FISCALIS 2020
TAX GAP PROJECT GROUP

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
TAXATION AND CUSTOMS UNION

THE CONCEPT OF TAX GAPS

Report on VAT Gap Estimations

by FISCALIS Tax Gap Project Group (FPG/041)

Brussels, March 2016

Disclaimer: This report was prepared by the participants of the Tax Gap Project Group. The views expressed in this report are those of the TGPG and do not necessarily represent the views of the participant's national administrations or those of the European Commission.

ACKNOWLEDGEMENTS

This report was prepared by the Tax Gap Project Group (TGPG). The TGPG was established under the FISCALIS 2020 programme and its work was coordinated by the European Commission Directorate-General for Taxation and Customs Union (DG TAXUD).

The contributions to this report were provided by Mr. Edmond Deloddere (BE), Mr. Geert Van Reybrouck (BE), Ms. Jana Stavjanova (CZ), Mr. Ivar Laur (EE), Mr. Aki Savolainen (FI), Ms. Charlotte Geay (FR), Ms. Stefanie Knoth (DE), Ms. Katja Blumenstein (DE), Mr. Stefano Pisani (IT), Ms. Natalija Filipovica (LV), Ms. Anita Zeire (LV), Ms. Justė Pabarčiūtė (LT), Mr. Tomasz Mazur (PL), Ms. Carla Pereira Rodrigues (PT), Mr. Rastislav Gábik (SK), Mr. Tomaž Lešnik (SI), Mr. Rubén Fernandez (ES), Ms. Caitriana Ahluwalia (UK), and Mr. Alexander Chislett (UK), Mr. Tanel Puetsep (EC, Vice-Chair TGPG) and Ms. Gyongyi Vegh (EC, Chair TGPG). For a complete list of participants of the TGPG, please see Annex I.

The contributions were compiled and the report was edited by Ms. Gyongyi Vegh (EC, Chair TGPG).

The TGPG held 5 meetings. At the meetings several presentations were given by both guest speakers and members of the project group. The TGPG is especially grateful for the very interesting presentations and useful inputs of Mr. Luca Barbone (CASE), Mr. Stéphane Buydens (OECD), Mr. Brian Erard (B. Erard & Associates), Ms. Marie Hassan (INSEE), Mr. Eric Hutton (IMF), Mr. Christos Kotsogiannis (Tax Administration Research Centre, University of Exeter), and Mr. Søren Pedersen (SKAT). For a complete list of presentations, please see Annex II.

The meetings of the TGPG were hosted by the Belgian Ministry of Finance, the Italian Revenue Agency and the European Commission. The TGPG is thankful to these administrations for making their facilities available.

ABBREVIATIONS AND ACRONYMS

EC	European Commission
EU	European Union
BE	Belgium
CASE	Center for Social and Economic Research
CIT	Corporate Income Tax
CZ	Czech Republic
DE	Germany
DG TAXUD	Directorate-General for Taxation and Customs Union
ESTAT	Eurostat
EE	Estonia
ES	Spain
ESA 1995	European System of Accounts 1995
ESA 2010	European system of national and regional accounts 2010
FI	Finland
FR	France
GDP	Gross Domestic Product
GNI	Gross National Income
HMRC	Her Majesty's Revenue and Customs
IMF	International Monetary Fund
IRS	Inland Revenue Service
IT	Italy
MoF	Ministry of Finance
LT	Lithuania
LV	Latvia

OECD	Organisation for Economic Cooperation and Development
PIT	Personal Income Tax
PL	Poland
PT	Portugal
SI	Slovenia
SK	Slovakia
SMEs	Small and medium-sized enterprises
SSC	Social Security Contribution
TGPG	Tax Gap Project Group
TGPG-MSs	Member States participating in the Tax Gap Project Group: Belgium, Czech Republic, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Poland, Portugal, Slovakia, Slovenia, Spain, United Kingdom
UK	United Kingdom
VAT	Value Added Tax

TABLE OF CONTENTS

LIST OF FIGURES AND TABLES

Introduction

Effective collection of taxes is a cornerstone of a fair taxation system. Taxes that remain unpaid cause revenue loss in the budget of Member States and may lead to an excessive burden on the honest taxpayers who correctly fulfil their tax obligations[1]. Furthermore, effective collection of taxes is essential for level playing field and avoids economic distortions. Tackling the issue of unpaid taxes is therefore a collective responsibility which starts with understanding the scale and the scope of the issue.

Tax gap estimations are rough indicators of revenue loss. In the past decades several methods have been developed by national (tax) administrations and international institutions to estimate revenue loss. In order to pool knowledge and share experience in existing tax gap estimations, the Tax Gap Project Group (TGPG) was established under the Fiscalis 2020 Program[2]. The TGPG consisted of national experts of 15 Member States[3] and its work was coordinated by the European Commission. The TGPG held several meetings where presentations were given also by external experts.

In order to share the gathered information with a broader public, the TGPG prepared this report. The report is intended to serve as a guide in the world of tax gap estimations. Accordingly, the report provides an introduction into the currently applied methodologies of tax gap estimations, but its focus is on VAT gap estimations because VAT is one of the main sources of government revenue[4] and several Member States developed a practice in estimating VAT gap. The scope of this report is also limited to EU Member States which participated in the TGPG (hereafter referred to as *'TGPG-Member States'*) and reflects the facts and circumstances in 2015.

The report is based on the contributions of the TGPG's participants. The participants drew up a survey and completed it for their relevant country. The information so gathered was discussed and analysed by the TGPG. The findings and the underlying information were incorporated in this report. The first chapter of the report describes the context of tax gap estimations. The second chapter explains the definition of tax gap and its composition. Hereby, also the aspects of costs and benefits are addressed. In the third chapter the focus is on VAT Gap estimations. This chapter describes the currently applied methodologies and their limitations and shortcomings. Finally, the fourth chapter contains descriptions of VAT gap methodologies applied in the Member States of the TGPG.

[1] http://ec.europa.eu/taxation_customs/taxation/tax_fraud_evasion/acting_together/index_en.htm
[2] http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=3260&Lang=EN
[3] Member States participating in the Tax Gap Project Group: Belgium, Czech Republic, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Poland, Portugal, Slovakia, Slovenia, Spain, United Kingdom.
[4] In 2014, taxes on production and imports accounted for 13.6% of GDP and current taxes on income, wealth, etc. stood at 12.8% of GDP. In the EU-28, revenue from VAT accounted for around 51.4% of the total taxes on production and imports.
http://ec.europa.eu/eurostat/statistics-explained/index.php/Tax_revenue_statistics

After the release of this report, also in the context of the Transparency Package of the European Commission[5], continuation of the work of the TGPG will be considered.

[5] http://ec.europa.eu/taxation_customs/resources/documents/taxation/company_tax/transparency/com_2015_136_en.pdf

1. Context of Tax Gaps

Where taxes are levied, tax revenue is also being lost. Throughout history, tax revenue has been used to fund different functions of state, including law enforcement, national defence, public infrastructure and the operation of governmental institutions. In modern societies taxes are also used to redistribute income, to influence consumption and production patterns, and to fund public services which are necessary or beneficial to society (e.g. education, healthcare). While taxes are essential to raise government revenue, they constitute a burden for taxpayers which burden is preferred to be minimised. It is therefore not surprising that, in practice, the amount of tax collected is less than the total amount of tax due. The difference constitutes a revenue loss for the state budget which in turn negatively affects fiscal policy, public spending, fair sharing of burden and, ultimately, also the economy. Tackling and preventing the loss of tax revenue is therefore crucial.

Understanding the scale and structure of the revenue loss may be a useful first step in tackling a potential issue of tax collection and preventing its occurrence. There are different methodologies available to estimate revenue loss. These methodologies are usually referred to as tax gap estimations.

Tax gap estimations may also help in learning the reasons behind the loss of tax revenue. In general, the occurrence of tax revenue loss can have various reasons. From a taxpayer behavioural perspective, it can relate to deliberate actions of taxpayers such as tax fraud, tax evasion and aggressive tax planning, but the revenue loss can also be caused by negligent omissions and insolvencies. While these phenomenon represent a serious problem for society because they limit the capacity of governments to implement their fiscal and economic policies, they also undermine fundamental principles of taxation.

Taxes are levied in accordance with fundamental principles of taxation, after careful policy choices by the legislator. Tax gap estimations may indicate distortions to the principle of equity in taxation. Horizontal equity requires that taxpayers with a similar ability to pay taxes, pay the same or similar amount of tax, while vertical equity suggests that taxpayers with a greater ability to pay taxes, pay more taxes, according to their ability to pay. Non-compliance with tax legislation, especially on a structural basis, undermines equal taxation and leads to unfairness for those who pay taxes as they will have to pay more because some others don't pay their fair share[6].

In all cases, it needs to be emphasised that tax gap estimations are rough indicators of revenue loss. The reliability and usefulness of such estimations strongly depend on the methodology and the data employed to prepare the estimation. Therefore, cautiousness is advised in interpreting estimations and drawing far reaching conclusions on its results without a clear understanding of the underlying methodology and data. For this reason, it is also advisable to put the emphasis on the trend in the estimated results rather than on the absolute numbers.

[6] http://ec.europa.eu/taxation_customs/taxation/tax_fraud_evasion/a_huge_problem/index_en.htm

2. Tax Gap Estimations

Several EU Member States developed a practice to assess tax gaps while other Member States are in the process of developing such practices. Tax gap estimations can be useful indicators for tax administrations and governments to assess the scale of taxpayers' non-compliance and the need for improving tax policy and tax administration. In order to be able to appropriately interpret the estimates, it is, however, essential to understand the main methodological features of the estimation.

There are different methodologies available to estimate tax gaps. The applied methodology and the underlying data used for the purposes of the estimation predestine how the results can be interpreted and used. In general, estimates based on macro-economic aggregates are less informative on the causes of revenue loss, while estimates based on micro-economic data are less comprehensive. Furthermore, the methodology very much determines the volume and the nature of resources required to perform the estimation. Accordingly, understanding the main features of tax gap estimations is not only important when interpreting the results, but also when selecting the most suitable methodology for a given purpose. The main aspects of tax gap estimations are therefore summarised in this chapter.

2.1 Definition of Tax Gap

Tax administrations collect a certain amount of tax in a given period. The amount of tax collected is likely to be less than the amount of tax due. This raises the question of what is the amount of tax which is not collected and, therefore, can be seen as the amount of revenue loss.

In general, the revenue loss can be described as the amount of tax liability incurred but not paid in a given period. The tax liability incurs as a result of the occurrence of a taxable event and is payable by a due date, as determined by tax law. This tax liability constitutes the tax due, which can be perceived as the theoretically collectable amount of tax. Accordingly, the tax gap can be estimated as the difference between the total amounts of tax theoretically collectable[7] based on the applicable tax law[8] and the total amounts of tax actually collected in a given period (see below Figure 1.).

The tax gap may be divided into an assessment gap and a collection gap. The assessment gap is the difference between the total amounts of tax assessed and the total amounts of theoretically collectable tax. The tax assessed is an aggregate of the total amounts of tax due based on tax returns

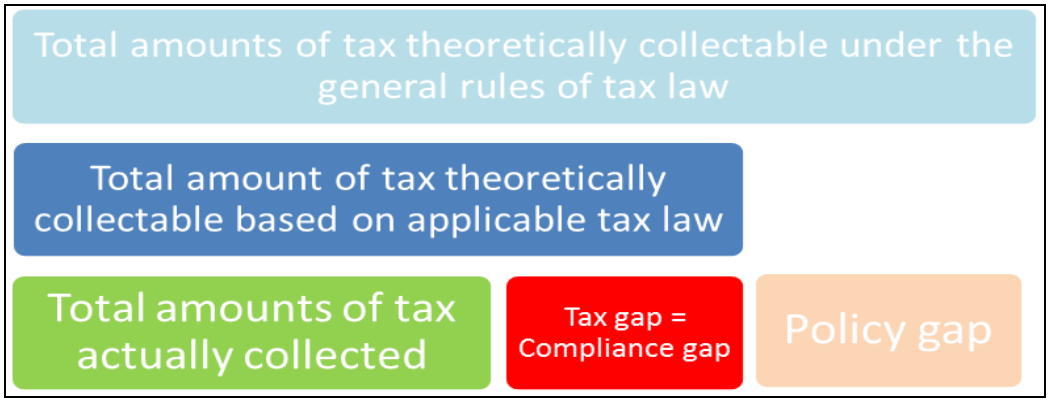
[7] In this context, the 'collectable amount of tax' means the amount of tax which was due for the relevant period of estimation. The 'theoretically collectable amount of tax' is also referred to as the theoretical tax liability.
[8] Where a tax administration's compliance strategy considers both the letter of the law and the spirit of the law in determining non-compliance, it is appropriate that the tax gap would include both tax due under the letter of the law and under the spirit of the law in calculating the tax theoretically collectable.

and additionally assessed by audits. The collection gap is the difference between the total amounts of tax actually collected and the total amounts of tax assessed.

From a tax collection perspective, the tax gap can further be specified according to net tax gap and gross tax gap. The gross tax gap is the difference between the total amounts of tax theoretically collectable and the total amounts of tax actually paid on time for a given tax period. For this purpose, late payments and results of enforced collection are disregarded in the calculation of the amounts of tax actually collected. In contrast, for the purposes of the net tax gap, late payments and the estimated amounts of enforced collections are taken into account, resulting in a lower tax gap estimate. With other words, in the concept of gross tax gap the focus is more on voluntary compliance, while in the concept of net tax gap also the results of the tax administration's (enforcement) activities are comprised. A practice of calculating gross and net tax gaps is developed by the IRS in the USA (see Section 2.1.2).

From a tax policy perspective, also a broader interpretation of the tax gap is possible which comprises the policy gap. Under a broader interpretation, the estimates include also revenue loss caused by tax policy choices of the legislator. These policy choices establish deviations to the general rules of taxation by providing for exemptions, allowances and lower rates in certain specific cases. The budgetary effects of these policy choices constitute tax expenditure, which is also referred to as the policy gap. To capture the policy gap, the tax gap can be estimated as the difference between the total amounts of taxes theoretically collectable under the general rules of tax law (i.e. ignoring deviations to the general rules) and the total amounts of tax actually collected. This estimate can then be decomposed into a compliance gap and a policy gap. The policy gap is defined as the difference between the total amounts of tax theoretically collectable under the general rules of tax law (i.e. if no exemptions, etc. would apply) and the total amounts of tax theoretically collectable based on the applicable tax law. The compliance gap corresponds to the 'general' definition of the tax gap, as described above.

Figure 1: Definition of tax gap



Source: TGPG

In policy gap estimations, the general rules of taxation under the relevant national tax law (e.g. tax base, tax rate), need to be determined by assumptions. The assumptions on the general rules need to be adequately identified and clearly described for the purposes of policy gap estimation, because the deviations to the general rules will be estimated based on these assumptions. In practice, this can be a challenging exercise due to complex taxation rules with several exemptions and conditionality to the rule. However, well-defined assumptions on the general rules of taxation are important for a good interpretation of the results. Finally, the assumptions will also impact the comparability of the estimated policy gap results. The aspects of policy gap are further not analysed in this report.

2.1.2 Some specific examples

In practice, the above described tax gap definitions have several variations when it comes to more precise definitions. These variations reflect not only the differences between the applicable methodologies, but also the specific characteristics of the type of the tax for which the estimation is performed and those of the employed methods and data. The existing methodologies have often been developed and applied for VAT gap estimations, but work is on-going also on income tax gap estimations[9]. The focus of this report is on VAT gap, but some well-known definitions are explained below in more details.

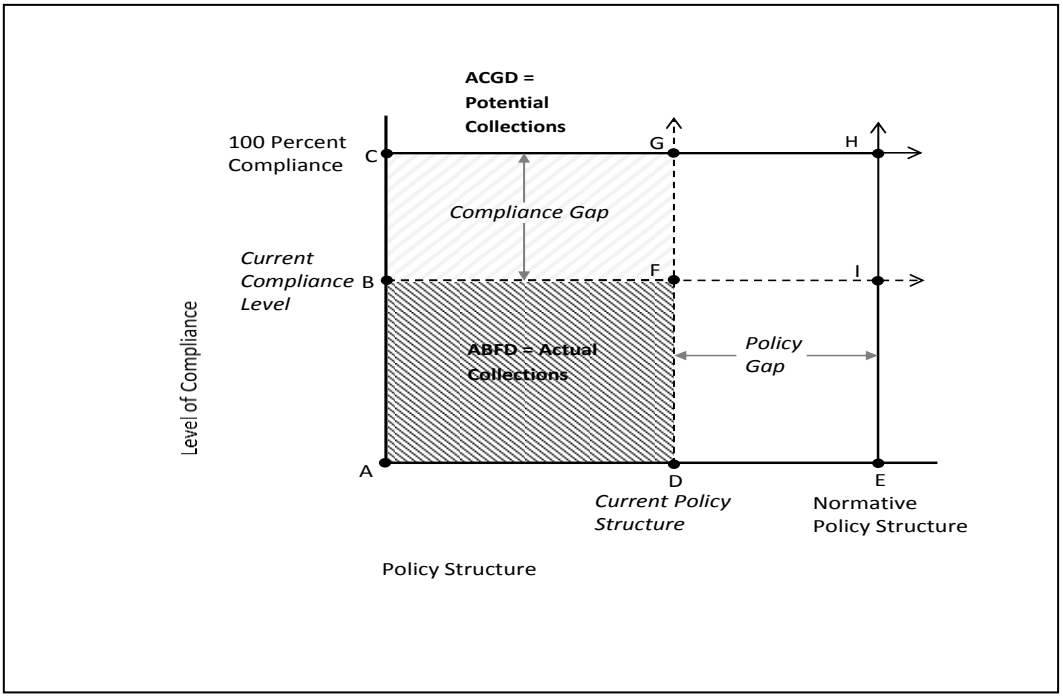
International Monetary Fund (IMF)

The IMF developed the Revenue Administration Gap Analyses Program (RA-GAP) to quantify and understand compliance gaps. In the IMF's approach, the overarching framework is one in which a gap arises between actual receipts from some tax and receipts under some perfectly enforced benchmark tax system. This overall gap can then be decomposed into the compliance gap (i.e. imperfect compliance with the current tax system) and the policy gap (i.e. deviations of current tax rules from the benchmark)[10]. Figure 2 shows graphically the differences between the “policy gap” and the “compliance gap” in this approach, where the former is included in rectangle “D-F-I-E” and the latter by the area “B-C-G-F”.

[9] In 2015 the OECD published a first rough estimate in the context of its Base Erosion and Profit Shifting project (BEPS). Accordingly, “Research undertaken since 2013 confirms the potential magnitude of the BEPS problem. Estimates conservatively indicate annual losses of anywhere from 4 - 10% of global corporate income tax (CIT) revenues, i.e. USD 100 to 240 billion annually”.
http://www.oecd.org/ctp/beps-about.htm

[10] IMF (2015), p. 64

Figure 2: RA-GAP by IMF



Source: Presentation of E. Hutton (IMF) at the TGPG

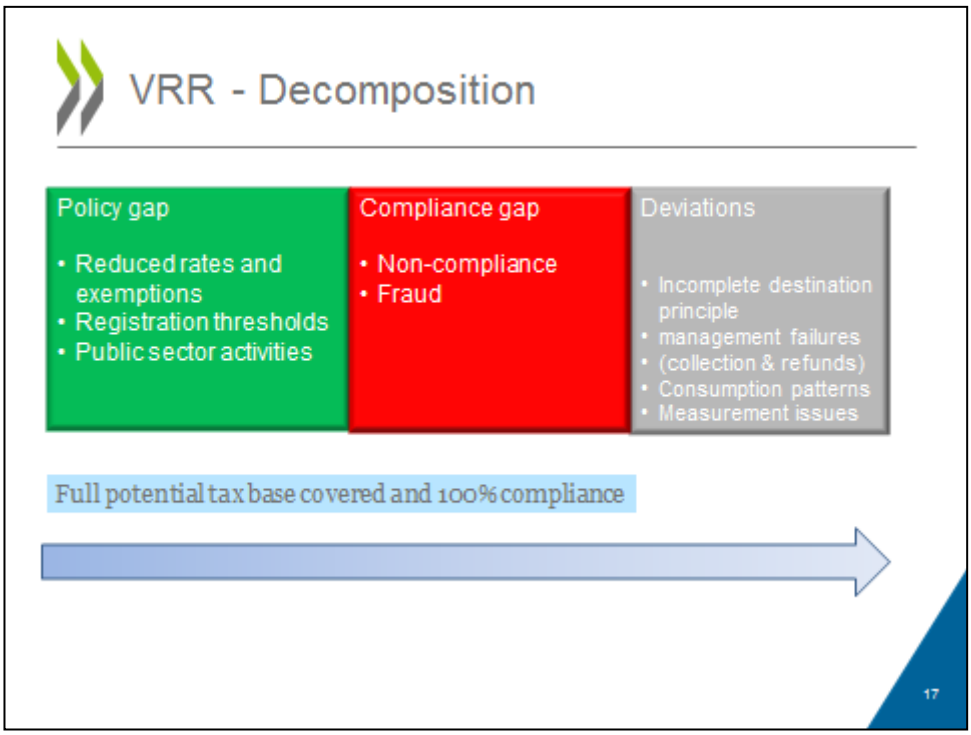
In practice, the RA-GAP methodology is being applied for the estimation of VAT gaps. Experts of the IMF advise national administrations world-wide in performing tax gap estimations based on the RA-GAP. In the EU, Member States which benefited from the RA-GAP program include in particular Estonia, Finland, Denmark, Portugal and the Slovak Republic. For more details, see Chapters 3 and 4.

OECD

The OECD developed the VAT Revenue Ratio (VRR) which is an indicator that combines the effect of revenue losses as a consequence of exemptions and reduced rates, fraud, evasion and tax planning[11]. In theory, the VRR measures the difference between the VAT revenue actually collected and what would be raised if VAT was applied at the standard rate to the entire potential tax base in a 'pure' VAT regime and all revenue was collected. Figure 3 pictures the decomposition of the VRR. In practice, however, it seems to be difficult to disentangle the different components of the VRR.

[11] OECD (2015), p. 91-110

Figure 3: VRR by OECD



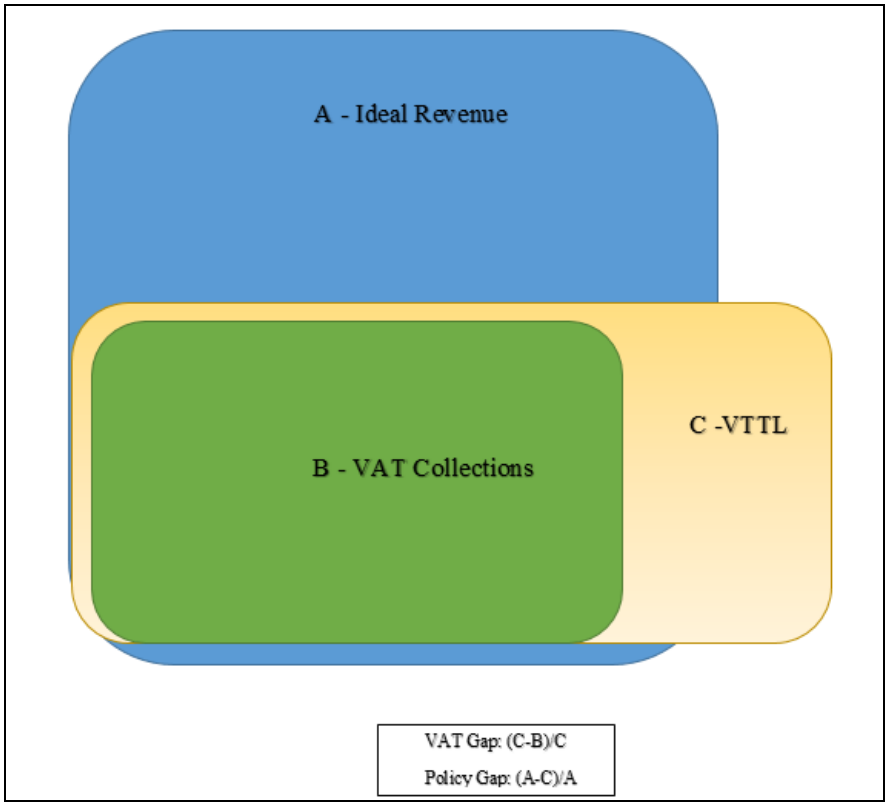
Source: Presentation of S. Buydens (OECD) at the TGPG

CASE

In the VAT Gap Study which was commissioned by the European Commission and performed by CASE[12], the concepts of VAT gap and Policy gap are used. The VAT gap is defined as the difference between the amount of VAT actually collected and the VAT Total Tax Liability (VTTL), in absolute or percentage terms. The VTTL is an estimated amount of VAT that is theoretically collectable based on the VAT legislation and ancillary regulations. The Policy gap is defined as the ratio between the VTTL and an "ideal" VAT Revenue. The ideal VAT revenue is estimated by applying the standard rate of VAT to final consumption, thereby eliminating the effects of reduced rates and exemptions. Thus, the Policy gap is to be seen as an indicator of the additional VAT revenue that a Member State could theoretically collect if it applied uniform taxation to all consumption of goods and services[13].

[12] Three reports on the *Study to quantify and analyse the VAT Gap in the EU Member States* are published: CASE (2013), CASE (2014) and CASE (2015)
[13] CASE (2015), p.20

Figure 4: Policy Gap, VAT Collections and VAT Gap by CASE



Source: 2015 Report to the VAT Gap Study[14]

HMRC, UK

In the UK, the Tax Authority (HMRC) developed a practice of tax gap estimations for all main taxes. In the HMRC's definition[15], the 'tax gap' is the difference between the amount of tax that should, in theory, be collected by HMRC, against what is actually collected. The 'theoretical liability' represents the tax that would be paid if all individuals and companies complied with both the letter of the law and HMRC's interpretation of Parliament's intention in setting law (referred to as the spirit of the law). Alternatively, the HMRC describes the tax gap as the tax that is lost through non-payment, use of avoidance schemes, interpretation of the tax effects of complex transactions, error, failure to take reasonable care, evasion, the hidden economy and criminal attack on the tax system. For more information on the VAT gap, see Section 4.15.

[14] CASE (2015), p. 54

[15] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/470540/HMRC-measuring-tax-gaps-2015-1.pdf , p. 13.

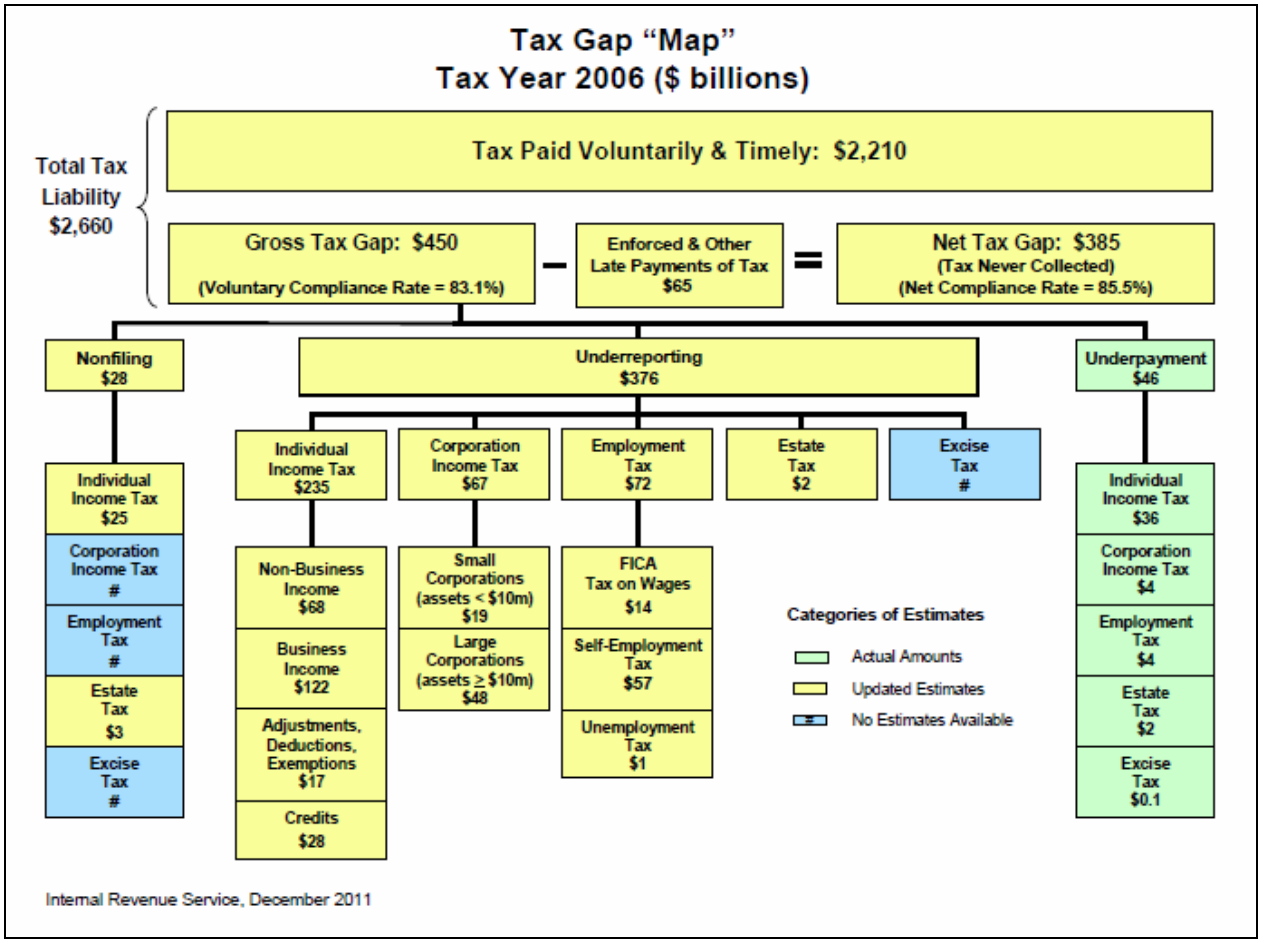
Internal Revenue Service, USA

In the United States, the Internal Revenue Service (IRS) distinguishes between gross tax gap and net tax gap[16]. The gross tax gap is defined as the difference between true tax liability for a given tax year and the amount that is actually paid on time. It can be divided into three components: the non-filing gap, the underreporting gap, and the underpayment gap. Accordingly, the non-filing gap is the tax not paid on time by taxpayers who have legal requirement to file a tax return, but do not file on time. It is calculated using estimates supplied by the Census Bureau[17],[18]. The underreporting gap is the tax owed by taxpayers who file tax returns on time, but underreport the amount of tax they owe. The underreporting gap is estimated from a combination of random audit and operational audit data[19]. The underpayment gap is the loss of revenue owed by taxpayers who file returns on time, but do not pay their reported tax due on time. The underpayment gap is calculated using tabulations from the IRS Master File[20],[21]. The IRS results show that the largest component of the tax gap in the US is related to underreporting and that compliance is the highest where there is third-party information reporting and/or withholding.

The net tax gap is the portion of the gross tax gap that will never be recovered through enforcement or other late payments. Accordingly, the net tax gap is derived by subtracting from the gross tax gap an amount estimated to be collected through enforcement and late payments.

[16] IRS (2012)
[17] The United States Census Bureau is a principal agency of the U.S. Federal Statistical System. Its mission is to serve as the leading source of quality data about the USA's people and economy.
http://www.census.gov/
[18] IRS (2012)
[19] IRS (2012)
[20] The IRS master file is a data base of electronic information about a taxpayer's tax accounts which is maintained by the Internal Revenue Service (IRS). It consists of a series of runs, data records and numerous files linked to numerous IRS systems within the main computer and various campuses. The IRS master file receives transactions through electronic submissions, posts and analyses the transactions and produces output information such as notice data, reports and refund data. The IRS master file produces numerous types of notices which are mailed to the taxpayer.
http://www.forensicaccountingcfe.com/what-can-my-irs-master-file-tell-me.html
[21] IRS (2012)

Figure 5: US Tax gap by IRS



Source: IRS[22]

2.2 Composition of Tax Gap

2.2.1 Taxes covered

Tax gap estimations can be carried out for any type of taxes. Most commonly, the tax gap is estimated for the VAT. VAT is an indirect tax and its legal framework is harmonized in the EU[23]. Only

[22] IRS: https://www.irs.gov/pub/newsroom/tax_gap_map_2006.pdf
[23] For more details on VAT Gap estimations, see Chapter 3.

a few Member States estimate tax gaps for direct taxes, such as the personal income tax[24] (PIT) and the corporate income tax[25] (CIT), and for social security contributions[26] (SSC). Table 1 below provides an overview of the currently performed tax gap estimations in the 15 TGPG-Member States, excluding EC-financed studies[27].

Table 1: Overview of tax gap estimations in TGPG-MSs

	Tax Gap Estimations			
EU Member State	**PIT**	**CIT**	**SSC**	**VAT**
Belgium	X	X	X	X
Czech Republic	X	X	X	YES
Estonia	YES	X	YES	YES
Finland	X	X	X	YES
France	X	X	X	YES
Germany	X	YES	X	YES
Italy	YES	YES	X	YES
Latvia	YES	X	YES	YES
Lithuania	X	X	X	X
Poland	X	X	X	YES
Portugal	X	X	X	YES
Slovak Republic	X	X	X	YES
Slovenia	X	X	X	YES
Spain	X	X	X	X
United Kingdom	YES	YES	YES	YES
Number of countries estimating tax gap	**4**	**3**	**3**	**12**

Source: TGPG questionnaire

As Table 1 illustrates, 12 TGPG-Member States produce VAT gap estimations, but estimations of CIT, PIT and SSC are only available in Estonia, Germany, Italy, Latvia and the United Kingdom. The United Kingdom regularly prepares tax gap estimations for all main taxes.

[24] The Personal Income Tax gap can generally be defined as the difference between the total amounts of PIT theoretically collectable based on the applicable tax law and the total amounts of PIT actually collected in a given period.
[25] The Corporate Income Tax gap can generally be defined as the difference between the total amounts of CIT theoretically collectable based on the applicable tax law and the total amounts of CIT actually collected in a given period.
[26] The Social Security Contributions gap can generally be defined as the difference between the total amounts of SSC theoretically collectable based on the applicable social security legislation and the total amounts of SSC actually collected in a given period.
[27] CASE (2013), (2014), (2015)

The fact that direct tax estimations are rare in practice can be explained by the fact that reliable and comprehensive estimations for direct taxes are more difficult to perform than for the VAT. In general, due to complex taxation rules (e.g. numerous exemptions, deductions, credits, allowances) it is difficult to develop a good methodology for estimating the amounts of tax theoretically collectible. For a top-down estimation of a direct tax gap, it is frequently the case that the available independent data sources on income and assets are not sufficiently comprehensive or detailed to enable a robust estimate of tax liability. In particular, national accounts data does not provide sufficient information about off-shore fraud or assets (e.g. bank deposits, shares, real estate) that taxpayers may hold in foreign countries. As a consequence, top-down estimations may only capture a part of tax evasion and will be biased downwards to an unknown extent. For more information on top-down and bottom-up methodologies, see Section 2.2.2.

2.2.2 Top-down and bottom-up

Tax gap estimations can be approached from a macro perspective as well as from a micro perspective. Methodologies based on a macro perspective usually employ economy-wide aggregates and are referred to as top-down (or indirect) methodologies. Methodologies based on a micro perspective employ more specific or individual data and are referred to as bottom-up (or direct) methodologies.

Top-down methodologies

Top-down methodologies are based on the assumption that the data source used for tax gap estimation covers the full tax base. Therefore, the data to estimate the tax gap is usually derived from macro model methods[28] or from national accounts[29]. National accounts describe the structure and evolution of the economy within a country or other geographic area (e.g. EU) and provide an exhaustive description of all productive activities. In the European Union, the *European system of national and regional accounts* (ESA 2010) is the newest internationally compatible accounting framework for a systematic and detailed description of an economy[30]. From September 2014 onwards the data transmission from Member States to Eurostat follows the ESA 2010 rules[31].

[28] The Inter-secretariat Working Group on National Accounts (ISWGNA - a body consisting of Eurostat, IMF, OECD, United Nations and World Bank, and is the global leader on National Accounting standards) issued an official declaration in 2006 where they explained with respect to macro-models the followings: "*Unofficial estimates are often based on macroeconomic models. For instance, they may assume a fixed relation between the size of the economy and money in circulation. Such methods may yield grossly exaggerated results, attracting the attention of politicians and newspapers and thereby gaining wide publicity. The OECD-ILO-IMF-CIS manual on measuring the non-observed economy rejects such "macro-model" methods because these methods suffer from serious problems that cast doubt on their utility for any purpose in which accuracy is important. In particular, they are completely unsuitable for use in compiling the national accounts.*"

[29] Rubin (2011)

[30] Paragraph 1.01 in ESA 2010 and http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:European_system_of_national_and_regional_accounts_%28ESA_2010%29

[31] At worldwide level the rules of ESA are coherent with the rules of the System of National Accounts disseminated by the United Nations.

The ESA 2010 is setting forth the rules, conventions, definitions and classifications to be applied in producing the national accounts in Member States[32]. Its framework consists of two main sets of tables: (i) the institutional sector accounts; and (ii) the input-output framework, and the accounts by industry[33]. For the purposes of estimating the theoretically collectable tax (i.e. theoretical tax liability), different data sets of the national accounts can be used. For VAT gap estimations, especially the supply and use tables (SUT), and input-output tables are used (see Section 3.2).

For the purposes of estimating the tax actually collected, the tax revenue statistics of ESA 2010 can be employed (see Figure 6). In this case, the method used for tax revenue approximation in the national accounts may affect the size of the tax gap and also the comparability of such estimates. Under ESA 2010, taxes and social contributions should be recorded in the national accounts on an accrual basis. In principle, flows shall be recorded on an accrual basis; that is, when economic value is created, transformed or extinguished, or when claims and obligations arise, are transformed or are cancelled[34]. However, in practice two methods can be used: (i) the time-adjusted cash method; or (ii) a method based on declarations and assessments.

The 'time-adjusted cash method' means that the cash is attributed when the activity took place to generate the tax liability or when the amount of taxes was determined in the case of some income taxes. This adjustment may be based on the average time difference between the activity and cash receipt[35]. In the case of a 'method based on declarations and assessments', an adjustment needs to be made for amounts assessed or declared but unlikely to be collected. These amounts have to be eliminated from government revenue, either by using a tax-specific coefficient based on past experience and future expectations or by recording a capital transfer for the same adjustment to the relevant sectors.[36] For purposes of tax gap estimation, the tax revenue statistics of national accounts can be adjusted or replaced by more specific tax data available in the tax administration to better approximate real accrual of tax revenue.

[32] Paragraph 1.12 in ESA 2010

[33] The sector accounts provide, by institutional sector, a systematic description of the different stages of the economic process: production, generation of income, distribution of income, redistribution of income, use of income and financial and non-financial accumulation. The sector accounts also include balance sheets to describe the stocks of assets, liabilities and net worth at the beginning and the end of the accounting period. The input-output framework, through the supply and use tables, sets out in more detail the production process (cost structure, income generated and employment) and the flows of goods and services (output, imports, exports, final consumption, intermediate consumption and capital formation by product group). Two important accounting identities are reflected in this framework: the sum of incomes generated in an industry is equal to the value added produced by that industry; and, for any product or grouping of products, supply is equal to demand. See paragraphs 1.06 – 1.08 in ESA 2010

[34] See paragraphs 1.101– 1.105 in ESA 2010.

[35] In national accounts, the cash receipts are recorded with a time-lag to better approximate real accrual. However, the time-lag can vary from country to country.

[36] http://ec.europa.eu/eurostat/statistics-explained/index.php/Tax_revenue_statistics#Data_sources_and_availability

Figure 6: ESA 2010 classifications and codes on tax revenue

D.2: TAXES ON PRODUCTION AND IMPORTS
D.21: Taxes on products
D.211: Value added type taxes (VAT)
D.212: Taxes and duties on imports excluding VAT
D.214: Taxes on products, except VAT and import taxes
D.29: Other taxes on production
D.5: CURRENT TAXES ON INCOME, WEALTH, ETC.
D.51: Taxes on income
D.59: Other current taxes
D.91: Capital Taxes
D.61: NET SOCIAL CONTRIBUTIONS
D.611: Employers' social contributions
D.612: Imputed social contributions
D.613: Households' social contributions
D.614: Households' social contribution supplements
D.61SC Social insurance scheme service charges
D.995: Capital transfers from general government to relevant sectors representing taxes and social contributions assessed but unlikely to be collected.

Source: Eurostat web-site[37]

Top-down methodologies aim at providing a single estimate based on data that is independent of the tax administration[38]. This latter point can be of advantage particularly in the cases where the tax administration's operational information is thin and possibly contaminated by governance issues[39]. However, when national accounts data is estimated or corrected with the help of tax data (e.g. using risk-based audit data for estimating evasion and fraud), the above mentioned formal independence is eroded[40].

Top-down methodologies are less time consuming and require relatively few resources, while the results can be considered comprehensive and comparable in time which enables to follow the trend over the time[41]. However, top-down methodologies are limited by the fact that only areas/activities which are traceable in macroeconomic statistics can be estimated and the quality of the estimation relies heavily on the exhaustiveness of the adjustments for non-observed economy in the national

[37] http://ec.europa.eu/eurostat/statistics-explained/index.php/Tax_revenue_statistics#Data_sources_and_availability
[38] Rubin (2011)
[39] Keen (2013)
[40] Rubin (2011)
[41] Risk Management Platform (2012)

accounts[42]. Furthermore, the foreign aspects of tax evasion (e.g. off-shore practices, bank deposits and assets abroad) cannot be captured by using national accounts data.

A disadvantage of national accounts is that the data is not sufficiently detailed to cover the particularities of each taxable item, so additional assumptions needs to be made for the purposes of the estimation to determine the relevant tax base.

Top-down estimates have a time lag of approximately 2 years due to the availability of national accounts data, and require revisions when the national accounts are revised. National accounts revisions can be ordinary or extraordinary. Ordinary revisions by the National Statistical Offices can occur each year[43], while extraordinary revisions usually occur when the general rules and the main data sources used to construct the national account data change. This latter usually happens every 5 year.

The main disadvantage of top-down methodologies is that these lack explanation on the causes and components of the gap. The results are, therefore, not directly useful for compliance management.

Bottom-up methodologies

Unlike the top-down approach, which theoretically starts with a data source that covers the full tax base, a bottom-up approach will use one or more data sources that cover components of the tax base. In the bottom-up methodologies, the components of the gap are estimated separately for different taxpayer groups and types of non-compliance, using data of individual cases. The data is gathered usually by the tax administration. The data gathering methods include audits, surveys and enquiry programs.

The tax gap is estimated by extrapolation[44] of data for the whole population respective to the relevant component of the tax base. When the extrapolation is based on operational risk-based audit data, rather than statistically randomly selected audits, it needs to be taken into account that operational audits are usually undertaken on returns where substantial non-compliance is deemed likely, i.e. biased toward the riskier side of non-compliance spectrum. Therefore, the outcome of extrapolation based on the risk-based audited returns is unlikely to be representative for all returns and is likely to give a misleading picture with respect to the unaudited returns and the overall return population[45]. It is therefore advisable to use statistical means to adjust for this difference in outcome between audited and unaudited returns. Regression, statistical matching and sample selection

[42] Keen (2013) and see Section 2.2.3.
[43] Ordinary revisions are usually of a small magnitude and do not (significantly) alter the tax gap estimates.
[44] Extrapolation is the process of projecting a value outside a data set. In this report, the term 'extrapolation' is used in the meaning of an up-lift. There are different methods of extrapolation (e.g. linear extrapolation, polynomial extrapolation). The choice for an extrapolation method depends also on the process how the existing data set was gathered. An extrapolation method is limited by the assumptions used in its application. Accordingly, the choice for a method affects the quality of the estimated value.
[45] In statistical terms it is not a representative sample of the target population since it is affected by a 'selection bias' deriving by the selection model adopted by the fiscal authority in order to audit the more 'dangerous' evaders.

models can be used to better predict non-compliance among unaudited returns. Alternatively, operational audit data can be combined with random audit data, or measures based on comparisons of surveys and administrative data can be used to predict non-compliance.

As in bottom-up methodologies the components of the tax gap are determined and estimated separately, it is not guaranteed that all elements of the tax gap have been included and so, that the tax gap estimate is comprehensive. In particular, bottom-up methodologies usually do not include an estimate of concealed activities. The methodology will however provide for an understanding of what each element of the gap is, and is valuable source of information for tax administration on measures to tackle the gap. For example, where a top-down estimate may give a comprehensive overall estimate, it may lack the detail of which sectors or non-compliance behaviours are the main drivers of the gap. On the other hand, a bottom-up estimate, derived from individual taxpayer data, can give the more granular information about the sectors and non-compliance behaviours that a tax administration should be looking to address.

Current practices

In practice, the choice for a specific methodology will depend on various aspects, including the availability of data, particularities of the tax system, type of fraud and evasion. In all cases of estimation, the features of the selected methodology and the quality of data used for the estimation will affect the robustness of the results (see also Section 2.3). Tables 2 and 3 outline the current practices of TGPG-Member States in estimating CIT gap, and PIT gap and SSC gap, respectively. For information on the estimation of VAT gaps, see Chapter 3.

Table 2: CIT gaps in TGPG-MSs

MS	In-house / External estimation	Methodology	Comments
DE	External	Bottom-up Top-down	External studies: Bottom-up (Finke, 2014); Top-down (Bach, 2013)
IT	In-house	Top-down	-
UK	In-house	Bottom-up (random enquiries, risk registers, data matching)	Coverage of all elements of CIT gap not guaranteed

Source: TGPG questionnaire

Table 3: PIT and SSC gaps in TGPG-MSs

MS	PIT gap/ SSC gap	In-house / External estimation	Methodology	Limits of the scope
EE	**PIT gap**	In-house	Surveys, 3rd party information	Undeclared salary, self-employed, other income
	SSC gap	Similar approach as for PIT gap		
IT	**PIT gap**	In-house	Top-down	Self-employed, enterprise activity for non-corporate taxpayers
LV	**PIT gap**	In-house	Top-down (cash-flow analysis principle), Bottom-up (salary and self-employed income analysis)	Bottom up only for undeclared salary and self-employed income
	SSC gap	Similar approach as for PIT gap (Project started in 2014, results not available yet)		
UK	**PIT gap**	In-house	Bottom-up (random enquiries, risk registers, data matching)	Coverage of all elements of PIT gap not guaranteed
	SSC gap	Similar approach as for PIT gap		

Source: TGPG questionnaire

2.2.3 Tax evasion and fraud

General aspects

Tax evasion is a component of the tax gap. It can be caused by the under-declaration of taxable income/transactions. The term 'tax evasion' can, however, cover also the non-declaration of taxable income/transactions generated by legal and illegal activities concealed from the tax administration. Concealed legal activities are often also referred to as the 'hidden economy' or 'underground economy'. As the terms 'tax evasion' and 'hidden economy' may have different meaning when used in different contexts, it is important to understand their definition in the relevant context. For example, in the UK, the non-declaration of an entire source of income is defined as the 'hidden economy', whereas evasion is the deliberate under-declaration of a declared source of income[46]. For the purposes of this report, the term 'tax evasion' refers, however, to both the under-declaration of taxable income/transactions and the non-declaration of taxable income/transactions generated by concealed legal or illegal activities.

Besides tax evasion, also tax fraud causes revenue loss. In this report, the term 'tax fraud' refers to criminal attacks aimed at fraudulently generating repayments of tax.

Tax evasion and fraud constitute a challenge in tax gap estimations because these activities usually remain under the radar of data collection mechanisms. Consequently, it is quite difficult to find reliable indicators on such activities. In top-down methodologies based on national accounts data, tax evasion and fraud is usually covered, but its coverage will strongly depend on the quality of the data[47]. In bottom-up methodologies, as the components of the gap are estimated separately for different taxpayer groups and types of non-compliance, the coverage primarily depends on the composition of the gap. Additionally, as it is difficult to find reliable data on tax evasion and fraud, it is also difficult to perform adequate statistical extrapolations.

With respect to illegal activities, it has to be noted that the definition of what is illegal depends on the national legislation of Member States[48]. Furthermore, also the taxability of illegal activities is determined by national legislation (for the VAT aspects, see Section 3.1.2). In several Member States illegal activities are in principle subject to tax based either on case law[49] or on tax legislation[50]. The underlying argument is that taxation should be neutral to the legal character or morality of the activity. Illegal or immoral activities should not have the benefit of non-taxability as this situation

[46] https://www.nao.org.uk/wp-content/uploads/2015/12/Tackling-tax-fraud-how-HMRC-responds-to-tax-evasion-the-hidden-economy-and-criminal-attacks.pdf

[47] Fraud, as defined in this report (e.g. MTIC fraud), is not a productive economic activity, and therefore is not recorded in national accounts. Accordingly, it is not estimated for the amounts of tax theoretically collectable. However, as fraud impacts the net tax actually collected, it is covered by top-down tax gap estimations.

[48] For example, prostitution is not (entirely) illegal in all Member States.

[49] For example: the Netherlands, UK .

[50] For example, Article 40 of the German Tax Procedure Code (i.e. Abgabenordung) provides that "*It shall be immaterial for taxation when an action that is completely or partly taxable violates a statutory regulation or prohibition or is contrary to public policy*". In the Netherlands the same principle applies based on case law and legal theory.

would result in an economic disadvantage of legal activities. Hereby, the taxation of illegal and immoral activities is not considered as legalization or approval of these activities.

Although in practice the tax liability occurred by illegal activities is likely to be entirely concealed from the (tax) administration, when illegal activities are subject to tax, they can be taken into account for the purposes of tax gap estimation as these probably contribute to the tax gap. However, when illegal activities do not fall under the scope of tax legislation, they can be disregarded as these per definition do not contribute to the tax gap.

Top-down methodologies

In top-down methodologies based on national accounts data, the basic assumption applies that, because national accounts data is assumed to be exhaustive, the tax gap estimate covers all economic activities, including those concealed from the (tax) administration. With other words, the assumption of exhaustiveness implies that a tax gap estimate based on national accounts data includes also revenue loss caused by tax evasion. In fact, however, if certain concealed economic activities are not captured by the national accounts, the revenue loss caused by these activities won't be covered by the tax gap estimate. Therefore, the quality of national accounts data is of great importance for a robust tax gap estimate.

In striving for exhaustiveness, national accounts data is adjusted (as good as possible) for the non-observed economy. The term 'non-observed economy' (NOE) refers to all productive activities that may not be captured in administrative data sources used for compiling national accounts[51] and consist of the following three types of activity[52]:

(1) illegal activities where the parties are willing partners in an economic transaction. Illegal economic actions shall be considered as transactions when all units involved enter the actions by mutual agreement. Thus, purchases, sales or barters of illegal drugs or stolen property are transactions, while theft is not. Accordingly, illegal activities where either of the parties are not willing participants (e.g. theft) are not economic transactions and so are not included in the production boundary;

(2) hidden and underground activities where the transactions themselves are not against the law, but are unreported to avoid official scrutiny;

(3) activities described as 'informal', typically where no records are kept.

[51] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Non-observed_economy_%28NOE%29
[52] Paragraphs 1.79 and 11.26 in ESA2010, and http://ec.europa.eu/eurostat/statistics-explained/index.php/Building_the_System_of_National_Accounts_-_non-observed_sector

Figure 7: Observed and non-observed economy

<table>
<tr><td colspan="2">Problem areas of NOE

Underground activities

Illegal activities

Production of households for own final use

Deficiencies in data collection</td><td colspan="2">Observed Economy

Registered/reported activities</td></tr>
<tr><td rowspan="2"></td><td colspan="2">Informal activities</td><td rowspan="2"></td></tr>
<tr><td>Non-observed</td><td>Observed</td></tr>
</table>

Source: Presentation of Ms. Catrine Boogh Dahlberg (ESTAT) at the TGPG

How the NOE adjustments for a country's national accounts impact on a tax gap estimation, is for the estimator (i.e. authority performing the tax gap estimation) to distinguish. In the EU, all Member States account for the non-observed economy in their national accounts. However, the measurement methods vary across Member States and the measured values are often not published. This means that any comparison of the values of the non-observed economy is rather difficult. To improve this situation and the exhaustiveness of national accounts in the EU, Eurostat established a framework based on the tabular approach. The Eurostat Tabular Approach to exhaustiveness was designed to identify potential resources of underestimation of GDP estimates due to omissions from the source data used in compiling national accounts. The seven types of non-exhaustiveness under this framework can broadly be classified into the four categories of not registered, not surveyed, misreported and other deficiencies (see Figure 8). Nevertheless, the methods to estimate exhaustiveness adjustments under the tabular approach remain different for different types of non-exhaustiveness within one Member State and mainly depend on the available data sources (e.g. surveys, administrative data). Furthermore, the methods of exhaustiveness adjustments remain different also between Member States, which can be detrimental to the comparison of the measured values across Member States.

Figure 8: SNA Eurostat tabular approach types of non-exhaustiveness

I Not registered

N1 - Producer deliberately not registering - underground
Producer deliberately does not register to avoid tax and social security obligations. Most often this refers to small producers with turnovers that exceed threshold levels above which they should register. Producers that do not register because they are engaged in illegal activities fall under type N2. Type N1 does not include all underground activities, some of which are associated with type N6.

N2 - Producers deliberately not registering - illegal
Producer deliberately does not register as a legal entity or as an entrepreneur because it is involved in illegal activities. Type N2 excludes illegal activities by registered legal entities or entrepreneurs that report (or misreport) their activities under legal activity codes.

N3 - Producers not required to register
Producer is not required to register because it has no market output. Typically these are non-market household producers that engage in production of goods for own consumption, for own fixed capital formation, and construction of and repairs to dwellings. Or, producer has some market output but it is below the level at which the producer is obliged to register as an entrepreneur.

II Not surveyed

N4 - Legal persons not surveyed
Legal persons not surveyed due to several reasons such as: the business register is out of date or updating procedures are inadequate; the classification data (activity, size or geographic codes) are incorrect; the legal person is excluded from the survey frame because its size is below a certain threshold etc. This leads to (systematic) exclusion of the legal person from surveys when in principle they should be included.

N5 - Registered entrepreneurs not surveyed
Registered entrepreneurs may not be surveyed for a variety of reasons: the statistical office does not conduct a survey of registered entrepreneurs; the registered entrepreneur is not in the list of registered entrepreneurs available to the statistical office, or if available, is systematically excluded from it; the registered entrepreneur is not in the survey frame because the classification data (activity code, size code, geographic code) are incorrect.

III Misreporting

N6 - Producers deliberately misreporting
Gross output is under-reported and/or intermediate consumption is overstated, in order to evade income tax, value added tax (VAT), other taxes, or social security contributions. Misreporting often involves maintenance of two sets of books, payments of envelope salaries which are recorded as intermediate consumption; payments in cash without receipts, and VAT fraud.

IV. Other

N7 - Other statistical deficiencies
Type N7 is subdivided into:
N7a: data that are incomplete, not collected or not directly collectable;
N7b: data that are incorrectly handled, processed or compiled by statisticians.
The following areas should be investigated: handling of non-response; production for own final use by market producers; tips; wages and salaries in kind; and secondary activities.

Source: Eurostat web-site[53]

[53] http://ec.europa.eu/eurostat/statistics-explained/index.php/File:SNA_Eurostat_tabular_approach_types_of_non-exhaustiveness,_2012.PNG

With the arrival of ESA 2010, the European Commission and the Member States agreed on common methodological reporting on the measurement of certain illegal activities. The reporting concerns prostitution, the production and trafficking of drugs, and alcohol and tobacco smuggling[54]. Also the OECD is engaged in identifying and promoting international best practice in this field. In 2002, it published the Handbook for Measurement of the Non-Observed Economy[55,56].

Despite the above described efforts to improve the data on non-observed economy, there is currently no harmonised measurement method or publication requirement for the measured NOE adjustments in EU Member States. As the non-observed economy is assumed to be a substantial contributor to the tax gap[57], qualified and consistent measurements on the scale of this economy are important for the purposes of tax gap estimation. For this reason, the development of a harmonized methodology for measuring the non-observed economy in the European Union and the implementation of a publication requirement for the measured values would be desirable. These actions would also enhance transparency and comparability in NOE measurements between Member States.

Bottom-up methodologies

In bottom-up methodologies, it is rather difficult to capture the revenue loss caused by evasion and fraud. With respect to concealed economic activities and fraud, if these form a component of the bottom-up tax gap estimation, the revenue loss caused by the activity should be captured by the estimation. However, operational or random audit results are usually only available for registered economic activities. For concealed economic activities and fraud, other data gathering methods and data sources need to be used. In practice, surveys and enquiries that directly ask about tax evasion and fraud, while better than random enquiries that rely on registration, may not fully capture the full extent of concealment. Consequently, it is rather difficult to adequately perform an extrapolation in bottom-up methodologies for these activities.

2.2.4 Tax avoidance

Unlike tax evasion, which is illegal, tax avoidance normally falls within the letter of the law. However, aggressive forms of tax avoidance may go against the spirit of the law, stretching the interpretation

[54] http://europa.eu/rapid/press-release_MEMO-14-594_en.htm
[55] http://www.oecd.org/std/na/measuringthenon-observedeconomy-ahandbook.htm
[56] The Handbook has been prepared by a team of experts from the OECD, the International Labour Organisation, the International Monetary Fund, the Interstate Statistical Committee of the Commonwealth of Independent States, the Italian National Statistical Institute, Statistics Netherlands, the Russian Federation State Statistical Committee, and the University of Versailles.
[57] Non-observed economy is present in all countries, but its nature, scope and economic impact varies considerably from country to country depending on historical, political and social developments, on the structure of the economy and on legislation.

of what is legal in minimising the tax burden[58]. In practice, it is difficult to draw a clear line between legal tax avoidance and illegal aggressive tax planning, unless court decisions provide clear guidance.

Where an administration has a compliance strategy to tackle the problem of revenue loss from avoidance, it may be appropriate to include avoidance within the estimates of the tax gap. Whether tax avoidance is covered by tax gap estimation, depends on the methodology and the underlying methods and data employed to estimate the gap. In top-down methodologies based on national accounts, tax avoidance will be captured if the economic activities related to the tax avoidance are captured by the national accounts data. In bottom-up methodologies, the coverage of tax avoidance is a conscious choice of the estimator when determining the methods and the data used in the estimation. In the case of aggressive tax planning (i.e. avoidance which is against the spirit of the law), as this can best be determined on a case by case basis, a bottom-up methodology is more suitable to estimate the tax gap, provided that qualified data is available.

2.2.5 Other factors

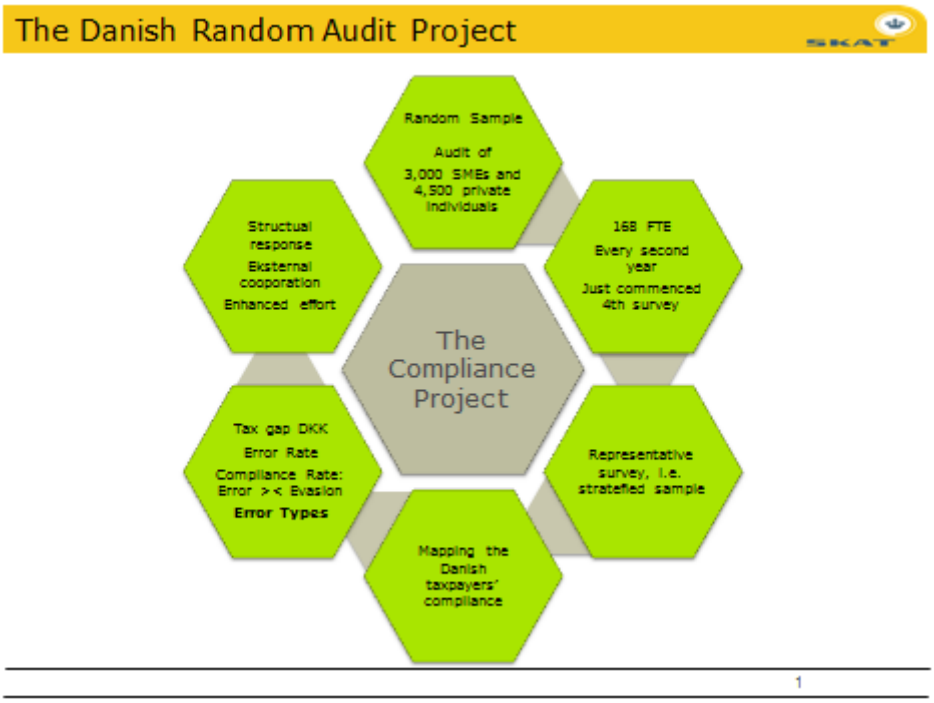
Errors

Tax gap estimates may capture also revenue loss which is caused by factors other than tax evasion, fraud or tax avoidance. One of these factors is errors. While tax evasion (etc.) relate to deliberate behaviour, errors are caused unintentionally and hence require a different approach from a compliance risk management perspective. To distinguish between errors and deliberate tax evasion, the Danish Tax Authority (SKAT) developed the Random Audit Project with the ultimate aim to better monitor compliance risks and design more effective treatments[59]. This is also an important part of tax gap estimation, particularly as identifying the error part of the tax gap can lead to cost efficiencies by improving tax administration processes, as opposed the expense of prosecuting evaders or changing legislation to stop avoidance.

[58] http://ec.europa.eu/taxation_customs/resources/documents/taxation/company_tax/transparency/com_2015_136_en.pdf

[59] https://www.skat.dk/SKAT.aspx?oId=2085053&vId=0

Figure 9: Danish Random Audit Project



Source: Presentation of Mr. Pedersen at the TGPG

Economic cycles

Economic cycles play also a role in tax revenues. In the period of recessions, there are usually more bankruptcies and insolvencies, resulting in a revenue loss for the state budget and increasing the size of the tax gap. Furthermore, past experience in tax gap estimations suggests that, while the theoretical tax liability generally follows the economic cycle, the tax actually collected falls quicker in a period of recession and recovers slower, than the theoretical tax liability. This phenomenon contributes to a larger tax gap in periods of recession, and suggests the influence of economic cycles on tax gap estimates.

Tax and legal system

The structure of the tax and legal system[60] and, more specifically, the provisions of tax law are likely to predestine certain areas of non-compliance. These areas form compliance risks which may be specific to the country's tax legislation. Therefore, when striving for a more robust estimate, the tax gap estimation methodology may need to be adjusted to accommodate country specific features of the tax system. This way, the tax gap estimates will be more robust and suitable for informing

[60] With respect to the legal system, it has to be noted that the rules on bank secrecy, exchange of administrative data and third party data also may affect the accuracy of the estimation.

compliance strategy. In the context of international comparison of tax gaps, differences in the structure of the tax system mean that the development of a 'one-size-fits-for-all' methodology is difficult. As not all particularities of each individual tax system can be reflected in a single methodology, a 'one-size-fits-for-all' methodology may give less robust and less comprehensive tax gap estimates.

Methodological features

Finally, the methodological features of the tax gap estimation (e.g. assumptions, bias corrections, data collection methods, extrapolation methods) will also influence the estimated amount of revenue loss.

2.3. Costs and Benefits

When considering performing a tax gap estimation, it is advisable to first clearly identify the aim and purpose of the estimation, and then analyse the cost/benefit ratio of the potential methodologies.

2.3.1 Use of Tax Gap

Tax gap estimations, including policy gaps, are an indicator of tax revenue loss. Depending on the methodology applied for the estimation, the tax gap can give information on the components of the gap and on the causes of the revenue loss, or it can be only a rough indicator for a trend in revenue loss. When selecting a methodology, it is therefore important to clearly identify the purpose of the estimation and how the results are to be used.

Tax gap estimations, including policy gaps, can be used for different purposes, including:

1. Risk identification in the context of compliance risk management, i.e. identifying the areas and causes of tax evasion and tax fraud;
2. Setting information reporting requirements;
3. Assessing the potential fiscal/budgetary effects of proposed legislative amendments; and
4. Monitoring and evaluating the effects of a legislative or administrative measure on tax revenue.

In contrast to the above examples, it is less advisable to use tax gap estimations for the purposes of short-term performance measurement of the tax administration. This is mainly for the reasons that the size of the tax gap is not only determined by taxpayer compliance, but also by numerous other factors which are beyond the influence of tax administration (e.g. features of tax system, insolvencies in economic recession), and that all tax gap estimates have a certain time-lag and grade of uncertainty, which may bias conclusions (see also Section 3.3 for more details).

If resources allow, it can be recommended to combine top-down and bottom-up methodologies to estimate the tax gap because this allows a comparison of the results. This comparison and the analysis of deviations in the results can provide valuable information on the reliability and robustness of the results and on the need for improvements in the methodology.

As one of the most important drawbacks of the top-down methodology consists in providing macroeconomic indicators that can be hardly split by kind of noncompliance behavior, a tax administration can integrate the bottom-up methodology with the top-down in order to overcome the gap in the results. Such integration can give insight into more detailed information about the tax gap than using a single method on its own. For example, in the UK, this integration is used to better understand the underlying non-compliance behaviours for the tax gap, whereas, in the IMF RA-GAP methodology, the integration is used to understand the industry sector breakdown of the tax gap.

In all cases, one should bear in mind that tax gap estimations always contain a certain uncertainty. The grade of uncertainty is strongly influenced by the data and methods used to estimate the gap, but the results will always remain an approximation of the revenue loss. A prudent interpretation and evaluation of the results therefore require that the element of uncertainty is taken into account when drawing conclusions on the basis of the results. This also implies that the emphasis should be on the trend in the results rather than on the absolute numbers.

2.3.2 Resource intensity

Depending on the selected methodology, tax gap estimations have different resource intensity. The required resources include human resources, information technology (IT), suitable data, and sufficient time and budget. Top-down methodologies are usually less resource intensive than bottom-up methodologies. When selecting a methodology for tax gap estimation, one should carefully consider the resources required to perform the estimation and the usefulness of the produced estimates in the light of the purpose of the estimation. For example, it is not advisable to select a resource intense bottom-up methodology when the results are not going to be utilized in the compliance risk management strategy of the tax administration. By contrast, a top-down methodology may not be suitable if the aim of the estimation is to underpin the tax administration's compliance strategy with information on the sources of non-compliance.

When considering the resource intensity of a desired methodology, the possibility of outsourcing the estimation can also be taken into account. This is, however, not only a financial question or a question of efficiency and cost/benefit ratio, there might be also legal or practical constrains to outsourcing. Legal constraints can relate to the confidentiality of taxpayer data and to the transmission of such data. A practical constraint could be that outsourcing may create future dependency on the contractor for future iterations of the analysis, e.g. when the tax administration wants to repeat the estimation to determine if the level of non-compliance has changed. In practice, most Member States prepare the tax gap estimates in-house.

It is also possible that estimates are prepared by third parties (e.g. research institutions) without an assignment from the national (tax) administration. As these estimations are usually based on top-

down methodologies whereby more accurate and timely national administration data was not available, the results of such estimations may give a rougher estimate of the tax gap compared to the in-house estimations of national (tax) administrations and may lack the relevant context for interpreting the estimates.

For an overview of the current practices of TGPG-Member States in the field of direct tax gap estimations, see Tables 2 and 3 in Section 2.2.2, and in the field of VAT gap estimations, see Tables 5 to 7 in Section 3.2.3.

2.3.3 Background questionnaire

In the questionnaire below (see Table 4), some of the most relevant background aspects of tax gap estimations are listed in the form of questions. These aspects should be considered when making a choice for a specific methodology of tax gap estimation.

Table 4: Background questionnaire

The aim of this questionnaire is to gather some background information about the tax administration which is planning to perform tax gap estimations. The gathered information should aid in optimising the choices made for the most suitable methodology.		
A.	**Tax Administration background**	
1.	How is the administration structured? E.g. large vs. medium vs. small taxpayer offices? Or regional? Filing administration separate from audit control? All taxes administered together or separate indirect vs. direct?	
2.	How is each tax administered? Timing of filing? Registration threshold? Variation in rates? Exemptions? Flat rate scheme?	
3.	How is data collected in the administration? One system for all, e.g. tax returns, payment records and audit records in one place? Is all data linked or linkable via unique tax reference number? What level of detail is held on taxpayers, e.g. size, sector? How reliable are the data systems?	
4.	How are receipts monitored? How are stocks and flows of debt/non-payment monitored?	
5.	What compliance and enforcement activities are carried out? Risk-based audits vs. random audits? Education? Others?	
6.	Is there/ what is the current risk identification and prioritisation process? Does the administration have risk registers? What level of	

	detail is captured in the risk registers?	
7.	What analysis, if any, is already carried out by the administration (or by the Ministry of Finance) on tax gaps? VAT gap estimated? Any others?	
B.	**Other data available**	
8.	Do the National Accounts include input/output tables? If so, how detailed and how reliable? What is the main data source? Who is responsible for producing the National Accounts?	
9.	Does the tax administration have transaction level data, i.e. records per taxpayer of payments received and refunds issued?	
10.	Other survey data available? E.g. business surveys, household consumption survey? Survey of population asking about activity in the informal economy?	

Source: TGPG

2.4 Conclusions

Tax gap estimations are not an easy exercise and it is widely acknowledged that there is no 'one-size-fits-for-all' methodology. For this reason, it is recommended selecting an estimation methodology which is the most suitable under the given circumstances and for the given purposes. In assessing the suitability of a methodology, it is important for a (tax) administration to consider: (i) the structure of the tax system, (ii) potential areas of compliance risks, (iii) available data, and (iv) available resources. Additionally, it is also recommended using multiple approaches (i.e. a top-down approach and a bottom-up approach) for broader perspectives in analyses, and for quality assurance.

3. The VAT Gap

In the European Union, the value added tax is one of the main sources of government revenue in all Member States[61] and is one of the three own resources of the EU[62]. It is therefore important to learn about the scale of potential VAT revenue loss and the underlying reasons. In several EU Member States an estimation of the VAT gap is available. The estimations are prepared in-house by the national administration, by external experts and via EC-financed studies[63]. This chapter describes the most relevant features of the methodologies applied by the TGPG-Member States.

3.1 The VAT System

3.1.1 Main principles

The VAT system in the EU is governed by a common legal framework: the VAT Directive[64]. Accordingly, VAT is a consumption tax and is charged on the supply of goods and services (hereafter together: the product) for consideration within the territory of a Member State by a VAT-taxable person acting as such[65]. This means that VAT is charged when VAT-taxable businesses sell to other businesses or to a final consumer. When VAT is charged to businesses, they are in principle able to deduct the VAT that they pay on their purchases (i.e. input VAT)[66]. Ultimately, only the final consumer should bear the burden of the VAT.

The system of deduction of input VAT ensures that at each stage of production and distribution, VAT is levied only on the 'value added' to the product. The 'value added' means the difference between the cost of inputs into the product and the price at which it is sold to the consumer[67]. As VAT is collected fractionally on the 'value added' to the products at each stage of production and distribution, the VAT revenue is not affected by the length of production and distribution chain. Under the VAT Directive, there is a minimum standard VAT rate of 15%, above which Member States are free to set their own national VAT rates.

---

[61] In 2014, taxes on production and imports accounted for 13.6% of GDP and current taxes on income, wealth, etc. stood at 12.8% of GDP. In the EU-28, revenue from VAT accounted for around 51.4% of the total taxes on production and imports.
http://ec.europa.eu/eurostat/statistics-explained/index.php/Tax_revenue_statistics

[62] Member States decide how to spend the revenue they receive from VAT receipts, except for a small percentage of this total (around 0.3%) which is paid towards the EU budget.

[63] CASE (2013), (2014), (2015)

[64] COUNCIL DIRECTIVE 2006/112/EC of 28 November 2006 on the common system of value added tax
http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02006L0112-20130815&qid=1395759816178&from=EN

[65] Article 2 of the VAT Directive.

[66] Input VAT is not deductible if it is attributable to transactions which are exempt from VAT without the right to deduct input VAT.

[67] http://europa.eu/rapid/press-release_MEMO-11-874_en.htm?locale=en

For the purposes of VAT gap estimations, it is important to understand which economic actors pay final VAT (i.e. VAT which is non-deductible). Households are final consumers and, accordingly, cannot deduct the VAT on their purchases of goods and services. The VAT paid by them will be final. There are, however, also other economic actors who are not allowed, fully or partially, to deduct the VAT on their purchases. These include general governmental institutions and businesses with VAT exempt supplies (i.e. exemption without the right to deduct) or non-taxable supplies (i.e. out of the scope of VAT). When these economic actors purchase goods and services and have no right to deduct, fully or partially, the VAT paid on these purchases will be final. These economic actors can then be considered as final consumers in these cases. In VAT gap estimations, all amounts of final VAT need to be taken into account to be able to adequately estimate the total amounts of VAT theoretically collectable and so the VAT gap.

3.1.2 VAT evasion and fraud

Transactions carried out among economic actors may lead to non-compliant behavior in the relationship between businesses (i.e. taxable persons: B2B), and between business and households (i.e. taxable person and consumer: B2C). Tax evasion by businesses relate usually to segments of the value chain where the right to deduct VAT is limited and the business is practically in the position of a final consumer.

There is no generally applicable definition of VAT evasion. The meaning of evasion depends on the interpretation given to it in the national administrations or on the context in which it is used. Usually, VAT evasion refers to the deliberate under-declaration of taxable transactions, but it can also cover the non-declaration of taxable transactions related to concealed legal and illegal economic activities. For more details on the terminology, see Section 2.2.3.

VAT fraud is a specific phenomenon which is inherent to the VAT system and, in general, involves a fraudulent deduction/claim of input VAT and non-payment of output VAT. There are a number of different kinds of VAT fraud. One of the most known types of fraud is the Missing Trader Intra-Community (MTIC) fraud. MTIC fraud involves two elements: (i) a defaulting trader, literally a trader that defaults on its VAT liability without paying the tax due; and (ii) goods being traded, which to a large extent in carousel[68] and contra-trading variants[69] are irrelevant and are only present in order that the fraud can be perpetrated. The fraud may also be perpetrated with no goods being involved.

[68] HMRC definition: Carousel fraud is like acquisition fraud, except that the goods or services do not end up with an end consumer. Instead they go round, usually ending up back in the UK. (http://www.hmrc.gov.uk/manuals/vatfmanual/VATF23540.htm). Acquisition fraud involves the purchase of goods or services from another EC Member State and the sale to a final consumer. In many cases the route the goods or service take is different to the audit trail (invoices). It involves a defaulter and usually buffers (http://www.hmrc.gov.uk/manuals/vatfmanual/VATF23530.htm).

[69] HMRC definition: The term 'contra trader' refers to a UK VAT registered taxable person that participates in two separate types of transaction chain during the same VAT period, where the output tax from one chain is designed to off-set the input tax incurred on the other chain (http://www.hmrc.gov.uk/manuals/vatfmanual/vatf23550.htm).

With respect to illegal transactions, it has to be noted that these fall under the scope of VAT, though the VAT Directive does not explicitly addresses the taxability of such transactions. Art 2. VAT Directive provides that a transaction is subject to VAT if it constitutes the supply of goods/services for consideration within the territory of a Member State by a taxable person acting as such. Accordingly, and based on the general principles of VAT[70] and on the case law of the European Court of Justice[71], the illegal character of a transaction is irrelevant, unless it concerns clearly prohibited supplies, such as e.g. narcotic drugs, counterfeit money.

3.2 VAT Gap Methodologies

3.2.1 Definition of VAT Gap

In this Chapter, the VAT gap is defined as the difference between the total amounts of VAT theoretically collectable based on the applicable tax law (i.e. including exemptions and lower rates) and the total amounts of VAT actually collected in a given period. It can be expressed in absolute or percentage terms. This definition of the VAT gap may also be referred to as the compliance gap, especially in relation to the policy gap (see also Section 2.1).

Figure 10: Definition of VAT gap in absolute and in percentage terms

VAT gap = (total amounts of VAT theoretically collectable based on the applicable tax law) – (total amounts of VAT actually collected)

$$\text{VAT gap (\%)} = \frac{VAT\ gap}{\text{total amounts of VAT theoretically collectable based on the applicable tax law}}$$

Source: TGPG

There are several reasons for VAT revenue loss. Some of the reasons relate to tax evasion and fraud, while other possible reasons include tax avoidance, bankruptcies, insolvencies, errors in determining tax liability, as well as cancelled or deferred VAT debts. It is therefore important to understand that the above defined VAT gap captures more than only deliberate non-compliance by taxpayers, and

[70] In order to secure the neutrality of the VAT and to prevent distortion in competition, the illegal character of the transaction should in principle be irrelevant.

[71] Based on the merit of the VAT Directive, the ECJ ruled in specific cases that the following activities are under the scope of the VAT: sale of counterfeit perfume (see C-3/97), the organization of illegal games (see C-283/95), facilitation of the sale of drugs (see C-158/98) and the export of illegal computer systems (C-111/92). However, the ECJ also ruled that certain prohibited activities are outside the scope of VAT: the sale of narcotic drugs (see C-294/82, 269/86, 289/86) and the trade in counterfeit money (C-343/89).

that each tax gap estimate needs to be interpreted in the light of the specific methodology and underlying data employed for the estimation.

3.2.2 Top-down and bottom-up

In the top-down methodologies of VAT gap estimation, the tax gap is usually estimated on the basis of national accounts data. For the purposes of determining the amount of VAT theoretically collectable, basically, two different methods can be followed: the 'consumption based method' and the 'production based method'.

Under the 'consumption based method', the total potential taxable final consumption forms the potential VAT base. The potential VAT base is estimated by employing national accounts data on final consumption and on intermediate consumption for exempt supplies. The total amounts of VAT theoretically collectable are then obtained by multiplying the potential VAT base with the relevant effective VAT rate. The 'consumption based method' is also referred to as the 'demand based method' and is applied, for example, by CASE in the VAT Gap Study[72].

Under the 'production based method', the potential VAT base is estimated based on the value added by industry, with the help of national accounts data. The total amounts of VAT theoretically collectable are determined based on the difference between the VAT due on taxable output per sector and the amount of input VAT deductible per sector[73]. The 'production based method' is also referred to as the 'supply based method' or 'value added method' and is applied in the IMF's RA-GAP methodology.

The tax actually collected can be estimated based on the ESA tax revenue statistics (see Section 2.2.2) or revenue data in the databases of the national tax administration. It is also possible to employ primarily ESA data and refine it with tax administration data, where necessary, in order to get a more accurate estimate for the purposes of the VAT gap estimation. For example, the RA-GAP methodology uses tax returns data to better estimate the real accrual of tax revenue.

The top-down methodologies of VAT gap estimations identify the maximal size of the gap. The basic assumption behind revenue loss estimation based on national accounts is that the macro-economic aggregates of private consumption, intermediate consumption, investments of governments and other specific sectors providing VAT exempt supplies (e.g. financial sector) encompass all VAT taxable consumption. However, as the exact level of the non-observed economy is difficult to estimate and incorporate into the national accounts[74], the real scale of VAT evasion might differ from the estimated values in the VAT gap. Nevertheless, the top-down methodologies are more likely to give comprehensive results than the bottom-up methodologies, but the latter are unlikely to allow for quantification of the main components of the VAT gap, e.g. how much is due to evasion and fraud.

[72] CASE (2013), (2014), (2015)
[73] Presentation of Mr. Eric Hutton (IMF) at the TGPG in Brussels.
[74] National accounts may cover non-observed activities to a different extent because the measurements depend on national practices. For more details see Section 2.2.3.

In the bottom-up methodologies of VAT gap estimation, the gap is estimated with the help of micro-level data, e.g. data of individual cases, which is then extrapolated to the population of the relevant segment. The data can be gathered by the tax administration in tax audits or other enquiries. The extrapolation of data can be a very challenging aspect of bottom-up methodologies. The most prudent extrapolation requires a random sample of tax audits, rather than risk-based audits in order to reduce sampling errors and narrow confidence intervals. In terms of VAT evasion and fraud, drawing a random sample for B2C evasion is costly, and for B2B evasion/fraud is very difficult. Therefore, bottom-up approaches may not deliver a comprehensive estimation of VAT revenue loss due to evasion/fraud.

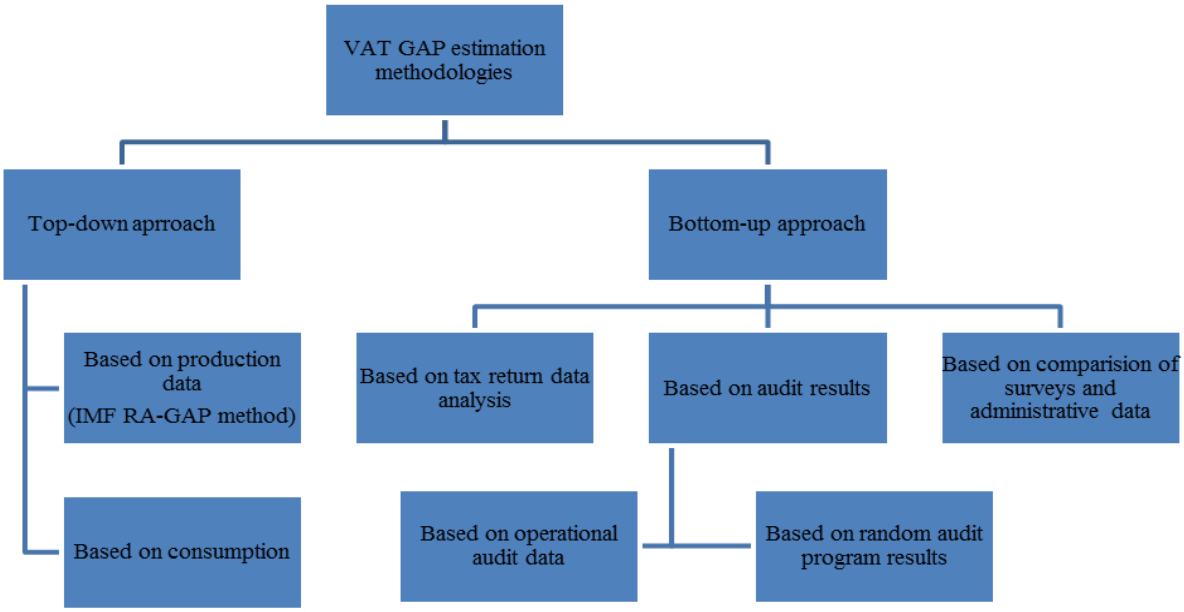
For more information on potential shortcomings and biases of VAT gap methodologies, see Section 3.3.

3.2.3 Current practices

Methodologies

Depending on the available data, administrative capacity and main objectives of the VAT gap estimation, the TGPG-Member States apply different methodologies to estimate the gap. There is no common methodology to estimate the VAT gap. Most commonly, a methodology based on a top-down approach is applied. There are, however, several practices based on a bottom-up methodology. The VAT gap tree below illustrates the methodologies applied in the TGPG-Member States in relation to each other based their main characteristics.

Figure 11: VAT gap tree of the TGPG-MSs



Source: TGPG

The most relevant and specific aspects of the methodologies indicated in the VAT gap tree above are further outlined in Table 5. The table shows that the estimations are usually prepared in-house according to a (mainly) top-down methodology.

Table 5: VAT gap methodologies in the TGPG-MSs

MS	In-house / External	Top-down (T)/ Bottom-up (B)	Specific aspects
CZ	In-house	T	VTTL estimation based on two methods: consumption based method and GDP adjustment method
EE	In-house	T, B	T: production based method (IMF RA-GAP method) B: analysing VAT returns, certain added value is set and it is assumed that taxpayers must exceed this level to survive
FI	In-house, External	T	Production based method (IMF RA-GAP method)

FR	In-house	T	-
DE	External	T	-
IT	In-house	T	VAT gap is estimated following two hypothesis: with complicity (upper limit of gap estimates); and without complicity (lower limit)
LV	In-house	T	$GAP = \frac{(PM - FA) + D}{PM}$ *PM* - potential VAT; *FA* - tax calculated voluntarily by taxpayers; *D* - VAT calculated voluntarily but not paid
PL	In-house	T	VTTL is estimated using final VAT base on macro level
PT	In-house	T	Production based method (IMF RA-GAP method)
SK	In-house	T	Consumption based method: adjusted nominal GDP is used as a VAT base, components that are not subject to VAT are deducted
	In-house	T	Production based method (IMF RA-GAP method)
SI	In-house	B	VAT return data analysis – comparing the value added from tax returns with certain level of value added. It is expected that value added should amount at least 10 % of value of purchases.
UK	In-house	T	Consumption based method
		B	Combination of analysis of random audit results and management information as well as illustrative estimation where assumptions are applied to management information to estimate the gap

Source: TGPG questionnaire

Resource intensity

The data required for VAT gap estimation is usually gathered from the National Statistical Office (e.g. input-output tables) and from the national tax administration (e.g. VAT returns data). In all estimations, the quality of data is decisive for the reliability of the estimated results. In most TGPG-Member States, the calculation of the VAT gap is done in Excel. Only some TGPG-Member States use specialized software, such as Stata or SAS.

The human resources and the time employed for VAT gap estimations vary country by country as the intensity of these resources depends also on the specificities of the national VAT legislation and the level of details in the calculation. Furthermore, differences in the resource intensity may also follow from the experience build-up in performing the estimation. While the development of the estimation methodology is the most time and human resources consuming phase, the updating of the estimates is usually less demanding.

The country specific information on the employed resources is summarized in Table 6 below.

Table 6: Resource intensity

MS	Data resources	Other resources		
		Headcount	Time	Software
CZ	National accounts, input-output tables, internal source of MoF	0,5	1 month	Excel
EE	National accounts, VAT declarations` database	2	T: 2x a year 2 weeks B: quarterly 1 week	Excel, SAS
FI	Input-output tables, other statistics (e.g. sales of hotel and restaurants, foreign trade)	na	3-4 months	na
FR	National accounts, input-output and consumption tables, VAT statements	na	na	na
DE	ESA data, input-output tables, annual reports of state-owned companies, other statistics	na	na	na
IT	Administrative and national accounts data	3	4 months	SAS, Excel
LV	National accounts, supply-use tables, PIT and VAT returns, annual reports of taxpayers	1-3	2 weeks	Excel, Data Warehouse (VAT returns)
PT	Resources-uses tables, national accounts, VAT returns	1	1-2 months (plus extraction of data)	Excel, Stata
PL	National accounts	3	na	Excel, R.
SK	Consumption method: national accounts, administration data, statistical office data	1	na	Excel, Stata
	Value-added method: supply and use tables, investment and VAT matrix, individual VAT tax returns and database of transactions	1	2 weeks	Excel, Stata
SI	VAT returns	1	1 year (for 3x a year)	Excel
UK	T: National accounts, consumer trends data, VAT receipts, VAT own resources	1 + supervisor	3 months	Excel, macro
	B: random audit, risk registers, administrative data, third party information, tax returns	3	3 months	Excel, SAS, SQL, Access

na: not available
MoF: Ministry of Finance
B: Bottom-up methodology
T: Top-down methodology

Source: TGPG questionnaire

Purpose and publication

In most of the TGPG-Member States, the VAT gap estimates calculated in-house are not published. Estimations made by external parties are however, published. The in-house estimates in most cases cannot be decomposed and are usually used for VAT policy purposes. Table 7 provides an overview on the use and publication of the results in the TGPG-countries.

Table 7: Use and publication of results

MS	Top-down (T)/ Bottom-up (B)	Decomposition of the VAT Gap	Use of results	Publication of results
CZ	T	No	Policy measures, measures to decrease VAT gap	Not officially by MoF
EE	T	No	Setting strategic and tactical priorities, motivation for changes in law, to draw public attention	Published through press announcements
	B	Yes	Quality of tax administration`s performance	
FI	T	Yes	Not finished yet	Not finished yet
FR	T	No	Construction of national accounts (VAT gap is a part of GDP)	Yes (approx. every 5 years)
DE	T	na	Indication for further research	Yes – external studies
IT	T	Yes: by territorial dimension and final consumption users involved	Policy evaluation, Key performance indicator (KPI) of Italian Revenue Agency	Yes
LV	T	No	Indicator used in strategy of tax administration	Presented to media
LT	T	No	For taking strategic decisions	No - for internal use only
	B	Yes: by sector and region	Selection of taxpayers for VAT audits	
	Surveys	No	Communication strategy, identification of risk areas, Tax administration action plan	
PL	T	No	Internal use	Not yet
PT	T	Yes: by sector	Confidential use only	No
SK	T: Consumption based method	No	Indicator of VAT collection efficiency, part of revenue forecast	Not yet

	T: Production based method	Yes: by sector	Identification of most risky sectors, targeting of anti-fraud measures	
SI	B	Yes: by sector, region, individual groups of taxpayers	Estimations are only informative	No
UK	T	No	Forecast of VAT receipts, strategy development, operational planning	3 times per year - Measuring Tax Gaps publication and two standalone VAT gap publications
	B	Yes: by behaviour (error vs evasion), customer group (large vs SME)		Only some components

na: not available
MoF: Ministry of Finance
B: Bottom-up methodology
T: Top-down methodology

Source: TGPG questionnaire

3.3 Limitations and Shortcomings

Each methodology of VAT gap estimation has its advantages, but also its limitations and shortcomings. When selecting a methodology or evaluating the results of the estimation, it is important that the main features of the methodology, and its limitations and shortcomings are taken into account. For this purpose, this section tries to provide an overview of the most relevant features of VAT gap estimations.

It is paramount to stress the 'uncertainty' in any tax gap estimations in terms of sampling errors or confidence intervals. This uncertainty affects the reliability of the estimated results and should always be considered in a conscious interpretation of the results.

3.3.1 Top-down methodology

The top-down methodology can be characterized by the following features:

1. VAT gap estimations may show volatility over time which is actually due to revisions in the underlying estimates rather than changes in compliance. Accordingly, such revisions can be caused by:

   (i) a periodic revision of the national account magnitudes and/or of the VAT revenue series (e.g. the switching from ESA 1995 to ESA 2010); and

(ii) updates of previously forecasted input data. It is not uncommon for the estimation of the latest possible VAT gap to require the application of forecasts and projections. This way, the latest VAT gap might be the least reliable estimate. In subsequent years, when outturn data becomes available, the VAT gap estimates may be subject to revision where the forecasts and projections differ from the outturn data.

2. There can be factors other than compliance which contribute to the difference between the amounts of VAT theoretically collectable (as calculated on the basis of national accounts aggregates) and the amounts of VAT actually collected, i.e. to the VAT gap. In order to reduce the effects of these factors and to improve the quality of the estimates, the following measures are advisable:

   (i) In the estimation of the VAT actually collected, it is advisable to substitute the VAT national account revenue figures with figures which are closer to "real accruals" in order to arrive at a more accurate VAT gap estimate and gain stability in the results. The VAT national account figures are usually derived from cash accounting data. In principle national accounts recording is on an accrual basis[75]. However, in the context of taxes "*the time-adjusted cash method is considered an acceptable proxy for accruals*"[76,77]. The revenue collected is usually estimated from payment receipts and include also revenues and refund flows related to previous tax years[78]. In this system, also the impact of changes in VAT excess credits[79] carried forward can be distorting and outstanding[80]. In genuine accrual based VAT collection figures, it makes no difference if the excess credit is actually refunded or if it's carried forward, as it's considered that the liability is generated in the moment in which the excess credit is generated and not in which it is refunded.

   Net VAT due (i. e. total revenue in the absence of non-compliance) corresponds to the difference between total output tax and total input tax in a given period, evaluated from VAT returns. This estimate doesn't include VAT payments and excess credits related to previous periods. Thus, for each return, potential revenue (VAT due) can either be positive or negative, depending on the relative size of input tax and output tax. If negative, this excess

[75] Section 20.171 in ESA 2010.
[76] Section 20.174 and Section 4.150 in ESA 2010.
[77] In the context of tax gap calculations these proxies might be insufficiently accurate, hence the efforts to estimate real accurals.
[78] Although net VAT cash collections are corrected with a lag of about 2-3 months in national accounts data in order to approximate accrued revenues, the figures represent a quite rough approximation of accrued revenues. Therefore, several countries have made efforts to construct better data series which more closely approximate accrued revenues.
[79] VAT excess credit is the amount of VAT which is refundable to the taxable person, but which is carried forward to following taxable periods. This carry forward facility is not available in all EU Member States.
[80] Cash basis estimated revenue is more volatile mainly because, in periods of economic recession, there is a significant increase in requests for refunds while in periods of economic growth there is a tendency to carry the excess credit forward, mirroring more the cash needs of taxpayers than changes to the economic cycle. This effect is likely to bias indicators, namely the VAT gap which considers cash adjusted revenue, implying relatively higher volatility to the economic cycle than there actually is.

credit is considered expenditure, regardless of being refunded or being carried forward. If positive, the tax liability can translate into a payment, reduce the stock of credits carried forward from previous periods or not be paid. This last case makes the difference between potential revenue (net VAT due) and accrued collections[81].

For the above reasons, a method whereby the revenue figures are based on VAT taxable period figures obtained from the VAT returns (i.e. output VAT minus input VAT, corrected from non-paid amounts), is more sensible and accurate. These accrual VAT figures also avoid the impact of some distorting extraordinary events (e.g.: major refunds due to court cases resolved in year t but derived from tax returns submitted in year t-x).

(ii) In the estimation of the VAT theoretically collectable, it is advisable to have a systematic and thorough revision of the impacts of the discrepancies that may derive from:

- non-harmonized definitions of the VAT taxable base and the national account aggregates which require a number of adjustments to national accounts data to get closer and be consistent with the VAT taxable base. As definitions in VAT laws and statistical conventions are not harmonized, there may be relevant discrepancies in the periods in which transactions are recorded[82], leading to bias in the estimation of the liability[83]. In these cases, the use of transition matrices needs to be considered;

- conciliation of the estimates of exempt transactions (without the right to deduct input VAT) and calculation of 'propexes';

- lack of coverage in some sectors or geographic areas; and

- threshold issues (for SMEs), limitations to the deductibility of input VAT (e.g. for cars, fuel) or special regimes for some specific activities (e.g. agriculture and livestock, travel agencies) or territories.

The above described discrepancies between the VAT and the national accounts data must be properly addressed in order to avoid misleading VAT gap estimations which are statistically biased.

3. The estimated amounts of the VAT theoretically collectable include also national accounts estimates of the non-observed economy to fulfill the exhaustiveness criteria. The component of the non-observed economy, however, cannot be isolated in the VAT gap estimation

[81] Rodrigues (2015)

[82] Concerns imputation rules of transactions to periods (e.g. calendar register, housing expenditures attributed when the house is sold or when it was built).

[83] This appears to have been the case, for instance, in Spain with regards to the construction industry, where the taxable moment for VAT purposes is different from the time at which construction is recorded in the national accounts. In normal times, these differences would even themselves out over time, but for instance during the post-2008 construction collapse, important differences remained as stocks of unsold housing continued as such over time. See, CASE (2015).

because the underlying data is confidential and country-specific[84]. This means that the estimated size of the VAT gap may be influenced by the relative importance, scope and accuracy of national accounts adjustments to incorporate concealed economic activities in each country. Furthermore, it needs to be noted that estimates of concealed economic activities do not provide a useful basis for assessing trends in tax fraud, in particular since uplift factors are usually not verified and updated systematically.

4. It is difficult to isolate which part of the top-down VAT gap estimate is related to evasion and fraud, and which part of the gap arises from avoidance, errors, payment deferrals or insolvency[85]. Further, top-down VAT gap estimations do not provide any guidance on the nature and characteristics of VAT evasion and fraud, and do not indicate the practices where such activities are concentrated[86]. Accordingly, from the perspective of tackling non-compliance, the top-down VAT gap estimate is not fully informative, so may be of limited use, leaving tax administrations in a precarious position regarding the causes and potential measures.

5. The top-down estimation methodologies can't be applied to periods shorter than 1 year as a consequence of the characteristics of national accounts data.

6. Finally, a top-down approach might suggest implicitly that national accounts data sources and estimations are more accurate and comprehensive than tax data (i.e. administrative data). This would be an unjustified assumption as it is acknowledged that the continuous process to incorporate administrative registers and tax data into national accounts databases improves the quality and broadness of national accounts. However, this process of internalization of tax data into national accounts taints top-down VAT gap estimations because independence between tax data and national accounts data is not ensured, which might bias top-down estimations. Countries which use more intensively tax data in their national accounts tend to get lower VAT gap estimates than countries which rely more on statistical samples for the purposes of national accounts estimates. In the end, this might imply that the size of the VAT gap can be more affected by the quality of the national accounts data than by the effects of measures against non-compliance. Furthermore, the here described feature of top-down methodologies can distort international comparisons.

3.3.2 Bottom-up approach

The bottom-up methodology can be characterized by the following features:

1. In many cases, the estimates are derived from information disclosed (to the administration) in individual cases (e.g. tax returns, enquiries, surveys). As disclosure of the requested

[84] As Eurostat has recognized, there is a wide range between countries of uplift corrections — from 1.7% to 23.3% of GDP —to fulfill the exhaustiveness criteria in national accounts using different methodologies.
[85] The more the top-down estimates are broken down, the more errors occur.
[86] Break-down of the top-down estimates by geographical areas and economic sectors is performed e.g. in Italy and under the IMF RA-GAP.

information (even if done anonymously) depends on the honesty of the respondent, estimates based on this type of disclosure are likely to be biased downwards, i.e. to give a lower bound of non-compliance.

2. Where extrapolation is based on operational risk-based audits, it needs to be taken into account that operational audits are usually undertaken on returns where substantial non-compliance is deemed likely, i.e. biased toward the riskier side of non-compliance spectrum. To adjust for this bias, statistical means (e.g. regression, statistical matching and sample selection models) should be applied.

3. Where extrapolation is based on random audits, the size of the random audits needs to be large enough to obtain reasonable precision in the extrapolation. Obtaining a statistically robust sample size of random audits is highly resource intensive. In practice, where a tax administration has yield targets for their audits, tax auditors are not very keen to do random audits for the purposes of expanding the sample because this work can be less rewarding in terms of yield. Auditors have to "sacrifice" their (more profitable) targeted operational risk-based audits to carry out random audits. Furthermore, in some countries, there can be administrative and legal restrictions in tax administrations to modify the audit selection planning in order to incorporate random audits.

4. In the bottom-up methodologies, when using extrapolation based on the random audit results, a multiplier is often needed to account for where the auditor is unable to uncover all discrepancies in the actual tax liability. Hereby, it is implicitly assumed that the amount revealed by the random audit is the total amount concealed, which in fact does not always have to be the case.

5. It can be difficult to include large businesses into bottom-up methodologies of VAT gap estimations. Therefore, large businesses may not be covered by bottom-up estimation which can result in partial VAT gap estimates. The main issue with the coverage of large businesses is that the population tends to be much smaller and much more heterogeneous than the SMEs population. As such, traditional sampling approaches are not appropriate for obtaining a representative sample.

6. The use of methods based on the discrepancy between the results of multiplying total purchases by a fixed value-added factor (the same over all the economic activities and the business cycle) and total sales declared, might give less accurate results. The results might rather be an indicator of general under-profitability than of under-reporting. Besides, the VAT gap depends on the fixed value-added factor considered, which means that the lowest factor gives the lowest gap.

3.3.3 Combined top-down and bottom-up

While it may be more costly in terms of resources, to carry out a combined top-down and bottom-up approach, the benefits can be significant. Using more than one approach to tax gap estimation can

provide options for sense checking and quality assurance of estimates. Also, while the top-down methodologies of VAT gap estimations can offer a ‘comprehensive’ estimate of the total revenue losses, the bottom-up methodologies can provide insights as to which parts of these revenue losses can be tackled with an envisaged reform method. Such a case might be the ex-ante assessment of the fiscal effects of major tax reform options. An impact assessment for a comprehensive VAT reform requires a comprehensive gap analysis, including both tax gap and policy gap, to break down the 'total VAT gap'.

3.4 Conclusion

The reasons for seeking to measure the VAT gap might vary. For instance, one might want to quantify the main channels through which VAT evasion takes place, to assess (ex-ante) the likely effects of reform options or to monitor and evaluate the impact of such reforms and other counter-measures after they have been introduced. To achieve such objectives, as described in the sections above, it needs to be clearly defined beforehand what is the aim and purpose of the estimation and the main features of potential methodologies. As this report shows, there is no 'one-fits- for-all' VAT gap indicator or 'one-fits-for- all' estimation methodology. The choice for a methodology largely depends on the purposes of the estimation and the available resources.

4. Country chapter

This chapter provides an overview of the current practices of TGPG-Member States and descriptions of the methodologies applied to estimate the VAT gap. The chapter is prepared based on a questionnaire which was developed and completed by the participants of the project group (see Table 8). The findings are included in this chapter per TGPG-Member State. It needs to be noted that the information reflects only on national practices and therefore the EC-financed studies[87] are not covered.

Table 8: TGPG questionnaire

PART I. TAX GAP Estimates (other than VAT Gap)	PART II. VAT GAP Methodology
1. Does your country estimate personal income tax gap? 1.1 Based on which methodology? Please give a short description. 1.2 Are the results published? If possible, please include link to web-site. 1.3 Are there any particular issues which you would like to raise for potential discussions? **2. Does your country estimate corporate income tax gap?** 2.1 Based on which methodology? Please give a short description. 2.2 Are the results published? If possible, please include link to web-site. 2.3 Are there any particular issues which you would like to raise for potential discussions? **3. Does your country estimate social security gap?** 3.1 Based on which methodology? Please give a short description. 3.2 Are the results published? If possible, please include link to web-site. 3.3 Are there any particular issues which you would like to raise for potential discussions?	1. Which method is used by your country to estimate the VAT Gap? #. Who prepares the estimations (e.g. in-house or outsourced)? 2. Which data sources are used? 3. What and how much resources are required (e.g. time, headcount (fte), software)? 4. How is the calculation made? Which formulas are used? 5. Which assumptions are used? 6. Which bias corrections are applied? 7. What is the nature of the result(s) of the methodology? 8. Is it possible to break-down the results per sector, per region or otherwise? 9. How does your country use the estimates? Please give some examples. 10. What are the main issues and/or disadvantages of the methodology? 11. Are the estimates published? If possible please indicate the link to the web-site? 12. What is the time difference between the publication and the reference year of the estimates? 13. What is the coverage of the estimation (taxpayer population)? 14. How does the revision process of national accounts affect the estimation?

Source: TGPG

[87] CASE (2013), (2014), (2015)

4.1 Belgium

The Belgian administration has a long tradition in estimating elements of the policy gap, but it does not prepare in-house estimations of the VAT gap. There is an annual inventory of tax expenditures[88]. The Belgian Ministry of Finance considers VAT gap estimations as part of the work done in the context of the EU VAT own resources and the CASE-study[89], because of the link with budgetary and tax expenditure calculations. Hence, it closely reviews the results of the CASE-study. In the past, it was explored if the results of the CASE-study for Belgium could be refined, but this attempt did not lead to useful results.

4.2 Czech Republic

In the Czech Republic, the VAT gap is estimated based on a top-down approach. The estimations are prepared in-house by the Ministry of Finance.

4.2.1 Methodology

The VAT gap estimations cover the total taxpayer population and cannot be broken down by sectors or otherwise. The calculation of the VAT gap consists of four main steps: (i) a theoretical VAT tax base of the whole economy is estimated; (ii) an effective VAT tax rate is determined for the whole economy; (iii) the effective VAT tax rate is applied to the theoretical VAT tax base, resulting in a theoretical VAT tax liability; and (iv) the theoretical VAT liability is compared with the actual VAT receipts. The difference between the theoretical VAT liability and the actual VAT receipts constitutes the VAT gap.

For the calculation of theoretical VAT liability, two methods are used: (i) consumption based method: estimation based on input-output tables of the national accounts (so called consumption based method), and (ii) estimation based on GDP adjustments. More information on the methodology and related data collection methods can be found in an academic paper on the VAT gap in the Czech Republic[90].

As not all data required for the estimation of the VAT gap can be known with certainty, some assumptions are made in the calculations. These assumptions relate to the determination of the applicable VAT rate when consumption is divided in different categories which categories are subject to different VAT rates. In this case, without knowing any details, one must decide which VAT rate to use or how to calculate the “average” rate. No bias corrections are applied.

The main disadvantage of the methodology is that it only provides an overall figure of the VAT gap which cannot be broken down to different elements of the gap, indicating specific areas of increased

[88] http://finance.belgium.be/en/figures_and_analysis/figures/federal_tax_expenditures_report
[89] CASE (2013), (2014), (2015)
[90] Stavjaňová, J. (2014)

non-compliance. Furthermore, revisions of the national accounts data require a revision of the VAT gap estimates. A revision, however, is very time consuming and thus not always feasible.

4.2.2 Resources

The data used for the estimations is mainly taken from national accounts. Additionally, some specific data is used from internal sources of the Ministry of Finance, such as e.g. effective VAT rate, VAT taxable persons whose turnover is below the registration threshold. The calculations are done in excel.

Experience shows that the most time consuming is to download and prepare data from national accounts as only publicly available data is used for the estimations. The estimations therefore depend on the availability of data, the frequency of publishing new data by the Czech Statistical Office and also on the revision of the available data.

4.2.3 Results

The VAT gap estimations are prepared only for internal purposes and the time difference between the internally estimated results and the year of estimation is 2 years. For official communications and public announcements, the results of the CASE study[91] are used. Additionally, an academic paper about the VAT gap in the Czech Republic is available in English[92].

As tax evasion is a high priority in the Czech Republic and several measures are being planned to fight it (e.g. fiscalisation of cash payments, electronic VAT reporting), it is hoped that these measures will positively affect the VAT gap (i.e. reduce the gap). Hereby, the evolution of the gap is considered to be more important than just the absolute size of the gap.

4.3 Estonia

The Estonian administration applies a top-down approach based on consumption, and a bottom-up approach based on VAT returns to estimate the VAT gap. The estimations are prepared in-house by the Estonian Tax Authority. Also, there has been a project with IMF to estimate the VAT gap according to the production based method. The report can be found online: https://www.imf.org/external/pubs/ft/scr/2014/cr14133.pdf

4.3.1 Methodology

The VAT gap estimations cover the total taxpayer population which includes ca. 75 000 VAT registered taxpayers. The top-down methodology uses national accounts data and is very similar to the one applied in the CASE study[93]. The result of the estimation is a total amount of the VAT gap (i.e.

[91] CASE (2013), (2014), (2015)
[92] Stavjaňová, J. (2014)
[93] CASE 2013, 2014, 2015

sum and percentage of total theoretical liability and GDP) which cannot be broken down for sectors or otherwise. For the calculation of the actual VAT collection, the data of actual accrued collection is used. This means that the VAT paid is attributed to the period in which the VAT obligation actually occurred. When estimating the target year's VAT gap, the potential VAT of the target year is compared with the VAT declared in the target year and with VAT paid based on the VAT returns of the target year.

The bottom-up methodology uses data form the VAT returns. The VAT gap is calculated based on the added value declared in the VAT returns of the year of estimation (i.e. 12 months period). The main assumption of the bottom-up estimation is that the VAT taxable person's income from its economic activities exceeds its expenditures. Therefore, for the purposes of the estimation, a certain expectable added value level (rather conservative - low) is assumed which is necessary for the survival of the business (i.e. for the continuation of the economic activity). The bottom-up methodology gives the possibility to break-down the results and to present the figures from a specific angle. The logic of the methodology is to estimate the taxpayer's cash flow from non-financial transactions by using VAT returns. Usability of the methodology depends a lot on the complexity of a country's VAT rules and on the exact form of the VAT return.

The main disadvantage of the top-down methodology is the time-lag between the present and the period for which the statistical data is available. To mitigate this disadvantage, the tax administration tries to predict missing years' data. Furthermore, if the consumption data in national accounts is adjusted, and usually it is, then the top-down estimations need to be revised. This is also the reason why the results are being announced only ca. 11 months after the year of estimation. The main disadvantage of the bottom-up methodology is that it does not cover the entire VAT gap, but approximately only half of it.

4.3.2 Resources

For the purposes of the top-down methodology, the national accounts' data and the accrued VAT collection data are used. For the bottom-up methodology the data of the VAT returns' database is used.

In the context of human resources, 2 employees are engaged in estimating the VAT gap. The preparation of the top-down estimation of the gap takes about 2 weeks per estimation, twice a year. The preparation of the bottom-up estimation takes about a week and is estimated quarterly.

4.3.3 Results

The results are public, but not published as a document on the website of the tax administration. The results are made public through press announcements in Estonian. The time difference between the publication of the results and the year of estimation is usually 11 months. Preliminary estimates are used in public communications 4–5 months after the year of estimation.

The results of the VAT gap estimates are used for setting strategic and tactical priorities for the tax administration. Additionally, the results of the bottom-up estimations are also used to evaluate the performance of the tax administration and the impact of tax administration measures. Furthermore, the VAT gap estimates are also used to motivate changes in the legislation aimed at reducing VAT fraud and evasion, and to raise awareness of tax evasion. By announcing the results, the tax administration tries to make clear that tax evasion is not only an issue of the tax administration, but also of the society. It tries to call on people to be more compliant and show what public benefits could be provided with a higher tax revenue.

4.4 Finland

In Finland, the IMF's RA-GAP methodology is used for estimating the VAT gap. Initially, an in-house estimation was prepared for 2010, but after having joined the IMF's RA-GAP Program, the VAT gap is being estimated for the period 2008-2014 with the assistance of the IMF.

4.4.1 Methodology

The VAT gap estimations cover the total taxpayer population. The application of the RA-GAP methodology in Finland is described in more details in the IMF's country report (see reference under Section 4.4.3). At this stage, it is difficult to evaluate the strengths and weaknesses of the methodology in Finland and their effects on the results. Naturally, if national accounts are revised, then also the results of the VAT gap estimations will change and, therefore, need to be revised.

4.4.2 Resources

In the calculations, the theoretical VAT liability is estimated primarily by using data of the input-output tables in the national accounts, but also some other statistics are used (e.g. PRODCOM, sales of hotels and restaurants, foreign trade statistics).

Experience showed that making the calculations for the first time is the most time consuming. It took about 3-4 months (not fulltime) to estimate the VAT gap.

4.4.3 Results

The results of the first VAT gap estimations are published in Finnish. A summary of the results in English can be found at: http://www.vero.fi/download/The_Grey_Economy_2014/%7BB108A9DB-3AD6-4377-8D54-47349CA2D496%7D/10269 (see p. 6-7). The IMF's country report can be found at: http://www.vero.fi/download/Revenue_Administration_Gap_Analysis_Program__The_Value_Added_Tax_Gap/%7B0ECEC06F-AC04-4C91-9048-7E1F0CCB00ED%7D/11669

The time difference between the publication and the reference year of the estimates is about two years. Currently, the results of the estimates are not directly used for a specific purpose in Finland.

4.5 France

In France, a top-down approach is used to estimate the VAT gap. The estimations are prepared by the French National Institute for Statistics and Economic Research (INSEE), with the support of the French Treasury in the analysis of the fiscal legislation.

4.5.1 Methodology

The VAT gap is estimated for the whole economy and it is not possible to break-down the results per sector or otherwise. The theoretical VAT liability is calculated by using data of the use-tables in the national accounts[94], data of VAT returns (at an aggregated level) and some specific statistics for few products (e.g. agriculture, water, energy). For final consumption, the VAT liability is calculated by applying the VAT legislation on consumption data. For intermediate consumption and GFCF, additional calculations are made in order to adjust for the (partial) deductibility of input VAT by VAT taxpayers. In order to arrive at the VAT gap, the total theoretical VAT liability is compared to the actual VAT receipts.

The main assumption in the estimation of the theoretical VAT liability relates to the estimation of the deductible share of input VAT by VAT taxpayers. Namely, the hypothesis is that the share of deductible input VAT in the total amount of input VAT, is equal to the share of supplies subject to output VAT (i.e. supplies which are not subject to exemptions) in the total volume of supplies.

One should however keep in mind that national accounts data includes auto-consumption, imputed rents, tips, and production for own final use, which are not subject to VAT. In practice, the consumption figures attributable to these activities are subtracted from the national accounts data before estimating the theoretical VAT liability.

Because of the indirect nature of this method, the VAT gap estimates include not only VAT evasion and fraud, but also statistical discrepancies. The better the quality of the data used for the estimation, the more reliable the VAT gap estimates are. Therefore, the INSEE estimation of VAT gap, which is based on very detailed information and analysis of fiscal legislation, is less likely to include statistical discrepancy than e.g. the CASE-study[95]. Moreover the revision process of national accounts (approx. every 5 years) enables to reduce statistical discrepancy and improve the quality of statistics.

Another limitation of this method (which is also a disadvantage for the CASE-study[96]) is that the evolution of the VAT gap is not necessarily an indication for the evolution of evasion and fraud. For example, it can also reflect changes in the behaviour of VAT taxpayers as regards VAT

[94] To construct national accounts, a correction is sometimes imputed for evasion and fraud, mainly when the data is based on tax declarations, so that the adjusted data on production and consumption includes evasion and fraud.
[95] CASE (2013), (2014), (2015)
[96] CASE (2013), (2014), (2015)

reimbursements from the tax administration. Alternatively, it may also be the consequence of the evolution of statistical discrepancy.

4.5.2 Resources

For a good estimation of the VAT gap, very detailed data is needed, in particular about consumption. This data is usually produced for the national accounts (60 persons for the annual account). The VAT gap is estimated as a by-product of national accounts, hence there are no specific resources attributed to its estimation.

4.5.3 Results

The results of the estimations are used in the construction process of national accounts and the VAT gap is a part of the GDP. This is consistent with the European System of Accounts' requirement according to which the GDP should include an estimation of the non-observed economy.

Hence, as a part of the GDP, the VAT gap is estimated every year with refreshed data for year N-1, N-2, N-3. However, as INSEE does not consider the evolution of the VAT gap as an indicator exclusively for fraud, the estimated results are published only once in every five year, when the "base"[97] of national accounts changes. The results are published in French. In May 2014, INSEE published a new base of national accounts and the VAT gap for the year 2010. The report can be found at: www.insee.fr/fr/indicateurs/cnat_annu/base_2010/methodologie/comptes-nationaux-base-2010.pdf (see p. 67).

4.6 Germany

The German administration does not prepare official estimates of the VAT gap. The German authorities, however, use the VAT gap estimations calculated by the Ifo Institute (Leibniz Institute for Economic Research at the University of Munichеconomic)[98]. The methodology of the Ifo Institute is based on a top-down approach.

4.6.1 Methodology

The methodology applied by the Ifo Institute includes the calculations explained below.

The theoretical VAT liability in a given fiscal year 'u' (VAT_u^{hyp}) is generally expressed as:

[97] Approximately every 5 year, for the purposes of national accounts, the level of GDP and the national account concepts or methods are reconsidered and revised. This process is called as a change in the base. It does not only affect the GDP growth, but also the GDP level. When the base changes, the level of the correction for fraud included in the GDP, and an estimation of the VAT gap for the basis year are published in the national accounts. The most recent revision was small and not significant: in the previous base, the French VAT gap estimation was equal to 10.8 billion € for year 2010 and is now equal to 11.2 billion € (for the same year).

[98] http://www.cesifo-group.de/ifoHome/CESifo-Group/ifo.html

$$VAT_u^{hyp} = \sum_{i=1}^{n}(t_{Z,u}\alpha C_{i,u} + t_{R,u}\beta C_{i,u} + t_{N,u}\gamma C_{i,u}) \quad ($$

$$+ \sum_{i=1}^{n}\left(t_{Z,u}\alpha K_{i,u}^{g} + t_{R,u}\beta K_{i,u}^{g} + t_{N,u}\gamma K_{i,u}^{g}\right) + \sum_{j=1}^{m}\left(t_{R,u}\delta I_{j,u}^{g} + t_{N,u}\varphi I_{j,u}^{g}\right)$$

$$+ \sum_{i=1}^{n}\left(t_{Z,u}\alpha K_{i,u}^{o} + t_{R,u}\beta K_{i,u}^{o} + t_{N,u}\gamma K_{i,u}^{o}\right) + \sum_{j=1}^{m}\left(t_{R,u}\delta I_{j,u}^{o} + t_{N,u}\varphi I_{j,u}^{o}\right)$$

$$+ \sum_{i=1}^{n}\left(t_{Z,u}\alpha K_{i,u}^{f} + t_{R,u}\beta K_{i,u}^{f} + t_{N,u}\gamma K_{i,u}^{f}\right) + \sum_{j=1}^{m}\left(t_{R,u}\delta I_{j,u}^{f} + t_{N,u}\varphi I_{j,u}^{f}\right)$$

$$+ \sum_{i=1}^{n}\left(t_{Z,u}\alpha K_{i,u}^{h} + t_{R,u}\beta K_{i,u}^{h} + t_{N,u}\gamma K_{i,u}^{h}\right) + \sum_{j=1}^{m}\left(t_{R,u}\delta I_{j,u}^{h} + t_{N,u}\varphi I_{j,u}^{h}\right)$$

$$+ \sum_{i=1}^{n}\left(t_{Z,u}\alpha K_{i,u}^{l} + t_{R,u}\beta K_{i,u}^{l} + t_{N,u}\gamma K_{i,u}^{l}\right) + \sum_{j=1}^{m}\left(t_{R,u}\delta I_{j,u}^{l} + t_{N,u}\varphi I_{j,u}^{l}\right)$$

$$+ \sum_{i=1}^{n}\left(t_{Z,u}\alpha K_{i,u}^{p} + t_{R,u}\beta K_{i,u}^{p} + t_{N,u}\gamma K_{i,u}^{p}\right) + \sum_{j=1}^{m}\left(t_{R,u}\delta I_{j,u}^{p} + t_{N,u}\varphi I_{j,u}^{p}\right)$$

Where:

t_Z, t_R, and t_N = the net zero, reduced, and normal VAT rates (see table 1);
u = a given fiscal year;
i = consumption product or service items ($i = 1, 2, \ldots, n$);
j = items of investment goods ($j = 1, 2, \ldots, m$);
α, β, γ = the sales shares of consumption products and services that are taxed differently ($\alpha + \beta + \gamma = 1$);
δ, φ = sales shares of investment goods that are taxed differently ($\delta + \varphi = 1$);
C = final consumption of private households;
K^g = intermediate consumption of (central and local) governments;
I^g = investment made by (central and local) governments;
K^o = intermediate consumption of nonprofit private organizations;
I^o = investment made by nonprofit private organizations;
K^f = intermediate consumption by banks and insurance companies;
I^f = investments made by banks and insurance companies;
K^h = intermediate consumption in the market-oriented health service sector;
I^h = investments made in the market-oriented health service sector;
K^l = intermediate consumption in the sector of house and apartment rental;
I^l = investments made in the sector of house and apartment rental;
K^p = intermediate consumption by other public or nonprofit private institutions (postal service, lottery, etc.);
I^p = investments made by other public institutions (postal service, lottery, etc.).

Bias corrections are applied in the following areas:

(i) Since national accounts data on private consumption are generally expressed in gross terms (i.e. containing VAT), gross VAT rates are applied. In case a consumption item cannot be entirely assigned to one VAT rate, a weighted gross rate is implied;
(ii) Adjustments for non-deductible input VAT of governments, banks, insurance companies, private non-profit organizations, and of transactions which are attributable to economic activities that are exempt from VAT without the right to deduct input VAT;
(iii) Adjustments for the time-lag between the availability of national statistics and the VAT collection; and
(iv) Adjustments for suspended tax claims as a result of bankruptcy, and for other tax waivers.

The results of the estimations are affected by a revision of the national accounts data. However, revisions of the German System of National Accounts data has been of a relatively limited scope.

4.6.2 Resources

As the estimations are prepared externally, there is no information available on the required resources. Concerning the data resources, the theoretical VAT liability is calculated based on the following data sources: (i) ESA data, (ii) input-output tables published by the National Statistical Office, (iii) annual reports of various state-owned companies, and (iv) other relevant statistics. The amount of collected VAT revenue is determined based on the official fiscal statistics of the tax authority.

4.6.3 Results

The results are published by the Ifo Institute[99]. The publication in 2008 shows the development since 1998 until 2008. The estimated results are used by the German authorities as an indicator for further research.

While the “top down” approach of tax gap estimates offers an upper threshold of the potential tax revenue which could be gained, the micro approach can provide insights which part of this potential tax revenue can be tackled with an envisaged reform method. However an impact assessment which uses a combination of “top down” and “bottom up” would require an extraordinary amount of resources. Therefore the cost-benefit ratio would be positive only in cases of impact assessments for substantial tax reforms. For routine assessments the cost-benefit test would fail.

[99] https://www.cesifo-group.de/de/ifoHome/publications/docbase/details.html?docId=14568580 and Parsche, R (2008)

4.7 Italy

In Italy, a top-down approach is applied to estimate the national VAT gap. The estimates are calculated in-house by the Italian Revenue Agency (IRA).

4.7.1 Methodology

The VAT gap estimations cover the total taxpayer population and have a macroeconomic nature. The applied top-down methodology is consumption based, and compares the total amount of tax collected with the theoretical VAT liability in circumstances of perfect compliance. As a general rule, highly detailed national accounts aggregates are required in order to capture the complexity of VAT legislation and to calculate accurately the theoretical VAT base and VAT[100]. For each detailed subclass of national accounts, the share of VAT exempted base is deducted and its own proper statutory VAT rate is applied to the residual amount.

The main formulas of the VAT gap computations are:

$$BIND = BIT - BID$$
$$IVAEV = IVAT - IVAEC$$

Where
BIND = VAT base gap;
BIT = theoretical (potential) VAT base;
BID = actual VAT base;
IVAEV = VAT gap;
IVAT = theoretical (potential) VAT;
IVAEC = collected VAT.

All the aggregates are calculated on accrual basis in order to be consistent with the recording rules adopted by the national account figures.

In order to better understand the role played by the VAT rates and exemptions, it is necessary to estimate the VAT base, both the theoretical and actual bases. The theoretical VAT base (BIT) is computed consistently with the classifications and definitions applied for the actual VAT base (BID), and, consequently, both bases are coherent with IVAT and IVAEC, respectively.

The gaps, BIND and IVAEV, are estimated following two hypothesis[101]: first, with complicity (seller and buyer agree and there is no invoice, tax is not collected); second, without complicity (tax is collected but not remitted). Currently, it is not possible to identify the amount of evasion for each behavior and, therefore, two estimates are produced. First, an estimate is prepared with the

[100] For more details see D'Agosto et al. (2014), Pisani (2014).
[101] The two types of behaviors are recognized within the EU and the European Commission in the Decision 98/527/CE, G.U. n. L234 del 21/8/1998 pg. 0039-0042.

assumption that all evasion occurs with complicity, then an estimate is made with the assumption that all evasion is without complicity.

The BIT estimates employ detailed expenditure subclasses of national accounts components, named Na_g, where g identify the following subclasses (i) to (v) [102]:

(i) Households Consumption (261 items);
(ii) General Government Investments (12 items);
(iii) General Government Intermediate Consumption (17 items);
(iv) Businesses Intermediate Consumption (58 items); and
(v) Specific types of Business Investments (e.g. cars).

The aim consists of decomposing NAg with respect to the definition previously mentioned, as follows:

$$NAg = EXEg + BIDg + BINDg_{wout} + BINDg_{with} + IVAEVg_{wout} + IVAECg \quad [4.7.1]$$

where, in addition to the variables already defined, is denoted as:

$BINDg_{wout}$ = VAT base gap "without complicity";

$BINDg_{with}$ = VAT base gap "with complicity";

$EXEg$ = part of NAg exempted or not subject to VAT, 0≤ NAg ≤1;

$IVAEVg_{wout}$ = VAT invoiced, collected but not remitted by evaders (without complicity);

$IVAECg$ = VAT actually collected and remitted.

Equation [4.7.1] implies:

$$BINDg = BINDg_{wout} + BINDg_{with}$$

Under the assumption that VAT rate τ_g, for each NAg, is equal for both declared and hidden transaction[103], [4.7.1] can be rewritten as:

[102] For VAT purposes, both General Government which offers non-market services and specific segments of businesses behave as final consumers since they cannot deduct input VAT.
[103] This assumption strongly depends on the level of detail for "g".

$$NAg = (BIDg + BINDg_{wout})(1 + \tau_g) + BINDg_{with} + EXEg$$

In the first step of the procedure, $EXEg$ will be excluded from NAg. On the basis of the fiscal norm and by using specific indicators, the coefficient $cexe$ is calculated. It is a proxy of the ratio:

$$cexe = \left(\frac{EXEg}{[(BIDg + BINDg_{wout}) \cdot (1 + \tau_g) + BINDg_{with} + EXEg]} \right)$$

By applying $(1 - cexe)$ to NAg, an amount is derived which represents the potential VAT base plus VAT actually remitted, and VAT invoiced and not remitted. That is equal to:

$$BITIVAECg = (BIDg + BINDg_{wout})(1 + \tau_g) + BINDg_{with} \quad [4.7.2]$$

Hereafter, the VAT gap calculations follow two different methodologies to determine the gap with complicity and that without complicity.

On one hand, if it is assumed that all evasion occurs with complicity, then VAT actually remitted (IVAEC) can be subtracted from [4.7.2], obtaining the potential VAT base, $BITg_{with}$, as:

$$BITg_{with} = BIDg + BINDg_{wout}(1 + \tau_g) + BINDg_{with} \quad [4.7.3]$$

The [4.7.3] over-estimates the VAT potential base, BITg, since it includes the amount of VAT invoiced and not remitted in the evasion without complicity.

On the other hand, if it is assumed that all gap occurs without complicity, then [4.7.2] can be divided by $(1 + \tau_g)$,

The potential VAT base, $BITg_{wout}$, is:

$$BITg_{wout} = \frac{(BIDg + BINDg_{wout}) \cdot (1 + \tau_g) + BINDg_{with}}{(1 + \tau_g)} \quad [4.7.4]$$

The [4.7.4] under-estimate VAT potential base, BITg, since it is reduced of an amount of VAT not included in NA figures, due to $BINDg_{with}$

From [4.7.3] and [4.7.4], we may conclude that the unknown "true" value of BITg is included in the following range:

$$BITg_{wout} \leq BITg \leq BITg_{with} \qquad [4.7.5]$$

In order to obtain the potential VAT, $IVATg$, in both hypothesis, VAT rate, τ_g, is multiplied by $BITg_{wout}$ and $BITg_{with}$. In formal terms:

$$IVATg_{wout} = BITg_{wout} \cdot \tau_g \qquad [4.7.6a]$$

$$IVATg_{with} = BITg_{with} \cdot \tau_g \qquad [4.7.6b]$$

On the basis of [4.7.5], the following can be obtained:

$$IVATg_{wout} \leq IVATg \leq IVATg_{with} \qquad [4.7.7]$$

The amount of BIT and IVAT referred to the total economy are obtained by summing up $BITg$ and $IVATg$ for all groups of products "g" .

The estimation of BIND and IVAEV requires computing the actual VAT base, BID, the VAT collected, IVAEC.

The IVAEC (accrued revenue) stems from all flows involving VAT, as shown in the following equation[104]:

[104] See also Rodrigues (2015).

IVAEC =VAT Gross Revenue[105] – (Refunds + Compensation[106]) – Adjusting for accrual accounting – Variation in the amount of VAT credits to bring to next year[107] [4.7.8]

Where:

IVAEC = economic accrued revenue consistent with the gap estimation methodology;

VAT gross revenue = VAT paid to IRA as a result of VAT transactions in the domestic market and VAT on imports (i.e. VAT paid voluntarily), before adjustments for refunds and compensations;

Adjusting for accrual accounting = adjusting for potential timing differences in revenues between accrual basis and cash basis[108];

Variation in the amount of VAT credits = Every year, taxpayers annotate in the VAT return the amount of VAT credits they can use in the year following the return; the aggregate variation of this stock measures the VAT credit that has been generated in the economic system after refunds or compensations have been requested. To get IVAEC consistent with the National Accounts, the change in the stock is subtracted from the accrued VAT.

To obtain the actual VAT base (BID), the VAT revenue on accrual basis (IVAEC)[109] is divided by the implicit declared rate (τd), computed on the bases of VAT return data.

BID = IVAEC/ τd [4.7.9]

τd is calculated as a weighted average of the VAT rate applicable to imported goods (τdimp), and to domestic transactions (τddom). In formal terms:

$$\tau d = \tau dimp * w_{imp} + \tau ddom * w_{dom}$$

where τdimp and τdom are implicit VAT rates calculated on the basis of tax returns and the weights w_{imp} and w_{dom} are equal to:

$$w_{imp} = \frac{\frac{IVAEC_{imp}}{\tau dimp}}{\frac{IVAEC_{imp}}{\tau dimp} + \frac{IVAEC_{dom}}{\tau ddom}}$$

$$w_{dom} = \frac{\frac{IVAEC_{dom}}{\tau dimp}}{\frac{IVAEC_{imp}}{\tau dimp} + \frac{IVAEC_{dom}}{\tau ddom}}$$

[105] It represents the voluntary compliance and it excludes the amount collected through the audits.

[106] It is an alternative way to the request for reimbursement, under which you may use a VAT tax credit to pay other taxes.

[107] To have this opportunity the taxpayer reports VAT credit in the tax return.

[108] The procedure is defined by the European Union in accordance with Regulation ESA95.

[109] The VAT revenue generated by the economic system (IVAEC) as a result of transactions subject to VAT in the reference period (a tax year), is subject to bias correction.

where $IVAEC_{imp}$ + $IVAEC_{dom}$ =IVAEC

In sum, the theoretical VAT base, BIT, is calculated trough equations [4.7.3] and [4.7.4]; the corresponding VAT, IVAT, is obtained by [4.7.6a and b]; the collected VAT is derived from [4.7.8] and the actual VAT base, BID, by [4.7.8]. The gap in the base and in the tax is then calculated by subtracting the actual (collected) values from the theoretical values.

In order to calculate the net VAT gap, it is necessary to subtract from IVAEV the additional tax assessed and actually collected as a result of tax audits (OM). In fact, OM is not time consistent with IVAEV at time t, since it is given by:

$$OM_t = \sum_{i=1}^{Ta} \sum_{n=1}^{m} Tg_{i,t-n}$$

Where
Ta = number of taxpayers audited (Ta);
Tg = tax gap assessed by the tax authority; and
n = the physiological time span between the tax year audited and the year in which the IRA collects the amounts due.

In practice, OM erodes also the tax gaps of years earlier than the current one. Under the assumption of n=3, the above formula summarizes the situation shown in table 9. There, in the last row, OM is defined, while the in last column the same OM is reclassified according to the fiscal year audited (OMa). The table shows that, while the full information for OM is available at time "t", for the OMa it is available with a certain delay, which depends on "n" of the above formula, namely on the physiological time span between the tax year audited and the year in which the tax authority collects the amounts due.

Table 9: Additional tax assessed actually collected by tax audits classified by years in which the additional taxes are actually collected and by fiscal years audited

Fiscal years audited	Years in which the additional taxes are actually collected					
	t-4	t-3	t-2	t-1	t	OMa
t-4	Tg_{t-4}	Tg_{t-4}	Tg_{t-4}			OMa_{t-4}
t-3		Tg_{t-3}	Tg_{t-3}	Tg_{t-3}		OMa_{t-3}
t-2			Tg_{t-2}	Tg_{t-2}	Tg_{t-2}	OMa_{t-2}
t-1				Tg_{t-1}	Tg_{t-1}	NA
T					Tg_t	NA
OM	OM_{t-4}	OM_{t-3}	OM_{t-2}	OM_{t-1}	OM_t	

NA = year for which the full information is not available.

The main bias in the methodology concerns the improper correction of national accounts data performed to extract from them the VAT base. To check this bias, a time series analysis on the dynamic of implicit VAT rate and on the rate of exemption should be performed, in order to verify if the changes in these rates are coherent with the changes in tax legislation or in the composition of VAT base.

A bias correction concerns also the amount of VAT actually collected. It needs to be ensured that:
(i) the criterion of "accrued" in the data is coherent with the definition used to calculate the VAT gap. In order to ensure this coherence, the data provided by the Italian Istitute of Statistics is corrected for the variation in the amount of VAT credits to be carried forward to the following year, see formula [4.7.8]; and
(ii) the VAT data used to calculate the VAT gap does not include the sum collected by the audit activity. This latter amount, classified according to the scheme showed in table 9, is used only to calculate the net VAT gap.

Methodology for break-down of VAT gap

One of the most important drawbacks of the top-down methodology consists in providing macroeconomic indicators that can be hardly split by kind of noncompliance behavior. Currently, the VAT gap is broken down to a value which is mainly due to errors in calculating the VAT and to late payments of VAT. This amount is computed with the information obtained from automatic controls (according to Art. 54bis of the law 633/72). These kinds of controls are conducted on the entire VAT taxpayer population and are therefore not biased by selection mechanisms.

The VAT gap is also split by kind of users, the classification of the theoretical liability, BIT and VAT, shown in the previous paragraph, is grouped into three main clusters:

1. Households consumption, (BITcf, IVATcf);
2. General Government (General Government Investments plus General Government Intermediate Consumption, BITpa, IVATpa);
3. Uses for Market Enterprises (Market enterprises Intermediate Consumption plus specific types of market enterprises Investments, BITal, IVATal).

Similarly, declared and paid amounts, BID and IVAEC require to be split into the same three main categories

The reported VAT base for Households (BIDcf) is derived from the 'VT' part of the VAT return. The VT part contains taxable transactions with final consumers and with VAT registered businesses.

General Government expenditure (BIDpa) is derived from public finance data, which is harmonized with definitions and classifications stated by ESA 1995. In this procedure BIDpa is equal to BITpa, under the hypothesis of no evasion[110].

The VAT base for market enterprises, BIDal, is obtained as follows:

$$BIDal = BID - BIDcf - BIDpa$$

VAT is calculated by applying the appropriate rate to each base. Similarly, tax is split as follows:

$$IVAEC = IVAECcf + IVAECpa + IVAECal$$

Therefore, gap in the VAT base, BIND, and VAT gap, IVAEV, can be broken-down as follows:

$$BIND = BINDcf + BINDal + BIND\ pa$$

$$IVAEV = IVAEVcf + IVAEVal + IVAEVpa$$

where BINDpa =IVAEVpa=0.

The above described method applies also for the calculation of a geographical break-down of the VAT gap, which is further explained below.

The VAT gap is broken-down per geographical territories, according to the place of consumption and according to the place of VAT collection. The calculation of the break-down by the place of VAT collection is an ongoing project, and the estimations are not yet finalised. This is different for the break-down by the place of consumption.

The break-down by the place of consumption is calculated similarly to the national VAT gap, but additional information with geographical aspects is applied. For breaking down the actual VAT base (BID) by region, the following indicators are used: (i) the 'VT section' of the Italian VAT return to break-down household consumption (see Figure 12); (ii) national accounts data to break down the purchases of General Government (under the hypothesis of no evasion); and (iii) the reported taxable base structure of IRAP[111] to break down the final consumption of businesses.

[110] This is a very simplified hypothesis. It is assumed that the evasion which arises from General Government purchases is equal to zero. There are studies underway to overcome the limitations of this hypothesis.

[111] IRAP stands for Regional Tax on Productive activity. By using the IRAP form, it is possible to decompose the enterprise production by local activity unit. The IRAP values are weighted according to the VAT base produced by the different economy sectors.

The theoretical VAT base (BIT) is allocated to the regions as follows: (i) the household consumption is allocated according to the regional households expenditure in national accounts data; (ii) the purchases of Regional General Government is allocated also according to national accounts data; and (iii) the final consumption of businesses is allocated by means of specific regional indicators for intermediate expenditures and investments from national accounts.

The regional VAT is estimated by applying the appropriate VAT rates to the regional BID and BIT.

Figure 12: VT section of the VAT return

PART VT

SEPARATE INDICATION OF OPERATIONS CARRIED OUT REGARDING END CONSUMERS AND HOLDERS OF VAT NUMBERS

VT1	**Division of taxable operations carried out regarding end consumers and holders of VAT numbers**	Total taxable operations	1 ,00	Total tax	2 ,00
		Taxable operations regarding end consumers	3 ,00	Tax	4 ,00
		Taxable operations regarding holders of VAT numbers	5 ,00	Tax	6 ,00

		Taxable operations regarding end consumers	Tax
		1	2
VT2	Abruzzo	,00	,00
VT3	Basilicata	,00	,00
VT4	Bolzano	,00	,00
VT5	Calabria	,00	,00
VT6	Campania	,00	,00
VT7	Emilia Romagna	,00	,00
VT8	Friuli Venezia Giulia	,00	,00
VT9	Lazio	,00	,00
VT10	Liguria	,00	,00
VT11	Lombardy	,00	,00
VT12	Marche	,00	,00
VT13	Molise	,00	,00
VT14	Piedmont	,00	,00
VT15	Apulia	,00	,00
VT16	Sardinia	,00	,00
VT17	Sicily	,00	,00
VT18	Tuscany	,00	,00
VT19	Trento	,00	,00
VT20	Umbria	,00	,00
VT21	Aosta Valley	,00	,00
VT22	Veneto	,00	,00

4.7.2 Resources

For the purposes of the calculations, data is taken from the national accounts and from the databases of Italian Revenue Agency. Table 10 below provides more details on the data sources.

Table 10: Data sources

VAT gap component	Data source
VAT economic accrued revenue (IVAEC): • VAT gross revenue, refunds and compensation; • Adjusting for accrual accounting; • Variation of the amount of VAT credit to brings to the next year.	State Budget; Correction provided by National Account Department of Italian Institute of Statistics (ISTAT); VAT Statements.
Actual VAT base (BID): • VAT economic accrued revenue; • Actual VAT rate.	Italian Revenue Agency calculation; VAT Statements.
VAT potential (theoretical) base (BIT): • Households Consumption; • General Government Investments (GGI); • General Government Intermediate Consumption (GGIC); • Market enterprises Intermediate Consumption (MEIC) • Specific types of market enterprises Investments (MEI) • Rate of exemption by Nace division	ISTAT National Accounts figures and Households budget survey. ISTAT Accounts for General Government. ISTAT Accounts for General Government. ISTAT National Account for Production and Value added by Nace division. ISTAT National Account by type of Investment. VAT Own resources calculation (for HC, GGIC, GGI) VAT Statements (MEIC, MEI).
Potential (theoretical) VAT economic accrued revenue (IVAT): • Legal VAT rate by item.	Own resources VAT.

In terms of human resources, 3 fte are working for 4 months to prepare the VAT gap estimates. The software used are SAS and Excel.

4.7.3 Results

The results are published in an annex to the Italian Economic and Financial Document (EFD) at *http://www.mef.gov.it/documenti-allegati/2014/Rapporto_art6_dl66_13_luglio.pdf* . The time difference between the publication of the estimates and the reference year is two years.

The VAT gap is one of the key performance indicators of the Italian Revenue Agency (IRA), which indicators are synthetic indices to measure the value generation of the Italian Revenue Agency (IRA) with respect to its institutional mission. The adopted measurement criteria are aimed at assessing the effectiveness (satisfaction of the results), the efficiency (ratio of inputs employed and results achieved) and the costs of its activities. Indicators are part of a conceptual model designed to maximize the outcome of IRA. Additionally, the VAT gap is also used in the analysis of tax policy effects.

In the system of key performance indicators two indices are considered: The Erosion of Tax Gap Index and the Tax Compliance Index. The Erosion of Tax Gap Index is used to control how much the control activity affects the evasion. The formula is:

$$\frac{(Additional\ tax\ assessed + sanctions\ actually\ collected\ by\ tax\ audits)}{Diachronic\ tax\ gap}$$

The diachronic tax gap is achieved by a linear transformation of the tax gap 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:

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

Where
Ta= number of taxpayers audited (Ta);
Tg = tax gap assessed by the tax authority;
Pe = actual penalties and interest paid by the audited taxpayer; and
N = 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:

$$1 - \frac{Tax\ gap}{Voluntary\ compliance\ of\ taxpayers}$$

The Tax Compliance Index is used also in process of allocation of resources.

4.8 Latvia

In Latvia, the VAT gap is estimated based on a top-down approach. The Latvian Tax Authority started to estimate the VAT gap in 2014 and performs the calculations in-house.

4.8.1 Methodology

The VAT gap estimations cover the total taxpayer population. The calculations are prepared according to the top-down methodology which employs national accounts data, and some additional

data sources for the estimation of the potential VAT (i.e. theoretical VAT liability). The potential VAT is then compared with the VAT paid by taxpayers.

It is not possible to break-down the results into sectors or in any other way, because the consumption statistics are categorised by the type of economic activity (i.e. industry), while the data on the VAT liability is linked to the actual taxpayers who can act within different industries. In practice, situations occurred, where some specific industries took part in other industries' VAT gap. For example, transportation services are consumed to provide almost all kinds of goods. In the statistics, these services are separated from the industry's data, but it is impossible to reveal to which economic activities of the actual taxpayer the transportation services are attributable.

The formulas used for the calculations are:

(1)

$$GAP = \frac{(PM - FA) + D}{PM}$$

Where:
GAP = VAT GAP
PM = potential VAT which should be calculated and paid under conditions of full compliance;
FA = tax calculated voluntarily by taxpayers (difference between tax which should be paid to the budget and refunded); and
D = tax sum calculated by taxpayers voluntarily, but not paid for the analysed year, which forms new VAT debt (actually, approx. 1 month time lag appears as a result of the difference between the occurrence of the tax liability and the payment period).
According to the methodology of the Statistics Bureau, gross domestic product evaluated on the basis of consumption, is evaluated using prices paid by the final consumer, therefore the consumption data contains VAT paid. Taking into consideration the fact that the greatest part of the total consumption formed by household final consumption commonly consumes products/services that have substitutes, Tax Authority assumes that the factor of separate companies' paying or not paying VAT does not affect the market price of goods and services. Thus, the potential VAT is calculated by extracting the share of VAT from the total sum of consumption using formula 2.

(2)

$$PM = \sum \frac{Ci * Ri}{(1 + Ri)}$$

Where:
PM = potential VAT which should be calculated and paid under conditions of full compliance;
Ci = value of goods and services consumed for each consumption segment; and
Ri = average weighted VAT rate applicable to separate groups of goods and services.

Table 11 below summarizes the common approaches used to estimate average weighted VAT rate applicable to separate groups of goods and services.

Table 11: The methods used for recognising VAT rate

Groups of goods and services	**Approach used to identify the average weighted VAT rate**	**Sources of information**
Groups subject only to the main VAT rate	The main VAT rate	The law on VAT
Groups that mainly consist of VAT exempt activities	Average weighted rate calculated on the basis of the assumption that activity' s consumption is VAT non-deductible, except activities which are reported in the tax returns of taxpayers representing industries.	Volume of activities subject to the main and reduced VAT rate declared by taxpayers of appropriate industries
Groups subject to the main and reduced VAT rate	Average weighted rate is calculated on the basis of activity's structure declared by taxpayers	Volume of activities subject to the main and reduced VAT rate declared by taxpayers of appropriate industries

The segments of total consumption which carry the final VAT are:
(i) Household final consumption (excluding imputed rent and the turnover of small VAT taxable persons who are exempt from paying VAT);
(ii) HRPISH final consumption;
(iii) Government final consumption;
(iv) Increase in the value of stocks and long term-assets of VAT taxable persons with exempt supplies without the right to deduct input VAT; and
(v) Value of goods and services consumed to produce VAT exempt supplies without the right to deduct input VAT.

The main assumptions used in the methodology include:
(i) The assumption that the structure of consumption has not changed for 3 years. This is necessary because the consumption data is broken down to the products and services using SUT table which is published with a 3 year time delay;

(ii) The assumption that the goods and services produced by small VAT taxable persons, who are exempt from paying VAT, are consumed by households;
(iii) VAT GAP caused by goods and services is mainly caused by markets which suit conditions of perfect competition or monopolistic competition, so the fact of paying or not paying VAT does not affect the market price of goods and services;
(iv) Certain assumptions in determining the average weighted VAT rate for those groups of goods and services which are subject to different VAT rates.

The above described methodology is rather simple and its main disadvantage is that - compared to a bottom-up approach - the results cannot be broken-down into industries or in any other way. Furthermore, the results need to be revised when more accurate or revised statistics become available. However, the advantage of the methodology is that it is not costly to apply and the VAT gap dynamics can be evaluated. In conclusion, this VAT gap methodology is like the average body temperature in a hospital, which helps to understand the main trend, but it does not help to understand what the causes are.

4.8.2 Resources

The following data sources are used:
(i) Data on gross domestic product from the expenditure perspective in the national accounts is used to estimate household final consumption, HRPISH consumption, and government consumption;
(ii) SUT (supply-use) tables data of the national accounts is used to split consumption data into separate types of products and to assess the value of goods and services used for VAT exempt supplies without the right to deduct input VAT;
(iii) Personal income tax return data is used for the estimation of VAT exempt turnover (i.e. exempt without the right to deduct input VAT);
(iv) Annual reports of companies are used for the estimation of VAT exempt turnover (i.e. exempt without the right to deduct input VAT);
(v) VAT return data is used to adjust the VAT rate applicable to groups of goods and services which are subject to different VAT rates and to estimate the amount of VAT voluntarily declared by taxpayers; and
(vi) Information on VAT debt available to the Tax Authority is used to assess the value of newly formed VAT debt.

In terms of human resources, the following resources have been employed since 2014:
(i) For meetings with the Statistical Office on national accounts methodology and SUT table contents, ca. 3 employees for 3-4 working hours;
(ii) For extracting additional data from the DATA WARENHOUSE of the Tax Authority, ca. 1 employee for 10 working hours;
(iii) For pulling the available data together and planning consumption structures, ca. 1 employee for 40 working hours;
(iv) For the preparation of a description on the methodology for the Tax Authority's management, ca. 1 employee for 24 working hours;

(v) For the preparation of presentations and other documentations for the management and media, ca. 1 employee for 32 working hours; and
(vi) For studying possible approaches to estimate tax gaps: many hours.

In terms of software, Excel is used for calculating the VAT gap, and the software of the DATA WAREHOUSE is used for employing additional data from VAT returns.

4.8.3 Results

The VAT gap results were presented to the media at specific events on taxation in order to highlight the issues and challenges in VAT administration. Otherwise, the results have not yet been published. The time difference between the estimated period and the final results of the estimations is ca. 7-8 months, mainly because of the delay in the availability of the official GDP statistics. The VAT gap is one of the indicators used in the strategy of the Tax Authority.

4.9 Lithuania

In Lithuania, the Tax Authority recently started to estimate the VAT gap. The calculations are made in-house and are based on different approaches.

4.9.1 Methodology

For the estimation of the VAT gap, both a top-down and a bottom-up methodology are used. Additionally, gap estimations are also prepared with the help of surveys. The top-down methodology covers the entire taxpayer population, while the bottom-up methodology covers ca. 62 % of VAT taxpayers. In the latter, VAT non-registered taxpayers (i.e. taxpayers which should be registered), taxpayers whose declared yearly sales are less than 300 EUR or have no purchases, and taxpayers which are registered for a period shorter than 1.5 year, are excluded from the scope of the estimation. The scope of the surveys varies according to targeted issue.

The main formula applied of the top-down methodology is:

$$\text{VAT gap} = (\text{Theoretical VAT base} - \text{Actual VAT base}) * \text{WAR'}$$

Where
Theoretical VAT base = evaluated according to national accounts data (general consumption);
Actual VAT base = estimated from tax returns and financial reports; and
WAR' = WAR (by Statistical Office) is adjusted, because some categories of consumption is excluded (for example, imputed rentals for housing).

The main formula of the bottom-up methodology is:

$$\sum (P_i * M_s) - S_i, \text{ for those i, where } S_i / P_i < M_s * c_s$$

Where
P_i = yearly purchases of i^{th} taxpayer
S_i = yearly sales of i^{th} taxpayer
M_s = sales to purchases ratio median in s^{th} sector (NACE2)
c_s = coefficient of correction for every sector

The survey estimations use different formulas, dependent on the actual method. The main principle is:

Tax gap because of single aspect = (A * N) * (B * Y)

Where
A = share of uncompliant taxpayers – *spread* (survey result)
B = *depth* of incompliance (for example, share of undeclared sales) (survey result)
N = amount of taxpayers
Y = declared / 'legal' value (for example, declared sales total)

Assumptions are used in all three methodologies. The main assumption of the top-down methodology is that (i) some expenditure is unreported in every COICOP category (even excluded from VAT), because of other taxes, regulations and etc.; (ii) the incentives to participate in shadow economy do not vary between COICOP categories; and (iii) the adjusted WAR is more accurate than the WAR for tax gap evaluation purposes.

In the bottom-up methodology, the main assumptions include that (i) the correction coefficient applied to sales to purchases ratio is correct; (ii) taxpayers sales to purchases ratios are comparable in the same sectors (NACE2) (i.e. taxpayers profit margin in the same sector is quite similar); and (iii) the sector of economy declared by taxpayers is correct.

In the survey estimations, it is assumed that the respondents are able to understand the questions and are honest. Additional assumptions are made according to the specificities of the targeted issue and the estimation method.

The main disadvantages of the top-down methodology include that (i) VAT evasion in intermediate consumption is not captured; (ii) there is a time lag in statistical data; (iii) the reliability of the applied methodology is still quite low: there are sharp differences in time series of results (but still there were major differences in tax policy); and the revision of national accounts affects the estimation (as average increase of annual GDP of Lithuania was 0.6 %, estimated VAT gap increased by 1.3 %). The main disadvantage of the bottom-up methodology is that it is impossible to adjust companies' sales to purchase ratio according to purchases of some long term assets (for example, machinery). This means that the tax gap is overestimated. Finally, survey estimations are highly dependent on public information.

4.9.2 Resources

The resources employed in the VAT gap estimations are summarised in Table 12 below.

Table 12: Resources

	Top-down	Bottom-up	Surveys estimation
Data	• National accounts • Tax returns and financial reports • VAT administered in Lithuanian customs payment data	• VAT returns • Investments funded from EU funds data • Investments (new long term assets) data (CIT exemption)	• Survey • Registers and tax returns data • Statistical office data
HR	~0.5 fte	~0.5 fte	2-3 persons ~1 month
Software	MS Office		

4.9.3 Results

The estimated results are only for internal use. The results of the top-down methodology is to be used by the Tax Authority's management in strategic planning. The results of the bottom-up methodology are useful for selecting taxpayers for VAT audits, and for checking the results of the top-down methodology. Finally, the survey estimates are used in preparing communication strategies, identifying the highest risk areas, and preparing the Tax Authority's action plan.

4.10 Poland

In Poland, the Ministry of Finance has recently started preparing estimations of the VAT gap. The estimations are based on a top-down approach and are intended to cover the period from 2005 to 2014.

4.10.1 Methodology

The VAT gap is computed for the whole economy at macro level. As the estimation is based on a top-down approach, it will not be possible to break down the results per sector or otherwise.

The top down approach based on final consumption data is applied. The VAT gap is calculated as a difference between the theoretical VAT liability and the actual VAT revenues, with some adjustments. In the estimation of the final VAT base, every element of the VAT base (i.e. private consumption, government investment, government intermediate consumption, investment and intermediate consumption of other sectors which are subject to non-deductible input VAT) is divided according to different applicable VAT rates in a given year. The total theoretical VAT liability is a sum of the above computations: every elements/components of the VAT base and the applicable VAT

rate. In this process of VAT gap estimation, also some adjustments and corrections are applied with respect to e.g. company cars, some tax returns data of natural persons.

4.10.2 Resources

The data sources are mainly national accounts (input – output tables) provided by the National Statistical Office (GUS). Many other sources are also used, e.g. data from tax returns provided by the Ministry of Finance, the Motor Transport Institute, the Polish Chamber of Liquid Fuels. The data about VAT revenues comes from the state budget accounting system. In the calculations, they are presented according to ESA rules, i.e. on an accrual basis (one month time adjustment is applied). The VAT gap estimations are performed by 3 employees (i.e. 3 fte).

4.10.3 Results

The estimations are currently in progress. The preliminary results of the VAT gap are only for internal purposes. The Ministry of Finance is going to consider the publication of the results once they are final. In general, the results are close to the estimations of the CASE-study[112] financed by the European Commission.

The Ministry of Finance also works on the methods of forecasting VAT gap for the year *t*. In the current situation the statistical data provided by the National statistical Office are available for the year t-2 (e.g. in 2015, macro data about the VAT base is available for the year 2013). The goal is to develop a methodology that can be applied in extrapolating macro data up to year *t*. Research is also being done on the cyclical nature of the tax gap.

4.11 Portugal

In Portugal, the top-down approach is applied to estimate the VAT gap. The estimations are prepared in-house by the Portuguese Tax Administration. Recently, the Tax Administration embarked on a cooperation project with the IMF and started to apply the RA-GAP methodology.

4.11.1 Methodology

The VAT gap estimations cover the total taxpayer population. Initially, the estimations were prepared according to a 'Traditional model', but since 2012, the IMF's RA-GAP methodology is applied to estimate the gap. The results of the RA-GAP methodology can be broken-down per economic sector.

In the traditional model, the VAT gap is estimated as follows**:**

$$V = \sum_c FC_c * r_c + \sum_s \sum_c (IC_c^s + GFCF_c^s) * r_c * p_s + \sum_s \sum_c (IC_c^s + GFCF_c^s) * r_c * n_c * (1 - p_s) - V_{sr}$$

[112] CASE (2013), (2014), (2015)

where
V = Potential VAT revenue
FC_c = Final consumption of product c
r_c = VAT rate of product c
IC_c^s = Intermediate consumption of product c of sector s
$GFCF_c^s$ = Gross fixed capital formation of product c of sector s
P_s = percentage of exempt business of sector s[113] (prorate)
n_c = indicator of product c non-deductibility
V_{sr} = VAT revenue loss due to special regimes

The two main assumptions in the traditional model are that (i) the percentage of exempt business (prorate) is assumed to be uniform within a given sector, whereas it could be different for each component; and (ii) the same VAT rate for a commodity is assumed to apply for all taxpayers using or supplying it.

In the IMF RA-GAP methodology, the VAT gap is estimated according to the following calculation:

$$V^s = \sum_c (M_c^s \times \tau_c) + \left[\sum_c (Y_c^s - X_c^s) \times T_c\right] \times r^S - \left[\sum_c (N_c^s + I_c^s) \times T_c\right] \times r^s \times e^s$$

where

V^s = the potential net VAT for a sector,
τ_c = the VAT rate that applies to commodity c (zero if zero-rated or exempt),
M_c^s = imports by sector s of commodity c,
Y_c^s = output by sector s of commodity c,
X_c^s = exports by sector s of commodity c,
N_c^s = intermediate demand (consumption) by sector s of commodity c,
I_c^s = investment by sector s of commodity c,
r^s = the proportion of output for a sector produced by registered businesses, and
e^s = the proportion of output for a sector which is taxable output.

The main assumptions in the RA-GAP methodology are:
(i) The output by registrants ratio (*r*) is assumed to be uniform within a given sector, whereas it could be different for each component (*Y*, *X*, *N*, and *I*);
(ii) The taxable output ratio (*e*) implicitly assumes that the proportion of inputs to outputs for taxable supplies and for non-taxable supplies are identical within a sector; and
(iii) The same VAT rate for a commodity is assumed to apply for all taxpayers using or supplying it.

In both methodologies, bias corrections are made using pro-rates (i.e. a) proportion of output of a sector produced by registered businesses, and b) the proportion of output of a sector which is taxable output).

[113] Prorate is considered zero for "non-exempt" sectors.

The main disadvantages of the methodologies are:
(i) The estimated VAT gap is an overall gap and cannot be disaggregated to identify the part which is due to fraud;
(ii) There are some simplifying assumptions made in the 'traditional model', which are necessary to deal with VAT at a sector level as opposed to an individual taxpayer level;
(iii) Some definitions used to compile national accounts data are not consistent with definitions for the VAT base; and
(iv) There can be gaps in the national accounts data which affect the estimations. Furthermore, also revisions of the national accounts impact the estimated results of the VAT gap and require their recalculation.

4.11.2 Resources

The data sources include: (i) for the calculation of the theoretical VAT liability, the resources-uses tables in national accounts, and (ii) for the estimation of actual revenue, the VAT revenue figures from national accounts. More recently, following the cooperation project with the IMF, VAT returns and VAT payment invoices are also used to estimate actual revenue.

In terms of human resources, 1 fte is engaged with performing the estimations (not considering data extraction). It's difficult to give an indication of the time required for the calculations, because the estimations of actual revenue depend on extracting data from the VAT returns and VAT payments invoices databases, which is quite time consuming. Since these databases are not designed for the purposes of VAT gap estimations, there are usually extraction errors which need to be corrected. After all data is available, it takes about one to two months to estimate the VAT gap. The software used for the estimations are STATA and Excel.

4.11.3 Results

The results of the VAT gap estimation are only for internal purposes and are not published. The time difference between the publication and the reference year of the estimates is 3/4 year.

4.12 Slovakia

In Slovakia, VAT gap estimates are prepared based on a top-down approach, according to two different methods. The estimations are done by the Ministry of Finance. In 2013 Slovakia has joined the IMF's RA-GAP Program and the VAT gap has been estimated for the period 2008-2012 with the assistance of the IMF.

4.12.1 Methodology

The estimates cover the whole economy. The two top-down methodologies which are used to estimate the VAT gap are the consumption based method, and the production based method of the IMF's RA-GAP.

The advantage of using two different methods lies in the different features of these methods. The consumption based method is quite simple. It does not require very detailed data and allows a quick estimate of the VAT gap for a given year. The VAT gap estimate cannot be broken-down, but serves as an indicator for the trend of the VAT gap in a longer period. The production based method is more comprehensive. It requires much more detailed data, but allows also a deeper analysis.

Both methods define the VAT gap as a difference between potential VAT revenues and actual VAT collection. The VAT gap of the production based method is decomposed into two portions: an assessment gap and a collection gap. The collection gap is the difference between the actual VAT paid and the amount of VAT assessed as due from tax returns. The assessment gap is the difference between the amount of VAT assessed as due from tax returns and the potential VAT.

VAT gap = potential VAT – accrued VAT collections for the period

The consumption based method, uses adjusted nominal GDP as a VAT base. Components that are not subject to VAT are deducted from nominal GDP. To calculate potential VAT, the weighted VAT rate is applied to assessed VAT base. The formulas are:

Potential VAT = VAT base * weighted average VAT rate (WAR)

$$\text{VAT base} = GDP + (M - X) - (GFCF - GFCF_{GG} - GFCF_{H} - GFCF_{FC} - GFCF_{NF}) - (FC_{GG} - IC_{GG}) - (CE_{RW} + AP_{H} - CE_{NR})$$

Where

M = import
E = export
GFCF = gross fixed capital formation
$GFCF_{GG}$ = gross fixed capital formation of general government without right to claim input VAT
$GFCF_{H}$ = gross fixed capital formation of households
$GFCF_{FC}$ = gross fixed capital formation of financial corporations
$GFCF_{NF}$ = gross fixed capital formation of non – financial corp. without right to claim input VAT
FC_{GG} = final consumption of general government
IC_{GG} = intermediate consumption of general government
CE_{RW} = consumption expenditures of residents outside the economic territory
AP_{H} = agricultural production of households
CE_{NR} = consumption expenditure of non-resident households in the economic territory

Accrued VAT collections are calculated using individual transactions between taxpayers and Tax Authority. It requires reallocation of cash collection data into periods in which they actually accrued.

Accrued VAT collections = collections at customs + payments received – excess credit

In the production based method of the IMF's RA-GAP, the approach is similar to the method which individual taxpayers use to determine their individual liabilities. The tax liability for each sector is determined as VAT paid on customs plus VAT charged on output sold domestically, less the VAT paid on inputs. The formula is as follows:

$$PV^S = \sum_C \left(M_C^S \times \tau_C\right) \times r^S + \left[\sum_C \left(Y_C^S - X_C^S\right) \times \tau_C\right] \times r^S - \left[\sum_c \left(N_C^S + I_C^S\right) \times \tau_C\right] * r^S \times (1 - e^S) \times \mu_C^S$$

Where

PV^S = the potential net VAT for a sector
M_C^S = Imports by sector of commodity c
Y_C^S = output by sector s of commodity c
X_C^S = exports by sector s of commodity c
N_C^S = intermediate consumption by sector s of commodity c
I_C^S = investment by sector s of commodity c
τ_C = the VAT rate that applies to commodity c
μ_C^S = the proportion of input tax credits for commodity c by sector s allowed to be claimed
r^S = the proportion of output for a sector produced by registered businesses
e^S = the proportion of output for a sector which is exempt

Assessed VAT is calculated for each sector using individual VAT returns. Accrued VAT collection for each sector is calculated from database of individual transactions between Tax Authority and taxpayers. The same calculation is applied as in the consumption based method. Sectors are identified according to the database of Statistical Office where the NACE code is attributed to taxpayer number.

The main assumptions in the consumption based method include:
(i) The ratio of gross fixed capital formation of non-financial corporations;
(ii) The ratio of intermediate consumption of general government without right to claim input VAT; and
(iii) The weighted average VAT rate is based on “Calculation of the Harmonised VAT Own Resource base” provided by the Statistical Office.

The main assumptions of the production based method are:
(i) Adjustments for variables X and M. The values for exports are adjusted to remove the value of domestic consumption by non-nationals, and the value of consumption abroad by nationals included

in imports is removed. Approximation is made by removing values for the import and export of services which are typically consumed at the place of supply;
(ii) Investment matrix (showing the value of each sector's use of each commodity for gross fixed capital formation) is estimated as a product of total fixed capital formation in sector s and a ratio of gross fixed capital formation of commodity c on total gross fixed capital formation; and
(iii) Matrices of inventories and tax subsidies are estimated.

Bias corrections are applied in both methodologies for the adjustment of accrued revenues by one-off payments, if necessary. For example, the 2011 and 2012 receipts were increased by one-off payments of EUR213 million from public private partnership (PPP) projects. For the purposes of estimating the VAT gap, these payments are accrued back over the period 2009 – 2012, for consistency with National Accounts treatment.

Under the consumption based method, the estimation of the VAT gap is simple, because it does not require detailed data and the data is available with short time lag. However, the application of the method is more difficult in countries with several VAT rates, because the application of the weighted average rate could significantly bias the results. Although this method gives quite accurate results, the VAT gap can rather be used as an indicator for the trend of the gap and it does not allow deeper analysis of the results.

The production based method is rather data-intensive. It requires detailed data that are published with 3 years lag (supply and use tables). In some cases it is necessary to adopt assumptions with significant impact on sectoral results. The complexity of this approach brings more accurate results which can be used in further analysis.

For both methods, the quality of estimates greatly depends on the quality of available national accounts data. A revision of national accounts affects the estimation of VAT gap. Currently the estimates are based on ESA 1995 data and it will be necessary to update the model with ESA 2010 data.

4.12.2 Resources

The data sources used for the consumption based method are:
(i) Aggregates from national accounts, i.e. GDP and main components, other aggregates described in calculation;
(ii) Weighted average VAT rates calculated by the Statistical Office;
(iii) Database of individual transactions between Tax Authority and taxpayers; and
(iv) Information about one-off revenues that influenced VAT revenues.

The data sources for the production based method are:
(i) Supply and use tables in the national accounts;
(ii) Ideally, investment matrix (shows the value of each sector's use of each commodity for gross fixed capital formation), VAT matrix (shows the differences between basic prices and purchaser's price of

each cells in a use table), export and import matrices (show the value of each sector's import and export of each commodity);
(iii) Individual VAT tax returns;
(iv) Database of individual transactions between Tax Authority and taxpayers; and
(v) Information about one-off revenues that influenced VAT revenues.

4.12.3 Results

The VAT gap estimates are only for internal purposes and are not published. The VAT gap of the consumption based method is seen as an indicator of the VAT collection efficiency in a given year. It forms a part of the revenue forecast and shows what current revenue forecast means in terms of VAT gap. The VAT gap of the production based method allows identifying the most risky sectors. This information helps more precisely targeting of anti-fraud measures.

The time difference between the availability of the results and the reference year of the estimates is very short in the case of the consumption based method. The data required to perform the calculations is usually published with 3 months lag. In the case of production based method, the time lag depends on the availability of the supply and use table of the national accounts. These are usually published with 3 years lag.

4.13 Slovenia

In Slovenia, the bottom-up approach is used for estimating the VAT gap. The estimates are prepared in-house by the Financial Administration of the Republic of Slovenia.

4.13.1 Methodology

All taxpayers which filed a VAT return are considered for the estimation of the VAT gap. However, only those taxpayers are covered by the estimations whose added value does not exceed the theoretical added value (see below for more details). The methodology allows performing a break-down of the estimations per sector, per region, and per individual groups of tax payers.

The methodology is based on a bottom-up approach and uses the data of the VAT returns. As the VAT returns constitute the only source of data, the estimated results reflect the VAT gap only with respect to the reporting non-compliance. By using the data on turnover and on purchases in the VAT returns, the difference between the turnover and purchases is calculated for each VAT taxable person who has filed a return. This difference presents the added value in terms of VAT returns. Normally, a VAT taxable person should create a positive added value in a certain period, which means that its turnovers should exceed its purchases. Furthermore, it is presumed that the added value should amount at least 10 % of the value of purchases. The value of 10 % of the purchases is considered to be the theoretical added value. The added value and the theoretical added value are then compared. It is expected that the added value is the least as high as the theoretical added value,

or higher. VAT returns which indicate an added value that doesn't reach the theoretical added value, can be considered as the starting point for the VAT gap estimation.

The following formulas are applied:

$VA_t = \sum TO_t - \sum PUR_t$
$TVA_t = 0,1 * \sum PUR_t$
$VA_t >= TVA_t$

Where:
VA_t = added value in the period t
$\sum TO_t$ = sum of turnovers in the period t
$\sum PUR_t$ = sum of purchases in the period t, while the purchases of the fixed assets and real estate are excluded.
TVA_t = theoretical added value in the period t

If it is:
$VA_t < TVA_t$, then it is: Tax gap = $(TVA_t - VA_t) * 0,22$[114]

Respectively, the consideration of the proportional share of the VAT charged at 22 % and 9,5 %.

The basic and main assumption in this methodology is the expectation that the difference between the turnover and purchases is positive in the observed period. Also, the theoretical added value (established at 10% of the purchases) is presumed to be the minimum added value that the individual taxpayer should create.

In applying the methodology, at least the following bias corrections should be made:
(i) Large taxpayers have to be excluded from the list of potential VAT returns for the tax gap calculation. It is well known that large taxpayers do not engage in the tax avoidance in the way that small or medium businesses;
(ii) The taxpayers which have registered into the tax system within the year of the tax gap estimation have also to be excluded from the tax gap calculation. Namely, a new company which has just started with the economic activity cannot fully achieve the expected course of its business;
(iii) The taxpayers in the insolvency procedures should be excluded since such taxpayers don't achieve the expected ratio between turnover and purchases;
(iv)The branches of foreign companies should be excluded;
(v) The comparison between turnover and purchases has to be made within a relevant time period. For the purposes of the estimations, a too short period isn't appropriate, because the ratio between turnover and purchase might not be representative for the business of the taxpayer. Therefore, a too

[114] In 2013, tax rates are increased from 20 % to 22 % and from 8,5 % to 9,5 %.

short period of observation cannot be considered as a relevant time period. It is presumed that one year is an appropriate time period for comparing turnover and purchases in the VAT returns; and
(vi) The value of purchases should be adjusted for the purchases of fixed assets and real estates. Namely, the purchases of fixed assets and real estate's usually amount large sums and therefore could bias the comparison between turnover and purchases.

The main issues of the methodology include:
(i) The estimates are rough due to the simplicity of the calculation;
(ii) There is only a single source of data (i.e. VAT returns), however, this way uniformity of data is achieved;
(iii) The results do not cover the entire tax gap in terms of the OECD's definition of tax gap[115], but only the gap caused by under-reporting (i.e. reporting non-compliance);
(iv) Also the amount of VAT being written-off needs to be included in the estimation of the VAT gap. However, such data is not always available (especially for earlier periods) and can therefore not be taken into account; and
(v) The results are not complete in the sense that turnover which is not declared in the tax return is not included in the calculations. Namely, according to the VAT regulations, the turnover which has been achieved with respect to a foreign buyer and the service was performed abroad, is not included in the VAT return (e.g. certain services such as transport, construction industry, tourist agencies). This means that the calculation of the difference between turnover and purchases may be incomplete. Therefore, more detailed information and data are required on taxpayers with the highest VAT gaps.

4.13.2 Resources

The methodology is based on data from VAT returns. Knowledge of how to prepare the necessary data is important (i.e. for a given year, the data from all filed tax returns have to be arranged in a way that allows performing the estimation). The preparation of the necessary data is time consuming and depends on the characteristics of the VAT returns' database. It needs to be cautiously done in order to avoid miscalculations. The software used to prepare the data and perform the calculations is Excel.

4.13.3 Results

The results of the VAT gap estimates are considered to be informative and are not published. The Slovenian Financial Administration plans to analyse the impact of some determinants of the tax gap

[115] According to the OECD's definition, the gross tax gap is comprised of three components: (1) Filing non-compliance (failure to file a tax return): The dollar amount of tax not paid timely on delinquent and non-filed returns; (2) Reporting non-compliance (understating income or over-claiming tax deductions and credits): The total tax that should be reported on timely filed returns minus the total tax actually reported on those returns; and (3) Payment non-compliance (failure to fully pay reported taxes owed): This is the difference between the total tax liability actually reported on timely filed returns and the total amount of timely payments associated with those reported liabilities. For more details, see OECD (2008).

(e.g. macroeconomic variables, tax administration measures). As the results can be broken down per economic sector, geographical area or specific taxpayer segments, they can also be used in audit selection processes.

4.14 Spain

The Spanish administration does not estimate the VAT Gap in a formal and recurrent way. However, the Spanish Tax Authority reviews the preliminary calculations and estimates of the CASE study[116] and proposes adjustments which need to be considered to correct some biases related to Spanish data´s idiosyncrasy. These adjustments relate to the VAT figures in accrual terms, the differences in dwellings expenditures between the VAT base and the national accounts, and the use of Spanish own resources data in elaborating on the VAT base. For the above purpose, the following data sources are employed: (i) VAT revenue series in accrual terms, (ii) tax bases and propexes declared in the VAT tax forms, (iii) national accounts total expenditure breakdown by product, and (iv) own resource account VAT submissions.

The Spanish Tax Authority estimated that if it would perform its own estimations of the VAT gap, it would take about one month of 4 employees working full-time on the estimations.

4.15 United Kingdom

In the United Kingdom, the VAT gap is estimated by both a top-down methodology and a bottom-up methodology. The calculations are prepared in-house by the Tax Authority (HMRC).

4.15.1 Methodology

The results of the top-down methodology are the estimates published by the HMRC, but it also uses a bottom-up estimate to inform the top-down, e.g. to estimate behavioural segments of the tax gap. In both methodologies, the 'theoretical liability' represents the tax that would be paid if all individuals and companies complied with both the letter of the law and our interpretation of Parliament's intention in setting law (referred to as the spirit of the law). The final top-down estimate cannot be broken down further as the receipts data is not split into sectors like the VAT theoretical tax liability (VTTL) is. This is the drawback of the top-down approach, and hence the HMRC uses the bottom-up methodology to inform the top-down.

The basic formula of the top-down methodology is:

VAT gap = VAT theoretical tax liability (VTTL) – VAT receipts

[116] CASE (2013), (2014), (2015)

The VTTL is comprised of government, housing, household, and exempt sectors. The HMRC receives low level data on each of these areas where it apportions the amount that is standard, reduced, zero and exempt rated to the different commodities. The reduced and standard rated commodities add together to give the VTTL. The VAT receipts are then deducted from this total.

In the bottom-up methodology, for the SME components of the estimate, primarily random audit results are analysed to estimate the average level of non-compliance and then are grossed up to the full population.

The main assumptions in the top-down methodology concern:
(i) Partial exemption percentages;
(ii) The profile of unregistered traders turnover is assumed to be the same as that for registered traders);
(iii) VAT rate proportions (percentage split of commodities that are standard, reduced or zero rated or exempt); and
(iv) Forecast the latest year's data using the Office for Budget Responsibility determinants.

The main assumptions in the bottom-up methodology include (i) the level of non-detection within random audit.

In general, the main issue in both methodologies is data limitations. Furthermore, national statistics data revisions have large impact on the estimates. Revisions can be in the quarterly consumer trends data and annual Blue Book / National Accounts data. These will feed through to the VAT gap. Broadly, a 1% change in the consumer trends data will result in a 0.6-0.7 percentage change in the VAT gap (as consumer trends accounts for about 70% of the VTTL).

The main disadvantages of the top-down methodology are that (i) it cannot be broken down to quantify different aspects of non-compliance or VAT avoidance; (ii) it doesn't mirror actual VAT payment/repayment process; (iii) it is subject to regular revision; and (iv) statistical error can make inference about year on year changes more difficult. In contrast, the main advantages of the methodology are that (i) the results are largely independent from VAT administrative sources; (ii) it allows more sophisticated forecasting of future receipts and modelling of policy options; (iii) it can be considered as a reliable measure of trend over time; and (iv) it will pick up losses either not included or incorrectly quantified in the bottom up approach.

With the bottom-up methodology, it is not guaranteed that all elements of the tax gap have been included. The use of different data sources and timing issues mean there can be a reconciliation issue where the top-down and the bottom-up estimates differ, which is usually the case.

4.15.2 Resources

For the top-down methodology, the required data sources are:
(i) Consumer Trends data (Office for National Statistics)
(ii) Blue Book data – National Accounts (Office for National Statistics)

(iii) VAT receipts (HMRC)
(iv) VAT Own Resources (HMRC)

For the bottom-up methodology, the data sources include:
(i) Random audit results
(ii) Risk registers
(iii) HMRC administrative data (e.g. debt)
(iv) Third party information
(v) Tax returns

The top-down methodology is based in MS Excel and uses a macro to update it.

1 FTE higher/senior statistical officer has responsibility for maintaining and updating the model and it is overseen by a senior G7 manager with input/sign-off of publications and methodologies from a wide ranging VAT gap working group.

The bottom-up gap is comprised of 11 components. The components are updated across three areas of the overall tax gap team, requiring input from 3 FTEs putting in from 3 weeks to 3 months work, depending on the particular component. Software used includes Excel, SAS, SQL and Access.

4.15.3 Results

The top-down estimates are published as part of the Measuring Tax Gaps publication at https://www.gov.uk/government/statistics/measuring-tax-gaps. Also preliminary estimates (at Autumn Statement) and second estimates (at Budget) are published at https://www.gov.uk/government/statistics/vat-gap-estimates. In some specific cases, only some bottom-up components are published (e.g. debt, avoidance and Missing trader Intra-community fraud (MTIC).

The VAT gap is used in the forecast of VAT receipts. The estimates also provide context for strategy development and operational planning. The tax gap provides evidence against which the benefits cases of new proposals can be tested. The revenue implications of proposals are typically developed as part of investment cases – typically these cases are built 'bottom-up' in isolation from one another. These can be tested against the value of the tax gap that they are supposed to be closing to assess whether they are realistic. This is particularly important when there are a number of difficult proposals under consideration. Although individually plausible, they can be attempting to reduce the same element of the tax gap and hence unrealistic when the total benefits are summed together.

References

Bach, S. (2013): "Has German Business Income Taxation Raised Too Little Revenue Over the Last Decades?"
DIW Discussion Papers 1303, German Institute for Economic Research, Berlin, 2013

Breusch, T. (2005): Estimating the Underground Economy using MIMIC Models
November 2005
Online: http://128.118.178.162/eps/em/papers/0507/0507003.pdf

CASE (2013): Study to quantify and analyse the VAT Gap in the EU-27 Member States. TAXUD/2012/DE/316, 2013
Online:
http://ec.europa.eu/taxation_customs/resources/documents/common/publications/studies/vat-gap.pdf

CASE (2014): 2012 Update Report to the Study to quantify and analyse the VAT Gap in the EU-27 Member States. TAXUD/2013/DE/321, 2014
Online:http://ec.europa.eu/taxation_customs/resources/documents/common/publications/studies/vat_gap2012.pdf

CASE (2015): Study to quantify and analyse the VAT Gap in the EU member States, 2015 Report. TAXUD/2013/DE/321, 2015
Online:http://ec.europa.eu/taxation_customs/resources/documents/common/publications/studies/vat_gap2013.pdf

Cinta, A. – Myles, G. – Kotsogiannis, Ch. (2014): Self-Employment Underreporting in Great Britain: Who and How Much?
Discussion Paper: 010-14, Tax Administration Research Centre, University of Exeter, December 2014
Online:https://tarc.exeter.ac.uk/media/universityofexeter/businessschool/documents/centres/tarc/publications/discussionpapers/Self-Employment_Underreporting_in_GB.pdf

Convenevole, R. (2006): A good start for VT part. Here are the first outcomes of the data included in the VT part of the 2005 VAT return
Italian Revenue Agency Working Papers, Research Department, 2006/3.

D'Agosto, E. – Marigliani, M. – Pisani, S. (2014): Asymmetries in the territorial VAT gap
Italian Revenue Agency Discussion Topics n.2, 2014

Eurostat: About ESA 2010 (web-page)
Online: http://ec.europa.eu/eurostat/web/esa-2010

ESA 2010: European system of accounts - ESA 2010, Handbook, European Commission, Luxembourg 2013

Online: http://ec.europa.eu/eurostat/documents/3859598/5925693/KS-02-13-269-EN.PDF/44cd9d01-bc64-40e5-bd40-d17df0c69334

Finke, K. (2014): "What is the Scale of Tax Avoidance? Evidence from a Propensity Score Marching Approach"
Unpublished Manuscript (Preliminary Version of a Working Paper), Centre for European Economic Research (ZEW), Mannheim, 2014

Gemmell, N. - Hasseldine, J. (2012): The Tax Gap: A Methodological Review
Working Paper 09/2012 in Public Finance, Victoria Business School, University of Wellington, September 2012

HMRC (2011): The Practicality of a Top Down approach to the Direct tax Gap, HMRC Working Paper No 12, August 2011
Online:https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/331646/tax gap-workingpaper.pdf

HRMC: Measuring Tax Gaps (web-page)
Online: https://www.gov.uk/government/statistics/measuring-tax-gaps

HMRC: VAT gap estimates (web-page)
Online: http://www.gov.uk/government/statistics/vat-gap-estimates

EFD: Italian Economic and Financial Document (EFD)
Online: http://www.mef.gov.it/documenti-allegati/2014/Rapporto_art6_dl66_13_luglio.pdf (in Italian only)

IMF (2015): Current challenges in revenue mobilization: improving tax compliance,
IMF Staff Report, April 2015
Online: https://www.imf.org/external/np/pp/eng/2015/020215a.pdf

INSEE (2014): Les comptes nationaux passent en base 2010
INSTITUT NATIONAL DE LA STATISTIQUE ET DES ÉTUDES ÉCONOMIQUES (INSEE), Mai 2014
Online: http://www.insee.fr/fr/indicateurs/cnat_annu/base_2010/methodologie/comptes-nationaux-base-2010.pdf

IRS: The Tax Gap (web-page)
Online: https://www.irs.gov/uac/The-Tax-Gap

IRS (2012): IRS Releases New Tax Gap Estimates; Compliance Rates Remain Statistically Unchanged From Previous Study; IR-2012-4, January 2012
Online: https://www.irs.gov/uac/IRS-Releases-New-Tax-Gap-Estimates;-Compliance-Rates-Remain-Statistically-Unchanged-From-Previous-Study

ISWGNA (2006): Declaration on the Estimates of the unrecorded economy and national accounts, 2006

Kaufmann, D. – Kaliberda, A. (1996): Integrating the Unofficial Economy into the Dynamics of Post-Socialist Economies
Policy Research Working Paper, No 1691, The World Bank, December 1996
Online: http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-1691

Keen, M. (2013): The Anatomy of the VAT
IMF working paper, WP/13/111, 2013
Online: https://www.imf.org/external/pubs/ft/wp/2013/wp13111.pdf

LOUVOT-RUNAVOT, C. (2011): L'évaluation de l'activité dissimulée des entreprises sur la base des contrôles fiscaux et son insertion dans les comptes nationaux
INSTITUT NATIONAL DE LA STATISTIQUE ET DES ÉTUDES ÉCONOMIQUES, Série des documents de travail de la Direction des Études et Synthèses Économiques, Mai 2011
Online: http://www.insee.fr/fr/publications-et-services/docs_doc_travail/G2011-09.pdf

OECD (2002): Measuring the Non-Observed Economy: A Handbook
Online: http://www.oecd.org/std/na/1963116.pdf

OECD (2008): Monitoring Taxpayers' Compliance: A Practical Guide Based on Revenue Body Experience, Centre for Tax Policy and Administration, 2008
Online: http://www.oecd.org/tax/administration/40947920.pdf

OECD (2015): Consumption Tax Trends, 2015
Online: http://www.oecd.org/tax/consumption/consumption-tax-trends-19990979.htm

Parsche, R (2008): Trotz Erhöhung des Mehrwertsteuersatzes 2007 auf 19% ging die Ausfallquote auf 9% zurück und durfte auch 2008 bei 9% liegen
61. Jahrgang – ifo Schnelldienst 12/2008
Online: http://www.cesifo-group.de/pls/guest/download/ifo%20Schnelldienst/ifo%20Schnelldienst%202008/ifosd_2008_12_4.pdf

Pisani S. (2014): An approach to assess how the activity of the Italian revenue agency affects compliance, Discussion Topics, n.1, Italian Revenue Agency

Plumley, A. (2005): Preliminary Update of the Tax Year 2001 Individual Income Tax Underreporting Gap Estimates
Internal Revenue Service, 2005,
Online: http://www.irs.gov/pub/irs-soi/05plumley.pdf

Risk Management Platform (2012): Tax Gap and Compliance Map Report
Fiscalis Platform, Restricted report - not published, 2012

Rodrigues, C. (2015): VAT revenue estimation on an accrual basis (based on the IMF methodology) Autoridade Tributaria e Aduaneira, Centro de Estudos Fiscais e Aduaneiros, CEF, CTF Article pgs 7-21/2015, February 2015

Rubin, M. (2011): The Practicality of the Top-down approach to Estimating the Direct Tax-Gap
Her Majesty's Revenue and Customs, UK, September 2011
Online: https://www.gov.uk/government/publications/the-practicality-of-a-top-down-approach-to-the-direct-tax-gap or https://www.irs.gov/pub/irs-soi/11rescontaxgap.pdf

Stavjaňová, J. (2014): Value Added Tax Gap in the Czech Republic
Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis, 62(6): 1427–1436

Thackray, M. – Hutton, E. – Kapoor, K. (March 2015): Denmark, Revenue Administration Gap Analysis Program—The Value-Added Tax Gap
IMF, March 2015
Online: http://www.imf.org/external/pubs/ft/scr/2016/cr1659.pdf

Thackray, M. – Hutton, E. – Kapoor, K. (November 2015): Finland, Revenue Administration Gap Analysis Program—The Value-Added Tax Gap
IMF, November 2015
Online:
http://www.vero.fi/download/Revenue_Administration_Gap_Analysis_Program__The_Value_Added_Tax_Gap/%7B0ECEC06F-AC04-4C91-9048-7E1F0CCB00ED%7D/11669

Thackray, M. – Ueda, J. (2014): Technical Assistance Report—Revenue Administration Gap Analysis Program—The Value-Added Tax Gap, Republic of Estonia
IMF, Country Report No. 14/133, May 2015
Online: http://www.imf.org/external/pubs/ft/scr/2014/cr14133.pdf

Toder, E. (2007): Reducing the Tax Gap: The Illusion of Pain-Free Deficit Reduction
Urban Institute and Urban-Brookings, Tax Policy Center, July 2007
Online: http://www.taxpolicycenter.org/publications/urlprint.cfm?ID=411496

Toder, E. (2007): What is the Tax Gap?
Tax Notes, Taxanalysts, October 22, 2007
Online:http://www.americanbar.org/content/dam/aba/migrated/tax/nosearch/taxgap/papers/whatistaxgap.authcheckdam.pdf

Toro, J. - Ogata, K. - Hutton, E. - Caner S. (2013): Assessment of HMRC's Tax Gap Analysis, United Kingdom
IMF, Fiscal Affairs Department, Country Report No. 13/314, October 2013
Online: https://www.imf.org/external/pubs/ft/scr/2013/cr13314.pdf

Annex I. - List of participants

COUNTRY	Name of participant	Administration
BELGIË / BELGIQUE (Belgium)	Mr. Geert Van Reybrouck	Ministry of Finance, Belgium
	Mr. Edmond Deloddere	Ministry of Finance, Belgium
ČESKÁ REPUBLIKA (Czech R.)	Mr. Jiří Vlach	General Financial Directorate of the Czech Republic
	Ms. Jana Stavjaňová	Ministry of Finance of the Czech Republic
DEUTSCHLAND (Germany)	Ms. Stefanie Knoth	Federal Ministry of Finance Germany
	Ms. Katja Blumenstein	Federal Ministry of Finance Germany
EESTI (Estonia)	Ms. Helli Lepasaar	Estonian Tax and Customs Board
	Mr. Ivar Laur	Estonian Tax and Customs Board
ESPAÑA (Spain)	Mr. Ruben V. Fernandez de Santiago	Agencia Estatal de Administracion Tributaria
France	Ms. Charlotte Geay	Direction générale du Trésor
	Mr. Patrick Poncet	INSEE (French National Institute of Statistics and Economic Studies)
ITALIA (Italy)	Mr. Stefano Pisani	Italian Revenue Agency
LATVIJA (Latvia)	Ms. Anita Zeire	The State Revenue Service of the Republic of Latvia
	Ms. Natalija Filipovica	The State Revenue Service of the Republic of Latvia
LIETUVA (Lithuania)	Ms. Jolanta Navickienė	Ministry of Finance of Republic Lithuania
	Ms. Justė Pabarčiūtė	State Tax Inspectorate under the Ministry of Finance of the Republic of Lithuania
POLSKA (Poland)	Mr. Tomasz Mazur	Ministry of Finance, Poland
	Ms. Bożena Dąbrowska	Ministry of Finance, Poland
PORTUGAL	Ms. Carla Pereira Rodrigues	Centre for Tax and Customs Studies Portuguese Tax Authority

SLOVENIJA (Slovenia)	Mr. Tomaž Lešnik	Financial Administration of the Republic of Slovenia
SLOVENSKÁ Rep. (Slovakia)	Mr. Rastislav Gabik	Ministry of Finance of Slovak Republic
SUOMI (Finland)	Mr. Aki Savolainen	Finnish Tax Administration
UNITED KINGDOM	Ms. Caitriana Ahluwalia	HMRC
	Mr. Alexander Chislett	HMRC
EUROPEAN COMMISSION	Ms. Gyongyi Vegh	Directorate General Taxation and Customs Union
	Mr. Tanel Puetsep	Directorate General Taxation and Customs Union

Annex II. - List of presentations

I. Meeting: 27 November 2014, Brussels

- *Mr. Tanel Puetsep and Ms. Gyongyi Vegh (European Commission, DG TAXUD)*: Context, background and aim of the TGPG

II. Meeting: 4-5 February 2015, Brussels

- *Mr. Stefano Pisani (Italian Revenue Agency)*: Tax Gap estimation in Italy
- *Mr. Ivar Laur (Estonian Tax and Customs Board)*: Tax Gap estimation in Estonia
- *Mr. Søren Pedersen (Danish Tax Administration)*: Tax Gap estimations in Denmark
- *Mr. Tomaz Lesnik (Financial Administration of the Republic of Slovenia)*: Tax Gap estimation in Slovenia
- *Ms. Caitriana Ahluwalia and Mr. Alexander Chislett (HMRC)*: Tax Gap estimation in the UK
- *Mr. Luca Barbone (Center for Social and Economic Research (CASE))*: Methodology of the VAT Gap Study
- *Mr. Eric Hutton (IMF)*: Revenue Administration Gap Analysis Program
- *Ms. Catrine Boogh-Dahlberg (European Commission, DG ESTAT)*: The non-observed economy

III. Meeting: 21 April 2015, Brussels

- *Mr. Ludwig De Winter (European Commission, DG TAXUD)*: Recapitulative Statements and mini-one-stop shop
- *Ms. Kristina VITKAUSKAITE (European Commission, DG TAXUD)*: Standard VAT Return
- *Ms. Carla Pereira Rodrigues (Centre for Tax and Customs Studies, Portuguese Tax Authority)*: Revenue estimation on an accrual basis

IV. Meeting: 9 November 2015, Rome

- *Mr. Brian Erard (B. Erard & Associates):* Measuring the Tax Gap: Measures based on operational audit data and measures based on comparisons of surveys and administrative data
- *Mr. Stéphane Buydens (OECD):* VAT Revenue Ratio and other relevant aspects of tax gap estimations

- *Ms. Marie Hassan (National Institute of Statistics and Economic Studies, France):* Evaluation of Firms' dissimulated activity based on fiscal audits and integration in national accounts

- *Mr. Christos Kotsogiannis (Tax Administration Research Centre, University of Exeter)*: Self-employment underreporting in GB: Who and by how much?