

# Argomenti di discussione

(Discussion topics)

## AN APPROACH TO ASSESS HOW THE ACTIVITY OF THE ITALIAN REVENUE AGENCY AFFECTS COMPLIANCE

*S. Pisani*

N. 01/2014

*Argomenti di discussione* è una pubblicazione che intende divulgare contributi ed analisi su argomenti di economia, statistica, econometria e scienza delle finanze, che abbiano rilevanza per la missione dell'Agenzia delle Entrate, al fine di alimentare il dibattito scientifico sui temi di interesse strategico dell'Agenzia e favorire lo scambio di opinioni. La pubblicazione ospita contributi in lingua italiana o inglese proposti da autori sia interni sia esterni all'Agenzia. Le opinioni espresse negli articoli sono lasciate alla discrezionalità degli autori e non impegnano la responsabilità dell'Agenzia delle Entrate.

*Discussion topics is a publication aiming at disclosing contributions and analysis in economics, statistics, econometrics and public finance, which are relevant to the mission of the Italian Revenue Agency (Agenzia delle Entrate) in order to feed the scientific debate on topics of strategic interest for the Agency and to facilitate the exchange of opinions. This publication admits contributions in Italian or in English proposed by authors internal or external to the Agency. The views expressed in the articles are those of the authors and do not involve the responsibility of the Revenue Agency.*

#### LICENZA/LICENCE



Quest'opera è distribuita con Licenza Creative Commons Attribuzione - Non commerciale - Non opere derivate 3.0.  
*This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License.*

ISSN: 2420-773X

Stefano PISANI (Agenzia delle Entrate - Responsabile Scientifico/Editor in Chief)

#### COMITATO SCIENTIFICO/BOARD OF EDITORS

Bruno CHIARINI (Università degli Studi di Napoli "Parthenope")  
Valeria DE BONIS (Università degli Studi di Roma "La Sapienza")  
Antonio DI MAJO (Università degli Studi "Roma Tre")  
Roberto MONDUCCI (Istituto Nazionale di Statistica)  
Alessandro SANTORO (Università degli Studi "Milano-Bicocca")

#### REDAZIONE/PRODUCTION EDITORS

Nicoletta Alborino (Agenzia delle Entrate)  
Marta Gallucci (Agenzia delle Entrate)

Tel. +39-06-5054-3874/5071 Fax +39-06-5054-5038

E-mail: [ae.argomentididiscussione@agenziaentrate.it](mailto:ae.argomentididiscussione@agenziaentrate.it)

Web: [www.agenziaentrate.gov.it/wps/content/Nsilib/Nsi/Documentazione/Rivista/Argomenti+di+discussione](http://www.agenziaentrate.gov.it/wps/content/Nsilib/Nsi/Documentazione/Rivista/Argomenti+di+discussione)

# **An approach to assess how the activity of the Italian Revenue Agency affects compliance**

Stefano Pisani

Agenzia delle Entrate, [stefano.pisani@agenziaentrate.it](mailto:stefano.pisani@agenziaentrate.it)

## **Abstract**

In order to improve the level of compliance, the Italian Revenue Agency has adopted a methodology to calculate tax gap, defined as the difference between the amount of taxes the tax administration should levy and collect (the potential tax yield) and the actual tax revenues (cash due and paid in period).

Closing the tax gap is part of the Italian Revenue Agency vision and measuring its reduction is a way to assess the impact of its work. For this reason, a system of key performance indicators is used to improve effectiveness and efficiency in tax collection and fostering voluntary compliance; In this contest the closing of tax gap represents the ultimate target..

The literature suggests that tax compliance is determined by economic and non economic factors: penalties, fairness and trust (in tax administration), opportunity to evade, fiscal burden, enforcement of the tax Agency to prevent and combat tax evasion, business cycle, etc.. To evaluate the tax Agency enforcement macro-models are developed to isolate this impact by the other components.

To the end of monitoring the taxpayers' response to audit, a class of models based on micro data is used. The purpose of these models consists in verifying whether the taxpayer changes its attitude to be compliant after being undergone to the "treatment".

**JEL classifications:** H26, H83

**Key words:** Tax gap, Tax compliance, Performance indicators

## Index

1. Introduction.....	3
2. Tax Gap and key performance indicators.....	3
2.1. IRAP Tax gap.....	4
2.2. VAT Tax gap.....	8
2.3. Key performance indicators .....	13
3. The environmental factors influencing tax gap.....	16
3.1 The time series model .....	16
3.2 The panel analysis .....	19
4. Evaluation of the deterrent effect .....	23
4.1. Control of the territory .....	23
4.2. The letter campaign.....	23
5. Concluding remarks .....	25
Annex 1. VAT gap with and without complicity .....	27

## 1. Introduction<sup>1</sup>

“All revenues bodies share a common mandate. This mandate is to ensure high level of compliance with the various tax laws and regulations in place within their jurisdiction.” (OECD 2010, p. 5). In order to fulfill this mandate, the Italian Revenue Agency (hereinafter IRA) has adopted a methodology to estimate potential collection, that is “that which could be collected if no taxpayers would voluntary breach the law and involuntary errors would amount to zero”<sup>2</sup>. Then we can define the tax gap as the difference between the potential collection and the tax that is actually paid.

The objective of this paper is to present the sources and the calculation methods adopted by the IRA to estimate tax gap as the missing portion of the tax potential, setting forth the uses of such indicator as a parameter to schedule the IRA's activities, making the most efficient use of the finite resources available.

Closing the tax gap is part of the IRA vision and measuring its reduction is a way to show the impact on its compliance work. To properly use the tax gap as a programming tool you need to understand what may be the other causes that affect on it. In order to do this macro-models are developed to isolate the impact of the tax Agency enforcement by the other components.

Finally, it is necessary to evaluate the effect induced by the effort made by the Agency in terms of stimulating voluntary compliance. To this end a class of models based on micro data is used. The purpose of these models consist in verifying whether the taxpayer changes its attitude to be compliant after being undergone to the "treatment".

In this paper the logical steps of the project are described, explaining the methodological aspects and showing the first results. It is a work in progress, which need further refinements that will form the activity plan of the next years.

The paper is organized as follows. Section 2 summarizes the estimation method of tax gap and shows how it is included in the key indicators model. Section 3 describes the macro model used to isolate the impact of the audit strategy on the taxpayers behavior. Section 4 is devoted to the micro analysis adopted to monitor the effectiveness of audit strategy.

## 2. Tax Gap and key performance indicators

Numerous publications are available on the possible methods to calculate tax gap<sup>3</sup>. It does not exist the best method to estimate the tax gap but there exists the best method according to the available information, the tax law and the economic structure. For this

---

<sup>1</sup> The work is a part of the research project developed within the Planning and Control Department of the Italian Revenue Agency and in particular the estimates of the tax gap is the result of the work of the Econometric and Statistics Analysis for Compliance office. A preliminary version of this paper has been presented at “International Tax Analysis Conference, 2014”, January 21<sup>st</sup>, London.

<sup>2</sup> Das-Gupta, Mookherjee (2000).

<sup>3</sup> For a summary, refer to OECD (2004a, 2008).

reason, different methods are applied by the tax agencies of various countries, trying to tailor the methodology to the national context<sup>4</sup>.

The IRA adopts the top-down approach, based on the comparison between tax data and National Accounts figures, provided by Italian National Institute of Statistics (ISTAT). The latter incorporate an estimate of the underground economy, and then provide an indicator of the "potential " tax base. From this potential base an estimate of the potential collection is then derived, through which it is possible to calculate the tax gap<sup>5</sup>.

IRA founded the estimate of the gap mainly on two key tributes: VAT and Regional Tax on Productive Activities (IRAP, as per the Italian acronym). While the VAT is an internationally standardized tax, IRAP is specific of Italian tax system, created in 1997.

From the point of view of economic analysis, the VAT gap intercepts the phenomenon at the time of consumption, while those of IRAP at the time of production. This differentiation is very important for the spatial analysis, since some areas of the country have a large concentration of production plants, while others are characterized primarily as a place of consumption. It is possible, therefore, that the evasion that is formed in the first ones turns in purchasing power in the second ones.

## **2.1. IRAP Tax gap**

The main features of IRAP are:

- ✓ a large number of taxpayer spanning the operators comprised in the assessment of the GDP almost in full;
- ✓ a substantially flat rate (around 4%)
- ✓ a definition of tax base very similar to that of value added at factor cost, as stated by the system of national accounts<sup>6</sup>;
- ✓ a regional breakdown based on the location of production establishment.

The similarity between the IRAP tax base and national account value added is remarkably important in the study of the tax gap. In fact, the latter is the basic unit that determines the GDP and, therefore, contains all the income that generates the change of the wealth of a country. It follows that the IRAP tax base encompasses much of the tax base resulting from the production of goods and services.

In addition, the large number of taxpayers subject to the tax means that the IRAP tax base gap represents a macro indicator of the value added concealed from tax authorities. In this case, therefore, the tax gap is not as important to focus on as the gap of the tax base.

The method of calculation of the gap follows the "top-down" approach, comparing the base inferred from the IRAP fiscal form (BIRAP) with the National Accounts value

---

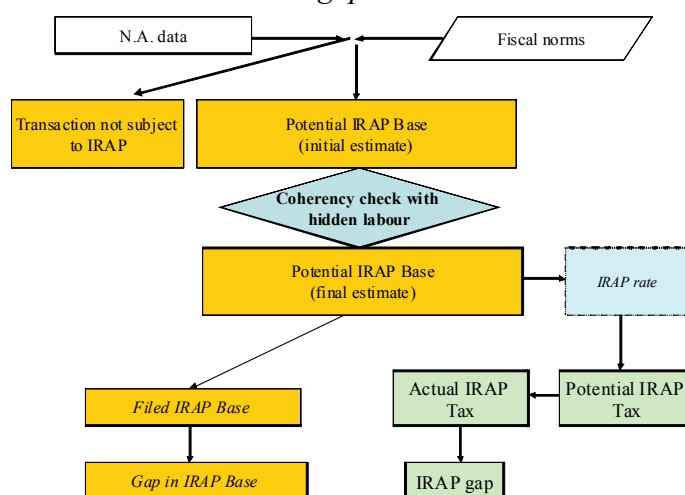
<sup>4</sup> See HMRC, 2012; Swedish National Tax Agency, 2008; Danish Tax and Customs Administration, 2006a, 2006b, Internal Revenue Service 2012, Australian Taxation Office, (2012).

<sup>5</sup> The adopted methodology is based on international best practices (see, among others, European Commission, 2011, 2013, HMRC, 2012).

<sup>6</sup> See United Nation (1992) and Eurostat (1995).

added at factor cost<sup>7</sup>. To make such a comparison is necessary to harmonize the two quantities from the point of view of the definitions and classifications adopted<sup>8</sup>, so that the resulting discrepancy is attributable solely to the IRAP base which is not declared. This phase is represented by the data link between National Accounting and tax rules shown in Figure 2.1.

**Figure 2.1:** *Flow chart of the methodology used to estimate the potential IRAP base and the tax gap*



In order to calculate the IRAP gap by sector of economic activity<sup>9</sup>, it is necessary to consider the difference between the elementary unit of analysis adopted by the IRA and that used by the National Accounts. The ISTAT Value Added is determined per unit of economic activity (UEA), while BIRAP is declared by the enterprise<sup>10</sup>. This

<sup>7</sup> For more details, see Braiotta et al (2013).

<sup>8</sup> The harmonization measures are aimed at excluding from ISTAT data subjects and transactions excluded from the scope of the tax. The main corrections are:

1. minimum taxpayers regime, particularly present in agriculture;
2. depreciation: included in the National Accounts data and excluded from the tax base;
3. domestic services for families and cohabitation: not subject to IRAP;
4. Groups of European Interest Grouping (GEIE): to comply with the data of National Accounts, add the latter, based in Italy, subject to IRAP;
5. exclusion from net production IRAP of the difference between interest income and interest expense of the banks;
6. additional premium of insurance, not included in the basis IRAP;
7. royalties are deductible for IRAP purposes, while there are in the National Accounts;
8. mineral exploration: in terms of National Accounts are considered investment expenditure, in contrast to what happens for the determination of BIRAP, where they are included in the cost items.

<sup>9</sup> 20 branches of activity for the nation, 20 at regional level and 6 for the provinces.

<sup>10</sup> According to Eurostat (1995), the UEA groups all the parts of an enterprise contributing to the performance of an economic activity. If, therefore, the productive activity of an enterprise is classified into one economic activity the definition of enterprise and UAE are the same, if it does not, for tax

classification problem has no impact on the quantification of the gap for the whole economy, but it can bias the estimates by branch of activity. To remedy this distortion it was necessary to provide a transition matrix (based on data from surveys conducted by ISTAT on businesses) to bring the production of the UAE to enterprise which they belong.

The adjustments listed above will allow us to obtain an initial estimate of the potential tax base (see Figure 1). A further consistency check is applied to this result in order to verify the correct allocation of the potential base by sector of economic activity. To this end, for each branch  $i$ , the gap in the base, BIND is calculated,

$$BIND^i = BIT - BID^i \quad [2.1]$$

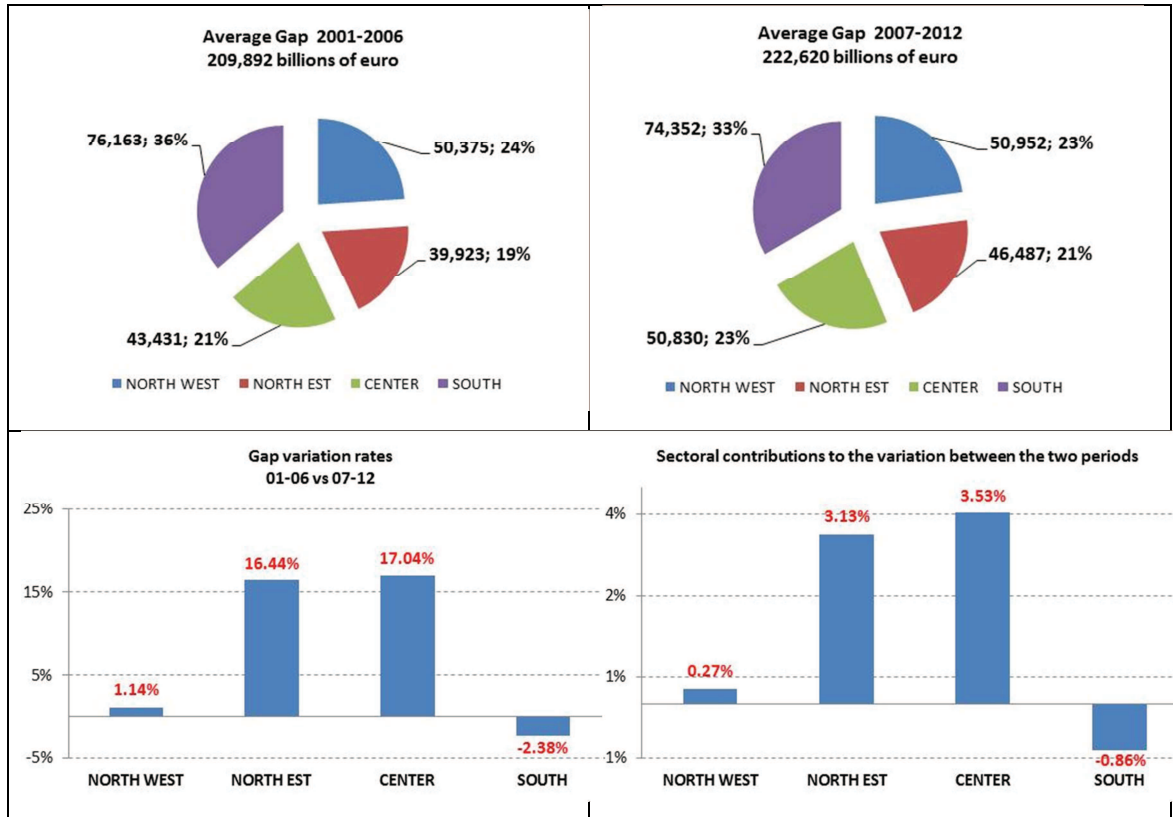
It is then verified whether Bind, for each  $i$ , is at least equal to the corresponding value added by the *black* labor recorded in the same branch, the latter being one of the components of the base gap. If this condition is not met a reallocation between the branches is done that, in any case, leaves unchanged the value of the base unreported by the whole economy. Then by applying the statutory tax rates is possible to calculate the gap of the tax (Figure 2.1).

Figure 2.2 shows the amount of the gap in the base across periods: 2001- 2006 and 2007-2012. Between the two periods, there was an increase in the gap (6.06%) by recording, on average in the period 2007-2012, a baseline value subtracted from taxation of around 223 billion Euros. It is more interesting to see how this gap was apportioned between the geographical areas of the country. Most recent data show a gap in the base approximately of: 97 billion Euros in Northern regions (44% of the total), 74 billion Euros in Southern (33%) and 51 billion Euros in the regions of the Center (23%). The geographical areas did not contribute evenly to the variation of the gap, in fact, in the South there was a decrease (-2.38%) associated with a slight increase in the North West (+1.14%). These variations are offset by growth in both the North East and in the Center (+16.44% and +17.04% respectively). To highlight the extent to which each individual allocation has influenced the rate of change on the whole (+6.06%), it is critical to calculate its contribution to the growth. Even in this case, it is confirmed that a larger contribution to the reduction is supplied by the Southern regions (-0.86%); the contribution of North West to the increase(+0.27 %) is very slight, while those of the Center and of the North-East are larger and very close, since the first one is equal to +3.13 % and the second one is +3.53%. The absolute values of the gap must be analyzed in conjunction with the propensity to the gap, which is obtained by dividing the base gap by the corresponding potential base. The average propensity of the two periods 2001-2006 (20.97%) and 2007-2012 (20.14%) remained almost unchanged , .

---

purposes the company is ranked in the industry "prevailing", while in the National Accounts is divided into several sectors.

**Figure 2.2:** *IRAP base gap by Macro region (Taxable income): absolute values, percentage composition and variation rates. 2001-2006 and 2007-2012*

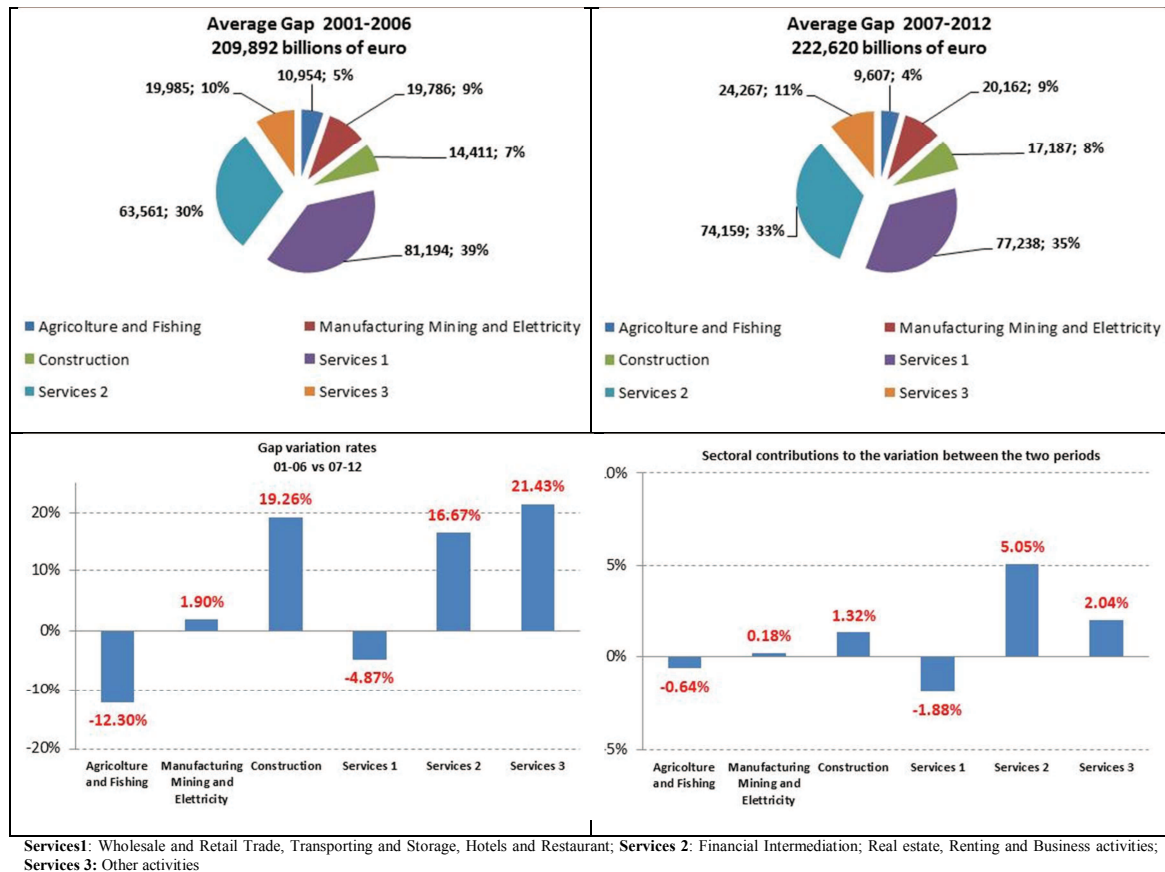


This slight reduction was driven by the Southern (-3.21 percentage points) and North Western regions (-0.95) , while the Center (0.23), and the North Eastern regions (+0.73) show slight increases. Despite different rates of change, there is still a certain inequality, in fact, taking the average for 2007-2012, the South shows the higher propensity to gap (30.24 %), followed by Centre (21.24%), from the North East (18.16%) and North West (13.99%).

The larger amount of the gap is concentrated in the service sector (Figure 2.3) and in particular in: trade, hotels, public exercises, repairs, transport (S1) and financial intermediation, real estate and business activities (S2). In S1 the base gap of about 81 billion in the first period is reduced to about 77 billion in the period 2007-2012, the base gap of sector S2, instead undergoes an increase from about 64 billion, in 2001-2006, to 74 billion in 2007-2012. Also in this case the overall change is the result of different trends: we observe a reduction in the sectors Agriculture (-12.30 %) and S1 (-4.87 %), in opposition to the growth shown by other sectors. The propensity to the gap in the period 2007-2012 is higher in agriculture (38.63 %), followed by the sectors S2 and S1 (32.76% and 26.24 % respectively) and the Construction (21.36%). Sectors S3 and Industry excluding construction, (12.42% and 7.10% respectively) complete the ranking. In the two six-year periods considered all industries have provided a boost to

the reduction in the propensity to gap. This impulse was particularly pronounced in sectors S1 (-5.32 %) and Agriculture (-4.84 %).

**Figure 2.3:** *IRAP base gap by economic sector: absolute values, percentage composition and variation rates. 2001-2006 and 2007-2012*



## 2.2. VAT Tax gap

The VAT is the second benchmark to calculate the Italian tax gap. In order to obtain a accurate measure of the potential liability, we require to correctly identify both taxable base and suitable legal VAT rates with respect to the legislation<sup>11</sup>. Afterwards we derive the VAT gap that includes tax evasion, the deliberate intention to fraud, insolvency, negligent acts and misinterpretation of the law.

The taxpayer voluntary compliance is calculated from the VAT revenue on accrual basis. This represents the VAT revenue that an economic system generates as a result of transactions burdened with VAT in the reference period (a fiscal year). The accrued revenue stems from all flows involving VAT as shown in the following equation:

<sup>11</sup> See Convenevole, Pisani (2003) and D'Agosto et al (2012) for details.

$$IVAEC = VAT \text{ Gross Revenue}^{12} - (Refunds + Compensation^{13}) - \text{Adjusting for accrual accounting} - \text{variation in the amount of VAT credits to bring to next year}^{14} \quad [2.2]$$

where IVAEC denotes the economic accrued revenue consistent with our method to estimate gap. VAT gross revenue is the taxpayers voluntary compliance and represents the tax due and paid to the Tax Authorities as a result of VAT transactions in the domestic market and those resulting from imports. This VAT revenue is defined “gross” as it comes before adjustments for refunds and compensations. After taking into account the latter corrections and adapting for potential timing differences in revenues between accrual basis and cash basis we attain the VAT accrual<sup>15</sup>. Every year, taxpayers annotate in the VAT statement the amount of VAT credits they can use in the year following the declaration. The aggregate variation of this stock measures the VAT credit that has been generated in the economic system after refunds or compensation have been requested. To get IVAEC consistent with the National Accounts we subtract changes in the stock from the accrued VAT.

Hence, the declared VAT base (BID) is obtained by dividing IVAEC by the implicit rate computed on the bases of VAT statements data, taking into account internal market components and imports., The theoretical VAT base (BIT), consistent with the classifications and definitions applied for BID, is calculated to estimate base gap. BIT is estimated from detailed expenditure subclasses of National Accounts components<sup>16</sup>: Households consumption (261 items); General Government Investments (12 items); General Government Intermediate Consumption (17 items); Market enterprises Intermediate Consumption (58 items), and specific types of market enterprises Investments<sup>17</sup> (eg. cars). We group them in three main clusters, the same applied for BID: Households, General Government and Uses for Market Enterprises. For VAT purposes, both General Government which offers non-market services and specific segments of market enterprises behave as final consumers since they cannot recover tax<sup>18</sup>.

As for market enterprises, there are two kind of not recoverability: the first is due to the type of goods purchased, denoted as “objective”; the second, denoted “subjective”, is linked to the kind of business: enterprises which sell exempt goods and services cannot reclaim VAT paid for their purchases. Following VAT legislation, we have identified, among goods and services purchased by firms, those items whose tax is not recoverable. To take the “subjective” component into account, we compute non recoverable share by detailed economic activities from VAT statements, then we apply these percentages to National Accounts Intermediate Consumption.

As a general rule, we require highly detailed National Accounts aggregates in order to capture the complex system of VAT regulation and to calculate accurate theoretical base

<sup>12</sup> It represents the voluntary compliance and it excludes the amount collected through the audits.

<sup>13</sup> It is an alternative way to the request for reimbursement, under which you may use a VAT tax credit to pay other taxes.

<sup>14</sup> To have this opportunity the taxpayer reports VAT credit in the tax return.

<sup>15</sup> The procedure is defined by the European Union in accordance with Regulation ESA95.

<sup>16</sup> Applying the top-down method based on the national accounts may produce therefore different results from country to country. See for example Reckon (2009), Keen and Smith (2007), European Commission (2013).

<sup>17</sup> Includes data relating to valuables investments.

<sup>18</sup> This second type regards also all purchases by public administration which offers non-market services.

and tax. For each detailed subclass of National Accounts is deducted the share of exempted base; then to the residual amount is associated its own proper statutory VAT rate.

The gap is estimated following two hypothesis<sup>19</sup>: with complicity (seller and buyer agree and there is no invoice and the tax is not collected); without complicity (the tax is collected but not remitted). Currently, we are not able to identify the amount of evasion for each behavior, hence we produce two estimates, the first one assuming all evasion occurs with complicity, the other supposing all evasion is without complicity. The former represents an upper limit of gap estimates while the latter a lower limit (see Annex 1). Figures 4.a and 4.b, illustrate the estimation procedure of the VAT gap.

In Figure 2.5, the VAT base gap is a share of GDP. The figure shows a cyclical pattern which as local minimum in the years, 2002 and 2007, and local maximum in the years 2001, 2004, while the absolute maximum is located in 2006 (19.7%, medium range) and the absolute minimum is reached in 2010 (14.6%, medium range).

To evaluate the effect on Government Budget, Figure 2.6 shows the ratio between the VAT as a percentage of potential VAT liability. This trend is similar to that shown in Figure 5, due to the strong correlation between base and tax. Particular occurrences happen in 2009 and 2010: the compliance indicator (Figure 2.6) shows a greater improvement than that for the base (Figure 2.5).

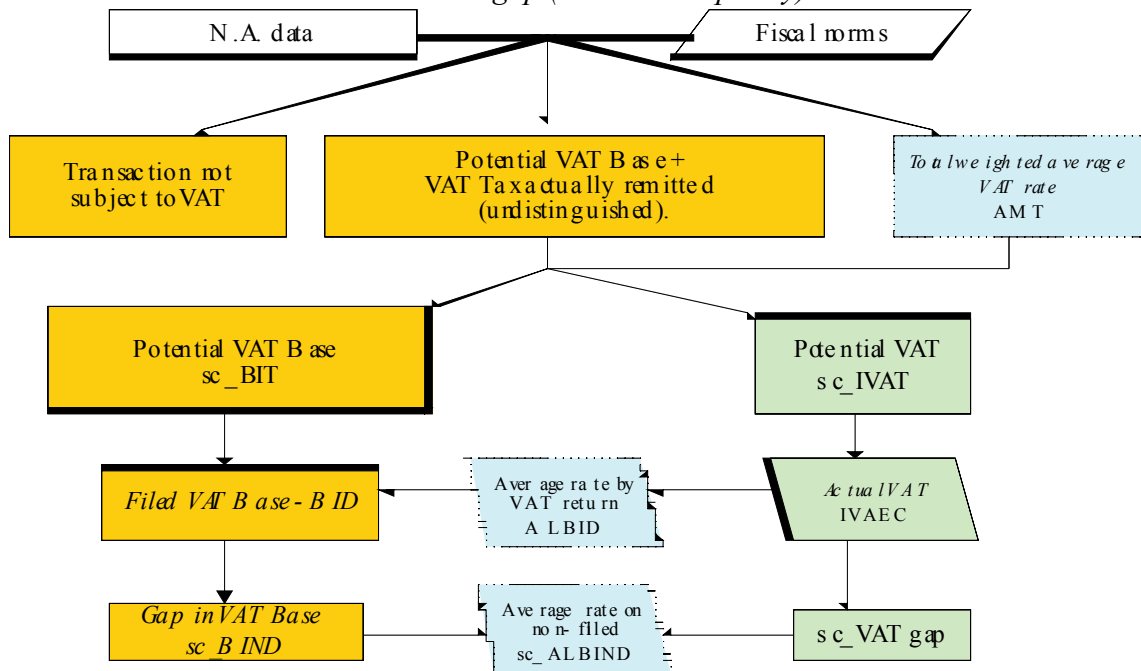
In the 2007-2011 the level of tax gap is also significantly lower than those estimated in previous period.

The estimation method applied to calculated tax gap includes in its definition the intentional evasion as well as avoidance, missed payments due to liquidity crisis, errors or accidental omissions of various kinds. With respect to VAT there is a measure of gap mainly due to errors in interpreting the laws or liquidity crisis. This information is taken from the results of automatic audit (according to Art. 54bis of the law 633/72) conducted on the entire VAT payers target population. The available data for the years 2003-2010 are shown in Figure 2.7.

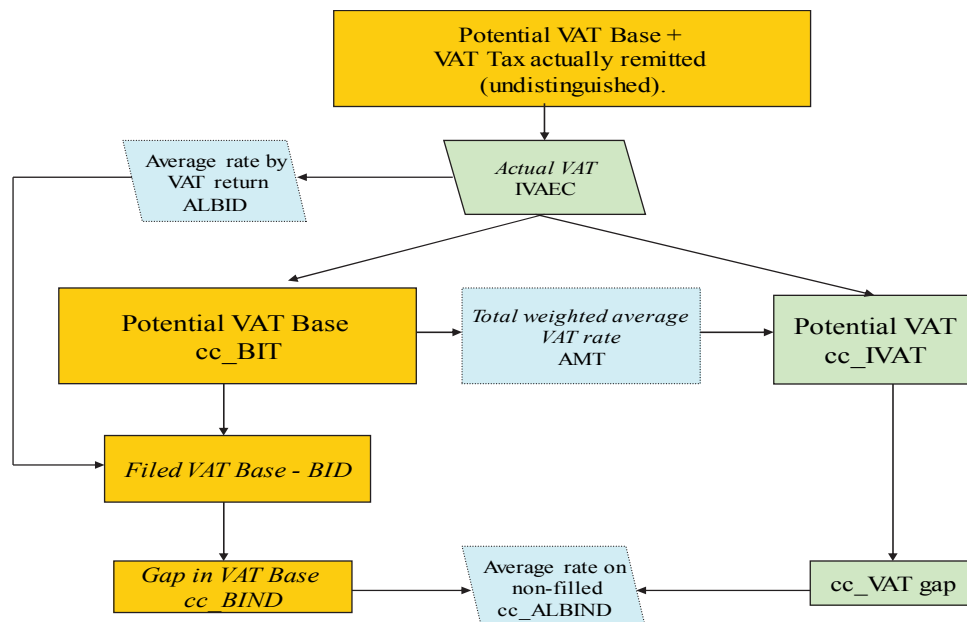
---

<sup>19</sup> The two types are recognized within the EU and the European Commission in the Decision 98/527/CE, G. U. n. L234 del 21/8/1998 p. 0039-0042.

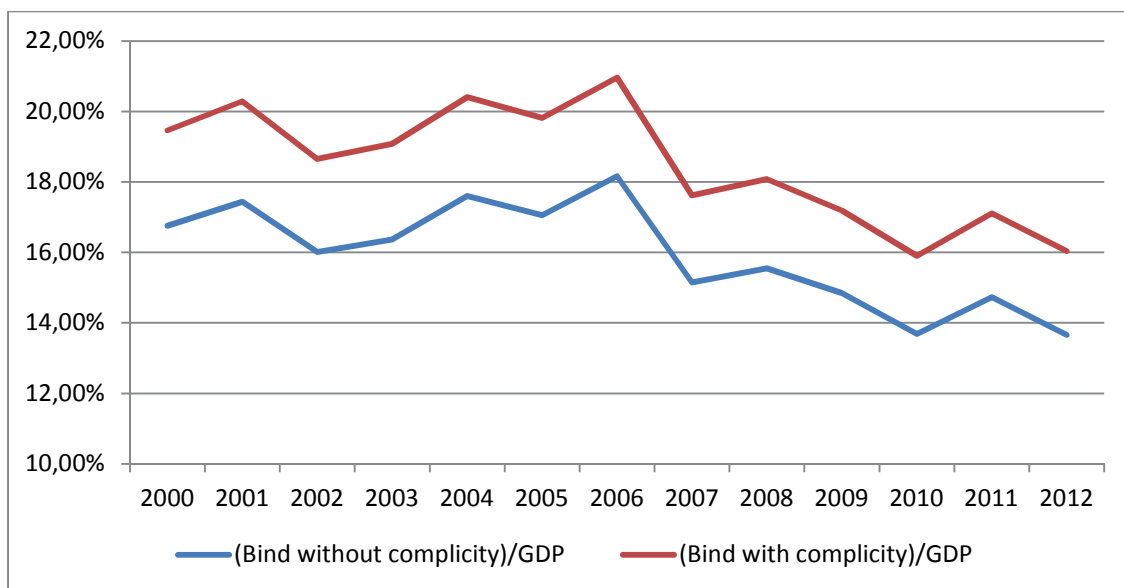
**Figure 2.4a:** Flow chart of the methodology used to estimate the potential VAT base and the VAT gap (without complicity)



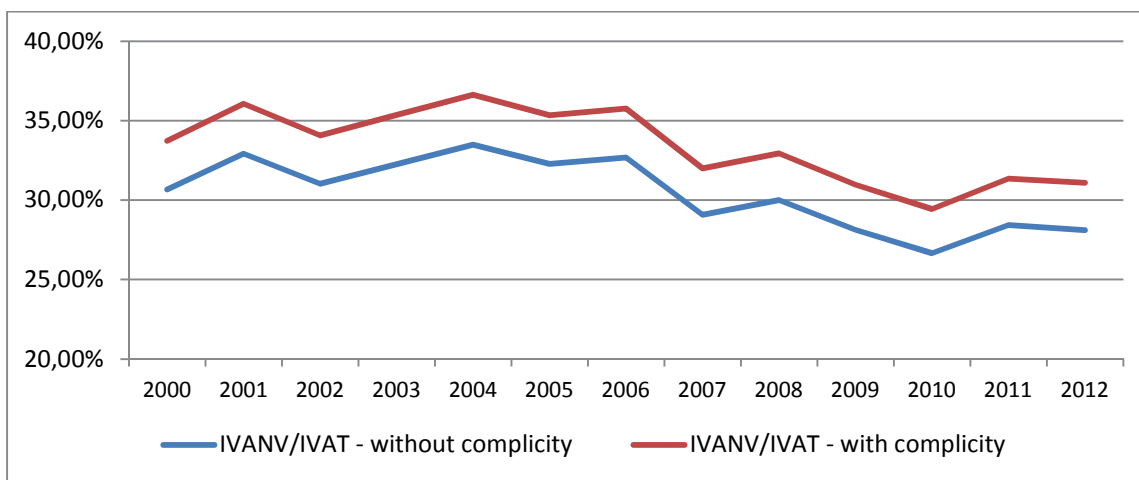
**Figure 2.4b:** Flow chart of the methodology used to estimate the potential VAT base and the VAT gap (with complicity)



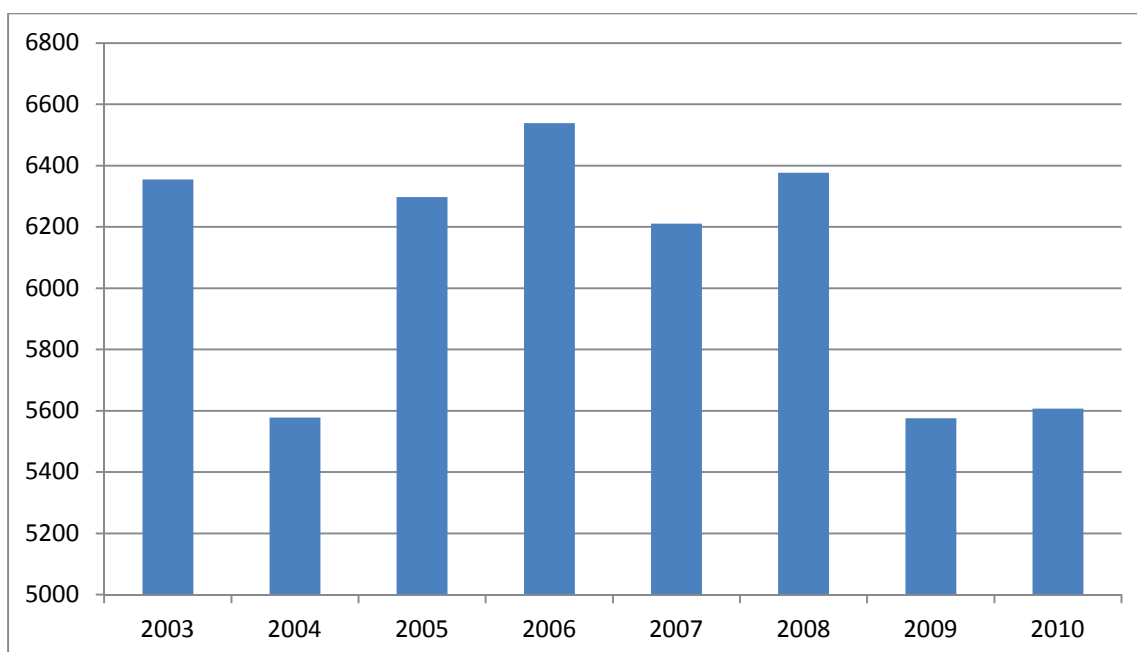
**Figure 2.5:** *VAT base gap (BIND) as a % of GDP. hypothesis with and without complicity (2000-2012).*



**Figure 2.6:** *VAT gap as a share of potential VAT liability hypothesis with and without complicity (2000-2012).*



**Figure 2.7:** *GAP due to errors in interpreting the laws or liquidity crisis (audits art. 54bis, law 633/72)*



### 2.3. Key performance indicators

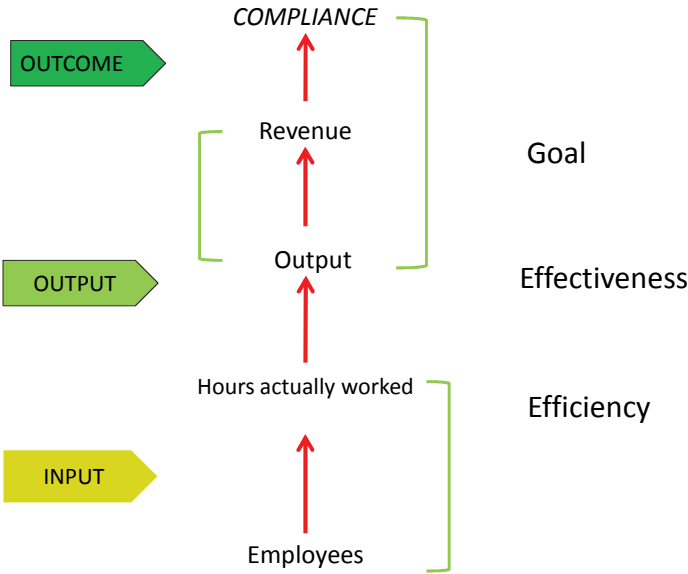
The key performance indicators are synthetic indices to measure the generation of value of the IRA with respect to its institutional mission assigned. Criteria adopted to measure its activities are aimed at assessing the effectiveness (satisfaction of the results), the efficiency (ratio of inputs employed and results achieved) and to contain costs.

Indicators are part of a conceptual model designed to maximize the outcome of IRA. This outcome consists in ensuring high level of compliance with tax laws and regulations in place within the actual jurisdiction. The outcome is achieved through two main mission areas: tackling and prevent tax evasion and tax avoidance, improving services for customer and making easy to comply with the tax system. The optimal functioning of both areas leads to the reduction of the tax gap.

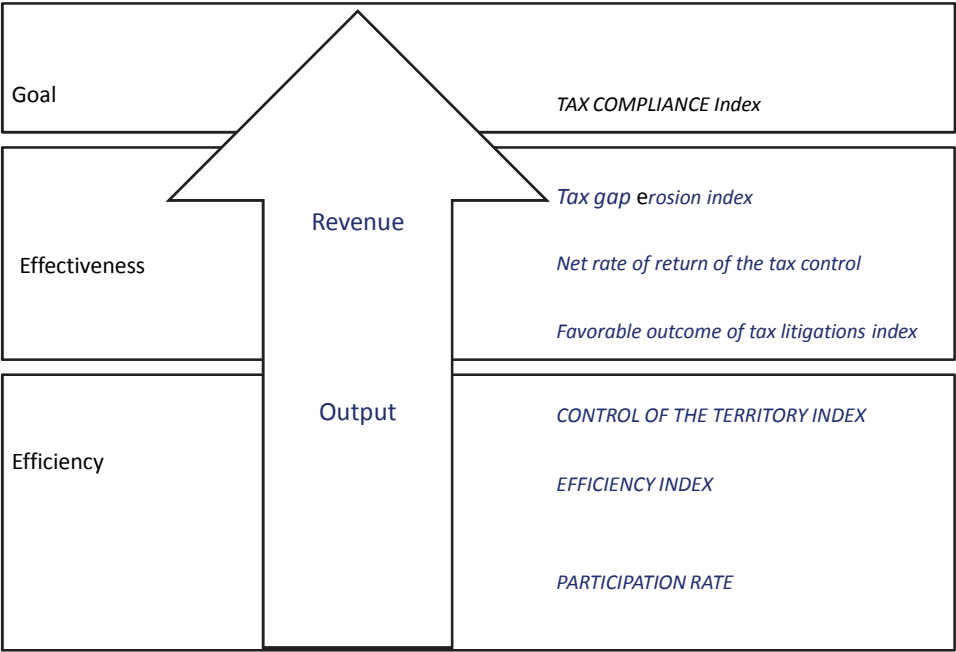
This framework is based on the causality links highlighted in Figure 2.8. The input part is given by the number of employees and hours actually worked. Then the output produced is measured to monitor the performance of the efficiency. In the third stage the outcome (summarized as "revenue") produced is analyzed. Finally, as a check of the whole process, we observe the dynamics of the tax gap over time (the ultimate goal)

The indices applied in the model are shown in Figure 2.9.

**Figure 2.8:** Key performance indicators – Theoretical model



**Figure 2.9:** Key performance indicators – Indices



The Participation Rate is calculated by dividing the hours actually worked by the theoretical workable hours. This index takes the value 1 if all the employees come to work regularly being absent only in the days of official holidays. This indicator aims to control the rate of absenteeism

The efficiency index is calculated using the following formula:

$$\frac{\text{Standardized output variation index}}{\text{Weighted labour input variation index}} \quad [2.3]$$

where: labour input includes all hours actually worked (effort) weighted on the basis of the compensation of different professional skills<sup>20</sup> and the output includes the external activities only (core business) weighted using theoretical time of work necessary to provides these activities.<sup>21</sup>

The control of territory index can be interpreted as the probability to be audited. It is obtained by the ratio between the number of enterprises and self employed audited and the total of enterprises and self employed.

The favorable outcome of tax litigation<sup>22</sup> measures the ability of defense in court and the goodness of the acts issued by the Revenue Agency in litigation. It is obtained though the following ratio:

$$\frac{\text{Monetary value of favourable outcome of tax litigation}}{\text{Total monetary value of tax litigation}} \quad [2.4]$$

The net rate of return of the tax audit aims at measuring the effectiveness of the audits and it is calculated as:

$$\frac{(\text{Additional tax assessed+sanctions}) \text{ actually collected by tax audits} - \text{costs}}{(\text{Additional tax assessed+sanctions}) \text{ imposed by tax audit}} \quad [2.5]$$

The erosion of tax gap index is used to control how much the control activity affects the evasion. The formula is

$$\frac{(\text{Additional tax assessed+sanctions actually collected by tax audits})}{\text{Diachronic tax gap}} \quad [2.6]$$

The diachronic tax gap is achieved by a linear transformation of the tax gap illustrated in the previous sections in order to make it consistent with the additional tax assessed plus sanction actually collected by tax audits (in brief OM). In fact OM at time t is given by:

$$OM_t = \sum_{i=1}^{Ta} \sum_{n=1}^m Tg_{i,t-n} + Pe_{i,t-n} \quad [2.7]$$

<sup>20</sup> It represents the value of employee labour input at constant compensation, see United Nation (1993, par. 17).

<sup>21</sup> The calculation is made considering more than 50 different types of products, both belonging to the services area (e.g. VAT refunds) and to the controls area (e.g. audits on large taxpayers). Each of these products is multiplied by an optimal minimum time that meets the quality standards. In this way, all the products are expressed by the same metric that makes them summable together. See Cutaia, Pisani (2004), Alborino et al. (2008).

<sup>22</sup> It includes the amounts that are recognized as just claim after the litigation has ended.

where: “Ta” denotes the number of taxpayers audited (Ta); “Tg” is the tax gap assessed by the tax authority; “Pe” are the actual penalties and interest paid by the audited taxpayer and “n” represents the physiological time span between the tax year audited and the year in which the tax authority collects the amounts due (Pe). In practice, OM erodes the tax gaps of years earlier than the current one and therefore the tax gap diachronic is obtained using a weighted average of the tax gap coherent with OM. The weights are calculated by using the amounts of OM related to each year.

The final indicator is the Tax compliance index, defined as:

$$1 - \frac{\text{Tax gap}}{\text{Voluntary compliance of taxpayers}} \quad [2.8]$$

where the methodology to estimate the tax gap is shown in paragraph 2.1 and 2.2.

The Key Performance Indicator model is applied to plan the strategies of regional and provincial departments of IRA. It provides a synthetic vision for top management. For the analytical planning a broader set of specific indices is used

### 3. The environmental factors influencing tax gap

Many devices can be used to enhance the taxpayers compliance, including: the activities of prevention and tackling tax evasion and tax avoidance, the simplification of the formalities, improving the supply of tax services, etc. In order to properly use the tax gap as a key performance indicators it is necessary to identify what part of its change is due to the activity carried out by the tax authorities, and how much is due to other causes. The economic literature has, in fact, pointed out that the tax gap can also be affected by variables that are not directly controlled by the tax agencies, such as the business cycle, tax rates, etc.<sup>23</sup>

To shed light on these aspects a class of macro models has developed. The first one is time series method devoted to analyse the fluctuation of VAT gap at national level, the second is a panel analysis finalised to identify the determinants of the VAT gap at the local level.

#### 3.1 The time series model

This model is based on VAT gap time series illustrated in par. 2.2, covering the period from 1983 to 2011,

The dependent variable examined is the propensity in VAT base gap (BIND/BIT, see figures 2.3 and 2.4)<sup>24</sup>. Due to the limited data availability a parsimony criterion was adopted in determining the number of explanatory variables.

<sup>23</sup> See, among others, Andreoni et al. (1998), Alm et al (2012), European Commission (2013).

<sup>24</sup> The model has some limitations, the main one of which is the small number of available information, as it is based on annual data ranging from 1983 to 2011. A future improvement will consist in applying a temporal disaggregation procedure to yearly data in order to obtain quarterly time series (see Basile et al. 2011).

The environmental variables considered are:

- a) business cycle (CE), measured by the output gap<sup>25</sup>;
- b) effective tax rate (PFE) = tax revenues net of tax amnesties / GDP net of tax evasion<sup>26</sup>;
- c) tax amnesties (CS) = the ratio of total receipts from amnesty and GDP observed in the 4 years following the amnesty, after the fourth year, this variable takes the value zero<sup>27</sup>;
- d) dummy variable (D) identifying regulatory changes and other shocks.<sup>28</sup>

The intervention variables are:

- i. enforcement action (ACC) = it is calculated as the ratio of the amounts collected through the work of preventing and tackling evasion and total tax gap, we consider the average of the ratio in the two years prior to those for which it is estimated the propensity to gap, the hypothesis is that the deterrent effect involved in the year following that in which you collect the amounts due and that the deterrent effect exists if the action is persistent over time.
- ii. updating of Sector Studies (SS)<sup>29</sup> = is a quantitative variable that summarizes the normal process of revision of sector studies, which causes a downward trend in the share of the total taxpayers congruous, for which the variable was set equal the ratio between taxpayers and the no congruous taxpayers;

The estimation was performed using an error correction model, based on the following long-run equation<sup>30</sup>:

$$\frac{BIND_t}{BIT_t} = \beta_0 + \beta_2 PFE_t + \beta_5 ACC_t + u_t \quad [3.1]$$

<sup>25</sup> Defined as the percentage difference between GDP and its long-run trend component, as estimated by OECD (see OECD 2012).

<sup>26</sup> A proxy has been used, obtained by subtracting from GDP the BIND.

<sup>27</sup> The basic idea is that taxpayers in the four subsequent years tend to recover the outlay of the amnesty, reducing the compliance, in a more than proportional to how much they paid (multiplier effect).

<sup>28</sup> It takes the value 1 in the years 1999 to 2003 (adoption of sector studies, UNICO and the F24 payment, birth Revenue Agency, etc.), and 2007 (Law on the traceability of payments and other obligations for taxpayers) and the same dummy assumes a negative value in the 2009-2011 period (the global financial and economic crisis).

<sup>29</sup> Small and medium Italian firms are audited, since 1998, according to a scheme known as Sector Studies. Firms are divided according to the business sector they belong. In every business sector, the IRA distinguishes, according to a pre-specified set of criteria, normal firms (named "congruous") from hard core evaders (named "no congruous"). See Santoro, Fiorio (2011).

<sup>30</sup> In order to avoid the existence of "spurious" causality, cointegration analysis was performed on the variables in points a)-d) and i-ii. The outcome of this analysis shows that there is a cointegration relationship between the propensity to gap, on the one hand, and the effective tax rate and enforcement efforts on the other. This can be considered a stable relationship in the long run, and it is estimated using a regression on the levels that links the propensity to gap with the effective tax rate and enforcement efforts. From this estimate are drawn residues, this variable is called ECM (error correction model), and tends to zero in the long run. To analyze the determinants of evasion is necessary to estimate a relation of short period, for which purpose one operates a regression with all the variables considered expressed in first differences and with the addition of the factor ECM. The estimation of the coefficient of this variable in the report of short period must necessarily be less than zero (correction effect) otherwise the system does not tend to converge to equilibrium of long period, or such component can be interpreted as a term of imbalance relative to 'previous year is not explained by the variables regression long-term.

The estimated residual in the long run equation  $\hat{u}$  has been considered in short period equation. This equation takes into account all the variables listed above as follows:

$$d \frac{BIND}{BIT} = \beta'_0 + \beta'_1 dCE + \beta'_2 dPFE + \beta'_3 dCS + \beta'_4 dD + \beta'_5 dACC + \beta'_6 dSS + \beta'_7 \hat{u}_{t-1} + \varepsilon'_t \quad [3.2]$$

where  $d$  indicates that the variable is considered in differences.

The tests show a good fit of the model to the actual data and assumptions about the disturbance term ( $R^2 = 0.90$ ;  $R^2_{adj} = 0.86$ ,  $DW = 2.3$ ). Table 3.1 shows the parameters estimated, along with the corresponding T values, which yields that the parameters are all significant and the signs are consistent with economic theory.

The CE coefficient shows a direct relationship between the business cycle and the propensity to tax gap. This evidence could have a twofold explanation: the first is due to the fact that, during economic crisis marginal firms are the first to leave the market and being also those characterized by an increased rate of irregularities the average gap decreased, the second explanation concerns the fact that taxpayers tend to plan tax compliance on the basis of their “normal” income and, therefore, in periods of economic expansion they expand the share of evasion contracting it during recession<sup>31</sup>.

**Table 3.1:** *Estimated coefficients in the short term equation*

Variables	Coefficients	T values
Constant	-0.068	-3.06
CE - business cycle	0.765	4.78
PFE – effective tax rate	1.131	7.87
CS - tax amnesties	1.971	5.08
ACC – enforcement action	-0.719	-2.13
SS – updating of Sector Studies	-0.158	-2.47
Dummy	-0.032	-4.57
ECM component	-0.335	-3.05

<sup>31</sup> There is not consensus regarding how the GAP (or the unofficial sector) interact with the official one over the business cycle (see Granada-Carvajal, 2012). Bajad (2003) and Giles (1997) provide evidence of a procyclical relation between the two sectors in Australia; in contrast Russo (2008) finds that the cyclical component of US GDP is negatively correlated with the cyclical component of the hidden output (1960-2003). Schneider (2005) argues that in poor countries the relationship between the underground economy and the GDP rate of growth is negative, while this same relationship becomes positive in industrialized countries. Duarte (2014) points out that in Spain real GDP growth generates, in terms of Granger-causality, the underground economy and not vice versa.

The PFE coefficient indicates that the reduction in tax burden stimulates compliance. This does not mean that the tax evasion rate is related to the level of the tax burden, but only that a change in the short-term fiscal pressure affects evasion<sup>32</sup>.

Equally remarkable is the effect of discouraging compliance induced by tax amnesties<sup>33</sup>.

The estimation results highlight a significant deterrent effect of the enforcement action. The parameter value of ACC highlights, however, that this alone is not able to counteract the opposite effect produced by the environmental variables<sup>34</sup>.

Also the sign of revisions of sector studies is consistent with expectations. The result suggests that the implementation of periodic reviews of sector studies is an effective tool of deterrence.

This econometric model is a preliminary exercise that can be improved, both in reference to the specification of the equation and the quantification of the variables.

### 3.2 The panel analysis

In addition to the previous considerations, a panel analysis has been done to identify the determinants of the VAT gap at the local level<sup>35</sup>. Our set of VAT gap measures covers a period from 2007 to 2010 and determine a panel bounded to 80 observations (20 regions times four years). Due to the limited data availability we also consider the following analysis a preliminary exercise.

The decision to evade VAT by means of non-reporting VAT taxable base allows the taxpayers to reduce also its direct tax burden: this makes VAT base gap more appropriate as our dependent variable than VAT gap. In order to identify suitable explanatory variables<sup>36</sup> we have to pay attention to minimize the possibility of endogeneity issues. Moreover, as we have few degrees of freedom, a limited numbers of independent variables can be used to control their effects on the gap.

---

<sup>32</sup> Many studies ascertain that tax and social security contribution burdens are among the main causes of the growth of hidden economy. See, among others, Thomas (1992), Schneider (2005), Giles and Tedds (2002), Dell'Anno (2003), Chiarini et. Al. (2013). Schneider (2012) provide an overview of empirical studies summarizing the various factor that influence the hidden economy. This summary shows that the increase of tax and social security contribution burdens is by far most important single contributor to the increase of the hidden economy, explain some 35-38% or 45-52% of the variance of the shadow economy.

<sup>33</sup> See, among others, Olivella (1996); Olivella (1996); Fedeli; Zangari (2003); Laborda; Rodrigo (2003); Locarno, Staderini (2008); Olivella (1996); Chiarini et. al. (2009).

<sup>34</sup> An analogous impact is obtained by adopting a panel analysis (see par. 3.2). Although the traditional economic theory devotes a string focus on deterrence in fighting the tax evasion, there is little known about the effect of deterrence from empirical studies. Andreoni et. al (1998) report that deterrence matters for tax evasion, but that the reported effect are rather small. Blackwell (2009) finds strong effect of deterrence effects of fines and audits in experimental tax evasion. Pedersen (2003), Feld and Larse (2009) report a negative impact, for Germany, of the subjectively perceived risk of detection by State audits on the probability of working in the shadow.

<sup>35</sup> See D'Agosto et al. (2013).

<sup>36</sup> See these studies for helping suggestions: Cappariello and Zizza (2004) and Christie and Holzner (2006).

Four groups of variables have been selected to account for different types of checks.

A first set intends to capture the extent of Public Administration (PA) in each region. This should help to capture its role carried out on the regular part of the economy. Two different variables have been considered: the share of regional value added produced by PA and the numbers of PA employees as percentage of resident population. The expected result is a negative correlation with tax evasion.

The second set concerns the role carried out by the Revenue Agency (IRA). The first variable measures the payments collected by the Agency through its audit enforcement (named OM, it includes: tax evasion, late payments and errors in filling the tax return)<sup>37</sup>. A second one is the key performance indicator related to favorable outcome of tax litigation (par. 2.3). Both variables refer to tax evasion of earlier years. Anyhow we take them lagged.

A third group intends to consider the economic and social condition of the area. In this cluster variables concerning the dangerousness of social setting and the hazard in doing business activity are included. In the former we take account of the figures of thefts, robberies and murders, while in the latter we encompass the numbers of cheats, frauds and crimes against economy. We assume that in a given context the more the social conditions are hard and it is risky doing business the lower is the attitude to pay taxes. In this group we also include variables that account for economic difficulties in running business, denoted as troubling business activity, measured as the number of drafts and promissory notes protested. These figures take into account the asymmetric effect of the business cycle upon regions because of their different economic structure. Their increase may reflect the economic difficulty of taxpayers in paying taxes.

A forth group of variables includes measures that account for spending capability. Such measures intend to convey the expenditure attitudes to both Households and Firms in each region. Firstly, we introduce bank deposits that can be considered a measure of wealth of the region. Then other controls applied concern the domestic wastes, resident population and energy consumption.

The Italian economic system is not homogeneous across regions and our estimation strategy require to take into account for this these disparities. This is going to affect in which way we control for heterogeneity. An important point concerns the fact that Italian regions are administrative areas not homogeneous regarding to tax compliance. Internal studies conducted by Italian Revenue Agency demonstrate that in the same region coexists territorial units<sup>38</sup> characterized by huge differences in tax behaviors<sup>39</sup>. A preliminary statistical analysis has shown that between regions variability always prevails over within variation, for all variables examined. This information are helpful in choosing the estimation method. The Breusch Pagan test support us that a pooled

---

<sup>37</sup> The OM is a key performance indicator described in par. 2.3. The Tax gap ( $Tg$ ) can be expressed as:

$$Tg_{i,t-n} = y_{i,t-n} \times \tau_{i,t-n} \dots$$

where:  $y$  is the income reported by the taxpayer and  $\tau$  is the rate of underreporting of the same taxpayer. Combining the definition of OM with the decomposition of  $Tg$  we can assert that OM depends on the: a) enforcement produced by the tax authority ( $Ta$ ); b) rate of underreporting,  $\tau$ , discovered by the tax authority, related to the income  $y$  reported at time  $t-n$ ,  $n = 1, 2, \dots, m$ ; c) effectiveness of penalties imposed ( $Pe$ ).

<sup>38</sup> In the nomenclature of territorial units, NUTS classification, level 3.

<sup>39</sup> Carbone et al. (2010)

estimation is not appropriate. We decide upon a random effect model in treating individual unobserved effects being aware of the limitations of our analysis<sup>40</sup>.

We run numerous regressions trying to find a good support to our analysis. In our baseline estimation (Table 2 column 1) we show the important role developed by PA, since its presence in the region is a limit to its irregular economy. PA represents a quota of legal economy in the area, the more this quota the more evasion decrease.

From the IRA point of view, the role of its enforcement is an interesting determinant of VAT gap. We use a specific enforcement dimension calculated by the revenue agency at regional level besides to other economic and social factors in the area. The variable is lagged to preserve us from possible endogeneity issue. IRA activity concerns tax evasion from years before then an increase in the enforcement would affect positively compliance of the following years: an increase of 1% of the enforcement reduce vat base gap of 7%. This result seems to be confirmed by all the sensitivity analysis we run. Even though we should consider this evidence just an exercise they confirm some theoretical musings (Andreoni, 1998).

Several checks are carried out by using different social and economic explanatory variables. In particular the role of bank deposits has been controlled in order to represent the richness of the region, as a measure of its economic welfare. It turns out that its increase of 1% produces an increase in the tax gap. This positive correlation captures a measure of scale that indicates the higher the level of wealth and the greater the part of the local economy hidden to Tax Authorities. We also consider domestic energy and domestic waste as a proxy of wealth conditions measured in terms of consumption (rather than in richness<sup>41</sup>). Their correlation with VAT base gap is positive.

We obtain a similar correlation after controlling for draft protested as a proxy of difficult economic conditions but also indicative of a less attitude of the social context to be compliant. We add a further group of checks, changing our basic explanatory variables. We use the employment of PA respect to resident population instead of the share of value added of PA to overall regional value added. Our previous result are confirmed, the extend of regular economy in the region matters. Again, the VAT base gap is increased when we check for crimes against the economy as a proxy of dangerousness in doing business in the region: the VAT base gap increases.

Furthermore, we adopt an alternative measure of the enforcement of IRA which is a specific dimension of enforcement since it measures the ability of IRA in judicial claims. It can be considered a subset of the previous enforcement variable which represents more complex or difficult cases the agency is involved in. It comes out that an increase of the enforcement in judicial cases tend to reduce evasion. This measure remains significant when we put aside the previous controlling variables.

---

<sup>40</sup> A further step will try to capture the endogeneity effect arising from IRA variables, applying more appropriate instrumental variable approaches.

<sup>41</sup> Both richness indicator and consumption indicators capture a part of the underground economy.

**Table 3.2:** *Determinants of VAT base gap. Years 2007-2010.*

Dependent variable: Vat base gap	(1)		(2)		(3)		(4)		(5)	
	Coeff..	Standard Error	Coeff..	Standard Error	Coeff..	Standard Error	Coeff..	Standard Error	Coeff.	Standard Error
Share_gg	-5.257***	1.549	-1.324*	0.800	-1.399*	0.813	-7.218***	0.975	-2.466**	1.041
Share employ										
Deposits	0.024*	0.013					0.026**	0.009		
Waste					0.849***	0.089				
Electricity			0.885***	0.0822					0.754***	0.081
Draft									0.109***	0.037
Promissory	0.608***	0.092	0.156***	0.053	0.131**	0.059	0.427***	0.078		
Against economy										
Enforcement_ob_lag	-0.075**	0.037	-0.131***	0.017	-0.091***	0.022				
Enforcement_invicto_lag							-0.133**	0.043	-0.087***	0.032
Cons	4.017***	0.874	2.321***	0.459	-2.836***	0.867	5.825***	0.847	3.119***	0.667
R-sq: within =	0.106		0.244		0.229		0.189		0.185	
between =	0.841		0.970		0.960		0.791		0.956	
overall =	0.837		0.968		0.957		0.788		0.954	
Theta =	.863		.852		.870		.921		.866	
Rho =	.929		.919		.936		.976		.932	
Observations:	80		80		80		80		80	

Notes: Robust standard error; significativity level: \*\*\*\*p< 1%, \*\*p< 5%, \*p< 10%.

Variables are considered in natural logarithm with the exception of Share\_gg and Share\_Employ

## 4. Evaluation of the deterrent effect

The general outlines of the project to assess the deterrent effect exerted by the activity of prevention and fight against tax evasion are described in this paragraph. These researches use methods suggested by the literature<sup>42</sup>, adapting them to Italian fiscal reality and available information.

### 4.1. Control of the territory

In the first months of 2012 a large audit campaign was conducted to verify any violations of the obligation to issue receipts (called briefly blitz). A study<sup>43</sup> was carried out on these actions intended to check whether the VAT payments would suffer significant changes in the aftermath of the controls.

The experiment is based on checks carried out in January 2012 in Milan. In particular, it is studied the indirect effect<sup>44</sup> of these controls on the sector ATECO 4724 (defined in short "bakeries"). The study uses as a control sample the economic performance recorded by the same economic sector in Turin and Genoa, cities not affected by blitz in the same period.

The main purpose of the blitz is to increase the spontaneous compliance of a larger group of taxpayers. From a theoretical point of view this result is achieved by increasing the perception that the taxpayer has to be audited. To this end the blitz must have the characteristic of being unexpected and their results amplified by the news media. Another aspect that could affect the blitz concerns the tax moral<sup>45</sup>, in the sense that the perception of effective and targeted controls can strengthen the trust in institutions, and thus induce greater compliance.

Two classes of models were tested on the data: first an OLS regression was performed on data from Milan with a dummy at the month following the month in which blitz are carried out and subsequently a difference in differences model has been estimated on panel data including also the data of Genoa and Turin.

Both analyses tend to confirm a significant deterrent effect induced by blitz of Milan, even if the persistence effect is very limited over time. This pilot study needs further deepening, but it suggest how to schedule interventions over time.

### 4.2. The letter campaign

Since 2007, the IRA has sent letters to taxpayers to inform them of some anomalies found in the statements related to previous years. The purpose of communication was to notify to the taxpayer where the Agency focuses its attention, no sanctions applied. The

---

<sup>42</sup> See OECD (2012a)

<sup>43</sup> Battiston et al. (2013).

<sup>44</sup> The direct effect of a fiscal control is given by the change in the tax compliance of the taxpayer who has undergone the inspection., The indirect effect concerns the behavior change induced uncontrolled taxpayers (Ratto et al., 2012). In this case, the indirect effect is tested, because the bakeries have not been object of blitz.

<sup>45</sup> See Filippin et. al. (2013).

communication was sent few months before the deadline for filing the tax return, and it was intended to induce a behavior-oriented fiscal compliance. Indeed, numerous anomalies would have increased the probability of being detected.

An ex-post analysis were carried out to test variations in the size of revenues and income declared by taxpayers having had received communications respect to those who had not received it. The tax years from 2007 to 2011 are considered; taxpayers recipients of the letters are more than 100,000 extracted from a target population of more than 3 million people.

The main difficulty to be addressed in this analysis is that the recipients of the "communications" are not a representative sample of the total taxpayers. Receivers were selected in a systematic way (and not randomly) on the basis of risk assessments about the fidelity of declarations submitted. A post-stratification of the subjects was performed to partially correct the selection bias. This consists in dividing the audience into clusters and assign each cluster the same grossing up ratio to the target population both to the recipients of the letters and to those not interested in the sending<sup>46</sup>.

For each year, it is compared the percentage change in per capita output of those who have received the communication with those of other taxpayers (Table 4.1). One observes that the former are systematically higher than the latter. If the same comparison is made on per capita incomes (Table 4.2), the result is not as unique since the positive inequality is observed in only three out of five-year periods (in 2005-06 and in 2008-09 the change in income of non-recipients is higher than that of the recipients).

A further study on this topic was carried out in Fiorio et al (2013). The study was conducted on two samples: the first of 49,138 companies that received notification of irregularities (the "treated") and the second consists of 89,240 taxpayers who did not receive the communication (the "control sample"). The first sample was drawn randomly from over 112,000 taxpayers who received the communication. The second one was also extracted randomly from a target population of 2.2 million businesses and self-employed.

**Table 4.1:** *Variation rate of per capita output.*

Years	Recipients of the communications		Not recipients of the communications	
	Absolute changes	Percentage changes	Absolute changes	Percentage changes
2005--2006	13.836	6,8%	11.376	5,4%
2006--2007	20.069	8,9%	9.610	4,2%
2007--2008	-267	-0,2%	-2.299	-0,9%
2008--2009	-12.858	-8,3%	-24.896	-9,8%
2009--2010	7.918	4,3%	2.986	1,3%

Source: Italian Revenue Agency

<sup>46</sup> Louvot-Runavot (2011).

**Table 4.2:** *Variation rate of per capita income.*

Years	Recipients of the communications		Not recipients of the communications	
	Absolute changes	Percentage changes	Absolute changes	Percentage changes
2005--2006	1.702	11,8%	3.435	12,1%
2006--2007	808	3,8%	654	2,1%
2007--2008	-913	-5,2%	-2.350	-7,1%
2008--2009	-1.656	-12,9%	-3.873	-12,2%
2009--2010	2.458	16,9%	1.140	4,0%

Source: Italian Revenue Agency

The strategy for the identification of the effect of the intervention (communications) is based on a matching procedure between treated and untreated enterprises with regard to a set of economic characteristics observed before the treatment. Through this matching procedure one tries to correct the error induced by the selection of subjects to whom the communication was sent in order to compare them with those not selected. The comparison is carried out by analyzing the dynamic of revenues and profits in tax years prior and following the sending of the letters. If one observes that the change in revenues and profits is systematically higher in the recipients of the letters compared to that of subjects who did not receive any notification, then one can infer that the "treatment" has had a positive effect.

This result seems to be confirmed by empirical evidence: in the years 2007-2008, the growth rate of revenues of the recipients of the letters was significantly higher than that of the control sample. In particular, the percentage variation of revenues "treated" taxpayer was greater than that of "untreated" ones from a minimum of 1,014 times to a maximum of 1,055. Similarly, profits have increased more for "treated" with respect to "untreated, and this increased dynamic is part of a range that is 1,036 to 1,057.

In addition to evaluating the activity, these analyses may be useful to better calibrate the mailing of the communication strategy.

## **5. Concluding remarks**

The aim of this paper is to illustrate the logical steps of the project that is being developed in Italy and that uses the indicator of tax compliance in planning the work of the IRA.

The first step is to measure the tax gap, because closing the tax gap is part of the IRA vision. The presented approach is "top down" and is limited to only two types of taxes. It should be further developed to include other types of taxes and integrating it with the bottom-up methods based on data from tax audits.

In the second step, the tax gap has been integrated into a framework of key performance indicators that links the inputs used with outputs, outcomes and the goals of the IRA.

Also in this field there is still much work to be done, especially to develop the monitoring service for customer.

Since measuring the reduction of tax gap is one way to show the impact of IRA compliance work, then it is crucial to understand the causes that may influence the tax gap. To this end, in the third step econometric models that allow to identify the determinants of the tax gap were presented. Through these models, one can get an idea of the environmental variables that affect the tax gap (economic cycle, fiscal pressure, etc..), in order to isolate the specific contribution of the IRA. Even if the models presented provide important information to make them useful for operational purposes it is necessary to carry out further investigations to improve their representativeness.

Finally, to provide an indication of which instruments may induce compliance (and, therefore, to reduce the tax gap) other econometric models are being developed. In this field, techniques typical of assessments of policy has been used, based mainly on the use of micro data. The latter represents our most recent line of research and, therefore, the results presented should be considered as preliminary work.

## **Annex 1. VAT gap with and without complicity**

VAT gap definitions:

1. Without complicity (Not remitted) = based on the assumption that fraud takes the form of traders not paying the VAT that they own;
2. With complicity (Not collected) = measures the VAT (base and tax) that would not have been collected if fraud had take the form of VAT (base and tax) not been charged on transaction where it should be.

In order to show why the two hypotheses lead to two different estimates of the VAT gap, consider the example shown in table A.1. Let's consider three types of transactions to final consumers: the first the seller sells goods to the consumer for € 1000, issues the invoice and regularly remits the VAT (not gap); the second the seller sells goods to the consumer for € 1000, the seller does not issue the invoice and consequently does not remit the VAT (gap with complicity);, the third the seller sells goods to the consumer for € 1000, the seller issues the invoice but does not remit the VAT (gap without complicity).

**Table A.1.Example: final consumption, 3 type of transactions (VAT rate=20%)**

ID.	VAT base	VAT invoiced	VAT actually remitted	National account figures	Economic behaviour
1	1.000	200	200	1.200	Not gap
2	1.000	0	0	1.000	Gap with complicity
3	1.000	200	0	1.200	Gap without complicity
Total	3.000	400	200	3.400	

In fact, this decomposition is not known, the available information on the potential VAT tax and base are derived from the following national account figures: final consumption=3.400, (of which) VAT actual remitted =200.

On the other hand, from the fiscal return we can derive the following figures: VAT base 1.000 and VAT=200.

The procedures for estimating gap with and without complicity are shown in Table A.2. If we assume that all the evasion occurs with complicity, then we must subtract from national accounts figures (€ 3400) the VAT actually remitted (€200), by obtaining a potential tax base equal to €3.200. If, however, we assume that all the gap occurs without complicity, then we have to divide the national accounts figures for the average VAT rate (20%) and, therefore, calculate a potential basis equal to €2.833.

From Table A.1 we know that the true VAT base evaded (not observable) is equal to €2.000. From Table A.2 is obtained that by adopting the procedure of calculation of evasion with complicity the evaded base is equal to €2.200, while adopting the method without complicity the same value is €1.833.

Since we know that VAT evasion happens both with and without complicity (but we do not know how the evasion is split between the former and the latter), the example shows that if we adopt the method with complicity then we overestimate the “true” gap and vice versa if we adopt the method without complicity

**Table A.2.Procedure adopted to estimate the gap wit and without complicity**

Aggregates	With complicity (Not collected)	Without complicity (Not remitted)
N.A.	3.400	3.400
VAT actual remitted	200	
Potential VAT base	3.200	$3.400/1.2=2.833$
VAT base actually declared	1.000	1.000
Estimation of VAT Base evasion	2.200 Overestimate	1.833 Underestimate

## References

- Alborino N., Dongiovanni S. e Spingola A. (2008) - Proposta di indicatori di efficienza per l'Agenzia delle Entrate-metodologia, Documenti di lavoro dell'Ufficio Studi dell'Agenzia delle Entrate.
- Alm J., Kirchler E., Muehlbacher S. (2012) "Combining psychology and economics in the analysis of compliance: from enforcement to cooperation", *Economic Analysis & Policy*, vol. 42, n.2.
- Andreoni, J., Erard, B. and Feinstein J., (1998), "Tax Compliance", *Journal of economic literature*. vol. 36, n.2, 818-860.
- Australian Taxation Office, (2012), "Measuring tax gap in Australia for the GST and LCT", November, Canberra.
- Bajada C. (2003) "Business cycle properties of the legitimate and underground economy in Australia", *Economic Record*, 79, pp. 397-411
- Basile R., Chiarini B., Marzano E. (2011) "Can we rely upon fiscal estimates in countries with unreported production of 15 per cent (or more) of GDP?", CESifo working paper, n. 3521.
- Battiston P., Gamba S., Santoro A. (2013) "When you audit, do it loudly: a natural experiment on fiscal compliance", paper presented at the conference The Shadow Economy, Tax Evasion and Governance, 25-28 luglio, Munster, Germania.
- Braiotta A., Pisani S., Pisano E. (2013) (2012) "Evasione fiscale e distribuzione primaria del reddito" in *Rivista di diritto finanziario e scienza delle finanze*, n.2.
- Duarte P. (2014) "The relationship between GDP and the size of informal economy: empirical evidence from Spain", University of Leipzig faculty papers, n. 127.
- Cappariello R., Zizza R., (2004), "Shadow economy and economic and institutional context: a regional Analysis", XIX National Conference of Labour Economics.
- Carbone E., Gentili F., Marino O., Spingola A., (2010) "Geo - referenced analysis of the provincial directorates", Italian Revenue Agency, Mimeo.
- Chiarini B., Marzano E., Schneider F. (2013) "Tax rates and tax evasion: an empirical analysis of the long-run aspects in Italy" *European Journal of Law and Economics*, vol. 35, n.2, April.
- Chiarini B., Di Domizio M., Marzano E. (2009) "Why do underground reducing polizie often fail their scope? Some answers from the Italian experience", *Economics & Politics*, vol. 21, n.2, July.
- Chrstie E., Holzner M., (2006), "What explains tax evasion? An empirical assessment based on European data", WIIN working paper, n. 40, Jun, Wien.
- Cutaia M., Pisani S. (2004) "Output, Input and Incentives Measurement for Non-market Activity – The Case of Italian Revenue Agency", paper presented at the FCSM conference, Whashington, US, available on web <http://www.fcsm.gov/events/papers2003.html>.
- D'Agosto E., Marigliani M., Pisani S. (2013) "Asymmetries in the territorial VAT gap", paper presented at the conference: *The Shadow Economy, Tax Evasion and Governance*, 25-28 July, Munster, Germany.
- D'Agosto E., Marigliani M., Pisani S. (2012) "Asimmetrie territoriali nel Gap Iva" in *Rivista di diritto finanziario e scienza delle finanze*, n.2.
- Danish Tax and Customs Administration, (2006a), "Random Audits – Business sector analysis", SKAT.
- Danish Tax and Customs Administration, (2006b), "Compliance with tax rules by business in Denmark", SKAT.

- Das-Gupta A., Mookherjee D. (2000) Incentives and institutional reform in tax enforcement: an analysis of developing country experience. Lavoisier.
- Dell'Anno R. (2013) "Estimating the shadow economy in Italy: a structural equation approach", Department of Economics, University of Aarhus, working paper n. 3.
- Feld L. P., Larsen C. (2009) "Undeclared work in Germany 2001-2007 – impact of deterrence, tax policy and social norms: an analysis based on survey data", Springer.
- European Commission (2013), "Study to quantify and analyse the VAT gap in the EU-27 Member States", report commissioned by TAXUD and prepared by a consortium under the leader CPB, the Netherlands.
- European Commission (2011), "Tax gap and compliance map report", *Fiscalis Risk Management Platform Group*. Directorate General Taxation and Customs Union, Indirect Taxation and Tax administration.
- Eurostat (1995) European System of Accounts – *ESA 1995*, Luxembourg.
- Fedeli S.; Zangari E. 2003 Una verifica empirica degli effetti dei principali condoni tributari sulle entrate dell'IVA *Rivista di diritto finanziario e scienza delle finanze*, vol. LXII, n. 1. pp. 43-69.
- Filippin A., Fiorio C. V., Viviano E. (2013) "The effect of tax enforcement on tax morale", Bank of Italy working paper, n. 937, October.
- Fiorio C., Iacus S., Santoro A. (2013) "taxpayer response to an increase probability of audit: some evidence from Italy, Working Paper of DEMS, University of Bicocca, Milan.
- Granada-Carvajal C. (2012) "Macroeconomic implications of the underground sector: challenging the double business cycle approach", in *Economic Analysis & Policy*, vol. 42, n. 2, September, pp.237-256.
- Giles D. E. A., Tedds L. M. (2002) "Taxes and the Canadian underground economy", Canadian tax paper n. 106, Canadian tax foundation, Toronto – Ontario.
- Laborda J. L.; Rodrigo F. 2003 Tax amnesties and income tax compliance: the case of Spain *Fiscal Studies*, vol. 24, n. 1, pp. 73-96.
- Locarno A., Staderini A. 2008 La relazione tra gettito tributario e quadro macroeconomico in Italia *Temi di discussione*, n. 694, Banca d'Italia
- Louvot-Runavot (2011) "L'évaluation de l'activité des entreprises sur la base des contrôles fiscaux et son insertion dans le comptes nationaux". INSEE, Document de travail, n. 9, Paris.
- Macho-Stadler I., Olivella P. and Perez-Catrillo D. 1999 Tax amnesties in a dynamic model of tax evasion *Journal of Public Economic Theory*, pp. 439-463.
- Pedersen S. (2003) "The shadow economy in Germany, Great Britain and Scandinavia: a measurement based on questionnaire services", study n. 10, the Rockwool foundation research unit, Copenhagen.
- HMRC, (2012), *Measuring tax gaps 2012*, HM Revenue & Customs, October, London.
- Internal Revenue Service 2012 IRS releases new tax gap estimates January, Washington.
- OECD (2012) *Output gap as estimated by OECD – Italy Economic Outlook n. 92 Dec 2012*, Paris.
- OECD (2012a) "Understanding and influencing taxpayers' compliance behavior", Forum on tax administration: small, medium enterprises compliance subgroup, Parigi
- OECD (2010) "Understanding and influencing taxpayers' compliance", *forum on tax administration*, November, Paris.
- Ratto M., Thomas R., Ulph D. (2013) "The indirect effects of auditing taxpayers",

- Public finance review, Volume 41, issue 3, pp.317-333.
- Olivella P. 1996 Tax amnesties and tax evasion inertia Public Finance, vol. 51, 4.
- Russo F. F. (2008) "Double business cycle: the hidden economy in the US, mimeo.
- Schneider (2012) "The shadow and work in the shadow: what do we (not) know?", IZA discussion paper series n.6423, March.
- Schneider (2005) "Shadow economy around the world:what we do really know?", European Journal of Political Economy, n. 21, pp. 598-642.
- Santoro, A., Fiorio, C. V. (2011). Taxpayer Behavior When Audit Rules Are Known: Evidence from Italy. Public finance review, 39(1), 103-123.
- Senato delle Repubblica (2013) "Rapporto concernente I risultati conseguiti in material di contrasto all'evasione fiscal", Allegato 2 alla *Nota di Aggiornamento del Documento di Economia E Finanza 2013*, Roma.
- Swedish National Tax Agency, (2008), "Tax gap map for Sweden. How was it created and how can it be used?", Report 1B.
- United Nation (1993) *System of National Account*, New York.