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TAXPAYER RESPONSE TO AN INCREASED PROBABILITY OF AUDIT:
SOME PRELIMINARY EVIDENCE FROM ITALY

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Taxpayer response to an increased probability of audit: some preliminary evidence from Italy.

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Abstract

Italy has adopted since 1998 a method to audit small businesses known as *Studi di settore.*The method is based on the derivation, for every business, of a presumptive level of turnover, such that a business can be audited if and only if it reports a turnover below this threshold. However, this threshold is based on values of inputs as reported by taxapayers, and thus it is highly manipulable.We examine here the taxpayers'response to a letter sent by the Tax Agency informing them that some input data they provided for tax year 2007 were seen as 'anomalous' and that, if repeated for tax year 2008, such a behaviour or a similar one would 'certainly' cause the inclusion of the taxpayer in a list of taxpayers to be audited.

VERY PRELIMINARY VERSION, DO NOT QUOTE WITHOUT PERMISSION.

Keywords: tax audit, studi di settore, tax compliance.

JEL: H26, H25

1 Introduction

Italy has adopted since 1998 a method to audit small businesses known as *Studi di settore* (Sds). This scheme, which shares some features with the Israeli Taaschiv [5] has been analyzed in details by [7] and by [6] and compared to other methods of presumptive taxation by [1]. The method is based on the derivation, for every business, of a presumptive level of turnover, such that a business can be audited if and only if it reports a turnover below this threshold. The threshold, in turn, is obtained in two steps. First, the Tax Agency calculates the weighted average productivity of a set of selected inputs within the economic branch of operation of the business. This calculation yields a vector of productivity parameters. Second, the value of inputs is reported by the firm and the threshold is obtained by multiplication of the vector of parameters by the vector of inputs' values. Since the vector of productivity parameters is known when the value of

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inputs is reported by the firm, the method is prone to manipulation by firms which can lower presumptive turnover by underreporting the value of selected inputs.

Up until 2005, the method was implemented by the Italian Tax Agency without paying any attention to this manipulation bias. As a result, the percentage of auditable firms decreased rapidly, and this was interpreted, rather than as a sign of increased compliance, as the direct consequence of the intense activity of underreporting of input values undertaken by a large number of firms. Since 2005, the Tax Agency has reacted to this activity by planning a number of administrative actions. Among these, we consider the initiative known as *Comunicazioni anomalie studi di settore* (Communications on anomalies concerning studi di settore) which was started in tax year 2007.

We examine here the taxpayers'response to a letter sent by the Tax Agency informing them that some input data they provided for tax year 2007 were seen as 'anomalous' and that, if repeated for tax year 2008, such a behaviour or a similar one would 'certainly' cause the inclusion of the taxpayer in a list of taxpayers to be audited. Thus, this letter is very similar to those sent by the Minnesota Department of Revenue in the field experiment studied by [3] and, to a lesser extent, by [2], where letters were sent to inform the taxpayer that his tax reports would have been closely examined or to enhance tax compliance by appealing to moral and social values.

The data we use consists of two panels:

-a panel of 52,782 taxpayers who received the letter for year 2007 (letter panel);

-a panel of 125,240 taxpayers who did not receive the letter for year 2007 (no-letter panel).

For every taxpayer, a number of accounting and tax variables are available for the three years 2006-2008.

The paper is organized as follows. In Section 2 we review the relevant literature where it should be stressed that quite often negative results emerge, indicating that letters sent by the Tax Agency did not have the expected positive results on compliance. In Section 3 we analyze the expected response of taxpayers in the institutional framework defined by Sds. In Section 4 we describe our databases and we provide some descriptive statistics. In Section 5 and 6 we present some preliminary analysis on the impact that letters seem to have had on anomalous reporting and on the change in reported income between tax year 2008 and tax year 2007. Section 7 indicate directions for future research. The Appendix contains the Tables.

2 Review of the relevant literature

One of the main limitations of the empirical analysis on taxpayers'behaviour is the difficulty to desentangle its various determinants. The Allingham and Sandmo model suggests that the choice of whether and how much to evade depends on the probability to be audited, the amount of sanctions if evasion is

detected, the tax rate and the propensity towards the risk to be caught evading. A problem with the probability of audit is that it is difficult to measure and that it can be endogenous, since it is usually influenced by the reaction by the Tax Agency to its perception of the effectiveness of audits. This has motivated a line of research based on natural experiments.Here we shall briefly discuss those documented in [3], which we describe as Minnesota 1, in [2], which we describe as Minnesota 2 and in [4] which we describe as Danish Experiment.

In the Minnesota 1 experiment a sample of 1700 taxpayers (*treated sample*) who filed a tax return for year 1993 is randomly extracted from the population of Minnesota taxpayers. The sample is randomly selected using as stratification criteria an income criterion and an opportunity of evasion criterion: income is splitted into high, medium and low, while opportunity of evasion is deemed to be low when the income is subject to third-party reporting and high when there is no such option. Taxpayers included in the treated sample received a letter warning them that their tax returns for year 1994 would be 'closely examined'. Their reporting behaviour is compared to that of a *control sample* formed by approximately 23000 taxpayers extracted from the stratified population of Minnesota taxpayers who filed a tax return for year 1993. More precisely, the paper compares for the two groups:

-the variation in the two tax years of the average and median values of a number of variables relevant for tax purposes, such as incomes, taxes, detractions (differences-in-differeces method);

-the impact -measured by a set of regressions- of a number of variables measuring income, age, civil status, assistance by a tax practitioner, type of return, marginal tax rate on average values listed above;

-the percentage of taxpayers who changed their reported income in the two years.

The main results of this experiment are the following:

-a partially significant *positive* impact of the letter in terms of average reported incomes (and taxes) for some of the subgroups, namely those with low and average incomes; however this impact is very low among taxpayers whose opportunity to evade is low;

-a significant *negative* impact of the letter on average reported incomes (and taxes) for the group of high-income taxpayers;

-a lack of significance of almost all regression coefficients in both samples.

These results have been interpreted as follows:

a) for all taxpayers the threat of an audit could have been non credible;

b) the negative impact on high-income taxpayers could be partly explained by the fact that the majority of them have an high opportunity to evade (since no third-party reporting is available for this kind of taxpayers). However, this explanation does not hold for high-income taxpayers who have low opportunity to evade but, despite that, react negatively to the letter.

In the Minnesota 2 experiment two samples (*treated samples*) each of approximately 20000 taxpayers are randomly selected from the population of Minnesota taxpayers who filed a tax return for year 1993 . The first sample received a letter named as Support Valuable Services whose meaning was that taxpayers should

comply voluntarily in order to support the provision of socially valuable activities. The second sample received a letter named as Join the Compliant Majority, whose message was that if one wished to belong to the majority community of citizens one should comply with the tax laws. The reporting behaviour of these two samples is compared to that of a *control sample* formed by approximately 20000 taxpayers randomly extracted from the population of Minnesota taxpayers who filed a tax return for year 1993. The methodology is very similar to the one adopted in the Minnesota 1 experiment.

Main results obtained are the following:

-both treated samples report a higher increase in average reported income with respect to the control group, but neither of them are significant;

-in the regression, dummies denoting groups are insignificant either when evaluated alone or when interacted with other variables.

Two somewhat alternative explanations are offered by authors:

a) either the impact of the letters on ethical and social values has been negligible since some expressions used in the letter were ambiguous and could have reinforced the sense of impunity by tax evaders

b)or these values have a modest impact on compliance so that Tax Agencies should not rely upon them to increase taxpayers'loyalty.

Finally, the Danish experiment is accomplished in two steps. In the first one, taxpayers are divided into 2 groups: a first who is audited on their tax returns for tax year 2006 without being previously alerted and a second group who is not audited. In the second part of the experiment, which concerns tax returns for tax year 2007, dependent workers belonging to both groups as previously described are divided in 3 new groups; a first group who receives a letter stating that they will surely be audited (100%-letter); a second group who receives a letter stating that they will be audited with a percentage of 50% (50% letter) and a third group who does not receive any letter. The experiment is complex in its structure and in its objectives. Here we limit the attention to results concerning the impact of the letters on income reported in the second experiment. The main finding of the paper is that such an impact is positive and significant, and, in particular, that it is higher for those dependent workers who were not audited.in the first part of the experiment.

3   A theory of taxpayers'response

Sds can be seen as a method to select taxpayers to be audited and also as a method of presumptive taxation. In principle, every taxpayer (in this paper this term is used to indicate either a firm or a self-employed) whose annual turnover is not over 7,5 millions of euros is subject to a specific Sds for its business sector. Every Sds is constructed as follows. The Tax Agency collects from the taxpayers information on structural variables (e.g. size of offices and warehouses, number of employees, main characteristics of customers and providers, etc.) and on accounting variables (mainly referring to amount and cost of inputs and the value of output). A number of statistical analyses are performed to identify

and prune the outliers, to group taxpayers in clusters within each business sector and to select inputs which are statistically more significant to explain the variance of reported output within each cluster of taxpayers. Then, for each cluster within a business sector, a parameter reflecting the presumptive productivity of each inputs is calculated. Presumptive output finally obtained for every taxpayer as the weighted sum of the reported value of selected inputs, where weights are the presumptive productivity parameters. Let us denote by $\widehat{R}_i$ the reported value of output and by $\widehat{X_i^j}$ the value of input $j, j = 1, ...J$ as reported by taxpayer $i, i = 1, ..., I$ and by B^j the presumptive productivity parameter associated to input j. Presumptive output for taxpayer j is thus equal to $\mathbf{B}\widehat{\mathbf{X}}_i = \sum_j B^j \widehat{X_i^j}, j = 1, ...J$. The probability to be audited is then equal to

$$
\begin{aligned}
q_i > 0 \quad &\text{if} \quad \widehat{R}_i < \mathbf{B}\widehat{\mathbf{X}}_i \\
q_i = 0 \quad &\text{if} \quad \widehat{R}_i \geq \mathbf{B}\widehat{\mathbf{X}}_i
\end{aligned}
\tag{1}
$$

i.e. the taxpayer can be audited if and only if the output reported value is lower than the presumptive one. The distinctive feature of Sds is that the taxpayer can determine the value of $\mathbf{B}\widehat{\mathbf{X}}_i$. This feature stems from the process of data generation. Data on input values are reported by the taxpayer using a software which is freely downloaded from the Internet (known as *Gerico*). For every vector of reported values, the software calculates the corresponding value of $\mathbf{B}\widehat{\mathbf{X}}_i$ and the taxpayer can then pick its preferred vector of reported values. In short, a taxpayer can manipulate the value of $\widehat{\mathbf{X}}_i$ and thus of $\mathbf{B}\widehat{\mathbf{X}}_i$; since in most (virtually all) cases $B^j > 0$, this manipulation consists of underreporting the values of inputs, i.e. to report a vector $\widehat{\mathbf{X}}_i$ where, for at least one j, $\widehat{X_i^j} < X_i^j$ where X_i^j is the true value of input j for taxpayer i. Its aim is to decrease q, i.e. the probability to be audited. Note that this happens in two cases that we analyze for a given value of reported output, $\widehat{R}_i$ and denoting the 'true' presumptive value (i.e. the presumptive value if not manipulated) by $\mathbf{BX}_i$. First, if $\mathbf{BX}_i > \widehat{R}_i \geq \mathbf{B}\widehat{\mathbf{X}}_i$, then the manipulation is such that the taxpayer decreases q from a positive to a zero value. But manipulating input values can be a rational strategy also if $\widehat{R}_i \leq \mathbf{B}\widehat{\mathbf{X}}_i < \mathbf{BX}_i$. In this case, the taxpayer may be audited also if he reports the true value of inputs, but q may be perceived as reduced by the taxpayer since the ratio $\widehat{R}_i/\mathbf{B}\widehat{\mathbf{X}}_i$ is higher than the ratio $\widehat{R}_i/\mathbf{BX}_i$ (see [7] and [6]).

The fact that Sds are prone to data manipulation has become evident since the first years of implementation of the scheme; however for some years the probability to be audited on the reported value of inputs has been negligible (see [6]). Things changed in tax year 2007. From this year onwards, the Tax Agency selects a set of taxpayers who allegedly manipulated data. These taxpayers received a letter informing them that some data they provided for the implementation of Sds in tax year 2007 were seen as 'anomalous'. A description

5

of the anomaly was also included. The final message of the letter was that, if repeated for tax year 2008, such an anomalous report *or a similar one* would 'certainly' cause the inclusion of the taxpayer in a list of taxpayers to be audited. Thus,from tax year 2008 and onwards, the probability to be audited can be written as

$$
\begin{aligned}
q_i > 0 \quad &\text{if} \quad \widehat{R}_i < \mathbf{B}\widehat{\mathbf{X}}_i \text{ or } A_i = 1 \\
q_i = 0 \quad &\text{if} \quad \widehat{R}_i \geq \mathbf{B}\widehat{\mathbf{X}}_i \text{ and } A_i = 0
\end{aligned} \tag{2}
$$

where A_i is a binary variable, with $A_i = 1$ if a letter was received and $A_i = 0$ if no letter was received[1].

Thus, four logical cases are possible (see Table 1)

Table 1: changes in the probability to be audited

	$q_i^{08} > 0$	$q_i^{08} = 0$
$q_i^{07} > 0$	?	decrease
$q_i^{07} = 0$	increase	constant

Three out of four cases are straightforward. The probability is increased if the taxpayer who reported $\widehat{R}_i^{07} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ and $\widehat{R}_i^{08} < \mathbf{B}\widehat{\mathbf{X}}_i^{08}$ or $A_i = 1$.To state it alternatively, the probability to be audited is increased for any taxpayer who reported $\widehat{R}_i^{07} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ and received the letter. The probability is decreased or constant for any taxpayer who did not receive the letter and reported $\widehat{R}_i^{08} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{08}$.The case where $q_i^{07} > 0$ and $q_i^{08} > 0$ is more difficult to interpret. One might be tempted to investigate this case adapting the theoretical model proposed by Santoro (2008) and Santoro and Fiorio (2011), but to obtain clearcut indications very stringent assumptions would be required.This implies that, on a priori basis, we cannot be sure that any taxpayer who received the letter perceived an increased probability to be audited if $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$.

In general, one can say that a taxpayer reporting a ratio $\widehat{R}_i^{07}/\mathbf{B}\widehat{\mathbf{X}}_i^{07}$ reasonably close to 1 and who received the the letter should have perceived an increased probability to be audited since, in such a case, the probability to be audited in tax year 2007 was very low. On the contrary, one can say that a taxpayer who did not receive the letter and reported a ratio $\widehat{R}_i^{07}/\mathbf{B}\widehat{\mathbf{X}}_i^{07}$ remarkably lower than 1 may have not perceived a higher probability to be audited, since this probability was already very high in year 2007.

Thus, we distinguish four subsets of taxpayers:

i) taxpayers who received the letter and reported $\widehat{R}_i^{07} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ perceived a higher probability to be audited on their 2008 reports than on their 2007 reports;

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[1] We are assuming that the probability to be audited in tax year 2008 is perceived to be increased by any taxpayer who received the letter concerning tax year 2007. This is justified by the fact that the letter warns the taxpayer that he would certainly be included in the list if the same anomaly *or a similar one* is repeated in tax year 2008. If only the same anomaly would trigger the audit, one could argue that the probability to be audited can be positive in tax year 2008 either if $\widehat{R}_i < \mathbf{B}\widehat{\mathbf{X}}_i$ or if the same anomaly is repeated in tax year 2008.

ii) taxpayers who received the letter and reported $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ may have perceived a higher probability to be audited on their 2008 reports than on their 2007 reports, especially if the ratio $\widehat{R}_i^{07}/\mathbf{B}\widehat{\mathbf{X}}_i^{07}$ is reasonably close to 1 ;

iii) taxpayers who did not receive the letter and reported $\widehat{R}_i^{08} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{08}$ perceived a lower or constant probability to be audited on their 2008 reports than on their 2007 reports;

iv) taxpayers who did not receive the letter and reported $\widehat{R}_i^{08} < \mathbf{B}\widehat{\mathbf{X}}_i^{08}$ may have perceived a lower or constant probability to be audited on their 2008 reports than on their 2007 reports; in particular, the probability to be audited should have not increased if $\widehat{R}_i^{07}/\mathbf{B}\widehat{\mathbf{X}}_i^{07}$ is remarkably lower than 1.

The next step is to ask ourselves how could a taxpayer respond to the increase in the probability to be audited as induced by the letter (cases i) and some cases belonging to ii). On a priori basis one can expect a *direct* and an *indirect* effect. A direct effect is produced when the anomaly described by the Tax Agency in the 2007 letter is not repeated in the 2008 report. An indirect effect is produced when the 2008 report does not contain similar (to the described one) anomalies or when the taxpayer changes other relevant features of his reporting behaviour. Direct and indirect effects can interact in different ways. For example, consider a taxpayer who reported $\widehat{R}_i^{07} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ but received the letter. He could respond by reporting higher output and/or income (output minus costs) and this indirect effect may be induced by the direct effect. To see why, consider that reducing the manipulating activity tends to increase presumptive output, so that the taxpayer could, coeteris paribus, be induced to increase reported output and reported income.

However, a taxpayer may vary the level of reported output and income for other reasons, namely for reasons associated with the business cycle, with the propensity to tax evasion prevailing in the sector of operation or in the region of location or with other specific features of the economic activity (size as measured by the number of workers or by the size of assets used). This is the reason why we need a control sample to evaluate properly the impact of the letters.

4   The dataset and some descriptive analysis

The dataset consists of two panels:

-a panel of 52,782 taxpayers who received the letter for year 2007 (letter panel);

-a panel of 125,240 taxpayers who did not receive the letter for year 2007 (no-letter panel).

The two panels were extracted by the Italian Tax Agency in three steps. First, a panel of all taxpayers to whom Sds were applied in the period 2006-2008 was extracted. Second, this panel was divided into two panels: a first one including those who received the letter for year 2007 (112,457 taxpayers) and a second one including taxpayers who did not receive the letter (2,211,513 taxpayers). From these panels, finally, the two samples were randomly extracted.

For every taxpayer, the following variables are available for years 2006,2007 and 2008:

-the level of reported, $\widehat{R}_i^t$, and presumptive output;

-macroarea of location (North-West, North-East, Center, South, Islands);

-business sector (ATECO Istat Code);

-legal form (self-employed; firm using simplified accounting; firm using ordinary accounting);

-weighted number of dependent workers, number of family and non-family collaborators;

-cost variables, namely labour cost, cost of inventories, cost of services, residual costs;

-the type of anomaly in reporting $\widehat{\mathbf{X}}$, classified into 19 categories as provided by the Tax Agency. The letter contained a detailed description of the anomaly imputed to taxpayer's report in 2007 return, i.e. to one of these 19 categories. Note that no anomaly was imputed to taxpayers belonging to the no-letter panel.

Some descriptive variables for the two samples are provided in the Appendix (see Tables from 1a to 4b), where self-employed and professionels were excluded due to the lack of some fundamental data (namely, reported income). Consequently, data reported here include only firms.

In general we can note that:

i) in the letter panel there is a higher share of firms located in southern regions and islands, while firms located in the North of Italy are relatively more frequent in the no-letter panel;

ii) the two panels are more similar with respect to business sectors, although trading sectors (both *commercio all'ingrosso* and *commercio al dettaglio*) are represent a higher share in the letter-panel while the transportation sector is a higher share in the no-letter panel;

iii) the letter-panel contains a lower share of firms adopting the simplified accounting method (54% versus 60%) rather than the ordinary accounting method, which is thus more frequent in the letter-panel;

iv) the size of the firms seems very similar across the two panels, with negliglible differences in terms of assets'size and number of dependent workers; average yearly turnover is 318,541 and 287,135 euros for the letter and no–letter panel, respectively. However, average values of income reported are inversely ranked being higher for the no-letter panel (32,190 euros) than for the letter panel (24,025). This is evidence of the fact that the manipulation (underreporting) of input values was allegedly accomplished while, at the same time, inflating the value of deductible costs.

5   The impact on anomalous reporting

In this Section we start to analyze anomalous reporting and we consider only the letter panel. The first thing to note is that 37,822 taxpayers receiving the letter for the 2007 tax file did not report any anomaly in tax year 2008. This means a success rate of 71,7% (see Table 5 in the Appendix). As explained previously

(see Section 3) we want to disentangle this success rate distinguishing between a direct and an indirect impact we expect from the letters. A *direct effect* is produced when the specific kind of anomaly described by the Tax Agency in the 2007 letter is not repeated in the 2008 report. An *indirect effect* is produced when the 2008 report does not contain similar (but not identical) anomalies.

To test for the direct effect, we distinguished between those taxpayers who did report the same anomaly in year 2008 from all the others, i.e. those who reported a different anomaly or those who did not report any anomaly. The idea here is that taxpayers were not able to discern what kind of 'similar' anomalies may have triggered an audit, so that the letter should have changed their behaviour only with respect to the anomaly as described in the letter. For reasons explained above, we expect the letter to have had a higher impact on firms reporting $\widehat{R}_i^{07} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ since they surely perceived a higher audit probability, while the impact on taxpayers reporting $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ may have been lower.

Thus, we use a simple linear probability model to estimate the determinants of the probability to repeat the same anomaly. More precisely, we regress a binary variable defined as *anomalia nodiff (*=1 if the same anomaly is repeated in 2008 and =0 in all other cases*)* against a binary variable named as *flag incongrui 07* (=1 if $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ and=0 if $\widehat{R}_i^{07} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{07}$) and a number of controls concerning geographic location, the business sector, the size of the firm and taxpayers-type. Results reported in Table 6 seem to confirm the theoretical intuition, with the probability to repeat the same anomaly being significantly and positively related to reporting $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$, or, to state it alternatively, the letter is apparently having a stronger direct effect on taxpayers reporting $\widehat{R}_i^{07} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{07}$.

To test for the presence of both a direct and an indirect effect, we distinguished between those taxpayers who report an anomaly (belonging to one of the 19 types) in 2008 (28,3% of cases) and those who, after receiving the letter, did not report any anomaly (71,7% of cases). We use again a linear probability model to estimate the determinants of the probability to remove all anomalies. More precisely, the dependent variable here is defined as *anomalia1_mob* (=0 an anomaly is reported also in 2008, 1= if no anomaly is reported in 2008) and the regressors are the same specified previously. Again, results reported in Table 8 seem to confirm the intuition: the probability of removing all anomalies is negatively related to reporting $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$, or, to state it alternatively, the letter is apparently having a stronger (direct or indirect) impact on anomalous reporting on taxpayers reporting $\widehat{R}_i^{07} \geq \mathbf{B}\widehat{\mathbf{X}}$.

6 The impact on reported income

When trying to evaluate the indirect impact of the letter on the change in income reported, one has to take into account that such a change could have been driven by many different factors. We present here the preliminary analysis of this impact by means of a regression where we use as dependent variable the change in reported income between 2008 and 2007 and as independent variables:

-a dummy named as *smpl* which is =1 when the taxpayer belongs to the letter panel and =0 when the taxpayer belongs to the no-letter panel;

-the same dummy *flag incongrui 07* described above, which is =1 when the firm reports $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ and =0 when the firm reports $\widehat{R}_i^{07} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{07}$;

-a dummy which interacts *flag incongrui 07* with *smpl*=1;

-the same controls described above.

From Table 9 we see that the dummy variables are significant while many controls, namely those referring to the region of location, are not. *Smpl* and *flag incongrui 07* both have a positive impact on the change in reported income, while the interacted dummy has a negative impact. More precisely, on average a firm which received the letter increased reported income in 2008 (with respect to 2007) by approximately 3700 euros more than a firm which did not receive the letter. On the other hand, on average a firm which reported $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ in 2007 increased reported income in 2008 (with respect to 2007) by approximately 6277 euros more than a firm which reported $\widehat{R}_i^{07} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ in 2007. However, the interacted dummy has a value of -3976 euros which means that on average a firm which reported $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ in 2007 and received a letter increased reported income (with respect to 2007) by approximately 6277-3976=2301 euros more than a firm which did not receive the letter. This amount is far less than that estimated for the whole panel of firms which received the letter (3700 euros). Finally, note that the negative coefficient on the interacted dummy is virtually equal to the positive coefficient of the *smpl* dummy.

To state it more clearly, these preliminary results seem to indicate that:

i) the letter had a positive impact on income reported;

ii) this impact was stronger when the letter was received by firms which reported $\widehat{R}_i^{07} \geq \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ in 2007 than by firms which reported $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ in 2007;

iii) this impact for firms which reported $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$ in 2007 was similar regardless of the firm belonging to the letter panel or the no-letter panel.

These results are broadly in line with theoretical expectations, indicating that the letter had an impact but this was almost completely determined by the response of taxpayers reporting $\widehat{R}_i^{07} < \mathbf{B}\widehat{\mathbf{X}}_i^{07}$, i.e. those that, before receiving the letter, felt to be in a safe position since they could not be audited.

7 Directions for future research

The preliminary analysis developed here seems to indicate that the letters sent by the Tax Agency to taxpayers who allegedly manipulated input values reported for the application of Sds were effective in enhancing tax compliance. In particular, this is apparently true with respect to firms which, by manipulating input values, were able to lower the threshold under the level of reported output.These firms, before receiving the letter, felt to be in a safe position since they could not be audited. After receiving the letter, they perceived an increased probability of being audited and they accordingly reduce the manipulating activity and increased reported income.

This analysis needs to be completed in many directions and this is the reason why these results are to be treated with extreme caution. The major issue we have to deal with is the non-randomness of the letter panel. This comprises all taxpayers who reported anomalies in tax year 2007. When we consider the change in their behaviour, we have to take into account that this can depend upon many different features. This is particularly true when we try to evaluate the impact of letters on reported income. The change in reported income can depend on the circumstance of receiving (or not) the letter and also on many different features. Some of them are observable in both the letter and the no-letter panel and we control for them. Some others may be unobservable. In particular, since they are not selected randomly, all taxpayers receiving the letter could have a common unobservable feature whose change in 2008 is significant to explain their change in reported income. We shall try to address this issue more properly in future research by trying to exploit more the richness of our dataset.

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APPENDIX

Table 1a: distribution according to region of geographic location (letter panel)

Area geografica, 5 areas*	Freq.	Percent	Cum.
1	24,717	24.09	24.09
2	16,665	16.25	40.34
3	20,294	19.78	60.12
4	25,194	24.56	84.68
5	11,533	11.24	95.92
.	4,181	4.08	100.00
Total	102,584	100.00	

Table 1b: distribution according to region of geographic location (no-letter panel)

Area geografica, 5 areas*	Freq.	Percent	Cum.
1	54,326	28.66	28.66
2	43,279	22.83	51.49
3	37,198	19.62	71.11
4	30,188	15.93	87.04
5	13,706	7.23	94.27
.	10,863	5.73	100.00
Total	189,560	100.00	

*1=NW, 2=NE, 3=C, 4=SOUTH, 5=ISLANDS

Table 2a: distribution according to business sector (letter panel)

codnew3	Freq.	Percent	Cum.
Industria, utilities	11,564	11.27	11.27
Agricoltura	200	0.19	11.47
Costruzioni	18,142	17.69	29.15
Commercio all'ingrosso	19,280	18.79	47.95
Commercio al dettaglio	27,670	26.97	74.92
Trasporto	678	0.66	75.58
Hotel, ristorazione	7,708	7.51	83.09
Servizi informatici	2,722	2.65	85.75
Att finanziarie assicurative	2,330	2.27	88.02
Att immobiliari	6,352	6.19	94.21
Altri professionisti	1,518	1.48	95.69
Altri servizi	4,248	4.14	99.83
Servizi sanitari	172	0.17	100.00
Total	102,584	100.00	

Table 2b: distribution according to business sector (no-letter panel)

codnew3	Freq.	Percent	Cum.
Industria, utilities	24,624	12.99	12.99
Agricoltura	492	0.26	13.25
Costruzioni	32,848	17.33	30.58
Commercio all'ingrosso	28,366	14.96	45.54
Commercio al dettaglio	37,942	20.02	65.56
Trasporto	9,270	4.89	70.45

```
          Hotel, ristorazione |  13,890      7.33     77.78
          Servizi informatici |   4,164      2.20     79.97
    Att finanziarie assicurative |   2,088      1.10     81.07
            Att immobiliari |  13,140      6.93     88.01
          Altri professionisti |   3,988      2.10     90.11
              Altri servizi |  17,942      9.47     99.57
            Servizi sanitari |     806      0.43    100.00
--------------------------+-----------------------------------
                   Total | 189,560    100.00
```

Table 3a: distribution according to taxpayer-type (letter panel)

```
Modello di dichiarazione |    Freq.     Percent       Cum.
-------------------------+-----------------------------------
Contabilità semplificata |  56,150      54.74      54.74
    Contabilità ordinaria |  46,380      45.21      99.95
     Enti non commerciali |      54       0.05     100.00
-------------------------+-----------------------------------
                   Total | 102,584     100.00
```

Table 3b: distribution according to taxpayer-type (no-letter panel)

```
Modello di dichiarazione |    Freq.     Percent       Cum.
-------------------------+-----------------------------------
Contabilità semplificata | 114,544      60.43      60.43
    Contabilità ordinaria |  74,928      39.53      99.95
     Enti non commerciali |      88       0.05     100.00
-------------------------+-----------------------------------
                   Total | 189,560     100.00
```

Table 4a: descriptive statistics for some explanatory variables (letter panel)

```
    Variable |      Obs       Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
superfici_~t |   102584   219.4663   2802.698          0     310114
   dip_appr_n |   102583    1.58182   4.119801          0   169.9071
    cocopro_n |   102584   .1263355   1.017777          0        119
   fam_assoc_n |   102584   .0993332   .3799078          0         20
  ricavi_congr |   102584   318541.7   629422.3          0    9642239
-------------+--------------------------------------------------------
 reddito_im~a |   102584    24025.6   161885.8   -9844174    8922451
```

Table 4b: descriptive statistics for some explanatory variables (no-letter panel)

```
    Variable |      Obs       Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
superfici_~t |   189560   265.2754   3860.891          0     546360
   dip_appr_n |   189559   1.508455   3.905321          0   164.8333
    cocopro_n |   189560   .1238816   .8899176          0         97
   fam_assoc_n |   189558   .1427162   .4436172          0         27
  ricavi_congr |   189558   287135.4   583079.9          0    7102007
-------------+--------------------------------------------------------
 reddito_im~a |   189558      32190   105763.8   -1.03e+07    8918314
```

Table 5: frequencies of 19 types of anomalies (letter-panel)

```
.
Tipologia |
      di |        anno
 anomalia |    2007      2008 |     Total
-----------+--------------------+----------
        0 |        0    37,822 |    37,822
        1 |    5,933     1,325 |     7,258
        2 |    3,428     1,114 |     4,542
        4 |       28       101 |       129
        5 |    2,426       496 |     2,922
        7 |    3,340     1,584 |     4,924
```

```
        8 |    5,598         547 |      6,145
       10 |    1,208          92 |      1,300
       11 |   10,513       3,023 |     13,536
       12 |    9,247       2,227 |     11,474
       13 |    2,290       1,444 |      3,734
       14 |    6,368       2,515 |      8,883
       15 |    2,121         286 |      2,407
       16 |      282         129 |        411
       18 |        0           7 |          7
       19 |        0          70 |         70
-----------+-----------------------+----------
    Total |   52,782      52,782 |    105,564 .
.
```

Table 6: linear probability model to estimate the probability to keep the same anomaly
, dependent variable anomalia nodiff (=1 if same anomaly in 2008 as 2007, =0 otherwise; letter panel)

```
   Source |       SS       df       MS              Number of obs =   49324
-------------+------------------------------         F( 22, 49301) =   57.70
    Model | 172.992461      22   7.8632937          Prob > F      =  0.0000
 Residual | 6718.37572   49301   .136272605         R-squared     =  0.0251
-------------+------------------------------         Adj R-squared =  0.0247
    Total | 6891.36818   49323   .139719161         Root MSE      =  .36915
```

```
------------------------------------------------------------------------------
anomalia_n~f |     Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
area_geo_cod |
          2 |   .0057171   .0052476     1.09   0.276    -.0045683    .0160026
          3 |   .0208525   .0049564     4.21   0.000     .0111379    .0305671
          4 |    .044263   .0047743     9.27   0.000     .0349052    .0536207
          5 |    .043198   .0059567     7.25   0.000     .0315228    .0548731
             |
   codnew3 |
          1 |   -.051217   .0450445    -1.14   0.256    -.1395048    .0370708
          3 |  -.0369661   .0063862    -5.79   0.000    -.0494831   -.0244491
          4 |   .0307606   .0063245     4.86   0.000     .0183645    .0431568
          5 |   .0597823   .0060146     9.94   0.000     .0479936    .0715709
          6 |  -.0303185   .0211953    -1.43   0.153    -.0718615    .0112246
          7 |  -.0160271    .007763    -2.06   0.039    -.0312427   -.0008114
          8 |   .0182983   .0114204     1.60   0.109    -.0040858    .0406824
          9 |   .0762262   .0121036     6.30   0.000      .052503    .0999494
         10 |  -.0241499   .0091451    -2.64   0.008    -.0420744   -.0062255
         11 |   .0331208   .0146114     2.27   0.023     .0044823    .0617594
         12 |   .0059834   .0095988     0.62   0.533    -.0128303    .0247971
         13 |   .0176955   .0403556     0.44   0.661     -.061402     .096793
             |
   dip_appr_n |  -.0013836   .0004331    -3.19   0.001    -.0022324   -.0005348
   cocopro_n |  -.0030144   .0016503    -1.83   0.068    -.0062489    .0002201
  fam_assoc_n |   -.018374   .0044504    -4.13   0.000    -.0270968   -.0096513
             |
    mod_dic2 |
          1 |  -.0428169   .0037281   -11.48   0.000     -.050124   -.0355099
          2 |  -.1448568   .0711958    -2.03   0.042    -.2844014   -.0053122
             |
1. f_inco~07a |    .027765   .0035116     7.91   0.000     .0208822    .0346477
      _cons |   .1378899   .0063576    21.69   0.000     .1254289    .1503509
------------------------------------------------------------------------------
```

Table 7: descriptive statistics for rate of mobility (from anomalous to non anomalous behaviour, letter panel)

```
    Anomalia: |
    mobilità |     Freq.     Percent        Cum.
---------------+-------------------------------
```

```
Sempre anomalo |     14,960       28.34       28.34
Non più anomalo |     37,822       71.66      100.00
----------------+-------------------------------
          Total |     52,782      100.00
```

Table 8: linear probability model to estimate the probability to remove any anomaly
dependent variable anomalia1_mob (=0 if any anomaly in 2008, =1 if no anomaly in 2008; letter panel)

```
      Source |       SS       df       MS              Number of obs =    50740
-------------+------------------------------          F( 20, 50719) =    64.19
       Model |   254.2709      20   12.713545          Prob > F      =   0.0000
    Residual | 10045.1555   50719  .198055078          R-squared     =   0.0247
-------------+------------------------------          Adj R-squared =   0.0243
       Total | 10299.4264   50739   .20298836          Root MSE      =   .44503
```

```
----------------------------------------------------------------------------
anomalia1_~b |     Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+--------------------------------------------------------------
area_geo_cod |
           2 |   .0035485   .0062222     0.57   0.568    -.0086471    .0157442
           3 |  -.0257504    .005871    -4.39   0.000    -.0372575   -.0142432
           4 |  -.0765908   .0056721   -13.50   0.000    -.0877083   -.0654733
           5 |  -.0672401    .007091    -9.48   0.000    -.0811385   -.0533417
             |
     codnew3 |
           1 |   .0740307   .0543013     1.36   0.173    -.0324003    .1804618
           3 |   .0136558   .0076917     1.78   0.076     -.00142     .0287316
           4 |   .0247118   .0076178     3.24   0.001     .0097809    .0396427
           5 |  -.0458935   .0072411    -6.34   0.000    -.0600862   -.0317009
           6 |   .1280294   .0252918     5.06   0.000     .0784572    .1776017
           7 |  -.0012932   .0093333    -0.14   0.890    -.0195866    .0170003
           8 |   .0640202   .0135691     4.72   0.000     .0374246    .0906159
           9 |   .0470679   .0145762     3.23   0.001     .0184984    .0756374
          10 |   .0764474   .0110056     6.95   0.000     .0548763    .0980185
          11 |   .0475823   .0140353     3.39   0.001      .020073    .0750916
          12 |   .0318604   .0113661     2.80   0.005     .0095827    .0541382
          13 |   .1600351   .0167172     9.57   0.000     .1272692    .1928011
             |
    dip_appr_n |  .0011691   .0005157     2.27   0.023     .0001582      .00218
             |
     mod_dic2 |
           1 |   .0035773   .0044611     0.80   0.423    -.0051666    .0123211
           2 |   .0976406   .0857643     1.14   0.255    -.0704584    .2657396
             |
1. f_inco~07a |  -.0568818   .0041737   -13.63   0.000    -.0650624   -.0487013
       _cons |   .7706956   .0075836   101.63   0.000     .7558317    .7855595
----------------------------------------------------------------------------
```

Table 9: difference-in-difference analysis (dependent variable Dreddito=change in
reported income between 2008 and 2007)

```
      Source |       SS       df       MS              Number of obs =   138811
-------------+------------------------------          F( 24,138786) =     7.29
       Model | 4.3301e+12      24  1.8042e+11          Prob > F      =   0.0000
    Residual | 3.4346e+15  138786  2.4748e+10          R-squared     =   0.0013
-------------+------------------------------          Adj R-squared =   0.0011
       Total | 3.4389e+15  138810  2.4774e+10          Root MSE      =   1.6e+05
```

```
----------------------------------------------------------------------------
     Dreddito |     Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+--------------------------------------------------------------
area_geo_cod |
           2 |    -490.96   1208.372    -0.41   0.685    -2859.346    1877.426
           3 |   287.9194   1222.986     0.24   0.814    -2109.109    2684.948
```

4	69.36532	1260.049	0.06	0.956	-2400.308	2539.038
5	-95.66569	1628.242	-0.06	0.953	-3286.99	3095.658
codnew3						
1	-1663.94	10312.06	-0.16	0.872	-21875.38	18547.5
3	12152.61	1586.008	7.66	0.000	9044.067	15261.16
4	3543.141	1592.41	2.23	0.026	422.0486	6664.234
5	1296.421	1515.616	0.86	0.392	-1674.158	4267
6	4415.481	2628.221	1.68	0.093	-735.7829	9566.744
7	3227.752	1933.332	1.67	0.095	-561.5426	7017.047
8	7826.105	2998.698	2.61	0.009	1948.713	13703.5
9	4947.833	3636.162	1.36	0.174	-2178.977	12074.64
10	7443.23	2218.611	3.35	0.001	3094.794	11791.67
11	3344.448	3293.333	1.02	0.310	-3110.423	9799.318
12	4606.464	1947.803	2.36	0.018	788.807	8424.122
13	14160.76	7248.744	1.95	0.051	-46.64096	28368.16
dip_appr_n	-668.3463	114.1111	-5.86	0.000	-892.0018	-444.6907
cocopro_n	59.12576	461.7432	0.13	0.898	-845.8821	964.1336
fam_assoc_n	1210.024	1006.873	1.20	0.229	-763.4284	3183.476
mod_dic2						
1	397.4568	943.6578	0.42	0.674	-1452.095	2247.008
2	-3954.767	19245.42	-0.21	0.837	-41675.43	33765.89
1.smpl	3699.696	1309.71	2.82	0.005	1132.689	6266.702
L. f_incongr_~r						
1	6277.468	1076.683	5.83	0.000	4167.19	8387.746
smpl # L. f_incongr_~r						
1 1	-3976.372	1794.149	-2.22	0.027	-7492.869	-459.8746
_cons	-8304.039	1523.04	-5.45	0.000	-11289.17	-5318.909