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## Fiscal Autonomy and EU Structural Funds: The Case of the Italian Regional Income Tax System.

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### Abstract

In light of the principle of additionality, the inflow of European Union (EU) funds should complement domestic public funds, which are required to cofinance the investment. EU funds should either be unrelated to fiscal decisions of recipient regions, and as such should not affect taxation choices, or they could imply an increase in taxation to finance the additional domestic funds required by the additionality principle. Empirical results linking fiscal autonomy of Italian regions, considered by looking at the number and the level of average tax rates for the regional surcharge on the personal income tax and committed EU funds, suggest the existence of a significant relationship, even after controlling for relevant economic and political factors. The level of average tax rates is lower the more EU funds are received, as is the complexity of the system, measured by the number of income tax brackets.

### Keywords

personal income tax, fiscal autonomy, Structural Funds, additionality

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During the 2007 to 2013 programming period, €27,598 million were allocated to Italy in the context of funding for regional and cohesion policy,<sup>1</sup> a figure that represents approximately 24 percent of cumulated national gross domestic product (GDP) over the same period.<sup>2</sup> These funds, the result of a complex multiactor game involving member states, regions, and the European Commission (Fenge and Wrede 2007), have been received at the regional level, and, as required by the “additionality” principle, should have been accompanied by cofinancing of the local recipients.<sup>3</sup> The principle of additionality is at the basis of European regional policy and the allocation mechanism of Structural Funds (SF) and the Cohesion Fund (CF; henceforth European Union [EU] funds or European Funds [EFs]), whose purpose is to stimulate convergence and growth in the European Union by cofinancing regional public investment. Additionality in terms of expenditure measures the extent to which additional EU funds increase the total amount of regional public spending, instead of replacing it, thus ultimately leading to a greater positive impact on the real economies of the recipients (on the growth effect of EU funds, see, among others, Becker, Egger, and von Ehrlich 2010; Dall’Erba and LeGallo 2008; Pellegrini et al. 2013).

The focus of the present analysis is instead to explore whether the influx of EU funds is related to fiscal choices at the regional level, thus looking at the revenue side, once other relevant determinants have been accounted for and, indirectly, adding to the understanding of the additionality principle in practice.<sup>4</sup> On the expenditure side, aside from the level effect driven by the compliance with the additionality principle, regional public investment and expenditures could be influenced, both in terms of sector and regional allocations (Del Bo and Sirtori, 2015). On the revenue side, if EU funds act at least in part as substitutes or complements to local public funds, regional taxation choices might also be modified. This latter aspect is analyzed in the present article.

The object of the empirical analysis is thus the nature of the relationship between EU funds and regional taxation systems, in the context of fiscal autonomy in Italian regions, focusing explicitly on the revenue side.<sup>5</sup> Regional taxation systems are here defined in terms of the level of the average rate of the regional surcharge on the tax on personal income (Imposta sul reddito delle persone fisiche [IRPEF]), over which regional authorities in Italy have fiscal autonomy, along with the number of income brackets in each region.<sup>6</sup> Another taxation choice available to regional governments is related to the tax on production activities (Imposta

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Regionale sulle Attività Produttive [IRAP]). However, this fiscal instrument, introduced with the 1997 reform, is more related to the industrial and business structure of the regions and traditionally linked to regional health expenditures. As such, the determinants of the regional IRAP rates might be different with respect to those of the personal income surcharges, also considering the mobility of the tax base of IRAP, suggesting the need for an ad hoc analysis, which is left for future research. If EFs are indeed related to the revenue side of the local fiscal system, a significant association should be found with all the aspects over which regional authorities enjoy autonomy, thus both the level of the tax rates and the complexity of the system, as summarized by the number of brackets.<sup>7</sup>

Results of the empirical analysis suggest that there is a negative correlation between EFs committed to Italian regions and both the level of the average rates and the number of income brackets of the regional surcharge on the tax on personal income. This result suggests that the inflow of additional public funds, in this case EU funds, is related to the local tax system. Further, in the European context, this result might also be read in terms of the compliance with the additionality principle, and it might have implications for the design of the official verification mechanism currently in place. If the additionality principle is observed, local (regional) public funds should complement EU funds and one might expect that regional tax rates should be either unrelated or potentially higher, due to the cofinancing mechanism, after the receipt of supranational funds. The negative correlation between EFs and the Italian regional tax rates on income could thus be motivated by an incomplete compliance with the additionality principle. An alternative explanation for the negative correlation could be instead motivated by the impact of EU funds on growth. Lower tax rates could in fact arise, even if the additionality principle is respected and EU funds act as complements of domestic local funds, if the additional EU funds have a growth-enhancing effect and indirectly contribute to the increase of the tax base, thus allowing local decision makers to not raise tax rates over which they can exert control. While further research is needed to disentangle these two competing explanations of the reported negative relationship that emerges from the empirical analysis, the empirical results support the existence of a relationship between EFs and local tax systems for the Italian case.

The results here may have wider relevance. The findings in fact relate in general to the literature exploring the link between tax rates at lower tiers of government in the presence of higher-level (national or supranational)

funds, in the form of both committed and uncommitted grants, thus providing evidence on the interrelations with local tax systems both within and outside the EU.

### *Previous Literature*

This article is related to previous literature examining the determinants of the local tax system and to contributions exploring the relationship of fiscal variables with additional intergovernmental and supranational funds.

Starting from the determinants of tax structures and drivers of reforms of local tax systems, several papers have focused explicitly on the determination of income tax rate levels, one of the key expressions of fiscal autonomy of lower-level government tiers. The surveyed studies differ in the choice of the tax variable of interest, focusing, alternatively, on individual or business property tax rates, personal income tax rates, depending on both data availability and the structure of tax autonomy in the different countries on which the empirical analyses are carried out, but overall offer a set of consistent empirical results.

Economic characteristics, including GDP, are found to be important covariates of tax rate levels, with more economically advanced regions or municipalities associated, *ceteris paribus*, with higher tax rates. The underlying mechanism at play may be labeled as a “base effect” (Kenny and Winer 2006), based on the relation between GDP per capita (or per worker) and the size of the potential tax base, implying a positive association between GDP and tax rates. Aidt and Jensen (2009) suggest another potential channel through which GDP per capita may influence tax rates, related to Wagner’s law. In this interpretation, the positive relationship between GDP and tax rates is motivated by the fact that larger economies will tend to spend more and thus also need more revenue from taxation. Winner (2005), while studying tax competition, also documents a positive relation between average effective tax rates on both labor and capital with GDP per capita in Organization for Economic Co-operation and Development countries, providing additional evidence of the positive association between rates and GDP.

Another potential determinant of the level and structure of local tax rates is represented by grants or transfers from higher levels of government. In a political economy context, transfers and grants should be allocated according to the income elasticities of the median voter, therefore resulting in lower local taxes (Dahlberg et al. 2008). Recently, Delgado, Lago-Pen˜as,

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and Mayor (2014) show that motor vehicle local tax rates in Spain are negatively associated with per capita grants, providing further support in favor of the median voter model. Potential increases in taxation, however, could arise if cofunding rules are in place. In a multilevel government context, Hulten and Schwab (1997) stress the role of tax competition among areas: if national (or higher-level government) funding must be cofinanced at the local level with own resources, a tax increase might become necessary to finance the investment, ultimately leading to a suboptimal level of investment at the local level. Lutz (2010) explicitly explores the relationship between voters and the local government and finds that additional public funds (in that case, New Hampshire's school grants) have a crowding out effect, since governments spend only between 0 and 25 cents per each dollar received in the form of a grant on the targeted area. The rest of the grant is instead directed toward tax reductions. Revelli (2013) examines the role of grants from higher tiers of government on the local tax mix in the presence of binding limitations imposed to the lower tiers. Both theoretical and empirical results show that local expenditures respond to changes, both positive and negative, of grants and can be seen as supporting the existence of the so-called flypaper effect.

Several contributions have framed the analysis of the determination of tax rates in a political economy context, viewing the existing tax structures as outcomes of a political process (Hotte and Winer 2001), thus leading to the empirical investigation of the association between political variables and levels of tax rates. Allers, De Haan, and Sterks (2001), analyzing the determinants of the local property tax rates in the Netherlands, explicitly consider political variables, namely, the local government's ideology and the role of multiparty coalitions. With respect to the partisan variable, local governments with a left-wing majority tend to set higher tax rates, while large coalition governments set lower rates. Similar results are obtained by Sole' Olle' (2003) for a range of municipal taxes in Spain, including the property tax, the local motor vehicle tax, and the local business tax. The underlying mechanism at play is related to a median voter setting, where the local government sets the tax levels as a function of local needs for public services, the local tax base's ideology, grants from higher levels of government, and disposable income. Delgado (2012) confirms the importance of political orientation of the local government by examining the local tax mix in Spanish municipalities, especially for the local property tax rate. Janeba (2014) provides additional insights on the existing

relationship between fiscal decisions and ideology by reporting results from a survey of politicians and a classroom experiment.

The existence of a political business cycle suggests instead that the local tax rates and the timing of reforms might be affected by the timing of elections. Support for this hypothesis is provided by Veiga and Veiga (2007), who analyze municipal tax levels in Portugal, and also by Ge´rard, Jayet, and Paty (2010), who focus on local tax rates in Belgium, finding that tax rates are lower in election years.

Closely intertwined with the importance of political aspects on the determination of the level of local tax rates is the role of fiscal interaction.<sup>8</sup> A local government may set local tax rates’ level not only based on its own preferences and the characteristics of the local economy and electorate but also in response to what neighboring jurisdictions are doing. Fiscal interactions can be the result of public expenditure spillovers, fiscal competition according to the Tiebout model, based on residents’ mobility, or “yardstick competition.” Bordignon, Cerniglia, and Revelli (2003) and Allers and Elhorst (2005) find support, respectively for Italian and Dutch local property tax rates, of yardstick competition, in the sense that local governments set tax rates knowing that the local electorate uses neighbor’s tax behavior to infer the quality of their representatives and entrants. Ge´rard, Jayet, and Paty (2010) analyze the local surcharge on the property and income taxes, finding evidence of yardstick competition only with respect to the latter, possibly suggesting the importance of mobility of the object of the tax base in determining strategic behaviors among different jurisdictions. Brett and Pinkse (2000), however, shed some doubts on the importance of yardstick competition as a source of the detected fiscal interaction among municipalities in their local tax setting behavior. Their results suggest that the spatial patterns in tax rates, after controlling for spatial heterogeneity, may not be linked to strategic behaviors of neighbors. A similar conclusion is reached by Baskaran (2014) who suggests that evidence in favor of tax mimicking may in fact be driven largely by model misspecification.

Another aspect of the local tax systems that reflects the level of fiscal autonomy of the local government is the complexity of the system in terms of the number of income tax brackets. Hettich and Winer (1988) consider the rate structure as one of the elements of an overall tax system and suggest that, in a political economy setting, complexity in tax structures is politically rational. Building on the Hettich and Winer model, Fletcher and Murray (2008) examine a set of features of the progressivity of the state income tax

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structure in the United States, suggesting the importance of political variables and selected state economic variables. Geys and Revelli (2011) document the greater importance of economic variables, with respect to political variables, in influencing the local tax mix, examined empirically with a panel of Belgian municipalities. Galli and Profeta (2009) provide both empirical and theoretical evidence from a probabilistic voting model framing the complexity issue as the result of the interplay between economic and political factors. While there appears to be a trend toward simplification of tax systems in developed economies related to the decrease in administrative costs of simpler systems, the heterogeneity of the population of voters pulls toward increased complexity. Their analysis, which accounts for the heterogeneity of voters, also suggests that left-oriented governments tend to favor increased complexity, as their electoral base generally tends to be advantaged by more nuanced personal income tax systems. Similarly, Ganghof (2006) documents that right-wing parties are more likely to reduce the complexity of the tax on income system, by simplifying and decreasing the number of income brackets, while left-oriented parties tend to be more keen on defending progressivity and, consequently, the number of brackets. Egger, Radulescu, and Rees (2014) further qualify this result by suggesting that political polarization, irrespective of the position in the political spectrum, induces decreases in complexity of a cross section of personal income tax rates around the world. Other relevant determinants of complexity suggested in the cited literature include local economic conditions such as GDP levels.

### *Fiscal Autonomy in Italy*

After the 2001 Constitutional Reform and subsequent reforms (Bizioli and Sacchetto 2011) that paved the way for increased fiscal federalism, sources of revenues for Italian regions fall within the following three categories: own taxes and revenues, shares of national taxes, and resources from an equalization fund. Only the first category is under direct control of regional authorities, representing the degree of their fiscal autonomy. The most important regional taxes, in terms of contribution to total regional revenues, include the tax on productive activities (IRAP, Legislative Decree 15 December 1997, No. 446) and the surcharge on personal income tax (IRPEF, Legislative Decree No. 446 of 15 December 1997). IRAP was originally introduced as a replacement of health contributions from the central government to finance regional health expenditures (Liberati 2002).

As such, the evolution of this tax instrument is highly correlated with the dynamics of health expenditure and the related transfers from the national government. Regional revenues from own taxes (thus excluding transfers from the central government and revenues from other sources) represent around 30 percent of total regional revenues in 2010 (Italian National Institute for Statistics). Of these, approximately 26 percent come from the tax on productive activities, while 19 percent come from the surcharge on personal income tax. With respect to transfers from the central government, these accounted for approximately 11 percent of total revenues in 2009 (Corte dei Conti 2012). In the remainder of this article, the focus is on taxation choices regarding the level of the rates and the number of brackets of the regional surcharge on personal income tax in order to explore the role played by the influx of EU funds.

### *Empirical Model and Data*

The analysis of the relationship between regional taxation choices and EU funds is carried out by first focusing on the average rate levels and then on the complexity of the system, in terms of the number of income brackets, for the twenty-one Italian regions between 2002 and 2011.

The link between EU funds and local taxation choices is analyzed by considering the amount of EU funds committed, and not paid, to each region per year.<sup>9</sup> Committed funds should be the basis for the political decision making process at the regional level and should also allow overcoming the potential problems related to the timing of the actual disbursement, due for example to the decommitment rule of EU funds. Introduced in 1999, this rule requires that any committed funding to a project must be paid within two years of its commitment (Council of the EU 1999). This rule was further relaxed for selected countries and allows for a three-year window (Council of the EU 2006).

Looking first at tax rates, data on the average rate imposed as the regional surcharge on personal income tax were computed for each region–year pair. As each region can set a flat rate or decide on the number of brackets, the average rate was chosen as the main dependent variable, computed by dividing revenues on the regional surcharge by the average income declared by the region’s citizens each year, thus approximating the effective tax rate. The idea is that regional authorities, when setting the rates, will also consider the expectations on the next year’s tax base and set the different



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rates (if different income brackets are in place) taking into account the distribution of income. As a robustness check, the arithmetic average of the rates per income bracket (or the level of the flat rate adopted by the region if no brackets are considered) is used as a dependent variable.

Based on the earlier literature survey, the average rate is a function of economic and political variables, along with the amount of EU funds received. In detail, the independent variables are GDP, the amount of committed EU funds (EFs), both divided by the region's area,<sup>10</sup> a political variable indicating the orientation of the majority party at the regional government, taking on value one if left wing (Left), and a dummy variable taking on value one if in the current year a regional election has taken place (Election). As additional controls, net contributions to the EU per capita at the national level (Net) are included, along with the amount of transfers from the central Italian government each region receives (Transf), divided by the region's area.<sup>11</sup> Detailed information on the sources of data is provided in Online Appendix 1, along with simple descriptive statistics of the main economic variables considered.

Estimation is carried out by means of a panel fixed effect model, with robust standard errors, as specified in equation (1). All right-hand side variables, with the exception of Election, are lagged one period, since decisions on tax rates usually take some time to be implemented and the resulting rate at time  $t$  depends on its determinants at time  $t - 1$ . This holds for all regressors with the exception of the election year dummy since the timing of elections is known ahead of time and thus:

$$t_{it} = \beta_1 \text{GDP}_{it-1} + \beta_2 \text{SF}_{it-1} + \beta_3 \text{Net}_{t-1} + \beta_4 \text{Left}_{it-1} + \beta_5 \text{Election}_{it} + \beta_6 \text{Transf}_{it-1} + \varepsilon_{it}. \quad (1)$$

As a robustness check, this model, with the exclusion of net contributions to the EU per capita at the national level (Net), is estimated with spatial econometric methods, specifically by means of a spatial autoregressive (SAR) model.

Also, when considering the complexity of the system, the dependent variable in equation (2) is a categorical value indicating the number of brackets chosen by each regional government, while the determinants are assumed to be the same as in equation (1), with the difference that an additional variable reflecting the lower tier of government, is added. The additional regressor is represented by the number of provinces within the region, divided by total regional area (Provinces) to account for the overall

complexity of the local government structure. Estimation of equation (2) is carried out by means of a pooled ordered probit model, and, as a robustness check, by means of a random effects ordered probit (Frechette 2001). In both models, the limited dependent variable is assumed to be a function of a latent, unobserved, variable that depends linearly on the chosen regressors. The first model does not fully account for the panel dimension of the data while the second model exploits the panel dimension by including the random effects, and both error terms are assumed normally distributed. As previously noted, all independent variables, with the exception of the election year, are lagged one period.

$$b_{it} = \beta_1 \text{GDP}_{it-1} + \beta_2 \text{SF}_{it-1} + \beta_3 \text{Net}_{t-1} + \beta_4 \text{Left}_{it-1} + \beta_5 \text{Election}_{it} + \beta_6 \text{Provinces}_{it-1} + \beta_7 \text{Transf}_{it-1} + \mu_{it} + \varepsilon_i \quad (2)$$

Data cover ten years (from 2002 through 2011) for all twenty-one Italian Nomenclature of Territorial Units for Statistics (NUTS2) regions. The sample therefore comprises 210 observations, which drop to 189 because independent variables are lagged one period in order to account for the timing of the decision process. Detailed data sources are discussed in Online Appendix 1.

### *Empirical Results Average Rates*

Starting from the values of the average regional tax rates, results for the determinants of the average tax rate are shown in table 1. Regressors are added progressively, with results for the full model, as in equation (1), presented in columns 4 and 5, respectively, for the average rate and the mean of rates as dependent variables.

First (column 1, table 1), only economic independent variables at the regional scale are considered, including GDP and the amount of committed EFs. Estimated coefficients are statistically significant and allow us to conclude that, on average, regions with higher GDP levels tend to choose higher average regional income tax rates. This result is in line with previous findings, which highlight how a greater tax base or a larger government, both characterized by higher GDP levels, are associated with higher tax rates.

On the contrary, the higher the amount of EFs that have been committed to a region is negatively associated with the average regional income tax

rate, a result that can be read as suggesting a substitution of regional public funds by means of additional EU funds. The inflow of EFs may thus, at least in part, substitute local public finance and free up resources that can be used to lower the average tax rate, instead of complementing regional public investment, as advocated by the respect of the principle of additionality.

Table 1. Average Rate's Determinants.

Dependent variable	Average rate				Mean of rates
	(1)	(2)	(3)	(4)	(5)
GDP (/area)	<b>0.486***</b> <i>0.08</i>	<b>0.385***</b> <i>0.07</i>	<b>0.375***</b> <i>0.07</i>	<b>0.365***</b> <i>0.08</i>	<b>0.168*</b> <i>0.093</i>
EF (/area)	<b>-0.434***</b> <i>0.07</i>	<b>-0.337***</b> <i>0.07</i>	<b>-0.325***</b> <i>0.07</i>	<b>-0.324***</b> <i>0.07</i>	<b>-0.157**</b> <i>0.07</i>
Net contribution		<b>0.113***</b> <i>0.02</i>	<b>0.130***</b> <i>0.03</i>	<b>0.129***</b> <i>0.02</i>	<b>0.082**</b> <i>0.03</i>
Left			<b>0.023</b> <i>0.05</i>	<b>0.023</b> <i>0.06</i>	<b>0.013</b> <i>0.06</i>
Election year			<b>-0.084***</b> <i>0.02</i>	<b>-0.085***</b> <i>0.02</i>	<b>-0.060**</b> <i>0.02</i>
Transfers (/area)				<b>0.009</b> <i>0.05</i>	<b>0.034</b> <i>0.05</i>
Constant	<b>1.880***</b> <i>0.55</i>	<b>0.640</b> <i>0.54</i>	<b>0.477</b> <i>0.55</i>	<b>0.477</b> <i>0.51</i>	<b>0.943*</b> <i>0.53</i>
Observations	<b>189</b>	<b>189</b>	<b>189</b>	<b>189</b>	<b>189</b>
R <sup>2</sup>					
Within	<i>0.34</i>	<i>0.37</i>	<i>0.40</i>	<i>0.40</i>	<i>0.18</i>
Between	<i>0.15</i>	<i>0.15</i>	<i>0.15</i>	<i>0.15</i>	<i>0.02</i>
Overall	<i>0.11</i>	<i>0.14</i>	<i>0.15</i>	<i>0.15</i>	<i>0.04</i>
Joint F-test	<b>20.17***</b>	<b>16.23***</b>	<b>14.65***</b>	<b>14.19***</b>	<b>4.22***</b>

Note: The estimated model is panel individual fixed effects estimation. Robust standard errors are in italics. GDP % gross domestic product; EF % European Funds. \*p < .1. \*\*p < .05. \*\*\*p < .01.

This result is in line with a median voter argument, where additional funds are acting as uncommitted grants and are used to lower the local tax rates.

Results related to both economic independent variables (GDP and committed EFs) are confirmed when adding additional regressors, although the value of the estimated coefficients decreases.

Controlling for the aggregate net position of Italy as a contributor to EU budget (column 2, table 1) does not alter these results, while it suggests that the higher the contribution at the country level the higher is the average tax

rate set at the regional level. This finding might be driven by a positive correlation between Italy's position as a net contributor and committed funds at the Italian regional scale. More information on the underlying redistributive mechanisms of EU's budget, however, would be required to delve deeper in this issue. Overall, the estimated coefficients for the two variables related to EFs and the EU budget are in line with theoretical predictions that suggest that, even if additionality does not affect local taxation in a direct way, there could be a positive indirect effect on the level of taxation through the redistributive properties of additional public funds.

Moving on to political aspects, an electoral cycle variable also plays a role (column 3, table 1), with regions in an election year on average characterized by lower average tax rates, while a partisan variable, which accounts for the fact that regions are governed by left-orientated parties, is statistically insignificant. These results confirm previous findings that have examined the level of tax rates as the outcomes of a political process.

Moreover, the total amount of transfers by the central Italian government, divided by the region's area, is added to the model (column 4, table 1). The variable is not statistically significant, while all other results are confirmed.

Finally, the average value of the rates for each bracket is considered as the dependent variable for the full model (column 5, table 1). Results in terms of sign and statistical significance are confirmed.

To gauge the magnitude of the estimated effects of the economic variables, the results of the complete model (column 4, table 1) suggest the following figures by considering a 1 percent increase in each independent variable. A 1 percent increase in GDP leads to a 0.37 percent increase in the average tax rate, while an increase in committed SF is associated with a 0.32 percent decrease and an increase in the country's contributor position suggests a 0.13 percent increase in the average tax rate.

To verify the robustness of the previous results to alternative explanations and models, the residuals from ordinary least square (OLS) regressions are checked for spatial correlation.<sup>13</sup> In fact, a relevant body of literature has highlighted the presence of spatial mechanisms when considering local tax rates, suggesting the existence of yardstick competition effects, especially at the province and municipal level. While a wide array of spatial models are available, the prior is that, given the level of spatial disaggregation, the most relevant spatial interaction should occur in terms of the dependent variable (endogenous interactions) or in the residuals. Regional tax rates are likely influenced by those of neighboring regions or may be driven by a common, unknown, factor, while it seems less likely that they should be

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influenced directly by the independent variables in other regions (exogenous interactions). Models implying the existence of global spillover effects (Le Sage and Pace 2009), such as the spatial Durbin model, seem more relevant in the case of finer spatial disaggregation, such as the municipal level, where the mobility of the tax base is more likely and the reciprocal influence between municipalities is more pronounced. This conjecture, however, has been formally verified by means of appropriate testing procedures, following a general to specific approach (Elhorst 2014).

The presentation of OLS estimates before those based on spatial econometrics techniques allows to better highlight the magnitude of the estimated coefficients, while also allowing a clearer picture of the differences in the estimated parameters, once spatial correlation is taken into account. An additional reason for showing results in this order is due to the nature of the analyzed processes and the level of spatial aggregation considered. In fact, spatial dependence may be more precisely captured at a finer spatial disaggregation (e.g., municipal level).

The model in equation (1), with the exclusion of the country-level variable referring to Italy's net contribution to the EU, is thus estimated by means of a panel SAR model with individual fixed effects,<sup>14</sup> with results in table 2. Neighbors are defined by means of a distance-based row standardized weight matrix  $W$ .<sup>15</sup>

Empirical results obtained in the a spatial setting are confirmed when considering the average rate as a dependent variable, with a positive and statically significant association between GDP and the level of the average tax rate. The negative association between EFs and the local tax rate is also confirmed, while the coefficients associated with the political variables lose significance. The spatial parameter  $\rho$  summarizing the endogenous spatial autocorrelation between the average rate in different regions is positive and statistically significant. It thus appears that average regional tax rates are correlated over space, with a coefficient for the spatial lag of 0.79 (column 3, table 2) that indicates that an increase in tax rates in neighboring regions lead to a higher average regional income tax rate, *ceteris paribus*.<sup>16</sup> The signs of the estimated coefficients are retained when considering the mean of the rates (column 4, table 2), although results are in general (with the exception of EFs) not statistically significant.

Table 2. Spatial Estimation.

Dependent variable	Average rate			Mean of rates
	(1)	(2)	(3)	(4)
GDP (/area)	0.125*** 0.04	0.126*** 0.04	0.131** 0.06	0.095 0.07
EF (/area)	0.095** 0.04	0.096** 0.04	0.097** 0.04	0.085* 0.05
Left		0.021 0.03	0.021 0.03	0.025 0.03
Election year		0.015 0.02	0.015 0.02	0.016 0.03
Transfers (/area)			0.004 0.04	0.027 0.04
r	0.792*** 0.05	0.785*** 0.05	0.786*** 0.05	0.638*** 0.08
Observations	189	189	189	189
R <sup>2</sup> Within	0.42	0.43	0.42	0.18
Between	0.13	0.11	0.11	0.004
Overall	0.23	0.23	0.22	0.04
Log likelihood	136.1169	136.7843	136.7923	95.3299

Note: The estimated model is a spatial lag model with individual fixed effects. Robust standard errors are in italics. The weight matrix  $W$  is a row standardized inverse distance matrix. GDP ¼ gross domestic product; EF ¼ European Funds.

\* $p < .1$ . \*\* $p < .05$ . \*\*\* $p < .01$ .

Table 3 shows a decomposition of the estimated parameters in column 3, table 2 into direct, indirect, and total effects (Le Sage and Pace 2009). These measures are capturing the cumulative effect in the Italian regions of

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changes in the independent variables, which induce a change in the longrun steady state equilibrium (Del Bo and Florio 2012).

Both direct and indirect effects are statistically significant, but only for the two main variables of interest (i.e., GDP and EU funds). Comparing the coefficients with those obtained by estimating the linear model (column 3, table 2), the magnitude and significance are comparable; the magnitude of indirect effects turns out instead to be larger with respect to the estimated direct effects.

### *Complexity of the System*

Another facet of regional fiscal autonomy is related to the complexity of the tax system, captured by the number of income brackets that are used,<sup>17</sup> and the existence of a relationship between complexity and incoming EFs is thus explored empirically.

In our sample of Italian regions, the number of brackets ranges from zero (only one bracket) to three (the maximum number of brackets defined). The empirical model of equation (2) must therefore be estimated by means of a limited dependent variable model. The number of brackets is the observable manifestation of the latent variable, that is, the complexity of the tax structure. Given the fiscal autonomy granted to Italian regions, regional governments may choose the structure of the local income tax, an important aspect of which is the number of income brackets. First, a pooled ordered probit model is considered (table 4), for which marginal effects are computed (table 5), then a random effects ordered probit is estimated as a robustness check (table A1.4 in the Technical Online Appendix).

Table 3. Scalar Summary Decomposition of Spatial Effects.

Dependent variable	Average rate		
	Direct effects	Indirect effects	Total effects
GDP (/area)	0.150**	0.463**	0.614**
	<i>0.06</i>	<i>2304</i>	<i>0.28</i>
EF (/area)	0.111**	0.338**	0.450**
	<i>0.04</i>	<i>0.15</i>	<i>0.04</i>
Left	0.026	0.081	0.107
	<i>0.03</i>	<i>0.10</i>	<i>0.13</i>
Election year	0.018	0.053	0.071
	<i>0.02</i>	<i>0.02</i>	<i>0.09</i>
Transfers (/area)	0.004	0.13	0.017
	<i>0.03</i>	<i>0.14</i>	<i>0.18</i>

Note: Estimates are based on column 3, table 2. Robust standard errors are in italics. The weight matrix  $W$  is a row standardized inverse distance matrix. GDP ¼ gross domestic product; EF ¼ European Funds. \* $p < .1$ . \*\* $p < .05$ . \*\*\* $p < .01$ .

The ordered probit estimation results are presented in table 4, where regressors are added a few at a time. With respect to the average tax rate analysis, some results are confirmed while interesting differences also emerge. Starting from economic performance, GDP is associated with a higher number of brackets, pointing toward a positive correlation between economic well-being and complexity of the tax system. Focusing on committed EFs, the relationship with the complexity of the regional income tax system is negative, suggesting that regions receiving more EU funds are more likely to have a less complex system. Once again, this result casts doubts on whether the principle of additionality is actually respected and suggests that the additional EU funds may free up regional funds and be associated with simplifications of the bracket structure or that more complex mechanisms are at play, which should be taken into account when evaluating the use and overall impact of EU funds. However, differently from the average rate-level analysis, Italy's net position as a contributor to



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the EU budget is not related to the complexity of the regional income tax structure, possibly suggesting a greater role for local political determinants as determinants of the structure of the tax system. This interpretation is corroborated by the statistical significance of the election year dummy. For regions in which an election is taking place, a simplification streak seems to occur in coincidence with election years, while the coefficient associated with the partisan variable is positive, suggesting that left-oriented regional governments tend to set a more complex system, although barely not statistically significant. Finally, the complexity of the region's administrative structure, as documented by the number of provinces per head, is not statistically significant.

Table 4. Complexity.

Dependent variable: number of brackets					
	(1)	(2)	(3)	(4)	(5)
GDP (/area)	0.913*** 0.23	0.910*** 0.23	1.015*** 0.28	0.878* 0.45	0.832* 0.43
EF (/area)	0.629*** 0.22	0.620*** 0.22	0.653*** 0.23	0.717** 0.30	0.751** 0.32
Net contribution		0.173 0.28	0.222 0.31	0.236 0.30	0.197 0.31
Left			0.537 0.33	0.528 0.33	0.539 0.34
Election year			0.293** 0.14	0.308** 0.13	0.310** 0.14
No. of provinces (/area)				0.258 0.62	0.203 0.67
Transfers (/area)					0.096 0.19
Observations	189	189	189	189	189
Pseudo R <sup>2</sup>	0.1790	0.1802	0.2004	0.2030	0.2046
Wald w <sup>2</sup>	15.57***	17.52***	20.19***	22.54***	23.04***

Note: The estimated model is a pooled ordered probit estimation. Clustered standard errors are in italics. GDP ¼ gross domestic product; EF ¼ European Funds. \*p < .1. \*\*p < .05. \*\*\*p < .01.

Considering marginal effects of the regressors for which statistically significant coefficients are reported from the ordered probit estimation (table 5) suggests a further qualification.<sup>18</sup> Interestingly, the signs of the statistically significant marginal effects in the first category, that is, corresponding to increasing the number of brackets from one to two, are quite different with respect to those estimated in the other categories.

Table 5. Complexity: Marginal Effects.

Number of brackets	(0–1)	(1–2)	(2–3)	(3–4)
GDP (/area)	0.259*	0.124	0.116*	0.020
EF (/area)	0.234**	0.112*	0.104*	0.018
Net contribution	0.061	0.029	0.027	0.005
Left	0.158	0.078	0.069	0.011
Election year	0.091*	0.046*	0.039*	0.006
No. of provinces (/area)	0.063	0.030	0.028	0.005
Transfers (/area)	0.030	0.014	0.013	0.002

Note: Marginal effects of statistically significant coefficients from a pooled ordered probit model are computed as the change in probability for the dependent variable associated with changing independent variables from  $\frac{1}{2}$  unit below to  $\frac{1}{2}$  unit above their mean value for each value of brackets. GDP  $\frac{1}{4}$  gross domestic product; EF  $\frac{1}{4}$  European Funds. \* $p < .1$ . \*\* $p < .05$ . \*\*\* $p < .01$ .

An increase in committed EFs increases the chance of having two brackets instead of one by around 23 percent (column 1, table 5), while it decreases the probability of increasing the number of brackets, and thus the complexity of the system, in the other categories, suggesting that the potential relationship between SF and complexity depends on the existing structure in terms of brackets in each region. A related, but of different sign result is found when considering GDP. An increase in GDP is associated with a decreasing probability of moving to two brackets instead of one, while the sign is reversed from two brackets onward. The electoral cycle variable suggests that being in an election year decreases the chances of increasing the complexity of the system if there is only one bracket, while increasing the chances in the other categories. These results, taken together, might thus suggest that the determinants of the decision to move from a flat rate system to a slightly more complex one are substantially different from those related to incrementing the complexity of an already complex system, that is, increasing the number of income brackets when two or more are already in place.

## *Conclusions*

European SF and the CF have been created to promote economic and social cohesion. Aside from the intended effect on economic growth and wellbeing

of the target regions, however, EU funds may also have consequences in terms of local public financing decisions, both from the spending and financing side. In this article, the link that has been explored is the one arising from the association between EU funds and local taxation choices, in the context of fiscal autonomy of Italian regions. In detail, is the reception of additional funds related to changes in the levels and number of regional tax rates on income? The empirical analysis suggests that local finance decisions of Italian regions on both the number and level of tax rates are indeed related to the amounts of EU funds received at the regional level, while controlling for the relevant economic and political factors suggested in the literature. The higher the amount of received funds, the lower the level and number of personal income regional tax rates, after controlling for other relevant factors. While further research would be needed to better understand the mechanisms at play, the empirical results for the Italian case possibly suggest that EU funds are used as unconditional, and not matching, grants that may thus substitute local funds and be used to lower taxation.

The first and most basic interpretation of this empirical result is that additional public funds, in this case from the supranational European level, are related to the structure of the local taxation system. Other studies have confirmed the existence of a relationship between intergovernmental transfers (or SF in the European context) and local public spending decisions. Taken together, these findings thus suggest that the receipt of additional public funds is related to both the expenditure and revenue side of the local fiscal system.

Focusing explicitly on EFs, an additional interpretation of the results is related to the compliance with the additionality principle and the overall economic impact of these funds. The existence of a statistically significant association between the local tax structure and EU funds, in the context of fiscal autonomy, has, in fact, an important implication in terms of the evaluation and appraisal of the ability of EFs to achieve their intended objectives. While more data, with a longer time dimension and greater cross-country variability, would be needed to attempt assessing the causal relationship between the two variables and its dynamics, the results point to the need of considering all aspects of local public finances when examining the impact of EFs. EFs are aimed at reducing the development disparities among the regions in the member states and, as such, require the cofinancing by the local regional public authorities. This requirement is summarized by the additionality principle, which states that “EU Structural Funds may not replace the national or equivalent expenditure by a Member State” (see

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[http://ec.europa.eu/regional\\_policy/archive/policy/how/additionality\\_en.htm](http://ec.europa.eu/regional_policy/archive/policy/how/additionality_en.htm)). The additionality principle is verified, for regions covered by the Convergence objective, at the national level, and is based on examination of flows of local public expenditure. If, however, the association between EFs and the local public finance system is also reflected in the level and number of the tax rates over which there is regional fiscal autonomy, then additionality should be evaluated by considering the revenue side of the local fiscal system as well.

Further, this result has potential implications also for the evaluation of the growth effect of EFs. The negative association found between the level of local tax rates on income and the receipt of EFs, in fact, has two possible explanations. On the one hand, the inflow of additional public funds may be used as substitutes for local public funds and, as such, lead to a reduction in the level of tax rates and complexity of the system. On the other hand, if EFs have a positive growth effect, the increase in local public funds required by the cofinancing mechanism may not require higher tax rates due to the positive growth effect. While further research would be needed to identify the actual mechanism in place, the empirical results suggest the need of considering the implications for the local taxation system, of the receipt of EFs, in order to correctly evaluate the compliance with the additionality principle and, ultimately, their impact on regional economic growth. A policy implication of these results is thus related to the current verification mechanism of the additionality principle for EFs. While an evaluation of the overall economic impact of EFs is beyond the scope of this article, the results suggest that the inflow of additional public funds from higher tiers of government, have complex implications for local public finances in general, including the levels and complexity of the taxation system. This suggests the design of proper verification mechanisms to ensure that the funds are put to their intended use and are not perceived as unconditional grants, thus fully respecting the additionality principle.

The policy implications of the empirical results, however, go beyond the analysis of EU funds. In fact, the main finding that the inflow of funds from higher levels of government, in a multitier system, is related to fiscal choices of local constituencies suggests the need to analyze the complex interrelations between the different administrative levels. In the context of fiscal federalism, both within single countries and in federations of countries, the understanding of the interrelations of choices between different government tiers will aid in designing the most appropriate allocation mechanism and policies to achieve the intended goals. With

respect to additional funds from higher levels, if the ultimate goal is to reduce disparities and promote economic well-being, as in the case of EFs, a clearer understanding of the intended and unintended implications in terms of local public finances can help devise allocation rules and verification mechanisms that can, in turn, help in achieving the ultimate policy goal.

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### Notes

1. [http://ec.europa.eu/regional\\_policy/impact/evaluation/data\\_en.cfm](http://ec.europa.eu/regional_policy/impact/evaluation/data_en.cfm). European Funds include the European Regional Development Fund (ERDF), the European Social Fund (ESF), the Cohesion Fund (CF), and the European Agricultural Fund for Rural Development and European Maritime and Fisheries Fund. All regions are eligible for ERDF and ESF, while CFs are targeted explicitly toward disadvantaged regions.
2. This is based on gross domestic product (GDP) data from EUROSTAT.
3. ERDF accounts for approximately 57 percent of the available European Union(EU) funds, while ESF and CF represent, respectively, 21 percent and 20 percent. The allocation rules are slightly different for each fund and in the programming periods but are based on a

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region's (or country's) economic performance relative to the EU average.

4. Notwithstanding the important real effects of this program in EU regions, the magnitude of EU funds in absolute terms is relatively minor. For the period and sample considered in this article, EU funds range from 0.03 percent to a maximum of 2.01 percent of regional GDP.
5. In a companion paper, Del Bo and Sirtori (2015), the additionality principle and the relationship between EU funds and the expenditure side is explored. A further interesting issue, which is left for future research, is to examine the interplay between EU funds and local public finance from both the expenditure and revenue side, accounting for the full set of interactions.
6. For a theoretical model of decentralization of the personal income tax at a subnational level in a welfare perspective, see Lo'pez-Laborda and Onrubia (2005).
7. It would be interesting to have data on number of allowances, exemptions, deductions, and tax credits along with the number of tax brackets. Unfortunately, these data are not available for all regions and years in the analyzed sample in a coherent and unified framework from a single official data source. This motivates the choice made here of considering only one component of the complexity of the tax system in the empirical analyses, that is, the number of tax brackets.
8. Empirical evidence on the importance of tax mimicking and competition among neighboring jurisdictions is usually performed by means of spatial econometric techniques.
9. Data were extracted from Directorate-General for Regional and Urban Policy's Datawarehouse on December 12, 2012, and include annual committed sums to Italian regions for ERDF, ESF, European Agricultural Guidance and Guarantee Fund, Financial Instrument for Fisheries Guidance, and CF for the programming period 2000 to 2006 and for ERDF, ESF, and CF for the 2007 to 2013 programming period.
10. See Online Appendix 2 for a more extensive discussion of the choice of the scaling variable.

11. In the absence of region-varying GDP deflators, all monetary variables in these analyses are used in nominal terms. However, the use of both the official Italy's EUROSTAT consumer price index (CPI) as an additional explanatory variable, as well as using the CPI to deflate all monetary variables, confirms findings reported below. Price changes-adjusted results are available upon request from the author. 12. All monetary variables are considered in logs.
13. Additional robustness checks for this section are available in Online Appendix 3.
14. First, a panel spatial Durbin model with individual fixed effects was estimated and a set of tests were performed to evaluate whether this model was appropriate. Both the Aikake Information Criterion (AIC) and linear tests suggested the use of the panel spatial autocorrelation model with individual fixed effects. This model was further rejected in favor of the spatial autoregressive model. Detailed results of the tests are available upon request.
15. Several consistency checks in terms of the choice of the weight matrix have been performed. In particular, results turn out to be qualitatively similar with a Minkowski distance weight matrix of order 10, with a standard Euclidean distance truncated at three arcminutes (this implicitly assuming the extent of spatial spillovers becomes negligible outside Italian macro regions, i.e., North, Center, and South), and, finally, with a Euclidean distance weight matrix truncated at five distance coordinates above and below the main diagonal. This last matrix assumes clustering of spatial decays processes at a relatively local level. For an overview of the implications of the choice of the spatial weight matrix, see Corrado and Fingleton (2012).
16. Usually, the literature on fiscal interactions is based on finer spatial scales, for example, provinces, municipalities or other small administrative units, yielding lower estimates. The use of a broader disaggregation might explain the difference in the size of the parameter with respect to the results in table 2. I would like to thank an anonymous reviewer for raising this issue.
17. The focus here is on the relationship between EU funds and taxation choices. Thus, a simplified definition of complexity, identified by the



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number of tax brackets, is adopted. A more in-depth analysis of the relationship between EU funds and the more nuanced definition of complexity, including exemptions and deductions, is beyond the scope of this article and is left for future research.

18. Marginal effects computed as the change in probability for dependent associated with changing independent variables from  $\frac{1}{2}$  unit below to  $\frac{1}{2}$  unit above their mean value for each value of brackets.

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