The determinants of local tax setting under reform: evidence from the Italian municipal property tax

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Abstract

This paper investigates the determinants of tax setting by local governments in the case of a tax system under reform. In particular the focus is on the municipal property tax on real estate in Italy which was radically reformed in 2012 as part of the fiscal consolidation package adopted by the central government. Using a cross-sectional dataset on all Italian municipalities, this paper shows that the institutional profiles of the reform significantly affected the tax rate setting by municipalities, together with factors more traditionally discussed by literature (socio-demographic, economic and political variables, tax interactions). In particular we find that the pre-reform regime, the cuts in transfers by central government that came with the reform and the uncertainties about the amount of tax resources actually available played an important role in shaping local fiscal decisions.

JEL Classification: H71, H77

Keywords: local taxation, tax reform, taxing power, fiscal effort

1. Introduction[1]

As pointed out by an extensive economic literature[2] the decisions of local governments on own taxes are the result of a large array of factors. These include both the socio-economic and demographic characteristics of local jurisdictions, such as population structure by age, per-capita income, unemployment rate, etc., and the political features of local governments (political stance, electoral margin and fragmentation). External factors such as the amount of vertical grants paid out by the central government and the tax policies carried out by neighbouring governments also turn out to be important in shaping local tax decisions.

This paper aims to investigate the role of these determinants with reference to the case of the reform of the municipal property tax on real estate (the *Imposta municipale unica* – IMU) carried out in Italy in 2012. The municipal property tax has been radically reformed as part of the fiscal consolidation package the Italian government adopted in December 2011 to achieve the balanced budget target by 2013 and to shift the tax burden from capital and labour income towards consumption and property: the tax base has been enlarged, the standard tax rate set at national level has been increased and additional scope for autonomous fiscal effort (in terms of setting the tax rate above/below the standard national level) have been allowed to municipalities.

The range of objectives and the number of measures included in the reform resulted in a complex institutional framework and this might have critically affected the decisions taken by local governments about tax rates on property tax. In this paper the transition in the tax system induced by the reform is specifically and thoroughly considered as one of the determinants of tax decisions by local jurisdictions. In this perspective this paper differs from previous studies on local tax setting which have typically analysed fiscal choices at decentralized level when the tax structure is taken as stable and not affected by wide-ranging reforms. The analysis of the role of the institutional framework in shaping local fiscal policies when the local tax system is under reform is the main original contribution of this paper.

The paper is organised as follows. Section 2 gives a brief description of the reform of the municipal property tax implemented in Italy in 2012. The empirical model is presented

[1] We gratefully acknowledge the Ifel Scientific Direction for the collaboration, and Christian Mongeau (Cefip-Roma3) and Federico Belotti (Ceis-TorVergata) for their valuable advices. Any opinions expressed here are those of the authors alone.

[2] See, for example, the review reported in Delgado at al. (2011).

in section 3. Section 4 describes the dataset used for the estimation. The estimation results are discussed in section 5. Section 6 concludes.

2. The reform of the Italian municipal property tax

The property tax on real estate is the main tax source of the Italian municipalities. Before the reform of 2012, the revenues from the property tax amounted to 9.2 billion euros entirely assigned to the municipal level of government. This tax was levied on all residential properties and real estate except for owner occupied dwellings. For most real estate the tax base was calculated by multiplying cadastral rents by 105 and the standard tax rate was set at 0.4%. Each municipality had the power to increase the rate by up to 0.7% but starting from 2008 this power was suspended with the likely consequence to have imposed an upper constraint to the tax yield collected by many municipalities. Taking account of the autonomous taxing power, the total average tax rate was 0.61%.

The 2012 reform has radically redesigned the structure of the municipal property tax. As a part of the effort at national level to shift the tax mix from labour and business income to consumption and property, the municipal property tax has been increased by raising the cadastral multiplier to 160 for most categories of real estates, by including the owner-occupied dwellings in the tax base and by increasing the standard tax rate at 0.76% (0.4% for owner-occupied houses).[3] Moreover each municipality has been allowed to increase/decrease the tax rate by +/-0.3% (+/-0.2% for owner-occupied houses) as from the standard tax rate. The result has been that total yield has risen in 2012 to as much as 24.5 billion euros, 20.5 billion euros corresponding to the standard tax rate and 4.0 billion euros to the additional fiscal effort decided at local level. About 85% of total tax yield can be ascribed to dwellings other than owner-occupied houses.

Even if the entire property tax has been collected at local level, revenue has been only partially acquired by municipalities since the central government has been assigned half of total yield but excluding revenues from owner-occupied houses and from autonomous fiscal effort (about 8.2 billion euros).

Table 1 reports the joint distribution of the tax rates set by municipalities for owner-occupied houses (+/-0.2% as from the standard rate of 0.4%) and other dwellings (+/-0.3% as from the standard rate of 0.76%). The power of setting a tax rate different from

[3] For equity reasons, a basic tax deduction of 200 euros is granted to owner-occupied dwellings. For years 2012-2013 the basic deduction is increased by 50 euros for each child aged up to 26 years, up to a maximum amount of 400 euros.

the standard level has been mainly exerted by municipalities on other dwellings: 42.6% of 8,012 municipalities considered here confirmed the standard tax rate, 55.6% increased the rate and only 1.8% provided for a reduction. On the contrary as much as 65% of municipalities left the tax rate for owner-occupied houses unchanged at standard level while 27.7% decided to raise it and 7.2% to reduce it. It is likely that redistributive concerns have prevented the municipalities from increasing the tax burden on owner-occupied houses. Since the autonomous determination of tax rates local authorities has been mainly concentrated on dwellings other than owner-occupied houses, this paper focuses specifically on this area of taxation.

Table 1 – Joint distribution of municipal choices for tax rates

tax rate for owner-occupied houses / tax rate for other dwellings	reduction up to 0.3%	reduction up to 0.2%	reduction up to 0.1%	standard tax rate (=0.4%)	increase up to 0.1%	increase up to 0.2%	increase up to 0.3%	total
reduction up to 0.2%	28	13	13	107	27	46	44	278
reduction up to 0.1%	6	11	22	82	49	78	47	295
standard tax rate (=0.4%)	8	14	23	3018	820	854	486	5223
increase up to 0.1%	0	4	3	144	607	543	246	1547
increase up to 0.2%	1	0	0	61	142	212	253	669
Total	43	42	61	3412	1645	1733	1076	8012
	0.5	0.5	0.8	42.6	20.5	21.6	13.4	100.0

In addition the reform of municipal property tax has dramatically changed the overall setting where local tax rate decision is taken. The main relevant profiles are as follows.

1. As a consequence of the general aim of shifting tax burden at national level from labour and business income to consumption and property, the total yield provided by the property tax at *standard* rates after the reform has turned out to be greater than the tax yield collected by municipalities before the reform at *total* tax rates (that is inclusive of fiscal effort). However a *compensating mechanism*[4] has been introduced to ultimately assign the municipalities the amount of tax yield they actually collected before the reform and to transfer the additional revenues to the central government (about 3 billion euros).[5]

[4] Accomplished by assigning part of the tax yield of the new municipal property tax to the central government and, on the other hand, by partially cutting the transfers the central government gives to municipal level.

[5] Accomplished by cutting the amount transferred from the central government to the municipal level.

This also has occurred for each single municipality[6]: the compensating mechanism has guaranteed each municipality the past yield, irrespective of the tax rates set before the reform. However this result of invariance of net resources for municipalities has been carried after that the standard tax rates have been "rebased" to a level higher than what established before the reform.

2. The co-habitation in the municipal property tax of a central government component and a local component produces a disincentive for local authorities to reduce tax rates below the standard level. Since the share of the tax yield assigned to the central government is determined by applying the *standard* tax rate to a large part of the tax base, any municipality willing to reduce the tax rate by x% below the standard level suffers from a total loss in total resources available by 2 times x% since x% should be paid to the central government anyway. More generally, the co-habitation compromises the capacity of the local property tax to enhance the 'electoral accountability' of the local government.
3. The reform of the municipal property tax has been integrated by severe cuts in central government transfers to municipalities (about 3 billion euros). This greatly affected the total resources available to local authorities.

We expect that this complex institutional framework has critically affected the decisions taken by local governments about tax rates on property tax. For this reason, as mentioned in the introduction, these components of the reform have been specifically and thoroughly analyzed.

3. The econometric model

In order to evaluate the effects of different factors on the choice of tax rates by local authorities first we define a tax rate-setting equation. In this equation the dependent variable is the level of local tax rate determined by local government. The explanatory variables include a number of socio-demographic, economic and political factors that traditionally are expected to influence the tax setting decision at municipal level.

Following relevant literature, we take also into account the possible effects on local tax-setting of interactions across local jurisdictions (tax mimicking). The existence of tax mimicking can be related to tax competition (policy makers mimic the tax policy of their neighbours for fear of tax base mobility), yardstick competition (fiscal choices made in

[6] By means of a system of inter-governmental transfers.

nearby jurisdictions provide a benchmark for local policy makers to be re-elected) or social interactions (politicians belonging to the same party interact with each other to draw inferences about party preferences). We allow for this spatial dependence by resorting to the appropriate specification and estimation procedure based on spatial econometrics (LaSage and Pace, 2009). Firstly we test the dependent variable and the model for spatial autocorrelation. According to the test results, which confirm the existence of a spatial lag structure, we estimate a model that includes amongst the explanatory variables a weighted average of the local tax rates determined by using a spatial weight matrix.

Afterwards the base tax-setting model estimated in this way has been augmented by a set of institutional factors, specifically related to the 2012 Italian reform, in order to test their impact on the actual tax rates decisions by municipalities.

Testing for spatial structure

Firstly we verify whether the levels of our dependent variable among nearby municipalities are correlated by using a Moran I spatial autocorrelation test (see Table 2 and Figure 1), using an aerial distance weight matrix.[7] The results of the test confirm the presence of statistically significant spatial correlation of the dependent variable..

Table 2 – Property tax rate autocorrelation Moran I test

Observed Moran's I	Expectation	Variance
0.1261	-0.000413	0.00001271
Moran I statistic standard deviate = 35.4775, p-value < 2.2e-16		

In order to verify the spatial lag model hypothesis we perform a LM test for a missing spatially lagged dependent variable over a OLS estimation of the non-spatial version of our model.[8] The tests results (see Table 3) confirm the spatial lag structure of the model showing significant levels of both the LM and the robust LM for spatially lagged models.

[7] Details of the distance weight matrix are shown in the following sections.
[8] Cfr. Anselin(1988).

Figure 1 – Property tax rate autocorrelation (Moran) scatterplot

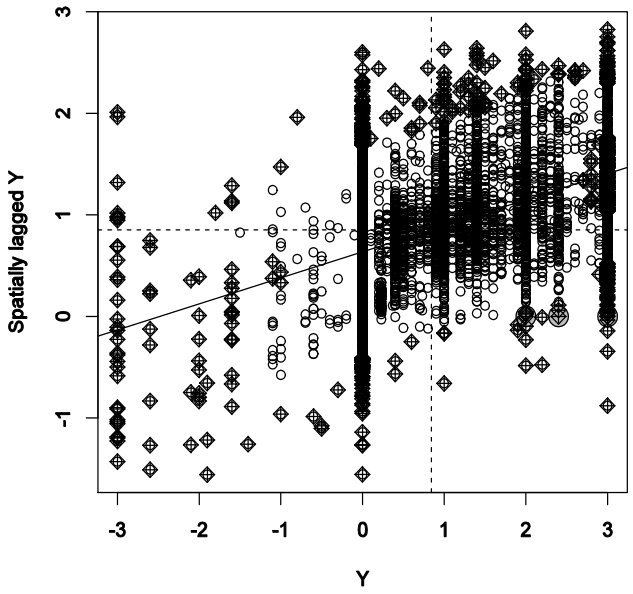


Table 3 – Lagrange Multiplier tests detecting spatial lagged model structure

LM Tests	Level	P-Value
LMlag	720.77	< 2.2e-16
RLMlag	106.17	< 2.2e-16

Given these results we estimate the tax-setting base model as a linear combination of a spatial lagged dependent and a vector of covariates:

$$t_i = \beta X_i + \rho W_i T_i + \varepsilon_i \qquad (1)$$

where:

the index *i* refers to the municipalities

t_i denotes the property tax rate (deviation from standard rate) set by municipality *i* (the i^{th} element of vector *T*)

X_i denotes the vector of socio-demographic, economic and political variables

Equation (1) is estimated by the Maximum Likelihood technique in order to overcome the issue of the endogeneity (spatial simultaneity) of tax rates decisions across local authorities.

In a second step of the analysis, we estimate an augmented model where the set of explanatory variables is increased by a number of reform-specific factors S_i that represent the institutional setting which affects the local tax setting mechanism:

$$t_i = \beta X_i + \rho W_i T_i + S_i + \varepsilon_i \quad (2)$$

4. The Data

The empirical analysis is based on a cross-section dataset for Italian municipalities we specifically collected for 2012. This dataset combines data from IFEL (the Research centre for local public finances of the Association of the Italian municipalities), the Italian Ministry of the Interior, the Italian Ministry of the Economy and the Italian Statistical Office. Estimations are carried out on a dataset that includes 7,898 observations, corresponding to almost all Italian municipalities (98%).[9]

The dependent variable of our model is the statutory tax rate (standard level plus autonomous fiscal effort) of property tax on dwellings different from owner-occupied houses set by the Italian municipalities.[10] As mentioned in section 2, the tax yield on these real estate accounts for about 85% of total revenue from property tax.

In the econometric analysis we include four blocks of variables as regressors:

- Structural (socio-demographic and economic) characteristics
- Political context
- Spatial interaction
- Reform-specific effects

Structural characteristics

We consider two different groups of structural factors which may influence tax setting at local level: a set of socio-demographic variables that capture the expenditure needs of the local jurisdiction and a set of economic variables that proxy the economic resources structure of the municipality.

[9] Because of their peculiarity the sample excludes the bigger cities (12 municipalities with more than 250,000 residents), the 104 municipalities involved in 2012 earthquake in Emilia Romagna, Lombardia and Veneto and the municipalities located in the autonomous region of Valle d'Aosta (74 municipalities) which have missing values for some of the variables in the sample.

[10] The effective rates for 2012 were set by municipalities from December 2011 to 30 October 2012. Our analysis is based on the results of the censual analysis of the municipality resolutions, carried out by IFEL in January 2013

As for the socio-demographic variables, we try to catch the heterogeneity of Italian municipalities in terms of population (ranging from 34 to a maximum of 2.5 million residents) by including in the equation four dummies (DEMO) which correspond to different demographic classes.[11] A set of specific dummy variables (RIPT) refer to macro-regions (north, central and south Italy). The dummy RSSP is employed to capture the higher level of fiscal autonomy allowed to the municipalities localized in Special Regions (Sicilia, Sardegna, Fruli-Venezia Giulia e Trentino-Alto Adige).

Real estate composition at local level between residential dwellings and industrial buildings) may influence tax rate decisions by local politicians since taxing industrial building does not directly affect voters and therefore can imply less political costs. In order to take account of variability of real estate composition across municipalities we include in the model the share of industrial buildings over total tax base (KIMD).

Finally, we expect that municipalities where residents have a higher income are more likely to set higher tax rates. To proxy economic condition of resident households we use the log of the normalised per capita taxable income (MRGI).

Political context

In order to determine the effects of politics on local tax setting, first of all we focus on the political stance of the voters in each municipality. To that end we consider the distribution of voters for the main political parties in the most recent national election (for the Chamber of deputies).[12] We account for the two major political groups: centre-left (PPSX) and centre-right (PPDX).

To control the effects on local tax policies of a more "politically active" local community we proxy political participation by using the electoral turnout (PPAS).

We also measure the proximity of the votes percentages gained by the two main coalitions in the most recent national election (centre-left and centre-right) as a measure of

[11] As mentioned before, the twelve largest cities (population > 250,000) are not included in the analysis due to their peculiarities compared to other municipalities. All of these cities have their tax rate set to the highest level, regardless of financial and political differences.

[12] It is difficult to draw this kind of information directly from the official databases of Italian municipal governments (mayors, council composition, etc) since over 75% of the elected mayors are recorded as being a candidate for a local party ('liste civiche') and not for a national party, and these local parties cannot be easily placed in the standard left- right political spectrum. Ministry of the Interior, Historical elections archive, http://elezionistorico.interno.it

the political strength of the leading party in the municipal council (PMAJ).[13] We expect that different majorities may affect the ability of the local government to set high tax rates.

Finally, we verify the existence of a political-cycle-effect (the closer a election is, the lower the tax rate is set) by including among the regressors the time interval (in years) to the next local election (ELEZ).

Spatial interaction

In order to capture the existence of spatial interactions in the tax rates setting among municipalities, we derive a spatially-weighted average matrix of the tax rates established by municipalities (WY). This comes from the product between a spatial weight matrix W and the vector of tax rates T set by single municipalities. The spatial weight matrix W is determined as the normalised reciprocal of the aerial distance (in kilometres) among municipalities.[14] We set the distance equal to infinite in the case of municipalities further than 50 km, and to 1 in the case of neighbouring municipalities.[15]

Reform-specific effects

This latter group of variables includes a number of factors specifically referred to the 2012 reform. We consider three subsets of factors which may influence tax rates decisions at municipal level:

1) the transfers cuts accomplished by the central government
2) the tax rates set by municipalities before the reform
3) the uncertainties in the reform implementation.

1) First of all, we have to consider, as discussed in Section 2, that the reform of property tax reform has been a part of a broader consolidation package that includes severe transfers cuts for local governments. As a consequence we expect that, given that local expenditure are quite inelastic, municipalities may have resorted to greater fiscal effort in order to offset transfers reductions. We consider the impact of these cuts on tax decisions by including in the model the amount of per-capita transfers cuts applied in 2012 to each municipality (RRIS).

[13] As the absolute value of the percentage difference.
[14] In the Appendix we extend the analysis of the weight matrix by considering the performance of different specifications.
[15] The aerial distance matrix is determined from municipality coordinates taken from Google Geocoding Application Program Interface, and the adjacent neighbours pattern is drawn from the Italian municipality Shapefile developed by Istat (www.istat.it/it/archivio/44523).

2) On principle, given the compensating mechanism provided by the reform and the financing requirements of each municipality, we expect that municipalities have no incentive to modify their own fiscal effort after the reform compared to their tax decisions in the pre-reform regime. However, the specific rules of the compensating mechanism (in particular, as mentioned in Sections 2, the fact that each municipality has been assigned a total amount equal to the pre-reform tax yield at *total* tax rates, that is inclusive of fiscal effort) make less straightforward the relationship between the new tax rate set by the municipalities after the reform and what happened under the previous regime. We can identify two specific sources of influence, the former based on "political" factors, the latter on "financial" factors:

- in the municipalities establishing low tax rates in the pre-reform regime taxpayers end up bearing an higher increase in tax burden owing to the reform. As a consequence in those municipalities local policy-makers should suffer high political costs if they decide to exert new fiscal effort. We try to catch this effect by considering the tax rate on property tax in the pre-reform regime (ICIP)[16];
- the municipalities that have already reached the upper bound of the tax effort in the pre-reform regime are likely to be strained to further increase tax rates when the reform assigns the municipalities new margins for tax effort. We capture this effect by defining a dummy variable which is equal to one if the pre-reform property tax rate has been already set at the top level (ICIM).

3) Finally, the uncertainties affecting the implementation of the reform about the evaluation of the pre-reform tax yield (and the corresponding cuts in compensating central government transfers)[17] may have strongly biased the decision of local tax setting by municipalities. As a matter of fact those uncertainties may have induced local governments to be prudent when setting tax rates in order to prevent financial unbalances. To account for this effect we include two additional explanatory variables in the model:

[16]Deviation from the unweighted mean.

[17] Transfer cuts (equal, as mentioned, to the difference between post-reform property tax and the pre-reform one) are carried out in the first part of the year on the basis of an estimated projection of potential yield at standard rate, before the payment of the first instalment (at standard rate) by the taxpayers. The estimates, and the corresponding amount of compensating cuts of central government transfers, have been revised three times during 2012, in March, August and October. For relevant groups of municipalities these estimates show great variability, and for some of them the estimates differ significantly from the actual yield at the standard rate. The yield at the standard rate has to be estimated when the tax rate differs from its basic level. The official estimation is still unavailable, we refer to provisional estimation carried out by IFEL.

Table 4 – Summary statistics

					Municipalities (%)	Mean	5th percentile	95th percentile
STRUCTURAL	Demographic class (number of inhabitants)	DEMO	Reference	Up to 2,000	43.73			
			1	From 2,000 to 5,000	26.88			
			2	From 5,000 to 10,000	14.57			
			3	From 10,000 to 60,000	13.67			
			4	From 60,000 to 250,000	1.14			
	Territory	RIPT	Reference	South	55.00			
			1	North	12.67			
			2	Center	32.32			
	Autonomous region	RSSP	Reference	No	83.38			
			1	Yes	16.62			
	Industrial buildings tax base (%)	KIMD	Scale			0.28	0.04	0.59
	Log of average taxable income	MRGI	Scale			-0.09	-0.70	0.35
POLITICAL	Voters (%) at national election (2008)	PPAS	Scale	Turnout (%)		0.81	0.69	0.89
		PPSX	Scale	Centre-left		0.40	0.23	0.59
		PPDX	Scale	Centre-right		0.47	0.26	0.69
		PMAJ	Scale	Majority		0.19	0.02	0.44
	Future local elections (year)	ELEZ	Scale			1.75	0.00	4.00
REFORM-SPECIFIC	Pre-reform property tax rate	ICIP	Scale			4.20	3.00	5.50
	Pre-reform property tax rate at maximum level	ICIM	Reference	No	69.32			
			1	Yes	30.68			
	Per capita transfers cuts in 2012 (hundreds of euro)	RRIS	Scale			0.57	0.25	1.10
	% Difference between actual yield and the most recent estimate	SCGT	Scale			-0.06	-0.14	0.00
	Pre-reform property tax estimation reduction greater than 30%	SICI	Reference	No	99.28			
			1	Yes	0.72			

- the percentage difference between the actual yield of the property tax and the most recent estimate (SCGT);
- a dummy variable that identifies the municipalities which experienced a large downward revision (more than -30%) of the initial estimate of the pre-reform tax yield (SICI).

Table 4 gives an overview of the explanatory variables included in the econometric model.

5. The results

Table 5 shows the estimation results for the base model (1) and for the augmented model (2) that includes some reform-specific factors among the regressors.

Table 5 – Estimation results

	Variable	Base model		Augmented model	
		B	*Sig*	*b*	*Sig*
STRUCTURAL	Constant	0.46	*	0.28	****
	DEMO=1	0.11	****	0.08	****
	DEMO=2	0.48	****	0.41	****
	DEMO=3	0.65	****	0.55	****
	DEMO=4	0.85	****	0.71	****
	RIPT=1	-0.01		0.05	
	RIPT=2	0.20	****	0.16	****
	RSSP=1	-0.29	****	-0.19	****
	KIMD	-0.27	***	-0.20	***
	MRGI	0.19	***	0.11	**
POLITICAL	PPAS	-0.19		-0.02	
	PPSX	0.21		0.06	
	PPDX	0.30		0.02	
	PMAJ	-0.14		-0.13	*
	ELEZ	0.05	****	0.05	****
SPATIAL	*r*	0.55	****	0.48	****
REFORM-SPECIFIC	ICIP	-	-	0.17	****
	ICIM	-	-	0.17	****
	RRIS	-	-	0.10	**
	SCGT	-	-	-0.80	***
	SICI	-	-	0.35	**
(*) Signif. codes: (****) 0.001; (***) 0.01; (**) 0.05;(*) 0.1					
AIC for LM		*20608*		*20254*	
Moran residuals test (pvalue)		*-0.0059*	*0.947*	*-0.0078*	*0.984*

Firstly looking at the base model, we can point out that structural and spatial factors fit well the data, while political variables show poor impact on tax rates decisions except for the proxy of the political-cycle (ELEZ).

As for structural variables, demographic size of the municipalities (DEMO) significantly affects local fiscal decisions: smaller towns (up to 2,000 inhabitants, our reference category) set lower rates that rise monotonically in upper demographic classes. For the largest cities in our sample (60,000-250,000 inhabitants) the estimated tax rate is +0.86 points (per mil) higher than in small villages (up to 250,000 inhabitants). In Central Italy (RIPT) the estimate shows higher rates, while the difference between South and North is non-significant. The municipalities located in Special regions (RSSP) set tax rates lower than those located in ordinary regions. The share of tax base referred to industrial buildings (KIMD) has a negative impact on tax rates. This is contrary to our expectations since the presence of important "non voter" taxpayers should spur local governments to raise tax rates. The personal per capita taxable income (MRGI) has a significant and positive impact on tax rates: the greater the ability of the taxpayer to pay, the higher the rate set by local governments.

On the political side, only the political-cycle effect (ELEZ) is statistically significant in affecting fiscal decisions of local governments: the further away the local election are, the higher the rates are set by the incumbent local politicians.

The spatial mimicking effect (ρ) is highly significant and shows the expected positive sign: tax rates decisions by each municipality are influenced in the same direction by fiscal choices of neighbouring jurisdictions within an aerial radius of 50 kilometres.

Looking now at the augmented model (2), the estimation results show that the coefficients already included in the base model (structural, political and spatial factors) preserve sign and statistical significance.

All the reform-specific variables included in the augmented model turn out to be statistically significant and show the expected sign.

- The positive coefficient of pre-reform tax rate (ICIP) underpins the hypothesis that, because of the higher burden produced by the reform mechanism on residents of municipalities with low tax rates in the pre-reform regime, local governments in those municipalities are pushed to keep the new rates lower than in other municipalities.
- The positive coefficient of the dummy denoting the tax rate set at the maximum level allowed in the pre-reform regime (ICIM) shows, as expected, that municipalities constrained in their fiscal effort before the reform are now spurred to increase tax rates when the reform assigns the municipalities new margins for tax effort.

- Also the impact of cuts in central government transfers (RRIS) on tax rate setting is positive and significant. Therefore there is evidence that the higher transfers cuts have been applied by the central government, the greater fiscal effort has been exerted by the municipality in order to at least partially offset total resource reduction.
- The estimation results show that the specific mechanism of reform implementation – particularly the uncertainties in projections at the basis of the compensating mechanism – contributes to explain the observed increase in tax rates.
  - The statistical significance and the negative sign of the variable measuring the percentage difference between actual yield (at the standard rate) and the most recent projection (SCGT) points out that the lower the actual yield compared to projection (and, as a consequence, the higher the cuts in central government transfers), the higher the tax rate set by the municipality.
  - The statistical significance and the positive sign of the dummy denoting those municipalities suffering a large downward revision (more than -30%) of the initial estimate of the pre-reform tax yield (SICI) shows that this group (approximately 60 municipalities) significantly raises tax rates in order to compensate for the loss caused by the estimation reassessment.

Finally we try to assess the overall impact of these reform-specific factors on local fiscal effort. To that end we compare the tax rates actually determined by municipalities with those that municipalities would have set in a "no-reform" scenario, that is a scenario where the reform-specific factors are assumed to be negligible. Given the estimated coefficients of the augmented model (2), at the application stage we replace the values of the reform-specific factors actually observed with those corresponding to the "no-reform" scenario.[18] The fitted values derived in this way correspond to the estimated tax rates that municipalities would have set in the "no-reform" scenario. As shown in table 6, the (un-weighted) average of tax rate across municipalities in the "no-reform" scenario turns to be lower (0.8150%) than the one estimated in the base scenario (0.8442%). Therefore the reform-specific effects explain about 0.03% on average of the tax rates established by municipalities, that is in the absence of these effects the average tax rate would be lower by

[18] In this exercise we set the values of the explanatory independents in order to picture a scenario in which reform-specific factors do not condition the tax setting process. This "no reform" scenario assumes: no transfer cuts (RRIS=0); no uncertainty (SICI=0; SGT=0). It is more complex to design a counterfactual scenario for the other two reform-specific variables that captures the effect of the previous property tax rates on the new ones, because these effects should hold in any case. In this exercise we left the two variables (ICIP and ICIM) at the actual levels.

3.5% compared to the base scenario. However, if we focus on the fiscal effort component by itself (that is we deduct the standard rate from the total tax rate), the estimated role of the reform-specific effects results to be more substantial: in the "no reform" scenario the average tax effort component would be lower by 34.5% compared to the base scenario.

Table 6 – Impact of reform-specific effects on tax rates (%)

	Average total tax rate	Average fiscal effort
Base scenario (*)	0.8442	0.0842
No-reform scenario (**)	0.8146	0.0546

(*) Fitted rates of model (2) with full parameter specification

(**) Fitted of model (2) with reform-specific effects set to zero

6. Concluding remarks

This paper investigates the determinants of tax setting by local governments in the case of a tax system under reform. In particular the focus is on the municipal property tax on real estate in Italy which was radically reformed in 2012 as part of the fiscal consolidation package adopted by the central government. Using a cross-sectional dataset on all Italian municipalities, we show that a number of socio-demographic, economic and political variables significantly affected the tax rates set by municipalities. Also the hypothesis of the relevance of tax mimiking across municipalities is confirmed.

However, differently from other studies which have typically analysed fiscal choices in the context of tax structure stable and not affected by wide-ranging reforms, in this paper the impact on local tax setting of the design and the implementations process of the reform is thoroughly investigated. In particular we show that the transfers cuts accomplished by the central government, the pre-reform regime - specifically the tax rate previously set by the municipality and the limitation the central government imposed on local taxing power - and the uncertainties in the reform implementation have affected to some extent tax rate decisions by municipalities following the 2012 reform in Italy. All in all these results point out the relevant role that the institutional framework can play in explaining fiscal decisions by local jurisdictions when decentralized tax system are involved in complex reforms.

This work can be extended in several directions. In particular, further insights are needed on the mimicking mechanism across municipalities by considering different specification of the weight matrix. For example, we can evaluate the effect of varying the maximum distance over which the weight to set to zero; we can test if tax mimicking mainly occurs amongst municipalities that are similar in terms of demographic size; we can explore if a leader-follower pattern is relevant in tax mimicking behaviour by considering the time sequence by which different municipalities have taken their tax rates decisions.

Appendix 1 – Exploring spatial autocorrelation patterns

In this appendix we investigate the pattern of tax rate spatial autocorrelation. We are interested in two separate issues: we would study the propagation mechanisms of the mimicking in terms of "radius" and if there is any preferential "track" of propagation.

The answers to these questions will help us in designing the weight matrix in order to capture the maximum level of spatial autocorrelation of our dependent variable in the forthcoming versions of our spatial lagged model. A better knowledge of the spatial pattern of the mimicking process will also improve the design of the model itself, taking into account more complex effect of interaction.

We will follow a data-driven approach: we perform several spatial autocorrelation test on the same variable (property tax rate) changing the weight matrix structure. We test four types of weighting matrix:

1) Distance weights (D)

   Weights determined as the inverse of the aerial distance (neighbours weights are set to one). The weights of the municipalities which distance is above a threshold are set to zero.

2) Distance / population weights (D+P)

   Base weights determined as above, but they are set to zero for the municipalities belonging to different class of population. The hypothesis behind this approach is that mimicking mechanisms operates only between structurally "similar" municipalities. The tax rates of a small village cannot be influenced by the tax rate imposed by the (even) near hundred-thousand inhabitants big city. […]

3) Distance / decision-sequence weights (D+S)

   Base weights are determined as in the distance hypothesis, but here we take into account the date in which the decision about the tax rate is undertaken: we argue here that the tax rate in one municipality is influenced only by the rates already set by the nearer municipality (leader – follower pattern). We take the information about the chronology of the decisions from the date of the official deliberation, that is stored in the Ifel database. The weights are consequently designed to let the spatial influence works in a one single direction; all the weights referring to a couple of municipality (a,b) are set to zero if the date of the official deliberation of the municipality b is foregoing respect to a; the weight matrix is therefore triangular.

4) K-neighbours weights

Base weights are also in this scheme the inverse of the aerial distance between municipalities, but here only the k nearest municipalities have positive weights and all the others are set to zero. This scheme is often used in literature, and has the main advantage in controlling the computational burden. If the municipalities dimensions are quite homogeneous (and if the adjacent neighbours weights are in any case positive) the k-neighbours and the bare distance weights may lead to similar results[19]. For the Italian municipalities we should expect that the weight schemes results would differ, because of the large heterogeneity between small and big municipalities (municipality population vary from 34 people to 2.5 million) and because the average municipality dimension vary across the country: larger in the south, smaller in the north. Given an average of k non negative weights, the k-neighbours method reduce the "propagation" distance of the mimicking mechanism for the smaller municipality and increase it for the bigger.

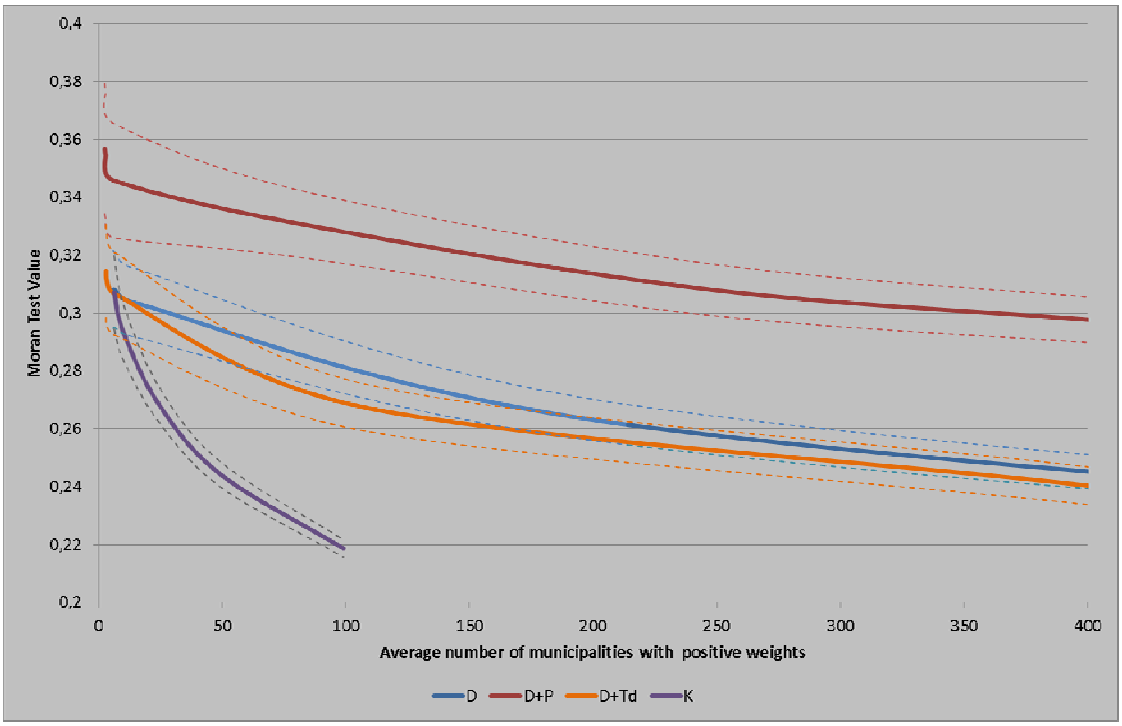
Given these four weight matrix scheme, we perform a set of spatial autocorrelation tests in order to identify the best fitting weight hypothesis. We use a conventional Moran autocorrelation testing procedure.

For all the schemes we should set a "propagation" threshold: an aerial distance radius for the schemes 1,2,3 and the maximum number of neighbours in the scheme 4. Because different level of threshold may influence spatial autocorrelation, we perform several tests for different thresholds: 1, 5, 10, 50, 100, 150, 200 kilometres of aerial distance and 4, 25, 50, 100 nearest neighbouring jurisdictions.

In order to compare the test results of different thresholds we refer to the effective average number of municipalities with positive weights. We plot in a scatter diagram the Moran's test levels results corresponding to the average number of municipalities with positive weights; we depict four curves corresponding to the results of the different weighting scheme we test, with respective significance bandwidth.

[19] If the spatial regions (municipalities in our case) are homogeneous in dimension is more likely that in a fixed radius of x kilometres we will find a quite stable number of neighbours.

Figure 2 – Moran I spatial autocorrelation test levels with different weight matrix schemes



The graph shows that:

- Spatial autocorrelation levels decrease as the number of municipalities with no zero weights increase (as the radius of the local autocorrelation grew).
- The weighting matrix that takes into account that mimicking occurs only between homogeneous municipality (population) outperform the other weights in term of level of spatial autocorrelation of property tax rates. The D+P curve stands over the others for all the range of the x scale, even considering the significance bands.
- No gain in level of spatial autocorrelation comes from the adoption of the D+S weight matrix.
- Given the number of non-zero weights municipalities, the approaches that select the autocorrelation domain by the aerial distance radius (D, D+S, D+P) seems to catch more autocorrelation than the k-neighbour scheme.

One of the principal consequences of the results presented in this section is that the spatial correlation in tax rates seems higher considering homogeneous regions, confirming the hypothesis that the mimicking occurs if the municipality are directly comparable. This appear to be a promising field of further deepening: allowing the weights to depend directly on municipality population differences (the higher the difference in population, the lower

the weight); and searching structural element (other than population) that better identify the "communicating" municipalities from the non-communicating, in terms of tax rate mimicking.

Further development requires also the analysis of the leader-follower weight scheme (D+S). The results show that (given the number of neighbours) that there is the same spatial autocorrelation if we consider the symmetric distance weights, or if we consider that followers (who takes the decision later in time) could imitate leaders and not vice-versa. Because we tend to hypothesize that some explanation gain should be achieved considering time sequence of the tax setting decisions, we will try in the future to study alternative autocorrelation model parameterization adopting a longitudinal (infra annual) approach in examining spatial interactions. This approach will allow to investigate also the models of strategic interaction among agents in the tax setting mechanism.

As we argued, the k-neighbours weights scheme shows to be less adaptive to the case of the Italian municipal property tax.

The model presented in the previous section use a large weight domain (100 km of aerial radius), an approach that, as shows in this section, tends to reduce the role of spatial autocorrelation in favour of covariates effects; in further developments of this work we will test spatial lagged models at a more "local" level testing for the robustness of the estimated coefficients.

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