

# Measuring Horizontal Fiscal Imbalances: the case of Italian Municipalities

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## **Abstract**

In the literature on fiscal federalism, vertical fiscal imbalances have been widely studied, while the theme of horizontal fiscal imbalances and inequality between local governments' fiscal capacities is still less explored. This paper contributes to fill the gap. A new method to compute fiscal capacities based on regression analysis is proposed, which can overcome some of the drawbacks of traditional methods such the representative tax system. This new approach is then employed to evaluate the fiscal capacities of Italian municipalities over the period 2002-2010. Finally two global measures of the horizontal fiscal imbalance are then used to evaluate the equity implication of a major policy change occurred in 2008 in Italian municipal finance.

*KEYWORDS: Inter-governmental grants, horizontal and fiscal imbalances, equalisation, fiscal capacity*

*JEL CLASSIFICATION: H73, H77*

# 1. Introduction

Two main forms of fiscal imbalances are discussed in the literature on fiscal federalism: *Vertical Fiscal Imbalances* (VFI), which depend on the differences between expenditure of sub-central governments (SCGs) and their own fiscal revenues, and *Horizontal Fiscal Imbalances* (HFI), which depend on the differences among the fiscal capacities of SCGs.

VFI exists because a portion of local government's expenditure is financed with intergovernmental grants, rather than local taxes. HFI exist because some jurisdictions are richer than others and can spend more with the same level of fiscal effort (Bird and Villancourt, 2006).

The majority of theoretical and empirical literature on fiscal federalism investigate the role of VFI (Bird and Villancourt, 2006). In particular, a number of papers consider the relationship between the degree of VFI and the behaviour of SCGs (Shankar and Shah, 2003; Villaverde, 2006). Instead, only a few works have referred to HFI (Sharma, 2012). To some extent this circumstance can be attributed to the lack of consensus about the meaning of HFI and the way to measure them. While the measurement of VFI is straightforward, as it consists in comparing expenditures and revenues of SCGs, the measurement of HFI is problematic as it entails the evaluation of revenue-raising capacity or, more broadly, the wealth of each jurisdiction. In fact, the problem of measuring HFI is still debated. Some scholars propose inequality indices based on macroeconomic indicators (Shankar and Shah, 2003; Wilson, 2007), while others make use of more complex measures constructed on fiscal data (Blöchliger and Charbit, 2008).

This paper is focussed on HFI. In order to measure HFI we suggest a new method for evaluating SCGs fiscal capacity based on regression analysis.

Alfirman (2003), Davoodi and Grigorian (2007), and Alfirman (2007) adopt a similar methodology, but they use regression analysis in order

to measure the *tax potential* of governments, which includes both the fiscal capacity and the tax effort. In our analysis, instead, regression analysis is employed to evaluate distinctively *fiscal capacity* and *tax effort*: the former depends only on tax bases and standard tax rates, excluding all other economic and institutional variables.

A new and unique dataset of Italian municipalities has been constructed, which includes the financial and census variables necessary to capture all the relevant aspects required to measure fiscal capacity. The analysis covers a nine-year period (2002–2010): to the best of our knowledge, it is the first time that the HFI for Italian municipalities are measured over a large time period. Having estimated fiscal capacities, we employ them in order to compute a global measure of HFI, given by the Gini index of distribution of resources among municipalities. A second index, inspired to the Reynolds-Smolesky measure of the redistributive impact of progressive taxation, is computed in order to evaluate the extent to which intergovernmental grants reduce inequality among local authorities.

Thus the analysis investigates both the change in degree of inequality over time and the effect of variations in central government's policy with regards to grants. In the period considered, a major policy change occurred in 2008, when the “main dwellings” were exempted from the municipal property tax, compensating the loss of revenue with an increase in the grants delivered by the central government. This reform clearly brought about an increase in VFI, but also had important implications in terms of HFI. In particular, we expect an increase of HFI as a result of the reform<sup>1</sup>. Our empirical results confirm the expectations: the 2008 reform of ICI increased inequality in the distribution of the fiscal capacity among Italian municipalities .

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<sup>1</sup> It is worth mentioning that in 2012 a change in the opposite direction was decided upon: the taxation of main dwellings was reintroduced, within a broad reform of the municipal property tax, which was renamed IMU (Imposta Municipale), and central government's were correspondingly reduced.

However, the increase in the flow of grants from the central government more than compensated the increase in inequality due to the reduction of local taxation.

The rest of the paper is organised as follows: Section 2 reviews the literature on VFI and HFI, mainly empirical works dealing with the measurement problems; Section 3 reviews the main techniques for the evaluation of fiscal capacity and describes the regression-based approach used in this paper; Section 4 describes the data and the structure of municipal public finance in Italy; Section 5 provides a measure of municipal fiscal capacity; Section 6 reports the evaluation of HFI before and after the central government intervention; Section 7 concludes.

## **2. Measuring VFI and HFI**

Many studies on fiscal federalism are devoted to the measurement of VFI and the evaluation of their impact on the economic performance of SCGs, such as GDP growth and technical or allocative efficiency in the provision of public services.

Conventionally, VFI are measured using multiple techniques, based on combinations of fiscal aggregates. One of the most common measure is the share of sub-national governments (SNGs) own purpose expenditures financed from own-source revenues (Collins, 2002; Ebel and Yilmaz, 2002)<sup>2</sup>. A variant of this measure is given by the ratio of a local government's own-source revenues to its total outlays including transfer payments to other governments and public enterprises. Hunter (1977) proposes three alternative measures of VFI that depend on three different concepts of independent revenue sources of SNGs: own-source

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<sup>2</sup> There is also no consensus on how to define the tax component of own source revenue. According to one view, tax revenue can be considered own-source only if SNGs have the power to define the tax base and set the tax rate. Others consider sufficient that SNGs are empowered of setting the tax rate and collecting the revenues, the tax base being centrally defined.

revenues only, own-source revenues plus shared taxes, and own-source revenues plus shared taxes and unconditional grants.

Another widely used indicator of VFI is the share of transfers in sub-national finances (measured either as transfers/SNGs' revenues or as transfers/SNGs' expenditures). With this method, increased transfers imply increased VFI (Rodden and Wibbels, 2002; McLean, 2004).<sup>3</sup>

Contrary to VFI, HFI has not yet been clearly defined due to the lack of consensus about the nature of inequality among local governments and the difficulties encountered in measuring it. In general, within each country, some jurisdictions are richer than others: HFI should be considered as the difference in the resources available to governments of the same level. Thus HFI turn out to be strictly related to differences in fiscal capacities among SNGs.

Bird (1993), Bird and Villancourt (2006) and Bird (2011) interpret HFI as the VFI which is left over after it has been solved for the richest SCG, that is to say when the standard rates of local taxes are set at the level necessary to provide the richest SCG with sufficient revenue to cover its expenditure needs. Thus, with this approach the measurement of HFI will depend on that one of expenditure needs (De Lombaerde and Costea, 2006). In this paper, we want, instead, to define and measure HFI as an autonomous concept, independent of VFI and expenditure needs. Therefore in the following we do not consider differences in expenditure needs, implicitly assuming they are equal in per capita terms across municipalities<sup>4</sup>.

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<sup>3</sup> With this measure disagreements also emerge on the qualitative aspect of transfers, if conditional or unconditional. Some scholars argue that unconditional transfers should be isolated to produce a qualitative analysis of VFI (Nice, 1987; Ahmad, 1997), because unconditional transfers have a smaller impact on SNGs behaviour. In contrast, Hunter (1977) identifies transfers, whether conditional or unconditional, with vertical imbalance: transfers, in his view, are an indicator of VFI simply because they are determined by the federal government and are outside subnational control.

<sup>4</sup> In many countries the equalisation system makes reference both to fiscal capacities and expenditure needs (Blöchliger et al. 2007). The ongoing reform of intergovernmental fiscal relation in Italy also establishes a new equalization

### 3. Measuring fiscal capacity

The fiscal capacity of a SCG can be defined as the potential ability to raise revenue from its own sources by means of a “standard” tax effort. Both in the literature and in the actual experience of many countries, the fiscal capacity of SCGs have so far been measured in three ways (Dafflon, 2007): the historical revenue approach, the macroeconomic indicators methodology and the representative tax system (RTS).

According to the *historical revenue approach*, fiscal capacity is measured by the actual amount of own source tax revenue recorded in the budget sheet. This approach has a strong drawback. It generates incentives for the local authorities to reduce their fiscal effort in order to receive more grants, thus, jeopardizing the financial equilibrium of both central and local governments.

The *macroeconomic indicators methodology* appears quite straightforward and simple: the fiscal capacity is approximated with some measure of local wealth per government unit. Per capita GNP, or GDP or personal income have been proposed (Boothe and Hermanutz, 1999; Yilmaz, 1999; Barro, 2002; Bajo and Bronić, 2007). Measures based on GNP or personal income could underestimate fiscal capacity in regions where significant taxable economic activities involve non resident persons: consider, for example, regions with important tourist attraction places, where the local governments collect significant amounts of revenues by taxing tourists with sales taxes, hotel taxes etc. (Yilmaz, 1999). In fact Barro (2002) suggests that a correct measure of fiscal capacity would be local GNP modified to take into account taxes paid to and subsidies received from the federal government and the ability of the province to raise tax revenue from non-residents by

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mechanism for municipalities based on the difference between expenditure needs and fiscal capacities.

exporting taxes. Many authors use measures based on per capita GDP: Table 1 shows some of them as presented by Shankar and Shah (2003).

**Table 1 – Common HFI measures (y = local per capita GDP)**

Min (Max) per capita local GDP as a % of national average	$\frac{y^{MIN}}{\bar{y}}; \frac{y^{MAX}}{\bar{y}}$
Maximum to minimum ratio (MMR)	$MMR = \frac{y^{MAX}}{y^{MIN}}$
Gini coefficient of average local per capita GDP	$G = \frac{1}{n} \left( n + 1 - 2 \left( \frac{\sum_{i=1}^n (n + 1 - i) y_i}{\sum_{i=1}^n y_i} \right) \right)$
Theil entropy index of average local per capita GDP	$T = \frac{1}{N} \sum_{i=1}^n \left( \frac{y_i}{\bar{y}} \ln \left( \frac{y_i}{\bar{y}} \right) \right)$

It must be mentioned that macro indicators, such as GDP, may not be available at micro-level or may be subject to huge approximation (Villaverde, 2006): for example, in many countries no data are available on GDP at the municipal level.

The *representative tax system* (RTS) is based on the evaluation of the standard tax revenues which jurisdictions could collect imposing taxes at the standard rate on the actual value of all their tax bases, regardless of whether they are indeed taxing them or not (the Canadian system is the best example of RTS). The RTS approach overcomes most of the drawbacks of the other two methods, but it still has its own weaknesses. It presents high operational costs because it requires the evaluation of the actual tax base for each source of revenue and for each local authority, which can be difficult when a complex set of laws

and rules are in force. Moreover, in some cases, the tax base may not exist or it may be impossible to properly evaluate it. Let us consider, for example, the case of local fees and tariffs covering just a fraction of the cost of local services, which therefore cannot be considered as prices, or the case of minor local taxes, such as municipal advertising tax, taxes on the occupation of public spaces, on the use of public billboards, on vital certificates, etc. A further major problem is that RTS cannot be used when the tax legislation does not establish a standard rate, but it recognises the local government the power to chose the rate within a given range. In principle all the revenue attributable to the part of the rate over the minimum (which can be zero) should be attributed to tax effort and not to fiscal capacity<sup>5</sup>.

In conclusion, all methods used so far do not properly capture the real capacity of local authorities to finance their expenditures using own sources of revenue: this generates some distortions when the distribution of equalization grants is based on fiscal capacity<sup>6</sup>.

### **3.1 Regression-based Fiscal Capacity Approach (RFCA)**

In the following a new approach to estimate fiscal capacity is proposed, which can overcome the main weaknesses of the traditional methodologies as discussed before. We have named this method *Regression-based Fiscal Capacity Approach* (RFCA) after the *Regression-based Cost Approach* (RCA) used in the literature with reference to expenditure needs (Blöchliger et al. 2007).<sup>7</sup> As far as we know, an

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<sup>5</sup> As we shall better see in the following, in Italy this is the case of the municipal surtax on the State personal income tax (Irpef), whose rate can vary from 0% to 0.8%: following a STR approach, all the revenue accruing to municipalities which apply the tax should be considered the result of an autonomous tax effort and not included in the estimate of fiscal capacity. For a discussion of some issues connected with SNGs “piggy-back” taxes, see Gastaldi, Longobardi and Zanardi (2009).

<sup>6</sup> For example, none of the three methods can measure the fiscal capacity related to revenues from municipal fees, without huge levels of approximation (Spahn, 2007).

<sup>7</sup> The possibility of estimating econometrically fiscal capacity, as an alternative to the traditional methods, is mentioned by Boex and Martinez-Vasquez (1997a, 1997b).



econometric approach has so far been adopted only by Alfirman (2003), Davoodi and Grigorian (2007), and Gupta (2007). In these three papers, however, the regression analysis is used to measure the *tax potential* of governments, which is given by the ability of raising revenue exerting the maximum fiscal effort. Instead, the challenge of estimating fiscal capacity consists in the ability to distinguish it from fiscal effort. While tax potential depends on factors such as government's policies, the structure of the economy, the quality of institutions, the stage of development (Gupta, 2007), fiscal capacity, by which we mean the ability of raising revenues exerting an average (standard) fiscal effort, depends only on the tax bases and the standard tax rates.

With the RFCA approach, actual revenues are regressed over a set of explanatory variables, as reported in the equation (1). Equation (1) is obtained from a standard model of local public finance à la Tiebout<sup>8</sup>, where local politicians try to minimize the level of local taxes in order to attract more people or to increase the probability of re-election.

$$T = \beta_1'R + \beta_2'S + \beta_3'A + \alpha + \varepsilon \quad (1)$$

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In equation (1),  $T$  represents the actual local tax revenue,  $R$  is a vector of socio-economic variables which can be used as proxies for the tax bases,  $S$  are intergovernmental grants and  $A$  is the vector of socio-demographic variables that captures local preferences and allows to control for the tax effort. The stochastic component includes two terms. The first component,  $\alpha$ , measures the level of efficiency or ability of the local administrators. It corresponds to municipal unobserved heterogeneity and/or tax evasion<sup>9</sup>. The second component,  $\varepsilon$ , is the idiosyncratic error with zero mean and homoscedastic variance. As

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They refer to this approach as *Representative Tax System using regression analysis* (RTS/R).

<sup>8</sup> For a general overview of the theoretical models of local public finance, see: Rubinfeld (1987), and Ross and Yinger (1999).

<sup>9</sup> In the estimation of the model,  $\alpha$  can be obtained using stochastic frontier techniques or panel data models.

reported in equation (1), we expect a positive sign for the coefficients associated to the proxies for the tax bases and a negative sign for those related to intergovernmental transfers.

The fiscal capacities of local governments are given by the fitted values. They should however be calculated considering only the coefficients associated with the tax bases as reported in equation (2):

$$\hat{T} = \hat{\beta}_1' R \quad (2)$$

As we'll better see in the following (equation 4), in the case of panel data, also time dummies should be employed in order to capture temporal shocks. By including only the socio-economic variables that are proxies for the tax bases, when computing the expected tax revenue, allows us to isolate fiscal capacity from fiscal effort – the actual revenue being the sum of the two components. The factors that are excluded are related to the preferences of the resident citizens, the impact of the central government's flow of grants and the effects of local government inefficiency and/or tax evasion that are captured by the stochastic components.

The main shortcomings of RFCA are implicit in its econometric nature. First, the need of large datasets limits the range of application to systems with a large number of SCGs. Therefore, RFCA is more appropriate for municipalities rather than intermediate governments, like regions in unitary countries and states in federal countries. A second limit is that, as in all econometric exercises, the results may depend on the specification of the model.

However, at the same time, the RFCA offers many advantages, when compared with the traditional approaches, provided that one can rely on large samples (panel data) and on a correct specification of the model. In particular, RFCA generates finer estimates of fiscal capacity if compared with the macro-indicators approach and can be used even

when the actual tax bases are difficult to compute or a standard tax rate has not been established, which, as we have seen, are the typical Achilles' heel of the RTS.

Moreover, even when RTS is feasible, an equalization system based on fiscal capacities computed with an RTS would distort the system of incentives for SCGs. At least four main causes of distortion have been emphasized in the literature (Smart, 1998, 2009; Dahlby, 2002; Borge and Rattsø, 2013; Boadway and Shah, 2009). First, equalization grants reduce the marginal cost of public funds because they compensate the SCGs for a portion of the revenue costs of raising tax rates. As a result, the rates of local taxes would be higher than those that would have been chosen by a benevolent government maximising social welfare. Second, equalization weakens the interest of SCGs in promoting local development, because to a certain extent the increases in the tax bases do not produce more revenue, being compensated by a decrease in grants. Third, equalisation grants, providing insurance towards macroeconomic shocks, reduce the needs of precautionary actions by SCGs. Fourth, when SCGs are involved in the assessment of the tax base, the equalization system would reduce the incentive for SCGs to contrast tax evasion.

It can be easily recognized that all these sources of distortion of an equalization system based on fiscal capacities evaluated through RTS, depend on the circumstance that with RTS a standard effective tax rate is applied to the actual tax bases. If instead fiscal capacities were estimated through RFCA, the amount of grants received by a SCG would not depend on the fluctuations of the actual tax bases in the short term. Thus the advantages of RFCA on efficiency grounds are undoubted with respect to RTS.

## 4. Data and structure of municipal finance in Italy

Since early 1990s, Italy has begun to implement a series of reforms with the aim of decentralizing expenditure and decisional competencies. More recently, the law on fiscal federalism (Law No. 42 of 5th May, 2009) has provided the country with an important opportunity to modernise intergovernmental financial relations and to improve the efficiency of SCGs (Longobardi, 2013).

The analysis of this paper refers to the system of Italian municipalities characterised by more than 8000 jurisdictions. Italian municipalities (*comuni*) are ruled by a government (*giunta*), headed by an elected mayor (*sindaco*), who stays in power for five years and is subject to a two-term limit. Mayors are empowered to appoint the other members of the *giunta*. The municipal government's competencies are primarily in the areas of land management and environment (water, sewage, public hygiene), social services, local transport, local police, culture and recreation, education (mainly nursery schools and complementary services). As it will be better seen in the next section, the municipal government also has some discretionary power on how to raise fiscal revenue to finance its expenditure.

A new unique dataset on the system of Italian municipalities has been built up for the time period 2002-2010. Tables 2a and 2b shows the variables considered and a list of summary statistics. The number of municipalities in terms of observations varies from 7,943 (2010) to 8,063 (2009). After eliminating outlier observations and incoherent values, and municipalities located in *special statute region*<sup>10</sup>, where local governments follow completely different regimes, the regression sample shrinks to 41,463 observations corresponding to 5,662 municipalities, for which at least one year of data is available in the period considered.

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<sup>10</sup> In Italy five regions out of twenty have a special statute, which confers them a larger autonomy.

Data are grouped in seven categories. Categories A, B and G contain data on revenues and other indicators of municipal finance (expenditure composition, loans, transfers etc.). These data have been collected from the final budget accounts provided by the Italian Ministry of Interior.

In particular, as reported in Table 2a and 2b, category A includes the following six categories of fiscal revenues:

- 1) *the property tax (ICI, Imposta Comunale sugli Immobili)*, which is the main source of revenue of Italian municipalities and counts for more than 35% of own-source revenues<sup>11</sup>;
- 2) *the main fees* (excluding waste management), which include a long list of fees and tariffs related to the main services provided by municipalities (nurseries, cemetery services, local transport, issuance of certificates, etc.) and correspond to roughly 27% of own-source revenues;
- 3) *the waste management tax and fees*, equal to 20% of own-source revenues;
- 4) *the municipal surtax on the personal income tax (Addizionale Comunale IRPEF)*, which corresponds to 10% of own-source revenues;
- 5) *other local taxes*, a residual category that counts for roughly 3% of municipal own-source revenues;
- 6) *other local fees*, a residual category that correspond to roughly 5% of municipal own-source revenues.

Category C reports data on average municipal incomes from official tax returns, provided by the Ministry of Economy and Finance. Category D includes variables about the cadastral income and the market values of the estate market, provided by the Agency of Territory at the Ministry of Economy and Finance.

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<sup>11</sup> For own-source revenues, we have considered all sources of revenues for which the council can modify at least the tax rate, and/or some aspects of the tax base.

**Table 2a – List of variables included in the econometric model**

A - Fiscal Revenues	A - Income surtax (IRPEF) - Euro ppc	33.239	24.008	0.03	221.161	41,463
	A - Main fees - Euro ppc	109.97	96.755	0	787.344	41,463
	A - Other fees - Euro ppc	15.388	20.572	0	150.841	41,463
	A - Other local taxes - Euro ppc	17.707	16.04	0.001	128.926	41,463
	A - Property tax (ICI) - Euro ppc	172.65	101.31	0	816.631	41,463
	A - Waste management rev. - Euro ppc	91.429	43.269	0	299.715	41,463
B - Expenditures percentages and other fiscal indicators	B - Administrative expenditures %	40.418	9.96	0	95.74	41,463
	B - Commercial cadastral estate yield	2419.5	2193	56.175	80772.7	41,446
	B - Culture expenditures %	1.98	2.024	0	33.52	41,463
	B - Education expenditures %	10.178	4.61	0	34.761	41,463
	B - ICI ordinary tax rate	1.024	0.121	0.5	1.25	41,463
	B - ICI tax credit as % of income	0.986	0.127	0.37	1.296	41,463
	B - ICI tax credit as % of income	1.117	0.56	0	12.441	41,463
	B - Local economy expenditures %	1.403	4.041	0	62.868	41,462
	B - Local police expenditures %	4.605	2.977	0	42.121	41,463
	B - Planning expenditures %	20.015	7.069	0	67.923	41,463
	B - Princ. house %	82.062	5.121	40.278	96.774	41,457
	B - Residential cadastral estate yield	337.31	133.69	24.779	1365.18	41,441
	B - Roads and traffic expenditures %	9.361	4.427	0	43.406	41,463
	B - Social services expenditures %	9.758	7.31	0	68.509	41,463
	B - Sport expenditures %	1.541	1.451	0	28.16	41,463
	B - Tax relief as % of income	27.016	8.579	1.584	72.69	41,457
B - Tourism expenditures %	0.622	1.306	0	32.341	41,463	
C - Average municipal incomes	C - Real estate declared income	1260.9	543.51	217.56	12001	41,463
	C - Total declared income	15359	3358.6	5605.7	61590.8	41,463
D - Average municipal estate market value	D - Commercial estate market value - Euro/sq.m.	1264.4	568.91	187.66	16493.1	35,987
	D - Residential estate market value - Euro/sq.m.	1128.4	514.09	257.3	12347.9	40,112

Category E includes a set of demographic and geographic control variables provided by ISTAT (Italian National Institute of Statistics) and category F data about electoral preferences in regional elections provided by the Ministry of Interior. We have used regional elections, instead of municipal ones, because in latter case it is often not possible to assign a political colour to all local political movements or citizens associations. We have included both demographic and geographic controls together with electoral variables, in order to capture local

preferences and the degree of fiscal effort generated by each municipality.

**Table 2b – List of variables included in the econometric model**

E - Context variables	E - Area sq. m.	34.068	48.679	0.2	1307.7	41,463
	E - Cancelled ( % of tot. pop.)	2.913	1.256	0	55.565	41,463
	E - Capital of the province - dummy	0.012	0.11	0	1	41,463
	E - Coastal Municipality - dummy	0.064	0.245	0	1	41,463
	E - Cohabitations over 1,000 inh.	0.496	2.343	0	416.39	36,802
	E - Commuters ( % of tot. pop.)	25.419	9.471	0	56.473	41,463
	E - Foreigners ( % of tot. pop.)	4.878	3.76	0	29.412	41,236
	E - Geographical (altimetric) scale.	3.123	1.513	1	5	41,463
	E - Graduated ( % of tot. pop.)	4.523	2.053	0	36.64	41,463
	E - Illiterates ( % of tot. pop.)	1.564	2.056	0	20.843	41,463
	E - Population	7668	45914	59	2761477	41,463
	E - Population 0-14 aged %	13.548	3.107	1.325	29.391	41,461
	E - Population 65+ aged %	20.87	6.26	4.105	63.333	41,461
	E - Registered ( % of tot. pop.)	3.748	1.814	0	20.345	41,463
	E - Total commuting	45.404	7.954	4.202	69.328	41,463
	E - Urbanization degree. Scale 1-3	1.685	0.695	1	3	41,463
F - Political context variables	F - Center Left % of votes	45.061	14.653	5.142	94.393	41,460
	F - Center Right % of votes	51.222	14.125	5.074	91.414	41,460
	F - Other parties % of votes	3.717	3.747	0	55.334	41,460
G - Average per capita grants and deficit	G - Current transfers from CG - Euro ppc	208.13	134.28	0.021	857.749	41,463
	G - Current transfers from RG - Euro ppc	34.133	49.142	0	1208.57	41,463
	G - Deficit - Euro ppc	122.89	203.92	0	1447.99	41,463

## 5. Measuring local government fiscal capacity using econometric methods

We have followed the RFCA, as described in section 3.1, by estimating a linear panel data model that relates the actual revenues of Italian municipalities to a long series of explanatory variables, like the tax bases for different forms of taxation, and a wide set of control variables. When significant and positive, the estimated coefficients associated with the proxies of tax bases, such as declared income and prices in the

housing market, have been used to predict the values of fiscal capacity for each category of tax revenue.

The econometric specification is reported in the equation (3):

$$Y_{it} = \beta X_{it} + \gamma Z_{it} + \eta EXP_{it} + \delta FE_{it} + \tau DT_{it} + \phi DREG_i + \iota MUN_i + \alpha_i + \varepsilon_{it} \quad (3)$$

where  $Y$  variables represent the six different categories of fiscal revenues as reported in Table 2a (category A);  $X$  includes the proxy variables of the tax bases (categories C and D);  $Z$  are context variables (categories E and F); the component  $FE$  represents a measure of the *relative fiscal effort* computed as the ratio between the effective tax rate of each category of revenues and the median effective tax rate of all municipalities<sup>12</sup>; and variables  $EXP$  refer to the composition of municipalities' expenditure, intergovernmental transfers, and local deficit (category B1 and G). The model also includes time dummies (DT) and territorial dummies for each Italian region (DREG). Because we use a panel data model,  $\alpha_i$  is the municipal fixed effect, while  $\varepsilon_{it}$  is the idiosyncratic error component with zero mean and homoscedastic variance.

We have estimated a Random Effect model by feasible generalized least squares (FGLS) estimator with the Mundlak (1978) correction in order to avoid the problem of possible correlation between the explanatory variables and the error term, i.e., we have included among the regressors the mean of each time varying variable ( $MUN$ ), that have been assumed to be correlated with the unobserved heterogeneity  $\alpha_i$ . This correction provides an indication of the relative contribution of each

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<sup>12</sup> In other words, the variable FE provides information on the relative level of the fiscal effort exerted by each municipality in the tax rate setting, compared to the median behaviour. In the regression related to the property tax, we have considered the nominal tax rates (category B2 in Table 2a). Although these variables are potentially affected by endogeneity, we think that we can ignore this problem since we are not interested in their coefficients and these variables are not correlated with the proxies of the tax base.



variable to the overall fixed effect. Although our coefficients' estimates are mathematically equivalent to those obtained from a Fixed Effect model (using, for example, a Within-the-Group estimator), with the Mundlak approach we can estimate the impact of time invariant variables, such as cadastral values.

The evaluation of the fiscal capacity of each municipality corresponds to the expected value obtained by considering only the variables related to the proxies of the tax bases and the year dummies. This allows us to take into account the shocks due to variations in the national tax laws or to the economic cycle. Thus the predicted fiscal capacity of each Italian municipality for each kind of revenue is:

$$CF_{it}^{\widehat{}} = \widehat{\beta}X_{it} + \widehat{\tau}_tDT_t \quad (4)$$

where  $\widehat{\beta}$  and  $\widehat{\tau}$  are vectors of elements equal to estimated coefficients when they are significant and zeros when they are not<sup>13</sup>.

## 5.1. Main results

Table 3 shows the coefficients<sup>14</sup> used for the estimation of fiscal capacity as reported in equation (4).

We can see that the most important determinants of fiscal capacity are the various categories of incomes and the market value of residential and commercial estates. With regard to residential and commercial properties, we have used lagged values in order to tackle the problem of endogeneity, due to the possibility of capitalization of the property tax.<sup>15</sup>

In general, coefficients in Table 3 can be interpreted as “*estimated*

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<sup>13</sup> Moreover it is important to emphasize that, in the computation of the fitted values, we have not included variables for which the estimated coefficient are negative, because they cannot be interpreted as proxies of the tax base.

<sup>14</sup> The full table of coefficient point estimates is available in appendix (Table a7).

<sup>15</sup> At the moment no estimate of capitalization of the local property tax in Italy is available. However we can suppose a quite flat degree of capitalization, because the tax base is determined according to cadastral values and to market values.

*standard tax rates*" that, once multiplied by the proxies of the tax bases, generate an estimate of the fiscal capacity for each municipality and each revenue category.

**Table 3 – Fiscal capacity coefficients point estimates for each category of revenues**

INDIPENDENT VARIABLES	PROPERTY TAX	MAIN FEES	WASTE REVENUES	OTHER LOCAL TAXES	OTHER FEES	INCOME SURTAX
Residential cadastral income	0.172041*** (0.0240)		0.076132*** (0.0080)			
Commercial cadastral income	0.012535*** (0.0020)					-0.000114** (0.000)
Lag of Commercial estate m.v.	0.004748** (0.0020)				0.000733*** (0.000)	
Lag of Residential estate m.v.	0.046323*** (0.0150)	0.003019*** (0.0010)			0.003396* (0.000)	
Real estate declared income	0.076964** (0.0300)	0.013333*** (0.0020)	0.033973*** (0.0050)	0.000921*** (0.000)	0.001274*** (0.000)	0.002796*** (0.0010)
Total declared income		0.005026*** (0.0010)		0.000757*** (0.000)	0.000680*** (0.000)	0.002258*** (0.000)
Real estate income**% Principal house	-0.000976*** (0.000)					
Lag of R.E. income**% Principal house	-0.000663*** (0.000)					
Dummy year 2004			-0.927745*** (0.2040)	0.197010*** (0.0700)	0.186927** (0.0730)	
Dummy year 2005	2.530672*** (0.9810)		-2.026576*** (0.3110)	0.410386*** (0.0950)	0.601558*** (0.1180)	
Dummy year 2006	2.113510* (1.2240)		-4.227933*** (0.4010)	0.477053*** (0.1580)	0.889028*** (0.1590)	
Dummy year 2007	8.495614*** (1.3650)		-4.017713*** (0.4550)	0.547986*** (0.1660)	0.554894*** (0.1680)	0.616104** (0.2540)
Dummy year 2008	-25.807530*** (1.2440)		-5.373878*** (0.4920)	0.468214*** (0.1380)	0.501355*** (0.1360)	
Dummy year 2009	-28.804285*** (1.2880)		-5.040511*** (0.5450)	0.431221*** (0.1380)	0.712977*** (0.1440)	-0.920569*** (0.2010)
Dummy year 2010	-30.878703*** (1.3120)		-3.483628*** (0.5780)	0.341729** (0.1360)	0.670173*** (0.1450)	-0.794707*** (0.2020)
Observations	(30841.00)	(30868.00)	(30868.00)	(30868.00)	(30841.00)	(30868.00)
Number of municipalities	(5661.00)	(5662.00)	(5662.00)	(5662.00)	(5661.00)	(5662.00)

Robust standard errors in parentheses

\*\*\*= p<0.01, \*\* = p<0.05, \* = p<0.1

For the sake of simplicity and shortness, we limit our comment to the contribution to the fiscal capacity of the main sources of revenues<sup>16</sup>.

Regarding the personal income surtax, the formula of the fiscal capacity (in per-capita terms) is as follows:

$$CF_{INCOME\_SURTAX} = 0.27\% \times real\_estate\_declared\_income + 0.22\% \times other\_declared\_income \quad (5) \\ + 0.61 \times year_{2007} - 0.92 \times year_{2009} - 0.79 \times year_{2010}$$

The coefficients in equation (5) look quite reasonable considering that the tax rate can be settled by the municipal council within the range 0-0.8% and that the actual tax base corresponds roughly to the total declared personal income. This is a good example of the advantages of RFCA if compared with RTS. With reference to this tax, the RTS could easily have been applied in relation to the tax base. However, as already mentioned, because the tax law does not establish a standard rate and a zero tax rate is admitted, within a RTS all the revenue should in principle have been attributed to fiscal effort. The RFCA allows us to identify a fiscal capacity component that should be excluded within a RTS.

A second good example of RFCA potentiality is given by the main fees. The formula of the fiscal capacity in per-capita terms is as follows:

$$CF_{MAIN\_FEES} = 0.3\% \times real\_estate\_market\_values + 1.3\% \times real\_estate\_declared\_income + \\ + 0.5\% \times other\_declared\_income \quad (6)$$

where years dummies have not been included, because their coefficients are not statistically significant (see Table a1 in the Appendix). Equation (6) provides a good estimate of the fiscal capacity related to local fees, whereas a RTS would have failed. Because of the absence of a standard tax rate and the difficulties in identifying the tax base, with RTS an

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<sup>16</sup> Results related to each local authority and analysis for each revenue category are available on request.

important component of the municipal fiscal capacity (about 27% of own-source revenue) would have been ignored, generating a huge distortion in the evaluation of the HFI and hence in the pattern of equalization.<sup>17</sup>

Let us now consider ICI, the municipal property tax. Within ICI different rules of taxation are applied to different kinds of property. In particular “main dwellings”, that is to say the houses occupied by their owners, are taxed with lower rates. Furthermore, in the period considered, a major policy change occurred in 2008, when the main dwellings were exempted from the tax, compensating the loss of revenue with an increase in the grants delivered by the central government<sup>18</sup>. In order to capture the effect of this reform, when calculating fitted values in order to estimate fiscal capacity, we have considered also variables with significant but negative coefficients, which have instead been excluded when estimating the fiscal capacity associated with other categories of municipal tax revenue. In particular, the coefficients of the following two variables have been included, which are significant and negative as it can be seen in Table 3:

- the product of the income from real estate and the percentage of residential properties;
- the product of the market value of houses and the percentage of residential properties.

In order to capture the impact of the 2008 ICI’s reform, in estimating fiscal capacity we have also considered year dummies. Looking at Table 3, we can see that, as a result of the reform, the coefficients of time dummies, which are positive and significant before 2008, become

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<sup>17</sup> As suggested by Spahn (2007), the fiscal capacity related to fees can also be determined as a fixed percentage of the fiscal capacity computed using the RTS. This solution, however, entails a larger approximation in comparison with RFCA.

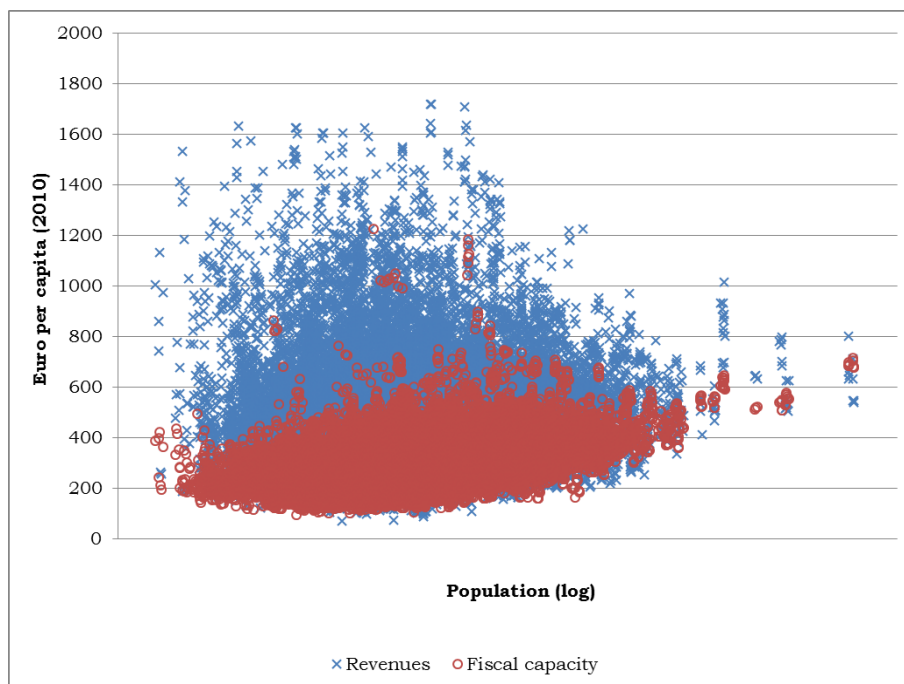
<sup>18</sup> It is worth mentioning that in 2012 a change in the opposite direction was decided upon: the taxation of main dwellings was reintroduced, within a broad reform of the municipal property tax, which was renamed IMU (Imposta Municipale), and central government’s were correspondingly reduced.

negative in the following years.

Total fiscal capacity has been computed as the sum of fiscal capacities for the six categories of revenues. Table a1 in the Appendix shows the complete list of coefficients' point estimates. Figure 1 compares the actual revenues with the estimated fiscal capacity.

We can see that the fitted values used to measure the fiscal capacity have been correctly depurated from elements related to local preferences and different degrees of fiscal effort. In fact, the fitted values draw a sort of lower bound of the actual data. Figures a1-a6 in the Appendix report similar graphs for each of the six revenue categories.

**Figure 1 - Actual revenues and estimated fiscal capacity**



**Figure 2 – Revenues and estimated fiscal capacity for the last year considered**

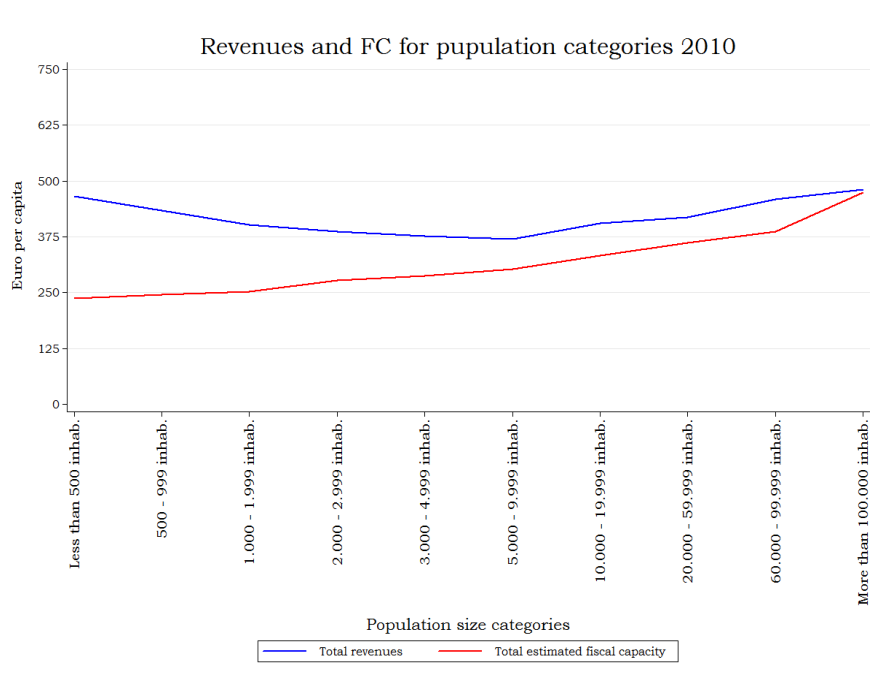


Figure 2 shows the gap between fiscal capacity and actual revenues (a direct measure of the fiscal effort) for the last year considered in the estimation, grouping municipalities by population size. We observe a larger gap for small-medium municipalities in term of population. This means that, on average, small municipalities exerted greater fiscal effort than large municipalities during the period considered in our analysis.

## 6. Measuring global HFI

In the following we provide a global measure of HFI that can be used for the evaluation of the redistributive implications of policy changes affecting the system of intergovernmental financial relations.

We consider two global indices of HFI, an *ex-ante* and an *ex-post Gini index*, where *ex-ante* and *ex-post* refer to intergovernmental grants.

The difference between the two indices is a measure of the redistributive impact of intergovernmental grants, which can be named “Reynolds-Smolensky intergovernmental grant index” ( $RS_G$ ) for the similarity with

the popular measure of the redistributive impact of the progressive income tax (Reynolds & Smolensky, 1977):

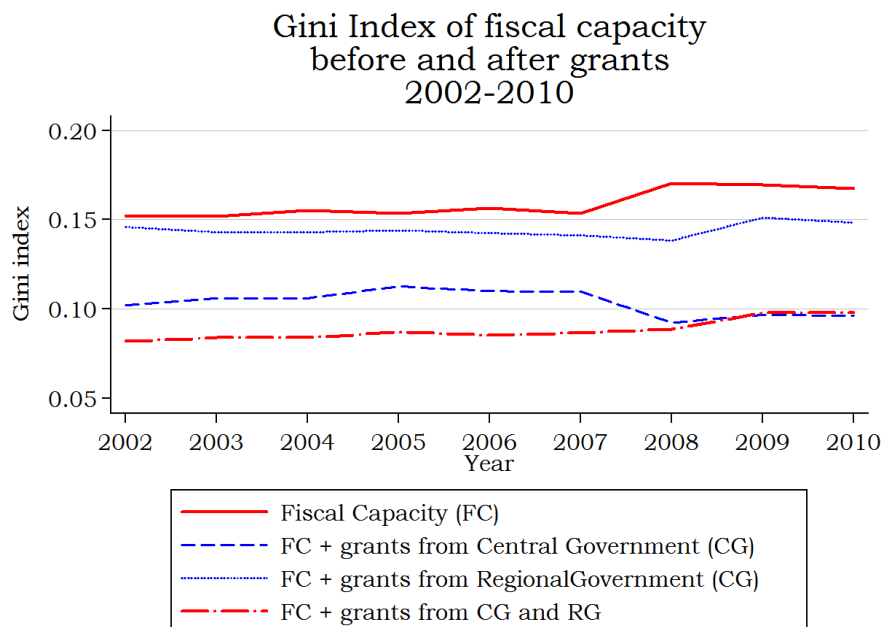
$$RS_G = SG_{FC} - G_{FC+G}$$

where  $G_{FC}$  is the Gini index calculated on fiscal capacities (the ex-ante index) and  $G_{FC+G}$  is that one calculated adding to fiscal capacities the grants that municipalities receive from central and regional government (the ex-post index).

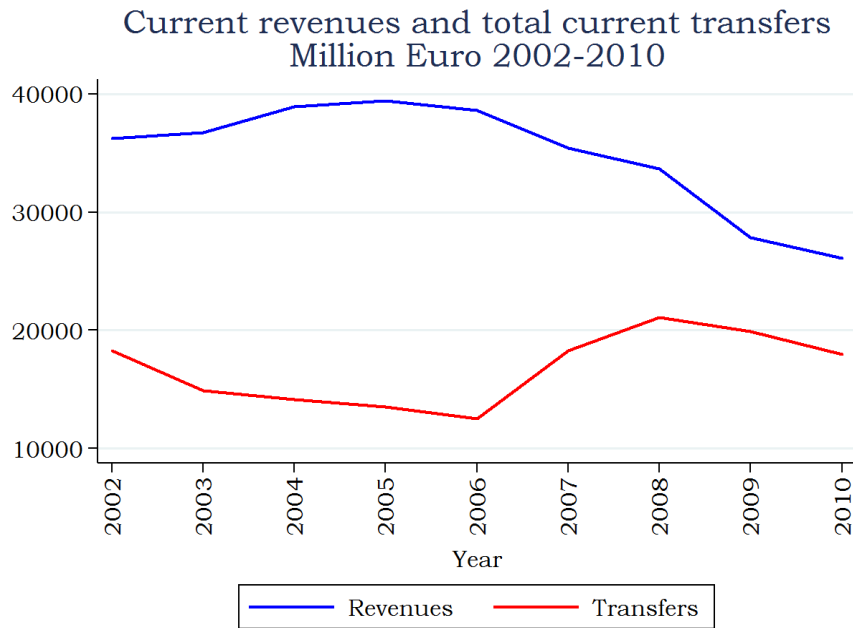
Figure 3 compares Gini indices of fiscal capacity before and after intergovernmental grants over the period considered, distinguishing grants from the central government and those the regions.

It can be seen that the main source of equalisation is given by the central government's transfers, while regional grants play a minor role.

**Figure 3 – Equalization effect of regional and national grants**



**Figure 4 – Impact of 2008 ICI reform on revenues and grants**



The Gini indexes can be employed to investigate the effects of policy changes in terms in HFI. A good example is given by the 2008 ICI reform, which, as we have seen, eliminated the tax on main dwellings, compensating the loss of revenue with more grants from the central government. This measure clearly brought about an increase in VFI, but also had important implications in terms of HFI. The VFI effect are illustrated in Figure 4 that shows the increase in transfers in correspondence to the decrease in tax revenue.

With regards to the HFI, we expect they increased as result of the reform, because the fiscal capacity of cities with a relatively low concentration of main dwellings, especially touristic places characterised by wealthy residents, was less affected than that one of municipalities with a relatively higher presence of owner occupied houses. The empirical results confirm this expectation. The 2008 ICI reform enhanced inequality among Italian municipalities: the ex ante Gini index increases by 13%, from 0.15 to 0.17. However, the increase

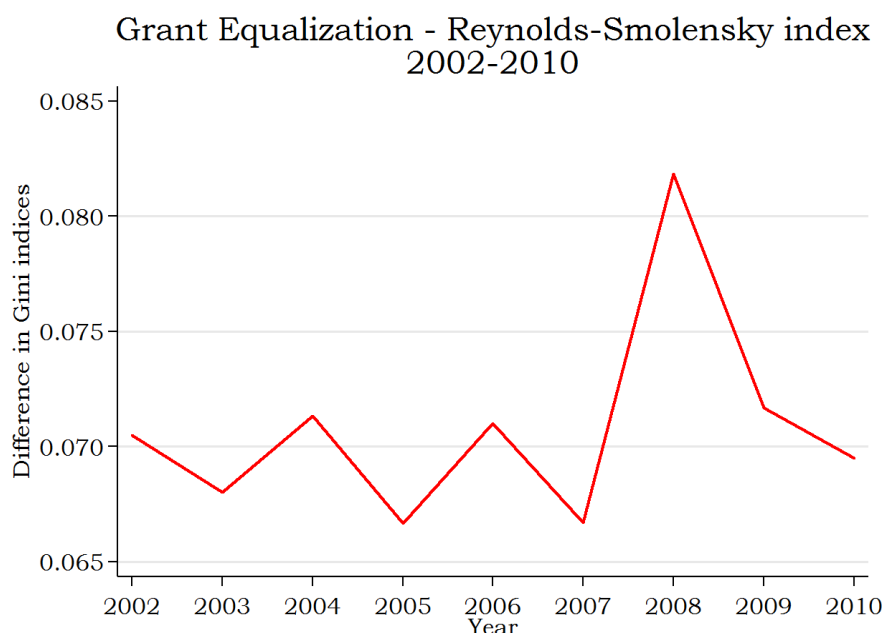


in the flow of intergovernmental grants more than compensates this change: the ex-post Gini decreases from 0.11 to 0.10. This last effect can be explained by the nature of the government compensation. The increase in grants was in fact related to the actual loss of revenue, including fiscal effort, and not to the loss calculated in terms of fiscal capacities. The relative position of municipalities exerting a larger fiscal effort on main dwellings improved in relation to municipalities that can rely to a relatively larger extent on the taxation of second dwellings.

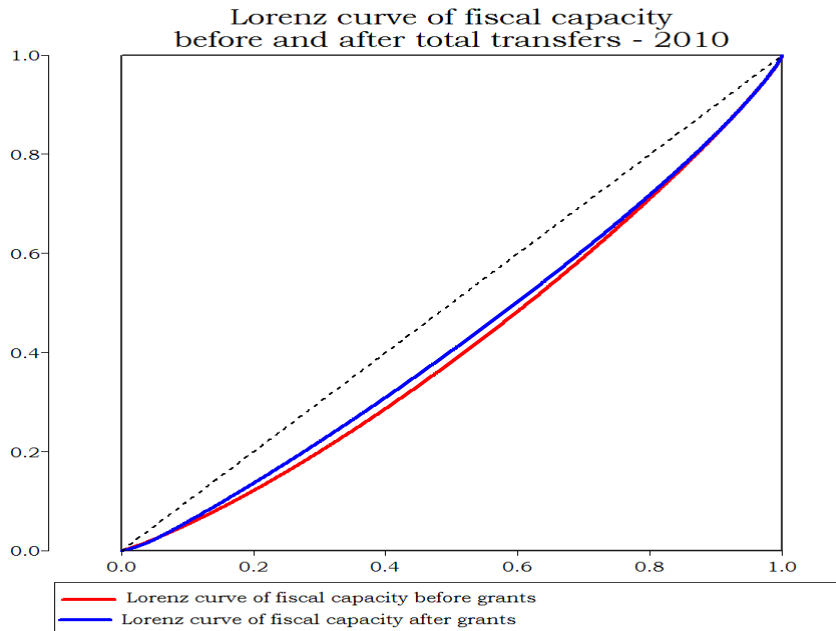
Figure 5 reports the  $RS_G$  index computed over the whole period considered in the analysis.

We can see the sharp increase on the redistributive impact of grants in 2008. In the following years, however, the financial crisis and the consequent cuts of central government transfers have weakened the equalisation power of intergovernmental grants.

**Figure 5 – Equalization effect of total grants – GE-RS index**



**Figure 6 – Equalization effect of total grants – Lorenz curve**



Finally, the equalising power of intergovernmental grants is illustrated in Figure 6 in terms of Lorenz curves with reference to 2010, the last year of the period considered in the analysis. We can observe that the ex ante Lorenz curve of fiscal capacities is dominated by ex post Lorenz curve, which considers fiscal capacities augmented by transfers from central and regional government.

## **7. Conclusions**

The aim of this paper has been to provide a measure of HFI independent of the degree of VFI. Such a measure must be based on the evaluation of fiscal capacity, considered alone and not in connection with expenditure needs.

In order to evaluate fiscal capacity we propose a new method, based on econometric analysis, the *Regression-based Fiscal Capacity Approach* (RFCA). With this technique, actual tax revenues are regressed over a set of explanatory variables, which include proxies for the tax bases and proxies for the tax effort. The fiscal capacity of each local authority is given by the fitted values of the regression, obtained using only significant coefficients associated to proxies of the tax bases and leaving out those related to fiscal effort. We can thus separate fiscal capacity from fiscal effort, which is the real challenge of estimating fiscal capacity. We have argued that RFCA can help in overcoming many of the problems related with simple macro indicators of fiscal capacity and with more complex measures based on RTS.

The paper also introduces a synthetic measure of HFI based on the Gini index and a second one referring to the redistributive impact of intergovernmental grants. They can be used for evaluating the distributional implications of changes in the regime of intergovernmental financial relations.

The empirical analysis refers to Italian municipalities over the 2002-2010 period. The fiscal capacity of each municipality has been estimated separately for six categories of current revenue using the RFCA. Then the total fiscal capacity was obtained adding up the six resulting amounts.

We have applied our synthetic measures in order to evaluate the HFI implication of a major policy change, which in 2008 increased the

overall degree of VFI in relation to Italian municipalities. The reform increased HFI but the increased inequality in terms of fiscal capacities was more than compensated by the increase in government grants.

## **Acknowledgement**

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# Appendix

Figure a1 - Property tax: actual revenues and estimated fiscal capacity

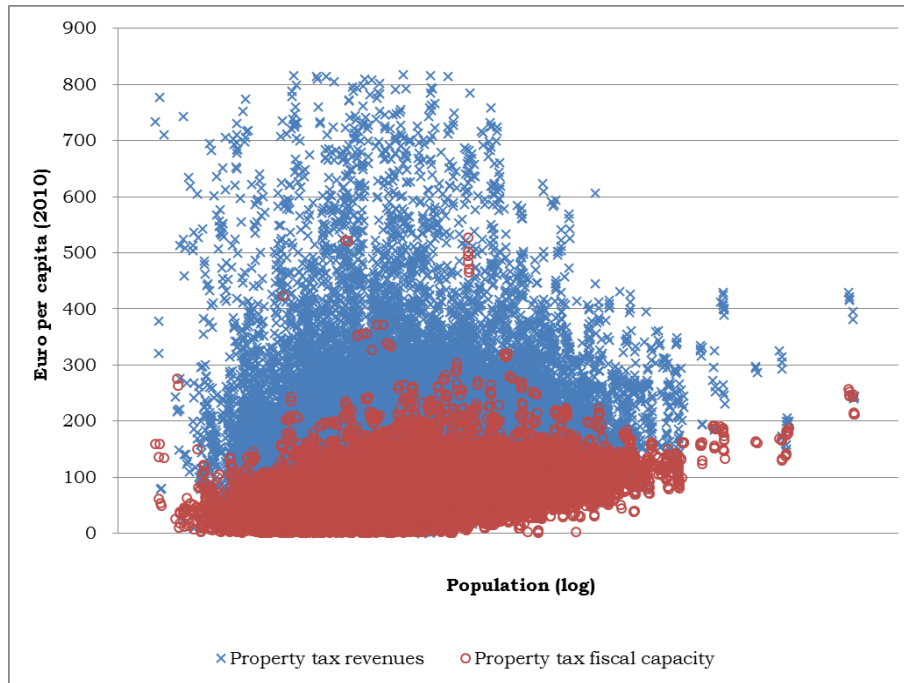


Figure a2 – Other local taxes: actual revenues and estimated fiscal capacity

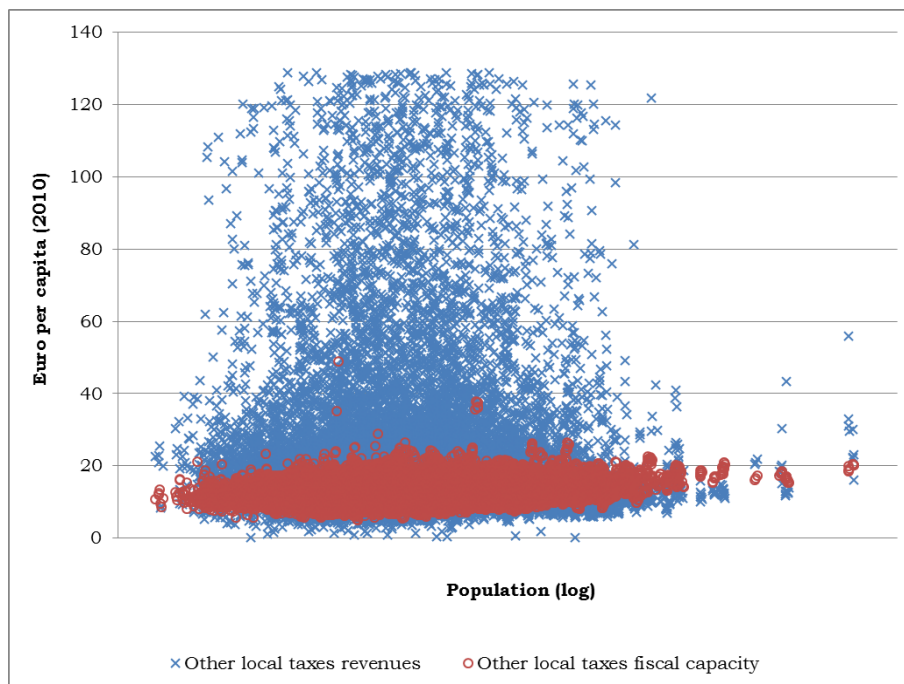


Figure a3 – Main fees: actual revenues and estimated fiscal capacity

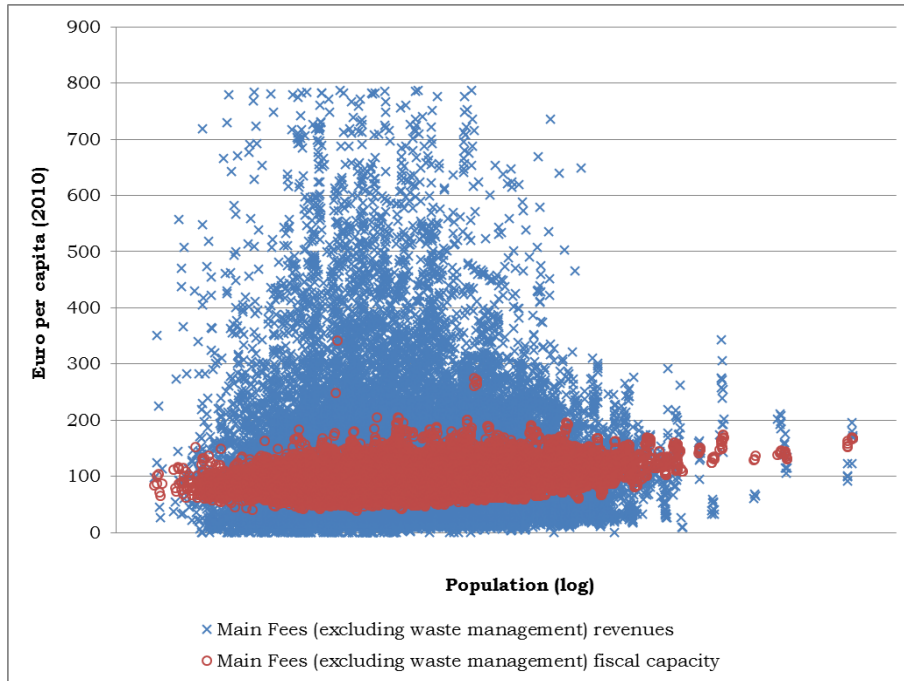


Figure a4 – Other local fees: actual revenues and estimated fiscal capacity

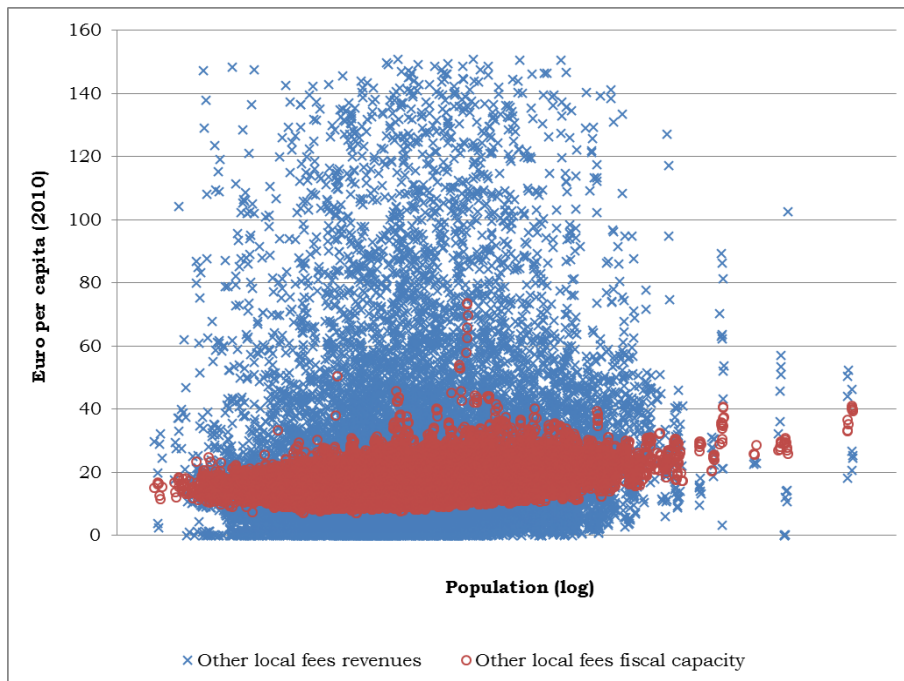




Figure a5 – Waste management tax and fees: actual revenues and estimated fiscal capacity

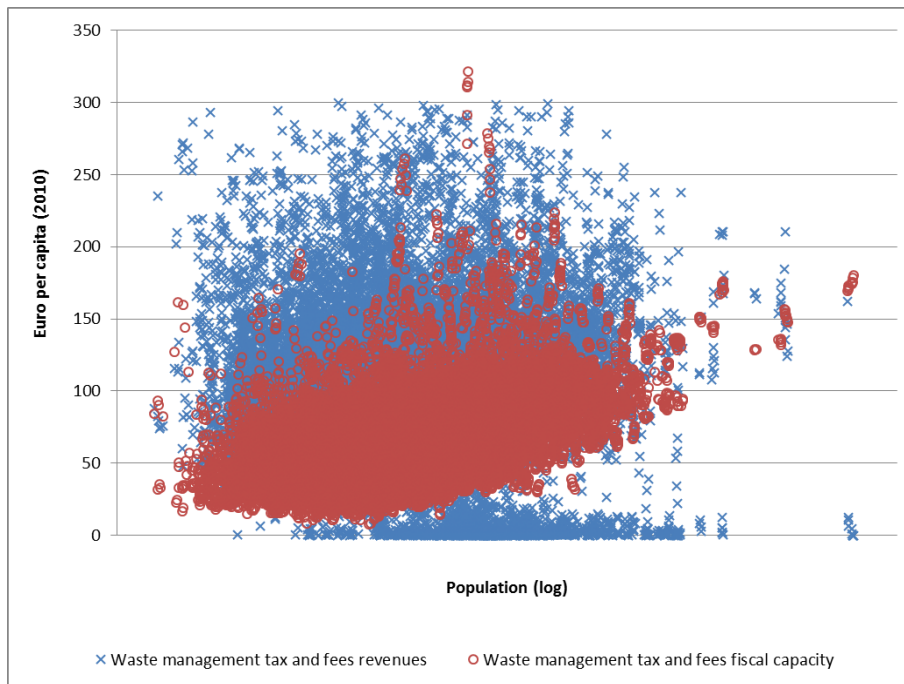


Figure a6 – Municipal personal income surtax: actual revenues and estimated fiscal capacity

