Tax Audits and Tax Compliance—Evidence from Italy

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1. Introduction

In Italy, tax evasion (including evasion of social security contributions) has been estimated to be 110 billion euros a year, about 7 percent of the GDP.[2] There exist a number of studies and reports showing that levels of compliance with tax laws are low in Italy compared to European standards.

In times of tightening fiscal constraints, combatting tax evasion and stimulating tax compliance have become a priority for economic policy. In this context, the most cost-effective strategy would be to use tax audit programs not only to directly detect tax evasion but also, and foremost, to promote voluntary compliance.

In this paper, we focus on the effect of tax audits on a sample of small firms and self-employed individuals over the period 2006-2011, using a unique and confidential dataset with tax return data and information on the tax audit activity of the Italian Revenue Agency (IRA). We investigate this particular group of firms for two reasons: first of all, among this group of taxpayers, the propensity to underreport income is higher than the national average; and second, the distribution of firms by size is skewed towards small and micro firms, which account for more than 98 percent of the total in Italy.[3]

Building on the results of a companion paper (D'Agosto, et al. (2017)), the aim of this study is to investigate whether tax audits exert a positive and relevant effect on tax compliance and to evaluate the effectiveness of different categories of audit programs. The final part of the paper is devoted to the analysis of the general deterrence effect of tax audits on tax compliance.

As most of the IRA audit programs are not random, we use an econometric approach that allows us to account for selection bias related to time-invariant individual characteristics. Moreover, our results seem robust to the endogeneity issues caused by the possible correlation between time-variant individual characteristics and the audit selection process.

The rest of the paper is organized as follows: the second section reviews the literature on tax compliance; the third section describes the dataset; section 4 describes the empirical model and the econometric approach used; and section 5 concludes.

2. Review of Related Literature

Since the pioneering Allingham and Sandmo (1972) study, economic research on taxpayer compliance has examined the role of enforcement to discourage fraudulent tax behavior. Empirically, studies have discerned two main effects of enforcement on tax collection. The first is the direct benefit from the additional tax, interest, and penalties paid by the audited taxpayer for the year(s) under audit. The second is an indirect effect, mainly defined in literature as a general deterrent effect, which is the change in tax collections among the general population—including those who were not audited.[4]

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[1] Opinions expressed in this article are those of the authors and do not necessarily reflect those of the Finance Department and of the Revenue Agency. Any errors are ours.

[2] See "RELAZIONE SULL'ECONOMIA NON OSSERVATA E SULL'EVASIONE FISCALE E CONTRIBUTIVA" available here: http://www.mef.gov.it/inevidenza/documenti/Relazione_evasione_fiscale_e_contributiva__0926_ore1300_xversione_definitivax-29_settembre_2016.pdf.

[3] See http://www.istat.it/it/files/2015/05/CAP-3-Rapporto-Annuale-2015–2.pdf.

[4] Within the indirect impacts, some scholars define the effects spread upon nonaudited taxpayers as a spillover deterrent effect and identify the subsequent year effect of those audited as a corrective impact (Gemmell and Ratto, 2012). An empirical estimation of the enforcement spillovers is shown in Rincke and Traxler (2011).

The direct outcome of investigations may be measured immediately, the indirect outcome, however, is more difficult to estimate, as the contrasting results in literature have shown.

In this perspective, some studies have explored the effects of an increasing probability of an audit: for instance those of Dubin and Wilde (1988), Dubin, Graetz, and Wilde (1990), Plumley (1996) and Dubin (2007). These authors have used aggregated time series and cross-sectional data, data on individuals at the State level, and audit rate data from the IRS. In evaluating the direct and indirect effects on revenue, they showed that the indirect prevails over the direct. Recent studies, such as those of Birskyte (2013) and Tagkalakis (2014), have obtained similar results.

Another approach has looked at the effects that the experience of an audit has produced on taxpayer behavior by using individual data. In this setting, Erard (1992) examined the effect of an audit on subsequent year reporting behavior and his results, although consistent with a positive influence, are not conclusive. Niu (2011) investigates the voluntary compliance shift after a firm is audited by applying a difference-in-differences approach to tax return and audit data. His findings show that audited firms report higher sales growth rate in the year of audit than nonaudited firms do. Gemmell and Ratto (2012) analyze the subsequent compliance behavior of audited taxpayers and their results are inconclusive. Ratto*, et al.* (2013) try to formalize the direct and indirect effects of an audit from a theoretical point of view. Interestingly, the authors derive the expression of direct and indirect effect of audit on tax compliance by introducing the behavioral response in terms of elasticity of evasion. They show that their ratio depends on behavioral elasticity, on the intensity with which a group is controlled and on the operational effectiveness of investigations.

In Italy, few studies have analyzed the effects of enforcement policies. The main contributions are due to Santoro (2008), and Santoro and Fiorio (2011). Both are concerned with the effectiveness of Sector Studies (SdS), an audit tool adopted by the Italian Tax Revenue Agency to increase compliance. A further study by Fiorio*, et al.* (2013) shows the positive effect on revenue of the threat of an audit.[5] Di Porto (2011) analyzes the impact of tax inspections on employer labor tax evasion. His analysis is based on a data set of individual artisan firms and individual audit data. However, he finds that inspections may decrease both tax compliance and tax revenues.

Recently, D'Agosto*, et al.* (2017) explore the compliance behaviors of small businesses by means of unique datasets from the Italian Revenue Agency. The analysis focuses on the tax compliance effects of various enforcement policies: field audit (i.e., soft audit), desk audit (i.e., deep audit), and a combination of field and desk audit activities, over the period 2004–2009. The authors measure the impact on individual tax compliance in terms of changes in the tax declared by the audited taxpayers with respect to the nonaudited ones. Findings show that each policy has a positive and significant effect on compliance, although with different magnitudes.

3. The Dataset

We use a unique and confidential dataset, which gathers data from tax returns, with detailed information on the tax audit activity of the IRA. In particular, the dataset contains information on the VAT (Value Added Tax), the PIT (Personal Income Tax), and the IRAP (Regional Tax on Business Activities) tax return for a sample of small businesses over the period 2006–2011. Moreover, we are able to identify the taxpayers in the sample that were audited, the date when the tax audit occurred, and the type of tax audit.

With regards to the timing of the audits, we assume that audited taxpayers can change their behavior immediately after having been informed that an inspection is taking place on their fiscal standing. Our assumption is that the audit effect on tax compliance can be observed only if the taxpayers become aware of the tax inspection before having paid the first installment of the tax due.[6] As in D'Agosto*, et al.* (2017), we consider that an audit has taken place in year t only if the taxpayer receives the first notice of the inspection between the 1st of July of year t and the 30th of June of year t+1.

[5] See Blumenthal*, et al.* (2001) for an analogous experiment in Minnesota.

[6] Even though the tax calendar differs among VAT, PIT, and IRAP and between type taxpayers, setting the deadline for paying the first installment at the end of June is the best approximation as it includes the majority of cases.

Our dataset contains detailed information on different types of audit programs carried out by the IRA. In particular, we identify two broad categories of tax audits: "desk audits" and "on-site audits."

A desk audit is normally performed in the IRA offices and requires a deep investigation on all the budget figures of the taxpayers using all the available evidence (including the results of previous inspections). When there is evidence that an audited taxpayer understated or omitted real income, the IRA performs a desk audit to determine the true taxable income and tax of the audited taxpayer. At the end of the process, the IRA sends a communication to the audited taxpayer explaining the taxes and penalties due. Within this category, we further distinguish between "partial desk audits," which concern specific types of income or violations, and "full desk audits." The latter type is the most accurate, as it includes all the types of income and taxes that have been understated or omitted by the taxpayers; moreover the full desk audit can be considered final as, if nothing new emerges, IRA cannot perform any further audits.

Onsite or field audits take place at a taxpayer's premises and can be classified in two categories that we call "deep field audit" and "soft field audits"; in the case of deep field audits, the tax inspectors can stay at the taxpayer's premises for up to 30–60 working days. Tax auditors can examine all the business records or documents that are deemed relevant for the purpose of the audit. At the end of the deep field audit, the inspectors are required to produce a report with the outcome of the audit. In contrast, the soft field audits are much shorter (normally they take a few hours) and the aim is to check up on specific elements of the taxpayer's fiscal standing. A field tax audit cannot bear any request to pay taxes or fees, but all the evidence emerging from the inspection can be used by the IRA during a desk audit.

The dataset has a balanced panel structure and includes information on 126,401 taxpayers per year. Table 1 reports the number of audits over the period concerned. The total number of audited taxpayers has slightly decreased from more than 11,000 in 2006 to less than 9,000 in 2011. The analysis of the number of audits disaggregated by category shows that an increasing number of taxpayers have experienced full desk audits. Every year, on average, about 8.2 percent of the taxpayers in our sample have been audited and 1.7 percent of them were subject to a full desk audit.

TABLE 1. Number and Percentage of Italian Revenue Agency Tax Audits Among the Study Sample, by Type and Year, 2006–2011

Year	Desk Audit		Field Audit		Audited Taxpayers	Percent Audited	Total Sample
	Full	Partial	Deep	Soft			
2006	1,339	5,425	844	6,919	11,392	9.0%	126,401
2007	1,424	6,078	977	6,036	11,253	8.9%	126,401
2008	1,938	6,456	1,103	4,732	10,950	8.7%	126,401
2009	2,826	5,083	1,054	4,385	10,127	8.0%	126,401
2010	2,679	4,671	996	4,162	9,503	7.5%	126,401
2011	2,339	4,135	1,079	4,175	8,846	7.0%	126,401
Total	**12,545**	**31,848**	**6,053**	**30,409**	**62,071**	**8.2%**	**758,406**

NOTE: Some audited taxpayers have experienced more than one type of tax audit in the same year. This is why the number of audited taxpayers differs from the sum of the first four columns.

TABLE 2. Italian Revenue Agency Tax Audits by Economic Sector Among the Study Sample, 2006–2011

Economic Sector	Desk Audit		Field Audit		Audited Taxpayers	Percent Distribution		
	Full	Partial	Deep	Soft		Full Desk	All Audits	Total Sample
Sport and recreation	721	2,184	400	2,634	4,495	5.7%	7.2%	5.6%
Hotels and restaurants	1,295	4,469	873	5,030	8,142	10.3%	13.1%	5.2%
Finance and insurance	132	166	60	33	353	1.1%	0.6%	1.3%
Real estate	177	211	53	133	522	1.4%	0.8%	1.1%
Management and consulting	288	440	61	213	915	2.3%	1.5%	4.1%
Legal, accounting and consultancy services	1,535	2,241	396	1,721	5,555	12.2%	8.9%	17.6%
Wholesale trade	972	1,386	298	685	2,954	7.7%	4.8%	11.2%
Retail trade	3,124	13,656	2,252	15,782	24,579	24.9%	39.6%	19.6%
Construction	2,169	2,461	792	814	5,732	17.3%	9.2%	15.5%
Mining	1,013	2,949	582	2,690	5,424	8.1%	8.7%	7.6%
Water supply	17	21	10	9	48	0.1%	0.1%	0.1%
Education and health care	308	557	73	248	1,102	2.5%	1.8%	4.2%
Renting and travel agencies	204	335	65	170	669	1.6%	1.1%	2.0%
Information and communication technology	80	159	19	81	309	0.6%	0.5%	1.3%
Transports and storage	510	613	119	166	1,272	4.1%	2.0%	3.8%
Total	**12,545**	**31,848**	**6,053**	**30,409**	**62,071**	**100%**	**100%**	**100%**

NOTE: Some audited taxpayers have experienced more than one type of tax audit in the same year. This is why the number of audited taxpayers differs from the sum of the first four columns.

Most of the taxpayers in the sample operate in the retail and wholesale trade sectors (20 percent and 11 percent, respectively), in the legal, accounting, and consultancy sector (18 percent), and in the construction sector (15 percent) (Table 2). Interestingly, almost 40 percent of audited taxpayers operate in the retail trade sector; this is mainly due to the typical activity of inspections of shops and restaurants aimed at checking that the receipts are correctly issued and the book of accounts is correctly updated.[7] This type of inspection falls in the category of soft field audits; indeed the vast majority of soft field audits have been conducted on businesses operating in the retail trade sector and in the "hotel and restaurants" category. The distribution of full desk audits is more uniform across economic activity. However, full desk audits are relatively more frequent in the construction sector where 15.5 percent of the businesses in the sample operate and 17.3 percent of full desk audits take place.

Summary statistics for audited and nonaudited taxpayers are reported in Table 3 for 2011. The audited group includes all the taxpayers that have been audited at least once over the period of 2006–2011. Taxpayers in the nonaudited group have never been audited over the analyzed period. The trend of the taxes paid over the whole period is reported in Annex 1.

[7] See Battiston, *et al.* (2016) for more details on this type of inspection.

TABLE 3. Amounts Reported (in €) by Audited and Nonaudited Taxpayers in the Study Sample, 2011

Item	Audited	Nonaudited	Total
Number of taxpayers	38,897	87,504	126,401
Regional business tax	1,543	1,284	1,364
Value Added Tax (VAT)	1,773	1,590	1,646
Personal Income Tax (PIT)	7,910	9,329	8,892
Sales of goods and services	191,318	113,420	137,391
Labor costs	20,920	13,426	15,732
Total costs	151,327	75,177	98,610
Total revenue	210,690	122,030	149,313

All the variables (except PIT) were higher on average for the audited group, suggesting that the IRA audit selection process is not random. In particular, the IRA seems to audit larger taxpayers more often, who report higher levels of costs and revenue but, at the same time, pay less personal income tax. However, as discussed in more detail in Section 4, as long as the IRA selection process depends on some (unobservable) characteristics that are time invariant, the validity of the estimates is not affected.

Our dataset contains information on the so called *Studi di Settore* (SdS), a program to audit small businesses, introduced in Italy in 1998. Under this program, the Italian Tax Administration provides each small business (with sales below €7.5 million) with an estimated level of sales depending on the economic sector and on the reported economic inputs such as the number of employees, the cost of inputs, and so on. All the taxpayers reporting sales below the estimated level are labelled as "noncongruent." Under the SdS program, sector-specific economic indicators are also computed (such as value added per employee or change in inventories) to detect common schemes of tax evasion. Taxpayers with indicators substantially different from the computed benchmark are considered as "noncoherent."

This information is used by the IRA in the audit selection process. Indeed, failing to meet the congruence and coherence criteria implies an increased probability of receiving a tax audit.

TABLE 4. SDS Coherence and Congruence Within Study Sample, by Tax Audit Category

Item	Audited	Nonaudited	Total
Percent of SDS coherent	47%	58%	57%
Percent of SDS congruent	56%	67%	62%

Table 4 shows that 47 percent of audited taxpayers were coherent in the year when they were audited and 56 percent were congruent. These percentages are much higher in the group of nonaudited taxpayers, indicating that the failure in meeting SDS criteria dramatically increases the probability of being tax audited. Overall, 57 percent of the taxpayers meet the coherence criteria and 62 percent meet the congruence criteria. As the coherence and congruence indicators influence both the probability of tax audit assignment and the amount of taxes paid, it is very important to control for these variables in the empirical specifications to avoid endogeneity.

4. The Empirical Model

Our analysis provides evidence of the effectiveness of tax audits in promoting tax compliance. Tax enforcement activity can influence tax compliance in several ways. The existing literature has identified a direct effect and an indirect effect of tax audits on tax collection. The direct effect consists in the tax evasion directly detected, therefore resulting in additional collected revenue, sanctions, and fees. The indirect effect is mostly related to changes in the behavior of the audited taxpayer; the assumption is that taxpayers spontaneously tend

to increase the amount of income reported after having been subject to a tax inspection. Moreover, scholars have identified a third effect of auditing activity, the so-called "general deterrence effect" of audit programs. Indeed, it is plausible that when an increase in the number or in the effectiveness of tax inspection is observed, taxpayers perceive a higher risk of being audited and they therefore tend to be more careful in correctly reporting their income. This implies a reduction in the expected payoff generated by underreporting income. In the next section, we focus on the indirect effect of tax audits on tax compliance; the analysis of the general deterrence effect is described in section 4.4.

4.1. The Indirect Effect of Tax Audits

Commonly, in the policy-evaluation literature, the simplest data structure is composed of two groups (the treatment group and the control group), both of which are observed before and after the implementation of the policy. In our case, the data structure is more complicated, as we have six time periods, each firm can be audited more than once, and, in some specifications of the model, we also investigate the effect of different types of audit programs (section 4.3). Hence, we can exploit the longitudinal nature of our data by estimating the following equation with a fixed-effect model that accounts for individual time-invariant heterogeneity:

$$y_{it} = a_i + d_t + \beta A_{it} + X'_{it}\gamma + \varepsilon_{it}, \quad (1)$$

where y_{it} is the natural log of the tax paid (Regional Business Tax, VAT, or PIT depending on the specification), a_i is a time-invariant fixed effect, d_t is a taxpayer-invariant fixed effect, A_{it} is a dummy variable, which takes value 1 if taxpayer i has been audited in year t and zero otherwise, X'_{it} is a vector of control variables influencing both the probability of being audited and the tax paid, and ε_{it} is the idiosyncratic error.

Regression results are reported in Table 5 for the three taxes analyzed. On average, a generic tax inspection implies an increase in the regional business tax paid by 1.8 percent in the same year in which the inspection takes place, and by 3.1 percent in the following year. The effect of the audit is higher for the personal income tax paid, which increases by 5.2 percent in the same year and by 3.5 percent in the following year. Taxpayers seem to be able to adjust the VAT paid faster (+5.3 percent in the same year in which the audit occurs while the lagged coefficient is not statistically significant). This is probably due to the fact that the VAT can be paid monthly or quarterly; therefore a change in the behavior of audited taxpayers can be observed earlier.

TABLE 5. Tax Audit Effect on Tax Compliance

Item	Regional Business Tax	VAT	PIT
Audit	0.018	0.053	0.052
	(0.009)**	(0.016)***	(0.013)***
Audit-1	0.031	0.011	0.035
	(0.009)***	(0.016)	(0.012)***
SDS Congruence	0.304	0.281	0.433
	(0.007)***	(0.012)***	(0.009)***
SDS Coherence	0.390	0.132	0.768
	(0.007)***	(0.011)***	(0.009)***
Sales of Goods and Services	0.394	0.440	0.401
	(0.008)***	(0.007)***	(0.009)***
Total Revenue	0.140	0.017	0.211
	(0.004)***	(0.005)***	(0.006)***
Total Cost	-0.025	-0.031	-0.073
	(0.003)***	(0.004)***	(0.004)***
Labor Cost	0.038	-0.002	-0.012
	(0.001)***	(0.002)	(0.001)***
Number of Observations	633,745	650,780	644,555

** $p<0.05$; *** $p<0.01$ Time dummies included. Robust standard errors in parentheses.

4.2. Robustness of the Results

In this section we discuss whether the econometric approach used addresses the endogeneity issues that are potentially arising from the nonrandomness of the IRA selection process. Indeed, descriptive statistics suggest that the IRA audits larger businesses with higher levels of reported income and costs more frequently. The IRA selection process could also be based on some individual characteristics that we do not observe.

The model used in this paper allows us to consistently estimate the casual effect of tax audits on tax compliance, as long as the selection process of the IRA is based on time-invariant individual characteristics. Indeed, under the fixed-effect estimation procedure, a within transformation that removes the individual fixed effect is applied to the data.

However, whether there exist time-varying unobservables that are correlated both with the probability of being tax audited and with the outcome variable (*i.e.,* the tax paid, in our model) still needs to be checked. Ruling out this possibility is crucial to the validity of our results. If the IRA selection process is based on some time-varying factors that affect the tax paid, then it is impossible to determine the direction of causality. In other words the key question is the following: "Is it the tax audit that is driving up tax compliance? Or is it the case that a taxpayer was selected because of other confounding factors that also influence the tax paid?"

TABLE 6. Leads and Lags

Item	One Lead and Lag			Two Leads and Lags		
	Regional Business Tax	VAT	PIT	Regional Business Tax	VAT	PIT
Audit	0.030	0.053	0.061	0.044	0.068	0.096
	(0.011)***	(0.019)***	(0.015)***	(0.027)	(0.051)	(0.037)***
Audit $_{t-1}$	0.043	0.009	0.046	0.080	0.035	0.086
	(0.011)***	(0.019)	(0.014)***	(0.025)***	(0.048)	(0.034)**
Audit $_{t-2}$				0.035	-0.005	0.006
				(0.020)*	(0.039)	(0.027)
Audit $_{t+1}$	0.006	-0.003	0.023	0.017	-0.042	0.068
	(0.011)	(0.020)	(0.015)	(0.027)	(0.050)	(0.036)*
Audit $_{t+2}$				0.001	-0.042	0.070
				(0.022)	(0.043)	(0.031)**
SDS congruence	0.280	0.286	0.412	0.222	0.264	0.354
	(0.008)***	(0.014)***	(0.011)***	(0.014)***	(0.026)***	(0.019)***
SDS coherence	0.447	0.118	0.775	0.529	0.178	0.918
	(0.008)***	(0.013)***	(0.010)***	(0.013)***	(0.025)***	(0.018)***
Sales of goods and services	0.442	0.463	0.443	0.428	0.518	0.445
	(0.010)***	(0.009)***	(0.011)***	(0.014)***	(0.016)***	(0.017)***
Total revenue	0.144	0.022	0.207	0.144	0.022	0.218
	(0.005)***	(0.006)***	(0.007)***	(0.008)***	(0.011)**	(0.011)***
Total costs	-0.032	-0.032	-0.068	-0.038	-0.039	-0.072
	(0.003)***	(0.005)***	(0.004)***	(0.006)***	(0.009)***	(0.007)***
Labour costs	0.035	-0.003	-0.009	0.028	-0.006	-0.004
	(0.002)***	(0.002)	(0.002)***	(0.002)***	(0.004)	(0.003)
Number of observations	505,604	520,624	515,644	252,802	260,312	257,822

* $p<0.1$; ** $p<0.05$; *** $p<0.01$ Time dummies included. Robust standard errors in parentheses.

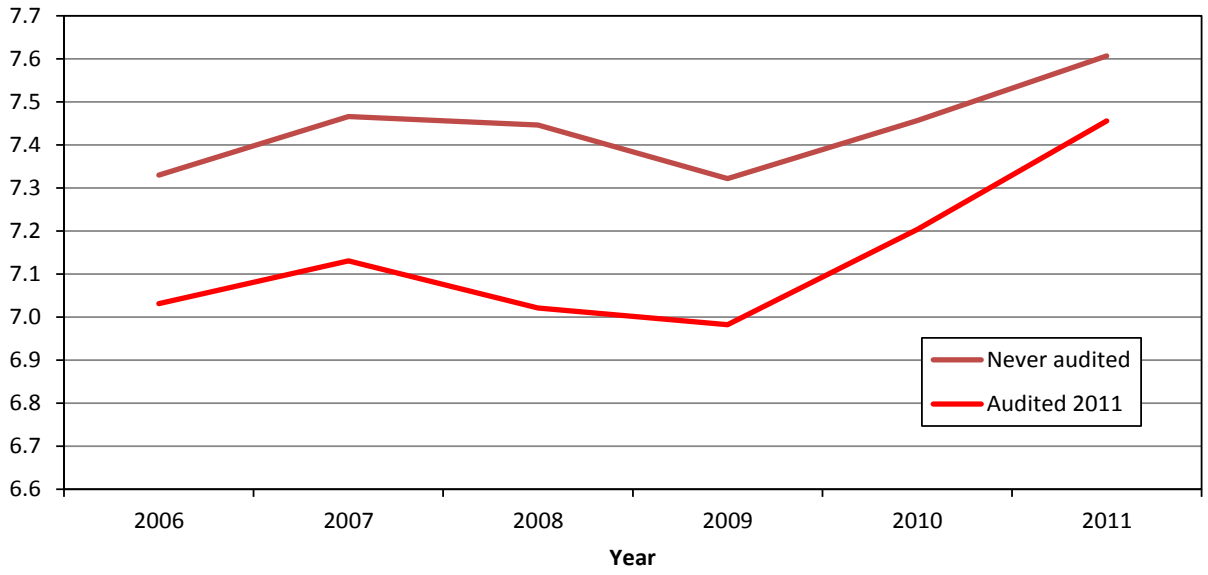
Results of the regression are reported in Table 6. Estimating the model with one lead and one lag, we find that future audits do not have any statistically significant explanatory power on the tax paid. However, running the same regression using two leads and two lags of the audit variable, the consistency of the estimates is confirmed for the Regional Business Tax and for the VAT model, but not for the PIT model.

To answer this question we use an approach originally developed by Autor (2003). We estimate equation (1) by introducing leads and lags of the audit variable.[8] We expect that past audits help to predict tax paid, while future audits do not.[9] When audits have an anticipatory effect on income reported and tax paid, it is not possible to determine the direction of causality (this is what Angrist and Pischke (2008) call a Granger test, used "to see whether causes happen before consequences and not vice versa").

Therefore, we further investigate the validity of the estimates of the PIT model by analyzing the trend of the PIT declared. Indeed, a crucial assumption for the validity of the estimates is the so-called common trend assumption. The hypothesis is that, without the treatment, the control group and the treatment group would have shared the same trend of the outcome variable. More specifically, in our case, the condition for the validity of the estimates requires that the pre-audit trend of the audited taxpayers is the same as the trend of the nonaudited taxpayers group.

Figure 1 compares the value of the average PIT declared by year (in logs) in the group of taxpayers audited in 2011, with the average PIT declared by taxpayers who were never audited in the analyzed period.[10]

FIGURE 1. Parallel Trend—Log of Personal Income Tax Declared



The trend is very similar across the two groups in the pretreatment period. The average PIT declared by the group of taxpayers who were audited in 2011 is always below the average PIT declared by the nonaudited taxpayers. However, as expected, in 2011 the amount of PIT declared by the audited taxpayers increases, reducing the difference between the groups.

The same analysis, considering (shorter) pretreatment periods for the group of taxpayers audited in previous years, leads to a similar result.

4.3. Tax Audit Effect by Type of Tax Audit

As the IRA carries on different audit programs, disentangling the causal channels through which audits exert their effect can be extremely relevant when forming policy advice. Depending on where the inspections actually take place, we identify two broad categories of tax audits—desk audits and field audits. These categories

[8] See Angrist and Pischke (2008) for a detailed discussion.

[9] The same approach to test for strictly endogeneity is proposed by Wooldridge (2002).

[10] In this graphical analysis, we drop all the taxpayers who had been audited before 2011.

can be further broken down, depending on the accuracy of the audit and on the type of tax analyzed, as described in section 3. We end up with four groups of audits: (1) full desk audits; (2) partial desk audits; (3) deep field audits; and (4) soft field audits. In the same year, taxpayers could be subject to different kinds of audits on different types of income.

We estimate equation 1, including in the set of explanatory variables the four categories of tax audits described above (Table 7).

TABLE 7. Tax Audit Effect on Tax Compliance, by Type of Audit

Item	Regional Business Tax (1)	Regional Business Tax (2)	VAT	PIT
Full desk audit $_{t}$	0.190	0.189	0.181	0.147
	(0.019)***	(0.019)***	(0.032)***	(0.026)***
Partial desk audits $_{t}$	-0.009	-0.007	-0.019	0.013
	(0.014)	(0.014)	(0.024)	(0.018)
Field audit deep $_{t}$	0.008	0.008	0.022	0.037
	(0.025)	(0.025)	(0.047)	(0.039)
Field audit soft $_{t}$	-0.032	-0.079	0.046	0.013
	(0.014)**	(0.022)***	(0.025)*	(0.020)
Full desk audit $_{t-1}$	0.176	0.175	0.109	0.119
	(0.019)***	(0.019)***	(0.034)***	(0.027)***
Partial desk audits $_{t-1}$	0.023	0.024	0.011	0.029
	(0.013)*	(0.013)*	(0.023)	(0.018)*
Field audit deep $_{t-1}$	0.047	0.047	-0.020	-0.026
	(0.025)*	(0.025)*	(0.047)	(0.040)
Field audit soft $_{t-1}$	-0.048	-0.098	-0.029	0.017
	(0.013)***	(0.019)***	(0.024)	(0.018)
SDS congruence	0.302	0.299	0.280	0.433
	(0.007)***	(0.007)***	(0.012)***	(0.009)***
SDS coherence	0.389	0.388	0.132	0.768
	(0.007)***	(0.007)***	(0.011)***	(0.009)***
Sales of goods and services	0.407	0.407	0.440	0.401
	(0.008)***	(0.008)***	(0.007)***	(0.009)***
Total revenue	0.141	0.141	0.017	0.211
	(0.004)***	(0.004)***	(0.005)***	(0.006)***
Total costs	-0.025	-0.025	-0.031	-0.073
	(0.003)***	(0.003)***	(0.004)***	(0.004)***
Labor costs	0.038	0.038	-0.002	-0.012
	(0.001)***	(0.001)***	(0.002)	(0.001)***
Field audit soft and SDS congruence $_{t}$		0.081		
		(0.025)***		
Field audit soft and SDS congruence $_{t-1}$		0.091		
		(0.022)***		
Number of observations	632,005	632,005	650,780	644,555

* $p<0.1$; ** $p<0.05$; *** $p<0.01$ Time dummies included. Robust standard errors in parentheses.

As expected, the results show that full desk audits are the most effective in increasing tax compliance. In particular, this type of inspection increases the regional business tax declared by about 19 percent in the same year when the audit takes place and by 17 percent in the following year, the VAT declared by about 18 percent and 11 percent, respectively, and the PIT declared by 14.7 percent and 12 percent. The direct effect of the other types of tax audits on tax compliance is more limited.

Surprisingly, the results reported in the first column of Table 7 show a statistically significant negative effect of the soft field audits on tax compliance. However, as taxpayers who are "noncongruent" (taxpayers reporting a level of income substantially below the level estimated by the SdS) are much more often subject to soft field audits, we investigate whether the effect of this type of audit is different across congruent and noncongruent taxpayers. Results reported in column 2 show that the effect of soft field audits is positive on the sample of congruent taxpayers. Indeed, taxpayers know that reporting income below the level estimated by SdS dramatically increases their probability of being audited. Therefore, it might be the case that noncongruent taxpayers are on average already compliant and do not adjust their level of declared income as a consequence of a tax inspection.

Even though field audits exert a statistically weaker effect on tax compliance, they are a very important part of the overall IRA strategy to increase tax compliance. Indeed, they often serve as input to subsequent desk audits.

4.4. The General Deterrence Effect

The question of whether a general deterrence effect exists has been discussed widely in the literature, as the empirical evidence has not been conclusive on the relationship between audit rates and tax compliance. In principle, increasing the number of audits (measured by audit rates) implies an increase in the probability of being audited, and should thereby incentivize tax compliance. Likewise, the effectiveness of the tax authorities in detecting tax evasion should exert a significant effect on tax compliance. Both the probability of being tax audited and, once audited, the ability of the inspectors should reduce the expected gain of tax evasion. While the probability of being audited could be easily approximated using the audit rate, it is more difficult to find a good proxy for the average effectiveness of the IRA in detecting evasion.

To measure if the IRA activity exerts a deterrence effect that spills over to nonaudited taxpayers, we include in equation 1 the audit rate by province and the ratio of the additional regional business tax evaded and detected by the IRA to the overall regional business tax declared by province. The latter variable measures both the probability of being audited and the amount of tax evasion detected on the total tax declared.[11]

As shown in Table 8, if the audit rate in the province where the taxpayer is resident for tax purposes increases by 1 percent, tax compliance increases between 1.1 percent and 1.7 percent. The effect of the regional business tax evaded and detected to the overall amount of tax declared is also positive and statistically significant as expected.

[11] There can be some simultaneity; more tax compliance in one province can induce tax administration to decrease the number of audits in that province while, at the same time, more tax audits in that province can have a positive effect on tax compliance. The econometric approach used in this paper allows us to address the endogeneity caused by the correlation between the error term and any time invariant individual unobservable. So, even if the revenue agency sets the audit rates in each province using a criterion based on some time invariant characteristic (which is correlated with the compliance), then our estimates are still consistent and unbiased. Moreover, both audit rates and the additional regional business tax evaded and detected by the IRA, as well as the overall regional business tax declared by province depend on the aggregate tax compliance at the province level but our dependent variable is disaggregated at the individual level. This could partly mitigate the endogeneity problem.

TABLE 8. General Deterrence (Spillover) Effect, Regional Business Tax

Item	Model 1	Model 2	Model 3
Full desk audit $_{t}$	0.135	0.138	0.135
	(0.023)***	(0.023)***	(0.023)***
Partial desk audits $_{t}$	-0.012	-0.011	-0.011
	(0.018)	(0.018)	(0.018)
Field audit deep $_{t}$	-0.007	-0.007	-0.007
	(0.032)	(0.032)	(0.032)
Field audit soft $_{t}$	-0.022	-0.022	-0.022
	(0.018)	(0.018)	(0.018)
Full desk audit $_{t-1}$	0.130	0.129	0.129
	(0.023)***	(0.023)***	(0.023)***
Partial desk audits $_{t-1}$	-0.005	-0.004	-0.004
	(0.016)	(0.016)	(0.016)
Field audit deep $_{t-1}$	0.026	0.026	0.026
	(0.031)	(0.031)	(0.031)
Field audit soft $_{t-1}$	-0.013	-0.012	-0.012
	(0.016)	(0.016)	(0.016)
Percent additional regional business tax evaded and detected by province		0.033	0.032
		(0.004)***	(0.004)***
Audit rate by province	0.017		0.011
	(0.005)***		(0.005)**
SDS congruence	0.275	0.274	0.274
	(0.009)***	(0.009)***	(0.009)***
SDS coherence	0.479	0.479	0.479
	(0.009)***	(0.009)***	(0.009)***
Sales of goods and services	0.362	0.362	0.362
	(0.009)***	(0.009)***	(0.009)***
Total revenue	0.143	0.143	0.143
	(0.006)***	(0.006)***	(0.006)***
Total costs	-0.029	-0.029	-0.029
	(0.004)***	(0.004)***	(0.004)***
Labor costs	0.033	0.033	0.033
	(0.002)***	(0.002)***	(0.002)***
Number of observations	419,072	419,072	419,072

** $p<0.05$; *** $p<0.01$ Time dummies included. Robust standard errors in parentheses.

5. Conclusions

Building and innovating on a companion paper (D'Agosto, et al. 2017), this study extends the analysis of the effect of tax audits on tax compliance across different types of taxes and audit programs. Along the lines of previous research, our results confirm the evidence that tax inspections increase taxpayers compliance.

Findings suggest that the relative magnitude of the effect is different across taxes; an audit increases the regional business tax declared by 1.8 percent, the VAT by 5.3 percent, and the PIT by 5.2 percent. Likewise, the persistence of the effect of the audit over time also differs across type of tax. While for both regional business tax and personal income tax the effect remains positive also in the first year after the audit, in the case of VAT this effect seems to vanish in the first year following the audit.

Full desk audits turn out to be the most effective in increasing tax compliance. In particular, taxpayers who experienced a full desk audit increased the regional business tax they declared by about 19 percent in the year of the audit, the VAT declared by about 18 percent, and the PIT by 14.7 percent. Field audits seem to exert a weaker effect on tax compliance. However, as they often serve as input to subsequent desk audits, their effect may be underestimated. It remains for future research to better understand the interactions between different types of audits.

Finally, we present a preliminary analysis of the general deterrence effect of tax audits on tax compliance. We proxy the probability of being audited and the effectiveness of tax inspectors in detecting tax evasion with the audit rate and with the ratio of the tax evaded and detected to the overall amount of tax paid, both disaggregated by province. Both variables exert a statistically significant effect on tax compliance.

Annex 1. Dynamic of Average Taxes Declared for the Audited and Nonaudited Groups

FIGURE A1. Number of Audited and Nonaudited Taxpayers—Regional Business Tax

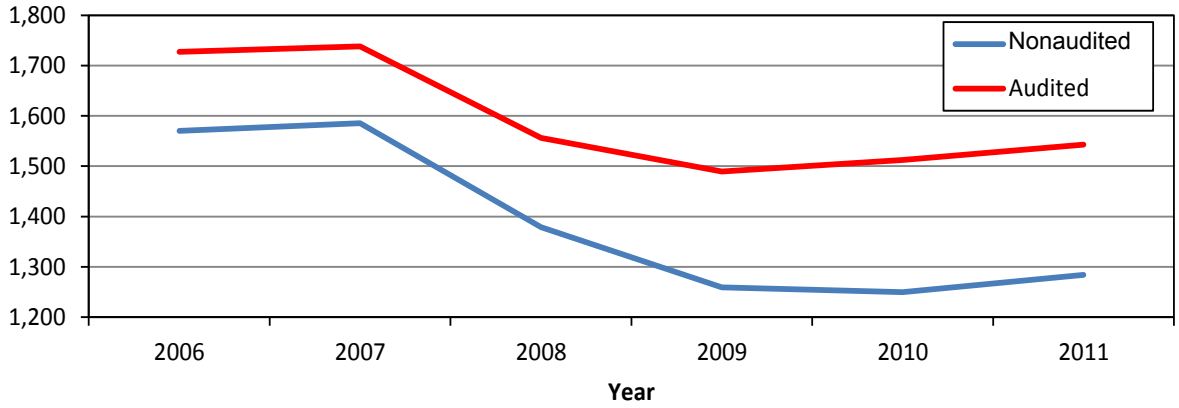


FIGURE A2. Number of Audited and Nonaudited Taxpayers—VAT

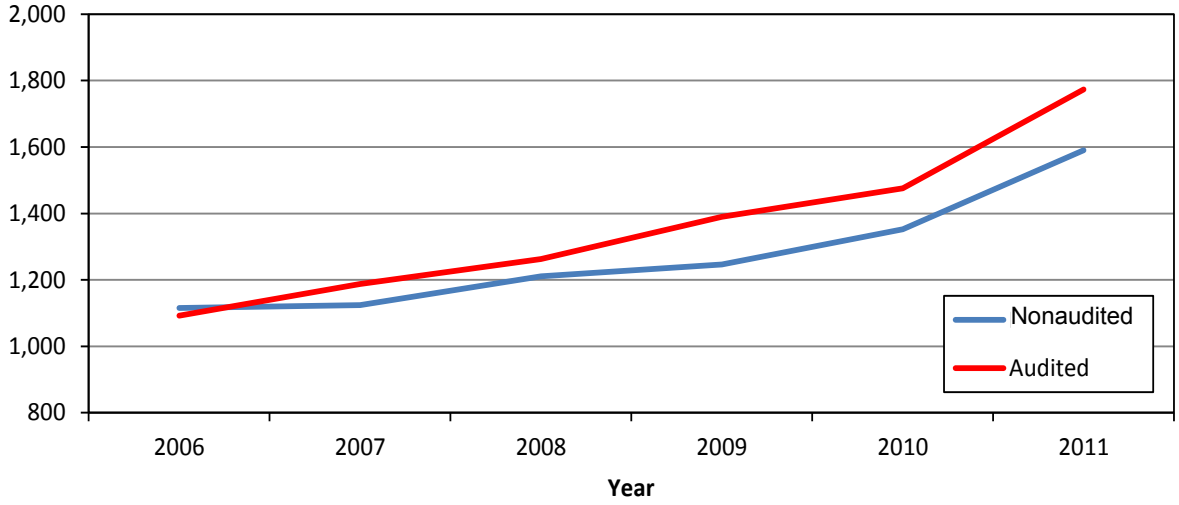
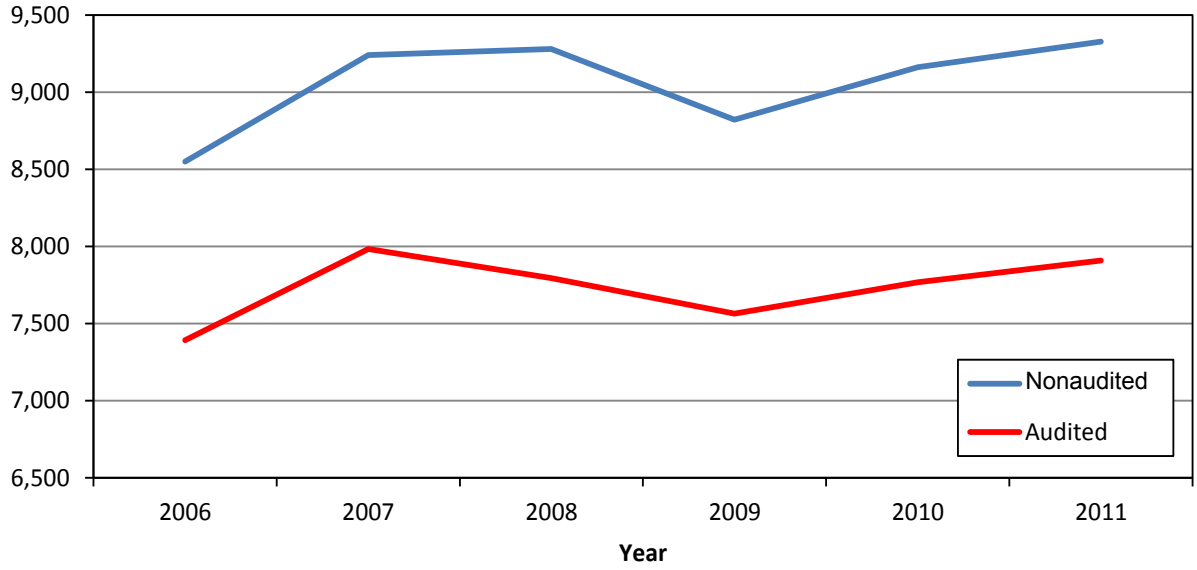


FIGURE A3. Number of Audited and Nonaudited Taxpayers—PIT



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