007	226	46	-0.075	6	0.067	-0.0585
2008	141	136	-0.082	1	0.1	-0.0803
(at max in 2007)		(61)	(-0,102)			
2009	233	38	-0.0667	7	0.076	-0.0445
2010	258	10	-0.0605	10	0.075	0.0072
2011	253	6	-0.0733	19	0.067	0.0332

[2]We represent the new Local Governments Law of 2007 by the vertical dashed line and highlight the respective change in the maximum boundary by the two blue horizontal lines.

4 Data and Empirical Identification

Our main aim is to find empirical evidence supporting the existence of yardstick competition among Portuguese municipalities (mainland). To achieve this goal, we exploit a panel data set consisting of 278 Portuguese municipalities over the period 2003 to 2011 to investigate whether there is strategic interaction in tax setting decisions, particularly for the property tax (IMI), and how this strategic interaction is affected by incumbency advantage. Our prediction is that a mayor who has already been in office for at least one term is not so concerned about election outcomes and, therefore, his tax setting decisions are not affected by those of his neighbors.

We build an empirical model where the property tax rates are assumed to be set depending on a series of local characteristics, as well as on the tax rates of the neighboring jurisdictions. Hence, the (urban) property tax rate is explained by a group of explanatory variables, which include structural, demographic and political characteristics. Table 4 presents the summary statistics.

Table 4: Summary Statistics

Variable	Obs.	Mean	St. Dev.	Min	Max
Tax IMI (‰)	2502	3.85	.89	2	5
Population	2502	36.07	57.84	1.81	560.42
Young (%)	2502	14.09	2.53	5.84	21.85
Old (%)	2502	22.65	6.73	9.02	44.40
Unemployment Rate	2502	6.53	2.33	1.44	16.93
Electric Energy Consumption pc	2502	4.27	4.75	1.24	66.56
Total Grants pc	2502	.48	.34	.06	2.27
IMT Revenues pc	2502	.04	.06	0	.70
Left (=1)	1281				
Majority (=1)	1476				

In a first stage of our empirical study, we analyze whether there is strategic interaction in the property tax setting among neighboring jurisdictions by including the neighbors' tax rates as an explanatory variable in our model. We find the coefficient of this variable always positive and statistically significant, implying a positive correlation between tax rates among municipalities and, therefore, supporting empirically the existence of strategic interaction. Furthermore, we find that all political variables affect significantly the property tax decision.

Considering these results, we then propose to identify explicitly the yardstick competition behavior and verify our key hypothesis that strategic interaction in tax setting decisions is reduced in the presence incumbency advantage. For this, we exploit the difference in the sample between mayors with different political tenure, following the rationale that if the strategic interaction in taxes is due to yardstick competition, we should find a weaker correlation among those municipalities where mayors enjoy some incumbency advantage.

4.1 Strategic Interaction

Firstly, we analyze whether there is strategic interaction in the property tax setting among neighboring jurisdictions by including the neighbors' tax rates as an explanatory variable in our model. In other words, we are interested in estimating empirically the reaction function that gives us the value of the property tax of a municipality as a function of spatially weighted property tax decisions of neighboring municipalities. However, this estimation poses some econometric problems studied extensively in the last years by spatial econometrics.

Spatial econometrics deals with interaction effects among geographical units, such as countries, states, regions, municipalities or neighborhoods. Elhorst (2014) reviews the several models put forward in the literature, where we can distinguish three types of interaction effects: endogenous interaction effects among the dependent variable, exogenous interaction effects among the independent variables, and interaction effects among the error terms. A full model with all types of interaction effects takes the form:

$$y_{it} = \rho \sum_{i \neq j} w_{ij} y_{jt} + \mathbf{x_{it}} \beta + \sum_{\mathbf{i \neq j}} w_{ij} \mathbf{x}_{jt} \theta + \delta_t + m_i + u_{it} \tag{1}$$

with

$$u_{it} = \lambda \sum_{i \neq j} w_{ij} u_{jt} + \varepsilon_{it} \tag{2}$$

where $\sum_{i \neq j} w_{ij} y_{jt}$ are the endogenous interaction effects among the dependent variable, $\sum_{i \neq j} w_{ij} \mathbf{x}_{jt}$ the exogenous interaction effects among the independent variables, and $\sum_{i \neq j} w_{ij} u_{jt}$ the interaction effects among the error terms of the different spatial units. ρ is often called the spatial autoregressive coefficient and λ the spatial autocorrelation coefficient, whereas β and θ are just unknown parameters associated to the independent variables contained in a K x 1 vector. w_{ij} is an element of the spatial weight matrix W, a nonnegative N x N matrix of known constants describing how the spatial units are arranged in the sample, and since no unit can be viewed as its own neighbor, its diagonal is composed by zero elements. Finally, m_i are the spatial fixed effects and δ_t the time-period fixed effects.

Manski (1993) argues that all the three interaction effects should be included simultaneously, but to avoid the problem of unidentified parameters at least one of the effects should be excluded. Thus, in the literature, we often find spatial models including just one or two types of interaction effects. Using LeSage and Pace (2009) terminology, the model including only interaction effects in the dependent is called a spatial autoregressive (SAR) model, the model including only interaction effects in the error term is denominated the spatial error model (SEM), and the model including both the interaction effects in the dependent and independent variables is named the spatial Durbin model (SDM). However, LeSage and Pace (2009) claim that the best option to produce unbiased coefficient estimates is the latter model, i.e. to exclude just the interaction effect in the error term, even if the true data generation process includes all the three effects.

Three methods have been developed to estimate models that include interaction effects. One is based on maximum likelihood (ML) or quasi-maximum likelihood (QML), one on instrumental variables or generalized method of moments (IV/GMM), and one on the Bayesian Markov Chain Monte Carlo (MCMC) approach. Anselin (1988), Lee (2004), Kelejian and Prucha (1998), and LeSage and Pace (2009) review the different approaches. Regarding the empirical studies of yardstick competition, the estimation methods rely either on IV techniques or on ML estimators. Specifically, the studies based on the two-equation or on the cross-product spatial lag model are estimated using IV, while the two-regime spatial lag models are estimated using the ML. Elhorst and Fréret (2009) points out the ML estimation as one of the biggest strengths of the two-regime spatial models in studying yardstick competition, since the coefficient of the interaction effect is restricted by the Jacobian term in the log-likelihood function and so will not take values outside the interval on which it is defined.

Following this argument, our identification strategy relies on the ML estimation of a two-regime spatial lag model. We start by estimating the model without spatial interaction effects in order test the inclusion of spatial interaction effects and to decide which effects would be more appropriate to include. For that, we use both the classic and the robust LM test whether we should use the spatial lag model or the spatial error model. Table 5 shows the results using a panel dataset of 278 Portuguese municipalities over the period 2003-2011 and with the Portuguese property tax rate (IMI) as dependent variable.

Regarding the results using the classic LM test, we obtain that both the hypothesis of no spatially lagged dependent variable and the hypothesis of no spatially auto-correlated error term must be rejected at 1 percent significance, independently on the inclusion of spatial and/or time-period fixed effects. A similar result is obtained using the robust LM test for the hypothesis of no spatially lagged dependent variable – except for the case when both spatial and time-period fixed effects are included, in which this hypothesis would be rejected at 5 percent significance. However, not consensual results are obtained when the robust LM test is used to test the hypothesis of no spatially auto-correlated error term: it must not be rejected neither when no fixed effects are included nor when only time-fixed effects are included; whereas it must be rejected at 1 percent significance with just spatial fixed effects and at 10 percent significance with both spatial and time-period fixed

Table 5: OLS Estimates: Inclusion of Spatial Interaction Effects

Dependent Variable: IMI	(1)	(2)	(3)	(4)
	No Fixed Effects	Spatial FE	Time-period FE	Spatial and Time FE
Population	0.000905	-0.062500	0.001003	-0.008864
	(2.755)	(-7.613)	(3.299)	(-1.148)
Young	0.062409	0.102941	0.002973	-0.010712
	(3.769)	(4.514)	(0.190)	(-0.499)
Old	0.012691	-0.138770	-0.006251	0.036693
	(1.668)	(-8.017)	(-0.879)	(2.097)
Unemp. Rate	-0.009277	-0.039120	0.015412	-0.009649
	(-1.254)	(-4.158)	(2.099)	(-0.922)
Electric pc	0.007363	-0.032496	0.009222	-0.004470
	(2.103)	(3.095)	(2.845)	(-0.468)
Grants pc	-0.000860	-0.002359	-0.000748	0.000794
	(-9.919)	(-11.023)	(-9.243)	(3.235)
Left	0.185822	0.264197	0.180116	0.228517
	(5.590)	(5.408)	(5.854)	(5.210)
Majority	0.079239	0.053280	0.094121	0.008081
	(2.325)	(1.840)	(2.981)	(3.106)
IMT pc	0.831439	-0.955830	1.077323	-0.586583
	(3.054)	(-2.506)	(4.233)	(-1.661)
Constant	2.912201			
	(7.378)			
LM No Spatial Lag	337.57***	302.80***	69.20***	9.04***
LM No Spatial Error	314.05***	196.19***	54.11***	7.75***
Robust LM No Sp. Lag	25.46***	156.46***	16.82***	4.27**
Robust LM No Sp. Error	1.94	49.84***	1.73	2.98*
Log-Likelihood	-3003.8	-1697.4	-2809.8	-1423.3
R-squared	0.1897	0.7148	0.3061	0.7709
Corrected R2	-	0.2448	0.1903	0.0236

Note: T-statistics are in parentheses. *, ** and *** denote 10%, 5% and 1% significance, respectively.

effects.

This analysis highlights the importance of the decision to control for spatial and/or time-period fixed effects. First, by performing a LR test we can investigate whether the spatial fixed effects are jointly insignificant and the results indicate that we must reject this hypothesis (2772.8, with 278 degrees of freedom [df], $p < 0.01$). Second, using the same test we obtain that the hypothesis that the time-period fixed effects are jointly insignificant must also be rejected (548.1, with 9 degrees of freedom [df], $p < 0.01$). These results justify then the extension of the model with spatial and time-period fixed effects, the two-way fixed effects model (Baltagi, 2005).

Since the non-spatial model is rejected in favor of both the spatial lag model and the spatial error model, one must be careful in deciding which spatial interaction effects to include. LeSage and Pace (2009) recommend to also consider the spatial Durbin model, which extends the spatial lag model with spatially lagged independent variables. Further, we can test whether this model can be simplified either to a spatial lag model or to a spatial error model. Table 6 presents the estimation results using the spatial Durbin specification, where in first column the model is estimated using the direct approach and the second column is estimated following the bias correction procedure.

Although we do not observe major differences on the coefficients of the independent variables (X) and lagged independent variables (WX) nor on their significance, the coefficient of the lagged dependent variable appears to be sensitive to the bias correction procedure, increasing in value and in its significance.

Furthermore, in order to test the hypothesis whether the spatial Durbin model can be simplified to a spatial lag model or to a spatial error model, we perform a Wald and LR tests. Regarding the bias corrected model in the second column, we obtain that both hypotheses must be rejected in favor of the spatial Durbin model. Regarding whether the spatial Durbin could be simplified to a spatial lag model both tests indicate that it must rejected at 5 percent significance (Wald test: 18.57, 2 df, p = .029; LR test: 21.10, 2 df, p = .012). Similarly, we obtain that the hypothesis whether the spatial Durbin could be simplified to a spatial error model must be rejected at 5 percent significance with the Wald test (19.61, 2 df, p = .020) and 1 percent significance using the LR test (22.22, 2 df, p = .008).

Finally, the third column of Table 6 reports the parameter estimates if we treat m_i as random variable rather than a set of fixed effects. We use the Hausman's specification to test the random effects model against the fixed effects model and the results indicate that the random effects model must be rejected (166.5520, 19 df, p = .000). Another way to test the random effects model against the fixed effects model is to estimate the parameter "phi" (in Baltagi 2005), which measures the weight attached to the cross-sectional component of the data and which can takes value on the in-

Table 6: Spatial Durbin Model

Dependent Variable: Tax IMI	(1)	(2)	(3)
	Spatial and Time-period FE	Spatial and Time-period FE Bias-Correction	Spatial RE and Time FE
Population	-0.007973	-0.007988	0.000927
	(-1.006)	(-0.949)	(1.101)
Young (%)	0.007982	0.008110	0.004525
	(0.263)	(0.251)	(0.174)
Old (%)	0.001837	0.018278	-0.010511
	(0.813)	(0.762)	(-0.787)
Unemp. Rate	-0.014119	-0.014141	-0.011492
	(-1.140)	(-1.074)	(-1.002)
Electric pc	-0.002011	-0.002003	0.006368
	(-0.211)	(-0.198)	(1.019)
Grants pc	0.000441	0.000439	-0.000525
	(1.436)	(1.345)	(-2.874)
Left	0.206511	0.206729	0.204861
	(4.699)	(4.428)	(5.039)
Majority	0.085258	0.084930	0.082236
	(3.262)	(3.059)	(3.076)
IMT pc	-0.746338	-0.747141	-0.426125
	(-1.828)	(-1.722)	(-1.077)
W * Population	0.013074	0.013130	0.001385
	(0.759)	(0.717)	(1.274)
W * Young (%)	-0.052050	-0.051901	-0.048812
	(-1.297)	(-1.217)	(-1.389)
W * Old (%)	0.049824	0.049374	-0.022382
	(1.473)	(1.374)	(-1.180)
W * Unemp. Rate	0.004758	0.004848	0.021127
	(0.240)	(0.230)	(1.154)
W * Electric pc	-0.005532	-0.005481	0.035200
	(-0.206)	(-0.192)	(1.959)
W * Grants pc	0.000072	0.000715	0.000380
	(1.523)	(1.419)	(1.367)
W * Left	-0.136389	-0.138060	0.017217
	(-1.351)	(-1.288)	(0.205)
W * Majority	0.189180	0.187971	0.143949
	(3.158)	(2.954)	(2.411)
W * IMT pc	0.502533	0.506856	1.206685
	(0.770)	(0.731)	(2.009)
Rho	0.083714	0.092719	0.133709
	(2.738)	(3.043)	(4.467)
Phi			0.253050
			(17.083)
Wald Spatial Lag	21.15 (p=.012)	18.57 (p=.029)	21.09 (p=.012)
LR Spatial Lag	21.10 (p=.012)	21.10 (p=.012)	21.03 (p=.013)
Wald Spatial Error	22.25 (p=.008)	19.61 (p=.020)	22.63 (p=.007)
LR Spatial Error	22.22 (p=.008)	22.22 (p=.008)	34.73 (p=.000)
R-squared	0.7740	0.7740	0.6988
Corrected R2	0.0322	0.0322	0.1978
Log-likelihood	-1408.31	-1408.31	-1958.94

Note: Weight matrix W is a binary contiguity spatial matrix row normalized with positive weights if municipalities share a border (otherwise, zero). Asymptotic t-statistics are in parentheses.

terval [0,1]. If this parameter converges to 0, the random effects model converges to its fixed effects counterpart; if it goes to 1, it converges to a model without any controls for spatial specific effects. We obtain phi = .253, with t-value of 17.08, which just as Hausman's specification test indicates that the fixed and random effects models are significantly different from each other. Moreover, because the weight attached to the cross-sectional component is of the data is rather small, the spatial Durbin model with controls for spatial fixed effects is a better alternative to the random effects model than is the spatial Durbin model without controls. This justifies the extension of the two-way Durbin model to the two-regime Durbin model.

4.2 Yardstick Competition and Incumbency Advantage

In the second stage of our empirical study, we identify explicitly the yardstick competition behavior and verify the key hypothesis that strategic interaction in tax setting decisions is reduced in the presence incumbency advantage. Following our theoretical prediction that incumbency advantage reduces the disciplinary effect of elections, we exploit the difference in the sample between mayors with different political tenure and, inspired on the two-regime spatial Durbin model of Elhorst and Fréret (2009), we extend the first model to:

$$y_{it} = \rho_1 d_{it} \sum_{i \neq j} w_{ij} y_{jt} + \rho_2 (1 - d_{it}) \sum_{i \neq j} w_{ij} y_{jt} + \mathbf{x_{it}} \beta + \sum_{\mathbf{i \neq j}} w_{ij} \mathbf{x}_{jt} \theta + \delta_t + m_i + u_{it} \qquad (3)$$

where d_{it} represents a dummy variable that takes value 1 if mayor of jurisdiction i is in his first term in office, and 0 otherwise. This dummy divides the sample in two political regimes, one where the incumbents are politically sensitive to fiscal policy changes in neighboring jurisdictions and other where they are not. Consequently, the variables $d_{it} \sum_{i \neq j} w_{ij} y_{jt}$ and $(1 - d_{it}) \sum_{i \neq j} w_{ij} y_{jt}$ represent the interaction effects on the property tax rates that belong to the first and second regime, respectively. Thus, the coefficients ρ_1 and ρ_2 give us the degree of fiscal interaction in jurisdictions that belong to each of the respective regimes. The theoretical prediction is that if ρ_1 is significantly greater than ρ_2, then yardstick competition is explaining the fiscal strategic interaction results.

We estimate this model again by Maximum likelihood and Table 7 presents the results. The models were named following the terminology of Elhorst and Fréret (2009). In column (1), we have the estimation results for the Two-Way Durbin Model, which is the standard spatial Durbin model including both spatial and time-period fixed effects. Similarly, the One-Way Durbin Model is the standard spatial Durbin model including just time-period fixed effects and the respective estimation results are presented in column (2). Finally, column (3) presents the estimation results of the Two-regime spatial Durbin model, expressed previously in equation (3).

Table 7: Spatial Durbin Model

Dependent Variable: Tax IMI	(1)	(2)	(3)	
	Two-Way	One-Way	Two-Way Two Regimes	
Population	-0.007988	0.000505	-0.008192	
	(-0.949)	(1.443)	(-1.035)	
Young (%)	0.008110	-0.002917	0.006327	
	(0.251)	(-0.167)	(0.208)	
Old (%)	0.018278	0.001052	0.015979	
	(0.762)	(0.130)	(0.708)	
Unemp. Rate	-0.014141	0.005253	-0.013254	
	(-1.074)	(0.584)	(-1.071)	
Electric pc	-0.002003	0.009758	-0.002333	
	(-0.198)	(2.973)	(-0.245)	
Grants pc	0.000439	-0.000889	0.000443	
	(1.345)	(-9.430)	(1.444)	
Left	0.206729	0.083908	0.205173	
	(4.428)	(2.585)	(4.673)	
Majority	0.084930	0.146690	0.085142	
	(3.059)	(4.694)	(3.261)	
IMT	-0.747141	-0.329707	-0.755773	
	(-1.722)	(-0.959)	(-1.854)	
W * Population	0.013130	0.000802	0.013230	
	(0.717)	(1.722)	(0.768)	
W * Young	-0.051901	0.043964	-0.051464	
	(-1.217)	(1.491)	(-1.283)	
W * Old	0.049374	-0.000016	0.052441	
	(1.374)	(-0.001)	(1.552)	
W * Unemp. Rate	0.004848	0.020661	0.004894	
	(0.230)	(1.383)	(0.247)	
W * Electric pc	-0.005481	0.053130	-0.004896	
	(-0.192)	(5.229)	(-0.182)	
W * Grants pc	0.000715	0.000538	0.000701	
	(1.419)	(3.248)	(1.479)	
W * Left	-0.138060	0.123323	-0.141207	
	(-1.288)	(2.141)	(-1.401)	
W * Majority	0.187971	-0.088697	0.193879	
	(2.954)	(-1.317)	(3.240)	
W * IMT	0.506856	1.908070	0.531498	
	(0.731)	(3.989)	(0.815)	
Rho	0.092719	0.164674	0.1444	-0.0755
	(3.043)	(5.619)	(3.680)	(-1.026)
Spatial FE	Yes	No	Yes	
Time-period FE	Yes	Yes	Yes	
Regime Dummy	No	No	Yes	
R-squared	0.7740	0.3483	0.7745	
Log-likelihood	-1408.31	-2737.96	-1405.391	

Note: Weight matrix W is a binary contiguity spatial matrix row normalized with positive weights if municipalities share a border (otherwise, zero). Asymptotic t-statistics are in parentheses.

Comparing the results columns (1) and (2), we observe the importance of the inclusion of the spatial fixed effects, since their inclusion affects significantly the degree of strategic interaction. In the first model the interaction effect considerably lower and less significant than in the second one. In the two-way model, the coefficient is lower than in similar studies, whereas in the one-way model the coefficient is much in line with values often find in the literature. Moreover, the number significant controls increase greatly from one model to the other. Since the spatial fixed effects are jointly significant, and following the approach of Elhorst and Fréret, we extended the two-way spatial Durbin model to the two-regime spatial Durbin model to test the existence of yardstick competition. Our main model is showed in column (3) of Table 7, where we identify explicitly the presence of yardstick competition. According to our premise, mayors enjoying some incumbency advantage, i.e. in their second or higher term in office, would be less responsive to fiscal policy decisions of neighboring jurisdictions and our results corroborate this idea. The degree of interaction is higher and significant for mayors in the first political regime (with a coefficient of 0.144 and a t-value of 3.68), whereas the coefficient of fiscal interaction for mayors in the second regime is negative and not significant (with a coefficient -0.075 of and a t-value of -1.026). We also find the political variables, the Left and the Majority dummies, presenting again a positive and significant coefficient, which is in line with the theoretical predictions. Furthermore, we confirm the validity of our results by testing whether the difference between the two interaction coefficients is statistically different from zero. We obtain that the difference is indeed positive and significant (with a coefficient of 0.22 and a t-value of 2.40). However, when we use other thresholds on tenure to define the political regimes this difference is no longer statistically significant. Table 8 presents these results:

Table 8: Yardstick Competition and Political Tenure

Regime Dummy	**Term=1**		**Term**≥ 2		**Term**≥ 3	
Rho	0.1444	-0.0755	0.109	0.065	0.0674	0.0890
	(3.680)	(-1.0259)	(2.051)	(1.337)	(0.9067)	(2.2580)
Rho1-Rho2	0.2200		0.0429		-0.0215	
	(2.3996)		(0.5261)		(-0.2322)	
Observations	681	1821	1313	1189	1812	690

Finally, we test the robustness of these results by estimating the model with different controls and different spatial weight matrices (see Appendix A).

In summary, we find empirical evidence of strategic interaction in property tax-setting decisions among Portuguese municipalities and by disentangling the sample according to mayors' political tenure we were able to identify explicitly empirical support for the existence of yardstick competition.

5 Conclusion

We study the strategic interaction in property tax-setting decisions among Portuguese local governments decisions the period 2003-2011. Taking advantage of the fact that until 2013, in Portuguese municipalities, mayors were not binding by term limits and could run for office countless times, we explore the influence of their incumbency advantage on the degree of the strategic interaction. Given that in most countries mayors face term limits, this analysis provides valuable contribution to literature on yardstick competition connecting and extending it for the first time to the field of incumbency advantage.

The main intuition is that incumbency advantage reduces electoral competition. So, a mayor who was reelected at least one time feels sufficiently confident with the prospects of an additional reelection and enjoys enough policy freedom not to take in to account the tax-setting decisions at neighboring jurisdictions. On the other hand, for a mayor in his first term in office uncertainty about the electoral outcomes is higher, so his tax-setting decisions will depend on those of neighboring jurisdictions to enhance his prospects of reelection. Our main prediction is then that the degree of strategic interaction in property tax setting decisions is greater in municipalities where mayors are in office of the first time, than in municipalities where mayors already enjoy some incumbency advantage given their political tenure and past reelection success.

We find strong empirical strong empirical evidence of the impact of incumbency advantage on the degree of fiscal strategic interaction, supporting the hypothesis of yardstick competition among Portuguese municipalities. We identify that in municipalities where mayors are in office for the first term, the property tax rate changes 0.14 percentage points with respect to a change of 1 percentage point in the neighboring jurisdictions. However, in municipalities where mayors are in office for the second or higher term (ten being the maximum), the interaction effect is negative and not significant.

We build a two-regime spatial Durbin model with fixed effects, inspired by that of Elhorst and Fréret (2009), and with an innovative classification of the two political regimes based on political tenure. As further steps, we intend to extend this model to more than two regimes, defining the regimes by the actual number of terms, instead of using a dummy as threshold. Finally, we aim to build a theoretical model extending the Besley and Case (1995) model and incorporating the impact of incumbency advantage on fiscal strategic interaction.

6 References

Allers, M. A. and Elhorst, J. Paul. 2005. "Tax Mimicking and Yardstick Competition among Governments in the Netherlands," *International Tax and Public Finance*, 12: 493—513.

Anselin, L. 1988. *Spatial Econometrics: Methods and Models.* London: Kluwer.

Baltagi BH. 2005. *Econometric analysis of panel data*, 3rd edn. Wiley, Chichester.

Besley, T. J. and Case, A. C. 1995. "Incumbent Behavior: Vote Seeking, Tax Setting and Yardstick Competition." *American Economic Review*, 85(1): 25–45.

Bordignon, M., Cerniglia, F. and Revelli, F. 2003. "Property tax rates and electoral behaviour in Italian Cities." *Journal of Urban Economics*, 54: 199–217.

Brueckner, J. K. 2000. "Welfare Reform and the Race to the Bottom: Theory and Evidence." *Southern Economic Journal*, 66(1): 505–525.

Brueckner, J. K. 2003. "Strategic interaction among governments: an overview of empirical studies." *International Regional Science Review*, 26 (2): 175–188.

Case, Anne C. 1993. "Interstate Tax Competition after TRA86," *Journal of Policy Analysis and Management*, 12: 136—148.

Elhorst, J. Paul. and Fréret, Sandy. 2009. "Evidence of Political Yardstick Competition in France using a Two-Regime Spatial Durbin Model with Fixed Effects," *Journal of Regional Science*, 49(5): 931–951.

Elhorst, J. Paul. 2014. "Spatial Panel Models." In *Handbook of Regional Science*, ed. Manfred M. Fischer and Peter Nijkamp, 1637-1652. Berlin: Springer Berlin Heidelberg.

Kelejian, H. and Prucha, I. R. 1998. "A Generalized Spatial Two-Stage Least Squares Procedure for Estimating a Spatial Autoregressive Model with Autoregressive Disturbances," *Journal of Real Estate Finance and Economics*, 17(1): 99–121.

Lee, L. F. 2004. "Asymptotic distribution of quasi-maximum likelihood estimators for spatial autoregressive models," *Econometrica*, 72(6): 1899—1925

LeSage, J. and Pace, R. K. 2009. *Introduction to Spatial Econometrics.*, New York: CRC Press.

Manski, Charles F. 1993. "Identification of Endogenous Social Effects: The Reflection Problem," *The Review of Economic Studies*, 60(3): 531–542.

Revelli, Frederico. 2002. "Local Taxes, National Politics and Spatial Interactions in English District Election Results," *European Journal of Political Economy*, 18: 281—299.

Revelli, Frederico. 2006. "Performance Rating and Yardstick Competition in Social Service Provision," *Journal of Public Economics*, 90: 459—475.

Schaltegger, Christoph A. and Dominique Küttel. 2002. "Exit, Voice, and Mimicking Behavior: Evidence from Swiss Cantons," *Public Choice*, 113: 1—23.

Sollé-Ollé, Albert. 2003. "Electoral Accountability and Tax Mimicking the Effects of Electoral Margins, Coalition, Government Ideology," *European Journal of Political Economy*, 19: 685-–713.

Wildasin, David E. 1991. "Income Redistribution in a Common Labor Market," *American Economic Review*, 81(4): 757–774.

Wilson, John D. 1999. "Theories of Tax Competition," *National Tax Journal*, 52(2), 269–304.

Appendix A Robustness Tests

	Two-Way Two Regimes		No IMT		Inverse Distance		Squared Inverse Distance		Population	
Rho	0.1444	-0.0755	0.1439	-0.0753	0.1539	-0.0860	0.1318	-0.0735	0.1166	-0.0779
	(3.680)	(-1.0259)	(3.6648)	(-1.0225)	(4.2362)	(-1.2558)	(4.1390)	(-1.2262)	(3.3354)	(-1.2458)
Rho1-Rho2	0.2200		0.2192		0.2399		0.2053		0.1945	
	(2.3996)		(2.3902)		(2.8152)		(2.7547)		(2.5471)	
R-squared	0.7745		0.7742		0.7753		0.7756		0.7762	
Log-likelihood	-1405.39		-1407.12		-1401.29		-1399.75		-1394.96	