Tax Evasion, Government Size and Taxpayers Perceptions on Public Goods Provision. Evidence from Italian Regions.

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Abstract
We analyze the impact of government size, measured by total spending per capita, on tax evasion at the regional level in Italy over the period 2007-2015. In order to solve endogeneity issues we rely on a system-GMM and find that public expenditures positively affect tax evasion, as taxpayers feel that the government is not efficiently spending resources coming from the tax levy. Results are confirmed when (1) we consider expenditures that are more under control of bureaucrats, namely current spending per capita, and (2) we directly test the impact of different governments' efficiency indicators on tax evasion. In addition, our results hold true in areas with a high level of complaints about the quality of public goods provided by regional authorities. We also find that the impact of public spending is heterogeneous across geographical areas: an increase in public expenditures lead to a downward shift in tax evasion only in the southern part of Italy that is characterized by a relatively low initial level of public goods provision.

JEL Classification*: C33; C59; H20; H21; H26; H50.*
Keywords*: Tax evasion; Public Spending; Public Goods; Efficiency.*

1. Introduction

In Italy tax evasion represents a big issue for the national economy and public finance. The losses due to tax evasion are estimated to be € 183 billion annually up to 2011 (Murphy, 2011), where the widest opportunities to cheat fiscal authorities are available to entrepreneurs and professionals. In fact, 56.3 percent of them is estimated to pay no taxes or less taxes than the amount due (Evasione Fiscale, 2014).

Moreover, from the Italian Statistics Institute (ISTAT) and the Italian Revenue Agency (Agenzia delle Entrate, IRA henceforth) data sources a dramatic picture of the Italian situation emerges overtime: in 1981 tax evasion in Italy was about 28,000 billion, equivalent to 7-8% of GDP, and thirty years later this share has risen to between 16.3% and 17.5% of GDP, for a total that fluctuates between 255 and 275 billion of taxable income subtracted from the tax authorities, with strong repercussions on the public deficit and the consequent public debt, placing Italy on top of the European and OECD countries for tax evasion. Nonetheless, the tax evasion seems to be heterogeneous among regions: in northern

Italy, where the most significant share of business and income is realized, more taxable income is evaded in absolute monetary value, while the south has the record for number of evaders.

The public finance literature has mainly focused, on the one hand, on the determinants of tax evasion, such as tax morale, tax burden, quality of institutions, density of regulation and unemployment rate (see among others, Torgler and Schneider, 2007; Schneider and Enste, 2002; Schneider *et al*., 2010), and on the other hand, on the relationship between corruption and the shadow economy (Johnson *et al.,* 1997; 1998; Dreher and Schneider, 2010), whereas little is known on the impact of public spending on taxpayers' behavior.

The goal of our paper is to provide evidence on how government size, as measured by public spending, affects tax evasion using data at the regional level in Italy over the period 2007-2015. Findings show that an increase in government size leads to an upward shift in tax evasion by 2.2 percent, since taxpayers perceive the government is not efficiently working, wasting the public "pursue", and boosting in turn the general discontent of taxpayers. This is essentially true when in the face of an increase in public expenses, taxpayers does not feel satisfied about the quality of public goods provided by regional governments.

At this aim, we empirically test whether this conjecture finds support in our data and interact government size by the level of satisfaction citizens have about the quality of two public goods, namely lightening and condition of streets. In particular, we build two dichotomous variables taking the value of 1 if the number of residents' complaints is above the median and 0 otherwise and find that in areas characterized by a high level of complaints about public goods provided, public spending per capita positively affects tax evasion, whereas in areas with a low-level of quality perceived by citizens the impact is far from being statistically significant.

Findings are not affected by the inclusion of covariates, such as population size, unemployment rate, education of population, etc., considered by the mainstream literature as potential determinants of taxpayers' behavior, and are similar when we use as alternative measure of government size the change in public spending. Moreover, we also take into account in our analysis that the increase in government size might be due to inefficiencies produced by bureaucrats and focus in turn, on those expenses that are more likely to be under direct control of office-holders, i.e. current expenditures per capita. Results show that current spending increases the propensity to evade taxes by 3.4 percent. The same results hold true when we directly test for the impact of public spending efficiency on tax evasion, highlighting that the more regional government efficiency is the higher is the "cooperative" reaction of taxpayers in terms of a better attitude towards fiscal duties.

Finally, Italian regions are quite heterogeneous in terms of social capital and income with the south that is poor and endowed with a low level of social capital compared to the north. Given that tax evasion

(public spending) is higher (lower) in the northern (southern) part of Italy, we test if public spending differently affects taxpayers' behavior in these two main geographical areas. Findings show a negative government size effect in those regions where public expenditure is historically lower: a conclusion that finds theoretical support in Falkinger (1988) and Cowell and Gordon (1988), and reconsiders the role of morale, intrinsic motivations and reputational elements in explaining changes in taxpayers' behavior.

Our paper is closely related to Barone and Mocetti (2011)'s work in explaining tax evasion variation in the Italian scenario through a change in public spending, but with some improvements and also adding to the existing literature in different ways. First, we use regional data and, more importantly, we directly test the effect of public expenditures on actual tax evasion, using unique information provided by the IRA, rather than on tax morale, as in Barone and Mocetti (2011). Although surveys have the merit of incorporating additional social variables to a structural model, they may turn out to be unreliable or, at least, inaccurate since they are based on self[1].

Second, related to the previous point, we exploit the panel structure of our data set and hinge on a system-GMM technique to recover the causal (and not a simple spurious correlation with cross-sectional data) impact of public spending on tax evasion solving potential endogeneity issues, such as the reverse causality between government size and tax gap.

Last but not least, we further go deep into some channels through which public spending might impact tax evasion. In fact, we exploit geographical heterogeneity among Italian regions, and we also find an effect that is heterogeneous among areas characterized by a high/low level of complaints regarding the quality of public goods provided by regional governments, casting some doubts on some of the results found by Barone and Mocetti (2011).

The paper is structured as follows. In Section 2 we discuss the main literature on the determinants of tax evasion. In Section 3 we describe our sample. In Section 4 we present the methodology applied in our empirical exercise and the preliminary results, whereas in Section 5 we highlight results taking into account potential endogeneity issues. Section 6 concludes.

2. Literature Review

In their seminal work Alligham and Sadmo (1972) model the individual decision of evading taxes as a gamble, pointing out that tax evasion is negatively correlated with penalty and the probability of detection. This approach has been criticized as it is non-satisfactory in explaining the tax evasion

[1] For instance, participants in the survey have to scale their agreement to statements like "how much is justifiable not paying for your ticket on public transport". Not surprisingly, it may happen that people on average believe that it is not justifiable, but from their answers it is not possible to understand whether they have always paid the ticket for public transportation. On the inaccuracy of surveys see Ellfers *et al.* (1987).

phenomenon and its evidence all around the world. More generally, the criticism involves the paradigma of the traditional *homo oeconomicus* as a rational selfish decision maker (Andreoni *et al.* 1998; Slemrod, 2007). The main new frontier is rather to consider tax evasion as the final decision of a much more complex *iter* involving individual intrinsic motivations and morale, along with purely economic incentives.

Since the pioneer work by Jackson and Milliron (1986) many key-variables responsible for tax evasion have been evaluated in the literature. Among those related to taxpayers' characteristics, great relevance has been given to age, gender, education, occupational status and income. In particular, US data from the Taxpayer Compliance Measurement Program estimate that age negatively affects tax evasion, and people aged 65 or above are less likely to evade taxes (Andreoni *et al.*, 1998): a result confirmed by experimental studies (Baldry, 1987; Friedland *et al.,* 1978), and holding true also in those works where age is only used as control variable (Clotfelter, 1983; Feinstein, 1991). In addition, Tittle (1980) explains the relationship between age and tax evasion pointing out that young people are usually more risk-loving and less sensitive to the risk of penalties.

Education is another important determinant of tax evasion. Jackson and Milliron (1986) argue that education has two potential opposite effects on tax evasion. On the one hand, the increase of knowledge of the tax system should favor positive feelings about taxation, turning out in a lower level of tax evasion; on the other hand, an increased knowledge of the tax system may also increase knowledge of how to evade taxes, turning out favorable to higher tax evasion. The literature on this topic suggests that the first effect dominates the latter, so that education of taxpayers and tax evasion are negatively correlated (Song and Yarbrough, 1978; Wallschutzky 1984; Witte and Woodbury, 1985).

Also the unemployment rate has been investigated as a potential factor affecting taxpayers' behavior: unemployed people gain no wage and are not supposed to pay taxes, in turn reducing the propensity to evade. Conversely, there are studies focusing on the opposite relationship that is whether tax evasion influences unemployment. Isachsen and Strem (1981), using tax evasion to distinguish between an official labor market and a hidden labor markets, find that for workers who split between the official and the hidden markets an increase in the probability of being caught in tax evasion will have a positive impact on their choice for the official market. Generally speaking, a decline in the labor participation force rate may be associated to a switch of workers from the official market to the hidden market, so that unemployment should generate tax evasion (Contini, 1981).

A second strand of the literature has rather focused on contextual and public factors, such as marginal tax rates, sanctions and probability of detection, quality of institutions (Dreher *et al.*, 2009), corruption (Dreher and Schneider, 2010; Johnson *et al.*, 1997; Hibbs and Piculescu, 2005), and economic freedom (Riahi-Belkaoiu, 2004; Richardson, 2006) in order to explain the tax evasion

phenomenon. In fact, as far as the relationship between tax evasion and tax rate is concerned, Clotfelter (1983) proposes an empirical analysis for the United States, and using a cross-section analysis and a Tobit model finds a positive relationship between tax evasion and both marginal tax rate and after-tax income. However, tax rate and income are positively correlated. Feinstein (1991) sorts out this issue exploiting an exogenous change in the tax rate for given levels of income in the United States in both 1982 and 1985: no statistically significant effect of income on tax evasion is detected, although the impact of the marginal tax rate interestingly turns out to be negative and significant.

Moving to psychological determinants, i.e. those related to individual attitudes and behavior, of tax evasion, the literature becomes huge as it has embraced almost every aspect of the so-called tax morale, although also fairness, reciprocity and guilt have been fully explored. For instance, Bordignon (1993) proves that taxpayers' intrinsic motivation to pay taxes decreases when the neighbors are more willing to evade. The closest literature to our project is certainly that focusing on tax morale to be intended as satisfaction that taxpayers show to government policies on the provision of public goods and, more generally, on public expenditure. The experimental literature converges to assess that taxpayers are more likely to evade if they feel their money are not well spent (Alm *et al.,* 1992; Webley *et al.*, 1991).

At this aim, Barone and Mocetti (2011) propose an empirical work to analyze the effect of local efficiency on tax morale for Italian municipalities, where tax morale is measured by opinions on public spirit and taxation collected through the 2004 survey that is conducted every two years by the Bank of Italy and involving around 8,000 households. Empirical results show that public spending inefficiencies negatively affect citizens' tax morale and this effect is larger if the level of public spending is lower. Related to this point, Cowell and Gordon (1988) highlight the impact of redistribution through the provision of public goods on the perceived fairness and legitimacy of governments in collection taxes. Their theoretical model predicts a positive relation between tax rate (associated to public expenditure) and tax evasion when public goods are underprovided (because, e.g., the initial tax rate is low); conversely, a further increase in the tax rate once public goods are over-provided would lead to a decrease in tax evasion. Also authors rise concerns about their own results as intuitively individuals should be more prone to evade taxes when they feel that government does not use their money properly, that should be associated to over-provision (and not under-provision) of public goods.

Our paper is also related to the huge literature investigating the determinants of government size and its effect on economic outcomes. Above all, there are two main approaches in the literature that study government size and its influence on growth and development of a country. The first approach focuses on the market side, i.e. the demand for public services and the changes on the supply side due

to new technologies and globalization. In particular, Wagner's (1883) law establishes that government size increases due to an increase of demand for public services (security, public order, justice, etc.). On the same line, Bator (1958) proposes market failures as explanation for the increase of the government activities and public expenditure, whereas Samuelson (1954) focuses on the provision of public goods. On the supply side, Kau and Rubin (1981) identified changes in technology, an increase of market production and an increase in female labor participation as the main determinants of the growth of public expenditures.

The second approach looks at the structure of the State and other local governments, so that political institutions are identified to play a crucial role. On this line, a special focus has been devoted to bureaucracy (Niskanen, 1971), interest groups (Stiglitz, 1971), electoral rules (Persson and Tabellini, 1999) and fiscal illusions. Related to this point, Alesina and Perotti (1996) note that a complex tax legislation makes it very hard for citizens to understand the real tax pressure and to compare it with the provision of public services. As a result, government size increases due to higher tax revenues and public expenditure.

Motivated by these results, the present study adds to the literature that investigates the effect of government size on growth and development of the economy estimating a valid causal effect of public spending, as measured by total and current expenditures, on the propensity to evade from the payment of taxes at the regional level in Italy. In fact, an increase in public spending may reflect on more tax evasion if (and when) people realize that they are victims of this illusive process. Our work also relates to Li and Ma (2015) findings for China that highlight how a bigger government size is correlated with more severe tax evasion by firms, leading to the conclusion that tax evasion could be the effect of collusion between firms and local governments.

3. Data Description and Sample Selection

In our analysis we have adopted different sources of data, and Table 1 reports some descriptive statistics for the main variables used in the empirical exercise. First, to build up our outcome variable that is the *tax gap* (the propensity to evade from the payment of Value-added tax, IRAP, IRES and IRPEF taxes[2]) we have used unique information on tax evasion at regional level provided by the Italian Revenue Agency of the Ministry of Finance (Agenzia delle Entrate) over the period 2001-2015.

The common approach to calculate the tax gap (so-called top-down) is based on a comparison between fiscal data and a corresponding macroeconomic aggregate (generally represented by national accounting flows), which incorporates an estimate of the shadow economy, appropriately selected in

[2] IRAP (Imposta Regionale sulle Attività produttive) is the tax on net production value at regional level, IRPEF (Imposta Regionale sul Reddito delle Persone Fisiche) is the personal income tax, whereas IRES stands for the corporate income tax.

order to construct an all-encompassing theoretical tax base, that is compared then to the tax base declared by the universe of taxpayers. In international best practices, the top-down method is especially applied in quantifying the tax gap of indirect taxes (VAT, excise duties, etc.). In Italy, however, the presence of a tax on the value of net production, such as IRAP, makes it possible to measure also the tax gap of direct taxes through a top-down approach[3].

Table 1. Descriptive Statistics

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
Tax gap	171	0.3803	0.0931	0.1992	0.5850
Total Expenditures per capita (ln)	171	21.6656	0.3551	21.2247	23.2856
Current Expenditures per capita (ln)	171	21.5809	0.3262	21.1664	22.8902
Capital Expenditures per capita (ln)	171	18.9012	0.9249	16.6666	22.1666
Difference Total Expenditures	152	0.0016	0.1663	-0.6396	0.5249
Difference Current Expenditures	152	0.0014	0.1393	-0.5578	0.4452
Difference Capital Expenditures	152	-0.0018	0.7727	-2.4559	2.2917
Education of Population	171	11.1049	0.5353	10.0197	12.3974
Unemployment Rate (%)	171	10.0219	4.8278	2.8493	23.4153
% Elderly People	171	0.0115	0.0015	0.0083	0.0151
Value Added per capita	171	23,131.09	5,721.49	14,568.91	32,993.3
Population/1,000,000	171	3.0753	2.4169	0.1246	10.0026
South	171	0.3157	0.4662	0	1

Source: ISTAT website and Agenzia delle Entrate.

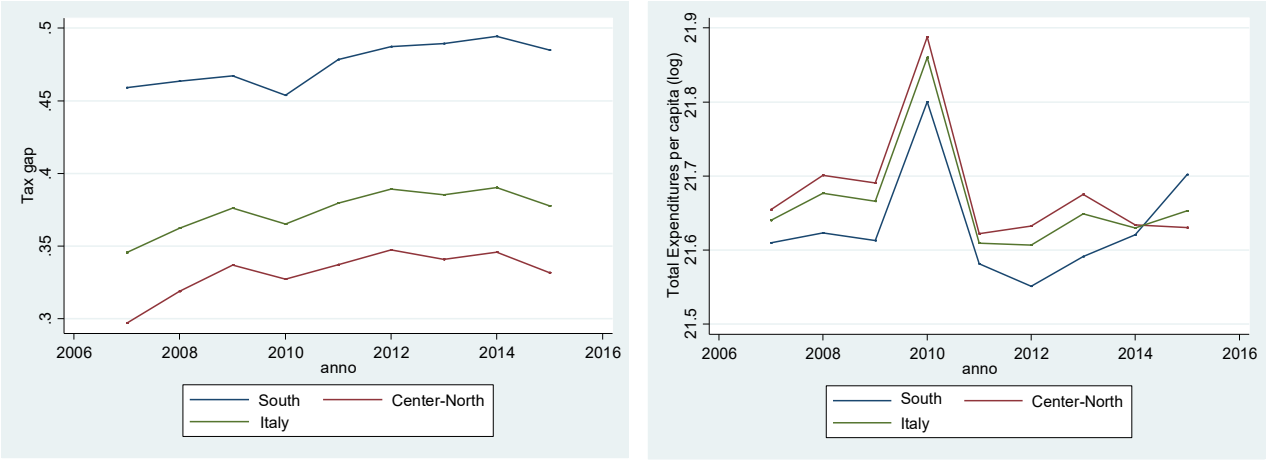
Second, we exploit public expenditures data coming from the balance sheets available on ISTAT (Istituto Nazionale di Statistica) website from 2007 to 2015. The budget is the main instrument used to plan the economic and financial management of regional governments in which all of information on total inflows and outflows (*Spese ed Entrate Totali*) can be found. Total inflows are essentially divided into current inflows (*Entrate Correnti*), including tax revenues (*Entrate Tributarie*), non-tax revenues (*Entrate Extra-Tributarie*) and transfers (*Entrate per Trasferimenti*) and capital inflows (*Entrate in Conto Capitale*), including transfers for investment projects (*Trasferimenti di Fondi per Investimenti*) and mortgages (*Spese per Rimborso Mutui*). Current inflows are usually used to finance current outflows (*Spese Correnti*), including expenses borne for a day-to-day regions' management, whereas capital outflows (*Spese in Conto Capitale*) are usually financed through capital inflows. We build our main variables of interest, measuring regional government size, as total spending per capita with a mean of 21.66 and a standard deviation of 0.35, current expenditures per capita and capital expenses per capita (in logarithm) with a mean of 21.58 and 18.89 respectively. We also compute the difference in the level of expenditures at time *t* and time *t-1* (total, current and capital) normalized by the

[3] For further details about the whole methodologies that can be applied to evaluate the tax gap and in particular on how the top-down approach works see the report on the observed economy and on the tax evasion that is annually published by Agenzia delle Entrate.

population size, as a proxy of the perception citizens have about the effort made by each regional government in terms of committed expenditures.

In Figure 1 we plot the pattern of the average tax gap (left panel) to give an insight on how it has changed over the period under scrutiny. The x axis of the graph shows the years while the average tax gap appears on the y axis. In particular, the green line refers to tax evasion for all regions, whereas the blue and the red line refer to the tax gap in the south and in the north of Italy respectively. Overall, it can be noticed that tax evasion on average is always above 35 percent, and slightly downturns since 2014. Furthermore, regions located in southern part of Italy[4] are characterized by a high level of tax gap compared to those in the center-north. Conversely, in the right panel of Figure 1 we present the patter of the total expenditures per capita in logarithm[5].

Figure 1: Tax gap and Total expenditures per capita over time



We further exclude from the analysis the autonomous provinces of Bolzano and Trento, as we do not have any information about the propensity to evade taxes, and Trentino region to avoid missing values in all the covariates used in the empirical analysis. We end up with a balanced panel data set on 19 Italian regions (171 observations) over the period 2007-2015.

Finally, in order to control for regional demographic characteristics that are largely considered in the literature as main drivers of tax evasion, we take from ISTAT website the size of resident population, the average rate of unemployment, the educational attainment of the population, the proportion of people aged 65 or over and the value added per capita, i.e. the value of all the productive activities carried out in each region.

[4] Apulia, Basilicata, Calabria, Campania, Sardinia and Sicily are considered regions belonging to the south of Italy.
[5] Figure A1 and A2 in the Appendix of the paper show the average level of expenditures and tax evasion by regions.

4. Methodology and Preliminary Results

We first estimate a dynamic OLS model with fixed effect at the regional level, to study the sign and the magnitude of the correlation between our variable of interest and the tax evasion, as follows:

$$Tax\ Evasion_{it} = \beta_0 + \beta_1 Tax\ Evasion_{it-} + \beta_2 Public\ Expenditures_{it} + X_{it} + \lambda_r + \mu_t + \varepsilon_{it,} \quad [1]$$

where the outcome variable is measured by the tax gap in region *i* at time *t*; $Tax\ Evasion_{it-}$ is the level of tax gap registered in region *i* at time *t-1; Public Expenditures*$_{it}$ is measured by the level of total expenditures per capita at the regional level; X_{it} is a vector containing the potential determinants of tax evasion, such as the educational attainment of population, the unemployment rate, the percentage of elderly people, the number of inhabitants, and the value added per capita. λ_r and μ_t are fixed effects at region level and year dummies respectively. The fixed effects λ_r account for the time-invariant characteristics of the region, either observable or unobservable. ε_{it} is the stochastic error in the model.

As a second step, we estimate equation [2] where we replace the level of public expenditures at time *t* with the difference in the level of public expenses registered at time *t* and time *t-1*, considered as a valid proxy of taxpayers' expectations about the future level of public expenditures committed by each region, in the following way:

$$Tax\ Evasion_{it} = \alpha_0 + \alpha_1 Tax\ Evasion_{it-1} + \alpha_2 \Delta(Public\ Expenditures)_{it} + X_{it} + \lambda_r + \mu_t + \varepsilon_{it,} \quad [2]$$

Table 2 reports the main preliminary OLS results. In column (1) and (2) the main variable of interest is measured by the level of total expenditure per capita, whereas in the last two specifications we focus on the correlation between the difference in the level of total expenditures normalized by population size and tax gap. Moreover, in odd specifications we only control for regional fixed effects and for year dummies, while in even columns we add some more tax gap determinants as explained before. In each specifications standard errors are robust to heteroscedasticity and clustered at regional level in order to take into account any potential common shocks affecting regions.

Findings highlighted in the specification reported in column (1) show how the level of total spending per capita is positively correlated to tax evasion: increasing the main variable of interest by 1 percent leads to an upward shift in the tax evasion by 2.2 percent roughly. The main explanation driving our results is that an increase in public expenditure, used as a valid proxy of regional government size, is not well-perceived by citizens. In fact, a disproportionate growing in public expenditure is a symptom that the government is not efficiently spending the resources coming from

the tax levy, leading in turn to a general discontent of the taxpayers. This generally happens if there is not an adequate supply of public goods behind the increase in public expenses, or if the quality of public goods supplied tends to be very low. Again our results tend to be consistent with those found in the theoretical literature by which taxpayers are more likely to evade if they feel that their money are not well spent (Alm *et al.,* 1992; Webley *et al.*, 1991).

Table 2: Tax evasion and Spending. OLS with FE results

	(1)	(2)	(3)	(4)
VARIABLES	Tax evasion	Tax evasion	Tax evasion	Tax evasion
Tax evasion (t-1)	0.409***	0.305***	0.421***	0.326***
	(0.107)	(0.099)	(0.108)	(0.101)
Total Expenditures per capita (ln)	0.022**	0.027***		
	(0.009)	(0.009)		
Δ Total Expenditures per capita			0.015**	0.016**
			(0.006)	(0.006)
Education of Population		-0.043***		-0.041***
		(0.014)		(0.013)
Unemployment rate		0.001		0.001
		(0.001)		(0.001)
%Elderly People		-1.498		-1.826
		(2.441)		(2.466)
Value Added per capita		0.001		0.001
		(0.001)		(0.001)
Population size		0.045*		0.033
		(0.024)		(0.025)
Constant	0.246	0.005	0.217***	0.564***
	(0.203)	(0.242)	(0.044)	(0.177)
Regional FE	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	152	152	152	152
R-squared	0.492	0.550	0.491	0.544
Number of Regions	19	19	19	19

Note: OLS estimates. We focus on the period 2007-2015. In each specification we control for year dummies and regional fixed effects. Standard Errors are robust to heteroscedasticity and are clustered at the regional level (shown in brackets). Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

In column (2) our findings remain substantially unchanged when we add some regions' characteristics as control variables. Again a 1 percent increase in the level of total spending per capita boosts the tax gap by 2.68 percent. As far as the control variables are concerned, we find a negative correlation between the average educational attainment of residents and the propensity to evade taxes that is in line with results highlighted in the literature (see Jackson and Milliron, 1986; Song and Yarbrough, 1978; Wallschutzky, 1984; Witte and Woodbury, 1985). We also find a positive correlation between the number of residents within the region and the tax gap as the larger the population size the higher the chance of evading taxes. Finally, all the other potential determinants of tax evasion (unemployment rate, the proportion of people aged 65 or above and the value added per capita) do not

have any statistically significant impact on our outcome variable, even though they have the expected sign.

In column (3) we look at the effect of the change in the level of total expenditures per capita with respect to the previous period on the tax gap. Again the correlation is positive and statistically significant at the 5 percent level. In addition, when total expenditures increase by 1 euro compared to the level of total spending registered last year, the tax gap will increase by 1.53 percent. The same results hold true when in column (4) we add the same controls as those reported in column (2) of Table 2.

We are aware that tax evasion and the level of spending are co-determined, and a simple OLS analysis with fixed effects at regional level is not enough to solve any potential issues related both to omitted variable bias (all those time-varying unobserved characteristics at the regional level correlated to the level of public expenditures that might also affect our outcome variable), and reverse causality (the government may decide to invest less in areas characterized by a high level of tax evasion, for instance). For this reason, in order to recover the causal effect of interest and to solve potential endogeneity problems, in the next section we present robust results by means of a system- Generalized Method of Moments (GMM).

5. Endogeneity issues and GMM estimates techniques

As previously stated, the OLS results with regional fixed effects, although robust to heteroskedasticity and with standard errors clustered at regional level, are still subject to different types of biases. Particularly relevant in our empirical context is: 1) the dynamic panel bias due to the presence of the lagged dependent variable among the regressors, and 2) the endogeneity bias caused by reverse causality between public spending per capita and the outcome variable.

As regards the first issue, in the previous section the positive correlation between the lagged value of income and the error term of the regression is likely to attenuate the coefficient estimates on the dependent variables. Moreover, as far as the reverse causality is concerned the potential endogeneity bias may shift the estimated coefficients either upward or downward. In order to avoid both types of bias, a common approach in the literature is to use the Generalized Methods of Moments (GMM estimation) techniques proposed by Arellano and Bond (1991) and Blundell and Bond (1998), which rely on using lagged values of the potentially endogenous covariates (included tax evasion) as instruments. One crucial difference between the two approaches relates to the exact choice of instruments. Arellano and Bond (1991) suggest the use of lags of the endogenous regressors in levels to estimate the specification of interest in first differences. On the other hand, Blundell and Bond (1998)

suggest the joint estimation of the specification of interest in levels and in first differences using lags of the endogenous regressors in terms of both levels and first differences.

In our case, we prefer to recover the causal impact of government size on tax evasion by means of a one-step-system GMM estimation techniques, treating some of the covariates as potentially endogenous (i.e. the lagged value of tax evasion, public spending per capita or the difference in the level of spending per capita depending on the specification, and the value added per capita)[6], since the system-GMM is considered more efficient than the difference-GMM[7].

Moreover, the two-step procedure, in a system-GMM setting, is more suitable as it leads to consistent (as the one-step procedure) and asymptotically efficient estimator. However, as our sample size is small, although the number of cross-section units (*regions*) is larger than the time series units (years), the one-step system GMM technique is preferred compared to the two-step technique. We also collapse the number of instruments, as suggested by Roodman (2009), to avoid redundancy in the instruments used. Furthermore, we use robust estimator of the covariance matrix of the parameter estimates with the resulting standard error estimates that are consistent in the presence of any pattern of heteroskedasticity and autocorrelation within panels, and we apply the backward orthogonal deviations that replace instruments with their deviations from past means in order to avoid any potential correlation between the instruments and the error term.

Results are displayed in Table 3, where we replicate the same specifications as those of Table 2. All in all, we can notice that a meaningful correction for the dynamic panel and endogeneity bias does not alter the qualitative nature of our main results. In fact, comparing the estimates in this table to those in Table 2, it is clear they are very similar. In all cases, we observe a positive and significant effect of government size, as measured by total expenditures per capita and tax evasion. The same results hold true when we measure our variable of interest as the change in the level of spending with respect to that reported the previous year. Also, the inclusion of covariates does not affect our findings.

Moreover, for all regressions at the bottom of Table 3, we report the results (*p-values*) of two key specification tests that are the Hansen J-test for instrument exogeneity and the Arellano–Bond test for second order autocorrelation. A significant Hansen J-statistic would indicate that some of the instruments are likely to be not exogenous. Similarly, a significant test statistic for the Arellano–Bond autocorrelation test would indicate that some of our instruments are potentially correlated with the error

[6] Considering the other covariates as endogenous does not change our results. In Table A2 we check whether results are the same as those presented in the main text of the paper when different lags of the endogenous variables are used as instruments to solve endogeneity issues. In order to be consistent among specifications we use all available lags as instruments.

[7] In Table A1 in the Appendix of the paper we present, as a robustness check, empirical results using the two-step difference-GMM technique.

term. However, as highlighted by the reported *p-values*, in both cases the statistics are never significant at any conventional levels.

Table 3: Tax evasion and Spending. GMM results

	(1)	(2)	(3)	(4)
VARIABLES	Tax evasion	Tax evasion	Tax evasion	Tax evasion
Tax evasion (t-1)	0.464***	0.416***	0.470***	0.433***
	(0.152)	(0.109)	(0.166)	(0.137)
Total Expenditures per capita (ln)	0.025**	0.026**		
	(0.009)	(0.011)		
Δ Total Expenditures per capita			0.014*	0.019**
			(0.007)	(0.008)
Education of Population		-0.040***		-0.038***
		(0.014)		(0.013)
Unemployment rate		0.001		0.001
		(0.001)		(0.001)
%Elderly People		-1.153		-1.646
		(2.385)		(2.398)
Value added per capita		0.001		0.001
		(0.001)		(0.001)
Population size		0.035*		0.022*
		(0.022)		(0.023)
Constant	0.390*	0.132	0.151***	0.466**
	(0.195)	(0.291)	(0.053)	(0.214)
Year dummies	Yes	Yes	Yes	Yes
Hansen Test	0.884	0.920	0.586	0.920
Arellano-Bond AR(2)	0.794	0.907	0.814	0.972
Observations	152	152	152	152
Number of Regions	19	19	19	19

Note: One-step system GMM estimates. We focus on the period 2007-2015. In each specification we control for year dummies. Standard Errors are robust to heteroscedasticity and are clustered at the regional level (shown in brackets). Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

To better investigate our conjecture by which the upward shift in the government size is potentially seen as a bad signal by taxpayers, we rely on the public finance literature (see for instance Niskanen, 1971) that has tried to explain the different motivations behind the growth of public spending, bringing them back essentially to the state-over-citizen theories of government growth. Here, the size of government is independent from citizen demand and government grows, not because there is a bigger provision of public goods, but because of inherent inefficiencies in public sector activities and incentives facing government bureaucrats. At this aim, we measure the regional government size by expenses that are more directly under control of bureaucrats, i.e. current expenditures per capita (as mentioned before they refer to expenses borne for a day-to-day management of regions) including, among others, operating expenditures and retributions paid to public employees.

Results coming from the implementation of a one-step system GMM are displayed in column (1) and (2) of Table 4 where we control for year dummies, regional fixed effects and we add the full set of

controls as described before. In the first column we look at the level of current spending while in column (2) we focus on the change in the current expenditures per capita. We can notice that the level of current spending per capita positively affects taxpayers' propensity to evade taxes, with a point estimate of 0.034. Conversely, as expected, when the focus is on capital expenditures (see column 3 and 4), i.e. those expenses intended to create future benefits, such as infrastructure investment in transport (roads, rail airports), health (water collection and distribution, sewage systems), communication and research spending, we find a negative although not statistically significant impact of government size on tax evasion: the more the regional governments invest in long-term projects the lower is the perception by taxpayers that money are not well-spent.

Table 4: Tax evasion and Current and Capital Spending. GMM results

	(1)	(2)	(3)	(4)
VARIABLES	Tax evasion	Tax evasion	Tax evasion	Tax evasion
Tax evasion (t-1)	0.398***	0.422***	0.424***	0.423***
	(0.101)	(0.133)	(0.115)	(0.117)
Current Expenditures per capita (ln)	0.034***			
	(0.012)			
Δ Current Expenditures per capita		0.019**		
		(0.008)		
Capital Expenditures per capita (ln)			-0.001	
			(0.002)	
Δ Capital Expenditures per capita				-0.001
				(0.001)
Constant	0.321	0.462**	0.450**	0.443*
	(0.317)	(0.218)	(0.210)	(0.211)
Year dummies	Yes	Yes	Yes	Yes
Hansen test	0.883	0.920	0.999	0.986
Arellano-Bond AR(2)	0.833	0.822	0.723	0.735
Controls	Yes	Yes	Yes	Yes
Observations	152	152	152	152
Number of regions	19	19	19	19

Note: One-step system GMM estimates. We focus on the period 2007-2015. In each specification we control for year. Standard Errors are robust to heteroscedasticity and are clustered at the regional level (shown in brackets). Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

As we are not only interested in the direct effect government size has on taxpayers' behavior in terms of tax evasion, we add among controls some measures of the perception taxpayers have about the quality of public goods provided by regional governments. In other words, the causal impact of public expenditures on tax evasion might be mitigated by the level of citizens' satisfaction in the area where they live, all else being equal.

At this aim, we further exploit information at regional level provided by ISTAT about the percentage of households complaining about some goods and services provided by regional governments, i.e. streets lightning and condition of streets: these variables can be seen as direct proxies of the quality of

public goods. In particular, we build two dummy variables (*Lightning* and *Streets*) that are equal to 1 if the percentage of families complaining is above the median and zero otherwise, and we interact them by the regional government size, as measured by the total expenditures per capita or by the difference in the level of expenditures, depending on the specification, as before.

Table 5. Tax evasion, Public spending and Perceptions about public goods quality. GMM results.

	(1)	(2)	(3)	(4)
VARIABLES	Tax evasion	Tax evasion	Tax evasion	Tax evasion
	Lightning	Lightning	Streets	Streets
Total Ependitures per capita (ln)	0.005		0.007	
	(0.013)		(0.013)	
Total Expenditures*Quality	0.017**		0.018**	
	(0.006)		(0.006)	
ΔTotal Expenditures per capita		0.002		0.003
		(0.006)		(0.006)
ΔTotal Expenditures*Quality		0.033***		0.035***
		(0.011)		(0.011)
Constant	0.072	0.265	0.066	0.255
	(0.357)	(0.189)	(0.355)	(0.179)
Hansen test	0.999	0.999	0.999	0.999
Arellano-Bond AR (2)	0.793	0.896	0.782	0.887
Controls	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Observations	152	152	152	152
Number of Regions	19	19	19	19

Note: One-step system GMM estimates. We focus on the period 2007-2015. In each specification we control for year dummies and the full set of controls. Standard Errors are robust to heteroscedasticity and are clustered at the regional level (shown in brackets). Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

GMM results are displayed in Table 5. We report only the coefficient attached to our variable of interest and to the interaction with the two measures of citizens perception about the quality of public goods provided. In all specifications we control for the full set of controls, for the interaction between controls and the quality perception measures and for year dummies[8]. Further, in odd specification we focus on total expenditures per capita, whereas in even columns we report our findings when the variable of interest is measured by the difference in the level of spending. Moreover, apart from the main variable of interest and the lagged value of tax evasion, all the interaction terms are treated as endogenous variables. All in all, we can notice that the interaction term is always positive and statistically significant at the 1 percent level (see column 1 and 3), suggesting that in areas characterized by a high level of complains, increasing government size leads to an upward shift in the tax evasion.

[8] We obviously cannot control for regional dummies as the indicators of quality perception are measured at regional level.

Table 6. Tax evasion and Efficiency. GMM results.

	(1)	(2)	(3)	(4)
VARIABLES	Tax evasion	Tax evasion	Tax evasion	Tax evasion
Tax evasion (t-1)	0.479***	0.431***	0.547***	0.472***
	(0.160)	(0.120)	(0.162)	(0.124)
Speed	-0.027*	-0.028*		
	(0.014)	(0.015)		
Speed Payment			-0.014*	-0.017*
			(0.008)	(0.008)
Constant	0.172***	0.403*	0.127	0.433**
	(0.050)	(0.218)	(0.128)	(0.203)
Year dummies	Yes	Yes	Yes	Yes
Arellano-Bond AR(2)	0.934	0.797	0.935	0.704
Hansen test	0.476	0.999	0.999	0.999
Controls	No	Yes	No	Yes
Observations	152	152	152	152
Number of Regions	19	19	19	19

Note: One-step system GMM estimates. We focus on the period 2007-2015. In each specification we control for year dummies. Standard Errors are robust to heteroscedasticity and are clustered at the regional level (shown in brackets). Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

Moreover, in Table 6 we instead focus on the supply side, rather than on the demand side of public goods as in the previous table and we directly test Barone and Mocetti (2011) prediction about the relationship between tax evasion and regional government efficiency. In fact, taxpayers' discontent might rise as regional governments spend more than the level desired by citizens, or more than resources collected through tax levy. In both cases regional governments work under inefficiency conditions, and following Gagliarducci and Nannicini (2013) we build two efficiency indicators for the management of the regional government that take into account also the amount of revenues by regional governments: the ratio between total revenues and total spending, i.e. the surplus (see column 1 and 2) with a mean of 0.869 and a standard deviation of 0.27, and the speed of payment, measured by the ratio between paid and committed outlays (column 3 and 4) that is on average 1.22 and it has a standard deviation of 0.169.

GMM findings, in line with those found by Barone and Mocetti (2011) on tax morale at the municipal level in Italy, highlight that both measures of regional government efficiency negatively impact tax evasion: the more the public administration is efficient the less is the propensity to evade taxes. Also the inclusion of controls in even specifications does not alter the results.

Finally, the channels through which public spending affects taxpayers' behavior may work dissimilarly in different parts of Italy. We are indeed considering a country that is very heterogeneous in terms of economic and social conditions, with the northern part being richer and endowed with higher social capital compared to the south. Moreover, as shown in Figure 1, regional governments spends on average more in the north compared to the south. To investigate whether the relationship

between government size and tax evasion is heterogeneous in the two parts of the country we have interacted all the variables in the right-hand side of equation (1) and (2) by a dummy variable taking the value of 1 if the region belongs to the south and 0 otherwise.

Results are displayed in Table 7. We measure government size as total, current and capital expenditures per capita in column (1), (2) and (3) respectively.

Table 7. Tax evasion and Public spending: South vs North. GMM results

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Tax evasion	Tax evasion	Tax evasion	Tax evasion	Tax evasion	Tax evasion
Total Expenditures per capita (ln)	0.002					
	(0.013)					
Total Expenditures per capita*South	-0.018*					
	(0.009)					
Current Expenditures per capita (ln)		0.002				
		(0.014)				
Current Expenditures per capita*South		-0.015*				
		(0.008)				
Capital Expenditures per capita (ln)			0.003			
			(0.003)			
Capital Expenditures per capita*South			-0.005			
			(0.005)			
Δ Total Expenditures per capita				0.024**		
				(0.011)		
Δ Total Expenditures per capita*South				-0.022*		
				(0.0125)		
Δ Current Expenditures per capita					0.028**	
					(0.013)	
Δ Current Expenditures per capita*South					-0.029*	
					(0.015)	
Δ Capital Expenditures per capita						-0.001
						(0.002)
Δ Capital Expenditures per capita*South						-0.002
						(0.003)
Constant	0.304	0.382	0.146	0.179	0.137	0.256
	(0.372)	(0.426)	(0.115)	(0.183)	(0.162)	(0.257)
Arellano-Bond AR(2)	0.843	0.684	0.898	0.643	0.463	0.781
Hansen test	0.999	0.999	0.999	0.999	0.999	0.999
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	152	152	152	152	152	152
Number of Regions	19	19	19	19	19	19

Note: One-step system GMM estimates. We focus on the period 2007-2015. In each specification we control for year dummies and for the full set of controls along with the interaction term between the set of controls and the variable *South.*. Standard Errors are robust to heteroscedasticity and are clustered at the regional level (shown in brackets). Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.

We show that the effect of our variable of interest on tax evasion is in fact heterogeneous: the coefficient attached to total public spending (column 1) interacted by the variable *South* is negative

and statistically significant. In particular, in the southern regions, an increase of public spending per capita by 1 percent reduces tax evasion by 1.8 percent compared to the north. Moreover, government size in the south negatively affects the outcome variable (the linear combination of the coefficient of *Total Expenditures per capita (ln)* and its interaction with the variable *South* is negative and significant at 10 percent level), whereas the effect of interest is positive in the north but not statistically significant at any conventional level. The same results are true when the focus is on current spending.

In the last three columns of Table 7 we highlight the effect of the change in the level of spending compared to that registered the period before on tax evasion. Again the impact on the outcome variable has the same sign as that displayed in the first three columns but it is a bit larger in terms of magnitude.

We are aware that the heterogeneous effect is very hard to be interpreted as causal, as many other factors might differ between south and center-north, and in turn, we can never fully attribute the differences found to a specific dimension. Nonetheless, our findings are only suggestive and relate to Gordon's (1998) intuition: in poor areas, as the south of Italy, where the level of spending is usually low compared to that registered in richer areas, individuals reduce the propensity to evade taxes when they feel the government intervention is meant to revive the fortunes of their regional economy, through an increase in public spending and a better provision of public goods.

6. Concluding remarks

Tax evasion is increasingly considered a social disease in every country, and reducing its negative impact on the national economy as a whole is a priority for policy-makers. Unfortunately, the government may involuntarily contribute to encourage taxpayers in evading from the payment of taxes, especially when citizens feel unsatisfied about how government spends their money.

A large literature has focused on the impact of public expenditures, as a measure of government size, emphasizing its potential effect on tax payers' motivations (Alm *et al.,* 1992; Webley *et al.*, 1991; Barone and Mocetti, 2011). Our paper falls on this field and focuses on Italy, an European country characterized, on the one hand, by geographical heterogeneity in both economy and social welfare and, on the other hand, by a very high level of tax evasion.

Using regional data on tax evasion provided by IRA and regional data on public expenditures provided by ISTAT over the period 2007-2015 we have tested whether government size, as measured by public spending, affects tax evasion in Italy.

First, we have implemented a dynamic OLS estimation with fixed effects, to take into account time-invariant characteristics of regions affecting both public spending and taxpayers' behavior, showing that the level of total and current spending per capita is positively correlated to tax evasion. To explain this result we have conjectured that taxpayers perceive the increase in public expenditure as a symptom

that the government is not efficiently spending their money, and consequently they feel unsatisfied, especially when the upward change regards those expenses borne for a day-to-day management of the public "purse" that are more under control of bureaucrats.

Second, we have applied a system-GMM technique aimed at solving potential reverse causality issues affecting our model, and found qualitatively similar results. All in all, our data confirm our conjecture, as using information about citizens' satisfaction about the quality of two public goods, namely lightening and condition of streets, we have found that in areas characterized by a high level of complaints public spending per capita positively affects tax evasion, whereas in areas with a low-level of quality perceived by citizens the impact is not statistically significant.

Finally, our findings show that the public spending effect is also heterogeneous between regions located in the north and in the southern part of Italy, suggesting that in poorer areas, usually characterized by a low level of spending, citizens are more willing to pay taxes due to an increase in public spending, since it is perceived as a greater involvement of the government in order to enhance the economic conditions of the area.

Evaluating the public spending effect using more disaggregated data, also at a lower level (provincial or municipal), in terms of both tax evasion, distinguishing between personal income tax, corporate income tax and value-added tax for instance, and different type of expenditures borne by the government (expenditures in education, defense, etc.), would be helpful for policy-makers as it could provide more accurate predictions on how government size affects tax evasion, and is left for future research.

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Appendix

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Figure A1: Expenditures per capita (log) by Regions

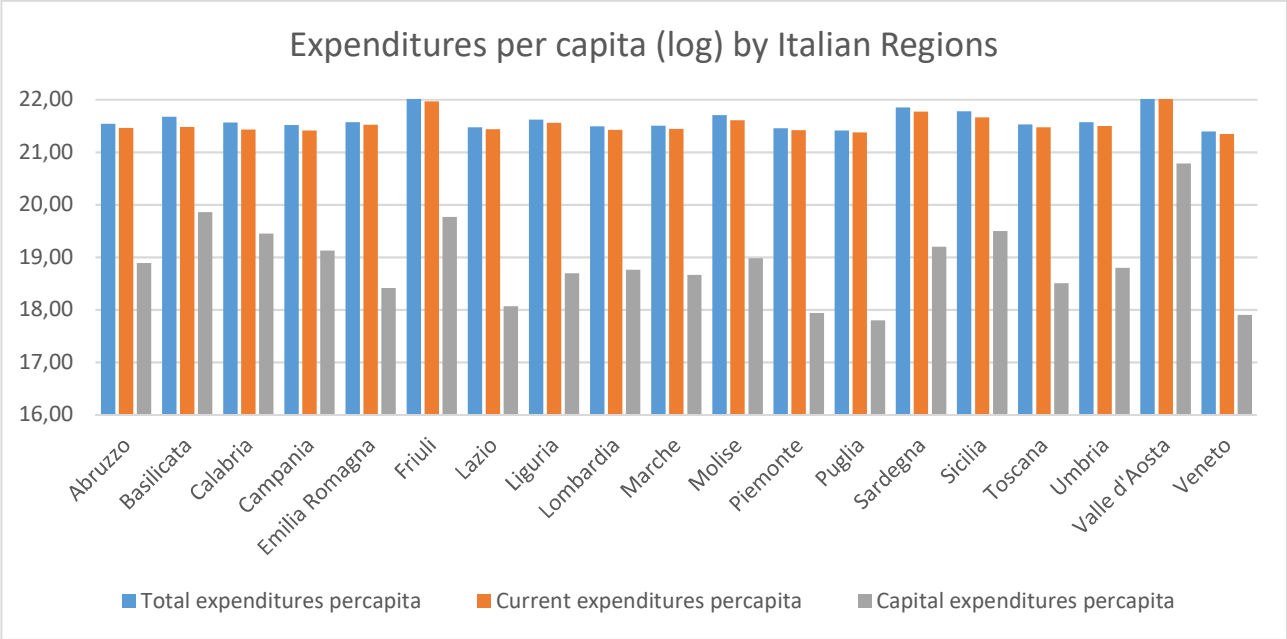

Figure A2: Tax evasion by Regions

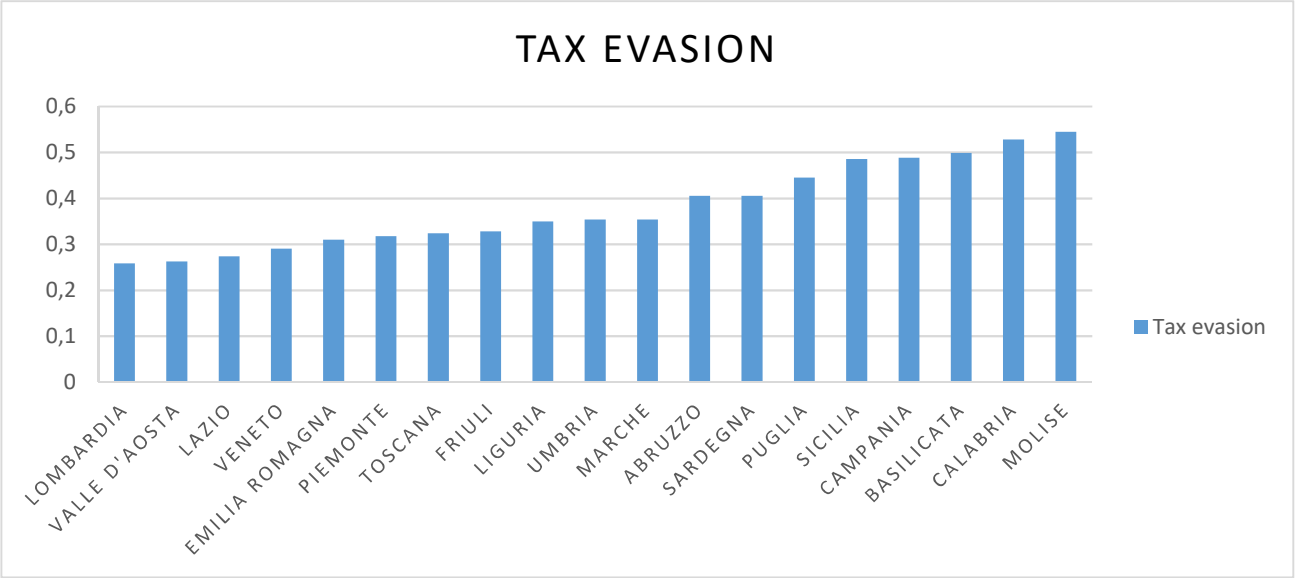

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Table A1. Tax evasion and Public spending. Difference-GMM results

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Tax evasion	Tax evasion	Tax evasion	Tax evasion	Tax evasion	Tax evasion
Tax evasion (t-1)	0.441***	0.556**	0.488***	0.503**	0.179*	0.522**
	(0.144)	(0.213)	(0.128)	(0.219)	(0.090)	(0.219)
Total Expenditures per capita (ln)	0.029***	0.028*				
	(0.007)	(0.015)				
Current Expenditures per capita (ln)			0.039***	0.037**		
			(0.009)	(0.018)		
Capital Expenditures per capita (ln)					-0.005***	-0.004*
					(0.002)	(0.002)
Arellano-Bond AR(2)	0.607	0.430	0.405	0.353	0.894	0.529
Hansen test	0.747	0.879	0.760	0.829	0.289	0.723
Controls	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	133	133	133	133	133	133
Number of Regions	19	19	19	19	19	19

Note: Two-step difference GMM estimates. In each specification we control for year dummies and regional fixed effects. Standard Errors are robust to heteroscedasticity and are clustered at the regional level (shown in brackets).

Table A2. Tax evasion and Public spending: Different lags. System-GMM results

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Tax evasion	Tax evasion	Tax evasion	Tax evasion	Tax evasion	Tax evasion
	Total Expenditures per capita					
Total Expenditures per capita (ln)	0.026**	0.025**	0.025**	0.026**	0.026**	0.027**
	(0.011)	(0.011)	(0.010)	(0.011)	(0.010)	(0.012)
Arellano-Bond AR(2)	0.911	0.922	0.932	0.933	0.960	0.962

Hansen Test	0.999	0.115	0.164	0.000	0.082	0.000
	Current Expenditures per capita					
Current Expenditures per capita (ln)	0.034***	0.033**	0.033***	0.035***	0.035***	0.036**
	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.013)
Arellano-Bond AR(2)	0.832	0.829	0.819	0.814	0.796	0.725
Hansen Test	0.746	0.994	0.050	0.000	0.000	0.000
	Capital Expenditures per capita					
Capital Expenditures per capita (ln)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Arellano-Bond AR(2)	0.733	0.755	0.743	0.747	0.776	0.876
Hansen Test	0.996	0.991	0.000	0.000	0.000	0.000
Lags	(1 7)	(1 6)	(1 5)	(1 4)	(1 3)	(1 2)
Controls	No	Yes	No	Yes	No	Yes
Regional FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	152	152	152	152	152	152
Number of Regions	19	19	19	19	19	19

Note: One-step system GMM estimates. We focus on the period 2007-2015. In each specification we control for year dummies. Standard Errors are robust to heteroscedasticity and are clustered at the regional level (shown in brackets). Significance at the 10% level is represented by *, at the 5% level by **, and at the 1% level by ***.