CASE Network Reports

Study to quantify and analyse the VAT Gap in the EU-27 Member States

Luca Barbone
Misha V. Belkindas
Leon Bettendorf
Richard Bird
Mikhail Bonch-Osmolovskiy
Michael Smart

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List of Acronyms and Abbreviations

B2B	Business-to-business
CASE	Center for Social and Economic Research
CPB	Netherlands Bureau for Economic Policy Analysis (Central Planning Bureau)
EU	European Union
EU-26	Current members of the European Union, minus Croatia and Cyprus
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GST	Goods and Services Tax
HMRC	Her Majesty's Revenue and Customs
MS	Member States
NMS	New Member States
NPISH	Non-Profit Institutions Serving Households
OECD	Organisation for Economic Cooperation and Development
OMS	Old Member States
TAXUD	Taxation and Customs Union Directorate-General (European Commission)
UK	United Kingdom
VAT	Value Added Tax
VTTL	VAT Total Tax Liability
VTL	VAT Tax Liability
VRR	VAT Revenue Ratio

The authors

Luca Barbone has been President of the CASE Management Board between September 2011 and September 2013. He joined CASE in January 2011 upon his retirement from the World Bank, where he had worked since 1988, holding various leadership posts, among others Director in the Poverty Reduction and Economic Policy Unit in the Europe and Central Asia Regional Office (2007-2011), World Bank Director for Poverty Reduction (2004-2007), and Regional Director for Ukraine, Moldova and Belarus (2000-2004). Prior to the World Bank, Mr. Barbone worked for the Organisation for Cooperation and Development (Paris), the International Monetary Fund, The Planning Institute of Jamaica, and the Bank of Italy. He holds a Ph.D. in Economics from the Massachusetts Institute of Technology. He has published a number of articles in professional journal and books. Main areas of personal interest now include: (i) economic crisis and growth prospects; (ii) economic consequence of long-term demographic trends; (iii) migration and development; (iv) fiscal institutions, fiscal consolidation (v) social cohesion and political economy of reforms in Europe and Central Asia.

Misha V. Belkindas has been a CASE Fellow since October 2012. Professor Belkindas specializes in Statistics and Development Economics. He is, among others, Chair of the International Advisory Panel on Statistical Education at the Higher School of Economics in Moscow and a Fellow of the Royal Statistical Society. Since 1992, he has held various positions in the World Bank, including his last position as Manager of the Development Data Group, where he led the International Statistical Programs Cluster and managed and oversaw management of Statistical Capacity Building trust funds, the International Comparison Program, the System of National Accounts updating, the Statistics for Results Catalytic Fund and others.

Leon Bettendorf (CPB) holds a Ph.D. in economics from the Catholic University of Leuven. He is researcher at the Taxation unit of the CPB Netherlands Bureau for Economic Policy Analysis. Currently, he is coordinator of a consortium that provides economic analysis in the area of taxation for the European Commission (DG TAXUD). His main interests are corporate taxation, value added taxes and applied general equilibrium models. He has published in various journals, including Economic Policy, Journal of Economic Behavior and Organization and Energy Economics.

Richard Bird (University of Toronto) is Professor Emeritus of Economics, Rotman School of Management, and Adjunct Professor and Senior Fellow of the Institute for Municipal Governance and Finance, Munk School of Global

Affairs, University of Toronto. He is also Distinguished Visiting Professor, Andrew Young School of Public Policy at Georgia State University in Atlanta, and Adjunct Professor of the Australian School of Taxation and Business Law of the University of New South Wales, Australia. He has served with the Fiscal Affairs Department of the IMF, and has been a visiting professor in the United States, the Netherlands, Australia, Japan, and India as well as a frequent consultant to the World Bank and other national and international organizations.

Mikhail Bonch-Osmolovskiy is a senior statistician expert with an in-depth knowledge of labour market and migration economics and statistics. He holds a PhD from the University of North Carolina at Chapel Hill for his dissertation "Work-related Migration and its Effect on Poverty Reduction and Educational Attainment in Nepal" (2009). He obtained both Master degree in Mathematics from the Moscow State University and Master degree in Economics from the New Economic School in Moscow.

Michael Smart (University of Toronto) is a Professor of Economics at the University of Toronto. He is a past editor of International Tax and Public Finance and the Canadian Journal of Economics, and a fellow of the Centre for Business Taxation at Oxford University.

Acknowledgements

Foreword

This report presents and discusses the findings of the "Study to quantify and analyse the VAT Gap in the EU-27 Member States" (Contract TAXUD/2012/DE/316, FWC No. TAXUD/2010/CC/104), conducted by CASE and CPB.

According to the Terms of Reference, the aim of the study is to help better understand the recent trends in the field of VAT fraud, by updating the VAT Gap estimates for 2000-2006 produced in the Reckon Report (Reckon, 2009) and by providing estimates for the VAT Gap for the period 2007-2010 and expanding the scope of the study to include the Member States that were not included in the initial study (Cyprus, Bulgaria and Romania). Croatia became a member of the European Union on July 1, 2013, and it is not included in the scope of the study.

The study is to follow - and improve where necessary - the methodology employed by the Reckon Report (Reckon 2009) for the production of top-down estimates of theoretical VAT. In addition, the study will also attempt to analyse determinants of VAT Gaps using a number of econometric techniques.

Estimates for Cyprus could not be produced, in view of the forthcoming revision in National Accounts that is expected to substantially increase GDP estimates and that of its components. On the other hand, we were able to extend the estimation period for the remaining 26 countries to 2011.

The structure of this report is as follows. In Chapter 1, we discuss the structure of the VAT systems in the EU, the broad trends in the EU economy over the period 2000-2011, and review the behaviour of VAT revenues, as well as the changes in VAT rates and exemptions that have occurred as a response to economic events or policy decisions. We pay particular attention to the events following the onset of the economic crisis in 2008. In Chapter 2, we discuss the definition of VAT Gaps that has been used in this study, as well as other alternatives existing in the literature. We review possible shortcomings associated with different concepts. In Chapter 3 we present the results of the estimations for EU-26 countries for the period 2000-2011. The estimates are first discussed for the EU-26 as a whole, and then for each country individually. Chapter 4 provides an econometric analysis of the determinants of VAT Gaps for the period under consideration. Appendix A discusses the methodology followed with regard to the estimates, and Appendix B reviews the differences with other, official and unofficial, estimates of the Gaps. Appendix C provides additional statistical material.

Executive Summary

This report presents and discusses the findings of the "Study to quantify and analyse the VAT Gap in the EU-27 Member States" (Contract TAXUD/2012/DE/316, FWC No. TAXUD/2010/CC/104), conducted by CASE and CPB.

This report provides estimates of the VAT Gaps for 26 of the 28 current countries of the European Union for the period 2000-2011 (Cyprus could not be included due to the imminent release of major revisions to its national accounts, and Croatia joined the EU after the report was completed). The VAT Gap is defined as the difference between the theoretical VAT liability and the collections of VAT, in any country and in any year (in absolute or percentage terms). The calculation of the theoretical VAT liability is performed by applying the "top-down" methodology employed by Reckon (2009), modified as necessary. The estimates in the report have benefitted from several direct communications from EU Member States authorities, which have allowed an improvement in accuracy of key parameters compared to Reckon (2009).

The report also reviews the literature regarding measures of VAT efficiency and non–compliance, and discusses other methodologies currently in use or under development by both academics and tax administrations. It cautions about the use that can be appropriate for the VAT Gaps, as they point not only to non-compliance, but can also register avoidance activities, which might be legal under the letter of the laws and regulations.

The analysis of VAT Gaps for the period 2000-2011 in this report shows that (i) prior to 2008 a moderate declining trend was present in the data, in many cases quite evident in post-accession countries; (ii) there continue however to be great disparities in the performance of countries, and most "worse performers" have been unable to improve their situation substantially over time; (iii) the post-2008 difficult economic times faced by several Member States have strained VAT systems, particularly in the hardest-hit countries, leading to increases in VAT Gaps even as rates were increased on several occasions.

The report estimates that the total VAT Gap for the 26 EU countries amounted to approximately Euro 193 billion in 2011, or about 1.5 percent of the GDP of the EU-26, an increase from the 1.1 percent of EU-26 GDP recorded in 2006. Italy, France, Germany and the United Kingdom contributed over half of the total VAT Gap in absolute terms, although in terms of their own GDP the countries with the largest gaps are Romania, Latvia, Greece and Lithuania.

Econometric estimates of the determinants of the VAT Gap show that VAT compliance appears to fall when tax rates are increased, at least in countries with weaker tax enforcement. In addition, VAT compliance appears to fall during recessions. These results are consistent with predictions from the theory of tax avoidance, and consistent with some previous estimates.

Together, the estimates of the VAT Gaps and the econometric analysis give some indication of the important place of tax enforcement and tax compliance considerations in determining how VAT should be reformed to respond to Europe's fiscal pressures. Certainly, these results are consistent with the notion that reforms to VAT policy and VAT enforcement can be an important part of fiscal consolidation exercises in some member states.

1. Introduction and Context

1.1.   VAT Revenues in the EU

All EU countries rely on the Value Added Tax (VAT) as one of their main sources of government revenue. Figure 1.1.1 shows that, on average, VAT revenues amounted to 21 percent of total general government revenues for the EU-27 countries over the period 2000-2011, or 7.5 percent of GDP. The lowest percentage in total revenues was registered in Italy, while Bulgaria relies most heavily on VAT in its total general government revenues.

Figure 1.1.1. VAT Revenues in the EU, 2000-2011
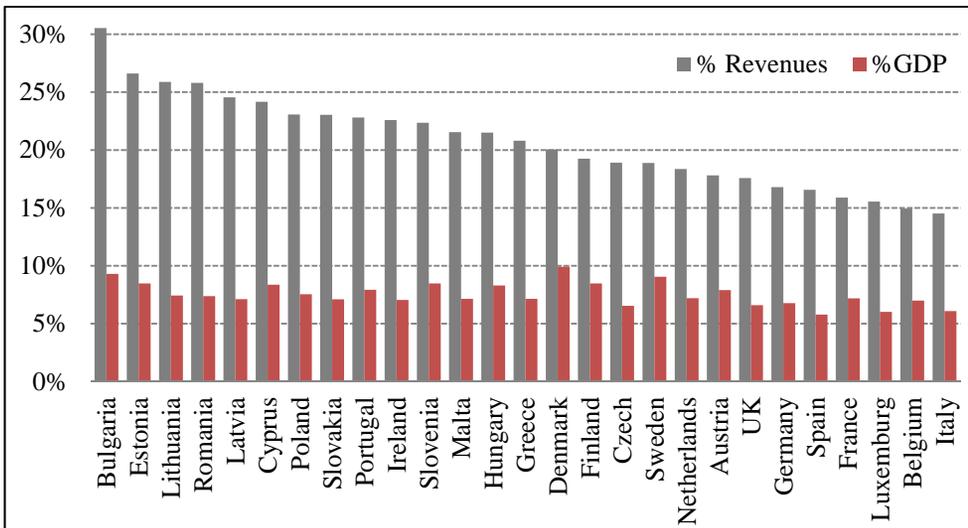
Source: EUROSTAT.

As a percentage of GDP, Denmark (which allows for few zero-rated items and no reduced rates) drew the highest amount of resources, at 10 percent of GDP, with Spain being at the opposite end of the spectrum, at 5.8 percent of GDP. During the period under review 8 of the 12 NMS (New Member States) relied most heavily on VAT for their public finances, reflecting among other things the commonalities in approaches to tax reform following the economic transformation of the early 1990s.

1.2.   VAT Structures in EU Countries

The VAT system is defined by parameters that determine its scope, most notably the level of the general rate and of reduced rates, the amount and types of exemptions, and a number of administrative provisions regarding the way in which economic agents must behave (thresholds for registration as taxpayers, frequency of declarations and payments, rules on cross-border trade, etc.). The EU has attempted over the years, in line with the objectives of the Single Market, to harmonize these parameters with a series of Directives. Currently, the VAT Directive, enacted on January 1, 2007 and replacing the Sixth Directive, contains all legislations concerning the common VAT system in place[1]. The Directive does not stipulate one uniform percentage rate for the whole Union, but sets boundaries for the Member States. For example, it restricts the minimum standard rate to 15 percent (this regulation has been extended to 31 December 2015) and allows for two reduced rates of at least 5 percent for goods and services listed in the Annex III of the EU VAT Directive (2006/112/EC). Some derogations and exceptions for Member States are in place, entailing the existence of exemptions, zero rates and super reduced rates.

Table 1.2.1 displays the situation existing at end-2011 with respect to standard and reduced rates, and for a number of other parameters, such as the importance of exempted activities/goods in the total VAT base, the frequency of changes to the rate structure, and the effective rate faced by households.

The table confirms the rather diverse structure of VAT parameters across Member States. The standard rate ranges from 15 to 25 percent; all countries have reduced rates, sometimes a multiplicity of them, with the exception of Denmark, which has no reduced rates, except for granting a zero rate to newspapers, exports, and a few other items. Rates have been changed over time by several countries (both standard and reduced ones). The country discussions in Chapter 3.2 provide details on the evolution of rates over the period of the study. In addition, Box 1.1 provides a discussion of the estimated effects of individual rate changes on VAT revenues.

Table 1.2.1 also displays the weighted average VAT rate faced by households in each country (calculated on the basis of consumption patterns of households, as discussed in Chapter 3 and Appendix A). As is apparent, given the composition of the consumption basket, and the existence of exempt, reduced or zero-rated items, the effective VAT rate faced by households is generally lower than

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[1] See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:347:0001:0118:en:PDF [2013/03/25].

the standard rate, sometimes considerably so (in most cases, the effective rate faced by households is less than half of the nominal standard rate).

Table 1.2.1. EU-26: VAT structure, 2011

Country	VAT rates (%)					Number of VAT changes* 2000-2011	Average Household Rate (%)**	Exempted industries (share, %)***
	Full	Reduced			Parking	Zero		
Austria	20.0	10.0			12.0	No	0	11.4	16.2
Belgium	21.0	12.0	6.0		12.0	Yes	0	10.3	14.4
Bulgaria	20.0	9.0				No	2	14.2	12.0
Czech Republic	20.0	10.0				No	4	11.5	10.8
Denmark	25.0					Yes	0	15.4	21.0
Estonia	20.0	9.0				No	2	13.6	9.2
Finland	23.0	13.0	9.0			Yes	4	11.5	15.6
France	19.6	5.5	2.1			No	1	10.3	13.1
Germany	19.0	7.0				No	1	9.5	16.9
Greece	23.0	13.0	6.5			No	11	9.6	16.8
Hungary	25.0	18.0	5.0			No	6	15.0	10.5
Ireland	21.0	13.5	9.0	4.8	13.5	Yes	10	9.2	14.8
Italy	21.0	10.0	4.0			Yes	1	10.6	9.5
Latvia	22.0	12.0				No	5	12.3	16.1
Lithuania	21.0	9.0	5.0			No	4	15.1	10.3
Luxembourg	15.0	12.0	6.0	3.0	12.0	No	0	7.8	53.6
Malta	18.0	5.0	7.0			Yes	2	9.2	13.2
Netherlands	19.0	6.0				No	1	8.4	21.4
Poland	23.0	8.0	5.0			No	4	10.1	12.0
Portugal	23.0	13.0	6.0		13.0	No	7	10.1	16.9
Romania	24.0	9.0	5.0			No	3	14.5	11.3
Slovakia	20.0	10.0				No	8	13.8	8.6
Slovenia	20.0	8.5				No	2	11.7	10.6
Spain	18.0	8.0	4.0			No	2	7.9	12.6
Sweden	25.0	12.0	6.0			Yes	0	12.2	20.0
United Kingdom	20.0	5.0				Yes	3	8.9	22.3

* Any change in full or reduced rates (incl. introduction/cancellation of rates).
** Weighted average VAT rate faced by households, calculated as VTTL on household consumption divided by Household consumption
***Percent of total gross output produced by exempt sectors, calculated from Use Tables
All countries apply zero rates to exports. The Parking rate is a transitional rate that applies to items moving from one category to the other.
Source: EUROSTAT; WIOD; TAXUD; Own Calculations.

Box 1.1. Assessing the Effects of Rate Changes

In order to assess the ex-ante effects of changes in the VAT rates, an "Index of Policy-Induced VAT Changes" was developed as a synthetic measure aiming at capturing the degree by which changes in VAT rates are used by countries over time (Figure Box 1.1). The index is based on the year 2000 structure of the VAT tax base in each country, and thus seeks to separate the effects of rate increases from those due to the composition of the VTTL. Increases in rates lead to an increase in the index, and the opposite for rate decreases. The amplitude of the change in the index is an approximation of the potential effect on revenues that can be expected from the policy measures. From Figure Box 1.1, one can see that most countries have been relatively conservative in the handling of their standard and special rates, but other have resorted to tinkering with the system much more often. The most notable cases in this respect are those of Latvia, Hungary, Portugal, the Czech Republic, and more recently the United Kingdom, Greece and Romania. About half of the EU-26 countries increased their rates following the onset of the financial-economic crisis in 2008. Interestingly, Ireland, which has had one of the highest frequencies in changes of rates over the sample period, registered overall small actual ex-ante effects on potential revenues—perhaps a case of tinkering at the margin. The full data set for the index is reported in Appendix C.

Figure Box 1.1. Index of Policy-Induced VAT Changes
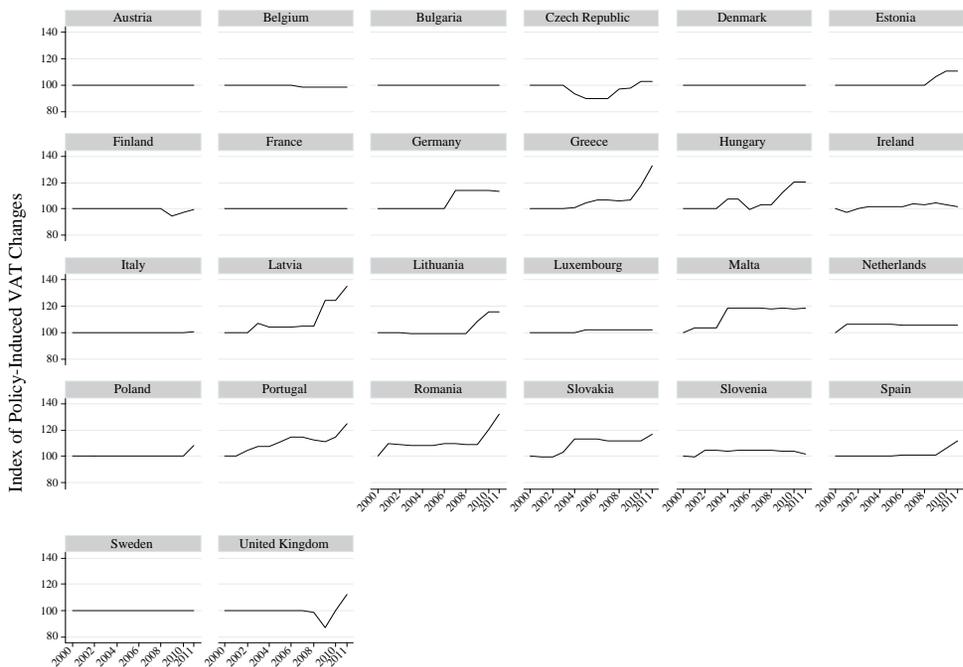
Source: Own calculations.

The last column in Table 1.2.1 displays the percentage of total intermediate consumption purchased by exempt industries, as a proportion of total output. This ratio also displays considerable variability, ranging from the low of 9.5 percent

in the case of Slovakia, to the high of 54 percent in the case of Luxembourg (the latter being the result of the exemptions in the financial sector, which has a higher importance in Luxembourg compared to the rest of the EU). This parameter is important with respect to the revenue capacity of the VAT, and at the same time it is an indication of inefficiencies built into the system. Exempt economic agents cannot reclaim VAT on inputs; this increases revenues for the treasury, but can lead to tax-induced distortions in the structure of relative prices (something that a "pure" VAT - with no exemptions and no reduced rates - is designed to avoid).

1.3.   Relevant Economic Developments, 2000-2011

Economic developments in the European Union during the period under review have been extensively discussed in the literature (Cf. European Commission, 2009). In this section, we restrict ourselves to highlighting a few facts that are useful to better understand/explain the evolution of the VAT Gaps which we will review in Chapter 3. For later analytical purposes, we also introduce two groupings of the EU-26 membership: Euro/non-Euro and Old Member States/New Member States[2]. These groupings are based on self-evident features such as membership in the currency union and duration of EU status. As will be shown in Chapters 3 and 4, the different groupings exhibit different patterns with respect to the level and behaviour of VAT Gaps.

Based on the existing literature, and as evident from Figure 1.3.1 and Figure 1.3.2, the 11-year period can be roughly divided into two sub-periods, 2000-2007 and 2008-2011. During the first period, economic conditions were favourable, although in retrospect large imbalances were accumulating in asset markets, particularly real estate, in a number of countries. Fuelled in part by easy availability of credit for both the public and private sectors, GDP growth was sustained and even robust among members of the European Union, but with noticeable differences. For the entire period 2000-2011, the EU GDP grew at an average of 2.6 percent, but New Member States (NMS) grew at twice the rate of Old Member States (OMS), 3.7 percent vs 1.8 percent. A similar pattern was observed for the Euro-Non-Euro country aggregates.

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[2] Euro: Eurozone (excl. Cyprus) / Non-Euro: Non-Eurozone countries; OMS: Old Member States; NMS: New Member States (excl. Cyprus).

Figure 1.3.2. GDP Growth (% change)
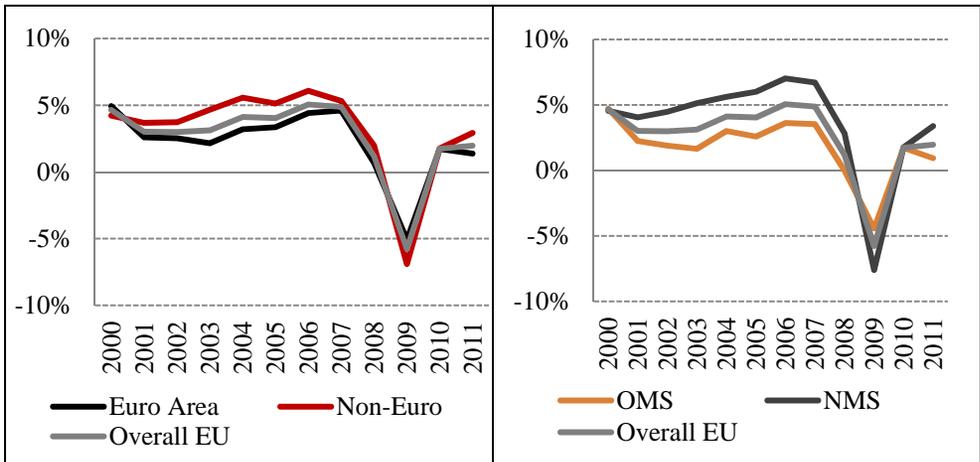
Source: EUROSTAT.

Following the onset of the 2008 crisis, all EU countries (with the exception of Poland) experienced a recession in 2009 which was in some cases very severe (e.g., Latvia: real GDP growth -18 percent, Lithuania: -15 percent). Since then, recovery has been slow in a majority of EU countries. With respect to the groupings that we have highlighted, there was a better performance of New Member States compared to OMSs during the boom years; the recession of 2009 was on average worse in the NMS, but the rebound once again brought the NMS on top of the GDP growth rankings.

Government finances were affected by general economic developments, as well as policy choices (Figure 1.3.2). While most (but not all) EU countries took advantage of the boom years to reduce their deficits, the onset of the recession in late 2008 brought about a sharp deterioration in public finances, reflected in increasing deficits. All groupings of countries displayed in Figure 1.3.2 saw an increase in general government deficits, but the highest deterioration was registered for the non-Euro grouping, despite the tightening of budgets begun in late 2009. As a consequence, public debt also rose sharply across the EU. New Member states, due to their higher growth performance, their lower initial levels of debt, and their moderate increases in deficits, continue to have the lowest levels of public debt in relations to their GDP.

General Government total revenues in 2009-2010 fell marginally with respect to GDP, and substantially more in real terms. Since 2011, a rebound has been registered that has continued in 2012, facilitated in many cases by revenue-enhancement measures (including in several countries substantial increases in standard VAT rates).

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Figure 1.3.3. Public Finances

a. Public Debt (% of GDP)

b. General Government Balance (% of GDP)

c. Total Government Revenues (% of GDP)
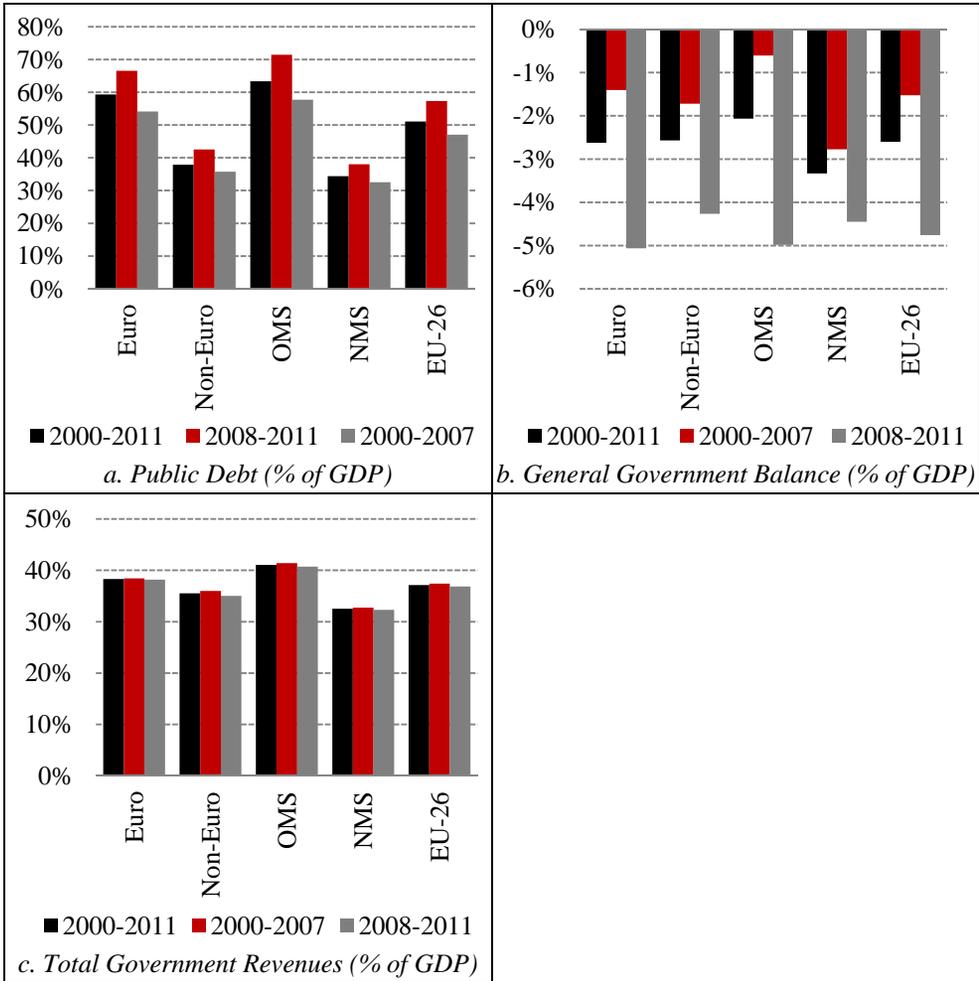
Source: EUROSTAT.

In sum, the overall economic environment in the European Union saw dramatic developments in the latter part of the period considered for this study. These developments have had a considerable impact on the performance of the VAT systems, as will be shown in the rest of this report.

2. VAT Gaps and Other Measures of Tax Non-compliance

This Chapter discusses the definition and the possible advantages and shortcomings of VAT Gaps as have been used in this study, as well as other alternatives concepts existing in the literature.

The VAT Gap measured in this report is simple in concept. It is the **difference between the theoretical tax liability according to the tax law and the actual revenue collected**. However, to understand how and to what extent the estimates in this report can be used to measure trends in tax fraud, it is important not only to know the details of how the VAT Gap has been calculated, as set out in the next chapter, but also to understand how the gap measured here relates to a number of 'gap' concepts and other measures relating to tax evasion, tax compliance, and the assessment of the performance of tax administrations that may be found in the literature.

This literature pursues several distinct objectives. One such objective may be to quantify the impact on revenue of the extent to which the VAT in force in any country deviates from a benchmark structure. We discuss such measures in section 2.1. Another objective may be to distinguish between the extent to which such deviations reflect policy decisions embodied in the VAT legislation as opposed to the effectiveness with which that legislation is enforced. We discuss such measures in section 2.2. Yet another objective may be, as already mentioned, to quantify and understand the extent and nature of tax evasion associated with the VAT and ideally the causes of such evasion. The first step in such analysis is to calculate the compliance gap, as discussed in section 2.3. A final objective may be to provide a basis for assessing the effectiveness with which the tax administration is able to reduce such evasion over time. We discuss measures aimed specifically at these objectives in section 2.4. As will be seen, different measures have been developed that can be valuable in achieving each of these objectives, and many of these measures are complementary to each other. The estimates of the compliance gap in the present report provide what in many ways is the key measure needed to link this array of attempts to benchmark VAT performance across countries and over time.

2.1. Benchmarking the VAT

The simplest measure of VAT effectiveness – VAT 'productivity', as it is sometimes called in the literature– is VAT collections divided by the standard rate of VAT as a percentage of GDP. A more refined version originating with the IMF (Ebrill et al. 2001), called ***c-efficiency*** – and currently estimated annually for OECD countries under the name of the **VAT Revenue Ratio (VRR)** (OECD 2012) -- is by far the most commonly used 'gap' measure found in the literature[3]. This benchmark measure which is commonly used for assessing VAT performance is defined as the ratio of actual VAT revenue to the revenue that would be raised if VAT were levied at the standard rate on all consumption with perfect enforcement. This measure has three important advantages. First, it is easy to calculate from readily available data. Secondly, it provides a clearly understandable normative benchmark – a uniform VAT imposed on all final consumption. Thirdly, as Keen (2013) discusses in detail, the gap between actual and 'potential' revenues thus measured may be decomposed in a number of useful ways (see section 2.2). Such decomposition is important because while the VRR (c-efficiency) measure provides a good starting point, it is not in itself adequate to assess either VAT compliance or administrative effort[4].

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[3] Occasionally, in popular discussion measures of the so-called 'informal' (or 'hidden') economy are cited as though they are also measures of the extent to which taxes are evaded. While there is often a strong association between such measures and taxation (Schneider 2012), apart from the fact that both are attempts to estimate the potentially knowable unknown, measuring tax gaps is not all the same as measuring the 'hidden' economy. Both the methodology and the meaning of hidden economy measures are still controversial (Breusch 2005). The comparability of such estimates to the value-added based concept of GDP is often unclear and appears to vary from country to country as well as over the business cycle, let alone in the extent, if any, to which it is related to tax evasion. Moreover, as Gemmell and Hasseldine (2012) note, although the measurement errors of hidden economy estimates are unknown the likely error in such estimates may easily be large enough to swamp the apparent year-to-year changes in hidden economy measures so that tax gap estimates that rely on similar methods are not meaningful. For these and other reasons, according to HMRC (2012), 'hidden economy' estimates do not provide a useful basis for assessing trends in tax fraud.

[4] The hypothetical VAT structure on which measures like VRR are based is conceptually interesting in several ways. As mentioned, it may, for example, provide a useful point of reference for a tax expenditure study or perhaps even an appropriate normative target for tax policy. As an instance, European Commission (2011) takes as the appropriate 'ideal' tax base all private consumption as recorded in the national accounts. However, although such measures may provide a useful and easy-to-calculate reference point for appraising VAT in a particular country, they have no clear welfare or behavioural

The VRR measure is not without some problems. For example, it assumes that moving to the benchmark tax would not affect either the level or composition of consumption, which is unlikely (Alm and El-Ganainy 2013). In addition, it assumes that "consumption" as defined in the national accounts is the same as the aggregate tax base that would be subject to such an ideal uniform comprehensive VAT. As OECD (2012) shows, however, in principle a number of adjustments to national accounts data are needed to estimate something closer to the real base of the VAT because final consumption as reported in the accounts includes some items that are not subject to VAT and excludes some items that are subject to VAT (see Appendix A for discussion of these adjustments). Finally, even if the national accounts base is simply accepted, several different versions of the c-efficiency ratio may be calculated depending on the precise nature of the consumption base chosen: for example, Alm and El-Ganainy (2013) use final household consumption expenditure (as do Borselli, Chiri, and Romagnano 2012), while the present report, like OECD (2012) and Keen (2013), uses a broader conception of final consumption that also includes such consumption not only by households but also by the government and non-profit sectors. In practice, final consumption is measured in expenditure terms and includes not only private final consumption expenditures by households but also final consumption expenditures by non-profit organizations serving households as well as by general government. All are at the end of the supply chain and in principle should therefore pay VAT on their inputs. However, because the output of government and non-profit sectors is usually not subject to output VAT, they cannot deduct such input VAT which thus becomes part of their costs as well as part of potential VAT revenues.

2.2. The Policy Gap and the Compliance Gap

The VRR (c-efficiency) measure assumes that the appropriate ideal or standard tax used as a benchmark is not the one set out in the law but rather a uniform tax imposed on total final consumption as measured by the national income accounts: it provides a measure of the extent to which actual VAT collections deviate from this benchmark. The VRR measure does not assume perfect compliance. Instead,

content and are neither easy to compare meaningfully across countries or to relate in any convincing way to changes in compliance behaviour or administrative effort.

it combines a measure of what may be called 'policy efficiency' – the extent to which the statutory tax imposed approximates that which would be collected by a tax imposed at the standard VAT rate from an idealized base with perfect compliance– and 'compliance efficiency' – the extent to which the tax actually assessed differs from what would be assessed if there was perfect compliance with the law. Since VAT non-compliance reduces actual VAT revenues it obviously contributes to the total gap. However, departures from uniform taxation in the design of member states' VATs, such as reduced rates and exemptions, also increase the gap between actual and potential revenue. The VRR and similar aggregate estimates may thus be decomposed into what may be called the **compliance gap** and the **policy gap**[5].

Several attempts have been made to decompose the total VAT Gap as measured by the c-efficiency concept outlined in section 2.1. For example, IMF (2010) combined the compliance gap estimates from Reckon (2009) with total gap estimates (estimated using the c-efficiency measure and based on EUROSTAT national accounts data) to estimate a policy gap for several EU states as a residual. Keen (2013), again using the gap estimates in Reckon (2009) but this time combining them with the VRR estimates from OECD (2012), extends this analysis and demonstrates that in 2006, the only year for which he presents this calculation, the policy gap in 15 EU member states was always greater than the estimated compliance gap and, for most countries, much larger[6]. Keen's approach is followed in this report, in Section 3.1.

An alternative approach to decomposing the VAT Gap into compliance and policy components is to calculate the policy gap and then estimate the compliance gap as a residual. Borselli, Chiri and Romagnano (2012) recently calculated for each of the 27 EU member states the extent of "policy erosion" of the VAT base for major commodity groups on the basis of the baskets of goods

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[5] As Keen (2013) notes, the policy gap may be thought of as zero if a single VAT rate is applied perfectly, with no compliance gap, to all final consumption (and only to such consumption) – subject, of course to the caveats noted elsewhere about exactly how consumption is actually measured. In effect, this is equivalent to a measure of the extent to which the legal structure of the actual VAT embodies 'tax expenditures' as compared to the assumed normative standard of a uniform tax on all final consumption. This concept provides a useful summary measure of the extent to which the c-inefficiency (VRR) ratio is attributable to political decisions embodied in tax law rather than to how well that law is enforced. Although no attempt is made to calculate this gap directly in the present report it is in effect measured by the difference between VRR and the compliance gap (see Table 3.1.3).

[6] The main exception was Greece, which had the largest c-efficiency 'gap' and by far the largest compliance gap – almost as large as its (residual) policy gap.

and services used by EUROSTAT to calculate consumption price indices[7]. This study provides estimates of the effective VAT rates on six categories of such consumption for each country and shows that the effective VAT rate ranges from a high of 96% of the standard rate in Bulgaria to a low of 60% in Ireland.

Keen (2013) goes further and decomposes the policy gap into 'rate' and 'exemption' gaps. The policy gap arises in part because few countries apply VAT at a single uniform rate. The impact of different rates may be captured in the **rate gap** since the average consumption-weighted rate is almost always considerably lower than the standard rate (Mathis 2004), as is shown for households in Table 3.1.1. What Keen (2013) calls the **exemption gap** may then be calculated as the difference between the policy gap and the rate gap. This gap may also be estimated from data on the importance in the tax base of zero-rated, exempt and excluded consumption (e.g. Borselli, Chiri, and Romagnano 2012, as well as Table 3.1.1)[8].

Finally, it should be noted that the compliance and policy gaps are not independent. For example, to the extent that the policy gap results from legal provisions (exemptions, reduced rates, thresholds, etc.) that make compliance more difficult, reducing the policy gap may often be the simplest and most effective way to reduce the compliance gap. On the other hand, efforts to reduce the compliance gap may lead taxpayers to delve further into the game of discovering and exploiting weaknesses in tax structure, hence increasing the (measured) policy gap.

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[7] Borselli, Chiri and Romagnano (2012) focus on household final consumption, ignoring not only VAT that falls on investments in dwellings and on consumption provided through public sector (unless directly charged for) but also that included in financing costs and imputed rent. The European Commission's calculation of the 'implicit tax rate on consumption' (European Commission 2012, Table 77), which weights each rate by the value of the transactions to which the rate applies, is based for recent years in some countries (2007-10 for Bulgaria, 2009-10 for Portugal, and 2010 for Lithuania and Romania) on projected bases.

[8] As Keen (2013) shows, these two approaches may produce quite different breakdowns between these two components of the policy gap for some countries. On the whole, however, his analysis shows that both non-uniform rates and the rather generous 'standard' EU exemptions as well as numerous country-specific base deviations appear to be important in understanding both cross-country differences in the VRR and the trends observed over time, although we do not pursue this issue further here.

2.3. Measuring the Compliance Gap

The focus of this report is on measuring the **compliance gap**, which is henceforth simply called the '**VAT Gap**'. The correct potential VAT base for measuring compliance and assessing administrative performance is that specified in the VAT law – that is, broadly, supplies made for consideration by a business to final consumers[9].

Two components need to be measured in order to calculate the VAT Gap by the top-down method used in this report: the theoretical VAT tax liability according to the law (**VTTL**) and the amount of VAT actually assessed and collected (**VAT**). The two are then combined to estimate the VAT Gap as 1-VAT/VTTL. The VAT Gap thus estimated measures the gap between potential VAT and actual VAT that may be attributed to non-compliance rather than to deliberate policy decisions to forego revenue by providing favourable treatment through rate differentiation, zero-rating or exemptions. We shall first discuss briefly some of the general problems encountered in calculating VTTL, leaving country-specific details to the later discussion. We comment later on the VAT collection data used in this report.

Studies such as Australia (2012), Corte dei Conti (2012 for Italy), HMRC (2012a), IFP (2012 for Slovakia), Instituto Nacional de Estatística (2012), Parsche, Rüdiger (2009 for Germany), Reckon (2009), Romania Fiscal Council (2011), and Sweden (2008) have, like the present report, estimated VTTL. The method employed in all these studies is a disaggregated 'top-down' approach which applies the appropriate VAT rates to an appropriately segmented final consumption base and then further adjusts the estimated base to take into account the non-deductible input VAT borne by exempt suppliers. This process is not simple. Problems arise both in matching consumption data with VAT bases and rates and in estimating the effects of legal exemptions and non-registrants in different sectors.

To deal with the first of these problems, the best approach is, as is done here, to use the most detailed possible consumption (and other base) data from such sources as national accounts, supply-use tables and household survey data[1011].

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[9] The sum total of such transactions is not precisely identical to any economic concept of consumption that can easily be derived from national accounts data or for that matter built up from the underlying supply and use tables or survey data.

[10] Since gap measures are based to a substantial extent on national accounts data, they are often changed substantially when the national accounts are revised, as is noted in Chapter 3 with respect to comparing the 2006 estimates for several countries found in Reckon (2009) with those in the present report. Such revisions are particularly likely

A set of net tax rates that has been as carefully constructed as possible on the basis of the tax code is then applied to this disaggregated base in order to estimate VTTL.

In addition to legal exclusions and exemptions, the VAT base in every country may differ from final consumption to the extent that exclusions, exemptions, registration thresholds, and other factors limit input credits with the result that some revenue is associated not with consumption but with production and investment[12]. As Giesecke and Tran (2010, 8) underline, "linkages between commodity-specific exemptions and the capacity of industry to reclaim VAT on their inputs are not straightforward if industries exhibit multi-production, and if exemptions on a given commodity differ across users of that commodity". While the additional tax burden imposed on much consumption as a result of such hidden VAT (non-deductible VAT on inputs) is unlikely to be large with respect to most labour-intensive services it may sometimes be quite substantial with respect to such capital-intensive services as, say, rental housing. As discussed in Appendix A, numerous assumptions must be made in order to measure this important component of the potential VAT base across countries in as comparable a fashion as possible.

Estimating VTTL is thus a complex procedure. However, since the VAT Gap is the difference between two numbers – VTTL and VAT – it is also important to understand what the second component, actual VAT revenues, means in this report because the figures commonly used to measure this component in different countries are not necessarily comparable. Cash collections in any particular period are obviously relevant from a revenue perspective. But such collections usually include some payments related to liabilities incurred in earlier periods, while some liabilities incurred in the present period will in turn not be collected until future periods. Not all countries actually know the amount of accrued collections for any particular period and some may use different conventions in estimating accruals. From these reasons, as well as to obtain data more directly comparable to such measures of economic activity as GDP, it is sensible to estimate the tax gap on the basis on accrued rather than cash figures. However, as Keen (2013)

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to be significant when there are major structural changes like those occurring in a number of countries after 2008.

[11] An additional complication is provided by the fact that EUROSTAT-reported NA data does not include a uniform methodology for the estimation of the informal economy, thus potentially resulting in random biases that might affect the calculated VTTL.

[12] This consideration applies also to construction and real estate investments, where the NA conventions may be at variance with those of the VAT legislation, and create important discrepancies. This is a point emphasized by the Spanish tax administration in view of the boom-bust cycle experienced in the second half of the 2000s.

stresses, it is surprisingly difficult to define accrued VAT receipts over time and across countries in a consistent and meaningful way. Changes in measured gaps as a result of changes in the relation between the concept of 'accrued' VAT revenues used here and other measures of revenues used in national reporting may be particularly important when events like the recent recession take place[13]. The relation between accrued and cash revenue may also be altered by changes in administrative regimes such as payment or refund periods or the definition of the taxpayer. In Spain, for example, the introduction of a group regime in 2008 altered the pattern of payments and refunds. Similarly, the 2009 extension of the right of taxpayers to claim monthly refunds shifted some refund payments that would have been made in 2010 to 2009[14].

For consistency, the present report, like Reckon (2009), uses the VAT revenues reported in EUROSTAT to measure annual VAT collections. For the most part, if not always, these numbers are cash collections within a year, offset by two months and recorded as 'accrued' for the period: that is, the reported accrued VAT collections for 2011 are cash collections for the March 2011 through February 2012 period. These figures are consistent and comparable over time and space (provided all countries have similar rates of inflation)[15], although some problems may exist. For example, some current collections (even allowing for the two-month adjustment period) may represent input VAT that will subsequently have to be refunded, especially when excess credits are required to be carried forward for some time before taxpayers (notably zero-rated exporters) may claim refunds. Moreover (as happened in the UK a few years ago)[16] losing a major court case may lead to the need for a substantial refund in a particular tax period that relates

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[13] In Portugal, for example, data provided by the tax agency (AT) shows that the (negative) impact of refunds on net revenue was much greater in 2009 than in earlier years because many taxpayers were carrying a stock of credits forward (in part perhaps because claiming refunds was likely to trigger a tax audit) and they drew down on this stock to meet their cash needs in the face of the economic crisis.

[14] The general rule in Spain is that taxpayers may, unless they are on the monthly refund system, may only request refunds at the end of each tax year, with refunds being paid the following year.

[15] Since these numbers are neither cash collections for the year in question nor 'accrued' collections in any meaningful sense, they unlikely to correspond precisely to the VAT collection data reported in public finance reports in different countries. For example, in making its own gap estimates (on a cash basis), the UK assumes a three month lag between the economic activity giving rise to VAT liability and actual collections. It also compares VTTL estimates for any calendar year with estimated VAT receipts in the following financial year (that is, calendar 2012 is compared with the April 2012-March 2013 period).

[16] Fleming case cited in HMRC (2010), Measuring Tax Gaps 2009 (revised March 2010) page 43.

to liabilities over a number of prior years. While it is conceptually possible to measure accrued payments in a more economically meaningful way – for example, as all payments received in a specified period plus any excess credits carried forward from the previous period – the latter information is usually available only from tax returns and is not recorded in any comparable data base[17].

Box 2.1. Possible alternative estimates of compliance gaps

In order to deal with some of the questions raised in Section 2.3, one could in principle estimate different 'compliance gaps.' For instance, one possible gap measure might be based on collections for liabilities incurred in a particular period that are received within that period compared to VTTL for that period. This measure is clearly closely related to economic activity within the period. However, it would not be an appropriate measure of administrative performance because it ignores the important issue of collecting arrears. Another possible gap measure could be based on total collections made within a period, an amount that includes collections for taxes due in prior periods. The first of these two possible gap measures may be thought of in a sense as measuring the extent of voluntary compliance while the second presumably in part reflects administrative efforts to collect past taxes due but not paid. Presumably, the first (voluntary compliance gap) should be based on the VAT data originally submitted by the taxpayer, while the second (administrative effort gap) should instead be based on the latest assessed VAT data for the relevant returns. Finally, since presumably the gap closed by administrative effort – e.g. with respect to delayed payments – has by definition been identified, one could think of yet another gap concept which would compare the total value of assessments (not payments) to potential collections (VTTL). This concept, like the second one mentioned above, would of course change over time as audits and assessments were carried out. Again, however, the data needed for such calculations are not readily available. Nonetheless, if one reason for estimating the VAT Gap is provide a basis for assessing or comparing the effectiveness of revenue administrations, more refined measures such as those just mentioned, which take account of the time profile of changes in accrued collections as a proportion of the gap calculated in this report would obviously be useful, as would sensitivity analysis of the impact of alternative assumptions with respect both to the VTTL and VAT calculations, especially when cyclical changes are marked. Although the data for the present report did not permit exploration of such matters across the EU, both Spain and Portugal have done some interesting work along these lines in recent years.

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[17] Another complication is that the liability for a refund occurs when an excess credit return is processed and not when the refund is actually paid. Again, the only way to calculate this amount is from actual VAT returns and such data are not normally available.

2.4. The Interpretation of the VAT Gap

The VAT Gaps reported in Chapter 3 are, as we believe, the best consistent and comparable estimates possible with the available data. It is important to stress that the 'compliance' gap thus measured includes fraud, but also changes in other important elements of the gap such as shifts in the accumulation and reduction of tax debt. In order to understand the nature of the VAT Gap and why it has changed over time, additional 'bottom-up' estimates are needed. One important question is the extent to which it is appropriate to include revenues 'lost' through legal avoidance, which may in some contexts perhaps be understood as part of the 'real' theoretical VAT structure, in contrast to clearly illegal evasion activity. In 2009-10, about one-third of the estimated 'compliance gap' in the UK was attributed to such avoidance (HMRC 2010). HMRC (2011) defines the VAT Gap as the difference between collections and "…the tax that would be paid if all …complied with both the letter of the law and HMRC's interpretation of the intention of Parliament in setting law (referred to as the spirit of the law)"[18]. As most who testified to the House of Commons (2012) on this issue noted, however, although this approach is understandable given that HMRC's objective is to assess the size of the potential threat to the tax base, it perhaps goes too far. The line between evasion and avoidance is invariably rather murky (as it has sometimes been recognized by lumping the two together under the heading of 'avoision')[19].

One way to resolve this problem followed by some countries is not to attempt to draw such a line and to treat both as identical despite their different legal status. HMRC's stance may perhaps be seen as a small step back from this position, since it implicitly accepts some legal manoeuvers to reduce tax as when an exempt registrant merges with a supplier to reduce non-deductible VAT (economically undesirable though such tax-induced restructuring may be). However, categorizing other forms of 'avoidance' -- even though in some cases such actions may be supported by court decisions -- as being so 'aggressive' in the sense of being outside the 'spirit or intended object of the law' (as understood by HMRC) that they are equivalent to evasion, may go too far. Alternatively, one might argue that since taxpayers can be expected to exploit fully any legal loopholes – and governments have the option of closing those loopholes and even imposing criminal charges on those who exploit them if they wish to do so – avoidance is best thought of as being included in the policy rather than the compliance gap. The proper treatment of tax avoidance is thus a very 'grey' matter that requires

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[18] See also Thackray (2013).
[19] See Oxford Dictionary, at http://oxforddictionaries.com/us/definition/english/avoision.

close examination in the context of every country to determine the extent to which it affects interpretation of the VAT Gaps estimated here. It has not been possible in a study covering 26 different legal systems, VAT structures, and administrative system to go into this issue in depth.

The second issue the important 'bottom-up' estimates reported for the UK in HMRC (2010) raises relates to the one-fifth or so of the total compliance gap attributed to payment difficulties arising from bankruptcy and financial insolvency. Similarly, Australia (2012) found that a third of the measured VAT (GST) gap in 2009-10 was attributable to debt, compared to an average of about 15% in earlier years. Although the estimated GST gap actually fell sharply from 9.1% in 2008-09 to only 4.9% the next year, Australia (2012) notes that this likely reflects more timing differences between national accounts and taxation data (e.g. with respect to housing) than any sharp improvement in reducing non-compliance[20].

Although the present study does not attempt to decompose its estimates of the compliance gap in this fashion, studies like those just mentioned, which indicate that as much as half of the estimated 'compliance gap' may sometimes be attributable to factors other than outright tax evasion suggest that caution should be exercised in using even the best compliance gap estimates as evidence of the extent of outright VAT evasion. An aggregate figure that lumps together (and implicitly attributes equal importance to) such varied behaviours as criminal attacks on the system, outright evasion, activities obscured in the so-called 'hidden' economy, perhaps some types of legal avoidance, differences in legal interpretation, non-payment or delayed payment (or changes in refund patterns), and simple error can provide only a starting point for appraising how well in terms of either effectiveness or efficiency any given tax administration is operating.[21] More detailed 'bottom up' examination of such administrative 'gaps' as those with respect to registration, filing, under-reporting, and payment are likely to be more

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[20] In Spain, for example, since the sale of houses (and land) is included in the VAT base when it takes place while in the national accounts housing investment is measured only in terms of building (not land) and when it is built rather than when it is sold, when house sales collapsed after 2007, so did a substantial piece of the VAT base as well as VAT revenues, resulting in an increase in the VAT Gap as measured here.

[21] With respect to errors, for example, the gap measure includes all sources of underpayment by taxpayers but does not take any account of the (admittedly less common but not non-existent) overpayment. In contrast, the correct metric for assessing tax administration performance is that taxpayers pay the right amount, not either too little or too much. Another example is the extent to which revenue performance in any period may be affected by changes in the timing of VAT refunds, which is often within the control of the tax administration to a considerable extent.

helpful in this respect. Nonetheless, changes in the aggregate VAT Gaps reported here can certainly provide a useful signal that more detailed examination of the behaviour of different components in the gap is called for.

Some countries have employed more 'bottom-up' methods to estimate various aspects of VAT compliance. Australia, for example, compares capital expenditure in specific sectors (e.g. mining) to estimated input credits for the sector and also analyses inputs and outputs within the business chain to ensure that B2B transactions (e.g. input tax credits claimed by mining to output tax liabilities reported by suppliers to the mining industry) result in no net VAT revenue. Further development of microdata approaches to measuring tax non-compliance within particular sectors appears to be the most promising path to develop usable and meaningful measures of the components of the VAT Gap from the perspective of assessing and improving tax administration performance.[22]

Summing up, the top-down estimation of the compliance gap that is used in this study has the advantage of producing comparable estimates across a wide range of countries for a substantial time period. However, it does not readily lend itself to decomposing the compliance gap either into such components as criminal fraud (including, e.g., Missing Trader Intra-Community fraud), aggressive avoidance, delayed payments, collection of past debts, changes in refund patterns, underreporting, failure to register, etc. Nor does it lend itself to decomposition in terms of industrial sectors or even imports vs. domestic production. Both types of decomposition are needed to examine the nature of VAT non-compliance in detail in order to understand its nature and causes and to provide an adequate basis for determining how best to cope with the problem and how to assess the effectiveness with which the tax administration is doing so. Such investigations require considerable additional information – information that is seldom publicly available in most countries – and are inherently quite country-specific in nature.

The VAT Gap estimates in the present report, and the trends over time in these estimates, provide a helpful summary starting point for such detailed investigations. Where more disaggregated (even micro) studies have been carried out, as discussed further in Appendix B, they may provide more directly useful guidance to tax policy and tax administration than aggregate estimates. They may also provide a useful 'bottom-up' (floor) estimate of the VAT compliance gap. In reverse, the VAT Gap estimates here may themselves may perhaps be thought

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[22] For example, Trigueros, Pleaiz and Vecorena (2012) review the various ways VAT non-compliance has been estimated in Latin American countries and Felstenstein et al (2013) summarize the current state of tax microdata modelling as well as estimating sectoral VAT Gaps for Pakistan.

of as establishing a 'top-down' (ceiling) approximation of the maximum possible VAT revenues given the existing legal structure (and the inherent uncertainties in all such aggregate estimates of residuals from data that is itself often the result of a complex estimating process).

3. VAT Gaps, 2000-2011

In this chapter we review the estimates of the VAT Gaps, as described in Chapter 2, for 26 EU countries[23] for the period 2000-2011. In section 3.1 we offer a general overview of trends across the EU and for sub-sets of EU countries. We concentrate in particular on two sub-periods, from 2000 to 2007, leading to the onset of the financial crisis that still affects the EU economies, and 2008-2011, a period which includes great economic distress as well as a number of policy initiatives involving the VAT in many if not all the EU countries. In Section 3.2 we present the country-by-country results. The detailed methodology used to arrive at the results is discussed in detail in Appendix A.

3.1. Overall Results

Figure 3.1.1 offers a comprehensive overview of VAT Gaps (plotted as a percentage of the estimated VAT Total Tax Liability, VTTL) for the 26 countries in our sample.

The estimated VAT Gaps have a very wide dispersion across countries, as had also been noted in Reckon (2009): they range from the low of 0.2 percent recorded for the Netherlands in 2005 to the high of 49 percent in Romania in 2009.

For the entire sample, over the period 2000-2011 the average VAT Gap is 17 percent, and the median 13 percent. In the year 2011, we estimate that the total VAT Gap for the EU-26 countries amounted to approximately Euro 193 billion (Table 3.1.1), or about 1.5 percent of EU-26 total GDP, an increase from the 1.1 percent of EU-26 GDP recorded in 2006, and above the 2000-2011 average of 1.2 percent. As Figure 3.1.2 shows, the overall gap as a percentage of the EU-26 has shown a marked upward trend since the inception of the 2008-9 recession and financial crisis.

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[23] Cyprus is undergoing, with assistance from EUROSTAT, a major revision of its national accounts which will affect all estimates for the period in question and is expected to lead to a substantial increase in GDP and consumption. The revision is expected to be finalized sometime in 2014. Because of this, we did not produce estimates for the country, as they would not have statistical validity at this point.

Figure 3.1.1. VAT Gaps for the EU-26 countries, 2000-2011 (VAT Gap as share of VTTL)
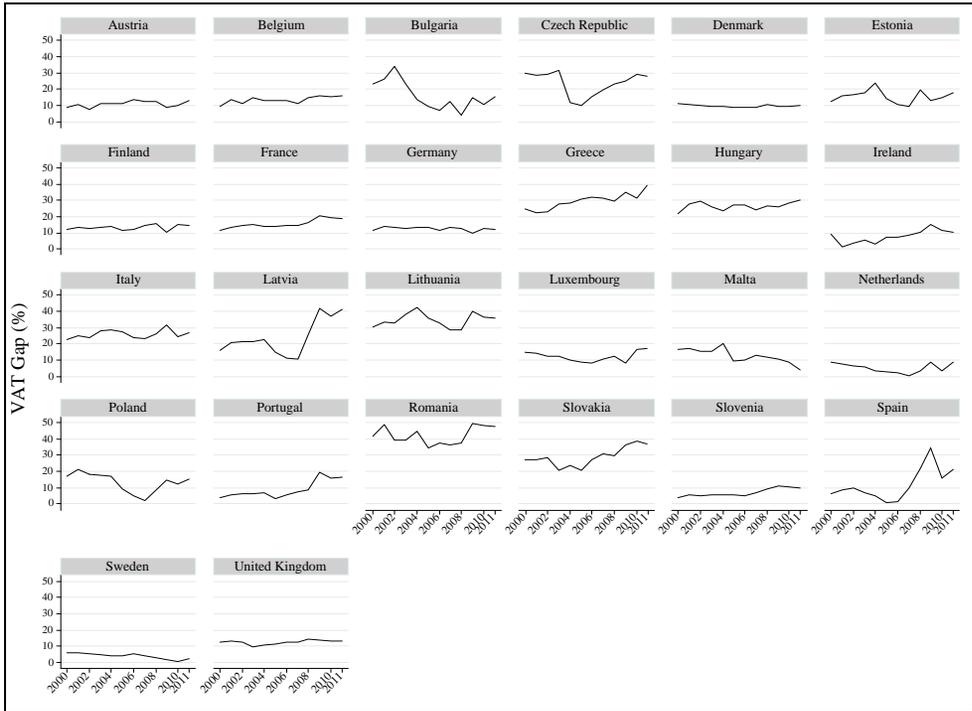
Source: EUROSTAT; WIOD; TAXUD; Own Calculations.

Figure 3.1.2. EU-26 VAT Gap (Percent of GDP)
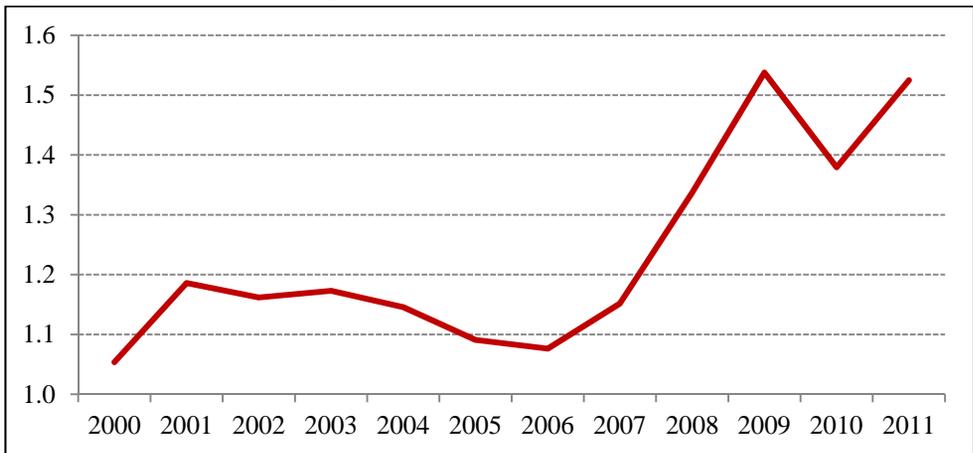
Source: Own Calculations.

Table 3.1.1. Estimates of the VAT Gap, 2011 and avg. 2000-2011 (EUR million)

Member State	VAT receipts	VTTL	VAT Gap	VAT Gap as a share of VTTL (%)		VAT Gap as a share of GDP (%)	
	2011	2011	2011	2011	2000-2011	2011	2000-2011
Austria	23 447	26 915	3 468	13	11	1.2	1.0
Belgium	26 021	30 991	4 970	16	13	1.3	1.1
Bulgaria	3 352	3 956	604	15	16	1.6	1.8
Czech Republic	10 994	15 235	4 241	28	23	2.7	2.1
Denmark	23 869	26 436	2 566	10	10	1.1	1.1
Estonia	1 363	1 664	301	18	15	1.9	1.6
Finland	16 915	19 746	2 831	14	13	1.5	1.3
France	140 506	172 739	32 233	19	16	1.6	1.3
Germany	189 920	216 830	26 910	12	13	1.0	1.0
Greece	15 027	24 790	9 763	39	30	4.7	3.0
Hungary	8 516	12 216	3 700	30	26	3.7	3.0
Ireland	9 782	10 890	1 108	10	8	0.7	0.6
Italy	98 557	134 691	36 134	27	26	2.3	2.1
Latvia	1 368	2 322	954	41	24	4.7	2.3
Lithuania	2 444	3 795	1 352	36	35	4.4	3.9
Luxembourg	2 690	3 242	551	17	12	1.3	0.8
Malta	520	541	21	4	13	0.3	1.0
Netherlands	41 610	45 622	4 012	9	5	0.7	0.4
Poland	29 843	35 253	5 410	15	13	1.5	1.1
Portugal	14 235	16 999	2 764	16	9	1.6	0.8
Romania	11 412	21 760	10 348	48	42	7.9	5.4
Slovakia	4 711	7 484	2 773	37	29	4.0	2.9
Slovenia	3 049	3 375	326	10	7	0.9	0.6
Spain	56 547	71 744	15 197	21	12	1.4	0.8
Sweden	36 610	37 542	932	2	4	0.2	0.4
United Kingdom	130 577	150 064	19 487	13	12	1.1	1.0
EU-26, total[a]	903 884	1 096 841	192 957	18	15	1.5	1.2
EU-26, average	..	..	..	20	17	2.1	1.6

a/: EU-26 treated as one unit.
Source: EUROSTAT; Own Calculations.

As cautioned in Section 2.4, the data presented in this section should not necessarily be interpreted as an estimate of VAT evasion, as other factors, including legal avoidance as well as unrecoverable debts, are at play.

The largest economies of the EU, France, Germany, Italy and the United Kingdom contributed over half of the total GAP (both in 2011 and throughout

the sample period). In terms of their own GDP, the countries with the largest gap (in 2011) were Romania, Latvia, Greece and Lithuania.

Box 3.1. VAT Gap Terminology

The following concepts (introduced in Chapter 2 and discussed in detail in Appendix A) will be used throughout this and the following chapters.

The **VAT Gap** is the difference, in any given year, between the **VAT Collections** (as recorded by EUROSTAT) and the amount theoretically due, i.e. **VTTL** (VAT Total Tax Liability). The latter is the total amount of estimated VAT payments on the basis of national accounts aggregates and the existing structure of rates and exemptions. It is composed, in our analysis, of four separate components (individual VAT Tax Liabilities, VTLs), plus some adjustments:

- **Household Consumption Liability:** the amount of VAT that is due on account of household consumption, and calculated as the product of the appropriate VAT rates times the amount of consumption of individual products or services.

- **Unrecoverable VAT on Intermediate Consumption**: the amount of VAT paid on inputs by industries that cannot claim a credit because their sales are exempt from VAT.

- **Unrecoverable VAT on inputs to Gross Fixed Capital Formation (GFCF):** the amount of VAT paid on inputs to GFCF activities of industries that cannot claim a credit because their sales are exempt from VAT.

- **Unrecoverable VAT on Government Consumption:** amount of VAT on inputs on government consumption that cannot be recovered because most government activities are exempt from VAT. For example, Government consumption in Education is composed of wages and salaries of Education workers, plus inputs into the education activities of the government at all levels. The VAT paid on such inputs is generally not recoverable, and therefore included into the VTTL.

Adjustments: Because of common provisions in all VAT legislation in Member States, a few Adjustments are performed across-the-board, namely (a) an estimate of the VAT not recovered by Small Businesses that can and choose not to register in the formal VAT system (there are different thresholds in different Member States, with some of them not allowing any non-registration); (b) limits to exemptions to VAT recovery on certain business expenditures, namely car purchases, purchases of fuel and entertainment expenses.

Finally, *propex* is defined as the percentage of output in a given sector that is exempt from VAT. If the propex for sector "i" equals 1, for instance, all the output of that sector is exempt from VAT, and consequently the sector is unable to recover the VAT paid on its inputs.

In this section we will also review estimates of the **VRR** (VAT Revenue Ratio), discussed in Chapter 2 and defined as the ratio between VAT collections and an "ideal" VAT with one single rate and no exemptions; and of the **Policy Gap**, defined as the ratio between the VTTL and the "ideal" VAT.

3.2. Analytical Issues

In this section we review a number of analytical issues related to the estimates of the VAT Gap, further pursued in Chapter 4, which reports the results of an econometric analysis of determinants of the gaps.

3.2.1. Performance across country groupings

As mentioned, Figure 3.1.1 shows that the performance of the VAT Gap has been rather differentiated across the EU-26. In order to help discern patterns, it is useful to turn to the country groupings introduced in Chapter 1 (Old Member States vs. New Member States, Eurozone vs. non-Eurozone). As Table 3.2.1 shows, they indeed offer interesting contrasts.

Table 3.2.1 Average VAT Gap (%), EU-26 and Selected Country Groupings

	Euro	Non-Euro	OMS	NMS	EU-26
2000-2003	13	22	12	24	17
2004-2007	13	17	12	19	15
2008-2011	17	22	15	24	19
2000-2011	14	21	13	22	17

Source: Own Calculations.

Over the period 2000-2011, New Member States (NMSs), which - as seen in Chapter 1 - rely on the VAT for a substantially higher percentage of their government revenues, had an average gap 9 percent higher than the older members of the European Union. The difference between NMSs and OMSs had on average narrowed after EU accession of the former (falling from 12 points to 7 during the period 2004-2007), but rose again after the onset of the economic and financial crisis in 2008-9 (to an average of 9 points for the period 2008-2011).

This difference was also mirrored in the Eurozone/Non-Eurozone divide, albeit with a smaller disparity in performance. Eurozone membership on average was associated to a VAT Gap lower by 7 percentage points during the period 2000-2011, with similar patterns to those seen for the OMS/NMSs in the sub-periods 2004-2007 and 2008-2011. The uneven performances of the two sub-groupings, sustained as they were for a considerable period of time, are further examined in Chapter 4.

Box 3.2. Variability of the Gap: Revenues vs. VTTL

The VAT Gap is the result of the difference between two variables, the collections of VAT revenues and the total VAT Liability (VTTL) as calculated in this report. Both variables are subject to changes, sometimes substantial, from year to year. Is it possible to gauge the relative importance of either variable in determining movements in the VAT Gap? This issue is partially addressed in Chapter 4, but on the basis of the calculated data it is possible to carry out a preliminary investigation. Visual inspection appears to suggest that the variability of the VAT Gap is driven in greater measure by the variability of revenues rather than the variability of the VTTL.

To test this hypothesis we have calculated the coefficient of variation for each variable (defined as the standard deviation divided by the average—this statistic is comparable across countries). In most (but not all) countries, the coefficient of variation of VAT revenues is higher than that of the VTTL. For the full sample, the average coefficient of variation of VAT revenues is 5.6 percent, against 4.5 percent for the VTTL, meaning that VAT revenues tend to exhibit higher variability than the VTTL. This finding is not surprising, as, barring changes in rates or exemptions, the VTTL tends to be driven in greater measure by structural economic developments, whereas VAT revenue collections may be more sensitive both to the economic cycle (as evidenced after the 2008-2009 crisis, see below) and to the degree of success of tax administrations in enforcing existing legislation, and to pro-cyclical compliance behaviour of taxpayers, as discussed in Chapter 2.

3.2.2.   Composition of the VTTL: on whom the VAT tolls

Chapter 2 argued that a "pure VAT" could be considered as one levied at a single rate and without exemptions. In reality, as seen in Chapter 1, all EU-26 countries have a VAT system that departs from the "pure VAT" ideal, on account of exemptions and reduced rates - this is what in fact gives rise to the separate components of the VTTL analysed in this report. Thus, as indicated, the VTTL is the sum of five separate components: VAT on Household Consumption, unrecoverable VAT on intermediate consumption by exempt sectors, unrecoverable VAT on Government and NPISH, unrecoverable VAT on GFCF of exempt sectors and several adjustments on account of specific items. Can one gauge from the relative importance of these components the extent to which the actual VAT systems depart from the "pure VAT" ones?

In Table 3.1.3 below we report a decomposition of the Vat Revenue Ratio introduced in Chapter 2. The relative sizes of the five components of the VTTL gives us a flavour of the extent to which the presence of exemptions (and zero and reduced rates) create a wedge between the VAT system in practice as opposed to an "ideal" one. As Figure 3.2.1 shows, indeed there exists a marked chasm between practice and ideal: during 2000-2011, Household consumption,

in practice, "produced" about only sixty-three percent of VTTL for the average of the EU-26 countries; non-recoverable VAT on inputs paid by exempt industries accounted for about 17 percent, non-recoverable VAT on Gross Fixed Capital Formation (GFCF) was about 14 percent, and the rest of the liability was split between government and NPISH consumption and a number of minor adjustments (small business exemption, limits to company cars and fuel purchases, entertainment expenses).

Figure 3.2.1. Composition of VTTL, EU-26, 2000-2011
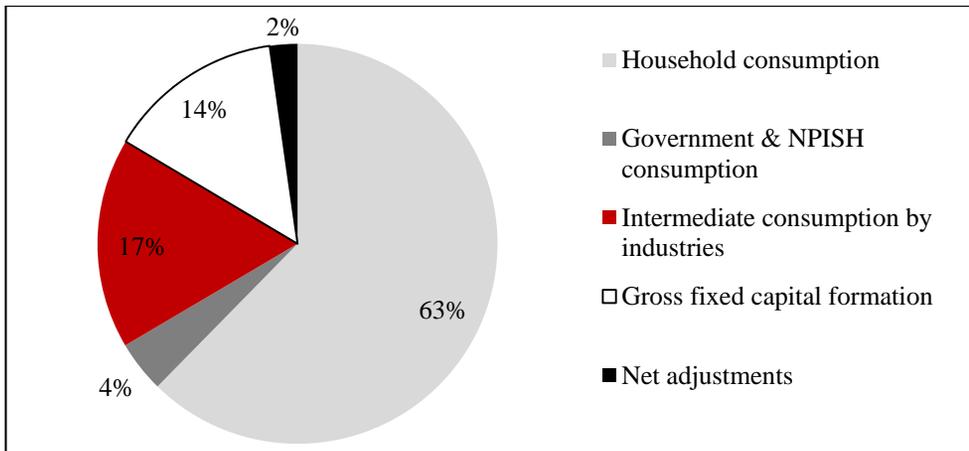
Source: Own Calculations.

The 31 percent of VAT thus paid by exempt sectors (on intermediate consumption and GFCF expenditures) provides a quick indication of the distortions introduced by the presence of exemptions. There is considerable variability across countries with respect to these components, as the proportion of household consumption in VTTL ranges from the low of 42 percent in Luxembourg to the high of 74 percent in Lithuania (see Section 3.3 for individual country discussions). However, the fact that less than 2/3 of total VAT liability accrues (for the EU-26 as a whole) directly from the intended final taxpayer, is something that should give pause to the policymaker.

This discussion is not meant to suggest that policy choices are easy, even if one takes the simple yardstick of ability to collect taxes. Our data show in fact an intriguing positive association between the share of VTTL that is accrued on account of Household Consumption and the size of the VAT Gap (Figure 3.2.2). It would thus seem that countries that attempt to collect more of their VAT directly from households, by limiting the amount of exemptions, may have more difficulty in doing so than countries that rely implicitly on greater

amounts from unrecoverable VAT on inputs (this hypothesis would need to be validated by further research that goes beyond the scope of this study).

Figure 3.2.2. VAT Gaps vs HH Cons. VTTL, 2000-2011
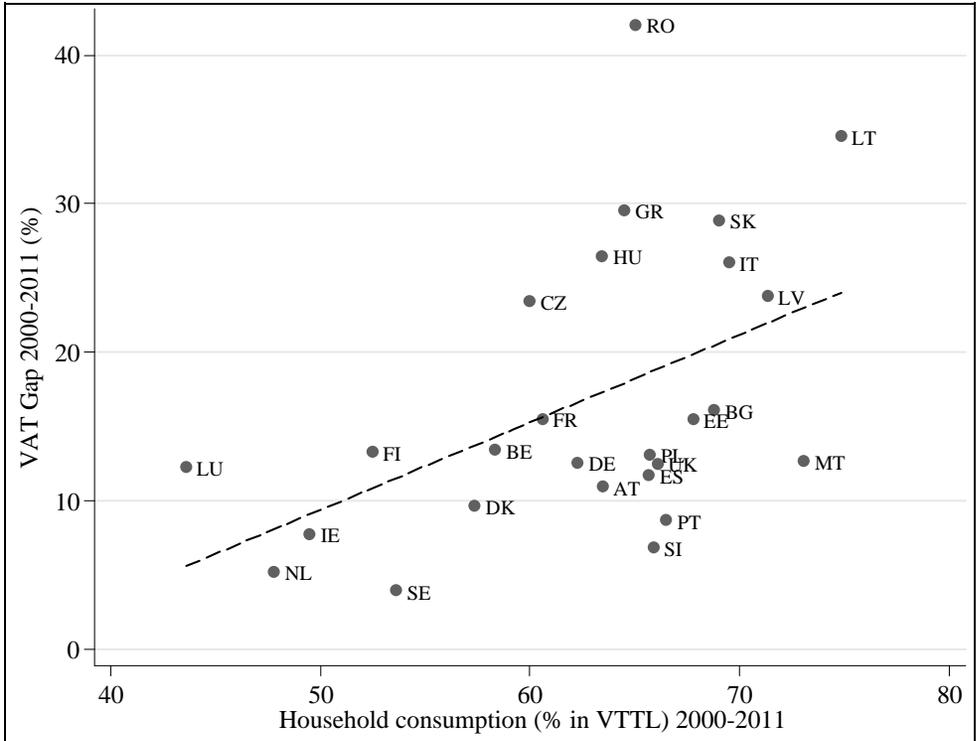
Source: Own Calculations.

3.2.3. The recession and the VAT gap

The economic crisis that started in 2008 affected all the EU members, which experienced a recession in 2009 (with the exception of Poland, which however saw a marked deceleration in its GDP growth rate). As discussed in Chapter 1, the severity of the recession varied across countries, with a few MS still experiencing negative output growth at the end of 2011. The data show that the VAT Gap in many (but not all) of the hardest hit countries was affected by these adverse economic developments. Figure 3.2.3 displays a scatter plot comparing the gap values for the years 2000-2003 against the values obtained for the recessionary period of 2008-2011. As is apparent, Spain, Greece, Latvia, Ireland, Portugal and Slovakia saw the highest increases in their gaps, whereas

Sweden, Poland, Malta, Bulgaria and the Czech Republic were able to improve their levels of collections relative to the theoretical liability.

Figure 3.2.3. VAT Gaps in 2000-2003 against the values in 2008-2011, 26 countries

Source: Own Calculations.

A simple regression of the VAT Gaps against a time trend and a dummy variable for the period 2008-2011 (controlling for country-specific effects) confirms that the post-2008 period saw statistically significant increases in the gap across the EU-26: the average gap in 2008-2011 is five percentage points higher.

$$VATGap = 6.302 + CountryDummies - 0.003\,Time + 0.051\,Dummy\,2008\text{-}11$$
$${}_{(2.652)}{}_{(0.001)}{}_{(0.010)}$$

$$R^2 = 0.807\,(\text{S.E. in parenthesis})$$

In Section 3.3 we review individual country performances, and the cyclical behaviour of the VAT Gap is investigated further in Chapter 4, but we can here point to a number of general indications that appear from the data. Tax systems are generally sensitive to adverse growth developments, as economic difficulties make it more difficult for taxpayers (and tax administrators) to comply with their

obligations. In addition, during the period 2008-2011, many of the worst-hit countries saw substantial declines, in greater proportion than GDP, in their imports, which often represent the easiest component of VAT collection to enforce. From the individual analyses one can also infer that, in countries where increases in rates were used to counteract lower revenues, the capacity of the system to absorb such increases may be limited in the short run (witness for instance the lower-than-expected response to substantial rate increases in VAT applicable to food and beverages in Poland in 2009-2010).

In sum, the analysis of the VAT Gaps for the 2000-2011 period shows that (i) prior to 2008 a moderate declining trend was present in the data, in many cases quite evident in post-accession countries; (ii) there continue however to be great disparities in the performance of countries, and most "worse performers" have been unable to improve their situation substantially over time; (iii) the post-2008 difficult economic times faced by several Member States have strained VAT systems, particularly in the hardest-hit countries, leading to increases in VAT Gaps even as rates were increased on several occasions.

3.2.4. VAT gaps, policy gaps and the VAT revenue ratio

To end this section, we now return to the question earlier raised with regard to the lessons that the VAT Gaps just reviewed provide with respect to a possible policy agenda. In particular, can the VAT Gap estimates (together with other gap measures) be used to gauge the scope for administrative vs. legislative measures in increasing the revenue capacity of VAT systems?

As discussed in Chapter 2, the VAT Gap is related to a more general measure of VAT efficiency, the VAT revenue ratio (VRR), which represents the "ideal" revenue that could be generated by a VAT system applied to consumption as measured in National Accounts, without exemptions or reduced/zero rates and with perfect enforcement (or zero VAT Gap). The VRR gap is a summary measure of the shortfall in VAT revenue collections, compared to a benchmark of uniform taxation of all consumption, and full compliance by taxpayers. As such, the VRR gap is a measure that comprises both the effects of policy and of taxpayer compliance on VAT revenues. VAT non-compliance (the VAT Gap) reduces actual VAT revenues and so contributes to the total gap. But departures from uniform taxation applied to consumption in the design of Member States' VATs, including reduced rates and VAT exemptions, also contribute to the total gap - this is defined as the Policy gap. For this reason,

the VRR gap measures both the imperfections of VAT policy, and non-compliance by taxpayers[24]. We estimated the VRR Gap for the EU-26 countries by applying the corresponding standard VAT rate to Final Consumption (net of VAT receipts), for the period 2000-2011, and we thus obtained estimates for the Policy Gap, which can be compared to the estimates of the VAT Gaps just reviewed.

The results are displayed in Table 3.2.2, which reports the mean VRR Gap together with the VAT Gap and the estimated Policy Gap for each country, averaged over all years in the sample period 2000-2011.

As the table shows, the average VAT Gap, as discussed in this Chapter, is 17 percent (and the median 13 percent), whereas the average Policy gap is twice as high, at 36 percent (with the median also at 36 percent). As is the case for the VAT Gap estimates we have reviewed, there is considerable dispersion in the Policy gap, which ranges from the low of 14 percent for Romania to the high of 48 percent for Spain and Poland. In most countries, however, the Policy Gap is indeed of a larger magnitude than the VAT Gap[25].

The interpretation of these results is that, compared to an "ideal" (at least from the economist's point of view) VAT system - with a single rate, no exemptions, and with perfect enforcement of tax laws and regulations - the most important amount of revenue loss during the period 2000-2011 stemmed (in most countries) from choices made over time that have introduced and sometimes extended multiple rates and exemptions. Thus, a strategy to address problems with the VAT system in the context of difficult overall fiscal situations in the EU would be well advised to incorporate both enforcement actions (addressing the VAT Gap) as well as tax policy actions (aimed at reducing the Policy gap).

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[24] More specifically, we recall the definition of the VAT Revenue Ratio gap:

VRR Gap = 1 – (Actual Revenue) / (Notional Ideal Revenue),

where the Notional Ideal Revenue is defined as the standard rate of VAT times the aggregate consumption of the household, non-profit, and government sectors, as recorded in the national accounts.

This is shown in the following identity:

*VRR Gap = 1 – [(Actual Revenues) / VTTL] * (VTTL / Notional Ideal Revenue)*

   *= 1 – [1 – VAT Gap] * [1 – Policy Gap]*

where the Policy Gap is defined as the ratio of the "legal" tax liability (the VTTL) to an ideal tax liability without reduced rates or exemptions.

The Policy Gap can then be obtained with the following formula:

Policy Gap = [VRR Gap – VAT Gap] / [1 – VAT Gap].

[25] The results shown in Table 3.1.3 are consistent with those provided by Keen (2013) for the year 2006 only.

Table 3.2.2. VAT Gaps, Policy Gaps and VRR Gaps (2000-2011)

	VRR Gap	**VAT Gap**	**Policy Gap**
Austria	43	11	36
Belgium	52	13	45
Bulgaria	34	16	21
Czech Republic	50	23	35
Denmark	42	10	36
Estonia	34	15	22
Finland	44	13	36
France	52	16	43
Germany	45	13	37
Greece	58	30	40
Hungary	50	26	32
Ireland	43	8	38
Italy	59	26	45
Latvia	49	24	33
Lithuania	47	35	18
Luxembourg	28	12	18
Malta	51	13	44
Netherlands	44	5	41
Poland	55	13	48
Portugal	49	9	44
Romania	50	42	14
Slovakia	49	29	28
Slovenia	40	7	35
Spain	54	12	48
Sweden	48	4	46
United Kingdom	53	12	47
Average	47	17	36
Median	49	13	29

Note. See text for definition of VRR Gap and Policy Gap. VAT Gap from Table 3.1.1. Estimates from Use tables.
Source: Own Calculations.

3.3. Individual Country Results

In this section we review in detail results for the 26 EU Member States for which this study has produced estimates of the VAT Gap. For each Country sheet, we provide the results for the component of the VAT Gap, as well as other statistics. We also offer a short overall assessment of the evolution of the Gap over the study period, the behaviour of VAT rates, and the composition of the VAT liability. In addition, we discuss the main methodological parameters adopted in the estimation, and we offer a comparison to other existing studies of the VAT Gaps.

Austria

Overall Assessment

Austria has a relatively low level of the Gap, compared to the EU-26 countries (second quintile by its average gap for the period 2000-2011, amounting to 11 percent). While some upward creep was evident during the mid-2000s, the financial crisis that started in 2008 did not cause appreciable increases in the gap, mostly on account of the fact that revenue collection did not suffer during this period (despite experiencing an overall GDP recession of -3.8 percent in 2009). In fact, Austria is one of the few countries in the EU-26 to have seen a steady increase in VAT revenues during the sample period (with a limited pause in 2003).

With respect to policy parameters, Austria has maintained its standard rate (20 percent) and its reduced rate (10 percent) unchanged over the sample period, one of only five EU countries to do so. The composition of the VTTL is typical of the EU average, with household consumption contributing a bit less than two-thirds of total, unrecoverable VAT on inputs somewhat less than one-fifth and the rest largely attributable to unrecoverable VAT on inputs on Gross Fixed Capital Formation and on consumption of Government and Non-Profit Institutions Serving Households.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For most of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3. In case of 8 products the rates were calculated based on the data from direct communications by national authorities: Manufacture of food products and beverages (DL33), Manufacture of chemicals and chemical products (DG24), Hotels and restaurants (H55), Air transport (I62), Supporting and auxiliary transport activities (I63); Real estate activities (K70), Recreational, cultural and sporting activities (O92) and Other service activities (O93).

Propex (**percentage of exemption in each of the 59 group categories**): For most of the products we have followed the procedure described in Appendix A4. In case of two products the propex was calculated based on data from direct

communications by national authorities: Recreational, cultural and sporting activities (O92, 15%) and Real estate activities (K70, 99%). Propex for Financial services (WIOD code J) was set at 90%.

GFCF: In the case of Austria, based on the estimates of VTTL from GFCF provided in direct communications for the years 2001-2009 we derived share of taxable GFCF and estimated VTTL in 2000, 2010 and 2011.

Miscellaneous Adjustments: Adjustment for small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

The only other published estimates of the VAT Gap for Austria are those of Reckon (2009). Our estimates for the years of overlap are slightly lower (on average about 2 percentage points) largely due to differences in the estimated average household liability. The latter in turn is explained by data revisions which have resulted in somewhat lower estimates for household consumption compared to Reckon (2009), and by differences in the average VAT rate on consumption, due to more precise estimates on account of direct communications from national authorities.

Table 3.3.1. Austria: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	18 466	19 281	19 453	20 079	20 963	21 907	22 867	23 995	25 091	24 309	25 308	26 915
Household consumption	12 191	12 350	12 603	12 847	13 451	13 946	14 409	14 858	15 498	15 400	15 927	16 632
Government & NPISH consumption	456	569	595	611	637	654	684	726	767	778	792	807
Intermediate consumption by industries	3 023	3 368	3 377	3 563	3 655	3 898	4 069	4 333	4 609	4 731	5 007	5 418
Gross fixed capital formation	2 251	2 250	2 167	2 289	2 333	2 482	2 733	2 977	2 932	2 191	2 254	2 471
Net adjustments	544	745	710	769	886	927	972	1 101	1 285	1 209	1 329	1 586
VAT receipts	16 840	17 251	17 972	17 893	18 590	19 414	19 735	20 970	21 935	22 158	22 735	23 447
VAT Gap	1 626	2 030	1 481	2 186	2 373	2 493	3 131	3 026	3 156	2 151	2 573	3 468
VAT Gap as a share of VTTL	**9%**	**11%**	**8%**	**11%**	**11%**	**11%**	**14%**	**13%**	**13%**	**9%**	**10%**	**13%**
VAT Gap as a share of GDP	**0.8%**	**0.9%**	**0.7%**	**1.0%**	**1.0%**	**1.0%**	**1.2%**	**1.1%**	**1.1%**	**0.8%**	**0.9%**	**1.2%**
Full rate	20%											
Reduced rates	10%											

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Belgium

Overall Assessment

Belgium's 2000-2011 VAT Gap averaged 13 percent, placing the country in the third quintile and at the median among the EU-26 countries, below the average of 17 percent. The gap increased significantly during 2008-2011 compared to the 2005-2007 period (by some 3 percentage points on average) following the onset of the financial crisis, largely on account of a sluggish revenue performance.

Belgium has not introduced any changes in its standard rate (21 percent) or its two reduced rates (12 and 6 percent) over the sample period. Belgium's share of VAT liability falling on households is lower than the European average, reflecting both exemptions and reduced rates on household consumption items. Consequently, the importance of unrecoverable VAT on purchases of intermediate inputs by industries producing exempt goods is higher than average - an indication of possible distortions to relative prices introduced by the VAT system in the presence of exemptions.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex **(percentage of exemption in each of the 59 group categories)**: For all of the products the propex factors were calculated using EUROSTAT consumption data as described in Appendix A4.

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications the shares were estimated by interpolation.

Miscellaneous Adjustments: The estimates for the following adjustments to VTTL have been used: Small business exemption: null adjustment, registration threshold below 10 thousands euro. Restriction on the right to deduct VAT

on business cars and fuel: based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

The only published estimates of the VAT Gap for Belgium are those of Reckon (2009). The estimates for the 2000-2006 VAT Gaps in this report are very similar to those of Reckon (2009) (on average less than half of one percentage point higher).

Table 3.3.2. Belgium: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	19 944	20 636	20 988	21 933	23 141	24 488	25 965	26 956	28 404	27 995	29 800	30 991
Household consumption	12 661	12 675	12 904	13 271	13 819	14 368	14 959	15 188	15 966	15 560	16 309	16 845
Government & NPISH consumption	438	729	795	1 006	1 032	1 023	1 067	1 123	1 219	1 229	1 269	1 324
Intermediate consumption by industries	3 273	3 725	3 890	4 162	4 425	4 649	4 889	5 218	5 690	5 673	6 261	6 788
Gross fixed capital formation	2 430	2 348	2 297	2 368	2 576	3 168	3 652	3 866	3 963	4 040	4 111	4 268
Net adjustments	1 142	1 159	1 101	1 126	1 289	1 279	1 398	1 561	1 567	1 493	1 850	1 767
VAT receipts	18 130	17 817	18 591	18 730	20 122	21 362	22 569	23 908	24 126	23 600	25 230	26 021
VAT Gap	1 815	2 818	2 397	3 203	3 019	3 126	3 397	3 048	4 278	4 395	4 571	4 970
VAT Gap as a share of VTTL	**9%**	**14%**	**11%**	**15%**	**13%**	**13%**	**13%**	**11%**	**15%**	**16%**	**15%**	**16%**
VAT Gap as a share of GDP	**0.7%**	**1.1%**	**0.9%**	**1.2%**	**1.0%**	**1.0%**	**1.1%**	**0.9%**	**1.2%**	**1.3%**	**1.3%**	**1.3%**
Full rate	21%											
Reduced rates	12% / 6%											

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Bulgaria

Overall Assessment

Bulgaria's average gap for the period 2000-2011, at 16 percent, places the country in the fourth quintile among the EU-26. However, the average masks a U-shaped pattern (shared with several other New Member States): a strong reduction in the gaps in the earlier part of the period (34 percent in 2002 vs. 4 percent in 2008), coinciding with the accession to the European Union, and resulting from substantial increases in VAT receipts; followed by a recession-induced partial reversal starting from 2009 (15 percent), thus increasing the VAT Gap again, albeit not to the levels witnessed in the early 2000s.

Bulgaria has maintained unchanged its standard rate (20 percent) while introducing a reduced rate in 2007 (7 percent, changed to 9 percent in 2011). It also shares with countries whose adoption of the VAT is more recent a greater percentage of the VAT liability levied on Household consumption rather than on unrecoverable VAT on inputs of industries producing exempted goods.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex (**percentage of exemption in each of the 59 group categories**): For all of the products the propex factors were calculated using EUROSTAT consumption data as described in the Appendix A4.

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: The estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: estimated based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

No other estimates of the VAT Gap could be found in published literature.

Table 3.3.3. Bulgaria: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	1 526	1 769	1 886	2 056	2 330	2 631	3 038	3 631	4 026	3 710	3 684	3 956
Household consumption	1 132	1 296	1 373	1 471	1 660	1 830	2 051	2 405	2 616	2 357	2 415	2 565
Government & NPISH consumption	44	65	63	77	76	75	106	95	116	81	84	87
Intermediate consumption by industries	245	281	305	346	400	450	521	630	713	735	722	816
Gross fixed capital formation	81	104	114	128	152	220	287	383	482	459	417	422
Net adjustments	24	23	30	34	42	56	73	118	100	77	45	65
VAT receipts	1 169	1 310	1 245	1 586	2 011	2 378	2 835	3 190	3 862	3 156	3 299	3 352
VAT Gap	357	458	641	471	319	253	203	441	164	554	385	604
VAT Gap as a share of VTTL	**23%**	**26%**	**34%**	**23%**	**14%**	**10%**	**7%**	**12%**	**4%**	**15%**	**10%**	**15%**
VAT Gap as a share of GDP	**2.5%**	**2.9%**	**3.8%**	**2.6%**	**1.6%**	**1.1%**	**0.8%**	**1.4%**	**0.5%**	**1.6%**	**1.1%**	**1.6%**
Full rate	20%											
Reduced rates	--								7%			9%

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Czech Republic

Overall Assessment

The Czech Republic recorded a relatively high average VAT Gap, at 23 percent for the period 2000-2011 (fourth quintile). The average however masks three distinct sub-periods, with high levels in 2000-2003, then 2004-2006, when a dramatic decrease in the general rate led to much higher revenues and a lower gap (which fell as low as 10 percent in 2005); and finally the period from 2007 until 2011, which saw a steady deterioration (markedly so after the onset of the 2008 recession) in the gap to almost 30 percent, in conjunction with repeated rate increases.

The Czech Republic has managed the VAT rates more actively than other countries during the period under consideration, albeit in changing directions. On average, it has a relatively high share of its VAT revenues accruing from unrecoverable VAT on intermediate inputs of industries producing exempt goods, mirroring the lower-than-EU-26 average contribution to the VTTL from Household consumption.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

***Propex* (percentage of exemption in each of the 59 group categories)**: For all of the products the propex factors were calculated using EUROSTAT consumption data as described in the Appendix A4.

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: The estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: estimated based on direct communications

from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

The only published estimated of VAT Gaps for the Czech Republic are those of Reckon (2009). These are on average 9 percentage points higher than results of this study (with the largest differences between 2000 and 2003). The major drivers of these differences are higher estimates of intermediate and household consumption liabilities. The first can be explained by different *propex* for Real estate activities (K70), while the latter by applying different VAT rates (especially for Post and telecommunications services (I64)) See table A.8.2 for further details.

Table 3.3.4. Czech Republic: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	5 632	6 149	7 106	7 511	7 292	8 028	8 937	10 389	13 602	13 017	14 735	15 235
Household consumption	3 584	3 981	4 473	4 586	4 513	4 884	5 492	5 954	7 809	7 345	8 230	8 573
Government & NPISH consumption	421	449	553	585	589	608	660	707	865	870	961	978
Intermediate consumption by industries	1 268	1 351	1 592	1 645	1 660	1 950	2 204	2 597	3 147	2 989	3 489	3 805
Gross fixed capital formation	268	270	321	503	347	391	438	796	1 409	1 654	1 795	1 677
Net adjustments	92	98	167	193	182	195	143	336	371	158	260	201
VAT receipts	3 970	4 382	5 036	5 158	6 416	7 223	7 541	8 366	10 437	9 784	10 420	10 994
VAT Gap	1 662	1 767	2 069	2 354	875	804	1 396	2 023	3 165	3 234	4 315	4 241
VAT Gap as a share of VTTL	**30%**	**29%**	**29%**	**31%**	**12%**	**10%**	**16%**	**19%**	**23%**	**25%**	**29%**	**28%**
VAT Gap as a share of GDP	**2.6%**	**2.5%**	**2.5%**	**2.8%**	**1.0%**	**0.8%**	**1.2%**	**1.5%**	**2.1%**	**2.3%**	**2.9%**	**2.7%**
Full rate	22%					19%					20%	
Reduced rates	5%									9%	10%	

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Denmark

Overall Assessment

Denmark, at an average 10 percent gap, belongs to the group of EU countries with moderately low VAT Gap levels (the second quintile). The financial crisis caused a blip in the gap in 2008 (from 9 percent in 2007 to 11 percent in 2008), mostly because of somewhat lower VAT revenues. Since then, the gap settled at its pre-crisis position which oscillates around the 9 percent level.

Denmark is the only country in the EU that uses just one full rate (25 percent, although newspapers and a few other items are zero-rated). Despite the near absence of reduced-rate items, Denmark has higher-than-average exemptions, resulting in a lower share of VAT revenues accruing from households, and a correspondingly larger share of unrecoverable VAT from intermediate consumption of industries - an indication of possible economic inefficiencies in the system.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT. The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex **(percentage of exemption in each of the 59 group categories)**: For all of the products the propex factors were calculated using EUROSTAT consumption data as described in Appendix A4.

GFCF: In the absence of the estimates of taxable investment in direct communications, the VTTL from GFCF was calculated using data from national accounts on GFCF expenditure on 31 industries (NACE rev 1) and 5 economic sectors (government, households, NPISH, financial and non-financial corporations). The share of investment without the right to deduct VAT among non-financial corporation was calculated as the share of GFCF by Education (M) and Health and Social Work (N) industries among the total GFCF by non-financial corporations. For other economic sectors it was assumed that all GFCF is subject to non-deductible VAT.

Miscellaneous Adjustments: The estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct

communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: estimated based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

Denmark estimates VAT Gaps on the basis of a bottom-up methodology that relies on analysis of returns. This methodology, which is discussed in greater detail in Appendix B to this report, is not directly comparable to the results according to the top-down methodology.

Reckon (2009) reported VAT Gaps on average 3 percentage points lower than the ones in this report for the period 2000-2006. The largest discrepancies come from estimation of unrecoverable VAT from intermediate consumption (application of different propex) and gross fixed capital formation. The latter is explained by differences in the National Accounts which have been updated since Reckon (2009) publication.

Table 3.3.5. Denmark: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	18 682	19 315	19 812	20 077	21 293	22 880	24 765	25 855	26 462	24 976	25 627	26 436
Household consumption	11 109	11 353	11 729	11 839	12 625	13 256	14 015	14 481	14 752	13 763	14 358	14 633
Government & NPISH consumption	676	730	769	786	817	836	861	857	899	921	946	943
Intermediate consumption by industries	3 801	4 066	4 264	4 415	4 651	5 003	5 420	5 849	6 202	6 271	6 465	6 959
Gross fixed capital formation	2 587	2 650	2 538	2 545	2 688	3 230	3 819	3 976	3 887	3 377	3 184	3 169
Net adjustments	509	516	512	492	512	555	650	692	723	645	674	732
VAT receipts	16 606	17 250	17 818	18 180	19 258	20 862	22 560	23 638	23 635	22 702	23 245	23 869
VAT Gap	2 076	2 064	1 994	1 897	2 035	2 017	2 206	2 218	2 827	2 274	2 382	2 566
VAT Gap as a share of VTTL	**11%**	**11%**	**10%**	**9%**	**10%**	**9%**	**9%**	**9%**	**11%**	**9%**	**9%**	**10%**
VAT Gap as a share of GDP	**1.2%**	**1.2%**	**1.1%**	**1.0%**	**1.0%**	**1.0%**	**1.0%**	**1.0%**	**1.2%**	**1.0%**	**1.0%**	**1.1%**
Full rate	25%											
Reduced rates	--											
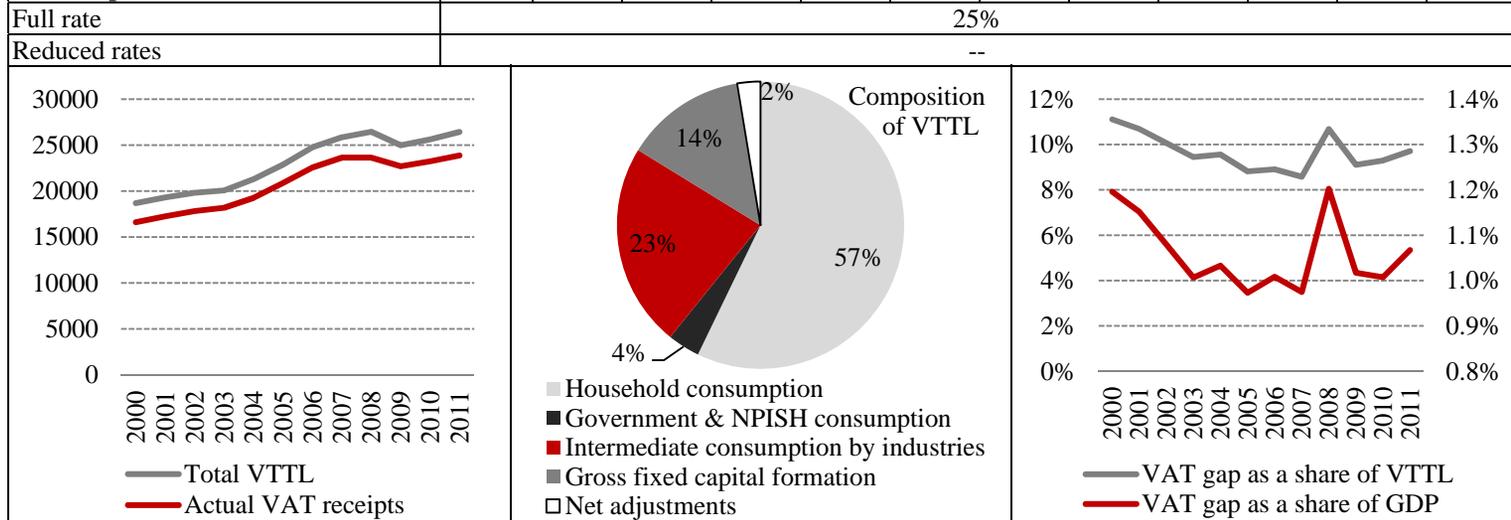
Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Estonia

Overall Assessment

Estonia is among the countries in the fourth VAT Gap quintile with its 15 percent average gap between 2000 and 2011. As with other NMSs, the gaps significantly decreased after 2004 (from 24 to 9 percent in 2007), but inched up again after 2008, following the onset of the financial crisis, which was felt very strongly in the country.

Estonia began the 2000s with a full (18 percent) and one reduced rate (5 percent), which were both increased in 2009 (to 20 and 9 percent, respectively), with minor effects on collected revenues. Its proportion of VTTL from the household sector is somewhat higher than the EU-26 average, reflecting possibly the relatively newer nature of the VAT system in the country.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex **(percentage of exemption in each of the 59 group categories)**: For most of the products we have followed the procedure described in Appendix A4. In case of seven products the propex was calculated based on data from direct communications by national authorities: Post and telecommunications (I64, 7%), Financial intermediation, except insurance (J65, 90%), Insurance (J66, 99%), Activities auxiliary to financial intermediation (J67, 44%), Health and social work (N85, 94%), Recreational, cultural and sporting activities (O92, 46%), Real estate activities (K70, 12%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: The estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between

10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: not applicable (full deductibility). Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

The estimates of VAT Gap in this study are on average 2 percentage points higher than results of Reckon (2009). The differences are explained by underestimated values of missing EUROSTAT use tables by Reckon, especially data on household final consumption. In addition, slightly higher propexes were utilized in a number of cases, based on direct communications from the authorities. See Appendix Table A.2.8 for details.

Table 3.3.6. Estonia: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	595	677	782	865	973	1 128	1 358	1 569	1 595	1 405	1 478	1 664
Household consumption	421	476	540	599	684	781	908	1 025	1 064	931	974	1 060
Government & NPISH consumption	23	26	31	33	39	44	51	58	68	72	75	78
Intermediate consumption by industries	83	92	99	111	113	128	147	178	195	189	228	274
Gross fixed capital formation	65	81	109	118	131	168	247	299	258	205	194	241
Net adjustments	3	3	4	4	5	7	5	10	10	7	8	11
VAT receipts	520	568	651	712	744	970	1 215	1 423	1 288	1 224	1 257	1 363
VAT Gap	75	109	132	153	229	158	143	146	308	181	221	301
VAT Gap as a share of VTTL	**13%**	**16%**	**17%**	**18%**	**24%**	**14%**	**11%**	**9%**	**19%**	**13%**	**15%**	**18%**
VAT Gap as a share of GDP	**1.2%**	**1.6%**	**1.7%**	**1.8%**	**2.4%**	**1.4%**	**1.1%**	**0.9%**	**1.9%**	**1.3%**	**1.5%**	**1.9%**
Full rate	18%									20%		
Reduced rates	5%									9%		

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Finland

Overall Assessment

Finland's average 2000-2011 VAT Gap is 13 percent, placing the country in the third quintile among the EU-26. The gaps have shown very modest fluctuations over the years, but edged upwards starting in 2007 and continuing in the post-2008-2009 crisis period.

The VAT system consists of a full and two reduced rates which were changed four times during the estimation period. Finland is also notable for the low proportion of the total VAT liability that accrues from household consumption, and the corresponding large share of unrecoverable VAT on industry inputs and on Gross Fixed Capital Formation - an indication of the possible economic inefficiencies induced by the prevalence of exemptions.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex **(percentage of exemption in each of the 59 group categories)**: For all of the products the propex factors were calculated using EUROSTAT consumption data as described in Appendix A4.

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: null adjustment, registration threshold below 10 thousands euro. Restriction on the right to deduct VAT on business cars and fuel: based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

Finland's average 2000-2006 VAT Gap published in this report is 8 percentage points higher than Reckon (2009) estimates. Discrepancies are due to underestimated output in the missing use tables by Reckon. In some cases different propexes and rates were applied. Direct communications with authorities allowed us to use more precise GFCF estimates.

Table 3.3.7. Finland: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	12 392	12 846	13 422	14 328	15 017	15 468	16 408	17 644	18 337	16 667	18 018	19 746
Household consumption	6 561	6 862	7 177	7 631	7 907	8 214	8 796	9 154	9 606	8 549	9 230	10 010
Government & NPISH consumption	692	711	750	784	803	835	775	808	834	846	887	947
Intermediate consumption by industries	2 578	2 658	2 875	3 082	3 209	3 358	3 478	3 686	3 959	4 023	4 398	4 880
Gross fixed capital formation	2 349	2 385	2 397	2 567	2 805	2 699	2 990	3 584	3 310	2 824	2 997	3 325
Net adjustments	211	229	221	264	293	362	369	412	628	424	507	585
VAT receipts	10 869	11 118	11 680	12 455	12 949	13 658	14 418	15 054	15 511	14 951	15 256	16 915
VAT Gap	1 523	1 728	1 741	1 873	2 068	1 810	1 990	2 590	2 826	1 716	2 762	2 831
VAT Gap as a share of VTTL	**12%**	**13%**	**13%**	**13%**	**14%**	**12%**	**12%**	**15%**	**15%**	**10%**	**15%**	**14%**
VAT Gap as a share of GDP	**1.2%**	**1.2%**	**1.2%**	**1.3%**	**1.4%**	**1.1%**	**1.2%**	**1.4%**	**1.5%**	**1.0%**	**1.5%**	**1.5%**
Full rate	22%										23%	
Reduced rates	17 / 8%									12 / 8%	13 / 9%	

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

France

Overall Assessment

The average VAT Gap in France over the period 2000-2011 was 16 percent (just below the average value for the EU-26 countries, but above the median), placing it in the fourth quintile for the EU-26 countries. There was a notable escalation of the gap as a result of the 2008-9 crisis period (from 14 percent in 2007 to 20 percent in 2009), brought about by a fall in revenues in 2009, and a sluggish recovery after that.

VAT rates (a full rate of 19.6 percent and two reduced rates of 5.5 and 2.1 percent) have not been changed during the period. France's share of VAT liability from household consumption is slightly lower than the EU average.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex (**percentage of exemption in each of the 59 group categories**): For most of the products we have followed the procedure described in Appendix A4. In case of six products the propex was calculated based on data from direct communications by national authorities: Post and telecommunications (I64, 5%), Financial intermediation, except insurance (J65, 66%), Insurance (J66, 100%), Activities auxiliary to financial intermediation (J67, 56%), Real estate activities (K70, 62%), Recreational, cultural and sporting activities (O92, 34%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to the VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: estimated based on direct communications

from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

Our VAT Gap estimates are on average 7 percentage points higher than figures of Reckon (2009). This reflects both revisions in national accounts data, and the application of different *propexes* and rates which result from direct communications with France's authorities and a finer level of disaggregation. See Appendix Table A.2.8 for details.

Table 3.3.8. France: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	120 868	125 149	129 566	134 051	139 912	147 140	154 054	159 651	164 505	163 781	167 727	172 739
Household consumption	74 348	77 337	79 919	82 372	85 229	88 560	91 593	95 156	98 505	98 816	101 311	103 691
Government & NPISH consumption	5 341	5 746	6 339	6 593	6 855	7 198	7 485	7 810	8 073	9 843	10 165	10 339
Intermediate consumption by industries	17 916	18 479	19 701	20 406	21 425	22 496	23 844	24 728	25 431	19 847	20 905	22 084
Gross fixed capital formation	19 349	19 683	19 784	20 829	22 240	24 397	26 693	27 460	26 967	30 186	29 688	31 195
Net adjustments	3 913	3 903	3 823	3 851	4 163	4 489	4 439	4 497	5 529	5 090	5 658	5 429
VAT receipts	107 163	108 581	110 413	113 622	120 224	126 625	131 693	136 542	137 736	130 303	135 579	140 506
VAT Gap	13 705	16 568	19 153	20 429	19 688	20 515	22 361	23 110	26 769	33 478	32 148	32 233
VAT Gap as a share of VTTL	11%	13%	15%	15%	14%	14%	15%	14%	16%	20%	19%	19%
VAT Gap as a share of GDP	1.0%	1.1%	1.2%	1.3%	1.2%	1.2%	1.2%	1.2%	1.4%	1.8%	1.7%	1.6%
Full rate	19.6%											
Reduced rates	5.5% / 2.1%											

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Germany

Overall Assessment

Germany's average VAT Gap amounted to 13 percent over the period 2000-2011; this is also the median value for the EU-26 group. The gap has been remarkably stable during the sample time period, including in the post-crisis period after 2008.

The VAT system is characterized by one full (changed once in 2007 from 16 to 19 percent) and one reduced rate (7 percent). The share of VAT liability from household consumption is in line with the average of the EU-26.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in the Appendix A3.

Propex **(percentage of exemption in each of the 59 group categories)**: For all of the products the propex factors were calculated using EUROSTAT consumption data as described in the Appendix A4.

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: not applicable (full deductibility). Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

Germany's average 2000-2006 VAT Gap calculated by Reckon (2009) is virtually identical to this report's estimates.

The IFO Institute (Parsche, 2009) has also occasionally produced estimates of the VAT Gap for Germany (until 2008) that are on average about 4 percent lower than those in this report. We were not able to reconcile the two estimates, in the absence of access to the details of the IFO calculations.

Table 3.3.9. Germany: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	157 896	161 207	157 665	157 689	158 468	160 996	166 848	196 743	201 402	197 267	206 364	216 830
Household consumption	96 492	100 443	99 319	99 481	101 019	102 873	106 008	121 621	124 734	122 371	125 930	129 502
Government & NPISH consumption	6 360	6 712	6 703	6 881	6 445	6 962	7 036	8 547	8 690	8 809	9 073	9 358
Intermediate consumption by industries	23 608	23 913	23 753	24 319	24 080	24 707	25 445	30 819	31 774	32 538	35 334	38 895
Gross fixed capital formation	30 225	28 940	26 927	26 111	26 041	25 595	27 500	34 888	35 317	32 621	34 989	37 933
Net adjustments	1 211	1 199	962	896	884	859	859	868	886	927	1 038	1 141
VAT receipts	140 020	139 090	136 780	137 190	137 430	139 810	147 140	170 080	175 870	177 680	180 220	189 920
VAT Gap	17 876	22 117	20 885	20 499	21 038	21 186	19 708	26 663	25 532	19 587	26 144	26 910
VAT Gap as a share of VTTL	**11%**	**14%**	**13%**	**13%**	**13%**	**13%**	**12%**	**14%**	**13%**	**10%**	**13%**	**12%**
VAT Gap as a share of GDP	**0.9%**	**1.1%**	**1.0%**	**1.0%**	**1.0%**	**1.0%**	**0.9%**	**1.1%**	**1.0%**	**0.8%**	**1.0%**	**1.0%**
Full rate	16%							19%				
Reduced rates	7%											

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Greece

Overall Assessment

Greece is among high VAT Gap level countries with its average 30 percent (fifth quintile of the EU-26 for the period 2000-2011). The gaps have shown a significant upward tendency, particularly after 2003 (from 22 percent in 2001 up to 39 percent in 2011). The increase in the post-2008 period has been driven by collapsing revenues, despite a number of rate increases, as a result of the strong recession in the economy.

Greece's share of theoretical VAT liability accruing from households is higher than the average in the EU-26, although the high level of gap makes it even more difficult to gauge the actual relative burden on economic sectors.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex (**percentage of exemption in each of the 59 group categories**): For most of the products we have followed the procedure described in Appendix A4. In case of three products the propex was calculated based on data from direct communications by national authorities: Financial intermediation, except insurance (J65, 96%), Insurance (J66, 73%), Activities auxiliary to financial intermediation (J67, 88%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: null adjustment, registration threshold not higher than 10 thousands euro. Restriction on the right to deduct VAT on business cars and fuel: based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

Our estimates of 2000-2006 VAT Gaps for Greece are on average one percentage point higher than the estimates in Reckon (2009). The main reasons for the differences are the National Accounts data used. Reckon (2009) had at its disposal only pre-2000 use tables, therefore, all 2000-2006 national statistics were extrapolated, leading to underestimation of the results.

Table 3.3.10. Greece: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	13 074	14 061	15 524	16 590	17 472	19 386	21 885	24 265	24 072	22 983	23 739	24 790
Household consumption	8 083	8 919	9 818	10 373	11 105	12 482	13 920	14 645	15 649	15 191	16 339	17 686
Government & NPISH consumption	36	45	51	54	61	66	88	96	110	107	105	120
Intermediate consumption by industries	1 642	1 584	1 801	1 763	1 937	2 073	2 215	2 599	2 662	3 003	3 036	3 266
Gross fixed capital formation	3 208	3 402	3 725	4 267	4 207	4 585	5 486	6 752	5 449	4 535	4 078	3 535
Net adjustments	104	110	128	133	163	180	177	174	202	147	180	183
VAT receipts	9 824	10 960	11 969	12 043	12 573	13 398	14 910	16 611	17 020	14 914	16 308	15 027
VAT Gap	3 250	3 101	3 555	4 547	4 899	5 988	6 975	7 654	7 052	8 069	7 431	9 763
VAT Gap as a share of VTTL	**25%**	**22%**	**23%**	**27%**	**28%**	**31%**	**32%**	**32%**	**29%**	**35%**	**31%**	**39%**
VAT Gap as a share of GDP	**2.4%**	**2.1%**	**2.3%**	**2.6%**	**2.6%**	**3.1%**	**3.3%**	**3.4%**	**3.0%**	**3.5%**	**3.3%**	**4.7%**
Full rate	18%							19%			23%	
Reduced rates	8/4%							9/4.5%			11/5.5%	13/6.5%

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Hungary

Overall Assessment

Hungary is among the EU countries with high level of VAT Gaps (fifth quintile by its average gap for the period 2000-2011, amounting to 26 percent, and consistently high over the period). Unlike most other EU-26 countries, the recession of 2008-2009 does not appear to have substantially increased the VAT Gap.

Hungary has managed quite actively its standard and reduced rates, with 6 changes over the sample period, but with unclear effects on collections. Neither decreases nor increases in rates appear to be correlated with the behaviour of the VAT Gap. Hungary's share of the VAT liability generated by the Household sector is in line with the average for the EU-26 countries.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For most of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3. In case of 8 products the rates were calculated based on the data from direct communications by national authorities: Manufacture of food products and beverages (DA15), Publishing, printing and reproduction of recorded media (DE22), Manufacture of furniture; manufacturing n.e.c. (DN36), Hotels and restaurants (H55), Post and telecommunications (I64), Other service activities (O93).

Propex (**percentage of exemption in each of the 59 group categories**): For most of the products we have followed the procedure described in Appendix A4. In case of seven products the *propex* was calculated based on data from direct communications by national authorities: Financial intermediation, except insurance and pension funding (J65, 94%), Insurance and pension funding, except compulsory social security (J66, 100%), Activities auxiliary to financial intermediation (J67, 93%), Real estate activities (K70, 95%), Public administration and defence; compulsory social security (L75, 92%), Health and social work (N85, 85%), Activities of membership organizations n.e.c. (O91, 61%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: estimated based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

The VAT Gap for Hungary calculated in this study is on average 4 percentage points higher that the estimates in Reckon (2009). The differences are due to different rates and *propexes* applied in the theoretical liability calculations, which result from direct communication with Hungarian national authorities. In addition, the values forecasted by Reckon (2009) for the missing use tables were underestimated, especially household final consumption expenditures.

Table 3.3.11. Hungary: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	5 702	6 630	7 854	8 182	9 482	10 239	9 351	10 577	11 168	10 590	11 793	12 216
Household consumption	3 604	4 188	4 841	5 166	5 937	6 392	5 925	6 897	7 342	6 782	7 470	7 741
Government & NPISH consumption	351	401	485	551	717	800	807	867	930	917	1 010	998
Intermediate consumption by industries	729	847	999	1 043	1 227	1 385	1 325	1 458	1 555	1 535	1 815	1 980
Gross fixed capital formation	946	1 113	1 430	1 326	1 491	1 552	1 182	1 232	1 226	1 278	1 401	1 379
Net adjustments	71	81	99	95	110	109	112	123	115	78	97	118
VAT receipts	4 461	4 794	5 519	6 072	7 278	7 485	6 813	8 010	8 224	7 820	8 442	8 516
VAT Gap	1 241	1 835	2 335	2 110	2 204	2 754	2 538	2 567	2 944	2 770	3 351	3 700
VAT Gap as a share of VTTL	**22%**	**28%**	**30%**	**26%**	**23%**	**27%**	**27%**	**24%**	**26%**	**26%**	**28%**	**30%**
VAT Gap as a share of GDP	**2.5%**	**3.1%**	**3.3%**	**2.9%**	**2.7%**	**3.1%**	**2.8%**	**2.6%**	**2.8%**	**3.0%**	**3.5%**	**3.7%**
Full rate	25%						20%			25%		
Reduced rates	12 / 0%				15 / 5%		5%			18 / 5%		

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Ireland

Overall Assessment

Ireland's average VAT Gap of 8 percent between 2000 and 2011 (first quintile of the EU-26 countries) masks a deterioration following the onset of the economic crisis. In the pre-crisis period, gaps were mostly below the 10 percent level, but rose to double-digits since, with a peak of 15 percent in 2009 (partially reversed in 2010-11).

Ireland introduced no less than 9 changes to its standard and reduced rates during the period, second only to Greece, but with minimal ex-ante effect on revenues (Table Appendix C.1). Ireland also has the second-lowest share of VAT Liability accruing from the household sector, at 49 percent, an indication of the possible large distortions introduced by the exemptions and multiple rate system.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex **(percentage of exemption in each of the 59 group categories)**: For most of the products we have followed the procedure described in Appendix A4. In case of two products the *propex* was calculated based on data from direct communications by national authorities: Financial intermediation (WIOD code J, 62%), Real estate services (K70, 23%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business

cars and fuel: estimated based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

The estimated VAT Gaps in this study are on average 3 percentage points higher than the 2000-2006 estimates in Reckon (2009). There are two main reasons for this discrepancy. The first is the different values of gross fixed capital formation of exempt sectors (estimated in this study from direct communications with authorities); the second is the use of different *propexes*, especially for Real estate activities (K70) (Appendix Table A.2.8).

Table 3.3.12. Ireland: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	8 447	8 110	9 537	10 417	11 276	13 312	14 853	15 670	14 650	12 149	11 350	10 890
Household consumption	4 350	4 209	4 522	5 038	5 302	6 395	7 168	7 120	6 927	6 234	6 063	5 876
Government & NPISH consumption	82	83	94	103	107	139	193	483	488	468	430	417
Intermediate consumption by industries	1 328	1 635	1 753	1 890	1 990	1 952	2 147	2 665	2 689	2 597	2 508	2 585
Gross fixed capital formation	2 448	1 926	2 829	3 083	3 498	4 428	5 021	5 090	4 220	2 632	2 134	1 792
Net adjustments	239	257	339	304	380	398	325	311	327	218	216	220
VAT receipts	7 657	7 999	9 168	9 814	10 947	12 364	13 802	14 334	13 102	10 338	10 056	9 782
VAT Gap	790	112	369	602	329	948	1 052	1 336	1 548	1 811	1 294	1 108
VAT Gap as a share of VTTL	**9%**	**1%**	**4%**	**6%**	**3%**	**7%**	**7%**	**9%**	**11%**	**15%**	**11%**	**10%**
VAT Gap as a share of GDP	**0.7%**	**0.1%**	**0.3%**	**0.4%**	**0.2%**	**0.6%**	**0.6%**	**0.7%**	**0.9%**	**1.1%**	**0.8%**	**0.7%**
Full rate	21%	20%	21%						21.5%		21%	
Reduced rates	12.5/ 4.2%	12.5/ 4.3%	12.5/ 4.3%	13.5/ 4.4%	13.5/ 4.8%							13.5/ 4.8/9%

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Italy

Overall Assessment

Italy's VAT Gap averaged 26 percent over the period 2000-2011, placing the country in the fifth quintile among the EU-26 countries. No significant trends in either direction are evident, but in 2009 the VAT Gap exceeded the 30 percent level, on account of a recession-induced 8 percent slide in VAT receipts, which has since been reversed.

There was only one change in the VAT rate, at the very end of the investigated period – from 20 to 21 percent in mid-2011. The average share of VTTL attributable to taxation of household consumption is one of the highest among the EU-26, and consequently the share of liability on unrecoverable VAT on intermediate consumption is low. While these figures would point to a more "economically efficient" system than the average EU country, the size of the gaps suggests that inefficiencies and inequities might de facto be very high.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex **(percentage of exemption in each of the 59 group categories)**: For most of the products we have followed the procedure described in Appendix A4. In case of seven products the *propex* was calculated based on data from direct communications by national authorities: Construction (F45, 2%), Financial intermediation, except insurance and pension funding (J65, 100%), Insurance and pension funding, except compulsory social security (J66, 99%), Activities auxiliary to financial intermediation (J67, 85%), Real estate activities (K70, 17%), Activities of membership organizations n.e.c. (O91,33%), Recreational, cultural and sporting activities (O92, 13%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: estimated based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

The estimates of VAT Gap for the period 2000-2006 by Reckon (2009) are very similar to the outcomes of this study (on average lower by less than one percentage point). There are two primary drivers of slightly different theoretical liabilities. Firstly, we applied different rates for 59 products categories (particularly for the goods purchased mostly by the government sector). Secondly, benefitting from direct communications with authorities, our gross fixed capital formation estimates are slightly higher.

Estimates produced by Italian authorities (Corte dei Conti 2012) point to somewhat higher Gap levels than the ones in this report. However, the estimates are only displayed in a graph, and detailed calculations are not published; this prevented an assessment of the differences with this report.

Table 3.3.13. Italy: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	100 292	103 772	105 848	110 025	114 054	117 705	122 122	124 980	127 308	126 337	129 285	134 691
Household consumption	72 081	73 883	75 458	77 677	80 049	81 980	84 618	86 253	87 683	84 722	87 246	90 607
Government & NPISH consumption	5 465	6 154	6 440	6 583	7 110	7 504	7 743	7 714	8 036	8 138	8 199	8 132
Intermediate consumption by industries	8 880	9 350	9 944	10 675	11 131	11 776	12 255	12 707	13 283	13 660	14 480	15 290
Gross fixed capital formation	10 036	10 591	10 314	11 435	11 885	12 310	13 018	13 689	13 657	15 790	15 587	15 887
Net adjustments	3 830	3 795	3 691	3 656	3 880	4 135	4 488	4 617	4 650	4 026	3 774	4 775
VAT receipts	77 473	78 056	80 382	79 099	81 515	85 317	92 992	95 623	93 698	86 544	97 586	98 557
VAT Gap	22 819	25 716	25 466	30 926	32 539	32 388	29 130	29 357	33 610	39 793	31 699	36 134
VAT Gap as a share of VTTL	**23%**	**25%**	**24%**	**28%**	**29%**	**28%**	**24%**	**23%**	**26%**	**31%**	**25%**	**27%**
VAT Gap as a share of GDP	**1.9%**	**2.0%**	**2.0%**	**2.3%**	**2.3%**	**2.3%**	**2.0%**	**1.9%**	**2.1%**	**2.6%**	**2.0%**	**2.3%**
Full rate	20%											21%
Reduced rates	10 / 4%											

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Latvia

Overall Assessment

Latvia registered a large VAT Gap during the period 2000-2011, placing the country in the fourth quintile of the EU-26, with an average of 24 percent. Latvia's economy was heavily hit by the financial crisis. Gains achieved in the mid-2000s in reducing the VAT Gap from the mid-20's before it joined the EU in 2004, to 13 percent by 2007, were reversed on account of the recession and a 30 percent collapse of VAT revenues in 2009. Despite a subsequent (partial) recovery of receipts, following substantial adjustments to the rates, the 2011 gap is still one of the highest registered in the EU.

Latvia has changed both the standard and reduced rates twice in response to the recession-induced fall in revenues in 2008-2009. Latvia's share of VAT liability generated by Household consumption is higher than the EU-26 average, as tends to be the case for NMS.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex **(percentage of exemption in each of the 59 group categories)**: For most of the products we have followed the procedure described in Appendix A4. In case of four products the propex was calculated based on data from direct communications by national authorities: Financial intermediation (WIOD code J, 99%), Health and social work. (N85, 98%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business

cars and fuel: estimated based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

Latvia's average 2000-2006 VAT Gap published in this report is around 10 percentage points lower than the estimates in Reckon (2009). The main driver of differences is the non-availability of use tables for the investigated time period by Reckon (2009), which used extrapolated values of National Accounts based on pre-2000 information. That led to different results in terms of theoretical liability estimations (mostly overestimated, see Appendix Table A.2.8).

Table 3.3.14. Latvia: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	711	789	843	918	1 010	1 190	1 548	1 942	2 069	1 913	1 890	2 322
Household consumption	549	604	645	675	723	838	1 062	1 334	1 428	1 295	1 299	1 570
Government & NPISH consumption	12	11	14	13	12	13	13	23	31	25	23	26
Intermediate consumption by industries	106	128	135	161	183	199	247	302	346	345	365	464
Gross fixed capital formation	42	42	46	65	88	134	218	273	251	235	194	251
Net adjustments	3	3	3	3	4	6	9	10	13	13	9	11
VAT receipts	599	626	661	720	779	1 011	1 374	1 733	1 538	1 109	1 192	1 368
VAT Gap	112	162	183	198	231	179	175	209	531	804	698	954
VAT Gap as a share of VTTL	**16%**	**21%**	**22%**	**22%**	**23%**	**15%**	**11%**	**11%**	**26%**	**42%**	**37%**	**41%**
VAT Gap as a share of GDP	**1.3%**	**1.8%**	**1.9%**	**2.0%**	**2.1%**	**1.4%**	**1.1%**	**1.0%**	**2.3%**	**4.3%**	**3.9%**	**4.7%**
Full rate	18%									21%		22%
Reduced rates	--			9%		5%						

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Lithuania

Overall Assessment

Lithuania has the second-largest VAT Gap in the EU-26, at an average of 35 percent during the period 2000-2011. The gap increased drastically in the after-2008 crisis years, from 29 percent in 2007 to 40 percent in 2009 - mostly due to lower VAT receipts in view of the severe recession that hit the country in 2008-2009.

There are two reduced rates and one full rate in the VAT system of Lithuania. The standard rate was increased in 2009 to 21 percent in order to shore up revenues severely affected by the recession, with moderate success as collections remained in 2011 below the 2008 peak. The country has the highest percentage of the VTTL levied on household consumption in the EU-26 countries, at 74 percent, and as shown in Table 1.2.1, one of the highest effective rates on household consumption.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex **(percentage of exemption in each of the 59 group categories)**: For most of the products we have followed the procedure described in Appendix A4. In case of three products the propex was calculated based on data from direct communications by national authorities: Financial intermediation, except insurance and pension funding (J65, 95%), Insurance and pension funding, except compulsory social security (J66, 98%), Activities auxiliary to financial intermediation (J67, 80%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro

and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: estimated based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

The estimates of 2000-2006 VAT Gaps in this study are on average 14 percentage points higher than the Reckon (2009) figures. One of the reasons is different source and revisions for National Accounts data. Due to direct communications with Lithuanian national authorities, for some product/industry groups we applied different VAT rates and propexes. Another significant driver of differences is theoretical liability from gross fixed capital formation, which is more precise due to direct communications from the authorities.

Table 3.3.15. Lithuania: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	1 347	1 488	1 650	1 792	2 033	2 325	2 711	3 261	3 641	3 258	3 423	3 795
Household consumption	1 036	1 149	1 263	1 363	1 534	1 743	1 978	2 310	2 623	2 479	2 551	2 818
Government & NPISH consumption	37	40	41	43	43	53	69	84	94	88	91	93
Intermediate consumption by industries	115	114	133	144	165	209	251	303	378	319	384	436
Gross fixed capital formation	153	176	205	235	279	306	387	528	524	366	385	431
Net adjustments	6	8	8	7	11	14	26	37	22	6	14	17
VAT receipts	939	989	1 111	1 111	1 175	1 488	1 826	2 330	2 593	1 961	2 180	2 444
VAT Gap	408	498	539	681	857	837	885	930	1 048	1 297	1 243	1 352
VAT Gap as a share of VTTL	**30%**	**34%**	**33%**	**38%**	**42%**	**36%**	**33%**	**29%**	**29%**	**40%**	**36%**	**36%**
VAT Gap as a share of GDP	**3.3%**	**3.7%**	**3.6%**	**4.1%**	**4.7%**	**4.0%**	**3.7%**	**3.2%**	**3.2%**	**4.9%**	**4.5%**	**4.4%**
Full rate						18%					21%	
Reduced rates	9%					9 / 5%						

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Luxembourg

Overall Assessment

Luxembourg's average VAT Gap, at 12 percent, puts it below the EU-26 median and average. The gap saw a sustained decrease in the mid-2000s, (to a low of 8 percent in 2006), but, in combination with the financial crisis, it started to rise, to reach 17 percent in 2010 and 2011. Luxembourg is unique in receiving large VAT revenues from E-commerce firms that choose their location on account of the low standard rate.

Luxembourg has the lowest standard VAT rate of the EU (15 percent) and has kept all its rates unchanged over the sample period. Luxembourg's share of VAT liability generated by Household consumption is the lowest of the EU-26, at 42 percent. This is the result of the favourable treatment of households through reduced rates and exemptions, as well as the exceptions role played by the financial sector and by the above-mentioned E-commerce revenues.

Methodological Notes

The estimates are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are from EUROSTAT.

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

***Propex* (percentage of exemption in each of the 59 group categories)**: For most of the products we have followed the procedure described in Appendix A4. For financial intermediation services the *propex* was calculated based on data from direct communications by national authorities: Financial intermediation (WIOD code J, 82%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: small business exemption: null adjustment, registration threshold not greater than 10 thousands euro. Restriction on the right to deduct VAT on business cars and fuel: not applicable (full deductibility). Entertainment deductions: uniform treatment as discussed in Appendix A. Estimates of VTTL

from services booked in Luxembourg by internet commerce companies have been obtained through direct communication from authorities.

Differences with other published estimates

The VAT Gap estimates in this study are on average 6 percentage points higher than the 2000-2006 VAT Gaps for Luxembourg in Reckon (2009). The main difference is due to non-inclusion in the VTTL by Reckon (2009) of substantial revenues accrued on account of services booked in Luxembourg by internet commerce companies that take advantage of Luxembourg's low standard rate, but do not appear in National Accounts (see Appendix Table A.2.8).

Table 3.3.16. Luxembourg: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	1 449	1 537	1 584	1 677	1 852	2 039	2 136	2 410	2 682	2 643	3 007	3 242
Household consumption	734	748	806	798	867	919	928	972	1 054	1 044	1 084	1 135
Government & NPISH consumption	22	24	28	31	35	38	41	41	43	50	53	56
Intermediate consumption by industries	356	390	375	372	425	471	523	654	747	740	877	944
Gross fixed capital formation	178	198	210	222	233	241	243	278	258	283	370	405
Net adjustments	158	175	166	254	293	369	401	465	580	526	624	702
VAT receipts	1 234	1 314	1 383	1 467	1 662	1 863	1 959	2 156	2 351	2 419	2 503	2 690
VAT Gap	215	223	202	210	190	176	177	254	331	224	504	551
VAT Gap as a share of VTTL	**15%**	**15%**	**13%**	**13%**	**10%**	**9%**	**8%**	**11%**	**12%**	**8%**	**17%**	**17%**
VAT Gap as a share of GDP	**1.0%**	**1.0%**	**0.8%**	**0.8%**	**0.7%**	**0.6%**	**0.5%**	**0.7%**	**0.9%**	**0.6%**	**1.3%**	**1.3%**
Full rate	15%											
Reduced rates	12 / 6 / 3%											

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Malta

Overall Assessment

Malta belongs to the group of EU countries with average levels of VAT Gap (third quintile by its average gap 2000-2011, amounting to 13 percent). The VAT Gap sharply decreased after the country became a member state of the EU. The financial crisis that started in 2008 did not cause any appreciable increases in the gap. On the contrary, the opposite is observable - from 13 percent in 2007 to 4 percent in 2011, the latter result due to exceptionally high receipts that year.

Malta has the second lowest standard rate among the EU-26 countries, at 18 percent. A second reduced rate was introduced in 2011. Malta's share of VTTL accruing to the Household sector is one of the highest in the EU-26, second only to Lithuania, at 73 percent.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For most of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3. In case of Recreational, cultural and sporting activities (O92) the rates were calculated based on the data from direct communications by national authorities.

Propex **(percentage of exemption in each of the 59 group categories)**: For all of the products the *propex* factors were calculated using EUROSTAT consumption data as described in the Appendix A4.

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: assuming 50% of GFCF expenditure on cars cannot be deducted (information from direct communications not available, similar assumption

was made by Reckon (2009). Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

Malta's 2000-2006 average VAT Gap reported in this study is 2 percentage points higher than that in Reckon (2009). One of the reasons lies in usage of extrapolated use tables by Reckon which underestimated the expenditures, especially household consumption. There are also cases where we apply different VAT rates for several product categories.

Table 3.3.17. Malta: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	283	313	324	340	416	438	455	482	521	510	522	541
Household consumption	218	243	250	258	310	323	326	337	370	355	361	377
Government & NPISH consumption	12	14	16	15	22	20	21	23	31	32	33	35
Intermediate consumption by industries	29	20	23	26	38	42	55	66	75	80	87	90
Gross fixed capital formation	22	21	23	28	30	37	36	37	29	26	26	24
Net adjustments	2	15	12	13	15	16	17	19	17	16	15	15
VAT receipts	236	259	273	288	333	397	410	420	458	457	477	520
VAT Gap	47	54	51	52	83	40	46	62	63	53	45	21
VAT Gap as a share of VTTL	**17%**	**17%**	**16%**	**15%**	**20%**	**9%**	**10%**	**13%**	**12%**	**10%**	**9%**	**4%**
VAT Gap as a share of GDP	**1.1%**	**1.3%**	**1.1%**	**1.1%**	**1.8%**	**0.8%**	**0.9%**	**1.1%**	**1.1%**	**0.9%**	**0.7%**	**0.3%**
Full rate	15%				18%							
Reduced rates	5%											5 / 7%

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Netherlands

Overall assessment

The Netherland's average VAT Gap between 2000 and 2011 is 5 percent (placing it in the first quintile among the EU-26 countries). The gap showed a steady decrease from 2000 to 2007 (from 9 to 0.2 percent), but the financial crises negatively impacted VAT receipts, causing an increase up to 9 percent in 2011.

VAT rates have been stable over the period. The Netherlands have one of the lowest percentages of VAT Liability accruing from Household consumption (47 percent) in the EU-26, and correspondingly a higher-than-average liability from exempt sectors, and indication of possible economic inefficiencies generated by the system.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

***Propex* (percentage of exemption in each of the 59 group categories)**: For all of the products the *propex* factors were calculated using EUROSTAT consumption data as described in the Appendix A4.

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and VAT under the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: not applicable (full deductibility). Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

Estimates of this report are very similar to those of Reckon (2009). Slight differences exist in *propexes* and rates applied in both calculations, and, due to revisions in the National Accounts, some values of expenditures differ, in particular for government and intermediate consumptions.

Table 3.3.18. Netherlands: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	31 617	35 283	35 871	36 987	37 051	38 014	40 838	42 943	44 850	43 934	44 199	45 622
Household consumption	15 954	17 469	18 091	18 166	18 220	18 586	19 464	20 269	20 906	19 696	20 015	20 253
Government & NPISH consumption	1 358	1 533	1 656	1 704	1 693	1 756	1 980	2 070	2 158	2 234	2 274	2 292
Intermediate consumption by industries	6 981	8 101	8 472	9 021	9 148	9 565	10 380	11 117	11 814	12 369	12 998	13 693
Gross fixed capital formation	7 063	7 901	7 367	7 823	7 693	7 807	8 695	9 169	9 641	9 312	8 531	9 033
Net adjustments	261	280	285	274	298	300	319	318	331	323	381	351
VAT receipts	28 849	32 509	33 493	34 754	35 811	36 950	39 888	42 873	43 221	40 086	42 654	41 610
VAT Gap	2 768	2 774	2 378	2 233	1 240	1 064	950	70	1 629	3 848	1 545	4 012
VAT Gap as a share of VTTL	**9%**	**8%**	**7%**	**6%**	**3%**	**3%**	**2%**	**0%**	**4%**	**9%**	**3%**	**9%**
VAT Gap as a share of GDP	**0.7%**	**0.6%**	**0.5%**	**0.5%**	**0.3%**	**0.2%**	**0.2%**	**0.0%**	**0.3%**	**0.7%**	**0.3%**	**0.7%**
Full rate	17.5%	19%										
Reduced rates	6%											

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Poland

Overall Assessment

Poland's VAT Gap over the period 2000-2011 amounted to 13 percent (third quintile). Starting from double-digit levels at the beginning of the 2000s, the Gap decreased substantially after the country joined the EU in 2004. Even though the financial crisis did not result in negative GDP growth in Poland, there was a significant increase in the VAT Gap in 2009 (to 15 percent, largely on account of a 20 percent decrease in revenues), which has been maintained through 2011.

There are two reduced rates and a full rate, which were increased during 2011 (a major driver of the VTTL increase in 2011). Poland's share of VAT Liability attributable to Household consumption is slightly above the average of the EU-26, at 65 percent for the period 2000-2011.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex (**percentage of exemption in each of the 59 group categories**): For all of the products the propex factors were calculated using EUROSTAT consumption data as described in the Appendix A4.

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: estimated based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

Poland's 2000-2006 VAT Gap calculated in this report is 3 percentage points lower than the average gap reported in Reckon (2009). The major drivers of differences lay in revisions of National Accounts data and Reckon's estimations of missing use tables (Reckon estimated four out of seven years). Other dissimilarities in VAT theoretical liability from intermediate consumption expenditures are explained by application of different *propexes* and VAT rates.

Table 3.3.19. Poland: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	15 483	18 184	18 436	16 593	17 610	20 753	23 337	26 434	31 847	27 041	31 300	45 622
Household consumption	10 528	12 314	12 641	11 165	11 963	13 995	15 288	16 958	20 152	17 164	19 660	20 253
Government & NPISH consumption	535	621	619	568	544	683	822	963	1 149	988	1 148	2 292
Intermediate consumption by industries	2 522	2 936	2 960	2 857	2 924	3 522	4 227	4 875	5 802	4 710	5 536	13 693
Gross fixed capital formation	1 587	2 003	1 909	1 692	1 804	2 123	2 571	3 177	4 003	3 612	4 265	9 033
Net adjustments	311	311	307	311	374	430	430	461	740	568	691	351
VAT receipts	12 877	14 381	15 066	13 686	14 633	18 837	22 127	25 923	29 103	23 056	27 535	41 610
VAT Gap	2 606	3 803	3 370	2 908	2 977	1 916	1 211	511	2 743	3 985	3 764	4 012
VAT Gap as a share of VTTL	17%	21%	18%	18%	17%	9%	5%	2%	9%	15%	12%	9%
VAT Gap as a share of GDP	1.4%	1.8%	1.6%	1.5%	1.5%	0.8%	0.4%	0.2%	0.8%	1.3%	1.1%	0.7%
Full rate	22%											23%
Reduced rates	7 / 3%											8 / 5%

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Portugal

Overall Assessment

Portugal's average VAT Gap for the period 2000-2011 places it in the group of EU countries with low levels of VAT Gap (first quintile by its average gap of 9 percent). This average however masks a substantial deterioration in performance following the onset of the post-2008 recession. Due to a collapse in revenues, only partially reversed, the 2011 gap stood at 16 percent, more than twice the pre-crisis level. Research by the Portuguese tax administration shows that the considerable increase in the Gap during 2009-2011 was in great part attributable to changes in taxpayers' behaviour with respect to requests for refunds ("out of the ordinary" refunds amounted, respectively, to about 7, 4 and 4 percent of the VTTL).

Portugal has frequently changed its standard and reduced rates (7 times in the sample period). As shown in table Appendix C1, this has increased its VAT revenue potential by one quarter, although the actual increase in revenues has been held in check by the increase in the VAT Gap. Portugal relies on VAT taxation of Household consumption in a larger proportion than the EU-26 average.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT. The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex (percentage of exemption in each of the 59 group categories): For most of the products we have followed the procedure described in Appendix A4. In case of fourteen products the *propex* was calculated based on data from direct communications by national authorities: Collection, purification and distribution of water (E41, 7%), Construction (F45, 18%), Supporting and auxiliary transport activities; activities of travel agencies (I63, 1%), Post and telecommunications (I64,7%), Financial intermediation, except insurance and pension funding (J65, 87%), Insurance and pension funding, except compulsory social security (J66,100%), Activities auxiliary to financial intermediation (J77, 75%), Real estate activities (K70, 96%), Research and development (K73, 43%), Public administration and defence; compulsory social security (L75, 94%), Health and social

work (N85, 98%), Sewage and refuse disposal, sanitation etc. (O90, 14%), Activities of membership organizations n.e.c. (O91, 93%), Recreational, cultural and sporting activities (O92, 51%), Other services (O93, 11%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: The estimates for the following adjustments to VTTL have been used: Small business exemption: null adjustment, registration threshold not greater than 10 thousands euro. Restriction on the right to deduct VAT on business cars and fuel: based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

The average VAT Gap in time period 2000-2006 estimated by Reckon (2009) is less than one percentage point higher than the one calculated in this study. Some of the drivers of these small differences are the VAT rates which are dissimilar to Reckon for several product categories. In addition, direct communications with authorities allowed estimation of more accurate gross fixed capital formation values.

The Portuguese authorities published in Instituto Nacional de Estatística (2012) estimates for the VAT Gap for 2006-2010, which are very close to the estimates reported in this report.

Table 3.3.20. Portugal: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	10 084	10 583	11 350	11 791	12 410	13 450	14 598	15 447	15 775	14 882	16 092	16 999
Household consumption	6 644	6 968	7 522	7 828	8 237	8 868	9 779	10 370	10 604	9 895	10 602	11 505
Government & NPISH consumption	198	226	245	260	281	312	370	403	419	387	399	411
Intermediate consumption by industries	1 847	1 933	2 073	2 210	2 354	2 613	2 733	2 891	2 933	2 909	3 170	3 302
Gross fixed capital formation	1 043	1 110	1 160	1 147	1 165	1 237	1 274	1 343	1 372	1 293	1 413	1 320
Net adjustments	352	346	351	346	373	421	443	440	446	399	508	461
VAT receipts	9 734	10 021	10 668	11 076	11 569	13 001	13 764	14 333	14 424	11 971	13 517	14 235
VAT Gap	350	562	682	715	842	449	835	1 114	1 351	2 911	2 575	2 764
VAT Gap as a share of VTTL	3%	5%	6%	6%	7%	3%	6%	7%	9%	20%	16%	16%
VAT Gap as a share of GDP	0.3%	0.4%	0.5%	0.5%	0.6%	0.3%	0.5%	0.7%	0.8%	1.7%	1.5%	1.6%
Full rate	17%			19%			21%			20%		21%	23%
Reduced rates	12 / 5%											13 / 6%

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Romania

Overall Assessment

Romania ranks last among the EU-26 with regard to its VAT Gap, on average 42 percent over the sample period. The progress registered during the pre-2008 crisis period, when the VAT Gap decreased to below 40 percent, was reversed after 2008, as VAT revenues collapsed by some 30 percent in 2009. Despite a recovery in revenues in 2010-2011, following the sharp increase of the standard rate in 2010, Romania's Gap in 2011 was the highest among EU-26 countries, at 48 percent.

Romania increased its standard rate sharply in 2010 (from 19 to 24 percent), in response to the revenue decline observed in the previous year. Its VAT structure, as exemplified by the share of VTTL that is attributable to the Household sector, is close to the EU-26 average. However, the extent of the VAT Gap is such that it is very hard to gauge which sectors might indeed bear a disproportionate share of the VAT burden.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex **(percentage of exemption in each of the 59 group categories)**: For all of the products the propex factors were calculated using EUROSTAT consumption data as described in Appendix A4.

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: assuming 50% of GFCF expenditure on cars cannot be deducted (information from direct communications not available,

similar assumption was made by Reckon (2009)). Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

Romania Fiscal Council (2011) published, in its annual report for 2011, a graph with figures for the VAT Gap for 2002-2009. The figures are in the range 31-41 percent of VTTL, somewhat lower than the estimates in this report, but nevertheless the highest in the EU. We were not able to verify the reasons for the differences in estimates, due to lack of information on the methodology and the data sources in the Fiscal Council report.

Table 3.3.21. Romania: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	4 510	5 545	5 696	6 232	7 388	9 826	12 338	15 769	17 601	15 482	18 381	21 760
Household consumption	3 046	3 874	3 967	4 229	5 139	6 739	8 371	10 217	11 092	8 936	10 675	12 206
Government & NPISH consumption	235	268	233	311	358	507	614	726	871	875	916	989
Intermediate consumption by industries	609	640	679	772	845	1 096	1 284	1 671	2 031	1 681	1 996	2 466
Gross fixed capital formation	561	616	642	723	805	1 201	1 678	2 582	2 974	3 603	4 367	5 553
Net adjustments	59	148	176	197	242	284	391	573	633	388	427	545
VAT receipts	2 633	2 830	3 449	3 781	4 075	6 439	7 741	10 079	11 036	7 852	9 494	11 412
VAT Gap	1 877	2 714	2 247	2 451	3 314	3 387	4 597	5 691	6 564	7 630	8 887	10 348
VAT Gap as a share of VTTL	42%	49%	39%	39%	45%	34%	37%	36%	37%	49%	48%	48%
VAT Gap as a share of GDP	4.6%	6.0%	4.6%	4.7%	5.4%	4.2%	4.7%	4.6%	4.7%	6.5%	7.1%	7.9%
Full rate	19%										24%	
Reduced rates	--					9%				9 / 5%		

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Slovakia

Overall Assessment

Slovakia belongs to the group of EU countries with high levels of VAT Gap (fifth quintile of the EU-26 by its average gap for the period 2000-2011, amounting to 29 percent). As in other NMS, the Gap was reduced in the pre-EU accession year via a lower VAT burden (the full rate decreased from 25 to 20 percent in 2003 while the reduced one was increased by 4 percentage points). However, the gains were lost with the economic crisis, leading to an increase in the gap to levels in the upper 30s.

Slovakia has changed its standard and reduced rates six times over 2000-2011. Its (theoretical) reliance on VAT Liability from the Household sector is higher than the EU-26 average, although the high level of the Gap makes it difficult to gauge the economic significance of this percentage.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex (**percentage of exemption in each of the 59 group categories**): For most of the products we have followed the procedure described in Appendix A4. In case of four products the propex was calculated based on data from direct communications by national authorities: Financial intermediation, except insurance and pension funding (J65, 100%), Insurance and pension funding, except compulsory social security (J66,100%), Activities auxiliary to financial intermediation (J77, 85%), Real estate activities (K70, 52%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: The estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications from national authorities on firms with turnover in between

10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: estimated based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

The VAT Gap for Slovakia calculated in this study is on average less than one percentage point higher that the estimates in Reckon (2009). The major differences between these two studies stem from different sources for National Accounts data. There are slight differences in volumes of consumption expenditures in use tables between EUROSTAT and WIOD use tables. In addition, direct communications with the authorities allowed us to employ more precise gross fixed capital formation estimates.

The Ministry of Finance of Slovakia has published estimates for the VAT Gap for the period 2000-2010 (IFP, 2012). The average estimate of the VAT Gap for 2000-2010, at 26 percent, is 2 percent lower than the average for the same period in this report.

Table 3.3.22. Slovakia: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	2 974	3 361	3 600	3 827	4 598	4 866	5 622	6 003	6 585	6 615	6 795	7 484
Household consumption	1 968	2 259	2 395	2 626	3 252	3 402	3 863	4 271	4 738	4 680	4 692	5 059
Government & NPISH consumption	160	166	187	230	246	216	273	260	280	282	287	293
Intermediate consumption by industries	420	446	486	515	616	673	775	750	902	877	979	1 133
Gross fixed capital formation	400	463	499	432	459	545	638	650	601	703	764	892
Net adjustments	26	27	33	24	24	29	73	73	65	73	74	107
VAT receipts	2 168	2 454	2 582	3 031	3 507	3 880	4 104	4 147	4 621	4 221	4 182	4 711
VAT Gap	806	907	1 018	795	1 091	986	1 518	1 856	1 964	2 393	2 613	2 773
VAT Gap as a share of VTTL	**27%**	**27%**	**28%**	**21%**	**24%**	**20%**	**27%**	**31%**	**30%**	**36%**	**38%**	**37%**
VAT Gap as a share of GDP	**2.6%**	**2.7%**	**2.8%**	**2.0%**	**2.4%**	**2.0%**	**2.8%**	**3.0%**	**2.9%**	**3.8%**	**4.0%**	**4.0%**
Full rate		23%		20%				19%				20%
Reduced rates		10%		14%		--				10%	10 / 6%	10%

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Slovenia

Overall Assessment

Slovenia is the country with the third-lowest VAT Gap among the EU-26 during the period 2000-2011, at 7 percent. The economic downturn resulted however in the lifting of the gap from around 4-5 percent level before the crisis, to a high of 11 percent in 2009 (mostly due to a sharper reduction in VAT receipts than that of the VTTL).

Slovenia has maintained its standard and reduced rates unchanged since 2002. The share of Household consumption in total VTTL is somewhat higher than the EU-26 average, as is the case for several NMS.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

Propex **(percentage of exemption in each of the 59 group categories**): For all of the products the propex factors were calculated using EUROSTAT consumption data as described in Appendix A4.

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: The estimates for the following adjustments to VTTL have been used: small business exemption: based on direct communications from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: estimated based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

Slovenia's average 2000-2006 VAT Gap calculated in this report is 5 percentage points lower than the average of the gaps estimated by Reckon (2009). The differences in the outcomes are due to National Account sources which have been revised since Reckon (2009) published its report. In addition, due to direct communications with Slovenian authorities we applied different rates for household and intermediate consumption, and were able to more accurately estimate the theoretical liability from investments (GFCF).

Table 3.3.23. Slovenia: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	1 657	1 817	2 084	2 273	2 450	2 610	2 783	3 132	3 476	3 352	3 401	3 375
Household consumption	1 123	1 222	1 380	1 505	1 616	1 732	1 826	2 033	2 224	2 163	2 226	2 237
Government & NPISH consumption	56	61	72	78	87	95	102	109	123	125	128	130
Intermediate consumption by industries	200	226	293	309	322	351	387	425	473	475	500	506
Gross fixed capital formation	216	236	257	294	332	328	365	441	490	453	415	363
Net adjustments	62	72	82	87	94	104	102	125	166	137	131	139
VAT receipts	1 599	1 718	1 982	2 140	2 311	2 472	2 647	2 923	3 165	2 991	3 045	3 049
VAT Gap	58	99	103	132	139	138	136	210	311	361	356	326
VAT Gap as a share of VTTL	4%	5%	5%	6%	6%	5%	5%	7%	9%	11%	10%	10%
VAT Gap as a share of GDP	0.3%	0.5%	0.4%	0.5%	0.5%	0.5%	0.4%	0.6%	0.8%	1.0%	1.0%	0.9%
Full rate	19%			20%								
Reduced rates	8%			8.5%								

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Spain

Overall Assessment

While the average gap over the period 2000-2011 is 12 percent, placing Spain in the second quintile among the EU-26 countries, Spain's performance has been rather uneven. As one of the hardest-hit countries by the 2007 real estate collapse and the ensuing 2008 economic crisis in the Euro area, Spain saw the VAT Gap increase from 2 percent in 2006 to 34 percent in 2009, on account of sharply reduced revenues (which fell by 32 percent in nominal terms between 2006 and 2009). Research by the Spanish Tax administration shows that the increase in the Gap after 2008 was heightened by changes to the filing and refund procedures implemented in those years. In particular, the effect of taxpayers taking advantage of new procedures is estimated at Euro 2.8, 5.6 and 7.7 billion for 2009-2011, corresponding to 3.4, 8.1 and 10.7 percent of the VTTL for that period.

The standard rate and one of the reduced rates were increased in 2010 to shore up collections, which indeed rose, although in 2011 they remained 11 percent lower than the high in 2007. Spain relied, during the sample period, on revenues from the household sector in a manner very similar to the average of the EU-26 countries.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT. VAT revenues are decreased by the amount attributable to the sales tax applicable in the Canary Islands.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in the Appendix A3.

Propex (**percentage of exemption in each of the 59 group categories**): For all of the products the propex factors were calculated using EUROSTAT consumption data as described in Appendix A4.

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small Business Exemption: does not apply in Spain. Farmers' special scheme: estimates provided by Spanish authorities. Restriction on the right to deduct VAT on business cars and fuel: assuming 50% of business expenditure on cars is not deductible, according to the Spanish VAT legislation. Entertainment deductions: uniform treatment as discussed in Appendix A. The VTTL is further decreased by an estimate of the VTTL attributable to the Canary Islands (for consistency with the treatment of revenues discussed above).

Differences with other published estimates

Spain's average 2000-2006 VAT Gap published in this report is around 3 percentage points lower than Reckon (2009) estimates. One of the reasons is the amount of VAT collected by authorities. Data on VAT revenues have been revised since Reckon's publication and now it is EUR 846 million higher, on average, than data used by Reckon. Some additional dissimilarity in VTTL can be explained by sources of National Accounts (EUROSTAT vs. WIOD) and employment of slightly different rates for products categories.

Table 3.3.24. Spain: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	40 777	43 421	46 065	49 347	53 483	58 591	64 105	68 461	69 506	65 143	68 757	71 744
Household consumption	28 309	30 070	31 267	32 982	35 417	38 085	40 894	43 466	44 159	40 705	44 103	47 372
Government & NPISH consumption	1 181	1 297	1 428	1 573	1 769	1 933	2 270	2 475	2 646	2 636	2 799	2 918
Intermediate consumption by industries	5 109	5 299	5 850	6 394	7 217	8 112	8 854	9 638	10 303	10 575	10 982	11 496
Gross fixed capital formation	5 215	5 778	6 516	7 269	7 883	9 252	10 724	11 577	11 002	10 206	9 848	8 914
Net adjustments	963	978	1 003	1 129	1 197	1 210	1 363	1 305	1 396	1 020	1 026	1 044
VAT receipts	38 159	39 831	41 648	46 030	50 795	58 213	63 273	61 713	54 280	42 669	57 992	56 547
VAT Gap	2 618	3 590	4 417	3 317	2 688	378	832	6 748	15 226	22 474	10 765	15 197
VAT Gap as a share of VTTL	**6%**	**8%**	**10%**	**7%**	**5%**	**1%**	**1%**	**10%**	**22%**	**34%**	**16%**	**21%**
VAT Gap as a share of GDP	**0.4%**	**0.5%**	**0.6%**	**0.4%**	**0.3%**	**0.0%**	**0.1%**	**0.6%**	**1.4%**	**2.1%**	**1.0%**	**1.4%**
Full rate	16%										18%	
Reduced rates	7 / 4%										8 / 4%	

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

Sweden

Overall Assessment

Sweden enjoyed the lowest average VAT Gap of the EU-26 countries, at 4 percent during the period 2000-2011, and with a steady downward trend. Sweden is in fact one of the few countries in the EU-26 that was able to reduce its gap during the post-2008 period.

Sweden has maintained its standard rate (25 percent) and its reduced rates (6 and 12 percent) unchanged over the sample period. The relative importance of exemptions, however, is high, as shown by the less-than-average reliance on household consumption in the total VTTL compared to the EU-26.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data are also from EUROSTAT.

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

***Propex* (percentage of exemption in each of the 59 group categories)**: For most of the products we have followed the procedure described in Appendix A4. In case of six products the propex was calculated based on data from direct communications by national authorities: Financial intermediation, except insurance and pension funding (J65, 93%), Insurance and pension funding, except compulsory social security (J66,94%), Activities auxiliary to financial intermediation (J77, 100%), Real estate activities (K70, 100%), Health and social work (N85, 98%), Recreational, cultural and sporting activities (O92, 37%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: The estimates for the following adjustments to VTTL have been used: Small business exemption: null adjustment. Restriction on the right to deduct VAT on business cars and fuel: based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

The estimates of Swedish VAT Gap in this study are on average 1 percentage point higher than results of Reckon (2009). This small difference is explained by different amounts of VAT revenues (in 2005 and 2006, on average, lower by 1.4 billion EUR). Due to revisions of National Accounts since Reckon's publication, there are some dissimilarity in consumption expenditures, especially intermediate and household consumption data. We also employ different propex rates for the intermediate consumption theoretical liability calculations.

As noted in Chapter 2, the Swedish National Tax Agency published a report in 2008 (Sweden 2008) containing a number of estimates of Gap concepts for several taxes (and has issued a number of updates in the period since). The methodology combines top-down with analysis of returns. While the numbers in the Sweden (2008) are not directly comparable to the estimates in this report, they indicate, for 2005, a "VAT Gap" of 14 percent of "assessed tax". This figure is considerably higher than the 5 percent estimated here for that year.

Table 3.3.25. Sweden: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	24 469	23 490	24 947	25 913	26 834	27 937	30 002	31 794	31 830	28 758	34 050	37 542
Household consumption	13 376	12 809	13 597	14 316	14 745	15 093	15 852	16 691	16 600	15 264	17 953	19 613
Government & NPISH consumption	1 064	1 034	1 112	1 179	1 237	1 218	1 280	1 397	1 393	1 312	1 512	1 658
Intermediate consumption by industries	6 693	6 448	6 895	7 037	7 244	7 506	7 979	8 317	8 286	7 572	9 078	10 095
Gross fixed capital formation	3 016	2 885	3 023	3 051	3 214	3 731	4 482	4 951	5 073	4 230	5 053	5 655
Net adjustments	320	315	321	331	394	389	409	439	479	379	454	521
VAT receipts	23 073	22 110	23 545	24 676	25 642	26 786	28 465	30 550	30 941	28 199	33 825	36 610
VAT Gap	1 396	1 381	1 403	1 237	1 192	1 152	1 537	1 245	889	558	225	932
VAT Gap as a share of VTTL	6%	6%	6%	5%	4%	4%	5%	4%	3%	2%	1%	2%
VAT Gap as a share of GDP	0.5%	0.5%	0.5%	0.4%	0.4%	0.4%	0.5%	0.4%	0.3%	0.2%	0.1%	0.2%
Full rate	25%											
Reduced rates	12 / 6%											

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

United Kingdom

Overall Assessment

At 12 percent, the United Kingdom is at the average of the VAT Gap and slightly above the median for the EU-26 countries. The onset of the post-2008 crisis appears to have consolidated slightly higher levels than the ones prevailing in the early 2000s.

The VAT system of the UK is based on a full rate (increased in 2011 from 17.5 to 20 percent) and one reduced rate (5 percent). The proportion of VAT liability accruing from Household consumption is somewhat higher than the average for the EU-26 countries.

Methodological Notes

As for all countries, the estimates provided in this section are based on National Accounts data as reported by WIOD in their use tables, and supplemented by more recent information concerning national account developments from EUROSTAT. The VAT collection data from EUROSTAT have been increased by the amounts collected from the NHS, BBC and others (which are reimbursed to the payers, and reported only on a net basis to EUROSTAT).

The assumptions for the most important parameters are as follows:

VAT rates for 59 product categories: For all of the products the rates were calculated using EUROSTAT consumption data as described in Appendix A3.

***Propex* (percentage of exemption in each of the 59 group categories)**: For most of the products we have followed the procedure described in Appendix A4. In case of six products the propex was calculated based on data from direct communications by national authorities: Financial intermediation, except insurance and pension funding (J65, 55%), Insurance and pension funding, except compulsory social security (J66, 59%), Activities auxiliary to financial intermediation (J77, 44%), Real estate activities (K70, 70%), Health and social work (N85, 81%), Activities of membership organizations n.e.c. (O91, 44%), Recreational, cultural and sporting activities (O92, 16%).

GFCF: The VTTL from GFCF was calculated using estimated shares of taxable investment by economic sectors from direct communications by national authorities. For the years not covered by the direct communications, the shares were estimated by interpolation.

Miscellaneous Adjustments: Estimates for the following adjustments to VTTL have been used: Small business exemption: based on direct communications

from national authorities on firms with turnover in between 10 thousand euro and the registration threshold; Restriction on the right to deduct VAT on business cars and fuel: estimated based on direct communications from national authorities. Entertainment deductions: uniform treatment as discussed in Appendix A.

Differences with other published estimates

UK's HMRC has published for a number of years estimates of the VAT Gap following a broadly similar methodology to the one used in this report. Published estimates are somewhat lower than the ones in this report (by about 2 percentage point, with the exception of a larger difference in 2011), but have been reconciled through a number of factors: (i) the use of fiscal vs calendar year; (ii) netting out of litigation repayments; (iii) slight differences in data revisions and calculation of rates applicable to product groupings.

The UK's 2000-2006 VAT Gap calculated in this report is 4 percentage points lower than the average gap reported in Reckon (2009). The major drivers of differences lay in revisions of National Accounts and Reckon's overestimations of missing use tables data. Dissimilarities in VAT theoretical liability from intermediate consumption expenditures are explained by application of different propexes and VAT rates. Due to direct communications with the authorities we estimated more precisely the gross fixed capital formation theoretical liability (see Appendix Table A.8.2 for details).

Table 3.3.26. United Kingdom: VAT receipts, rates, theoretical liability, compostion of VTTL and gap, 2000–2011 (EUR million)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total VTTL	121 490	125 763	131 319	125 710	136 941	139 488	149 492	156 296	137 366	105 445	130 650	150 064
Household consumption	83 769	85 811	89 966	85 375	92 439	93 593	97 124	100 498	87 762	67 275	83 700	95 647
Government & NPISH consumption	2 222	2 304	2 472	2 373	2 995	2 839	2 951	3 183	2 962	2 473	3 067	3 520
Intermediate consumption by industries	25 540	27 030	27 709	26 485	28 179	32 104	34 355	36 586	32 615	26 228	31 825	36 829
Gross fixed capital formation	7 860	8 383	9 202	9 569	11 018	8 320	11 988	13 933	12 389	8 499	10 840	11 674
Net adjustments	2 100	2 236	1 970	1 908	2 310	2 632	3 074	2 096	1 639	969	1 219	2 395
VAT receipts	106 512	109 188	114 583	113 314	121 812	123 766	130 571	136 404	117 292	91 229	113 714	130 577
VAT Gap	14 977	16 575	16 736	12 396	15 129	15 722	18 921	19 892	20 074	14 215	16 937	19 487
VAT Gap as a share of VTTL	**12%**	**13%**	**13%**	**10%**	**11%**	**11%**	**13%**	**13%**	**15%**	**13%**	**13%**	**13%**
VAT Gap as a share of GDP	**0.9%**	**1.0%**	**1.0%**	**0.8%**	**0.9%**	**0.9%**	**1.0%**	**1.0%**	**1.1%**	**0.9%**	**1.0%**	**1.1%**
Full rate	17.5%								15%		17.5%	20%
Reduced rates	5%											

Note. VAT rates stated at the end of calendar year. Middle figure presents average composition of VTTL in 2000-2011.

4. Econometric Estimates: Determinants of the VAT Gap

4.1. Introduction and Overview

As argued throughout this report, non-compliance in taxation is economically costly on account of two main factors. First, the revenue losses that it causes to governments and the public programs they finance, and the potential, among other things, of a spiral of higher rates to compensate for losses and higher non-compliance as a result of the higher rates (witness the large number of VAT rate increases in the EU in the past few years documented in Chapters 1 and 3). Secondly, tax non-compliance also reduces the efficiency of the tax system and the overall productivity of the economy. Tax avoidance and evasion lead to distortions in economic decisions, as individuals and firms structure their activities differently in order to reduce taxes.

This Chapter seeks to enhance understanding of the economic factors leading to revenue non-compliance. The VAT Gap estimates presented in Chapter 3 suggest that non-compliance varies substantially among member states, and it has also varied over time, with apparent increases in the gap since the 2008-9 financial crisis and recession. Understanding these patterns is a step towards improving VAT compliance among all member states and reaping its economic and fiscal benefits.

A secondary objective is to analyse differences in VAT Gaps among member states, and the characteristics of national economies that are correlated with compliance gaps.

Revenue losses and inefficiencies due to tax non-compliance are not confined to the VAT. Indeed, certain features of the design of VAT should make non-compliance less likely than with some other tax bases. An invoice-and-credit VAT is designed to make evasion easier for authorities to detect, because VAT is levied on taxable purchases at each stage of the production chain, with tax paid on inputs in turn refunded only to registered businesses. Therefore, underpayment of tax at one stage of the production change tends to reduce input tax credits available at subsequent stages, so that the effect of non-compliance on net revenues is reduced. And incentives for tax evasion may be reduced, since a tax-evading

business may escape at most the tax due on its value added in production, but is liable for the tax paid on production inputs and not creditable for the evader. This tends to raise production costs for evaders and it discourages other, registered businesses from dealing with evaders, since the tax charged by a registered supplier is creditable by a taxable purchaser, whereas the higher costs of an evading supplier are not[26].

Related considerations suggest that VAT compliance should be greatest in countries that are most open to international trade, since VAT is typically assessed on imported goods at the border, making VAT evasion far more difficult for imports, and the incentives for VAT compliance by exporters are strong. Some previous research has indeed found evidence that VAT compliance increases with openness, at least for less developed countries. However, this effect may be muted for individual EU countries, to the extent that much international trade occurs within the single market and is not subject to border controls.

Another consideration of interest is the role of tax rates. As VAT rates rise, all else equal the potential return to tax evasion increases. We therefore expect high rates of VAT to cause high rates of non-compliance with the tax, resulting in an erosion of the tax base and a decline in the revenue potential of VAT. In other words, VAT revenues are likely to rise less than proportionately with tax rates. Understanding the magnitude of this effect, if supported by the data, is evidently important to forecasting VAT revenues.

4.2. Previous Quantitative Studies

Several other studies have analysed the economic, social and institutional determinants of VAT non-compliance in the data. Much of this previous quantitative research, however, has been hampered by the difficulty in measuring non-compliance in a consistent way for a large sample of countries and years. For this reason, many studies have examined proxies for non-compliance that are less reliable or much smaller than our "top down" estimates of the VAT Gap based on national accounts data.

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[26] In recent work using Brazilian business microdata, De Paula and Sheinkman (2009) find that informal businesses are more likely to have informal suppliers and customers, a result that is consistent with the VAT chain effect on tax evasion. Pomeranz (2010) examines field experiments in Chile that shows how VAT non-compliance behaviour cascades through the supply chain.

In one early study, Agha and Haughton (1996) constructed an estimate of VAT compliance for a cross-section of 17 OECD countries in 1987. They found that non-compliance was generally higher in countries with higher standard VAT rates, and those with more departures from uniform taxation (i.e. those with multiple VAT rates). The effects were large: a one percentage point increase in the VAT rate is associated in their sample with a 2.7 percentage point reduction in the compliance rate.

Christie and Holzner (2006) estimated VAT compliance for 29 European countries in the period 2000-2003. They found that lower compliance is associated with higher rates of VAT and with lower levels of judicial and legal effectiveness, which they suggest is a proxy for the level of tax enforcement in a country. They also find that compliance is positively correlated with the share of tourism in GDP, which may reflect greater compliance in the tourism sector, or simply VAT revenues paid by international visitors whose consumption is not adequately captured in the national accounts[27].

Other studies have examined empirical determinants of the VAT revenues, rather than measures of VAT non-compliance per se. For example, Aizenman and Jinjirak (2008) regress VAT Revenue Ratios on economic and political variables for a panel of 44 countries over 1970–99. They find inter alia that the VRR is positively associated with a country's openness to trade, which could reflect the importance of border controls in enforcing the VAT[28]. Similarly, Matthews (2003) regresses VAT revenues on VAT rates and control variables for a sample of 14 EU countries. He concludes that the base-eroding effects of tax rate increases are strong.

Box 4.1. The "difference-in-difference" estimator

The Reckon (2009) study that is the precursor to this report based its econometric analysis of gaps on a cross-sectional estimator that correlates the level of estimated VAT Gap in each country to the levels of the corresponding explanatory variables. Formally, the statistical results in Reckon (2009) are based on a "random effects estimator" that assumes unobservable factors influencing the VAT Gap are uncorrelated with the explanatory variables of interest. As the authors of the Reckon study recognize, this approach is unlikely to uncover true causal determinants of VAT compliance, due to omitted variables bias.

Put simply, while differences in compliance gaps among countries may be correlated with certain observed explanatory variables, such as tax rates and institutional measures,

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[27] This may be the case because national accounts personal consumption data are based in part on household survey data that exclude international visitors from the sample frame.
[28] Desai and Hines (2005) examine the impact of the VAT on international trade in a cross-section of countries, finding that existence of VAT is associated with lower openness to trade, particularly for low and middle income countries.

they are probably also correlated with many other factors that are not included in the regressions. Attributing causal effects to regression coefficients in this context is therefore a precarious exercise. For example, if member states with weaker judicial and legal effectiveness also have less accurate national accounts data than other member states, then estimated VAT Gaps would be related to judicial and legal effectiveness in the data, even in the absence of a causal link.

In contrast, the econometric analysis reported below is based on a "fixed effects estimator" that is robust to the possibility of persistent, unobservable influences on the measured VAT Gap in each country that are correlated with explanatory variables. In effect, the fixed effects estimator removes the effect of time-invariant determinants of compliance gaps that may be correlated with variables of interest. Thus our estimates are driven by changes in explanatory variables over time within each country, rather than permanent differences in them between countries. This is apt to give a clearer picture of the causal effects of explanatory variables on VAT compliance, as long as the unobserved factors influencing compliance remain roughly constant within each country over time.

Specifications include year fixed effects, which remove the effect of unobservable factors driving VAT compliance over time that are common to all member states and that maybe correlated with trends in explanatory variables of interest (most notably, with the general economic downturn since 2008). Thus we employ a "difference in difference" estimator of the causes of VAT compliance that is identified from variation in explanatory variables within each country over time that is not common to all countries.

The persistence of fiscal and economic time series over time can also lead to downward bias in conventional estimated standard errors of regression coefficients in the panel data context. To deal with this, we estimate standard errors using a formula that is robust to arbitrary forms of serial correlation in the data for each country.

Caution must be exercised in comparing such studies to those that look at direct measures of VAT non-compliance. As noted earlier, VAT revenues and the VRR reflect the impact of policy choices such as exemptions and reduced rates on certain transactions, as well as the effects of non-compliance. Furthermore, VAT revenues may be eroded by various forms of tax avoidance behaviour that do not in themselves constitute non-compliance with the tax. Nevertheless, all the evidence cited is at least consistent with the proposition that VAT compliance decreases as the VAT rate increases, and some studies support other propositions on the importance of tax enforcement and specific features of VAT design such as tax enforcement at international borders.

Reckon (2009) also used econometric techniques to investigate the links between estimated VAT compliance gaps and the economic and social characteristics of member states. The main finding of the Reckon econometric analysis was that VAT Gaps were significantly higher among countries with weaker legal institutions, and higher perceived levels of corruption. This again highlights the idea that institutional differences among countries have effects on tax enforcement and compliance behaviour of taxpayers.

Reckon (2009) also examined correlations between compliance gaps and economic variables, including sectoral composition of the economy (measures of construction output and tourism), the level of taxation (VAT standard rate and theoretical VAT liability as a share of GDP), and other measures. However, no robust statistical relationships with these variables were detected in the analysis.

4.3. Econometric Analysis

The foregoing discussion has emphasized that the VAT compliance gap may vary over the business cycle, and it may rise in response to increases in rates of tax. Furthermore, compliance gaps differ substantially among member states, reflecting their different economic and institutional settings. These considerations highlight the potential benefits of measures to reduce VAT non-compliance, both as a means of enhancing government revenue and of ameliorating the loss in productivity resulting from non-compliance behaviour.

To investigate these considerations further, we conducted an econometric analysis to regress the calculated VAT Gaps as a percentage of theoretical liability on a number of explanatory variables. The main objectives of the analysis are to elucidate the evolution of the compliance gap over the business cycle and in response to tax rate changes, and to describe how these effects on compliance vary with the institutional quality of member states.

The key explanatory variables in the analysis are as follows:

- The output gap, defined as the percentage difference between GDP and its long-run trend component, as estimated by official sources. The theoretical considerations discussed above point to no particular predicted relationship between the business cycle and VAT compliance. However, the first look at the data suggests that the compliance gap is counter-cyclical, rising during economic downturns.

- The standard rate of VAT, to measure the potential gains to VAT evasion. Based on the previous empirical literature and theoretical considerations, we expect that the VAT rate exerts a positive effect on the compliance gap, at least among countries with poor tax enforcement.

All regressions include country and year fixed effects, so that our estimates reflect the impact of changes in explanatory variables within a country over time, rather than of persistent differences between countries. This is likely to give

a more accurate estimate of the determinants of VAT Gaps than previous studies based on cross-sectional comparisons between countries (See Box 4.1 for details.).

Although the year and country fixed effect variables are our primary controls for other factors affecting the VAT Gap, all specifications include additional control variables:

- The Corruption Perceptions Index (CPI) compiled by Transparency International, to control for factors related to public sector corruption, which may directly influence tax enforcement and tax morale of taxpayers (a higher index indicates a lower corruption level).

- An indicator for years following accession of the country to the EU, to control for the effects of accession on tax design and enforcement.

- The logarithm of real GDP per capita, which is intended to capture the changes in economic circumstances of new member states (particularly in eastern Europe) over the sample period, which may have had an independent influence on VAT compliance.

- In some specifications, other explanatory variables discussed below.

Column 1 of Table 4.3.1 reports results from the base specification, which simply regresses the VAT Gap as a percentage of theoretical liability on the output gap and standard tax rate, plus control variables. Consistent with expectations, the standard VAT rate exerts a significant positive effect on the compliance gap, with each percentage point increase in the tax rate associated on average with a decrease in the compliance rate of 0.67 percentage points. Since the average compliance gap in the sample is 17.4 per cent, this effect is rather large. Observe also that the compliance gap is indeed counter-cyclical, with a one percentage point increase in the output gap (i.e. one per cent fall in output below trend) associated on average with a 0.38 percentage point increase in the VAT Gap. However, the estimated effect of the output gap is not significantly different than zero.

One possible reason for the insignificant estimated effect of the output gap on the compliance gap is that this variable may not capture the business cycle accurately, particularly during the recent economic downturn[29]. If the output gap

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[29] The output gap is defined as the deviation of GDP from its long-run trend component, which is in turn estimated with a Hodrick-Prescott filter. It is well known that the Hodrick-Prescott filter (and other auto-regressive smoothing procedures) may do a poor job of detecting the persistent component of deviations in a series near the end of the sample period – in essence, because there is insufficient data there to determine whether changes in the data are permanent or transitory. Since our sample period is 2000 to 2011, many countries in the sample were experiencing substantial downturns in output at the end of the sample, which therefore may not be adequately captured by the output gap measure.

variable is measured with error, then the estimated effect of the business cycle on compliance in Column 1 will be biased towards zero. A simple alternative is to proxy for the business cycle with the headline unemployment rate, which may capture the effects of the recent downturn more accurately than the output gap variable. Results of this specification are reported in the second column of Table 4.3.1. In this case, as expected, the results do show a significant counter-cyclical effect in compliance, with each percentage point increase in the unemployment rate associated with a 0.90 per cent increase in the compliance gap. Other coefficients in the regression are essentially unchanged.

As noted previously, some researchers have found that VAT compliance is greater in countries that are more open to trade, which may reflect the importance of border controls in assessing imported goods for taxation under the VAT. The same effect might occur within a country over time, inasmuch as the VAT compliance gap might be smaller in years where imports comprise a larger share of the potential tax base for VAT.

Table 4.3.1. Basic Regression Results

Independent variables	Dependent variable: VAT Gap		
	(1)	(2)	(3)
Output gap	0.38	--	
	[0.28]		
Unemployment rate	--	0.90***	0.86***
		[0.30]	[0.29]
Standard VAT rate	0.67	0.74*	0.76*
	[0.42]	[0.44]	[0.44]
Imports subject to border controls	--	--	-0.08
			[0.08]
Corruption Perceptions Index	1.55	1.47	1.53
	[1.30]	[1.10]	[1.17]
EU accession	-2.85*	-2.50	-5.99*
	[1.69]	[1.63]	[3.62]
Observations	312	312	312
R-squared	0.86	0.88	0.88

Notes. * $p<0.10$; ** $p<0.05$; *** $p<0.01$. In brackets are robust standard errors clustered by country. All specifications include year and country fixed effects, and controls for log real GDP per capita and log population. Results for other control variables omitted for brevity. See text for details.
Source: Own Calculations.

Since a number of member states of the EU experienced a significant decline in trade as a share of GDP during the recent economic downturn, the effects of the import share may be confounded with the business cycle effects that these

regressions are seeking to uncover. In the last column of Table 4.3.1 an additional control is introduced that measures the share in GDP of imports that are in principle subject to border controls[30]. As predicted, the compliance gap is smaller in a country in years in which the import share rises relative to other member states. However, the effect is extremely small and statistically insignificant. Observe also that the estimated coefficients for the unemployment rate and the standard VAT rate are essentially unchanged. Thus our data offer essentially no support for the hypothesis that border controls on imports play a role in improving VAT compliance in the EU.

In all columns of Table 4.3.1, the estimated effect of the Corruption Perceptions Index on the VAT Gap is positive (though insignificant), indicating that an improvement in corruption perceptions within a country is associated with a larger compliance gap. This direction of this effect is unexpected and difficult to account for. However, the large standard error of the estimates indicates that we cannot reject the hypothesis that changes in CPI simply have no effect on compliance in the data.

The last row in the table reports the estimated effect of EU accession on the compliance gap of new member states. In the specification of Column 3, the estimate implies that the compliance gap dropped 6 per cent on average following accession, controlling for other factors[31]. This may reflect changes in the design or administration of VAT systems following accession to the EU, or broader effects of institutional changes in new member states. These considerations are discussed at greater length in what follows.

4.4. Differences among Countries and the Role of Institutions

The data in this report display large, persistent differences in VAT Gaps across countries. It seems likely that the economic, legal, and cultural institutions have

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[30] As noted, the effect of imports on VAT compliance is somewhat different in Europe, where member states have done away with border controls for internal trade. To account for this, the variable is defined as the share of extra-EU imports in GDP for years when the country is an EU member, and total imports as a percentage of GDP for years prior to accession.

[31] Given the fixed effect estimator employed in this report, this estimate reflects changes in the compliance gap over time within individual member states following accession, and it does not reflect the average differences in compliance gaps between old and new member states.

a variety of influences on how VAT systems are designed, how taxes are enforced, and how individual taxpayers view tax compliance. All such institutional influences may be reflected in the reported VAT Gaps and are worthy of further investigation. As discussed earlier, Reckon (2009) had investigated these issues and concluded that institutional factors were important in determining cross-country differences in the VAT Gaps.

To provide an initial sense of these cross-country differences, Figure 4.4.1 plots the mean VAT Gap for the period 2000-11 against the corresponding mean value of CPI for each country. (Corruption perceptions could reflect actual differences in the efficacy of tax enforcement among countries, which would be reflected in the compliance gap, or merely in public perceptions about enforcement, which could affect tax morale and tax compliance behaviour.) As expected, there is a strong negative association between CPI and compliance gaps across countries, which is displayed in the figure.

Figure 4.4.1. Mean VAT Gap against the corresponding mean value of CPI, 2000-2011
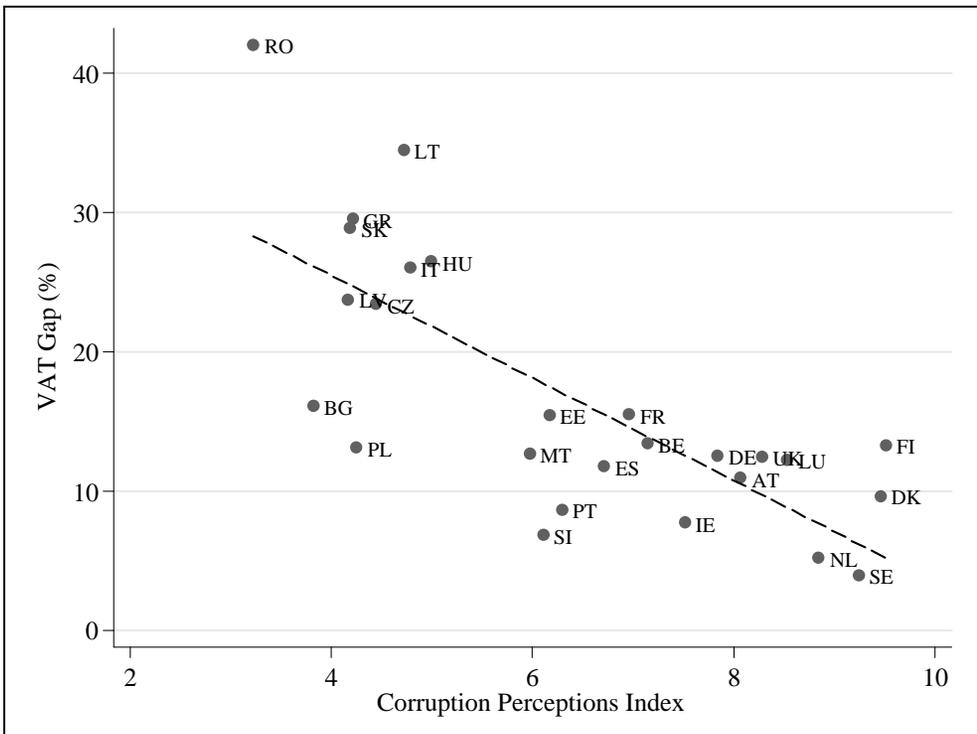
Source: Own Calculations.

As argued above, however, such cross-country differences may reflect the influence of omitted variables that are correlated with CPI, rather than the direct effect of corruption perceptions per se[32]. For example, the countries in the "southeast" portion of the figure, with above-average CPI and low compliance gaps, are also mainly in the Euro zone, they are mainly in northern Europe, and they generally acceded to the Union earlier than the other countries. Each of these additional factors may also explain some portion of the differences in mean compliance gaps. Further inspection of the data shows that the compliance gap is on average smaller for euro zone countries and countries with high (i.e. favourable) CPI. Indeed, the two measures are strongly correlated: of the 16 euro zone countries in the sample (Cyprus is excluded), 10 scored a CPI above the median; whereas, just 3 of the 10 other countries did.

Figure 4.4.2. Mean VAT Gap (%) over time for the average of Euro zone and other countries
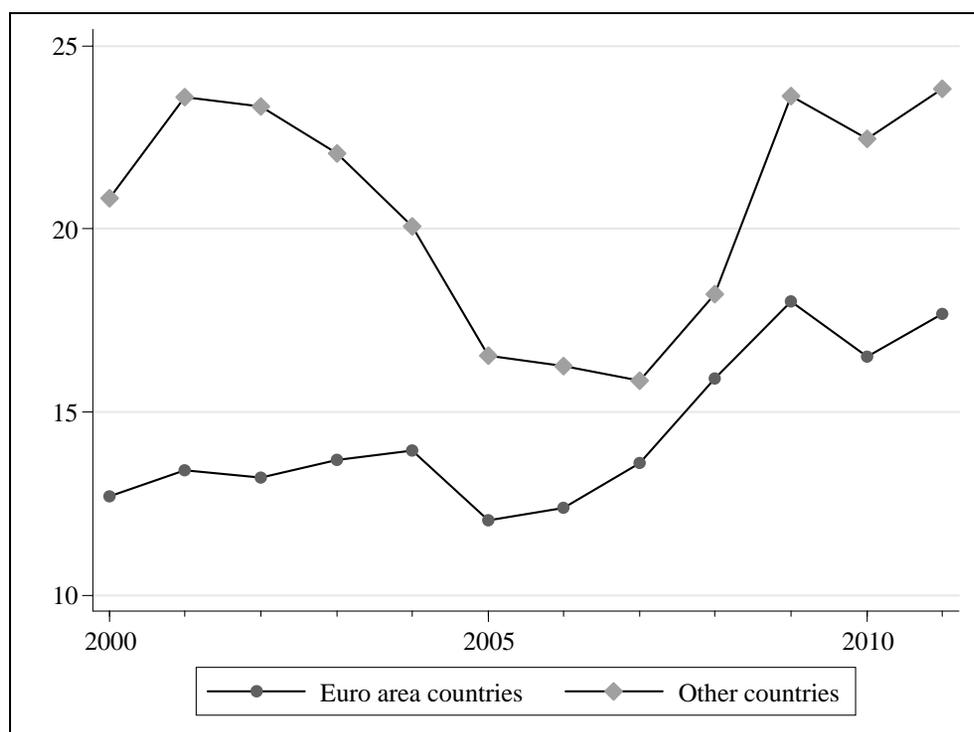
Source: Own Calculations.

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[32] Recall that, with the fixed estimator employed in this study, the effect is persistent cross-country differences in gaps is excluded from the regression analysis.

Likewise, Figure 4.4.2 plots the mean VAT Gap over time for the average of Euro zone and other countries[33]. Membership in the Euro zone may exert an independent effect on the VAT Gap, perhaps because of changes in VAT design or enforcement induced by the fiscal restraints imposed on Euro countries under the Maastricht treaty. Consistent with this hypothesis, the mean compliance gap is indeed lower among Euro zone countries in all years of the sample. The measured gaps have evidently risen on average since the 2008-9 economic crisis, especially among countries outside the Euro zone. In the latter group, the mean gap was also higher in the early years of the sample, which may reflect a secular downward trend in the compliance gap before the 2008-9 recession, or the effects of the 2001-2 recession, or other factors.

Summing up, since it would be imprudent on the basis of cross-country comparisons to infer any causal effect of corruption perceptions on compliance, because countries that differ in their measured CPI also likely differ in a variety of other, unobserved ways that may also influence tax compliance, a different approach has been chosen here. The degree of heterogeneity in tax compliance is assessed by dividing member states ex ante into two groups on the basis of these institutional differences, and then investigating how tax compliance responds differently to shocks in two groups of countries. For example, if tax compliance is more problematic in countries with poor institutions for tax enforcement and compliance, then we expect the VAT Gap to be more sensitive to increases in the VAT rate in those countries as well. Likewise, if taxpayers are less likely to comply with VAT during economic downturns, then we expect the sensitivity of the VAT Gap to the business cycle to be greater in those countries with persistently weaker compliance.

Consistent with this approach, Table 4.4.1 reports results for regression specifications that are the same as in Column 3 of Table 4.3.1, except that the key regression coefficients are allowed to differ for groups of countries with different institutional features presumably affecting their VAT systems. Each column of the table corresponds to one such definition of institutional diversity.

In Column 1, the criterion for belonging to a group or another is whether a country's CPI is below the EU median in 2006 (the midpoint of the sample). The estimated effect of the unemployment rate on the VAT Gap is now 0.99 for countries with low CPI, compared to 0.69 for countries with high CPI. This suggests there is greater cyclicality in the compliance gap and so in the VAT base in countries with poor institutions. However, the difference between the two estimated coefficients is not significantly different from zero. In this sense,

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[33] Euro zone countries are defined as those which had adopted the Euro by January 1, 2011.

the data do not support the notion that compliance is more cyclical in either group of countries. More strikingly, the VAT Gap is significantly positively related to the standard VAT rate in countries with low CPI, whereas the estimated coefficient is insignificant (and in fact negative) for countries with high CPI. Thus the data are consistent with the notion that increases in the standard rate of VAT lead to decrease in compliance in countries with poor institutions. However, no such effect on the VAT rate is discernible in countries with good institutions.

Table 4.4.1. Heterogeneity and the role of institutions

Independent variable	Dependent variable: VAT Gap		
	(1)	**(2)**	**(3)**
Classification Variable: Institutional Diversity Presumably Affecting VAT Systems	Below-average CPI	Non-members of Euro Area	New Member States
Unemployment Rate			
Countries in-group[a]	0.99***	1.04***	0.90**
Countries not in-group[b]	0.69*	0.73**	0.84***
Standard VAT rate			
Countries in-group[a]	0.93**	1.41**	0.89
Countries not in-group[b]	-0.73	0.02	0.46
Imports subject to border controls	-0.07	-0.08	-0.08
Corruption Perceptions Index	1.78	1.23	1.51
EU accession	-6.10	-5.86*	-6.16*
Observations	312	312	312
R-squared	0.88	0.88	0.88

Notes:
* $p<0.10$; ** $p<0.05$; *** $p<0.01$.
a/ Countries in-group are EU-26 countries belonging to any of the three classifications (Below-average CPI, Non-Members of Euro Area, New Member States), respectively;
b/ Countries not in-group are countries not belonging to any of the three classifications, respectively.Note.
All specifications include year and country fixed effects, and controls for log real GDP per capita, log population, and EU accession. Results for other control variables omitted for brevity.
Source: Own Calculations.

In Column 2 of the table, separate coefficients are estimated for Euro zone and other countries. The results in this case are extremely similar to those of Column 1, which is unsurprising given the strong correlation between CPI rankings and Euro zone membership, as depicted in Figure 4.4.1. In Column 3 of the table, coefficient estimates are instead allowed to differ for the EU-15 and New Member States. In this case, results are broadly similar, except that there is no significant difference in the estimated effect of the standard VAT rate

on compliance in the two groups of countries. This suggests that VAT Gaps are less explained by the date of EU accession than by Euro zone membership, or other factors that are correlated with measured CPI.

It is worth noting that the estimated effect of the tax rates on compliance for low CPI countries is of a magnitude that is economically significant, as well as statistically significant. The implied effect on VAT revenues can be estimated using the estimated parameter and a standard linear approximation. Taking the estimate of 0.93 for the tax rate effect from Column 1, and setting the tax rate at 21.5 per cent and the VAT Gap at 26.6 per cent (the average values among low CPI countries in 2011), we may estimate that VAT revenues in low CPI countries are 27.2 per cent lower than they would be if there were no effect of tax rates on compliance. Thus differences in compliance driven by institutions may be contributing substantially to revenue loss, as well as to productivity losses due to non-compliance behaviour.

In summary, these results show that VAT compliance appears to fall when tax rates are increased, at least in countries with ostensibly weaker institutions of tax enforcement and compliance. Similarly, VAT compliance appears to fall during recessions. These results are consistent with predictions from the theory of tax avoidance, and consistent with some previous estimates. Together, these results give some indication of the important place of tax enforcement and tax compliance considerations in determining how VAT should be reformed to respond to Europe's fiscal pressures. Certainly, these results are consistent with the notion that reforms to VAT policy and VAT enforcement can be an important part of fiscal consolidation exercises in some member states.

Appendix A - Methodology

A.1   Introduction

As discussed in Chapter 2, our general approach to calculating the VAT total theoretical liability (VTTL) is the so called "top-down" approach in which national accounts figures are used to estimate the VAT liability generated by different sub-aggregates of the total economy. Sections 2-5 of this Appendix describe the computation of different components of the VTTL. In particular, section 2 describes the definition of the VTTL in the presence of the perfect data; section 3.1 and 3.2 describes the WIOD use table data and estimated individual components of the VTTL, which can be obtained from these data; section 3.3 provides details on the final consumption VTL (VAT Theoretical Liability) and the calculation of the appropriate VAT rates; section 3.4 describes the VTL from intermediate consumption; section 3.5 describes the VTL from Gross Fixed Capital Formation (GFCF); section 4 discusses issues in forecasting WIOD data for 2010-2011; section 5 lists additional set of assumptions and adjustments made to the VTTL.

Readers already familiar with the "top-down" approach may want to skip to section A.8, which summarises differences in our computation with the one employed in Reckon's study of the VAT Gap 2000-2006. While similar in many respects and the general approach, important differences in several steps of the calculations have led to revision of the estimates earlier produced by Reckon.

One such difference between approaches is worth mentioning upfront. One of the additional sources of data for this study are the member states "Own Resource Account VAT submissions", referred to in the text as "direct communications". These direct communications are submitted annually to the European commission by each country and provide calculations of the total VAT taxable base. Each year the taxable base is estimated using the current VAT legislation and the data from two years prior to the year of submission. While countries employ different methodologies to calculate total taxable base, so that the final number may not be consistently compared across the countries, each submission contains a wealth of data on the VAT regime, applicable VAT rates, share of non-deductible inputs, etc., calculated at a very fine level of accuracy.

Therefore, in cases when direct communication offered an estimate more accurate than could be produced from the publicly available national data we chose to use such estimates[34].

A.2   A note on the computation of the VAT total theoretical liability (VTTL)

The total theoretical VAT liability can be broken down into the sum of the two major components: the VAT paid by final consumers and the VAT paid by producers. Final consumers pay the VAT on purchases of the taxable goods and services, while producers pay VAT on inputs when producing non-taxable or exempt goods and services.

If complete data on the values and applicable VAT rates for all individual purchases by consumers and producers were available, the VTTL could be computed as:

$$\sum_{i=1}^{n} value_i \cdot VATrate_i + \sum_{j=1}^{k} value_j \cdot VATrate_j \,,$$

where i - final taxable purchases by consumers, j - purchases of intermediate inputs used for production of exempt goods.

In the absence of complete data on all the purchases, we estimate the theoretical VAT liability using different national accounts aggregates. One of the main data sources is the data produced by WIOD project[35], which provides use tables for the 27 EU countries for the years 2000-2009. The WIOD data are used to calculate VTL from the intermediate and final consumption.

World Input-Output Database (WIOD) - WIOD.org
- Produced by University of Groningen;
- Funded by European Commission;
- Harmonized Supply and Use tables for 50 countries, including EU 27;
- Time period 2000-2009 (most 2007-2009 tables are estimated);
- CPA classification for 59 goods and NACE rev 1 classification for 36 industries.

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[34] Reckon (2009) mentions that at a late stage of their study they had been given access to the "Own Resources" statement, but goes on to say that because of the timing of the granting of access, they had been unable to incorporate the Statements in their results.
[35] http://www.wiod.org/database/index.htm.

WIOD use tables provide aggregate data on the purchases of goods and services by different uses. The goods and services are aggregated into 59 different groups, according to the CPA 2-digit classification. All purchases are classified into consumption (intermediate and final), investment and exports. Consumption and investment purchases can generate VAT liability, while the exports are not subject to VAT. For the reasons explained below, we have used WIOD data to calculate VTL arising from the intermediate and final consumption, but not from the investment.

Consumption data in WIOD is broken into 39 different categories: intermediate consumption by 36 industries and final consumption by 3 types of users: households, government and non-profit institutions serving households (NPISH).

The WIOD database records the investment use of a product as a single number without a further breakdown by type of investor: whether it is a household purchasing a dwelling or a vehicle (transaction which can generate VAT) or an enterprise purchasing a building or a vehicle for business use (transaction which would generally be VAT exempt). Therefore, we have used alternative data sources to calculate VAT from the investment type of purchases: a combination of national account aggregate for total investment by economic sector with assumptions derived from the VAT own resource accounts.

It is important to stress, that just as any other type of aggregate data, WIOD data are themselves estimates of the whole economy and are subject to possible error. WIOD data are estimated using the nationally available data from the statistical offices of the member states. There are two advantages of the WIOD data over the use tables available at EUROSTAT.

First is completeness: WIOD data are available for the 27 member states for years 2000-2009 without exceptions (albeit with most country tables for 2007-2009 estimated through a RAS procedure). Second is comparability: WIOD data was computed with an emphasis on comparability across countries, taking into account possible differences between the countries national accounts systems. While in general WIOD total consumption figures are consistent with the EUROSTAT estimates, in some cases, the EUROSTAT and WIOD values are different. This presumably means that WIOD numbers were adjusted to ensure comparability with other countries. However, the source of the difference remains unknown. Aware of these differences, we have chosen to generally use WIOD based figures, unless specifically convinced that EUROSTAT data are more accurate in any particular case.

We compute the total estimated VTL as the sum of three different components (Table A.2.1):

Table A.2.1. Three different components of VTL

	Type	Data source	Data detail
1.	VTL from final consumption	WIOD	59 CPA 2-digit products consumed by households, by government and by NPISH.
2.	VTL from intermediate consumption with non-deductible VAT	WIOD	59 CPA 2-digit products purchased by 36 industries
3.	VTL from investment	National accounts series and own account resource estimations.	Total gross fixed capital formation for 5 sectors: households, government, NPISHs, financial and non-financial corporations

Source: Own Calculations.

Details of the computation of each VTL component are presented in the following three sections.

A.3 VTL from final consumption of households, government and NPISH

The VTL from final consumption is estimated as the sum of the values of net consumption (not incl. VAT) of each of the 59 groups of goods times the average VAT rate for that group of goods and services in particular country and year.

The VAT rates for each of the 59 goods and services for 27 countries and 11 years were constructed on the basis of two major data sources: TAXUD publications of the full and reduced VAT rates in the EU member states and the VAT tax codes and tax changes database from the International Bureau of Fiscal Documentation (IBFD). Initially, we defined the VAT rates or each of the 2,531 goods at the lowest level of 6 digit CPA classification. The 6-digit VAT rates were then further aggregated to 2 digit CPA level by appropriate weighting of products with different VAT rates. Two sources for consumption weights were used: 1) EUROSTAT data on household consumption by 3 or 4 digit COICOP group. 2) Direct communications from the countries own resource VAT accounts sometimes were used when they provided consumption data at a greater detail.

A.4   VTL from the intermediate consumption with non-deductible VAT

For each of the 36 industries used in WIOD, the VTL from the intermediate consumption is computed as the product of the industries total use of each of the 59 inputs times the average VAT rate for these groups of inputs times industry average proportion of non-deductible VAT in the intermediate consumption, i.e. proportion of VAT that was charged on inputs that were used to produce exempt goods. Following the terminology coined in Reckon (2009) study, we are calling this proportion a "*propex*" factor. The calculation of *propex* for each of the 36 WIOD industries consisted of two steps.

As a first step, we calculated *propex* for each of the 59 industries according to NACE Rev 1 classification of industries, which also matches CPA rev 1 classification of goods. If no goods or services produced by industry were exempted, the *propex* was set to zero, if all the goods or services produced by industry were exempted the *propex* was set to one. When a portion of goods or services produced by industry was exempted, we had estimated *propex* to be equal to the share of exempt output in the industry's total output. This calculation involves assumption that proportion of inputs used by industry to produce exempt goods is equal to the share of exempted goods in the industry's output.

As a second step, the *propex* factors defined for the 59 NACE Rev 1 industries were aggregated for the 36 industries according to WIOD classification. The average *propex* for the aggregation of several industries is computed as the weighted average of *propex*es of these industries, with the weights equal to the total VAT paid on each industry's intermediate consumption, both deductible and non-deductible.

Finally, whenever possible, we verified our estimates of *propex* factors with the estimates provided by direct communication with the countries and, when more accurate estimates were available, we updated the values. An important departure from Reckon (2009) computation concerns the assumption regarding the *propex* factor for the financial sector industry. While Reckon applied a uniform assumption of 0.6 *propex* for each countries financial sector, we have country specific estimates ranging from 1 in Austria to 0.82 in Luxembourg to 0.55 in the UK.

A.5 VTTL arising from investment purchases

The VTL associated with investment purchases consists of two parts: gross fixed capital formation and "changes in valuables". The VTTL from changes in valuables is calculated by applying standard VAT rate to total changes in valuables taken from the EUROSTAT National Accounts GDP series. In order to calculate the VTL from gross fixed capital formation, we have used two data sources.

1. EUROSTAT national accounts series on the non-financial transactions provide GFCF expenditure for 5 economic sectors: households, government, NPISH, financial and non-financial corporations. However, no further breakdown of GFCF expenditure by different types of goods is available in these series, and no information on whether that expenditure was with or without right to deduct VAT.

2. We have relied on direct communications from the countries in order to estimate the shares of the deductible expenditure and the shares of non-deductible expenditure charged at full and reduced VAT rates for each five of the economic sectors or their combination. These shares were then applied to the non-financial transactions series to calculate the associated VAT liability. Such information was available for all of the countries except for Denmark and Austria. However, Austria had provided exact estimation of VAT liability from the gross fixed capital formation for all the years, and these values were used directly. For Denmark, the GFCF liability was calculated under additional set of assumptions described in footnote[36].

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[36] In case of Denmark we calculated GFCF VAT liability, using a combination of EUROSTAT non-financial transactions national accounts series (nf tr) with nama_nace_31 series, which provided estimate of GFCF expenditure by 31 industries. The total GFCF VTL was calculated as a sum of estimated VTL from GFCF by government, households, NPISH, financial and exempted non-financial corporations. The values for the GFCF expenditure by households and NPISH were taken from the nf tr series, the values for government, financial and exempted non-financial corporations were taken from the nace_31 series, using L (public administration), J and K (financial intermediation and real estate), and M and N (education and health and social work) industries respectively. The standard rate was applied to the net values to calculate the VTL.

A.6   Forecasting the WIOD 2010-2011 data

In order to obtain estimates of the VTTL from final and intermediate consumption for 2010 and 2011 we have used EUROSTAT national accounts series and forecasted WIOD tables under the following assumptions:

- the growth in total final consumption for households, government and NPISH is equal to growth of the total final consumption for households, government and NPISH estimated from the EUROSTAT national accounts series.

- the growth in total intermediate consumption of each of the 36 industries is equal to the growth in total intermediate consumption.

- changes in final and intermediate consumption across the products are proportionate to the total growth.

In other words, we have forecasted the 2010 and 2011 WIOD use tables, taking the total consumption figures across the products from national accounts series, but keeping the use table matrix as in 2009 WIOD data.

A.7   Additional assumptions and adjustments to the VTTL

Additional corrections were applied to the total VTTL to arrive at the final calculation. In two of them, the estimates were mostly based on data from direct communications:

- VTL deduction due to exemptions on the VAT charged on sales of businesses with annual turnover below a certain threshold. As of 2011, the level of threshold varied from more than 80 thousands euro in United Kingdom to about 3 thousands euro in Sweden and null in Spain. For 19 countries with the threshold above 10 thousand euro, we calculated partial adjustment to the VTTL, based on the data from direct communications. These data contained estimates of the taxable base by small firms, with turnover below the threshold but over 10 thousand euro, typically calculated as the difference between sales to final consumers and purchases of taxable inputs. The adjustment was then calculated as the product of the taxable base and average household vat rate. In case of seven countries (Belgium, Finland, Greece, Luxembourg, Portugal, Sweden and Spain) the threshold was set to 10 thousand euros or less and therefore no adjustment was applied.

- VTL arising from the restriction on the right to deduct in respect to business purchases of vehicles and fuel. As of 2011 this restriction applied in 22

out of the 26 countries and did not apply in Estonia, Germany, Luxembourg and Netherlands. In case of 20 countries, we have calculated the correction based on the estimates provided in direct communications. Two other countries, Romania and Malta, did not provide any estimates. In this case, the adjustment was calculated as proposed in Reckon (2009) in Section 7: by assuming that half of the GFCF purchases of vehicles are not VAT deductible.

Other corrections were calculated as proposed in Reckon (2009) in Section7.

- VTL arising from the restriction on the right to deduct in respect to business entertainment expenditures, business purchases of vehicles and fuel.
- VTL adjustment for the different VAT regime on the specific territories of the member states.

In case of Luxembourg we found it necessary to replace the "tank tourism" adjustment by a higher estimate, which includes not just fuel, but also other goods and services, which are exported from within the country to non-residents, but still generate VAT. Direct communication from Luxembourg quotes such services, as "Fuel exports to business users, information services (including those to internet-based companies), banking services etc.". These transactions were subject to VAT, but were not accounted in the either WIOD or EUROSTAT use tables (According to the use tables, such transactions would fall under exports and not generate any VAT liability). Using the estimates of the VAT liability from such transactions reported in Luxembourg direct communications, we calculated Luxembourg "VAT liable export to non-residents" adjustment for all the years.

A.8   List of main differences with Reckon (2009) computations

Table A.8.1 shows some of the important differences in computation and data used in this study and in Reckon (2009). While both studies apply the similar "top-down" approach, there is notable difference in the choice of data, computation of the VTL from the gross fixed capital formation and higher use of estimates from direct communications in this study than in the one conducted by Reckon.

Table A.8.2 illustrates major sources of differences in VAT Gap estimates by Reckon and CASE in 2006, when the Gap estimates differ by more than 2 percentage points.

Table A.8.1. Differences in computation and data used in this and in Reckon's study

	Reckon (2009) study	**This study**
Use table source data	EUROSTAT NACE Rev 1	WIOD
Computation of VAT rates	Computation starting at 4 digit CPA level	Own computation starting at higher precision 6-digit CPA level, estimates from direct communications.
Computation of *propex* factors	Assumptions, consumption based weights.	Assumptions, consumption based weights and estimates from direct communications.
Computation of liability from the GFCF	EUROSTAT investment series combined with a set of own assumptions.	EUROSTAT investment series combined with taxable shares estimates from direct communications.
Adjustments to the VTTL in Luxembourg	Adjustment for "tank tourism"	Adjustment for all VAT liable "export".

Source: Reckon (2006).

Table A.8.2. Major sources of differences in VAT Gap estimates by Reckon and CASE in 2006

Country	Gap estimates		Major source of the difference in VTL	Main reasons for the difference in assumptions	
	CASE	**Reckon**		**CASE**	**Reckon**
Lithuania	33%	22%	HH		Zero consumption of Food and beverages by HH in Reckon's data
France	15%	7%	HH, IC, GFCF	HH expenditure on food and beverages is 7 bln euro higher in WIOD than in Reckon's data. VAT rate for hotel and restaurants is 13%; VAT rate for construction is 19.6%. *propex* for Financial Intermediation industry is 0.74	VAT rate for hotel and restaurants is 12.8%; VAT rate for construction is 5%; *propex* for Financial Intermediation industry is 0.64.
Luxembourg	8%	1%	Adjustment to VTTL	Adjustment includes VTL from all "exported" services	Adjustment includes VTL from tank-tourism only
Latvia	11%	22%	Household, Government	Difference between the WIOD and Reckon's use tables data.	Negative values of government final expenditure and household consumption in Reckon's data
Finland	12%	5%	IC, GFCF	*Propex* for Real estate activities is 1	*Propex* for Real estate activities is 0.55

| Country | Gap estimates | | Major source of the difference in VTL | Main reasons for the difference in assumptions | |
	CASE	Reckon		CASE	Reckon
Ireland	7%	2%	IC	Propex for real estate activities is 1; Propex for Financial intermediation is 1	Propex for Real estate activities is 0.61; propex for Financial intermediation is 0.64.
Denmark	9%	4%	IC, GFCF.	*Propex* for Financial Intermediation industry is 1; *propex* for Inland Transport is 1	*Propex* for Financial Intermediation industry is 0.58; *propex* for Inland Transport is 0.11
Hungary	27%	23%	HH, IC	HH consumption of fuel in WIOD data are 250 bln HUF larger than in Reckon's data; *Propex* for Real estate activities is 0.96	Propex for real estate activities is 0.16
Estonia	11%	8%	HH	HH consumption of tobacco is 150 mln euro higher in WIOD than in Reckon's data.	
Sweden	5%	3%	Government, IC	Zero government expenditure on other business activities in Reckon's data vs. 18 bln in WIOD data; *propex* for Financial Intermediation industry is 0.95	*propex* for Financial Intermediation industry is 0.65
UK	14%	17%	Household, IC, GFCF	Difference between the WIOD and Reckon's use tables data.	
Germany	12%	10%	Household, IC	10% VAT rate for expenditure on Recreation and Culture. HH expenditure on petrol is 8 bln euro higher in WIOD than in Reckon's data. *Propex* for Financial Intermediation industry is 0.94; *Propex* for Real estate activities is 1	5% VAT rate for expenditure on Recreation and Culture. HH expenditure on petrol is 8 bln lower in Reckon's data than in WIOD. *Propex* for Financial Intermediation industry is 0.63. *Propex* for Real estate activities is 0.56
Malta	10%	11%	GFCF		

Source: Reckon (2006).

With the exception of Malta, UK and Latvia revision of VAT rates, propex factors and VTL from GFCF in addition to higher consumption figures in WIOD data have led to upward revision of the VTTL and the VAT Gap estimates. In case of UK and Latvia the source of the difference was difference in the source data (large values in Reckon's data than in WIOD). In case of Malta the difference was due to lower estimate of VTL from GFCF in this study than in Reckon's study.

Appendix B – Comparison to Other Approaches

As discussed in Chapter 2, two methods have been used to calculate the VAT compliance gap. Most such calculations, like this report, have used what was called above the top-down approach under which potential VAT revenues are calculated based on national income accounts and other statistical sources and then compared with VAT revenues. First, the total amount of expenditure theoretically liable to VAT is calculated. Second, the tax liability on that expenditure is calculated. Third, VAT receipts are deducted. The residual element is then the estimate of the VAT compliance gap, which is usually reported as either a percentage of the potential VAT collections (VTTL) or of GDP.

Of course, this measure of non-compliance includes not only losses due to evasion or fraud but also those arising from simple errors, financial insolvency and payment problems as well as the use of legal avoidance methods. It may also, as noted above, produce different and sometimes even conflicting results depending on the exact way in which 'actual' VAT is reported.

The data problems inherent in calculating the compliance gap mean that VAT Gap estimates are likely to contain a substantial (and largely unknowable) margin of error[37]. However, unless there is reason to think that the size of these problems

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[37] It can be exceptionally difficult to determine the potential VAT liability of certain activities owing to the sometimes quite complex and disaggregated natures of the 'commodities' for which statutory rates need to be calculated and the equally complex nature of the relevant legislation. For one example, see the recent detailed treatment of the VAT treatment of agriculture in Spain in Paton Garcia (2012): As European Commission (2011) shows, matters are especially complex with respect to the public sector where not only are the rules set out in the VAT directive not always clear, but they have to some extent been altered over time by ECJ decisions and have in any case been implemented in different member states to varying extents within very different legal systems. The result is that it can be exceptionally difficult in some countries even for experienced tax officials or private experts to determine to what extent the 'output' of public agencies is subject to VAT and even more complicated to determine the 'effective' VAT rate imposed in the form of non-recoverable input VAT on final consumption provided through such agencies. Not only are many of the border lines noted above drawn differently in the legal systems of EU member states but often tax principle seems to have little to do with how such activities are in fact treated in different countries.

fluctuates significantly over time – for example, with the business cycle - trend estimates of changes over time may still convey important information. In chapters 3 and 4 we have provided some evidence that both the theoretical (VTTL) and to a greater extent the actual (VAT) components of the gap estimates appear to exhibit some cyclical sensitivity. Before interpreting changes in the VAT (compliance) gap (VTTL –VAT) as indicating changes in fraud, evasion, or administrative efficiency, it is thus important to take explicitly into account cyclical factors such as important changes in base composition (e.g. the collapse of the housing sector in Spain) that may affect the VTTL estimate as well as cyclical and other factors that may affect the VAT figures through shifts in payment patterns. Such factors appear to have had markedly different effects in different countries in recent years. It is also, of course, important to allow for such well-known phenomena as the tendency of tax bases to shrink when rates are increased and the fact that consumption patterns may shift in response to tax change[38].

Alternative top-down approaches to measuring the VAT Gap are possible. In fact, several of the earliest attempts (mostly unpublished) to estimate the potential VAT base in countries considering the adoption of such a tax employed variant approaches based largely on national accounts and input-output data which made little or no use of household survey data[39]. A considerably more sophisticated version of this approach is currently under development at the IMF as one component of an extensive program of developing a broad set of indicators that may be used to assess and improve revenue administration in the wide range of countries to which the Fiscal Affairs Department of the IMF provides technical assistance. This approach focuses less on modelling the 'theoretical' tax base by estimating theoretically taxable final consumption and then applying the appropriate rate(s) than on estimating directly the amount of taxable output and the input tax credits in each sector in order to determine the potential net VAT for each sector. Assuming VAT is imposed on all final consumption and only on such consumption – which, as discussed earlier, it is not how it is done – in terms of the standard national accounting identity (Y=C+I+G+X-M), the approach used in Reckon (2009) and in the present report may be thought of directly estimating C + G, where G is a proxy for the exempt sector that gives rise to non-deductible VAT on inputs, and then calculating VTTL by applying the appropriate tax rates. In contrast, the alternative approach estimates

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[38] As an example of the latter, OECD (2012) cites the case of Australia in 2008 when a rise in housing prices led to shift in spending from goods subject to VAT (vehicles, etc.) to exempt goods (rents).). See also Alm and El-Ganainy (2013).

[39] For two examples, see Bird (1985) and Aguirre and Shome (1987).

the potential VAT directly as the amount that would be collected if applied to a base calculated as Y+M–X–I–G=C, where C includes VAT collected in the process of producing exempt or excluded activities. Output tax is calculated for each sector as sectoral output less exports, plus imports, plus excises and duties, times the relevant VAT rate. To calculate net potential VAT, an amount equal to the tax rate times the value of inputs plus investment (for deductible inputs and investment only, of course) is then deducted from output tax.

This alternative top-down approach requires VAT data on a sectoral basis and is even more dependent on national accounting data than the approach used in the present report, which relies heavily on the (presumably) more independent data base provided from consumer surveys. Since supply-use tables are aligned with GNP aggregates but the VAT base is in practice more closely related to the GDP, this approach in principal should adjust export data to exclude domestic consumption by non-nationals and imports to include consumption abroad by nationals. While such adjustments are possible, they obviously introduce additional estimation and complexity to the process. Nonetheless, this approach has at least two apparent advantages as a way of modelling the VAT Gap. First, in effect it models the potential net VAT for each sector in essentially the same way as VAT is actually determined for each taxpayer, which may perhaps make it easier to understand - for example, when VTTL falls sharply because of a decline in imports. Secondly, it focuses attention on the question of whether gap estimates are more sensitive to how the potential tax is modelled or how the tax is reported, as discussed in Chapter 2 above.

The primary data used in this alternative approach are the disaggregated supply-use (input-output) tables. To use these tables, which are also used in the estimates in the present report, several important assumptions must be made. With both approaches, the results reflect both underlying data problems and assumptions. For instance:

- There may be gaps in the national accounts data (e.g. re non-observed economy)[40];

- The definitions used in compiling national accounts data may not be consistent with those that define the VAT base;

- The share of output in each sector by VAT registrants may need to be estimated;

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[40] In principle, national accounts data include estimates of 'non-observable' activities but in fact they appear to do so to different degrees (and using different methods, including some that make use of VAT data) in different countries: see Blades and Roberts (2002) and UNICE (2008).

- Estimates of the proportion of inputs to outputs or taxable and non-taxable supplies in each sector are needed;

- It is assumed that the legal VAT rate for any activity applies to all taxpayers using or supplying it which is not always the case;

- Since the supply-use tables are closer to GNP than to GDP, adjustments are needed for both the domestic consumption of non-nationals and consumption abroad by nationals;

- Commodity detail for X and M may need to be constructed from customs data;

- Assumptions are needed to deal with such problems as years with missing data.

According to the EUROSTAT manual, the amount of non-deductible ('stuck') VAT is supposed to be reported by countries on the basis of VAT legislation as part of the process of assembling the matrices underlying the use tables[41]. Ideally, such calculations should encompass not only intermediate consumption, but investment (including inventories) and also domestic purchases of exempt products by non-residents. In principle, it may appear possible simply to estimate the amount of non-deductible VAT directly from such data. However, it is difficult to do so accurately owing to the lack of information on the distribution of such non-deductible VAT as well as some uncertainty about to what extent and how well different countries may have satisfied these requirements in preparing their tables in different years.

Yet another way to estimate the VAT Gap is to build it up from other disaggregated measures. Using a variant of the top-down approach, the UK estimates VTTL for five different components of expenditure – household consumption (which accounts for 70% of the base), capital expenditure on housing, government expenditure, expenditure of charities, and expenditure of partially exempt businesses, taking into account VAT rates as applied to the inputs and outputs of the different components as adjusted for special

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[41] The EUROSTAT supply-use tables record output and purchases in net terms in the sense that invoiced VAT is excluded from output data while purchases are recorded inclusive of non-deductible VAT in intermediate consumption, capital formation and, if necessary, inventories also (EUROSTAT Manual 2008). The non-deductible VAT included in the use table at purchasers' prices must then be deducted from the use table to balance supply and use. Although presumably many countries have made the complex estimations necessary for this procedure to be implemented – Chapters 4-6 of the manual indicate how difficult it would be to make such estimates 'correctly' and how much estimation and assumption is needed to do so -- it seems unlikely that such estimates have been adjusted annually to adapt to changing production and consumption patterns.

exemption and relief schemes[42]. In addition, however, it employs a complementary 'bottom-up' approach both to check the top-down estimate and to be able to attribute losses to specific problem areas in order to better guide tax management. In making these calculations, it is assumed that all taxes are imposed and collected in accordance with HMRC's definition of the appropriate tax base: that is, no allowance is made for what they consider to be tax avoidance (even when such avoidance has been ratified by judicial agreement) or for any debt as a result of payment schedules (even when explicitly agreed with HMRC).

A quite different "bottom-up" approach is used in Denmark, which relies on an extensive random audit system to build up a VAT Gap estimate on the basis of adjusting reported VAT returns by sector[43]. This approach has the considerable advantage of signalling clearly which sectors of the economy are most troublesome in this respect. For 2008, for example, while the overall VAT compliance gap for small and medium enterprises was estimated at only 2.9 percent of potential VAT liability, the sectoral gaps for the 10 largest contributors to this gap ranged from only 1.6 percent for the building and construction sector to an astonishing 50.7 percent for the leisure and culture sector (Pedersen 2013). Although the most common form of non-compliance uncovered was improper deduction of private expenses, almost half (44.9 percent) of the measured gap was attributable to undeclared sales, 17.3 percent to underreported VAT on sales, and 16.2 percent to missing documentation of VAT deducted on purchases. The total VAT Gap for 2008, including that for large companies not included in the random audit system, was estimated at 5 percent of tax liability. In contrast, this report using the top-down approach estimates the gap in 2008 as 11.2 percent. Discrepancies of this magnitude do not mean that one method or the other is 'wrong' or that one is necessarily more meaningful than the other. But they do suggest strongly that the words of caution with respect to the need to use gap measures with care and the usefulness of pursuing different approaches to estimating VAT non-compliance.

All top-down estimates, however disaggregated the form in which they are constructed may be, in effect aggregate all differences between potential and actual revenue into a single measure. Separate 'bottom up' estimates are needed to identify the relative importance of changes in such components of the estimated gap as simple errors, delayed payments, changes in the timing

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[42] As Bird and Gendron (2010) discuss in detail, a rather similar sectoral approach is used in Canada to allocate their share of revenues to those provinces imposing a VAT.

[43] This approach was of course pioneered by the US Internal Revenue Service in its well-known TCMP program.

of credits (especially refunds), legal and administrative changes that in effect accelerate payment schedules, criminal activities, and avoidance schemes that may be considered undesirable but are nonetheless legal. In addition, of course, bottom up analysis may be useful in helping to validate the reasonableness of the VAT Gap estimate and in addition to establish lower bounds for the gap.

Appendix C – Statistical Appendix

Table C.1. Index of Policy-Induced VAT Changes

Member state	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	99.8
Belgium	100.0	100.0	99.9	100.0	100.0	100.1	100.1	98.5	98.7	98.6	98.7	98.7
Bulgaria	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.1	100.1	100.1	100.1	100.1
Czech Republic	100.0	100.0	100.2	100.2	93.2	89.8	89.6	89.8	97.2	97.5	103.0	103.0
Denmark	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Estonia	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.1	106.1	110.7	110.7
Finland	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	94.9	97.1	99.3
France	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Germany	100.0	100.0	100.0	100.0	100.0	100.0	100.0	113.9	113.9	113.9	113.8	113.1
Greece	100.0	100.0	100.0	100.0	101.0	104.9	106.5	106.5	106.3	106.4	117.3	132.7
Hungary	100.0	100.0	100.1	100.1	107.7	107.6	99.5	103.2	103.3	112.3	120.8	115.2
Ireland	100.0	97.2	100.0	101.4	101.5	101.9	102.1	103.6	103.1	104.7	103.3	101.8
Italy	100.0	100.0	100.0	100.0	100.0	100.0	99.8	99.7	99.7	99.7	99.7	100.5
Latvia	100.0	100.0	100.0	107.3	104.2	104.2	104.2	104.8	104.8	124.3	124.3	135.2
Lithuania	100.0	100.0	100.0	99.2	99.2	99.1	99.1	99.2	99.4	108.9	116.1	115.8
Luxembourg	100.0	100.0	100.0	100.0	100.0	102.4	102.4	102.3	102.0	102.2	102.1	102.1
Malta	100.0	103.7	103.9	103.9	118.7	118.4	118.8	118.6	117.9	118.5	118.1	118.6
Netherlands	100.0	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1	106.1
Poland	100.0	100.5	100.5	100.5	100.5	100.5	100.5	100.3	100.4	100.4	100.4	108.0
Portugal	100.0	100.0	104.5	107.9	107.7	111.5	114.6	114.4	112.6	111.2	114.6	124.9
Romania	100.0	109.6	108.9	108.1	108.1	108.1	109.6	109.4	109.3	109.3	120.8	131.7
Slovakia	100.0	100.0	100.0	103.1	113.0	113.0	113.0	112.2	112.0	112.1	112.1	116.9
Slovenia	100.0	100.0	104.4	104.6	104.1	104.6	104.7	104.7	104.3	104.3	104.3	101.8
Spain	100.0	100.0	100.0	100.0	100.0	100.0	100.8	100.8	100.9	100.9	106.5	112.0
Sweden	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	100.0	100.0	100.0
United Kingdom	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.0	87.4	100.0	112.1

Source: Own Calculations.

Table C.2. Total VTTL, 2000–2011 (EUR million)

Member state	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	18 466	19 281	19 453	20 079	20 963	21 907	22 867	23 995	25 091	24 309	25 308	26 915
Belgium	19 944	20 636	20 988	21 933	23 141	24 488	25 965	26 956	28 404	27 995	29 800	30 991
Bulgaria	1 526	1 769	1 886	2 056	2 330	2 631	3 038	3 631	4 026	3 710	3 684	3 956
Czech Republic	5 632	6 149	7 106	7 511	7 292	8 028	8 937	10 389	13 602	13 017	14 735	15 235
Denmark	18 682	19 315	19 812	20 077	21 293	22 880	24 765	25 855	26 462	24 976	25 627	26 436
Estonia	595	677	782	865	973	1 128	1 358	1 569	1 595	1 405	1 478	1 664
Finland	12 392	12 846	13 422	14 328	15 017	15 468	16 408	17 644	18 337	16 667	18 018	19 746
France	120 868	125 149	129 566	134 051	139 912	147 140	154 054	159 651	164 505	163 781	167 727	172 739
Germany	157 896	161 207	157 665	157 689	158 468	160 996	166 848	196 743	201 402	197 267	206 364	216 830
Greece	13 074	14 061	15 524	16 590	17 472	19 386	21 885	24 265	24 072	22 983	23 739	24 790
Hungary	5 702	6 630	7 854	8 182	9 482	10 239	9 351	10 577	11 168	10 590	11 793	12 216
Ireland	8 447	8 110	9 537	10 417	11 276	13 312	14 853	15 670	14 650	12 149	11 350	10 890
Italy	100 292	103 772	105 848	110 025	114 054	117 705	122 122	124 980	127 308	126 337	129 285	134 691
Latvia	711	789	843	918	1 010	1 190	1 548	1 942	2 069	1 913	1 890	2 322
Lithuania	1 347	1 488	1 650	1 792	2 033	2 325	2 711	3 261	3 641	3 258	3 423	3 795
Luxembourg	1 449	1 537	1 584	1 677	1 852	2 039	2 136	2 410	2 682	2 643	3 007	3 242
Malta	283	313	324	340	416	438	455	482	521	510	522	541
Netherlands	31 617	35 283	35 871	36 987	37 051	38 014	40 838	42 943	44 850	43 934	44 199	45 622
Poland	15 483	18 184	18 436	16 593	17 610	20 753	23 337	26 434	31 847	27 041	31 300	35 253
Portugal	10 084	10 583	11 350	11 791	12 410	13 450	14 598	15 447	15 775	14 882	16 092	16 999
Romania	4 510	5 545	5 696	6 232	7 388	9 826	12 338	15 769	17 601	15 482	18 381	21 760
Slovakia	2 974	3 361	3 600	3 827	4 598	4 866	5 622	6 003	6 585	6 615	6 795	7 484
Slovenia	1 657	1 817	2 084	2 273	2 450	2 610	2 783	3 132	3 476	3 352	3 401	3 375
Spain	40 777	43 421	46 065	49 347	53 483	58 591	64 105	68 461	69 506	65 143	68 757	71 744
Sweden	24 469	23 490	24 947	25 913	26 834	27 937	30 002	31 794	31 830	28 758	34 050	37 542
United Kingdom	121 490	125 763	131 319	125 710	136 941	139 488	149 492	156 296	137 366	105 445	130 650	150 064

Source: Own Calculations.

Table C.3. VAT Liability from Household Consumption, 2000–2011 (EUR million)

Member state	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	12 191	12 350	12 603	12 847	13 451	13 946	14 409	14 858	15 498	15 400	15 927	16 632
Belgium	12 661	12 675	12 904	13 271	13 819	14 368	14 959	15 188	15 966	15 560	16 309	16 845
Bulgaria	1 132	1 296	1 373	1 471	1 660	1 830	2 051	2 405	2 616	2 357	2 415	2 565
Czech Republic	3 584	3 981	4 473	4 586	4 513	4 884	5 492	5 954	7 809	7 345	8 230	8 573
Denmark	11 109	11 353	11 729	11 839	12 625	13 256	14 015	14 481	14 752	13 763	14 358	14 633
Estonia	421	476	540	599	684	781	908	1 025	1 064	931	974	1 060
Finland	6 561	6 862	7 177	7 631	7 907	8 214	8 796	9 154	9 606	8 549	9 230	10 010
France	74 348	77 337	79 919	82 372	85 229	88 560	91 593	95 156	98 505	98 816	101 311	103 691
Germany	96 492	100 443	99 319	99 481	101 019	102 873	106 008	121 621	124 734	122 371	125 930	129 502
Greece	8 083	8 919	9 818	10 373	11 105	12 482	13 920	14 645	15 649	15 191	16 339	17 686
Hungary	3 604	4 188	4 841	5 166	5 937	6 392	5 925	6 897	7 342	6 782	7 470	7 741
Ireland	4 350	4 209	4 522	5 038	5 302	6 395	7 168	7 120	6 927	6 234	6 063	5 876
Italy	72 081	73 883	75 458	77 677	80 049	81 980	84 618	86 253	87 683	84 722	87 246	90 607
Latvia	549	604	645	675	723	838	1 062	1 334	1 428	1 295	1 299	1 570
Lithuania	1 036	1 149	1 263	1 363	1 534	1 743	1 978	2 310	2 623	2 479	2 551	2 818
Luxembourg	734	748	806	798	867	919	928	972	1 054	1 044	1 084	1 135
Malta	218	243	250	258	310	323	326	337	370	355	361	377
Netherlands	15 954	17 469	18 091	18 166	18 220	18 586	19 464	20 269	20 906	19 696	20 015	20 253
Poland	10 528	12 314	12 641	11 165	11 963	13 995	15 288	16 958	20 152	17 164	19 660	21 993
Portugal	6 644	6 968	7 522	7 828	8 237	8 868	9 779	10 370	10 604	9 895	10 602	11 505
Romania	3 046	3 874	3 967	4 229	5 139	6 739	8 371	10 217	11 092	8 936	10 675	12 206
Slovakia	1 968	2 259	2 395	2 626	3 252	3 402	3 863	4 271	4 738	4 680	4 692	5 059
Slovenia	1 123	1 222	1 380	1 505	1 616	1 732	1 826	2 033	2 224	2 163	2 226	2 237
Spain	28 309	30 070	31 267	32 982	35 417	38 085	40 894	43 466	44 159	40 705	44 103	47 372
Sweden	13 376	12 809	13 597	14 316	14 745	15 093	15 852	16 691	16 600	15 264	17 953	19 613
United Kingdom	83 769	85 811	89 966	85 375	92 439	93 593	97 124	100 498	87 762	67 275	83 700	95 647

Source: Own Calculations.

Table C.4. VAT Liability from Government & NPISH Consumption, 2000–2011 (EUR million)

Member state	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	456	569	595	611	637	654	684	726	767	778	792	807
Belgium	438	729	795	1 006	1 032	1 023	1 067	1 123	1 219	1 229	1 269	1 324
Bulgaria	44	65	63	77	76	75	106	95	116	81	84	87
Czech Republic	421	449	553	585	589	608	660	707	865	870	961	978
Denmark	676	730	769	786	817	836	861	857	899	921	946	943
Estonia	23	26	31	33	39	44	51	58	68	72	75	78
Finland	692	711	750	784	803	835	775	808	834	846	887	947
France	5 341	5 746	6 339	6 593	6 855	7 198	7 485	7 810	8 073	9 843	10 165	10 339
Germany	6 360	6 712	6 703	6 881	6 445	6 962	7 036	8 547	8 690	8 809	9 073	9 358
Greece	36	45	51	54	61	66	88	96	110	107	105	120
Hungary	351	401	485	551	717	800	807	867	930	917	1 010	998
Ireland	82	83	94	103	107	139	193	483	488	468	430	417
Italy	5 465	6 154	6 440	6 583	7 110	7 504	7 743	7 714	8 036	8 138	8 199	8 132
Latvia	12	11	14	13	12	13	13	23	31	25	23	26
Lithuania	37	40	41	43	43	53	69	84	94	88	91	93
Luxembourg	22	24	28	31	35	38	41	41	43	50	53	56
Malta	12	14	16	15	22	20	21	23	31	32	33	35
Netherlands	1 358	1 533	1 656	1 704	1 693	1 756	1 980	2 070	2 158	2 234	2 274	2 292
Poland	535	621	619	568	544	683	822	963	1 149	988	1 148	1 263
Portugal	198	226	245	260	281	312	370	403	419	387	399	411
Romania	235	268	233	311	358	507	614	726	871	875	916	989
Slovakia	160	166	187	230	246	216	273	260	280	282	287	293
Slovenia	56	61	72	78	87	95	102	109	123	125	128	130
Spain	1 181	1 297	1 428	1 573	1 769	1 933	2 270	2 475	2 646	2 636	2 799	2 918
Sweden	1 064	1 034	1 112	1 179	1 237	1 218	1 280	1 397	1 393	1 312	1 512	1 658
United Kingdom	2 222	2 304	2 472	2 373	2 995	2 839	2 951	3 183	2 962	2 473	3 067	3 520

Source: Own Calculations.

Table C.5. VAT Liability from Intermediate Consumption by Industries, 2000–2011 (EUR million)

Member state	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	3 023	3 368	3 377	3 563	3 655	3 898	4 069	4 333	4 609	4 731	5 007	5 418
Belgium	3 273	3 725	3 890	4 162	4 425	4 649	4 889	5 218	5 690	5 673	6 261	6 788
Bulgaria	245	281	305	346	400	450	521	630	713	735	722	816
Czech Republic	1 268	1 351	1 592	1 645	1 660	1 950	2 204	2 597	3 147	2 989	3 489	3 805
Denmark	3 801	4 066	4 264	4 415	4 651	5 003	5 420	5 849	6 202	6 271	6 465	6 959
Estonia	83	92	99	111	113	128	147	178	195	189	228	274
Finland	2 578	2 658	2 875	3 082	3 209	3 358	3 478	3 686	3 959	4 023	4 398	4 880
France	17 916	18 479	19 701	20 406	21 425	22 496	23 844	24 728	25 431	19 847	20 905	22 084
Germany	23 608	23 913	23 753	24 319	24 080	24 707	25 445	30 819	31 774	32 538	35 334	38 895
Greece	1 642	1 584	1 801	1 763	1 937	2 073	2 215	2 599	2 662	3 003	3 036	3 266
Hungary	729	847	999	1 043	1 227	1 385	1 325	1 458	1 555	1 535	1 815	1 980
Ireland	1 328	1 635	1 753	1 890	1 990	1 952	2 147	2 665	2 689	2 597	2 508	2 585
Italy	8 880	9 350	9 944	10 675	11 131	11 776	12 255	12 707	13 283	13 660	14 480	15 290
Latvia	106	128	135	161	183	199	247	302	346	345	365	464
Lithuania	115	114	133	144	165	209	251	303	378	319	384	436
Luxembourg	356	390	375	372	425	471	523	654	747	740	877	944
Malta	29	20	23	26	38	42	55	66	75	80	87	90
Netherlands	6 981	8 101	8 472	9 021	9 148	9 565	10 380	11 117	11 814	12 369	12 998	13 693
Poland	2 522	2 936	2 960	2 857	2 924	3 522	4 227	4 875	5 802	4 710	5 536	6 268
Portugal	1 847	1 933	2 073	2 210	2 354	2 613	2 733	2 891	2 933	2 909	3 170	3 302
Romania	609	640	679	772	845	1 096	1 284	1 671	2 031	1 681	1 996	2 466
Slovakia	420	446	486	515	616	673	775	750	902	877	979	1 133
Slovenia	200	226	293	309	322	351	387	425	473	475	500	506
Spain	5 109	5 299	5 850	6 394	7 217	8 112	8 854	9 638	10 303	10 575	10 982	11 496
Sweden	6 693	6 448	6 895	7 037	7 244	7 506	7 979	8 317	8 286	7 572	9 078	10 095
United Kingdom	25 540	27 030	27 709	26 485	28 179	32 104	34 355	36 586	32 615	26 228	31 825	36 829

Source: Own Calculations.

Table C.6. VAT Liability from Gross fixed capital formation, 2000–2011 (EUR million)

Member state	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	2 251	2 250	2 167	2 289	2 333	2 482	2 733	2 977	2 932	2 191	2 254	2 471
Belgium	2 430	2 348	2 297	2 368	2 576	3 168	3 652	3 866	3 963	4 040	4 111	4 268
Bulgaria	81	104	114	128	152	220	287	383	482	459	417	422
Czech Republic	268	270	321	503	347	391	438	796	1 409	1 654	1 795	1 677
Denmark	2 587	2 650	2 538	2 545	2 688	3 230	3 819	3 976	3 887	3 377	3 184	3 169
Estonia	65	81	109	118	131	168	247	299	258	205	194	241
Finland	2 349	2 385	2 397	2 567	2 805	2 699	2 990	3 584	3 310	2 824	2 997	3 325
France	19 349	19 683	19 784	20 829	22 240	24 397	26 693	27 460	26 967	30 186	29 688	31 195
Germany	30 225	28 940	26 927	26 111	26 041	25 595	27 500	34 888	35 317	32 621	34 989	37 933
Greece	3 208	3 402	3 725	4 267	4 207	4 585	5 486	6 752	5 449	4 535	4 078	3 535
Hungary	946	1 113	1 430	1 326	1 491	1 552	1 182	1 232	1 226	1 278	1 401	1 379
Ireland	2 448	1 926	2 829	3 083	3 498	4 428	5 021	5 090	4 220	2 632	2 134	1 792
Italy	10 036	10 591	10 314	11 435	11 885	12 310	13 018	13 689	13 657	15 790	15 587	15 887
Latvia	42	42	46	65	88	134	218	273	251	235	194	251
Lithuania	153	176	205	235	279	306	387	528	524	366	385	431
Luxembourg	178	198	210	222	233	241	243	278	258	283	370	405
Malta	22	21	23	28	30	37	36	37	29	26	26	24
Netherlands	7 063	7 901	7 367	7 823	7 693	7 807	8 695	9 169	9 641	9 312	8 531	9 033
Poland	1 587	2 003	1 909	1 692	1 804	2 123	2 571	3 177	4 003	3 612	4 265	4 783
Portugal	1 043	1 110	1 160	1 147	1 165	1 237	1 274	1 343	1 372	1 293	1 413	1 320
Romania	561	616	642	723	805	1 201	1 678	2 582	2 974	3 603	4 367	5 553
Slovakia	400	463	499	432	459	545	638	650	601	703	764	892
Slovenia	216	236	257	294	332	328	365	441	490	453	415	363
Spain	5 215	5 778	6 516	7 269	7 883	9 252	10 724	11 577	11 002	10 206	9 848	8 914
Sweden	3 016	2 885	3 023	3 051	3 214	3 731	4 482	4 951	5 073	4 230	5 053	5 655
United Kingdom	7 860	8 383	9 202	9 569	11 018	8 320	11 988	13 933	12 389	8 499	10 840	11 674

Source: Own Calculations.

Table C.7. VAT receipts, 2000–2011 (EUR million)

Member state	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	16 840	17 251	17 972	17 893	18 590	19 414	19 735	20 970	21 935	22 158	22 735	23 447
Belgium	18 130	17 817	18 591	18 730	20 122	21 362	22 569	23 908	24 126	23 600	25 230	26 021
Bulgaria	1 169	1 310	1 245	1 586	2 011	2 378	2 835	3 190	3 862	3 156	3 299	3 352
Czech Republic	3 970	4 382	5 036	5 158	6 416	7 223	7 541	8 366	10 437	9 784	10 420	10 994
Denmark	16 606	17 250	17 818	18 180	19 258	20 862	22 560	23 638	23 635	22 702	23 245	23 869
Estonia	520	568	651	712	744	970	1 215	1 423	1 288	1 224	1 257	1 363
Finland	10 869	11 118	11 680	12 455	12 949	13 658	14 418	15 054	15 511	14 951	15 256	16 915
France	107 163	108 581	110 413	113 622	120 224	126 625	131 693	136 542	137 736	130 303	135 579	140 506
Germany	140 020	139 090	136 780	137 190	137 430	139 810	147 140	170 080	175 870	177 680	180 220	189 920
Greece	9 824	10 960	11 969	12 043	12 573	13 398	14 910	16 611	17 020	14 914	16 308	15 027
Hungary	4 461	4 794	5 519	6 072	7 278	7 485	6 813	8 010	8 224	7 820	8 442	8 516
Ireland	7 657	7 999	9 168	9 814	10 947	12 364	13 802	14 334	13 102	10 338	10 056	9 782
Italy	77 473	78 056	80 382	79 099	81 515	85 317	92 992	95 623	93 698	86 544	97 586	98 557
Latvia	599	626	661	720	779	1 011	1 374	1 733	1 538	1 109	1 192	1 368
Lithuania	939	989	1 111	1 111	1 175	1 488	1 826	2 330	2 593	1 961	2 180	2 444
Luxembourg	1 234	1 314	1 383	1 467	1 662	1 863	1 959	2 156	2 351	2 419	2 503	2 690
Malta	236	259	273	288	333	397	410	420	458	457	477	520
Netherlands	28 849	32 509	33 493	34 754	35 811	36 950	39 888	42 873	43 221	40 086	42 654	41 610
Poland	12 877	14 381	15 066	13 686	14 633	18 837	22 127	25 923	29 103	23 056	27 535	29 843
Portugal	9 734	10 021	10 668	11 076	11 569	13 001	13 764	14 333	14 424	11 971	13 517	14 235
Romania	2 633	2 830	3 449	3 781	4 075	6 439	7 741	10 079	11 036	7 852	9 494	11 412
Slovakia	2 168	2 454	2 582	3 031	3 507	3 880	4 104	4 147	4 621	4 221	4 182	4 711
Slovenia	1 599	1 718	1 982	2 140	2 311	2 472	2 647	2 923	3 165	2 991	3 045	3 049
Spain	38 159	39 831	41 648	46 030	50 795	58 213	63 273	61 713	54 280	42 669	57 992	56 547
Sweden	23 073	22 110	23 545	24 676	25 642	26 786	28 465	30 550	30 941	28 199	33 825	36 610
United Kingdom	106 512	109 188	114 583	113 314	121 812	123 766	130 571	136 404	117 292	91 229	113 714	130 577

Source: EUROSTAT.

Table C.8. VAT Gap, 2000–2011 (EUR million)

Member state	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	1 626	2 030	1 481	2 186	2 373	2 493	3 131	3 026	3 156	2 151	2 573	3 468
Belgium	1 815	2 818	2 397	3 203	3 019	3 126	3 397	3 048	4 278	4 395	4 571	4 970
Bulgaria	357	458	641	471	319	253	203	441	164	554	385	604
Czech Republic	1 662	1 767	2 069	2 354	875	804	1 396	2 023	3 165	3 234	4 315	4 241
Denmark	2 076	2 064	1 994	1 897	2 035	2 017	2 206	2 218	2 827	2 274	2 382	2 566
Estonia	75	109	132	153	229	158	143	146	308	181	221	301
Finland	1 523	1 728	1 741	1 873	2 068	1 810	1 990	2 590	2 826	1 716	2 762	2 831
France	13 705	16 568	19 153	20 429	19 688	20 515	22 361	23 110	26 769	33 478	32 148	32 233
Germany	17 876	22 117	20 885	20 499	21 038	21 186	19 708	26 663	25 532	19 587	26 144	26 909
Greece	3 250	3 101	3 555	4 547	4 899	5 988	6 975	7 654	7 052	8 069	7 431	9 763
Hungary	1 241	1 835	2 335	2 110	2 204	2 754	2 538	2 567	2 944	2 770	3 351	3 700
Ireland	790	112	369	602	329	948	1 052	1 336	1 548	1 811	1 294	1 108
Italy	22 819	25 716	25 466	30 926	32 539	32 388	29 130	29 357	33 610	39 793	31 699	36 134
Latvia	112	162	183	198	231	179	175	209	531	804	698	954
Lithuania	408	498	539	681	857	837	885	930	1 048	1 297	1 243	1 352
Luxembourg	215	223	202	210	190	176	177	254	331	224	504	551
Malta	47	54	51	52	83	40	46	62	63	53	45	21
Netherlands	2 768	2 774	2 378	2 233	1 240	1 064	950	70	1 629	3 848	1 545	4 012
Poland	2 606	3 803	3 370	2 908	2 977	1 916	1 211	511	2 743	3 985	3 764	5 410
Portugal	350	562	682	715	842	449	835	1 114	1 351	2 911	2 575	2 764
Romania	1 877	2 714	2 247	2 451	3 314	3 387	4 597	5 691	6 564	7 630	8 887	10 348
Slovakia	806	907	1 018	795	1 091	986	1 518	1 856	1 964	2 393	2 613	2 773
Slovenia	58	99	103	132	139	138	136	210	311	361	356	326
Spain	2 618	3 590	4 417	3 317	2 688	378	832	6 748	15 226	22 474	10 765	15 197
Sweden	1 396	1 381	1 403	1 237	1 192	1 152	1 537	1 245	889	558	225	932
United Kingdom	14 977	16 575	16 736	12 396	15 129	15 722	18 921	19 892	20 074	14 215	16 937	19 487

Source: Own Calculations.

Table C.9. VAT Gap as a share of VTTL, 2000–2011 (%)

Member state	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	9	11	8	11	11	11	14	13	13	9	10	13
Belgium	9	14	11	15	13	13	13	11	15	16	15	16
Bulgaria	23	26	34	23	14	10	7	12	4	15	10	15
Czech Republic	30	29	29	31	12	10	16	19	23	25	29	28
Denmark	11	11	10	9	10	9	9	9	11	9	9	10
Estonia	13	16	17	18	24	14	11	9	19	13	15	18
Finland	12	13	13	13	14	12	12	15	15	10	15	14
France	11	13	15	15	14	14	15	14	16	20	19	19
Germany	11	14	13	13	13	13	12	14	13	10	13	12
Greece	25	22	23	27	28	31	32	32	29	35	31	39
Hungary	22	28	30	26	23	27	27	24	26	26	28	30
Ireland	9	1	4	6	3	7	7	9	11	15	11	10
Italy	23	25	24	28	29	28	24	23	26	31	25	27
Latvia	16	21	22	22	23	15	11	11	26	42	37	41
Lithuania	30	34	33	38	42	36	33	29	29	40	36	36
Luxembourg	15	15	13	13	10	9	8	11	12	8	17	17
Malta	17	17	16	15	20	9	10	13	12	10	9	4
Netherlands	9	8	7	6	3	3	2	0	4	9	3	9
Poland	17	21	18	18	17	9	5	2	9	15	12	15
Portugal	3	5	6	6	7	3	6	7	9	20	16	16
Romania	42	49	39	39	45	34	37	36	37	49	48	48
Slovakia	27	27	28	21	24	20	27	31	30	36	38	37
Slovenia	4	5	5	6	6	5	5	7	9	11	10	10
Spain	6	8	10	7	5	1	1	10	22	34	16	21
Sweden	6	6	6	5	4	4	5	4	3	2	1	2
United Kingdom	12	13	13	10	11	11	13	13	15	13	13	13

Source: Own Calculations.

Table C.10. VAT Gap as a share of GDP, 2000–2011 (%)

Member state	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Austria	0.8	0.9	0.7	1.0	1.0	1.0	1.2	1.1	1.1	0.8	0.9	1.2
Belgium	0.7	1.1	0.9	1.2	1.0	1.0	1.1	0.9	1.2	1.3	1.3	1.3
Bulgaria	2.5	2.9	3.8	2.6	1.6	1.1	0.8	1.4	0.5	1.6	1.1	1.6
Czech Republic	2.6	2.5	2.5	2.8	1.0	0.8	1.2	1.5	2.1	2.3	2.9	2.7
Denmark	1.2	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.2	1.0	1.0	1.1
Estonia	1.2	1.6	1.7	1.8	2.4	1.4	1.1	0.9	1.9	1.3	1.5	1.9
Finland	1.2	1.2	1.2	1.3	1.4	1.1	1.2	1.4	1.5	1.0	1.5	1.5
France	1.0	1.1	1.2	1.3	1.2	1.2	1.2	1.2	1.4	1.8	1.7	1.6
Germany	0.9	1.1	1.0	1.0	1.0	1.0	0.9	1.1	1.0	0.8	1.0	1.0
Greece	2.4	2.1	2.3	2.6	2.6	3.1	3.3	3.4	3.0	3.5	3.3	4.7
Hungary	2.5	3.1	3.3	2.9	2.7	3.1	2.8	2.6	2.8	3.0	3.5	3.7
Ireland	0.7	0.1	0.3	0.4	0.2	0.6	0.6	0.7	0.9	1.1	0.8	0.7
Italy	1.9	2.0	2.0	2.3	2.3	2.3	2.0	1.9	2.1	2.6	2.0	2.3
Latvia	1.3	1.8	1.9	2.0	2.1	1.4	1.1	1.0	2.3	4.3	3.9	4.7
Lithuania	3.3	3.7	3.6	4.1	4.7	4.0	3.7	3.2	3.2	4.9	4.5	4.4
Luxembourg	1.0	1.0	0.8	0.8	0.7	0.6	0.5	0.7	0.9	0.6	1.3	1.3
Malta	1.1	1.3	1.1	1.1	1.8	0.8	0.9	1.1	1.1	0.9	0.7	0.3
Netherlands	0.7	0.6	0.5	0.5	0.3	0.2	0.2	0.0	0.3	0.7	0.3	0.7
Poland	1.4	1.8	1.6	1.5	1.5	0.8	0.4	0.2	0.8	1.3	1.1	1.5
Portugal	0.3	0.4	0.5	0.5	0.6	0.3	0.5	0.7	0.8	1.7	1.5	1.6
Romania	4.6	6.0	4.6	4.7	5.4	4.2	4.7	4.6	4.7	6.5	7.1	7.9
Slovakia	2.6	2.7	2.8	2.0	2.4	2.0	2.8	3.0	2.9	3.8	4.0	4.0
Slovenia	0.3	0.5	0.4	0.5	0.5	0.5	0.4	0.6	0.8	1.0	1.0	0.9
Spain	0.4	0.5	0.6	0.4	0.3	0.0	0.1	0.6	1.4	2.1	1.0	1.4
Sweden	0.5	0.5	0.5	0.4	0.4	0.4	0.5	0.4	0.3	0.2	0.1	0.2
United Kingdom	0.9	1.0	1.0	0.8	0.9	0.9	1.0	1.0	1.1	0.9	1.0	1.1

Source: Own Calculations.

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