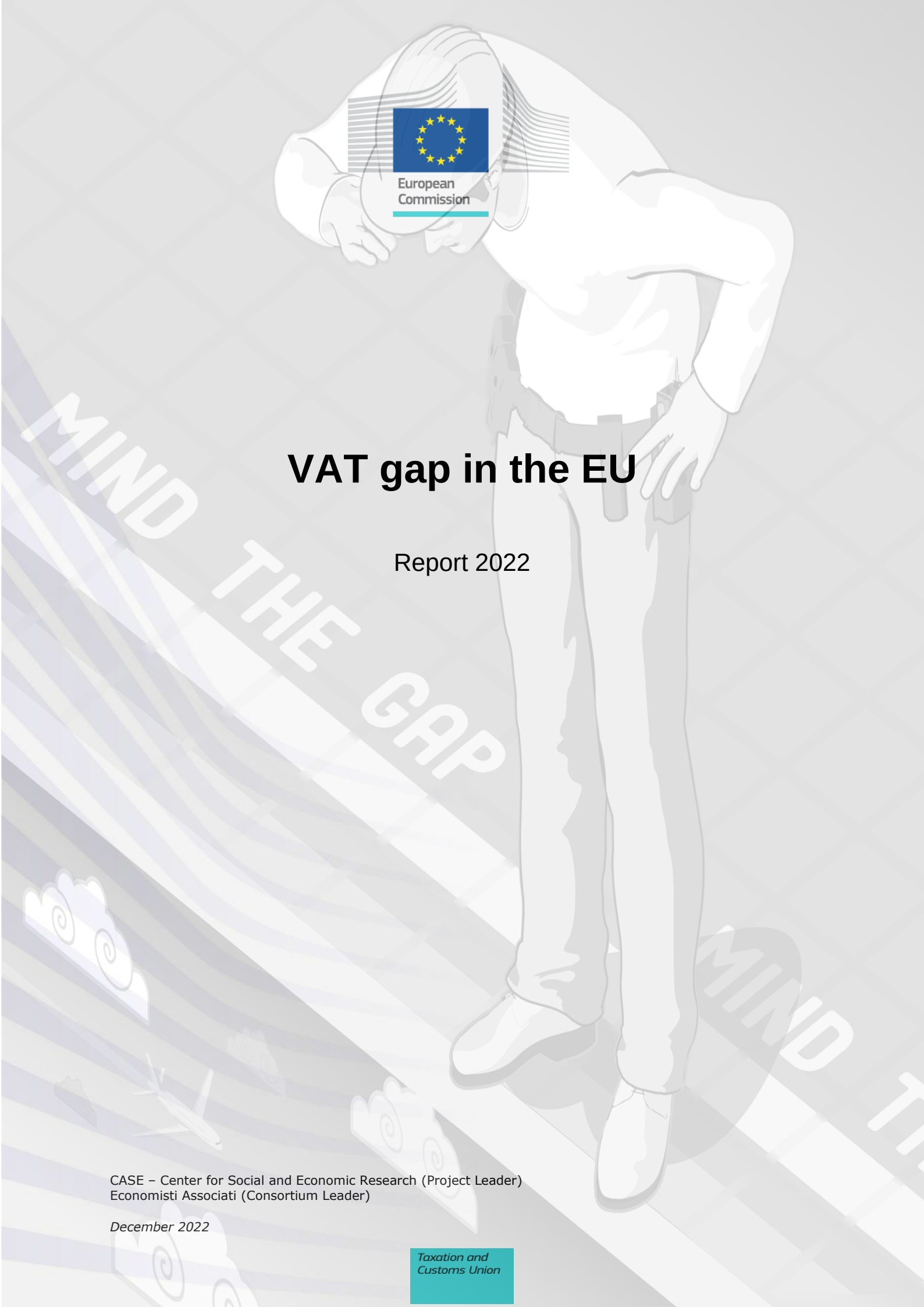

VAT gap in the EU

Report 2022

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List of acronyms and abbreviations

B2B	Business-to-Business
B2C	Business-to-Consumer
CASE	Center for Social and Economic Research (Warsaw)
COICOP	Classification of Individual Consumption according to Purpose
CPA	Statistical Classification of Products by Activity in accordance with Regulation (European Commission) No 451/2008 of the European Parliament and of the Council of 23 April 2008 establishing a new statistical classification of products by activity
EC	European Commission
ESA	European System of Accounts
EU	European Union
EU27	Current Member States of the European Union, UK exclusive
EU28	Member States of the European Union until January 2020 (including the UK)
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GOV	Government Final Consumption
GVA	Gross Value Added
HBS	Household Budget Surveys
HHC	Household Final Consumption
IC	Intermediate Consumption
KMO	Kaiser-Meyer-Olkin (statistic)
IMF	International Monetary Fund
MIMIC	Multiple Indicators, Multiple Causes (model)
MS	Member States of the European Union
NAC	National Currency
NPISH	Non-Profit Institutions Serving Households
ORS	Own Resource Submissions
PCA	Principal Components Analysis
PP	Percentage Points
PPS	Purchasing Power Standard
R&D	Research and Development
SAF-T	Standard Audit File for Tax
SUT	Supply and Use Tables
VAT	Value Added Tax
VTTL	VAT Total Tax Liability

Introduction

Value Added Tax (VAT) is one of the core sources of government revenue in all EU Member States. In 2020, its contribution to total tax receipts ranged from 20 to 50 percent across Member States and accounted for approximately 26 percent of the total yearly tax receipts for general government in the EU27.

Meeting the fiscal objective of VAT requires confronting numerous challenges. The key challenge addressed by this report is taxpayer non-compliance with VAT payment obligations. The forms of such non-compliance are numerous – from the legal exploitation of loopholes in tax systems to evasion or organised large-scale tax fraud. Non-compliance could also be non-intentional and result, among others, from administrative errors, omissions, and non-fraudulent bankruptcies. Tax fraud, evasion, and avoidance, which are the core interest of this study, cost EU Member States' budgets billions of euros every year. They also threaten the principle of fair taxation and impede fairness of competition between businesses. The need for effective tax collection and a fair business environment has become even more important as government budgets and businesses in the EU face the economic consequences of the war in Ukraine and the COVID-19 pandemic.

The other visible sources of foregone revenue are the policy decisions narrowing the tax base or reducing VAT liability for certain parts of the tax base. These choices, often referred to as *VAT expenditures*, are made to meet distributional objectives or to provide certain incentives for taxpayers. They could also be taken due to difficulties imposing payments on certain taxpayers or on certain types of consumption. As presented in detail in this report, foregone revenue due to the *VAT policy gap* in many Member States is higher than the actual VAT collection.

The relevance of the problem of foregone revenue due to non-compliance and the design of the tax rules would be largely unknown without tax gap estimates. These estimates not only serve as a useful tool to understand the overall size of the revenue losses but also help to understand its nature, which is crucial for making well-grounded policy decisions. The estimates of the tax gap components and their evolution in time provide insights on the strategies and measures that improve the efficiency of VAT collection.

For this reason, the number of tax administrations monitoring the gap in the EU has grown rapidly in recent years. The responses to the questionnaires of authorities from 22 Member States show that 13 Member States regularly monitor the VAT compliance gap. Most of these Member States commenced their calculations after 2013, that is, the year when the seminal EC/CASE report was published.[1] Many of these Member States currently use parallel methods to increase the accuracy of their estimates and allow for decomposing the gaps into sectors and types of economic activity.

This report aims to support tax administrations in their tax gap monitoring efforts. It scrutinises VAT gaps in all EU Member States using a standardised methodology and data sources, which allows for comparing the performance of administrations across time and against other Member States. The estimates provided in this report serve for some administrations as a reference

[1] *See EC/CASE (2013).*

point for own analyses. For other administrations that do not prepare own estimates, the estimates presented in this report are the primary source information on VAT gaps.

This is the 10th publication of the European Commission presenting VAT gap estimates. It follows the seminal study of EC/Reckon (2010) and the subsequent publication of EC/CASE (2013) that established the methodological approach to the tax gap calculations presented in this report. It also includes the methodological improvements and novelties introduced by the study teams working on previous VAT gap reports. This report also benefits from consultations with Member States' authorities and the validation of the estimates with the results available from national administrations.

The report provides yearly VAT compliance gap estimates for the EU27 covering the five-year period of 2016-2020. It also includes estimates using a simplified methodology – "fast estimates" – for the year immediately preceding the publication date. Based on an updated set of VAT compliance gap estimates, we analyse econometrically the VAT compliance gap determinants, scrutinise the evolution of the gaps for all Member States, and investigate the impact of the COVID-19 pandemic on VAT compliance. VAT policy gaps are also presented for the same five-year period and are decomposed to disentangle the impact that specific rate reductions and exemptions made to the theoretical VAT revenue losses. We also present estimates of the overall collection efficiency (the "C-efficiency" ratio) and investigate changes in yearly VAT revenue due to basic components, which are the tax base, tax rates, and taxpayer compliance.

One of the main findings of this report is that in 2020 the VAT compliance gap in the EU27 dropped sharply year-over-year. In relative terms, the gap fell by approximately 2 percentage points (pp) of the VAT total tax liability (VTTL) and, in nominal terms, by EUR 31 billion. The overall loss of revenue due to non-compliance, i.e., the VAT compliance gap, in the EU27 in 2020 was estimated at EUR 93 billion. The measure of foregone revenue resulting from the design of the tax base and rate structure – the VAT policy gap – increased due to the temporary measures reducing the VAT burden introduced as a response to the pandemic. The average EU27 policy gap was estimated at approximately 45.8 percent in 2020. This means that VAT liability defined by tax rules accounted for 54.2 percent of the revenue that would hypothetically be collected if the simplest VAT with a standard rate and broad tax base was implemented.

The statistical analysis of the shifts in the VAT compliance gap and other developments following the outbreak of the COVID-19 pandemic indicates that the main driving forces of the increased compliance were government policies. The largest decline of the VAT compliance gap was observed for Member States that implemented the most far-reaching support measures, which were often contingent on paying taxes, and Member States where the VAT burden significantly dropped. Unexpectedly, no evidence was found confirming that the increase in the share of electronic transactions contributed to sealing VAT compliance gaps. Similarly, the analysis did not confirm that a decline in the use of services, and tourism-related services specifically, contributed to an increase in VAT compliance.

On top of analysing the VAT gaps and their determinants, this report addresses the methodological difficulties that will be faced in the future when the study is updated and developed. More specifically, it analyses the impact of the discontinuation of the Own Resource Submissions (ORS), which were the primary source of information for estimating the parameters of the VAT compliance gap model for this and earlier studies. It also suggests potential paths for

changes in the methodology of the *VAT gap in the EU* study in the future and assesses the feasibility, costs, and benefits of such amendments.

The report is divided into two parts. Part I of the report presents the results of the VAT gap analysis. Chapter 1 of this part discusses the methodology used in the VAT gap analysis. Chapter 2 uses statistical methods and brings together the estimates from the following sections to provide a more detailed discussion on the impact of the COVID-19 pandemic on VAT revenue and VAT gaps. The estimates of the VAT compliance gap for 2016-2020 for the EU as a whole and for individual Member States are presented and briefly described in Chapter 3. In Chapter 4, we analyse C-efficiency as well as the VAT policy gap and the role of its components. Chapter 5 provides the detailed results of the VAT gap estimates and outlines trends for individual countries coupled with analytical insights. Chapter 6 is devoted to the econometric analysis.

Part II of the study assesses the solutions to the methodological and data availability issues. Chapter 1 of this part presents an overview of the methodologies for estimating VAT compliance gaps. Chapter 2 discusses the experiences of Member States' administrations in estimating the VAT compliance gap, which is used in Chapter 3 to assess the feasibility, costs, and accuracy of these methodologies. Based on this assessment, potential scenarios for the development of the study are drawn and compared. Chapter 4 presents an assessment of the accuracy of the top-down consumption-side approach that is used to assign confidence to the estimates derived for particular Member States. Finally, Chapter 5 assesses various designs of the web front end for visualisation and dissemination.

Annex A contains the detailed methodological considerations underlying all components of the analysis that were not included in Chapter 2 of the first part of the report. Annex B provides the statistical data and a set of comparative tables. The questionnaire for Member States' administrations used to assess the options for future studies is included in Annex C. Annex D contains external reviews of the inception and draft final reports by two external reviewers.

Part I

THE VAT GAP ANALYSIS

I. Methodology

I.a. Preliminaries

The VAT compliance gap, which is addressed in detail by the core of this report, is a measure of overall non-compliance in VAT. It is the difference between the tax revenue that would be collected in the case of full compliance (assuming an unchanged tax base), referred to as the VTTL, and the actual revenue. Most often, the compliance gap is expressed in absolute terms (1) or in relation to the benchmark, i.e., in relation to the VTTL (2):

$$VAT\ compliance\ gap\ = VTTL - VAT\ revenue \quad (1)$$

$$VAT\ compliance\ gap\ (\%) = \frac{VTTL - VAT\ revenue}{VTTL} \quad (2)$$

The VAT compliance gap represents more than just fraud and evasion and their associated policy measures. The VAT compliance gap also covers VAT lost due to, for example, insolvencies, bankruptcies, administrative errors, and legal tax optimisation. In this study, the VAT compliance gap is estimated using the top-down consumption-side approach based on national accounts and fiscal data as well as household budget surveys (see: ***VAT compliance gap estimation method***). The method employed does not allow for a breakdown into components. Yet, the availability of the relatively long time series of observation allows for an investigation of the determinants of non-compliance using statistical and econometric methods (see: ***Econometric analysis of the compliance gap***).

To assess the relative impact of reduced rates and exemptions on revenue losses, the liability according to the tax law needs to be compared with the potential revenue that could be collected in a VAT system with a uniform rate and the broadest possible base. This benchmark, called *notional ideal revenue*, assumes that the VAT is imposed on the entire household consumption and investment given the current standard VAT rate. The difference between the notional ideal revenue and the VTTL is the VAT policy gap; this captures the effects of applying multiple rates and exemptions on the theoretical revenue that could be levied in a given VAT system. The VAT policy gap is an indicator of the additional VAT revenue that could theoretically (i.e., under the assumption of perfect tax compliance) be generated if a uniform VAT rate is applied to the final domestic use of all goods and services by households. The VAT policy gap can also be expressed in absolute (3) or in relative terms (4):

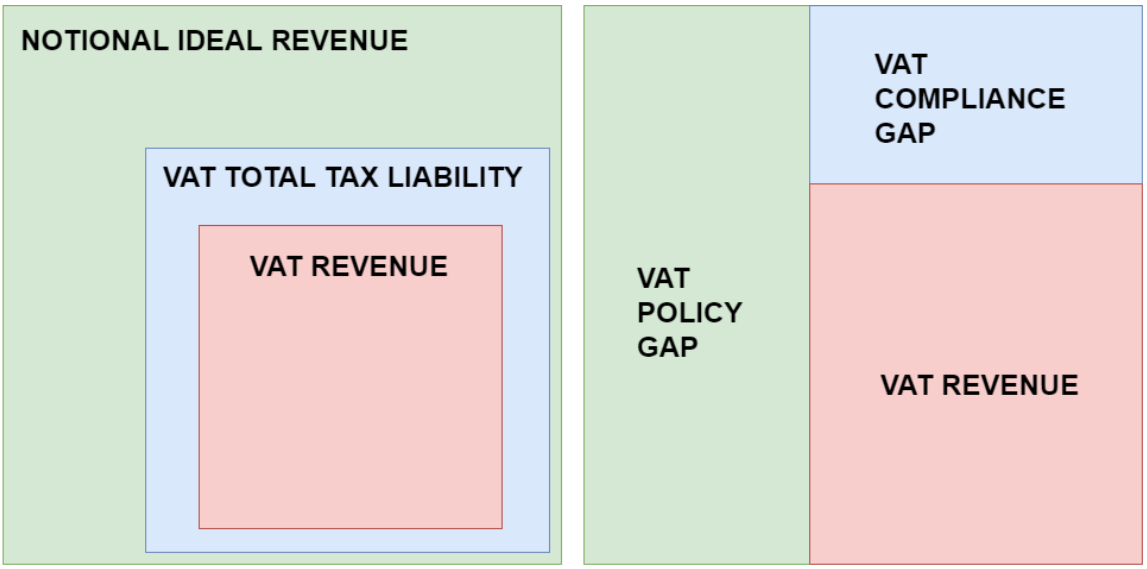
$$VAT\ policy\ gap\ = notional\ ideal\ revenue - VTTL \quad (3)$$

$$VAT\ policy\ gap\ (\%) = \frac{notional\ ideal\ revenue - VTTL}{notional\ ideal\ revenue} \quad (4)$$

The policy gap includes a broad range of exemptions, exclusions from the tax base, and preferential treatment. Many of these can be named as tax expenditures. Others are implemented for goods and services that are difficult to be taxed because, for example, the goods and services are not offered at market prices (public services), it is difficult to define the tax base (financial and insurance services), or it is too cumbersome to define the place of supply (international transport). In contrast to the VAT compliance gap, the policy gap can be decomposed to examine the impact of different types of preferential treatment or to analyse the impact of exemptions or reduced rates on certain parts of the tax base (see: ***VAT policy gap and its decomposition***).

There is an apparent relationship between the VAT gaps and the respective benchmarks. The difference between the notional ideal revenue and the VAT receipts is the sum of the policy and compliance gaps, which accounts for all revenue losses in a given VAT system (see Figure 1). A measure that is associated with these total losses is C-efficiency. It is an indicator of the departure of the VAT system from a perfectly enforced tax levied at a uniform rate on all final consumption. "*1 - C-efficiency*" could be regarded as a proxy of the relative size of the gap to the notional ideal revenue, which could take values from zero to one (see: ***C-efficiency***).

Figure 1: Components of the notional ideal revenue



Source: own elaboration.

The value of the VAT revenue can be decomposed into components in line with the described relationship between the gaps and the revenue. This is helpful in understanding the underlying sources of the evolution of the VAT revenue. Since revenue is a product of the VTTL and the compliance ratio, VAT collection could be expressed as:

$$VAT\ revenue\ =\ VTTL\ \times\ compliance\ ratio \tag{5}$$

where *compliance ratio* is: $1\ -\ VAT\ compliance\ gap\ (\%)$.

As the VTTL is a product of the base and the effective rate, the actual revenue could be further decomposed and expressed as:

$$VAT\ revenue\ =\ net\ base\ \times\ effective\ rate\ \times\ compliance\ ratio \tag{6}$$

where *effective rate* is the ratio of the theoretical VTTL to the net base. The net base (which is the sum of the final consumption and investment by households, non-profit institutions serving households [NPISH], and government), in turn, is calculated as the difference between the gross base, which includes VAT, and the VAT revenues. Equation (6) means that the growth rate of the VAT revenue equals, in approximation, the sum of the growth rate of the net base, the effective rate, and the compliance ratio.

I.b. VAT compliance gap estimation method

The calculation of the VAT compliance gap uses a methodology well-established by earlier VAT gap studies – the *top-down consumption-side* approach. This approach can be used to derive the estimates covering the five-year period between 2016-2020. The estimates presented in ***Annex B. Statistical appendix*** covering the remainder of the period (2021 and 2000-2015) use a simplified approach, which is described in detail in ***Annex A: VAT gap fast estimates for 2021*** and ***Annex A: VAT compliance gap backward update: 2000-2015***.

Estimation of the VTTL

The approach employed for the baseline estimates relies on the calculation of the VTTL for a defined period and on aligning the VTTL with relevant revenue figures. As a source of information to estimate the VTTL, figures from national accounts (as a source of information on the tax base) as well as data from fiscal registers and various surveys (as an evidence base for estimating the parameters of the model) are used. In contrast to the *production-side* approach which estimates the VTTL payments for all sectors, the *consumption-side* approach looks at the final liability in a product breakdown and corrects the liability estimates for the non-deductible VAT hidden at the intermediate stage.

The VTTL is estimated as the sum of the liability from six main components: final consumption by households (HHC), government (GOV), and non-profit institutions serving households (NPISH), intermediate consumption (IC), gross fixed capital formation (GFCF) and other, largely country-specific, adjustments like limited right to deduct VAT on fuel (net adjustments). For this purpose, for each year, around 10 thousand parameters are estimated, including weighted average rates[2] for each 2-digit CPA group of products and services, and *propexes* (aka *pro-ratas*), which stand for the percent of the sector's exempt output. Under the employed approach, the VTTL is estimated using the following formula (7):

[2] *Weighted average rate is understood as the ratio of tax liability to net tax base, i.e., the value of the respective types of use in national accounts.*

$$VTTL = \sum_{i=1}^{N}(HHC\ VAT\ rate_i \times HHC\ value_i) + \sum_{i=1}^{N}(GOV\ VAT\ rate_i \times GOV\ value_i) + \sum_{i=1}^{N}(NPISH\ VAT\ rate_i \times NPISH\ value_i) + \sum_{i=1}^{N}\sum_{j=1}^{M}\left(IC\ VAT\ rate_i \times Propex_j \times IC\ value_{i,j}\right) + \sum_{i=1}^{N}\sum_{j=1}^{M}\left(GFCF\ VAT\ rate_i \times Propex_j \times GFCF\ value_{i,j}\right) + net\ adjustments \quad (7)$$

where:

i denotes groups of products and services,

j denotes sectors of economic activities,

(HHC, GOV, NPISH, IC, GFCF) Value are the respective components of the final use – household, government, NPISH final consumption, intermediate consumption, and gross fixed capital formation (denoted in net terms),

(HHC, GOV, NPISH, IC, GFCF) VAT rate are the effective VAT rates for the respective sub-aggregates of the economy and groups of products and services,

Propex is the percentage of output in a given sector that is exempt from VAT.

Household consumption liability

The core component of the VTTL and the first component of Equation (7) is household consumption liability.[3] It is a product of the effective VAT rates and household consumption values of each of the groups of products and activities. Households' consumption values, similar to other components of the use tables, are recorded in purchaser's prices, thus they require correction for the included VAT component. Moreover, the calculation requires adjustment for non-taxable consumption, in particular self-supply, and imputed rents.

Government and NPISH consumption liability

The government and NPISH consumption liabilities are estimated as a product of the respective VAT rates and the government and NPISH consumption values. Contrary to household consumption, most government and NPISH transactions do not constitute a taxable event. The exception is transfers in kind, which are one of the components of individual government consumption.

[3] *See e.g., EC/CASE (2013) for a comparison of the VTTL components in EU Member States.*

Intermediate consumption liability

The liability from intermediate consumption is computed for each industry as a product of the intermediate use of each of the inputs times the average VAT rate for these groups of inputs times the industry-average proportion of non-deductible VAT in intermediate consumption. The latter, the propex or non-deductibility pro-rata coefficient, is estimated using the breakdown of sectoral production to narrow the categories of goods and services. Importantly, as intermediate consumption is reported in purchaser's prices, it includes non-deductible VAT that needs to be excluded from the use tables to reflect the net tax base.

GFCF liability

Similar to intermediate consumption liability, non-deductible investment is estimated as a product of the tax rate, the propex, and the base, i.e., the industry's GFCF. The core components of this liability component include housing and public investment.

Net adjustments

In addition to the core components of the base, the estimation method involves corrections that are accounted for outside of the main formula of the VAT compliance gap model. More specifically, these adjustments are: (1) the limited right to deduct VAT on accommodation and restaurant services (e.g., representation expenses), (2) the correction for small businesses under the VAT threshold, (3) non-deductible expenditures on business cars and fuel expenses, (4) the special VAT regime on selected territories (such as the Greek islands, Corsica island), (5) netting out non-VAT taxes from the reported VAT revenue (e.g., revenue from Canary Islands Tax that is included in Eurostat reported VAT revenue).

The liability on hospitality services (1) is estimated by multiplying the intermediate use of these services by the applicable rates. The small business correction (2) is estimated by multiplying the share of small companies' output in the overall output of economic operators by the gross VTTL before the adjustment. The business cars and fuel adjustments (3) are calculated by multiplying the ORS reported correction to the VAT base from these sources by the applicable rate. When ORS data are not available, this correction is calculated by multiplying the GFCF expenditure on cars and fuel, applicable rates, and pro-rata coefficients. (4) The adjustments for selected territories are calculated by adjusting the national VTTL by the estimated share of the VTTL generated on the territories.

Similar to the previous studies, the main sources of information are the ORS[4] and the national accounts published by Eurostat (see Table 1).

[4] "Own Resource Submissions" are the files submitted by Member States' administrations that include calculations of VAT own resources, which are used as a base to calculate contributions of Member States to the EU budget.

Table 1: Data sources for the VTTL calculation

DESCRIPTION	PURPOSE	SOURCE	COMMENT
Household expenditure by CPA/COICOP category	Estimation of effective VAT rates for household final consumption for each 2-digit CPA category	ORS / Eurostat	*Information included in the ORS is based most often on granular HBS figures. Since for some Member States ORS does not present a detailed consumption structure, aggregate HBS data from Eurostat needs to be used.*
The intermediate consumption of industries for which VAT on inputs cannot be deducted, pro-rata coefficients, alternatively share of exempt output	Estimation of propexes	ORS / Eurostat	*The main source of information is ORS. Eurostat (SUT) is used as a source of information on the structure of, among others, R&D output.*
Investment (gross fixed capital formation) of exempt sectors	Estimation of VAT liability from investment	ORS / Eurostat	*Values forecasted two years ahead of available time series.*
Government expenditure by CPA/COICOP category	Estimation of effective VAT rates for government final consumption for each 2-digit CPA category	ORS	*Only individual government consumption and social transfers in kind specifically are a part of the tax base. However, the weighted average rate is estimated using a broad definition of the base which includes entire government consumption.*
NPISH expenditure by CPA/COICOP category	Estimation of effective VAT rates for NPISH final consumption for each 2-digit CPA category	ORS	…
VTTL adjustment due to small business exemption, business expenditure on cars and fuel, and other country-specific adjustments	Estimation of net adjustments	ORS	*In general, adjustments forecasted two years ahead of available time series.*
Final household consumption, government final consumption, NPISH final consumption, and intermediate consumption	Estimation of VTTL	Eurostat	*As national accounts figures do not always correspond to the tax base, two corrections to the base are applied: (1) adjustments for the self-supply of food and agricultural products and (2) adjustments for the intermediate consumption of construction work due to the treatment of construction activities abroad. If use tables are not available for a particular year or available use tables include confidential values, use tables are imputed using the latest national account industry level growth rates.*

Source: own elaboration.

Overall, based on the information sources enumerated in Table 1, over 10 thousand parameters need to be estimated every year for the 27 EU VAT systems.[5] Although the number may seem large, dependence of the calculation on other than national accounts data is lower compared to the *production-side* approach. Lower dependence on external data sources results from the fact that the liability is modelled at the final stage and there is no need to model the VAT liability at the intermediate level whenever there are no exemptions without the right to deduct. In other words,

[5] *For 2019 and earlier years, the study covers 28 tax systems, inclusive of the United Kingdom.*

from the consumption-side perspective, VAT liability does not depend on the chain of VAT payments at the intermediate level if all transaction parties enjoy the right to deduct.

Calculation of the VAT compliance gap

The VAT compliance gap is the difference between the tax revenue that would be collected in the case of full compliance (assuming an unchanged tax base), referred to as the VTTL, and the actual revenue (see Equation (1) and (2)). To avoid potential inaccuracies, the VTTL and VAT revenue must be aligned in terms of timing. For this reason, the revenue included in the calculations follows accrual rather than cash accounting. Thus, if ESA 2010 (European System of National and Regional Accounts from 2021) revenue figures are reported not to account for some elements (e.g., late payments), they are amended accordingly using data obtained from Member State authorities.

Since the VAT liability is modelled both for groups of products (for the liability pertaining to final use categories) and for sectors of economic activity (correction for the liability at the intermediate stage), it is not possible to decompose the VAT compliance gap. The consumption-side approach allows only to estimate the overall value of the gap. As explained in Part II of this report, to decompose the VAT compliance gap, the production-side approach using sectoral revenue data needs to be applied. Since VAT liability components estimated using the consumption-side approach cannot be aligned with the respective VAT revenue elements available for administrations, the consumption-side approach does not allow for the analysis of types of irregularities and their contribution to the overall VAT compliance gap.

Since it has relatively low requirements, the consumption-side approach can be applied in many countries, if up-to-date and accurate national accounts figures are available. The advantage of this method is simplicity, the possibility to standardise the approach across Member States, and accuracy in deriving the overall size of the gap. Yet, the application of this method creates certain challenges and raises some criticism. ***Annex A: Limitations and challenges of the top-down approach*** addresses these problems and discusses their impact on the accuracy of the estimates.

I.c. VAT policy gap and its decomposition

The concept of the VAT policy gap is fairly simple – it is an indicator which captures the scale of the VAT revenue lost due to the application of reduced rates and exemptions. This share is derived based in reference to the notional ideal revenue, i.e., the VAT receipts that would be collected if the entire household consumption and investment was taxed at the standard VAT rate. Due to the idealistic assumption of perfect tax compliance and a very broad base that captures all final consumption and households' GFCF, the term of notional ideal revenue and the practical interpretation of the policy gap draw criticism. Nonetheless, the assumption of perfect VAT collectability is indispensable, as interdependencies between tax compliance and rate structure are not straightforward.

The policy gap can be decomposed in order to further understand how different elements of the VAT tax system contribute to the loss of VAT revenue. In this study, the VAT policy gap is decomposed into "additive" components.[6] The main components of this decomposition are the rate gap and the exemption gap, which capture the loss in VAT liability due to the application of reduced

[6] *In contrast to the multiplicative decomposition proposed by Keen (2013).*

rates and the loss in liability due to the implementation of exemptions or excluding part of household final consumption from the tax base.

The rate gap is defined as the difference between the VTTL and what would be obtained in a counterfactual situation in which the standard rate, instead of the reduced, parking, or zero rates, is applied to final consumption. The exemption gap is defined as the difference between the VTTL and what would be obtained in a counterfactual situation in which the standard rate is applied to exempt products and services and no restriction of the right to deduct applies. The actionable gaps complement the information given by the policy gap and exemption gap by excluding the effect of the potential taxation of financial and public services, namely services and notional values that are unlikely to be taxed even in an ideally simple world.

The notional ideal revenue can be expressed as (8):

$$notional\ ideal\ revenue = VAT\ standard\ rate \times \sum_{i=1}^{N} FC\ value_i \quad (8)$$

where:

$i \in (1; 65)$ – groups of products and services,

$FC\ value$ – final consumption (including HHC, GOV and NPISH).

The policy gap, the exemption gap, and the rate gap can be expressed in absolute terms as the sum of the products of the rates and tax base (8, 9, 10):

$$1 - VAT\ policy\ gap = \sum_{i=1}^{N} VAT\ effective\ rate_i \times FC\ value_i \quad (9)$$

$$1 - VAT\ exemption\ gap = \sum_{i=1}^{N} VAT\ effective\ rate_i^E \times FC\ value_i \quad (10)$$

$$1 - VAT\ rate\ gap = \sum_{i=1}^{N} VAT\ effective\ rate_i^R \times FC\ value_i \quad (11)$$

where:

$i \in (1; 65)$ – groups of products and services,

$VAT\ effective\ rate_i^E = \frac{VTTL_i^{*,E}}{FC\ value_i}$ – effective rate for group *i* of products in the case where the standard rate instead of the zero rate, parking rate, or reduced rate is applied (for final consumption and the GFCF of non-business activities).

$VTTL_i^{*,E}$ – liability from final consumption and GFCF of non-business activities of group *i* of products, in the case where the standard rate instead of the zero rate, parking rate, or reduced rate is applied. Actual liability from intermediate consumption and the GFCF of business activities is assumed.

$VAT\ effective\ rate_i^R = \frac{VTTL_i^{*,R}}{FC\ value_i}$ – effective rate for group *i* of products in the event where exempt products within the group are taxed at the standard rate.

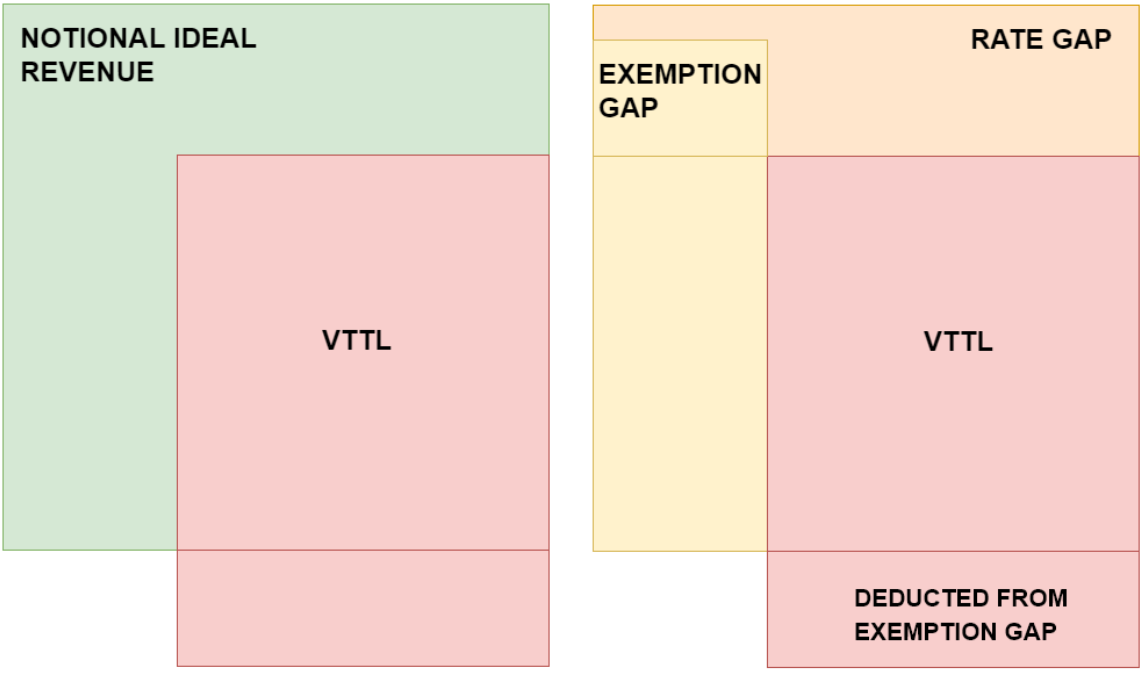
$VTTL_i^{*,R}$ – liability from final consumption of group *i* when exempt products within the group are taxed at the standard rate. Actual liability from final consumption and the GFCF of non-business activities is assumed,

$FC\ value_i$ – final consumption (including HHC, GOV and NPISH).

In relative terms, the VAT policy gap and its components could also be expressed as a ratio of forgone revenue and notional ideal revenue (see Equation 4).

The nature of the rate gap and exemption gap differs, which is visualised by Figure 2. Due to exemptions without the right to deduct, part of the revenue could be considered as disjunctive from the notional ideal revenue. This is because the actual revenue is partially collected in the intermediate stage due to the inability to deduct VAT accrued at the intermediate stage. In the ideal system this revenue would not be collected. Yet, the revenue collected instead at the final stage would be higher. As also shown in Figure 1, the VAT policy gap, i.e., the sum of the rate and exemption gaps, equals the difference between the notional ideal revenue and the VTTL.

Figure 2: Visualisation of the rate and exemption gaps



Source: own elaboration.

Using the above convention, one can decompose the rate gap and the exemption gap into components indicating the loss of the notional ideal revenue due to the implementation of reduced rates and exemptions on specific goods and services. Such additive decomposition is carried out for the computation of, as defined by EC/CASE (2015), the actionable exemption gap, which excludes the services and notional values that are unlikely to be taxed even in an ideal world. These measures exclude liability from the final consumption of “imputed rents” (the notional value of home occupancy by homeowners), the provision of public goods and services, and financial services. For these specific groups of services, charging VAT is impractical or currently goes beyond the control of national authorities.

I.d. C-efficiency

As discussed in the Introduction, C-efficiency is an indicator of the departure of the VAT from a perfectly enforced tax levied at a uniform rate on all consumption. It is expressed as:

$$E^C = \frac{VR}{tC}$$

where, *VR* stands for VAT revenue, *t* for statutory standard rate, and *C* for final consumption (net of VAT). The values of the measure could range from zero to one. However, values larger than 65 percent are rarely observed.[7] Even in a utopian situation of full compliance and a flat rate system, C-efficiency should be considerably lower than one, as domestic final consumption in the denominator of C-efficiency is broader than the actionable VAT base.[8] In other words, if C-efficiency equalled one, revenue would be higher than the notional ideal revenue.

I.e. Impact of the COVID-19 pandemic on the accuracy of estimates

The COVID-19 pandemic, apart from its impact on VAT revenues and the actual VAT gap (see ***Economic conditions, VAT regime changes and impact of the COVID-19 pandemic***), has also influenced the accuracy of estimates. The strength of this impact is unknown and can only be assessed when full estimates for the following years become available. The main factors behind the lower accuracy of the estimates for the pandemic years are:

- **Insufficient/inaccurate inclusion of deferred payments in tax base.** To reflect properly foregone revenue, VAT revenue should be aligned with corresponding VAT liability. This means that the VAT revenue used should be recorded in accrual rather than cash terms. More specifically, calculations of the VAT compliance gap for transactions that took place in 2020 should use the revenue collected in 2020 but also in 2021. In accordance with ESA 2010 standards, revenue in the taxes on production and imports are recorded when activities, transactions, or other events occur which create the liabilities to pay taxes, which makes it perfectly suited for the calculation.[9] Yet, the massive amounts of deferred payments collected in 2021 made it very difficult to compile the revenue in full accordance with the ESA 2010 principle. For this reason, we expect that the 2020 revenue does not account for all transactions made in 2020, which leads to overestimation of the gap.
- **Difficulty of compiling and potential inaccuracies in national statistics.** Due to additional problems in surveying companies and households in 2020 due to lockdown measures and the financial problems of economic operators, the estimates of national accounts figures are likely prone to larger errors than in other years.
- **Temporary changes in tax rates introduced in many Member States.** A number of Member States introduced large temporary changes in their tax rates system throughout 2020. Since information used for calculating the VTTL is to large extent available only in yearly terms, calculation of the effective rates is prone to larger errors than in years when changes in tax rules are introduced from the beginning of calendar year.

[7] *See: Keen (2013).*

[8] *Total domestic final consumption includes government and NPISH consumption, which to a large extent cannot be taxed.*

[9] *See: Eurostat (2013), European system of accounts: ESA 2010.*

II. Economic conditions, VAT regime changes and impact of the COVID-19 pandemic

This section presents the results of the analysis of the impact of the COVID-19 pandemic on VAT revenue and VAT gaps. It uses the main results presented throughout following Chapters 3 to 5 to scrutinize changes in VAT revenue and VTTL components in 2020. On top of this, using statistical methods we scrutinize the interrelation between the VAT gaps dynamic in 2020 across Member States and different factors characterising Member States and changes that occurred in 2020. As mentioned on the preceding subsection, the impact has multiple dimensions and has affected not only the values but also the accuracy of estimates (see ***Impact of the COVID-19 pandemic on the accuracy of estimates***).

I.a. General economic conditions in the EU2027 in 2020

In 2020, GDP fell in all EU Member States except for Ireland. In total, the EU27 economy shrank by 5.9 percent in real terms. The largest declines of GDP were recorded in Spain (-10.8 percent), Greece (-9 percent), and Italy (-9 percent), i.e., countries with a substantial contribution from touristic services to their economies (see Table 2). In nominal terms, GDP decreased by 4.3 percent. The decline of GDP was largely driven by gross fixed capital formation (GFCF), in part a component of the VAT base, which decreased by 7.7 percent. The core component of the base, final consumption, declined by approximately 3.6 percent in the EU27. Overall, a contraction of household final consumption in nominal terms was observed in 21 Member States. This is an unusual situation, as the nominal tax base increases in most countries even during unfavourable economic conditions. A decline in the tax base has a direct economic impact on VAT revenue but could also indirectly affect weighted average rates as during difficult economic times consumers often reduce their consumption of goods primarily taxed at standard rates. As shown by the econometric model, economic headwinds also lead to an increase in the gap, which further exacerbates the impact of the economic situation on VAT revenue.

Table 2: Real and nominal growth in the EU27 (2020, % growth of figures in national currencies)

Member State	Real GDP growth (%)	General government balance (%)	Change in unemploy-ment rate (pp)	Nominal growth (%)		
				GDP	Final consump-tion	GFCF
BE	-5.7	-9.0	0.3	-4.5	-4.5	-7.2
BG	-4.4	-4.0	0.9	-0.4	2.8	-3.5
CZ	-5.5	-5.8	0.6	-1.4	-0.4	-6.6
DK	-2.0	-0.2	0.6	0.6	0.4	4.3
DE	-3.7	-4.3	0.7	-2.0	-1.8	-7.4
EE	-3.0	-5.6	2.4	-3.2	-0.9	12.2
IE	6.2	-5.1	0.9	4.5	-4.4	-17.0
EL	-9.0	-10.2	-0.3	-9.8	-6.2	7.3
ES	-10.8	-10.3	1.4	-9.8	-7.9	-10.7
FR	-7.8	-8.9	-0.4	-5.2	-3.2	-7.7

Member State	Real GDP growth (%)	General government balance (%)	Change in unemployment rate (pp)	Nominal growth (%)		
				GDP	Final consumption	GFCF
HR	-8.1	-7.3	0.9	-8.2	-1.9	-3.7
IT	-9.0	-9.6	-0.6	-7.8	-7.5	-10.5
CY	-5.0	-5.8	0.5	-6.0	-1.5	-11.3
LV	-3.8	-4.5	1.8	-3.9	-4.3	-10.3
LT	-0.1	-7.3	2.2	1.3	1.4	-22.3
LU	-1.8	-3.4	1.2	2.4	-1.0	-0.5
HU	-4.5	-7.8	0.8	1.6	3.6	-2.6
MT	-8.3	-9.5	0.8	-7.0	-1.8	-3.8
NL	-3.9	-3.7	0.5	-2.0	-1.9	-3.5
AT	-6.7	-8.0	1.2	-4.6	-4.2	-2.7
PL	-2.2	-6.9	-0.1	2.0	2.3	-9.4
PT	-8.4	-5.8	0.3	-6.7	-4.0	-5.4
RO	-3.7	-9.3	1.2	0.0	-0.7	3.4
SI	-4.2	-7.8	0.6	-3.1	-3.0	-6.0
SK	-4.4	-5.5	1.0	-2.1	2.6	-19.3
FI	-2.2	-5.5	0.9	-0.8	-1.3	0.8
SE	-2.2	-2.7	1.5	-0.2	-0.6	-0.3
EU27 (EUR)	**-5.9**	**-6.8**	**0.4**	**-4.3**	**-3.6**	**-7.7**

Source: Eurostat, download underlying data.

I.b. VAT regime changes

As a consequence of the measures introduced by Member States' administrations, 2020 was also a very unstable year in terms of tax regime changes affecting the effective rates and the VTTL. The most significant changes were recorded for Germany, which temporarily reduced its standard VAT rate from 19 to 16 percent and its reduced VAT rate from 7 to 5 percent (July-December 2020) (see Table 3). Several Member States temporarily reduced the rates applicable to services provided by the producers most significantly affected by lockdown measures. Among those, Austria temporarily reduced to 5 percent the rate applicable to selected food services, tourism, cultural services, and publishing. Similarly, Ireland reduced the rate applicable to tourism and hospitality services from 13.5 percent to 9 percent. In addition, many Member Stats decreased rates or exempted sanitary materials such as protective masks against COVID-19. The vast majority of Member States also introduced deferrals, granted to the sectors and companies hit hardest by the crisis.[10]

[10] *Tax deferral refers to a legal permission to postpone payment of taxes to some future period.*

Table 3: VAT rate structure as of 1 January 2020 and changes during 2020 (%)

Member State	Standard rate (SR)	Reduced rate(s) (RR)	Super-reduced rate	Parking rate	Changes during 2020	Effective rate[11]
BE	21	6 / 12	-	12	-	9.9%
BG	20	9	-	-	-	13.6%
CZ	21	10 / 15		-	-	12.1%
DK	25	-	-	-	-	15.0%
DE	19	7	-	-	Standard rate to 16 and reduced rate to 5 (Jul 2020)	9.3%
EE	20	9	-	-	-	12.7%
IE	23	9 / 13.5	4.8	13.5	Standard rate to 21 (Sep 2020)	11.1%
EL	24	6 / 13	-	-	-	10.6%
ES	21	10	4	-	-	8.3%
FR	20	5.5 / 10	2.1	-	-	9.4%
HR	25	5 / 13	-	-	-	15.5%
IT	22	5 / 10	4	-	-	9.6%
CY	19	5 / 9	-	-	-	9.9%
LV	21	5 / 12		-	-	11.6%
LT	21	5 / 9	-	-	-	12.9%
LU	17	8	3	14	-	11.3%
HU	27	5 / 18	-	-	-	13.9%
MT	18	5 / 7	-	-	-	12.4%
NL	21	9	-	-	-	10.7%
AT	20	10 / 13	-	13	-	10.9%
PL	23	5 / 8	-	-	-	12.2%
PT	23	6 / 13	-	13	-	10.9%
RO	19	5 / 9	-	-	-	12.4%
SI	22	5 / 9.5	-	-	-	11.1%
SK	20	10	-	-	-	10.9%
FI	24	10 / 14	-	-	-	12.0%
SE	25	6 / 12	-	-	-	13.5%

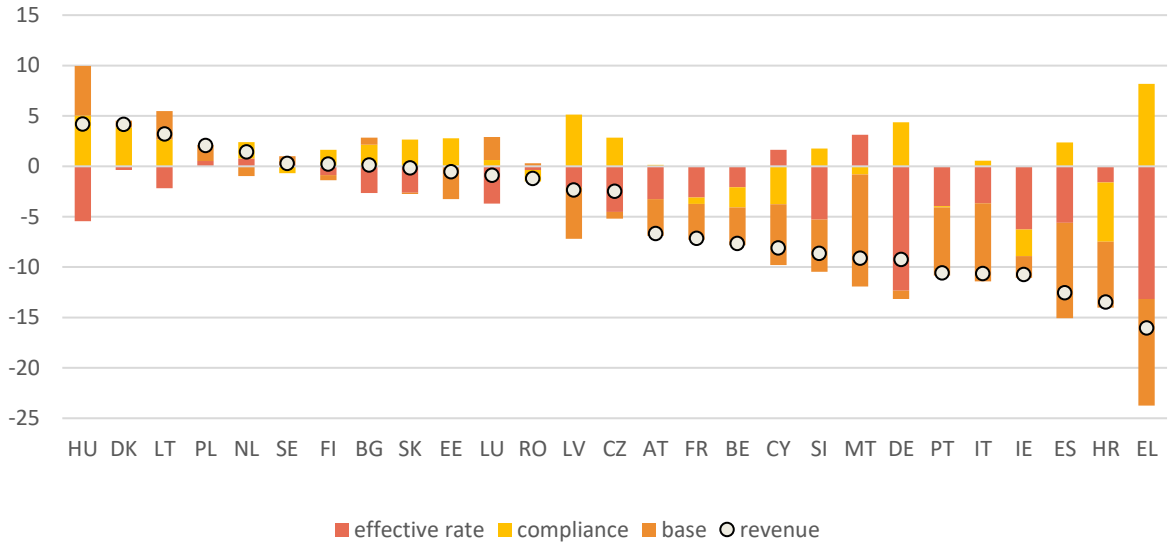
Source: TAXUD, VAT Rates Applied in the Member States of the European Union: Situation of 1st January 2020, download underlying data.

[11] *The effective rate is the ratio of the VTTL and the tax base. See methodological considerations in Annex A.*

I.c. Change in VAT revenue components

The direct effect of changes in the tax base and effective rate was highly negative in most EU Member States. In 27 Member States, the estimated VTTL dropped by 8.9 percent on average. In seven Member States, Greece, Spain, Malta, Germany, Italy, Portugal, and Slovenia, the estimated VTTL dropped by over 10 percent (see Table 4 and Figure 3). At the same time, VAT revenue dropped by substantially less, which marks a 2.2 percent improvement in VAT compliance (see ***Methodology: Preliminaries***).

Figure 3: Change in actual VAT revenue components (in %, 2020 vs. 2019)



Source: own calculations, download underlying data.

Table 4: Change in VAT revenue components (2020 over 2019)

Member State	Change in revenue	Change in the VTTL			Change in compliance
			Change in base	Change in effective rate	
BE	-7.6%	-6.6%	-3.6%	-3.1%	-1.1%
BG	-0.4%	-3.9%	-0.9%	-3.1%	3.7%
CZ	-2.5%	-5.1%	-0.6%	-4.5%	2.7%
DK	3.5%	-0.3%	0.4%	-0.7%	3.8%
DE	-9.2%	-13.3%	-0.4%	-12.9%	4.6%
EE	-0.5%	-2.0%	0.2%	-2.2%	1.5%
IE	-10.8%	-8.6%	-2.1%	-6.6%	-2.4%
EL	-16.0%	-19.9%	-11.6%	-9.4%	4.8%
ES	-12.5%	-13.8%	-9.2%	-5.1%	1.5%
FR	-7.1%	-7.8%	-3.6%	-4.3%	0.7%
HR	-13.4%	-7.9%	-8.4%	0.6%	-6.1%
IT	-10.6%	-11.7%	-7.7%	-4.3%	1.3%
CY	-13.5%	-8.9%	-5.9%	-3.2%	-5.0%
LV	-2.3%	-6.0%	-3.2%	-2.9%	3.9%
LT	3.2%	1.3%	3.4%	-2.1%	1.9%
LU	0.8%	-3.1%	-0.5%	-2.6%	4.0%
HU	4.2%	-1.0%	3.0%	-3.9%	5.2%
MT	-9.1%	-11.3%	-11.7%	0.4%	2.5%
NL	1.5%	-2.8%	-1.5%	-1.4%	4.4%
AT	-6.6%	-5.8%	-3.6%	-2.2%	-1.0%
PL	2.1%	0.4%	1.4%	-1.0%	1.7%
PT	-10.6%	-10.8%	-7.0%	-4.0%	0.2%
RO	-1.2%	-0.9%	-3.6%	2.8%	-0.3%
SI	-10.3%	-10.4%	-4.7%	-5.9%	0.0%
SK	-0.1%	-1.4%	0.2%	-1.6%	1.3%
FI	0.2%	-2.2%	-0.7%	-1.5%	2.5%
SE	0.3%	-1.0%	0.1%	-1.1%	1.4%
EU27 (total)	**-6.9%**	**-8.9%**	**-3.6%**	**-5.5%**	**2.2%**

Source: own calculations, download underlying data

I.a. Impact of the COVID-19 pandemic on VAT revenue and VAT gaps

In 2020, most Member States (19 out of 27) experienced a drop in VAT revenue (Table 4; Figure 4, Table 3 and Figure 9 in ***VAT compliance gap***). EU-wide revenue went down by approximately EUR 69 billion and 6.9 percent in relative terms. This is a result of the disruptions caused by the COVID-19 pandemic – some as an effect of reduced economic activity (affecting thus the tax base) and some as a direct result of government intervention and changes in the structure of consumption

(resulting, for instance, in a lower effective VAT rate). A similar situation was observed during the financial crisis of 2008.

Such an exceptional situation could be observed not only on the revenue side but also when looking at the VTTL. Only 2 countries out of 27 increased the VTTL, namely Lithuania and Poland (and only slightly). The drop in the VTTL was more pronounced than the drop in revenue and amounted to approximately EUR 100 billion and 8.9 percent year-over-year. Given the steeper decline of the VTTL compared to revenues, the total VAT compliance gap in the EU27 decreased.

To summarise, the year 2020 had a highly negative direct impact on VAT revenue due to the shrinking tax base and decreasing effective rate. The drop in the effective rate is partially marked by the growth of the policy gap from 44.5 percent in 2019 up to 45.8 percent in 2020 (see ***VAT policy gap***). Yet, the policy gap does not fully account for this drop, as the largest EU economy temporarily decreased its standard rate. The drop in the effective rate was driven by statutory changes but also by a decrease in the relative consumption of services (mostly food services and accommodation) often taxed at lower rates than other groups of products and services.

Despite the economic problems faced by many taxpayers, VAT compliance increased. The estimates show an increase in compliance despite some likely overestimation of the gap resulting from the inability to fully control for the value of deferrals. The increase in compliance in the aftermath of the COVID-19 pandemic departs from the trends and dependencies exhibited by the econometric model (see ***Econometric analysis of the compliance gap***). For this reason, we statistically analyse factors that could be regarded as both underlying reasons for an increase in compliance in 2020 and mediating factors, in other words – the variables that link the change in the VAT gap and unobservable phenomena (such as, for instance, the fear of being audited).

One of the developments observed in 2020 was an increase in electronic transactions, which might have hindered non-compliance. The value of electronic transactions went up by approximately 8 percent in the EU despite a decrease in the overall value of transactions.[12] The increase in compliance might also have been related to changes in the structure of expenditure, i.e., relatively higher purchases of commodities and lower purchases of services in sectors where non-compliance tends to be higher – namely, sectors related to tourism. Higher VAT compliance may also result from support measures, often contingent on paying taxes. The support measures in the form of government transfers or delayed or reduced tax burdens were worth billions. All in all, the total net balance of general government in the EU27 dropped from -0.6 percent in 2019 down to -6.8 percent in 2020. As a result of these measures, the number of bankruptcies in the EU fell by nearly 20 percent year-over-year, which must have had an impact on the value of forgone VAT due to non-compliance (the full list of hypotheses and factors scrutinised is presented in Table 5).

It could be suspected that a somewhat surprising positive change in compliance might be explained by some of the above-mentioned unique developments observed in 2020. Trends observed on aggregate values are insufficient to draw far-reaching conclusions. Yet, the strength of various developments related to the COVID-19 pandemic varied in time. This calls for analysing

[12] *Source: European Central Bank, Statistical Data Warehouse, Payment Statistics. Data was available for 22 EU Member States.*

cross-country variations in VAT compliance gap dynamics and the intensity of factors potentially affecting VAT compliance using correlation coefficients (see Table 5).

Table 5: Results of correlation analysis[13]

Underlying/mediating factor	Correlation coefficient[14]	Source of information	Hypothesis	Result
Value of electronic transactions (% change in 2020)	0.52	Own calculations based on: European Central Bank, Statistical Data Warehouse, Payment Statistics	Expectation: negative correlation. In Member States where the value of electronic transactions increased the VAT compliance gap might have decreased	Not confirmed statistically, all correlation coefficients are not significant at 5 and percent significance levels
Weighted average VAT rate (% change in 2020)	0.29	Own estimates	Expectation: negative correlation. In Member States where the VAT burden declined, the VAT compliance gap might have gone down due to declining incentives not to comply	
Contribution of services to GDP (% change in 2020)	-0.28	Source: Eurostat	Expectation: positive correlation. In Member States where the contribution of services to GDP declined, the VAT compliance gap might have decreased (as non-compliance in the trade of services tends to be higher)	
General government balance (pp change in 2020	-0.16	Source: Eurostat	Expectation: positive correlation. The strength of support measures and the economic situation, proxied somewhat by the change in the fiscal position of the general government, was interrelated with taxpayers' ability to pay taxes	
Business bankruptcies index (% change in 2020)	-0.11	Source: Eurostat (experimental statistics)	Expectation: negative correlation. Support measures and the declining share of bankruptcies might have led to a decrease of forgone VAT revenue	
Contribution of tourism sector to gross value added (2019, %)	0.06	Own calculations based on Eurostat	Expectation: negative correlation. The decline in compliance in 2020 was larger in Member States with a greater exposure to tourism (provide by the share of tourism in 2019). Due to restrictions regarding travel, activity in this sector sharply	

[13] Sorted by the absolute value of the correlation coefficient, descending.

[14] With percentage point change in the VAT compliance gap between 2020 and 2019.

Underlying/media ting factor	Correlation coefficient[14]	Source of information	Hypothesis	Result
			declined, which could have had a positive impact on aggregate VAT compliance	
Weighted average VAT rate (2019)	0.06	Own estimates	Expectation: positive correlation. In Member States where the VAT burden was lower, the VAT compliance gap might have decreased more	
Reporting obligations in place	0.06	Own analysis	Expectation: negative correlation. Reporting obligations in place might have supported decline in the VAT compliance gap	
VAT compliance gap in 2019 (% of VTTL)	-0.04	Own estimates	Expectation: no expectation for the sign. The strength of compliance improvement might have been related to the scale of the problem of non-compliance	
Real GDP growth (2020, %)	-0.02	Source: Eurostat	Expectation: negative correlation. Although a GDP decrease does not explain an increase in compliance, it could be expected that compliance improved more in Member States where the economic situation was relatively good	

Source: own elaboration. Note: correlation coefficients are used to measure how strong a relationship is between two variables, in this case – between the VAT compliance gap change and factors described by table's lines. Green colour depicts positive correlation, whereas red stands for its negative value. Intensity of colours depends on the value of the coefficient.

The analysis using correlation coefficients did not confirm any of the hypotheses posed. The largest absolute value of the correlation coefficient was observed for the change in the share of electronic transactions. Yet, the sign of the coefficient is against the expectation, i.e., the change in the VAT compliance gap was positively correlated with the change in the share of electronic transactions. Relatively large correlation coefficients were also recorded for the absolute values of the weighted average rate and for the change in the contribution of services to GDP. In line with expectations, the weighted average was positively correlated with the change in the VAT compliance gap. The correlation between the change in the VAT compliance gap and the change in the contribution of services to GDP was negative, which contradicts the hypothesis that was posed.

One reason for the statistical insignificance and contradicting signs of the correlation coefficients could be non-linearity of the relationship between the VAT compliance gap and the factors included

in the analysis.[15] Thus, to complement the assessment, we analyse the mean change in the VAT compliance gap in the groups of Member States distinguished by the values of the factors included in the analysis (see Table 6).

The clustering analysis pointed to a number of interesting patterns. The drop in the VAT compliance gap appeared to be more pronounced for Member States where:

- **the weighted average rate dropped visibly** (in these Member States, the VAT compliance gap dropped on average by approximately 1.8 pp),
- **the number of bankruptcies decreased significantly** (in these Member States, the VAT compliance gap dropped on average by approximately 1.9 pp),
- **the general government balance did not deteriorate sharply** (in these Member States, the VAT compliance gap dropped on average by approximately 2.1 pp),
- **the contribution of services to GDP increased** (in these Member States, the VAT compliance gap dropped on average by approximately 1.9 pp),
- **the share of electronic transactions decreased** (in these Member States, the VAT compliance gap dropped on average by approximately 2.2 pp).

Table 6: Clustering and descriptive statistics

	Mean change (pp)	Minimum change (pp)	Maximum change (pp)	Count
Share of tourism in GDP				
Small (<2%)	-1.19	-4.73	6.00	13
Large (>= 2%)	-1.58	-4.21	1.62	14
Reporting obligations				
Yes	-1.24	-4.73	6.00	12
No	-1.52	-4.21	2.20	15
Change in value of electronic transactions				
Decrease	-1.48	-4.21	2.20	10
Increase	-1.36	-3.68	1.62	10
No information	-1.32	-4.73	1.62	7
Change in weighted average rate				
Significant decrease (>=3%)	-1.76	-4.73	2.20	13
Other than significant decrease	-1.05	-4.12	6.00	14
Change in the number of bankruptcies				
Significant decrease (>15%)	-1.86	-4.21	1.62	12
Other than significant decrease	-1.43	-4.12	0.18	7

[15] *In a non-linear relationship between the explaining factor and the explained variable (in our case – the VAT compliance gap), changes in the explaining factor might result in changes in the VAT compliance gap in a different and non-constant magnitude).*

	Mean change (pp)	Minimum change (pp)	Maximum change (pp)	Count
Change in contribution of services to GDP				
Decrease/no change	-0.89	-4.12	6.00	14
Increase	-1.94	-4.73	0.18	13
Change in general government deficit				
Significant increase (>7% of GDP)	-0.20	-3.68	6.00	10
Other than signigicant increase	-2.10	-4.73	2.20	17
Change in share of electronic transactions				
Significant increase (>15%)	-1.67	-4.12	2.20	6
Increase (< 15%)	-1.08	-4.21	1.62	11
Decrease	-2.19	-3.64	-1.07	3
No data	-1.32	-4.73	6.00	7

Source: own calculations.

Due to the multiplicity of the developments in the economies and tax systems in 2020 and the relatively few observations of changes in the VAT compliance gap, the statistical analysis presented above poses limitations. This analysis also clearly illustrates that the impact of the changes occurring in the aftermath of the pandemic varied between Member States. This is likely related to the individual specificity of the situation in various Member States, which cannot be fully measured and, thus, cannot be incorporated in the analysis. For this reason, the interpretations made below are rather cautious. Against this backdrop, the analysis revealed that the support measures contingent on companies' operations, which resulted in a decline in the rate of bankruptcies, was one of the core driving factors of the increase in compliance in 2020. In addition, the increase in compliance was likely partially caused by the decline in the VAT burden, which reduced incentives to not comply. In Member States where the economic situation was relatively difficult and government balances significantly deteriorated, the decreases in the VAT compliance gaps were significantly lower. Unexpectedly, there was no evidence found confirming that the increase in the share of electronic transactions contributed to sealing VAT compliance gaps. Similarly, the analysis did not confirm that the decline in the use of services – and tourism-related services specifically – contributed to the increase in VAT compliance. These results indicate that the main driving forces of the increased compliance were government policies and the incentives they provided, rather than a change in the structural patterns of the economies.

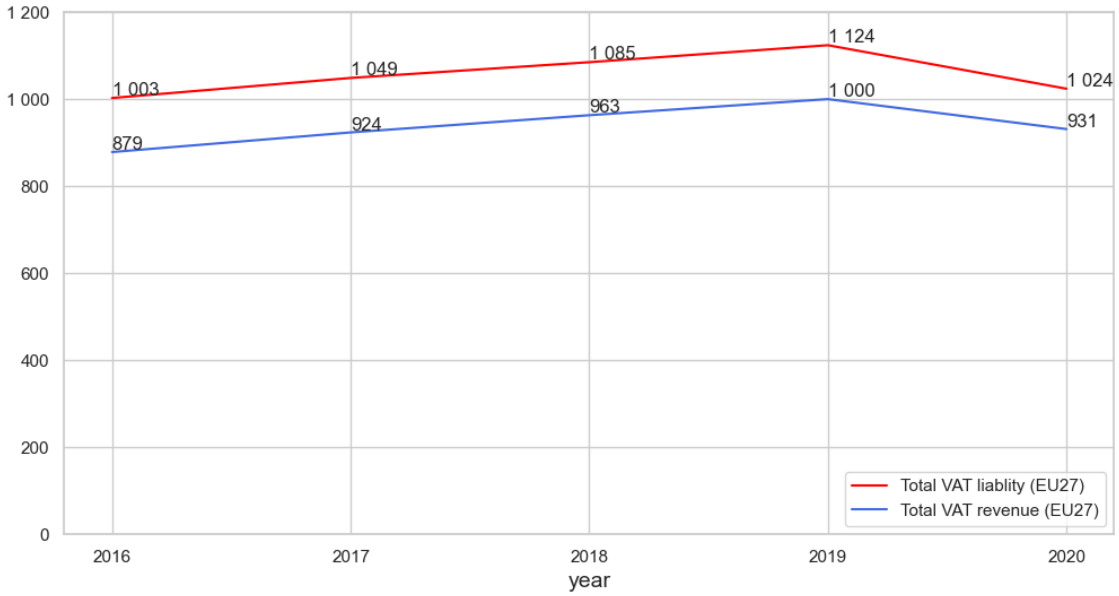
III. VAT compliance gap

This section looks at the evolution of the VAT compliance gap in the time horizon of 2016-2020. A more comprehensive analysis of the impact of the COVID-19 pandemic on all gaps is presented in the preceding section (see ***Economic conditions, VAT regime changes and impact of the COVID-19 pandemic***).

As shown by Figure 4, VAT revenue and VAT liability were gradually increasing in the years preceding the pandemic. At the same time, between 2016 and 2019, the distance between the two was narrowing and the VAT compliance gap declined at an average pace of 0.5 pp a year. In 2019, the VAT compliance gap in the EU27 amounted to EUR 124 billion in nominal terms and 11.0 percent expressed as a share of the VTTL.

In 2020, the gap amounted to EUR 93 billion and 9.1 percent of the VTTL. Compared to 2019, it went down by approximately 2 pp of the VTTL and EUR 31 billion despite some likely overestimation of its size due to the insufficient inclusion of late payments in the referred VAT revenue.[16] Overall, between 2016 and 2020, the gap in the EU27 declined by EUR 31 billion and 3.3 pp of the VTTL (see Figure 5).

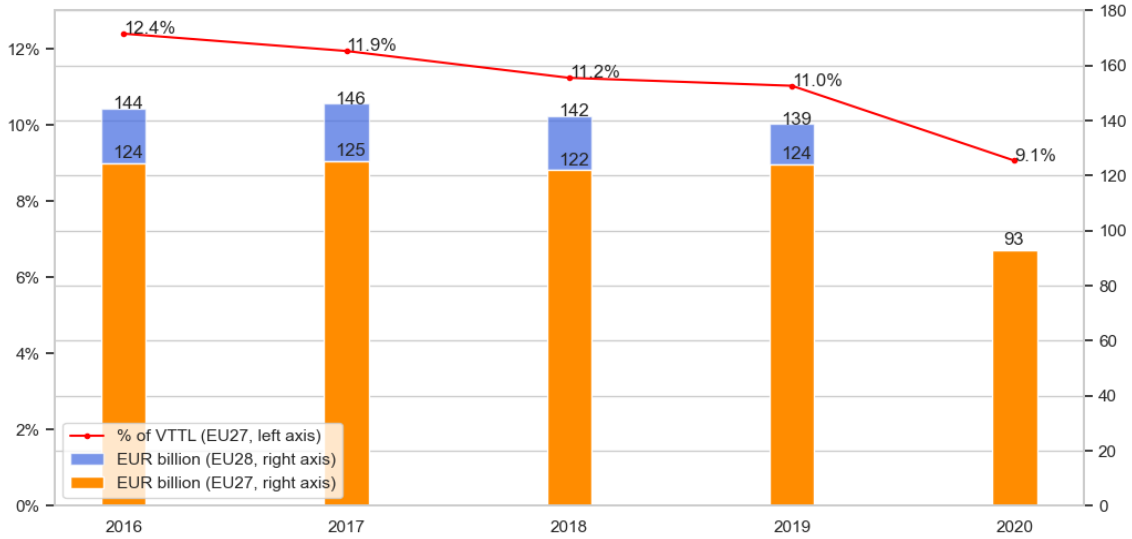
Figure 4: Evolution of VAT liability and revenue in the EU27 (EUR billion, 2016-2020)



Source: own calculations, download underlying data.

[16] *For more details please see section I.e on the Impact of the COVID-19 pandemic on the accuracy of estimates.*

Figure 5: Evolution of the VAT compliance gap in the EU27 and EU28 (% of the VTTL and EUR billion, 2016-2020)[17]



Source: own calculations, download underlying data.

In most Member States, the absolute year-over-year change in the VAT gap was below 2 pp. However, in some Member States, the estimated shifts in the VAT compliance gap were relatively large, leading to a significant change compared to other countries. The VAT compliance gap increased year-over-year in only six Member States – Croatia, Cyprus, Ireland, Romania, Austria and Belgium (see Figure 6 and Figure 7). The largest increase in the gap was observed for Croatia (increase by 6 pp). This large incline in the VAT gap for Croatia followed a large decline in 2019 of approximately 6.5 pp, which might point to some inaccuracy in the underlying data for 2019.[18]

The most significant decreases occurred in Hungary (4.7 pp), Germany (4.2 pp), the Netherlands (4.1 pp), and Greece (3.7 pp). Such positive changes in compliance during the recession might have been partially caused by support measures contingent on paying taxes and reducing the frequency of bankruptcies (see ***Economic conditions, VAT regime changes and impact of the COVID-19*** pandemic).

The estimates for the vast majority of Member States in 2020 ranged from 3 to 15 percent of the VTTL (19 Member States). The smallest VAT compliance gaps were observed in Finland (1.3 percent), Estonia (1.8 percent), and Sweden (2 percent). On the opposite side were Romania (35.7 percent) and Malta (24.1 percent). In nominal terms, the largest gaps were recorded in Italy (EUR 26.2 billion), France (EUR 14 billion), and Germany (EUR 11.1 billion). The median VAT gap was

[17] It is important to note that the 2020 results are presented for the EU27, accounting for BREXIT in January 2020. As a reference, the EU28 estimates including the UK are presented in some graphs and tables until year 2019.

[18] In 2019, VAT revenue in Croatia sharply increased despite a significant reduction in the effective rate. The issue of the fluctuating revenue was discussed with the authorities. In connection to this, national accounts figures were revised. At the time of the publication of this report, these figures were in the process of validation in Eurostat

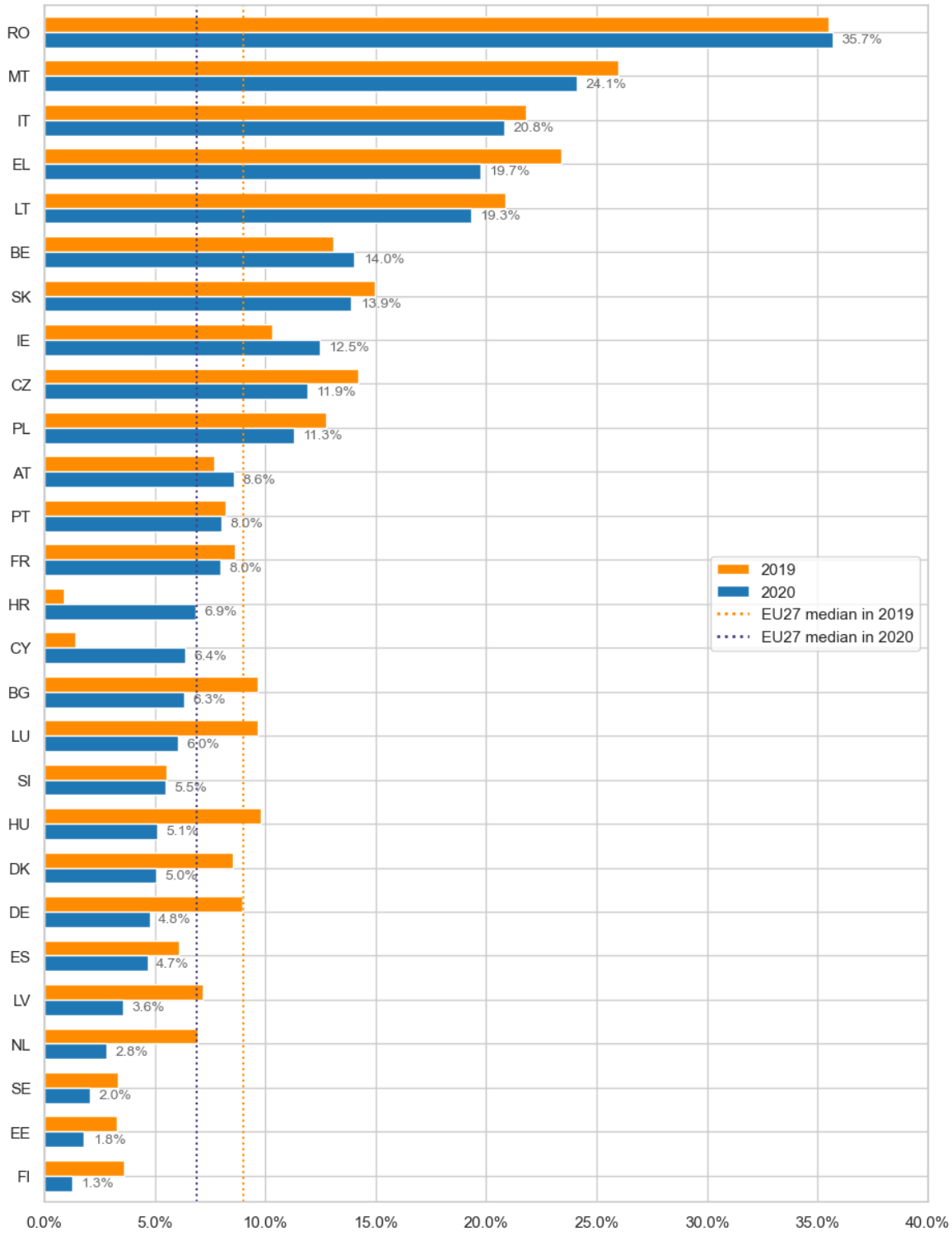
6.9 percent, which was lower than the average, which is influenced by the very high gap in the least compliant VAT systems (see Table 7 and Figure 6).

Table 7: VAT compliance gap as a percent of the VTTL in EU MS (2019 and 2020)

MS	2019				2020				
	Revenues (EUR)	VTTL (EUR)	VAT gap (EUR)	VAT gap (%)	Revenues (EUR)	VTTL (EUR)	VAT gap (EUR)	VAT gap (%)	VAT gap change (pp)
BE	31 702	36 468	4 766	13.1%	29 282	34 066	4 784	14.0%	1.0
BG	5 656	6 261	606	9.7%	5 635	6 014	379	6.3%	-3.4
CZ	16 931	19 740	2 809	14.2%	16 022	18 187	2 164	11.9%	-2.3
DK	29 832	32 617	2 785	8.5%	30 918	32 561	1 643	5.0%	-3.5
DE	244 111	268 176	24 065	9.0%	221 562	232 638	11 076	4.8%	-4.2
EE	2 483	2 566	84	3.3%	2 469	2 514	45	1.8%	-1.5
IE	15 301	17 056	1 755	10.3%	13 644	15 591	1 947	12.5%	2.2
EL	15 390	20 095	4 705	23.4%	12 925	16 103	3 178	19.7%	-3.7
ES	79 301	84 465	5 164	6.1%	69 382	72 778	3 396	4.7%	-1.4
FR	173 953	190 372	16 419	8.6%	161 537	175 499	13 962	8.0%	-0.7
HR	7 419	7 484	65	0.9%	6 319	6 784	466	6.9%	6.0
IT	111 464	142 549	31 085	21.8%	99 669	125 886	26 217	20.8%	-1.0
CY	2 066	2 095	30	1.4%	1 786	1 908	122	6.4%	5.0
LV	2 632	2 836	204	7.2%	2 571	2 666	95	3.6%	-3.6
LT	3 850	4 865	1 015	20.9%	3 975	4 926	952	19.3%	-1.5
LU	3 702	4 098	396	9.7%	3 730	3 970	240	6.0%	-3.6
HU	13 916	15 431	1 515	9.8%	13 429	14 149	720	5.1%	-4.7
MT	934	1 262	328	26.0%	849	1 119	270	24.1%	-1.9
NL	58 115	62 452	4 337	6.9%	58 971	60 685	1 714	2.8%	-4.1
AT	30 405	32 939	2 533	7.7%	28 384	31 044	2 660	8.6%	0.9
PL	42 383	48 572	6 189	12.7%	41 856	47 175	5 320	11.3%	-1.5
PT	18 786	20 465	1 679	8.2%	16 803	18 263	1 460	8.0%	-0.2
RO	13 795	21 394	7 599	35.5%	13 368	20 789	7 421	35.7%	0.2
SI	3 962	4 194	231	5.5%	3 553	3 759	206	5.5%	0.0
SK	6 830	8 033	1 202	15.0%	6 820	7 921	1 101	13.9%	-1.1
FI	21 974	22 800	826	3.6%	22 026	22 307	281	1.3%	-2.4
SE	43 412	44 914	1 502	3.3%	43 981	44 896	915	2.0%	-1.3
UK	176 317	191 046	14 728	7.7%	-	-	-	-	-
Total (EU27)	**1 000 306**	**1 124 200**	**123 894**	**11.0%**	**931 466**	**1 024 198**	**92 732**	**9.1%**	**-2.0**
Total (EU28)	1 176 623	1 315 246	138 623	10.5%	-	-	-	-	-
Median (EU27)				**9.0%**				**6.9%**	
Median (EU28)				8.8%					

Source: own calculations, download underlying data. Note: numbers may not add up due to rounding.

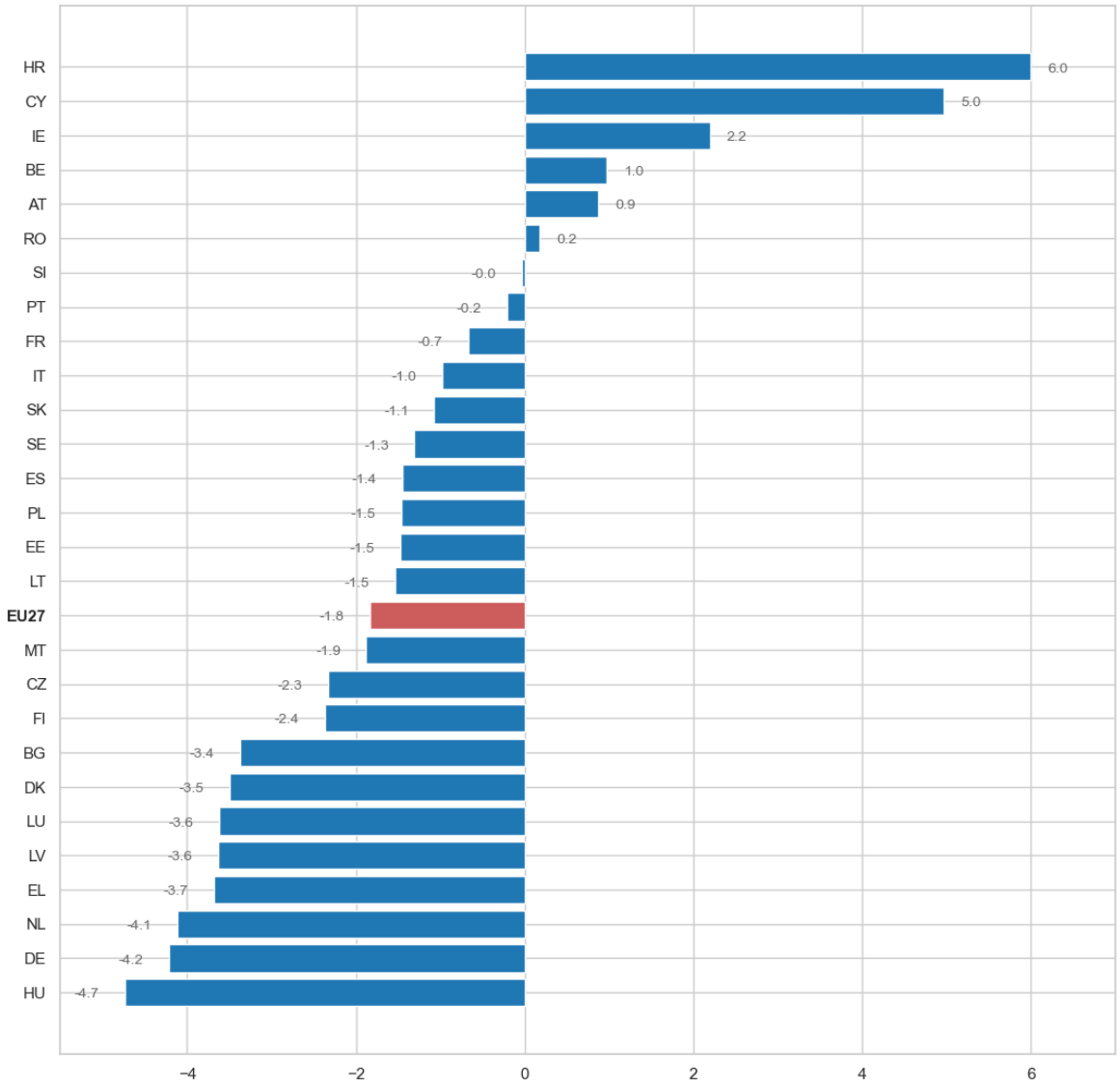
Figure 6: VAT compliance gap by Member State (as % of VTTL, 2019 vs. 2020)



Source: own calculations, download underlying data.

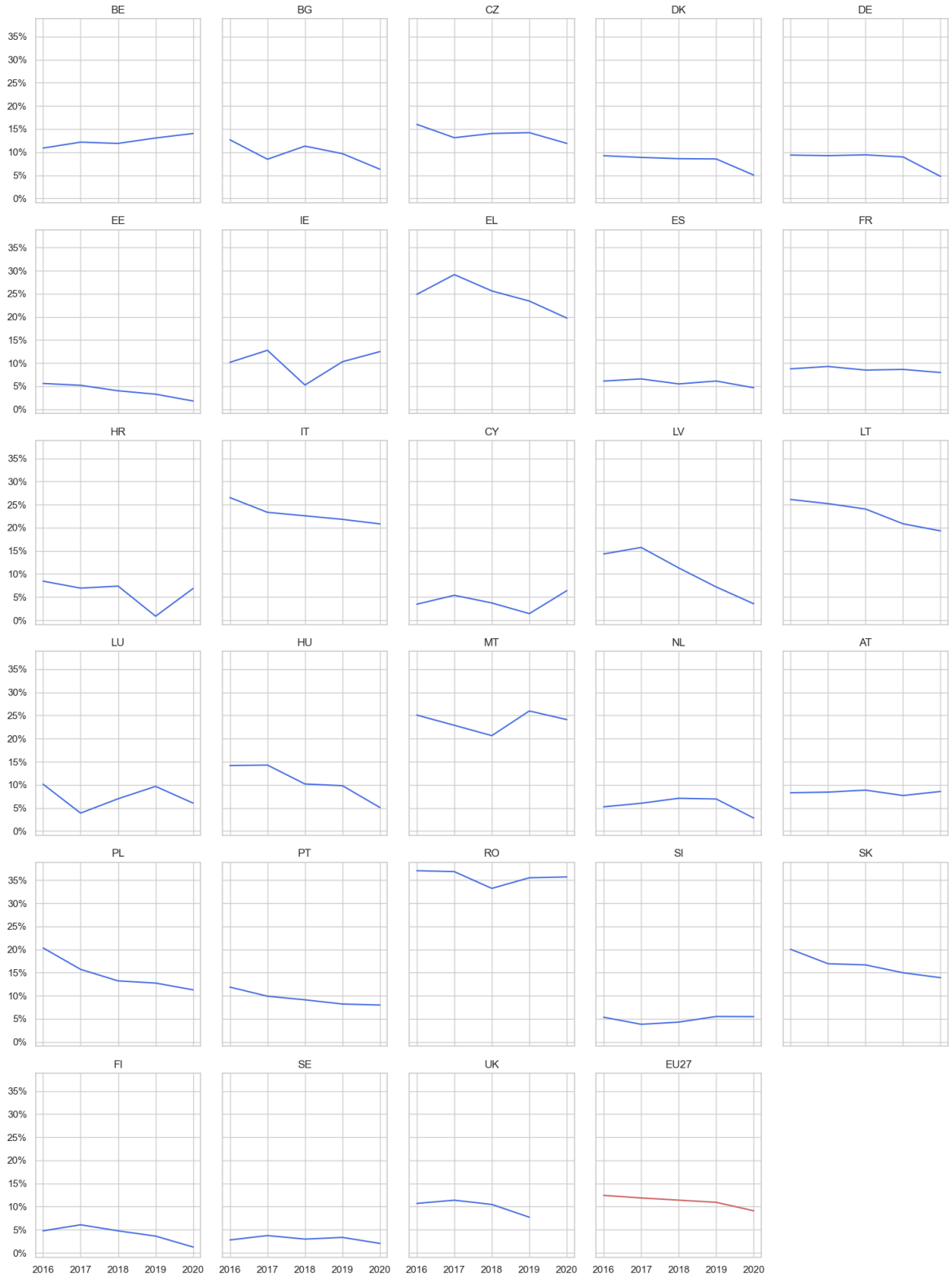
Note: The dotted lines depict the median VAT compliance gap in the EU27 in 2019 (orange) and 2020 (blue). Labels indicate the VAT compliance gap in 2020 in the respective Member State.

Figure 7: Change in the VAT compliance gap (in percentage points, 2020 vs. 2019)



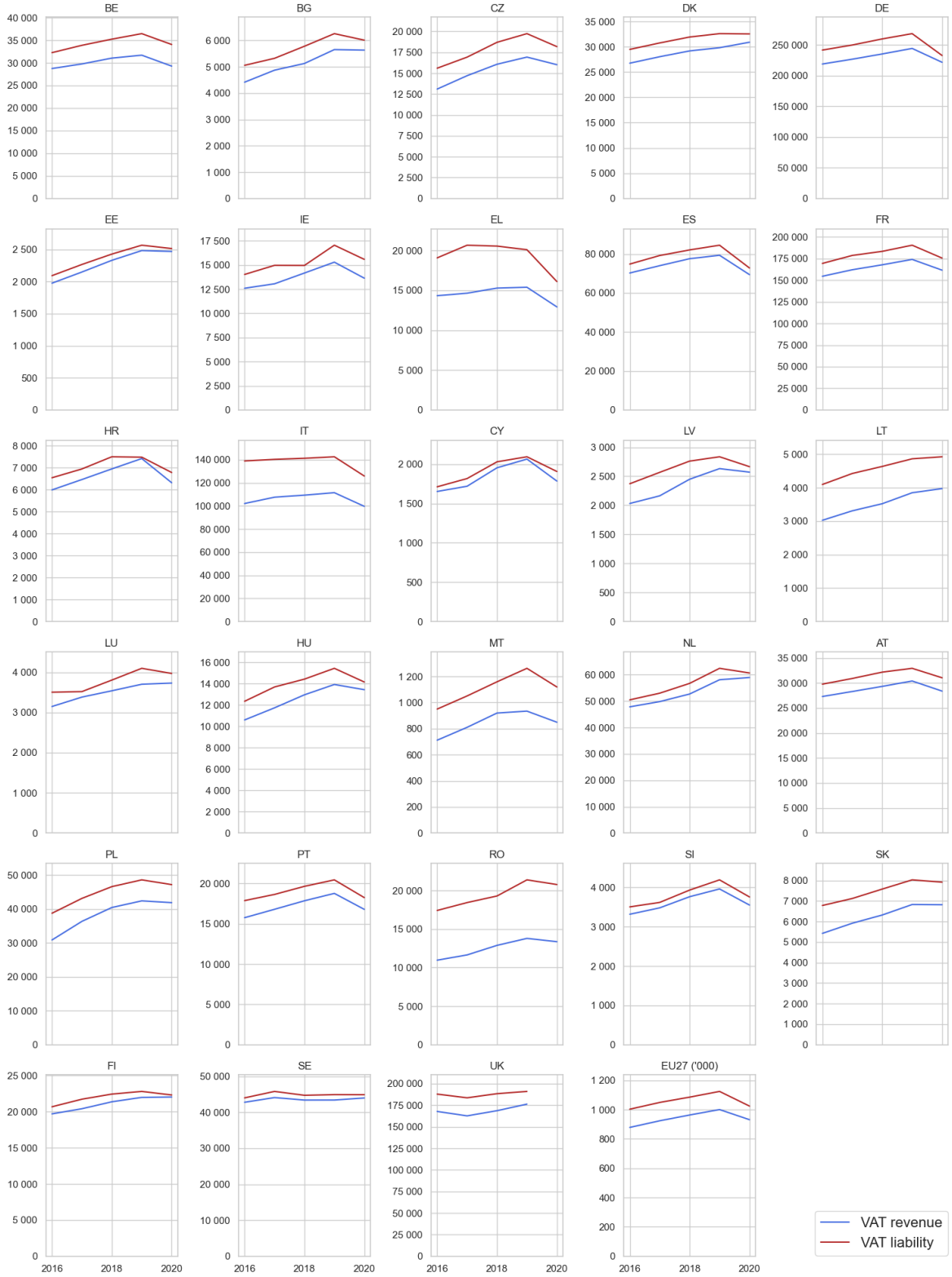
Source: own calculations, download underlying data.
Note: EU27 figure stands for the simple average.

Figure 8: VAT compliance gap in EU Member States (as % of VTTL, 2016-2020)



Source: own calculations, download underlying data.

Figure 9: VAT revenue and VTTL in EU Member States (EUR million, 2016-2020)



Source: own calculations, [download underlying data](#).

IV. VAT policy gap

For the EU27 overall, the average VAT policy gap level was slightly above 45.8 percent, which is a significant increase from previous years when it was around 44.5 percent (of the notional ideal revenue). As shown by Figure 12, this was largely caused by the increase in the public services gap – clearly a consequence of the additional measures introduced to mitigate the economic impact of the COVID-19 pandemic.[19] In nominal terms, the policy gap in 2020 amounted to EUR 1 043 billion, which, due to a decline in the overall tax base, was approximately EUR 19 billion lower than in 2019 (see Figure 11).

Of the average value of 45.8 percent, in 2020, approximately 9.9 percent can be attributed to the application of various reduced and super reduced rates. The latter share remained relatively stable compared to 2019 despite the introduction of reduced rates, among others, for services provided by the sectors affected by the pandemic and for sanitary materials. This could be related to an overall change in the structure of household expenditures and the inability to use various services often taxed at reduced rates (e.g., hospitality services). Reduced rates are least applied in Denmark (0.7 percent), Estonia (2.4 percent), and Bulgaria (2.64 percent). On the other side of the spectrum are Austria, Malta, Ireland, Italy, Poland, Portugal, Greece, and Luxembourg, with rate gaps of over 14 percent of notional ideal revenue.

The VAT exemption gap, interpreted as the share of notional ideal revenue lost due to various exemptions or maintaining some components of household final consumption outside the VAT base, was on average 35.8 percent in 2020. The Member States with the highest value of the exemption gap is Spain (46.9 percent); this is due to the application of other than VAT indirect taxes in the Canary Islands, Ceuta, and Melilla. The lowest value of the exemption gap was observed in Malta (15.9 percent). The largest part of the exemption gap is composed of exemptions on services that cannot be taxed in principle, i.e., the provision of public goods and imputed rents (19.12 percent and 8.20 percent, respectively). The remaining amount of the exemption gap is financial services (2.01 percent) and the actionable exemption gap, which is 6.52 percent, on average.[20] The actionable policy gap – a combination of the rate gap and the actionable exemption gap – was 16.44 percent on average. This figure shows the combined reduction of revenue due to reduced rates (9.92 percent) and exemptions (6.52 percent) which could possibly be removed.

Overall, collection efficiency ranged from 38.10 percent in Italy up to 73.84 percent in Estonia and amounted to 55.53 percent of net final consumption on average. The high efficiency of VAT collection in Estonia is a combined effect of having one of the lowest policy gaps and compliance gaps in the EU.

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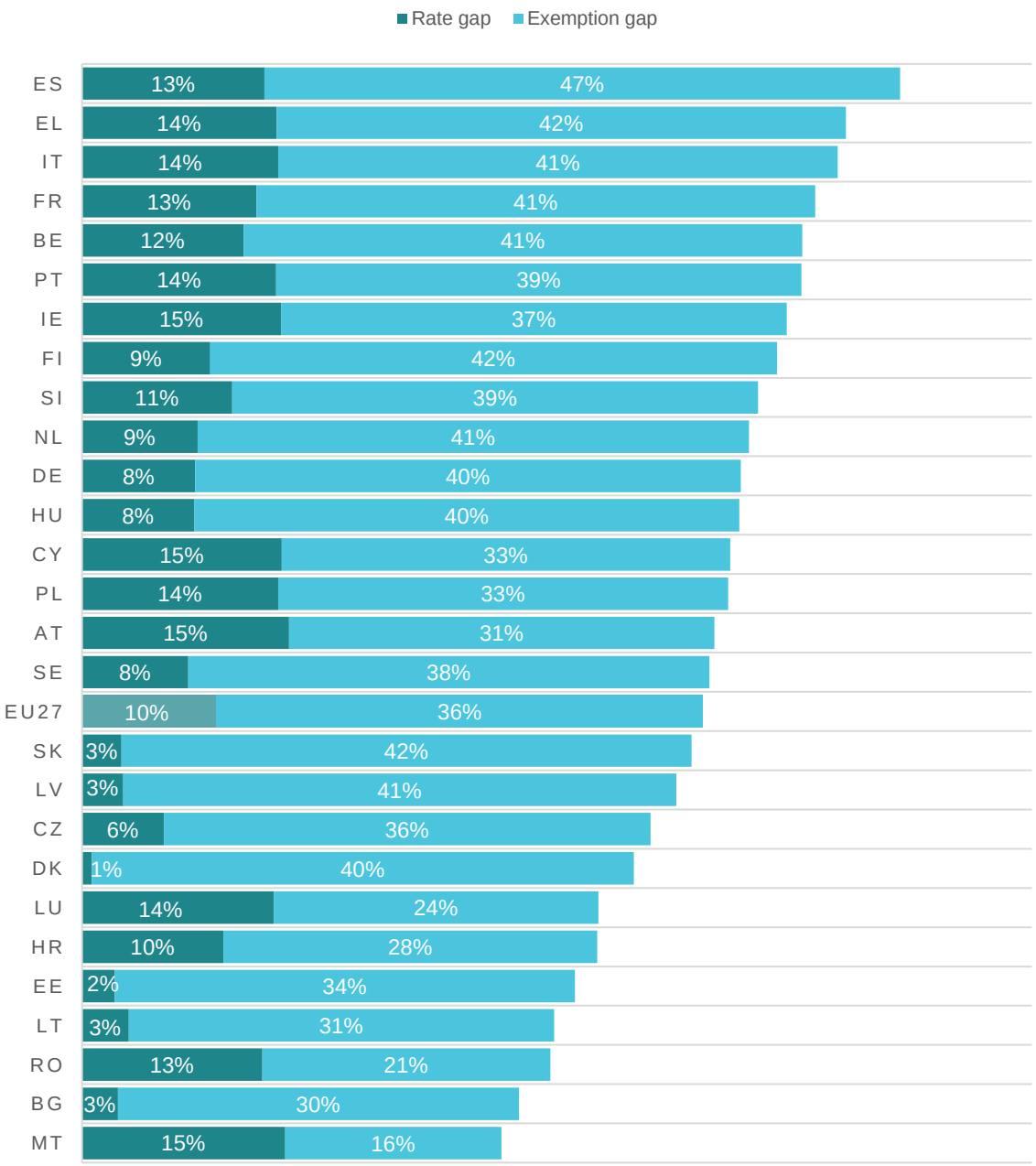
[19] See e.g., https://taxation-customs.ec.europa.eu/covid-19-taxud-response/covid-19-waiving-vat-and-customs-duties-vital-medical-equipment_en.

[20] In some cases, e.g., the financial services gap in Cyprus, negative gaps were observed. Although theoretically possible, this may also result from a measurement error. The exemption gap and its components could become negative if the respective goods and services are used mostly as intermediate inputs or in periods when input VAT exceeds potential output VAT, like periods of increased investment or when losses are incurred. The measurement error may result from difficulties in decomposing the components of the base, such as sectoral GFCF and net adjustments, and inaccuracies in the underlying data and parameters.

Figure 10: VAT policy gap (as % of notional ideal revenue, 2020)



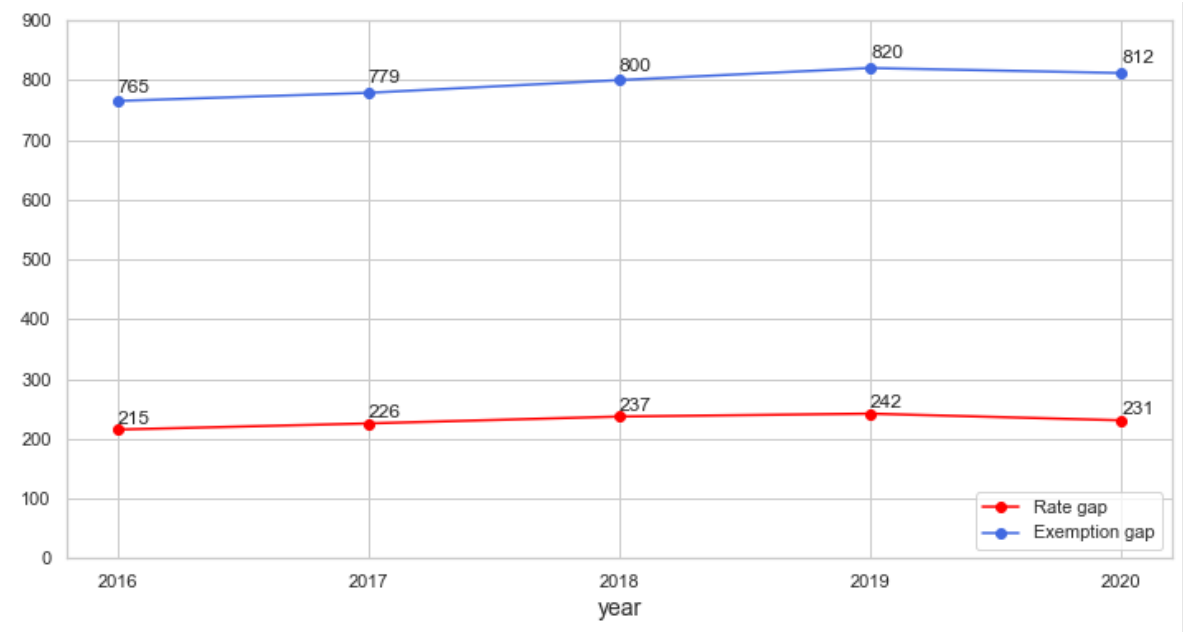
Source: own calculations, download underlying data.

Table 8: Policy gap, rate gap, exemption gap, and actionable gaps (2020)

	A	B	C	D	E	F	G	H	I
	Policy gap (%)	Rate gap (%)	Exemption gap (%)	o/w imputed rents (%)	o/w public services (%)	o/w financial services (%)	Actionable exemption gap (C - D - E - F) (%)	Actionable policy gap (G + B) (%)	C-efficiency (%)
BE	53.08	11.90	41.18	7.45	26.43	3.61	3.68	15.59	45.50
BG	32.20	2.64	29.56	9.49	16.84	1.47	1.75	4.39	69.33
CZ	41.90	6.03	35.87	9.11	18.68	2.02	6.05	12.09	59.18
DK	40.67	0.72	39.94	7.47	24.22	4.54	3.72	4.44	64.97
DE	48.54	8.36	40.18	6.88	22.36	2.42	8.52	16.87	57.66
EE	36.33	2.42	33.91	6.81	16.33	2.42	8.35	10.77	73.84
IE	51.94	14.67	37.27	12.33	23.84	0.63	0.47	15.14	47.89
EL	56.30	14.34	41.96	9.64	19.56	2.37	10.39	24.73	37.52
ES	60.30	13.44	46.86	9.81	21.34	2.44	13.26	26.70	41.18
FR	54.02	12.87	41.15	9.58	22.81	2.81	5.95	18.82	48.82
HR	37.97	10.42	27.55	7.20	14.98	2.04	3.33	13.76	65.21
IT	55.70	14.45	41.25	11.43	19.67	1.23	8.92	23.37	38.10
CY	47.76	14.72	33.04	7.15	20.95	-5.58	10.52	25.24	55.93
LV	43.80	3.04	40.76	10.27	17.05	1.89	11.56	14.59	60.62
LT	34.79	3.44	31.35	4.39	16.35	1.75	8.87	12.31	54.64
LU	38.05	14.12	23.93	7.81	-2.52	1.22	17.42	31.54	75.19
HU	48.45	8.28	40.16	9.37	17.87	2.95	9.97	18.26	57.91
MT	30.91	14.98	15.93	6.17	16.19	0.81	-7.24	7.73	59.98
NL	49.16	8.51	40.65	7.37	25.91	5.13	2.24	10.75	57.95
AT	46.61	15.27	31.34	7.90	20.26	2.60	0.58	15.85	56.91
PL	47.62	14.45	33.17	3.49	15.95	2.92	10.81	25.26	52.19
PT	53.01	14.31	38.70	8.66	20.53	2.90	6.61	20.93	47.23
RO	34.51	13.28	21.22	7.90	13.23	-0.09	0.18	13.46	47.17
SI	49.83	11.07	38.76	7.85	19.63	2.50	8.78	19.85	53.44
SK	44.92	2.91	42.01	10.56	18.39	1.97	11.09	14.00	52.43
FI	51.22	9.45	41.77	10.37	22.45	2.84	6.12	15.57	58.36
SE	46.25	7.84	38.41	4.88	26.97	2.54	4.01	11.85	60.14
EU27	**45.77**	**9.92**	**35.85**	**8.20**	**19.12**	**2.01**	**6.52**	**16.44**	**55.53**

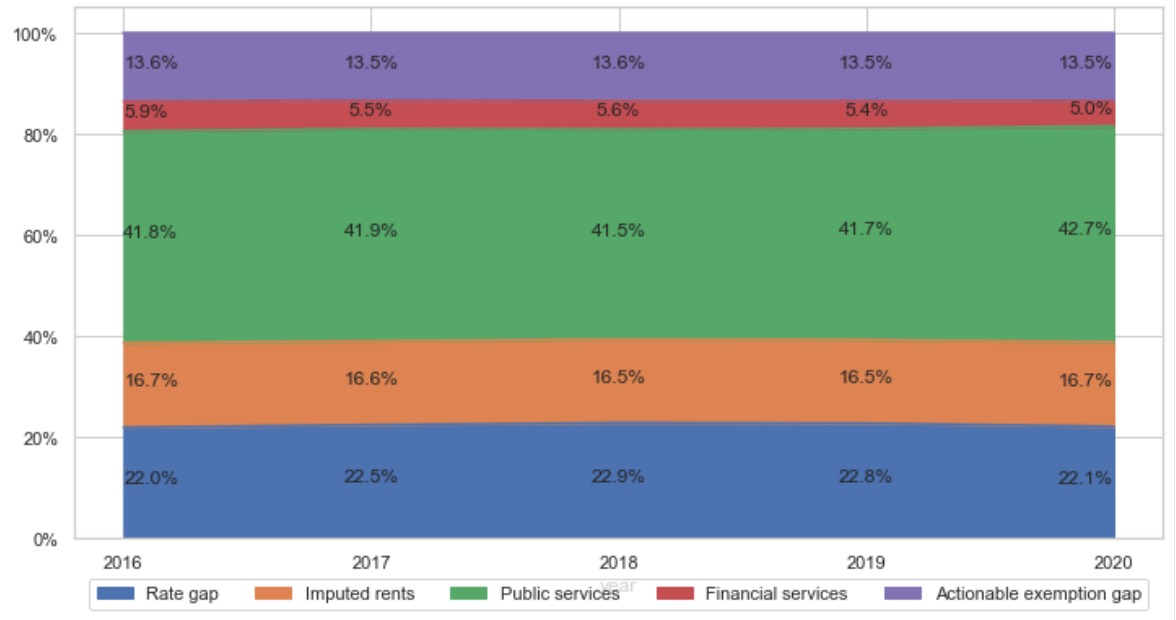
Source: own calculations, download underlying data.

Figure 11: VAT rate and exemption gap (EUR billion, 2016-2020)



Source: own calculations, download underlying data.

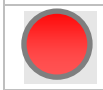
Figure 12: Decomposition of policy gap into main components (% of policy gap, 2016-2020)



Source: own calculations, download underlying data.

V. Individual country results

This section presents the VAT gap estimates for each Member State and discusses the developments that might have affected their values and dynamics. For the first time, we also present road signalling which indicates the confidence around the VAT compliance gap estimates. Three different signs are used (for a more detailed discussion and the classification criteria, see ***Assessment of the accuracy of the top-down consumption-side approach***):

	- Estimates based on relatively up-to-date information with no unexplained volatility which could signal inaccuracies.
	- Estimates based on somewhat outdated information or relatively large unexplained volatility of estimates.
	- Estimates based on some very outdated information or very large unexplained volatility of estimates.

Country	Page
Belgium	50
Bulgaria	53
Czechia	56
Denmark	59
Germany	62
Estonia	65
Ireland	68
Greece	71
Spain	74
France	77
Croatia	80
Italy	83
Cyprus	86
Latvia	89
Lithuania	92
Luxembourg	95
Hungary	98
Malta	101
Netherlands	104
Austria	107
Poland	110
Portugal	113
Romania	116
Slovenia	119
Slovakia	122
Finland	125
Sweden	128

Belgium

Highlights

- In 2020, the estimated VAT compliance gap in Belgium increased by approximately 0.9 pp up to 14.0 percent. In 2021, the gap is expected to decline rapidly, which may be caused by the inability to control for late payments from 2020 which were registered in 2021. It may also be related to strong economic headwinds: In 2020, the Belgian economy shrank by 5.7 percent in real terms. The net balances of the general government deteriorated by 7 pp of GDP as a consequence of both a decline in revenue and an increase in government expenditure.
- The increase in the VAT compliance gap in Belgium between 2019 and 2020 is largely driven by an increase in the estimated values of tax unlikely to be collected (*D.995a*). This component was removed from the reference figures to ensure higher accuracy and comparability with other EU Member States.
- The policy gap increased from 51.6 percent in 2019 to 53.1 percent in 2020, which was driven to a large extent by temporary VAT rate cuts. Among those, during the course of the year, Belgium reduced the rate applicable to restaurant and catering services as well as to selected personal protective equipment.
- As a consequence of the increase in the compliance and policy gaps, C-efficiency decreased from 47.8 to 45.5 percent, which was approximately 10 pp below the EU median.

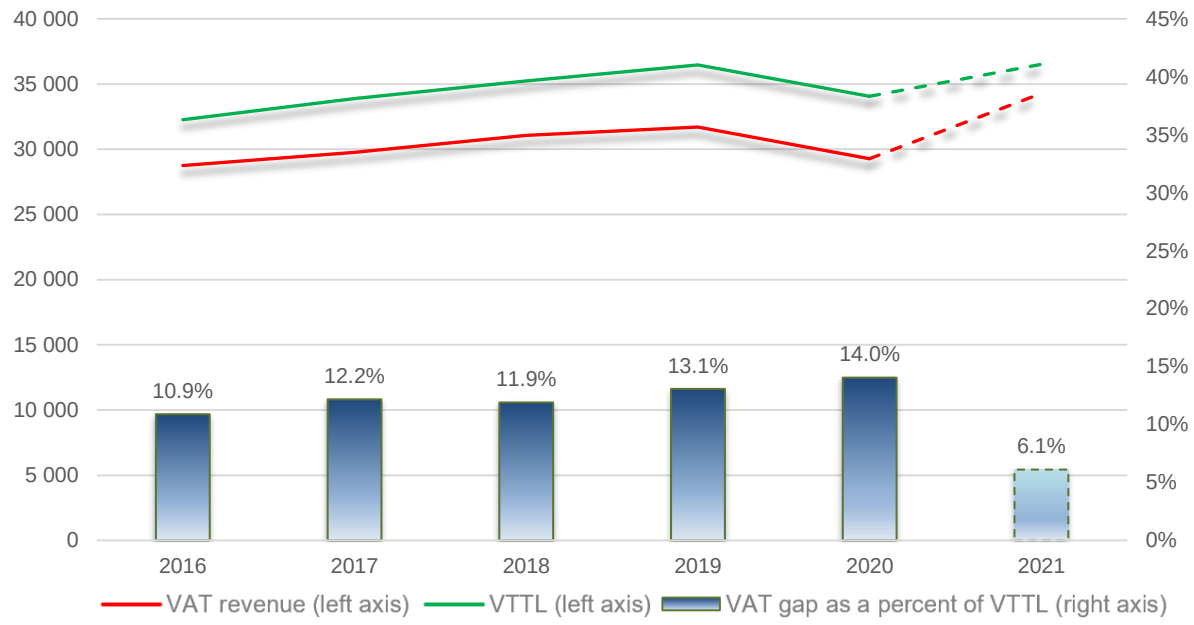
confidence in estimates:[21] 

[21] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 9: BE: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[22]

	2016	2017	2018	2019	2020	*2021*
VTTL	**32 263**	**33 887**	**35 247**	**36 468**	**34 066**	***36 515***
o/w liability on household final consumption	18 522	19 148	19 731	20 216	18 313	
o/w liability on gov. and NPISH final consumption	1 272	1 401	1 472	1 515	1 541	
o/w liability on intermediate consumption	7 017	7 331	7 715	7 985	7 832	
o/w liability on GFCF	4 808	5 319	5 653	6 016	5 748	
o/w net adjustments	644	688	676	736	632	
VAT revenue	**28 750**	**29 763**	**31 053**	**31 702**	**29 282**	***34 283***
VAT compliance gap	**3 513**	**4 124**	**4 194**	**4 766**	**4 784**	
VAT compliance gap (percent of VTTL)	**10.9%**	**12.2%**	**11.9%**	**13.1%**	**14.0%**	***6.1%***
VAT compliance gap change since 2016					**+3.2 pp**	

Figure 13: BE: VAT compliance gap, VAT revenue, and VTTL[22]



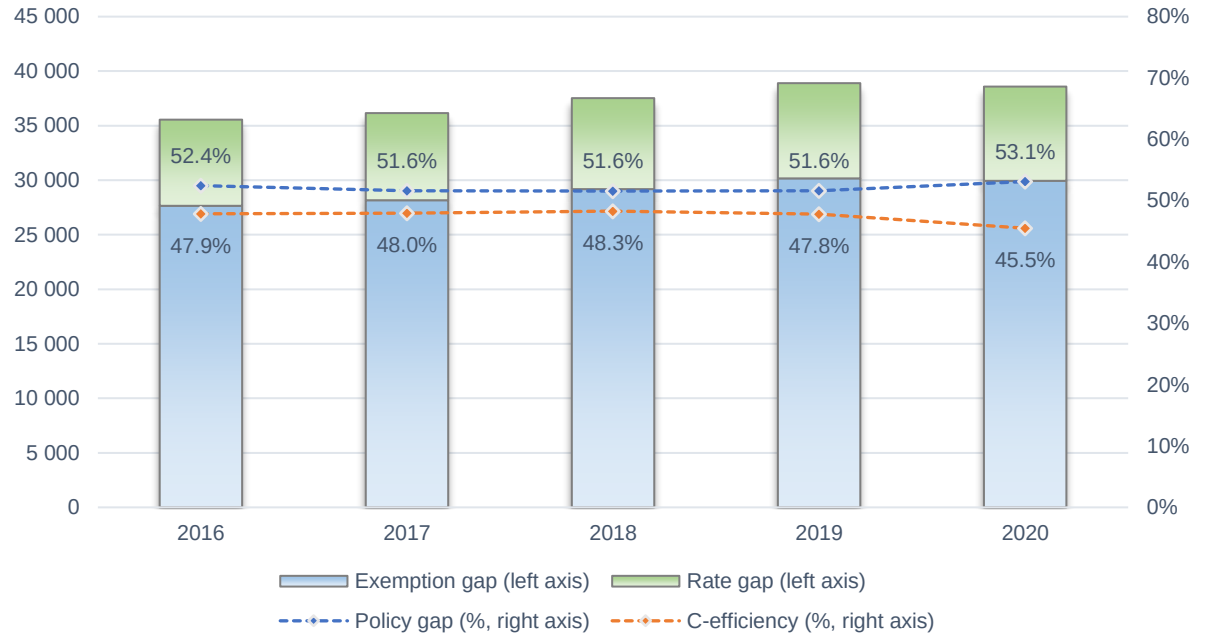
Source: own calculation, download underlying data.

[22] *The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.*

Table 10: BE: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**35 552**	**36 154**	**37 527**	**38 900**	**38 539**
Rate gap	7 900	7 990	8 343	8 732	8 641
Exemption gap	27 652	28 163	29 184	30 168	29 898
o/w imputed rents	4 987	5 140	5 308	5 431	5 412
o/w public services	17 591	17 987	18 516	19 234	19 188
o/w financial services	*2 613*	*2 714*	*2 870*	*2 913*	*2 624*
Actionable exemption gap	**2 461**	**2 322**	**2 489**	**2 590**	**2 675**
Actionable policy gap	**10 361**	**10 313**	**10 832**	**11 322**	**11 316**
C-efficiency	**47.9%**	**48.0%**	**48.3%**	**47.8%**	**45.5%**

Figure 14: BE: VAT policy gap, rate gap, and exemption gap

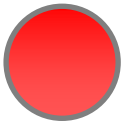


Source: own calculation, download underlying data,

Bulgaria

Highlights

- In 2020, the VTTL in Bulgaria went down by nearly 4 percent. This was the effect of a drop in the tax base of 0.9 percent (of the VTTL in nominal terms) and a decline in the effective rate. While the VTTL declined, the revenue remained nearly unchanged, which was caused by an increase in VAT compliance. More specifically, the VAT compliance gap went down by 3.4 pp and amounted to 6.3 percent of the VTTL.
- The increase in VAT compliance occurred in parallel with a decline of 16.6 percent in the bankruptcy rate and an increase of approximately 13 percent in the value of electronic transactions.
- During the course of 2020, Bulgaria extended the scope of the reduced VAT rate to cover, among others, electronic and paper books, restaurant and catering services, the use of sports facilities, and tour operators' services. Despite introducing such measures, the rate gap dropped due to a decline in the household consumption of reduced-rated services. Yet, the overall policy gap increased both in relative and nominal terms, which was mostly driven by the increased value of exempt public expenditure.
- The policy gap in Bulgaria remains one of the lowest in the EU due to the relatively narrow application of reduced rates and the low share of the consumption of exempt and non-taxable goods and services.
- The estimates for Bulgaria were derived using rescaled SUT from 2014. Outdated information on the structure of intermediate consumption has likely impacted the accuracy of the presented estimates.

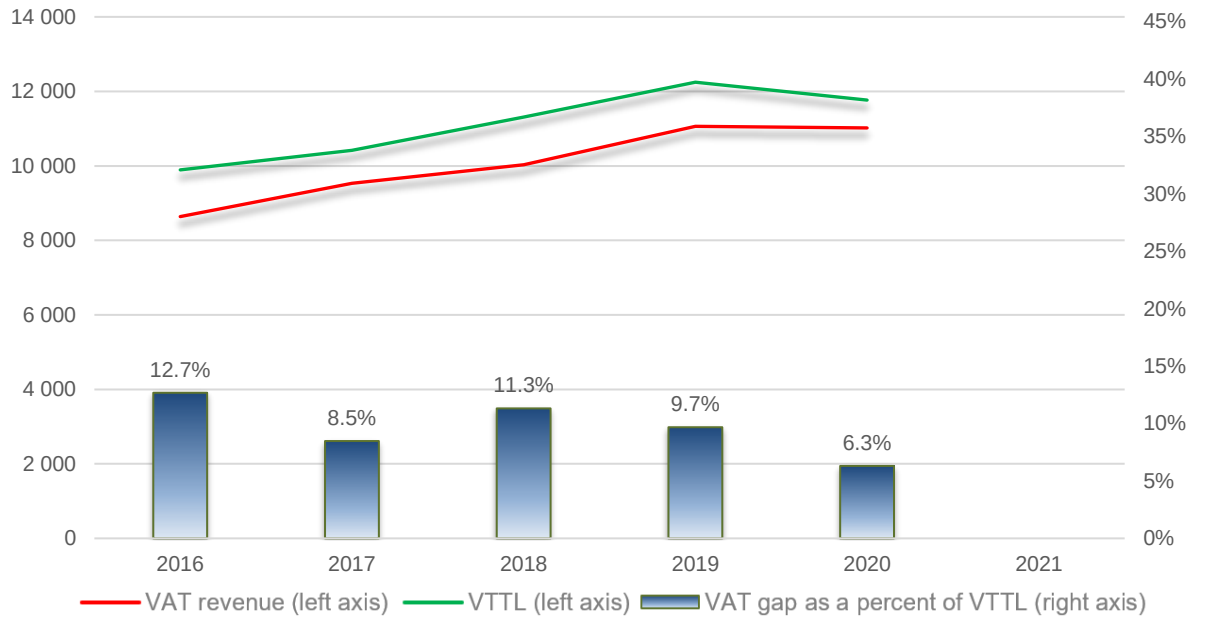
confidence in estimates:[23] 

[23] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 11: BG: VAT compliance gaps, VAT receipts, composition of VTTL (BGN million, 2016-2021)[24]

	2016	2017	2018	2019	2020	*2021*
VTTL	**9 892**	**10 413**	**11 310**	**12 246**	**11 763**	*X*
o/w liability on household final consumption	7 304	7 799	8 260	8 879	8 320	
o/w liability on gov. and NPISH final consumption	284	298	341	383	450	
o/w liability on intermediate consumption	1 145	1 261	1 430	1 528	1 450	
o/w liability on GFCF	1 143	1 041	1 254	1 439	1 492	
o/w net adjustments	16	14	25	17	50	
VAT revenue	**8 638**	**9 531**	**10 030**	**11 061**	**11 021**	*X*
VAT compliance gap	**1 254**	**882**	**1 280**	**1 185**	**742**	*X*
VAT compliance gap (percent of VTTL)	**12.7%**	**8.5%**	**11.3%**	**9.7%**	**6.3%**	*X*
VAT compliance gap change since 2016					**-6.4 pp**	*X*

Figure 15: BG: VAT compliance gap, VAT revenue, and VTTL[24]



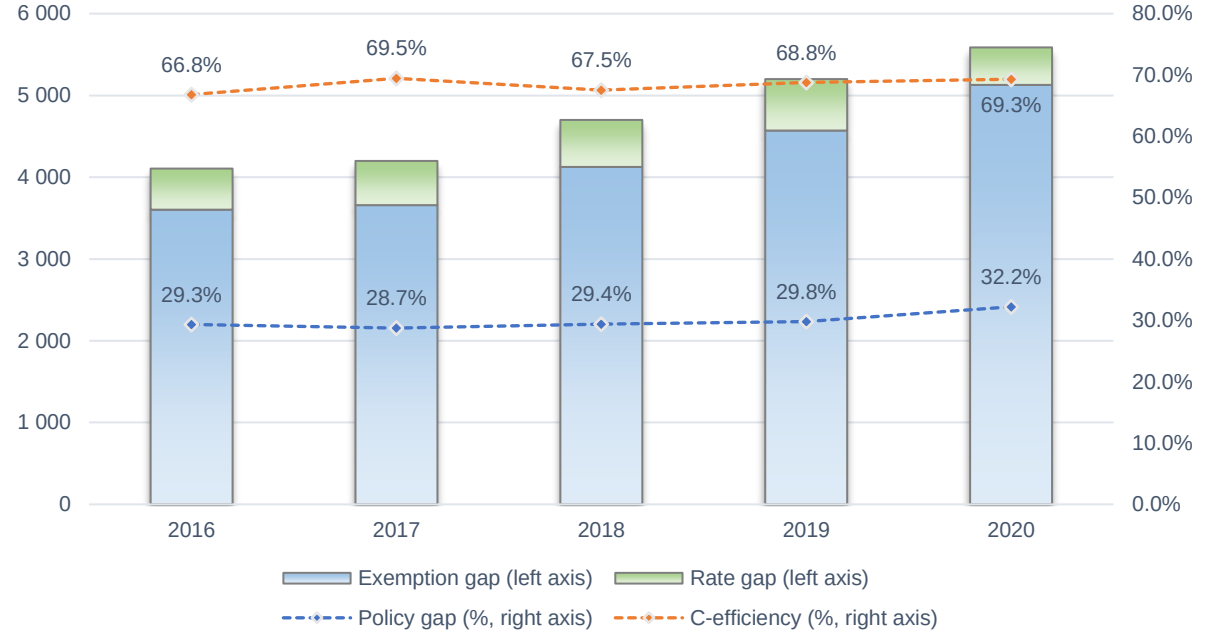
Source: own calculation, download underlying data.

[24] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 12: BG: VAT policy gap and their components (BGN million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**4 106**	**4 199**	**4 701**	**5 200**	**5 587**
Rate gap	502	540	575	629	458
Exemption gap	3 603	3 659	4 126	4 571	5 129
o/w imputed rents	*1 357*	*1 474*	*1 597*	*1 715*	*1 647*
o/w public services	*1 947*	*2 083*	*2 260*	*2 482*	*2 922*
o/w financial services	*265*	*294*	*282*	*294*	*256*
Actionable exemption gap	**34**	**- 192**	**- 14**	**80**	**304**
Actionable policy gap	**536**	**348**	**561**	**709**	**762**
C-efficiency	**66.8%**	**69.5%**	**67.5%**	**68.8%**	**69.3%**

Figure 16: BG: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Czechia

Highlights

- In 2020 and 2021, the estimated VAT compliance gap followed a consistently downward trend. This indicates that the problem of accounting for deferrals in VAT revenue figures did not markedly affect the accuracy of the VAT compliance gap estimates.
- The decline of 2.3 pp of the VAT compliance gap in 2020 (down to 11.9 percent of the VTTL) is a continuation of a longer-term downward trend. In recent years, Czechia extended the application of the reverse charge mechanism to the domestic supply of natural gas and electricity, construction, scrap, computer chips, mobile phones, game consoles, laptops and tablets, some commodities, and CO2 emission certificates. Yet, in contrast to other tax systems in the region, Czechia did not implement advanced electronic reporting obligations.
- In 2020, the VTTL dropped by over 5 percent, which was caused primarily by the decline in the effective rate. The decline in the effective rate and the increase in the policy gap of 2.6 pp was an effect of the increased share of expenditure on exempt services. At the same time, the rate gap dropped despite the downward reclassification of the VAT rate applicable to the supplies of drinking water and the draining of sewage water, catering services, draught beer, cleaning, care for elderly people and children, and others.
- Revenue was amended to more accurately reflect the tax accrued to the taxation period on the basis of information received from the tax authorities.

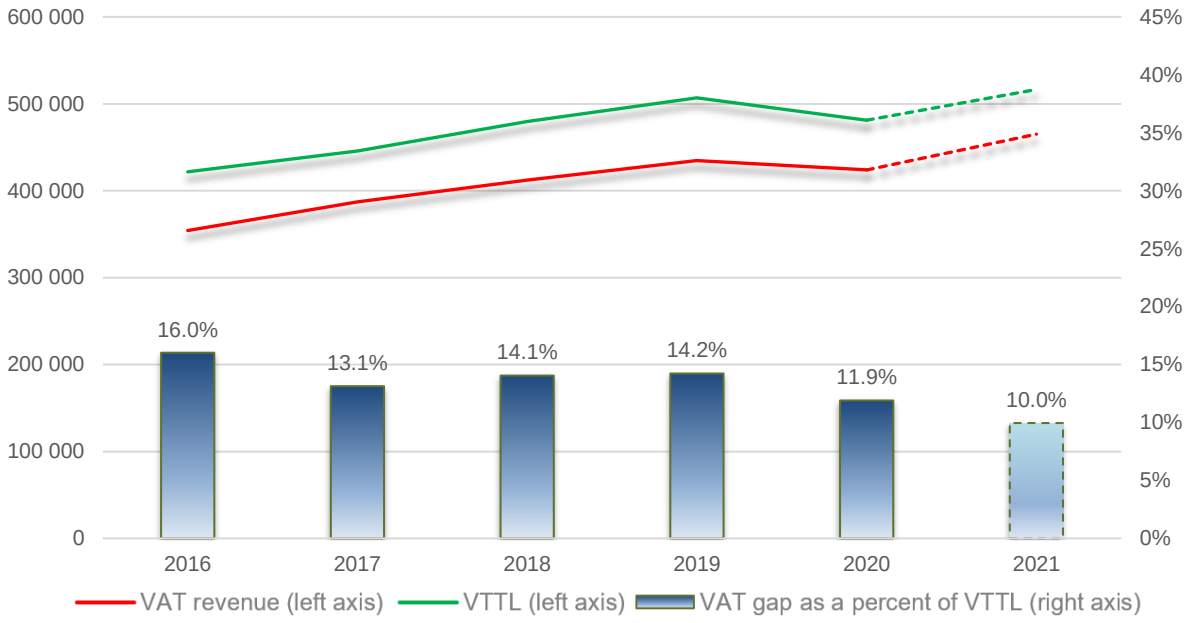
confidence in estimates:[25] 

[25] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 13: CZ: VAT compliance gaps, VAT receipts, composition of VTTL (CZK million, 2016-2021)[26]

	2016	2017	2018	2019	2020	*2021*
VTTL	**421 750**	**445 597**	**479 666**	**506 722**	**481 126**	***516 443***
o/w liability on household final consumption	267 630	280 660	293 848	304 328	277 559	
o/w liability on gov. and NPISH final consumption	21 601	20 740	22 969	25 006	26 224	
o/w liability on intermediate consumption	79 469	84 390	89 868	95 292	95 378	
o/w liability on GFCF	53 287	59 904	71 452	80 403	82 140	
o/w net adjustments	-238	-97	1 529	1 693	-176	
VAT revenue	**354 181**	**387 074**	**412 271**	**434 627**	**423 868**	***465 045***
VAT compliance gap	**67 569**	**58 523**	**67 395**	**72 095**	**57 258**	
VAT compliance gap (percent of VTTL)	**16.0%**	**13.1%**	**14.1%**	**14.2%**	**11.9%**	***10.0%***
VAT compliance gap change since 2016					**-4.1 pp**	

Figure 17: CZ: VAT compliance gap, VAT revenue, and VTTL[26]



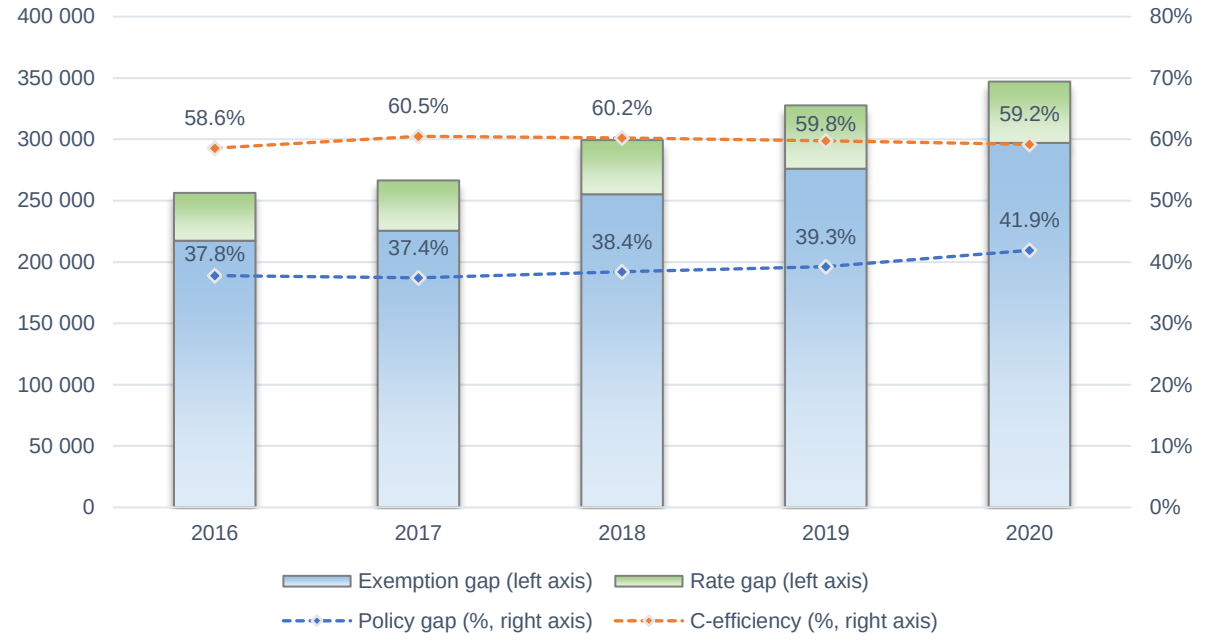
Source: own calculation, download underlying data.

[26] The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.

Table 14: CZ: VAT policy gap and their components (CZK million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**256 331**	**266 493**	**299 367**	**327 654**	**347 040**
Rate gap	38 999	41 006	44 140	51 625	49 966
Exemption gap	217 332	225 487	255 226	276 029	297 074
o/w imputed rents	*56 493*	*59 790*	*67 248*	*72 379*	*75 469*
o/w public services	*112 858*	*120 302*	*128 212*	*139 918*	*154 731*
o/w financial services	*15 339*	*14 900*	*14 342*	*15 196*	*16 752*
Actionable exemption gap	**32 642**	**30 495**	**45 424**	**48 535**	**50 122**
Actionable policy gap	**71 641**	**71 501**	**89 565**	**100 160**	**100 088**
C-efficiency	**58.6%**	**60.5%**	**60.2%**	**59.8%**	**59.2%**

Figure 18: CZ: VAT policy gap, rate gap, and exemption gap



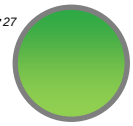
Source: own calculation, download underlying data.

Denmark

Highlights

- After a period of stability between 2016 and 2019, the VAT compliance gap went down in 2020 by 3.5 pp. It reached 5 percent in that year, considerably below the EU median (of 6.9 percent). For 2021, the VAT compliance gap is expected to grow again and reach 5.7 percent of the VTTL. Both 2020 and 2021 estimates are a clear deviation from the comparably stable estimates for the VAT compliance gap between 2016 and 2019.
- The Danish economy was relatively mildly affected by the COVID-19 pandemic in 2020. In real terms, GDP declined by 2 percent. The general government deficit accounted for 0.2 percent of GDP, which was the lowest share in the EU27. A relatively good macroeconomic situation, support measures in place, and the resulting significant decline in the bankruptcy rate of 33.3 percent might have contributed to the upward shift in VAT compliance.
- The VAT policy gap slightly increased in 2020 (by 0.6 pp compared 2019) due to the hike in the public services gap. The rate gap in Denmark slightly declined and remains one of the lowest in the EU. It primarily consists of zero-rated international transport services.
- Thanks to increased compliance in 2020, C-efficiency reached 65 percent in that year, which is the fifth highest value in the EU.

confidence in estimates:[27]

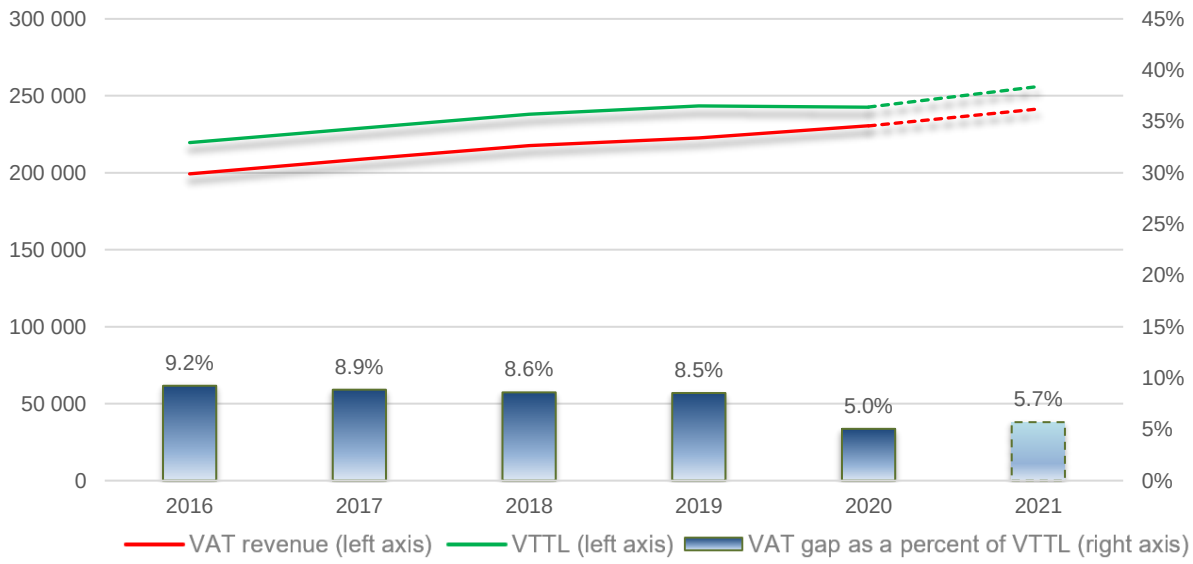


[27] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 15: DK: VAT compliance gaps, VAT receipts, composition of VTTL (DKK million, 2016-2021)[28]

	2016	2017	2018	2019	2020	*2021*
VTTL	**219 611**	**228 932**	**238 108**	**243 522**	**242 716**	***256 066***
o/w liability on household final consumption	128 717	134 280	140 388	144 003	139 713	
o/w liability on gov. and NPISH final consumption	5 114	5 309	5 301	5 363	5 533	
o/w liability on intermediate consumption	51 615	53 627	55 374	56 605	57 681	
o/w liability on GFCF	28 498	29 939	31 490	31 761	33 512	
o/w net adjustments	5 668	5 776	5 556	5 791	6 276	
VAT revenue	**199 306**	**208 643**	**217 627**	**222 730**	**230 467**	***241 476***
VAT compliance gap	**20 305**	**20 289**	**20 481**	**20 792**	**12 249**	
VAT compliance gap (percent of VTTL)	**9.2%**	**8.9%**	**8.6%**	**8.5%**	**5.0%**	***5.7%***
VAT compliance gap change since 2016					**-4.2 pp**	

Figure 19: DK: VAT compliance gap, VAT revenue, and VTTL[28]



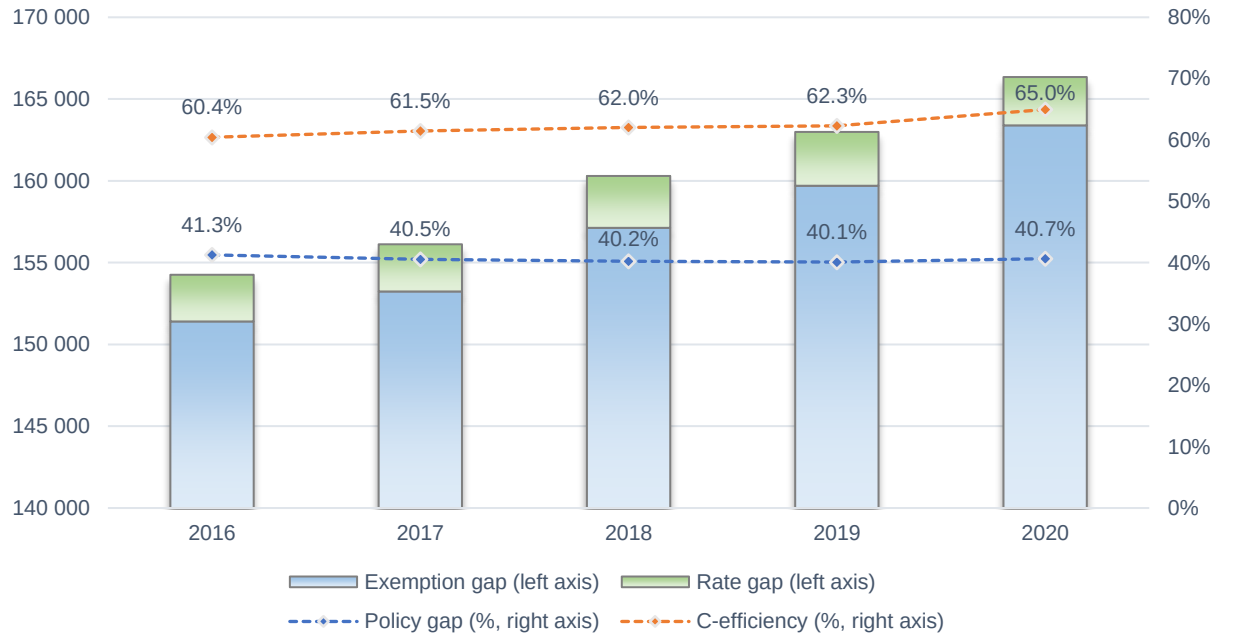
Source: own calculation, download underlying data.

[28] *The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.*

Table 16: DK: VAT policy gap and their components (DKK million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**154 260**	**156 122**	**160 299**	**162 991**	**166 348**
Rate gap	2 853	2 884	3 171	3 289	2 955
Exemption gap	151 406	153 238	157 129	159 702	163 393
o/w imputed rents	*27 889*	*28 328*	*29 578*	*30 022*	*30 567*
o/w public services	*92 557*	*93 917*	*95 644*	*97 255*	*99 067*
o/w financial services	*18 241*	*18 818*	*18 814*	*18 693*	*18 561*
Actionable exemption gap	**12 720**	**12 175**	**13 093**	**13 732**	**15 199**
Actionable policy gap	**15 573**	**15 059**	**16 264**	**17 021**	**18 153**
C-efficiency	**60.4%**	**61.5%**	**62.0%**	**62.3%**	**65.0%**

Figure 20: DK: VAT policy gap, rate gap, and exemption gap



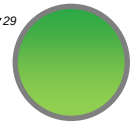
Source: own calculation, download underlying data.

Germany

Highlights

- After a period of stability between 2016 and 2019, the gap went down in 2020 by 4.2 pp (down to 4.8 percent of the VTTL). A supporting factor for the increase in compliance was a significant drop in the VAT burden. Due to a decline in the statutory standard and reduced rates (from 19 to 16 and from 7 to 5 percent, respectively), the effective rate went down by nearly 13 percent. As a result of the decline in the tax burden and other support measures, the bankruptcy rate fell by 15.5 percent, likely reducing forgone VAT revenue.
- The policy gap went up in 2020 from 44 to 48.5 percent of the notional ideal revenue. This was driven largely by the rate gap, as due to the relatively larger relative decline of the statutory reduced rate, the rate gap markedly increased.
- The increase in the policy gap was offset by the decrease in the compliance gap, leaving C-efficiency in 2020 broadly unchanged.
- Due to significant changes in the rate structure during the year, i.e., a temporary decrease of both the standard and reduced rates, quarterly household consumption data was used to increase the accuracy of the estimates.

confidence in estimates:[29]

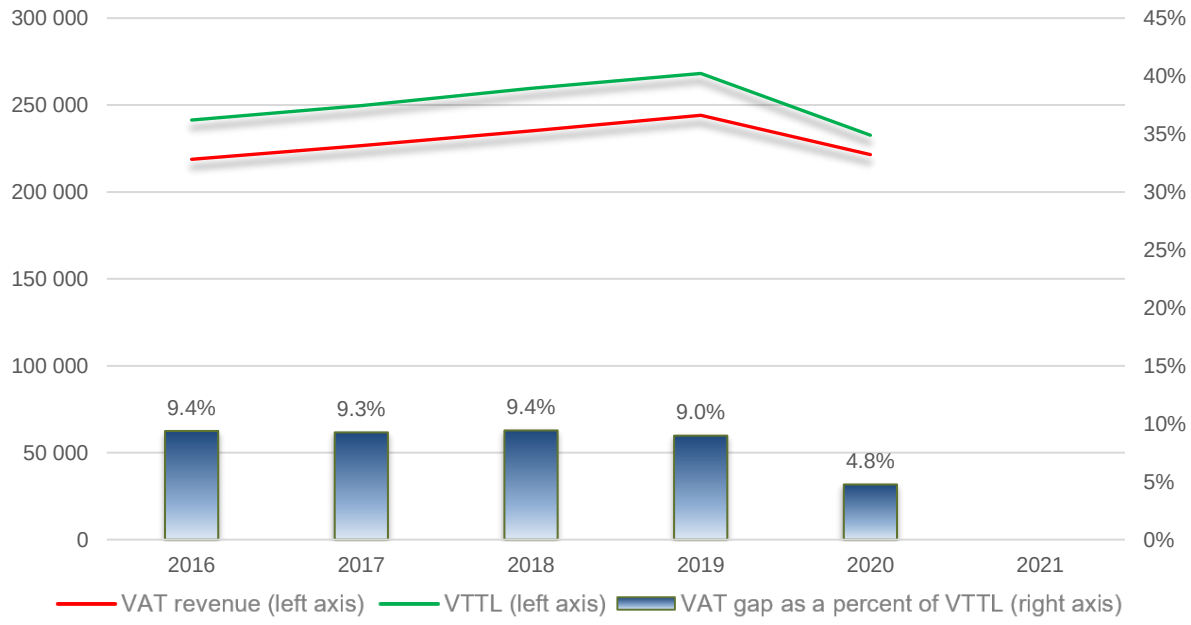


[29] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 17: DE: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[30]

	2016	2017	2018	2019	2020	*2021*
VTTL	**241 411**	**249 693**	**259 592**	**268 176**	**232 638**	*X*
o/w liability on household final consumption	145 894	149 768	153 440	157 588	130 084	
o/w liability on gov. and NPISH final consumption	6 825	6 924	7 208	7 580	7 312	
o/w liability on intermediate consumption	47 417	49 274	51 935	54 247	50 938	
o/w liability on GFCF	39 483	41 422	44 735	46 612	42 714	
o/w net adjustments	1 791	2 304	2 273	2 148	1 590	
VAT revenue	**218 779**	**226 582**	**235 130**	**244 111**	**221 562**	*X*
VAT compliance gap	**22 632**	**23 111**	**24 462**	**24 065**	**11 076**	*X*
VAT compliance gap (percent of VTTL)	**9.4%**	**9.3%**	**9.4%**	**9.0%**	**4.8%**	*X*
VAT compliance gap change since 2016					**-4.6 pp**	*X*

Figure 21: DE: VAT compliance gap, VAT revenue, and VTTL[30]



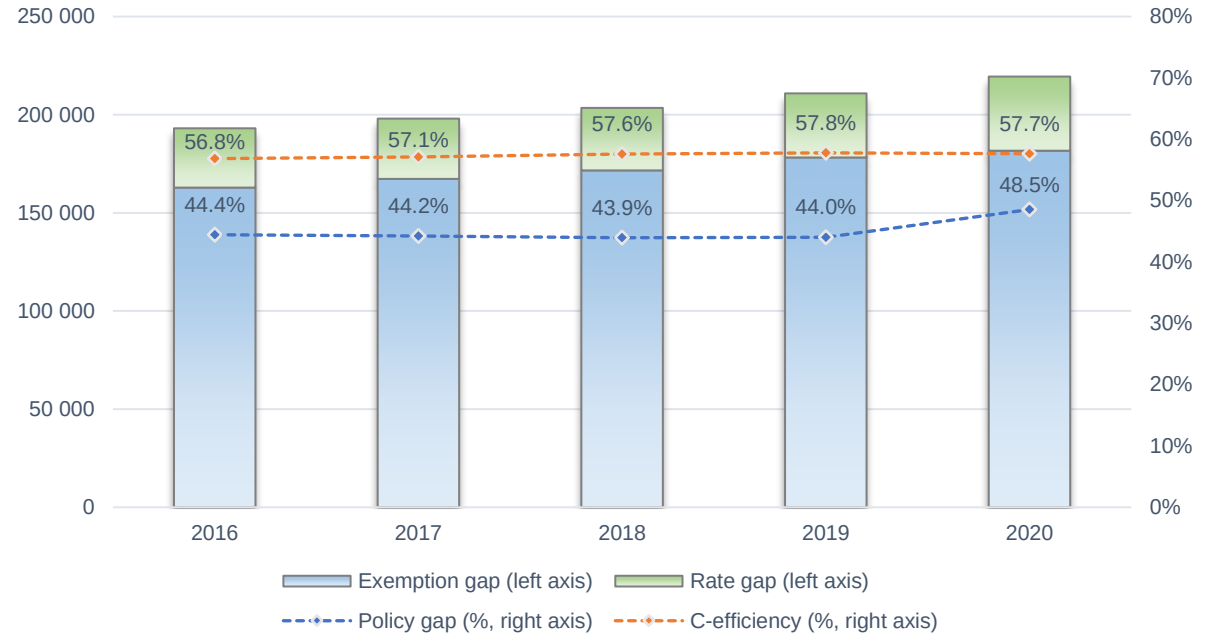
Source: own calculation, download underlying data.

[30] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 18: DE: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**193 065**	**198 019**	**203 464**	**210 866**	**219 435**
Rate gap	30 190	30 717	31 833	32 647	37 773
Exemption gap	162 875	167 302	171 632	178 218	181 662
o/w imputed rents	*29 458*	*30 355*	*31 327*	*32 200*	*31 108*
o/w public services	*92 928*	*97 003*	*99 248*	*103 744*	*101 100*
o/w financial services	*11 944*	*11 691*	*12 063*	*11 941*	*10 949*
Actionable exemption gap	**28 545**	**28 253**	**28 994**	**30 334**	**38 505**
Actionable policy gap	**58 734**	**58 970**	**60 826**	**62 981**	**76 278**
C-efficiency	**56.8%**	**57.1%**	**57.6%**	**57.8%**	**57.7%**

Figure 22: DE: VAT policy gap, rate gap, and exemption gap

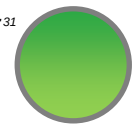


Source: own calculation, download underlying data.

Estonia

Highlights

- In 2020, Estonia had to face economic headwinds. Yet, the decline in economic activity was milder than in other Member States, with GDP falling by 3 percent in real terms. As the macroeconomic and policy situation was more stable than in many other Member States, the rate of bankruptcies, the share of electronic transactions, and the structure of household expenditure were also relatively stable.
- In 2020, the VAT compliance gap reached 1.8 percent of the VTTL, i.e., the second lowest value in the EU. The drop of 1.5 pp was a continuation of the monotonous downward path observed in the entire period of 2016-2020. Overall, in five years' time, the VAT compliance gap dropped by nearly 4 pp.
- Despite an increase in the policy gap caused by increased government expenditure, C-efficiency went up in 2020 and remains one of the highest in the EU.
- VAT revenue in 2020 for Estonia was adjusted for deferrals of approximately EUR 30 million to align the tax base and revenue figures.

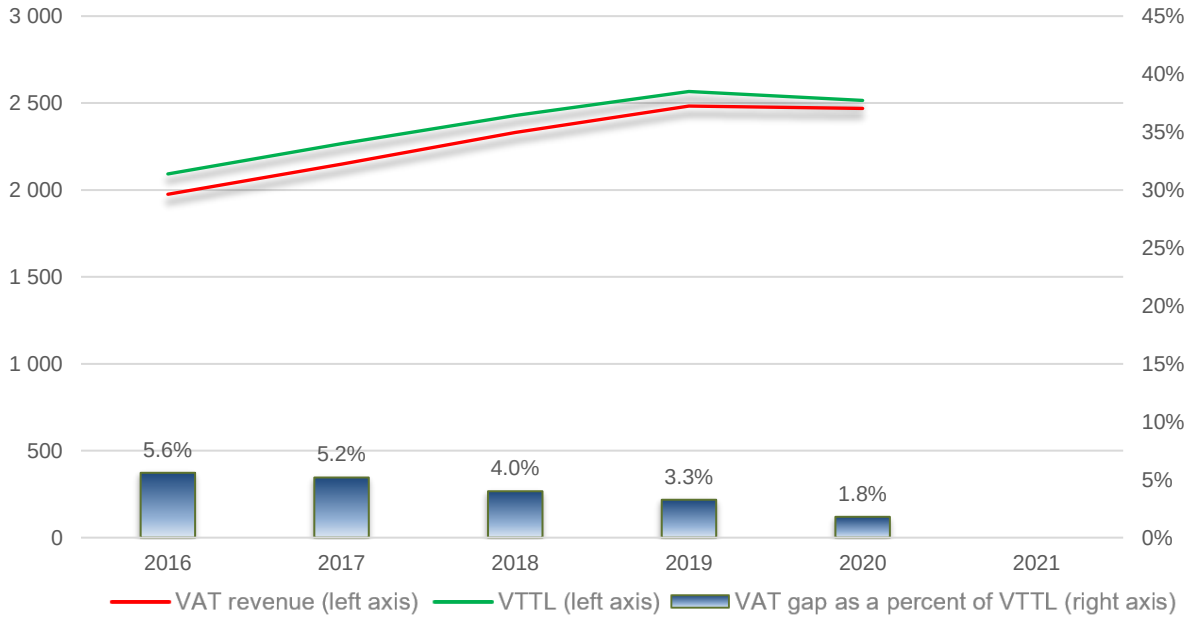
confidence in estimates:[31] 

[31] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 19: EE: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[32]

	2016	2017	2018	2019	2020	*2021*
VTTL	**2 092**	**2 266**	**2 428**	**2 566**	**2 514**	*X*
o/w liability on household final consumption	1 437	1 525	1 628	1 702	1 615	
o/w liability on gov. and NPISH final consumption	64	68	76	82	87	
o/w liability on intermediate consumption	263	281	302	337	321	
o/w liability on GFCF	318	381	420	442	488	
o/w net adjustments	11	12	3	4	3	
VAT revenue	**1 975**	**2 149**	**2 331**	**2 483**	**2 469**	*X*
VAT compliance gap	**117**	**118**	**97**	**84**	**45**	*X*
VAT compliance gap (percent of VTTL)	**5.6%**	**5.2%**	**4.0%**	**3.3%**	**1.8%**	*X*
VAT compliance gap change since 2016					**-3.8 pp**	*X*

Figure 23: EE: VAT compliance gap, VAT revenue, and VTTL[32]



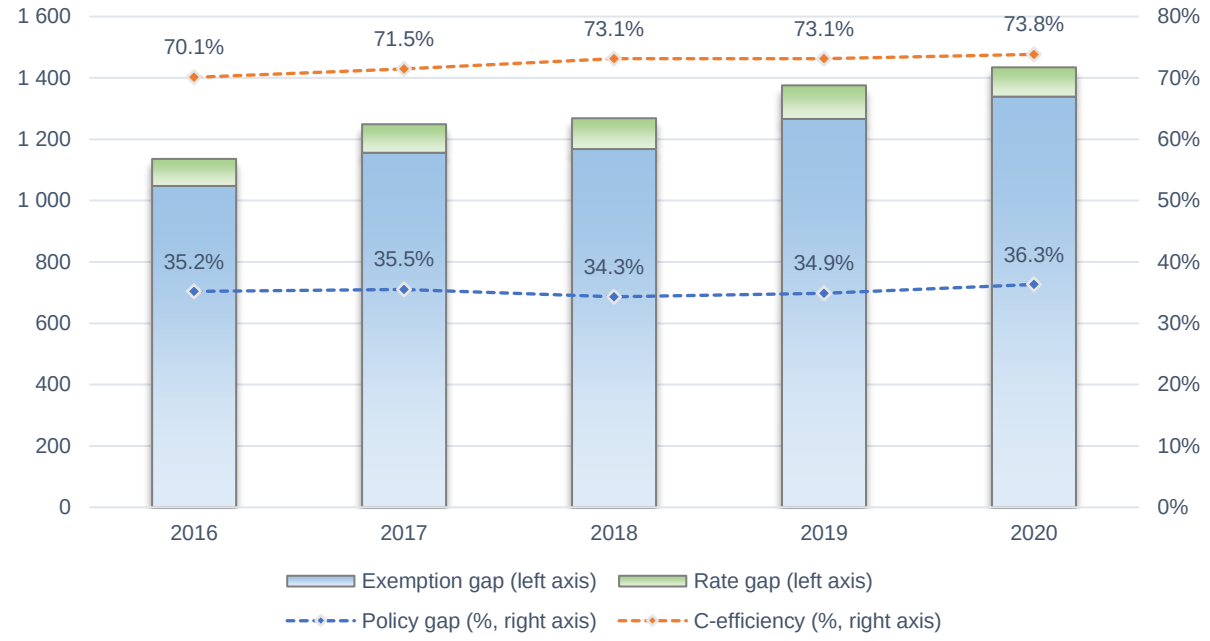
Source: own calculation, download underlying data.

[32] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 20: EE: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**1 136**	**1 249**	**1 268**	**1 376**	**1 434**
Rate gap	88	93	100	110	95
Exemption gap	1 048	1 156	1 168	1 266	1 339
o/w imputed rents	*228*	*241*	*253*	*275*	*269*
o/w public services	*516*	*528*	*531*	*596*	*645*
o/w financial services	*74*	*82*	*89*	*98*	*96*
Actionable exemption gap	**230**	**304**	**295**	**297**	**330**
Actionable policy gap	**318**	**397**	**396**	**407**	**425**
C-efficiency	**70.1%**	**71.5%**	**73.1%**	**73.1%**	**73.8%**

Figure 24: EE: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Ireland

Highlights

- In 2020, the VAT compliance gap increased by 2.2 pp and accounted for 12.5 percent of the VTTL. In 2021, the gap is expected to decline to 9 percent of the VTTL. These fluctuations are driven by the volatility of revenue figures. Despite the adjustment of 2020 revenue for deferrals of over EUR 1 billion to align the tax base and revenue figures, the estimated accrual revenue in 2020 dropped by over 10 percent. The large increase in the revenue for 2021 may indicate that the value of deferred tax payments was larger than shown by underlying data.
- The average VAT compliance gap in 2020 increased compared to the values estimated for 2018 and 2019. Such an increase might seem unexpected as the economic conditions in Ireland were the most favourable in the EU. In real terms, in 2020, the GDP of Ireland increased by over 6 percent. The nature of this growth is, however, specific. Ireland is home to several large multinationals that experienced significant economic growth during the pandemic. Their exports – especially for information and telecommunications companies and pharmaceuticals – have been a driving force behind Ireland's economic expansion in 2020 and 2021.
- At the same time, the VAT burden increased. From November 2020, the Irish VAT rate applied to certain goods and services, mainly in the tourism and hospitality sectors, decreased from 13.5 to 9 percent. As a result of this as well as changes in expenditure structure, the policy gap increased by 3.4 pp (up to 51.9 percent of the notional ideal revenue).

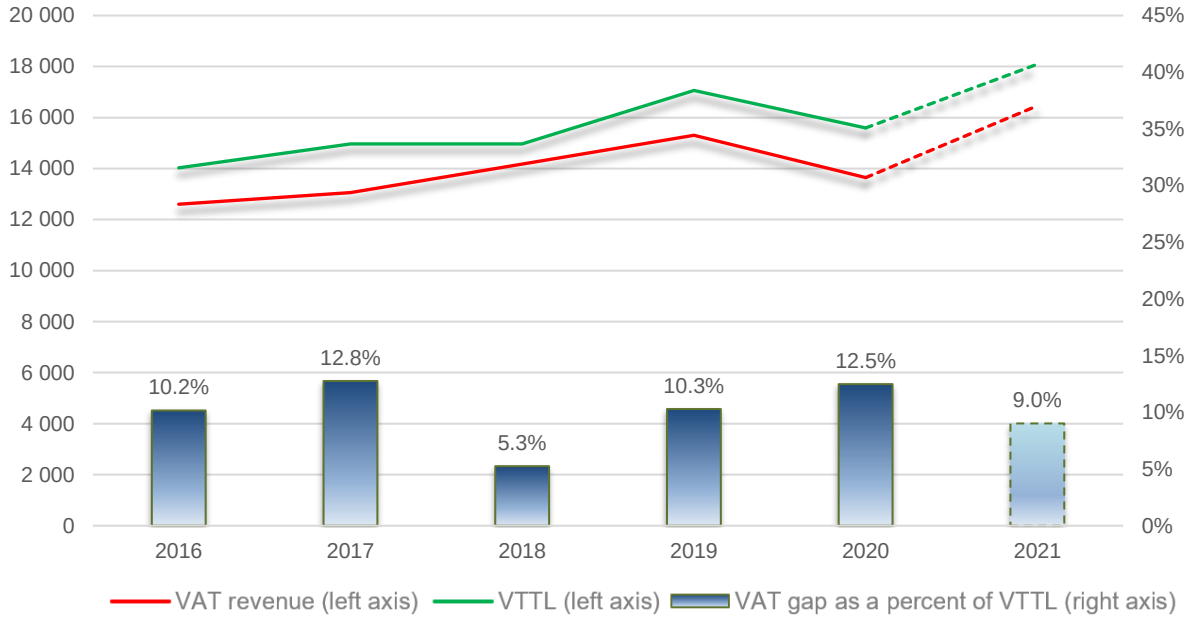
confidence in estimates:[33]

[33] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 21: IE: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[34]

	2016	2017	2018	2019	2020	*2021*
VTTL	**14 028**	**14 970**	**14 961**	**17 056**	**15 591**	***18 092***
o/w liability on household final consumption	7 816	8 786	8 060	8 952	7 693	
o/w liability on gov. and NPISH final consumption	202	171	204	219	238	
o/w liability on intermediate consumption	3 820	3 960	4 439	4 935	4 937	
o/w liability on GFCF	1 995	1 839	2 073	2 556	2 360	
o/w net adjustments	195	214	185	394	364	
VAT revenue	**12 603**	**13 060**	**14 175**	**15 301**	**13 644**	***16 460***
VAT compliance gap	**1 426**	**1 911**	**785**	**1 755**	**1 947**	
VAT compliance gap (percent of VTTL)	**10.2%**	**12.8%**	**5.3%**	**10.3%**	**12.5%**	***9.0%***
VAT compliance gap change since 2016					**+2.3 pp**	

Figure 25: IE: VAT compliance gap, VAT revenue, and VTTL[34]



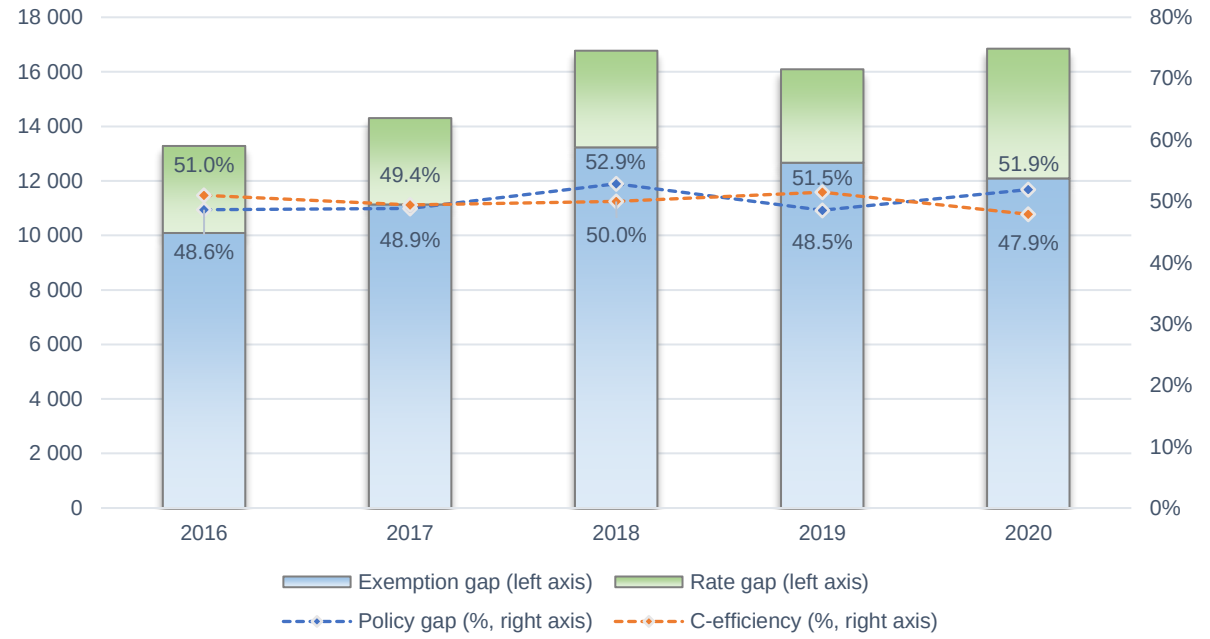
Source: own calculation, download underlying data.

[34] *The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.*

Table 22: IE: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**13 280**	**14 303**	**16 775**	**16 093**	**16 849**
Rate gap	3 192	3 169	3 545	3 427	4 759
Exemption gap	10 088	11 134	13 230	12 666	12 090
o/w imputed rents	*2 936*	*3 018*	*3 816*	*3 893*	*4 001*
o/w public services	*6 523*	*7 235*	*7 935*	*7 477*	*7 734*
o/w financial services	*- 255*	*- 335*	*288*	*208*	*203*
Actionable exemption gap	**885**	**1 216**	**1 191**	**1 087**	**152**
Actionable policy gap	**4 076**	**4 385**	**4 736**	**4 514**	**4 910**
C-efficiency	**51.0%**	**49.4%**	**50.0%**	**51.5%**	**47.9%**

Figure 26: IE: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Greece

Highlights

- In 2020, the VAT compliance gap fell by 3.7 pp down to 19.7 percent of the VTTL. In the following year, the compliance gap is expected to decline even faster (by 5.7 pp). This significant improvement in compliance was accompanied by dire economic straits. In 2020, GDP in Greece fell by 9 percent in real terms, which was caused to a large extent by the decline in tourist arrivals. As the share of touristic services in Greek GDP is one of the largest in the EU, the structure of expenditure changed significantly, resulting in a 2 pp lower contribution of services to GDP in 2020.
- Strong economic headwinds were alleviated by the drop in the VAT burden. The decrease in the effective rate of 9.5 percent was largely driven by the increase in the rate gap due to temporary rate cuts on a broad list of services introduced in the middle of the year.
- In the longer term, a downward trend for the VAT compliance gap and an upward trend for the policy gap can be observed. Since 2017, compliance in Greece has been gradually improving (a decrease of the gap of 9.4 pp), whereas the policy gap sharply increased between 2018 and 2020.
- Due to the large policy gap resulting from the broad application of reduced rates and a large compliance gap, C-efficiency was relatively low (37.5 percent in 2020).

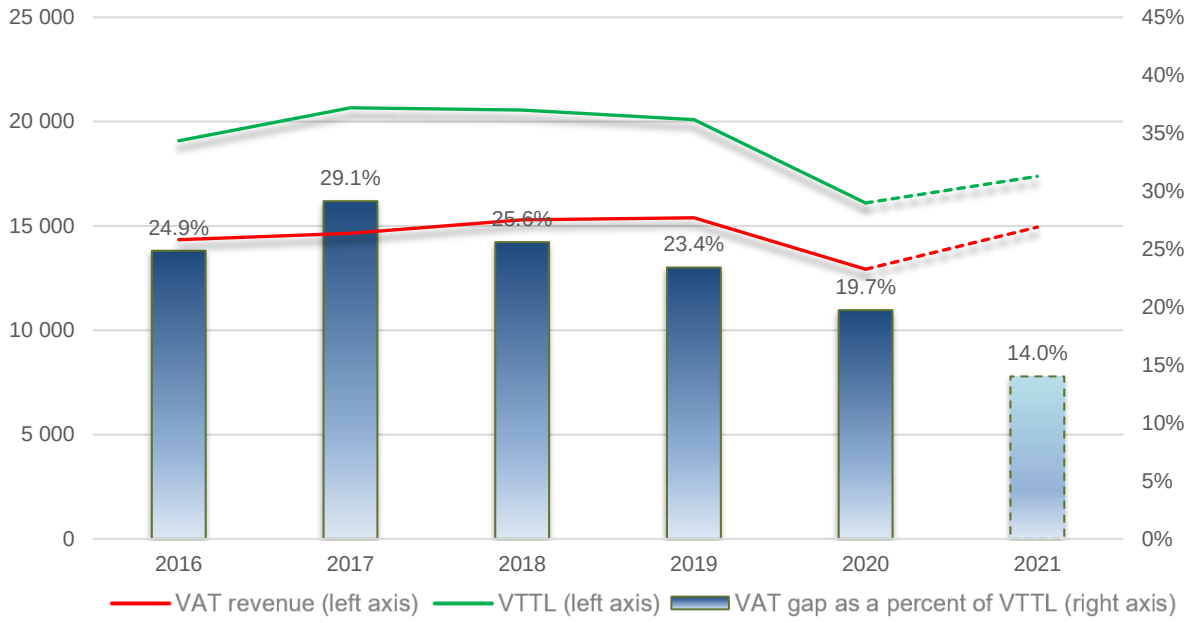
confidence in estimates:[35] 

[35] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 23: EL: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[36]

	2016	2017	2018	2019	2020	*2021*
VTTL	**19 075**	**20 663**	**20 549**	**20 095**	**16 103**	***17 379***
o/w liability on household final consumption	14 745	15 827	16 349	15 867	12 092	
o/w liability on gov. and NPISH final consumption	688	734	674	705	794	
o/w liability on intermediate consumption	2 006	2 189	2 191	2 141	1 823	
o/w liability on GFCF	1 355	1 605	1 047	1 061	1 112	
o/w net adjustments	281	308	289	321	282	
VAT revenue	**14 333**	**14 642**	**15 288**	**15 390**	**12 925**	***14 943***
VAT compliance gap	**4 742**	**6 021**	**5 261**	**4 705**	**3 178**	
VAT compliance gap (percent of VTTL)	**24.9%**	**29.1%**	**25.6%**	**23.4%**	**19.7%**	***14.0%***
VAT compliance gap change since 2016					**-5.1 pp**	

Figure 27: EL: VAT compliance gap, VAT revenue, and VTTL[36]



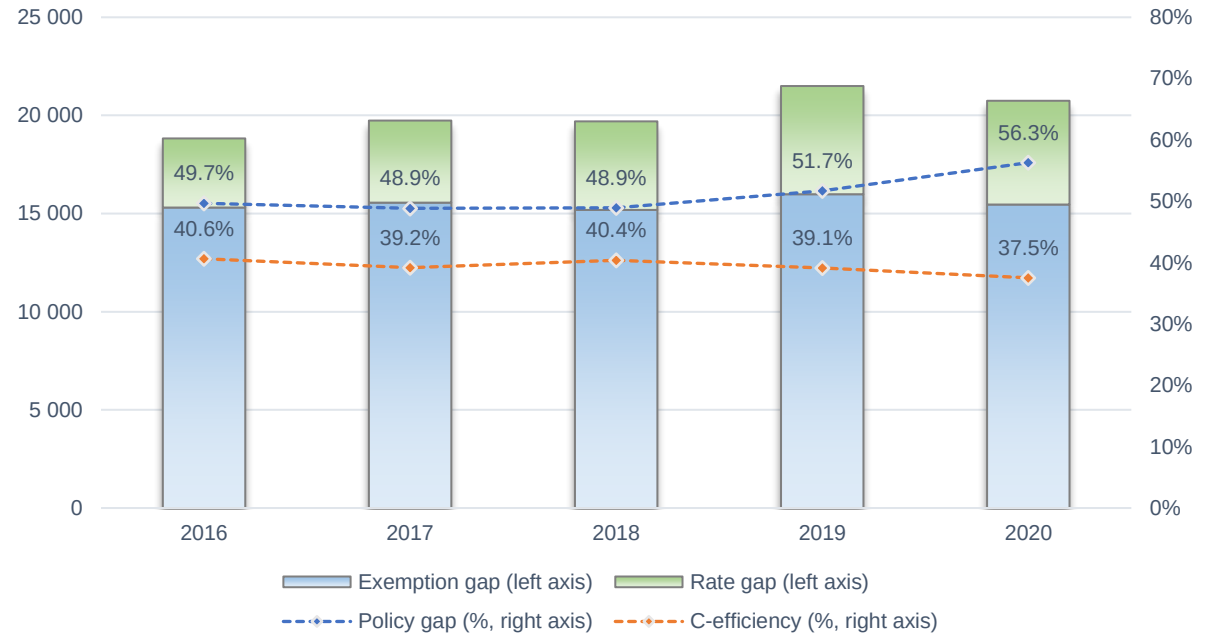
Source: own calculation, download underlying data.

[36] *The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.*

Table 24: EL: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**18 829**	**19 738**	**19 698**	**21 498**	**20 747**
Rate gap	3 520	4 180	4 511	5 512	5 285
Exemption gap	15 308	15 558	15 187	15 986	15 462
o/w imputed rents	*3 572*	*3 582*	*3 475*	*3 497*	*3 553*
o/w public services	*6 402*	*6 167*	*6 561*	*7 282*	*7 209*
o/w financial services	*1 095*	*1 060*	*1 079*	*1 051*	*873*
Actionable exemption gap	**4 239**	**4 749**	**4 072**	**4 156**	**3 827**
Actionable policy gap	**7 760**	**8 929**	**8 583**	**9 668**	**9 112**
C-efficiency	**40.6%**	**39.2%**	**40.4%**	**39.1%**	**37.5%**

Figure 28: EL: VAT policy gap, rate gap, and exemption gap

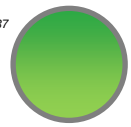


Source: own calculation, download underlying data.

Spain

Highlights

- In 2020, the estimated VAT compliance gap in Spain decreased by 1.4 pp down to 4.7 percent of the VTTL. In parallel, the economic problems in Spain were some of the most severe in the EU. GDP fell by 10.8 percent in real terms to a large extent due to restrictions to travel and a decline in touristic sector's activity. At the same time, the rate of bankruptcies dropped (by 7.3 percent), which resulted from the support measures introduced. The value of this measures and decline in the economic activity were marked by the largest general government deficit in the EU in 2020 (10.2 percent of GDP).
- Between 2016 and 2019, the VAT compliance gap remained relatively stable and below the EU median. This was likely supported by the reporting obligations in place. In 2017, Spain introduced the obligation of reporting on a real-time basis all sales and purchase transactions for large businesses.
- One of the largest policy gaps in the EU (60.3 percent) in 2020 results from the application of other than VAT indirect taxes in the Canary Islands, Ceuta, and Melilla. Liability from local consumption taxes was excluded from the calculations of the VTTL, which increases the estimated foregone VAT liability.

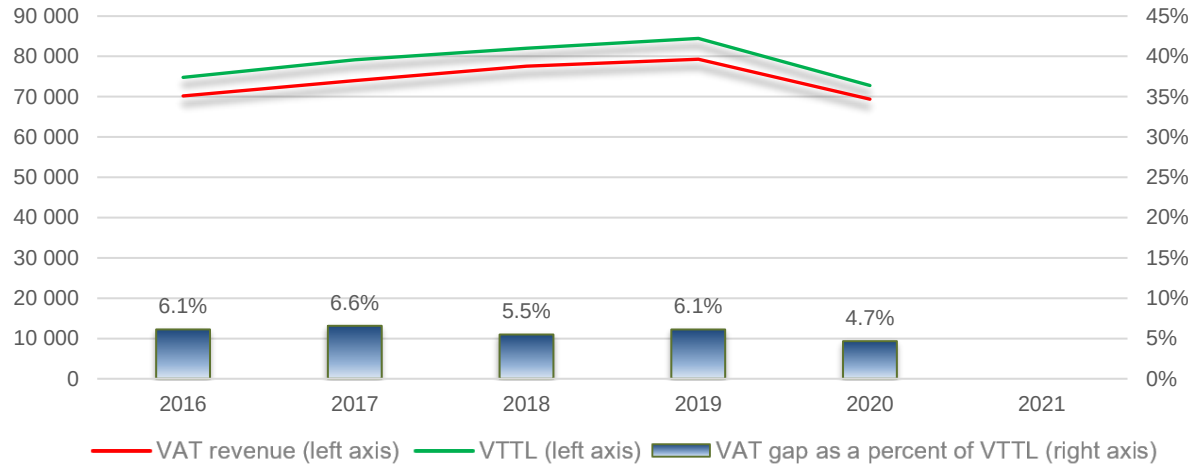
confidence in estimates:[37] 

[37] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 25: ES: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[39]

	2016	2017	2018	2019	2020	*2021*
VTTL	**74 791**	**79 172**	**82 040**	**84 465**	**72 778**	*X*
o/w liability on household final consumption	55 178	58 709	60 170	61 371	49 696	
o/w liability on gov. and NPISH final consumption	2 494	2 715	2 894	3 077	3 281	
o/w liability on intermediate consumption	8 552	9 244	9 668	10 328	10 250	
o/w liability on GFCF	7 891	7 758	8 464	8 782	8 714	
o/w net adjustments	675	746	844	907	836	
VAT revenue	**70 214**	**73 970**	**77 536**	**79 301**	**69 382**	*X*
VAT compliance gap	**4 577**	**5 202**	**4 504**	**5 164**	**3 396**	*X*
VAT compliance gap (percent of VTTL)	**6.1%**	**6.6%**	**5.5%**	**6.1%**	**4.7%**	*X*
VAT compliance gap change since 2016					**-1.5 pp**	*X*
VAT compliance gap, alternative estimates[38]	*2 077*	*3 174*	*1 246*	*709*	*191*	
VAT compliance gap, alternative estimates (% of VTTL)	*2.9%*	*4.1%*	*1.6%*	*0.9%*	*0.3%*	

Figure 29: ES: VAT compliance gap, VAT revenue, and VTTL[39]



Source: own calculation, download underlying data.

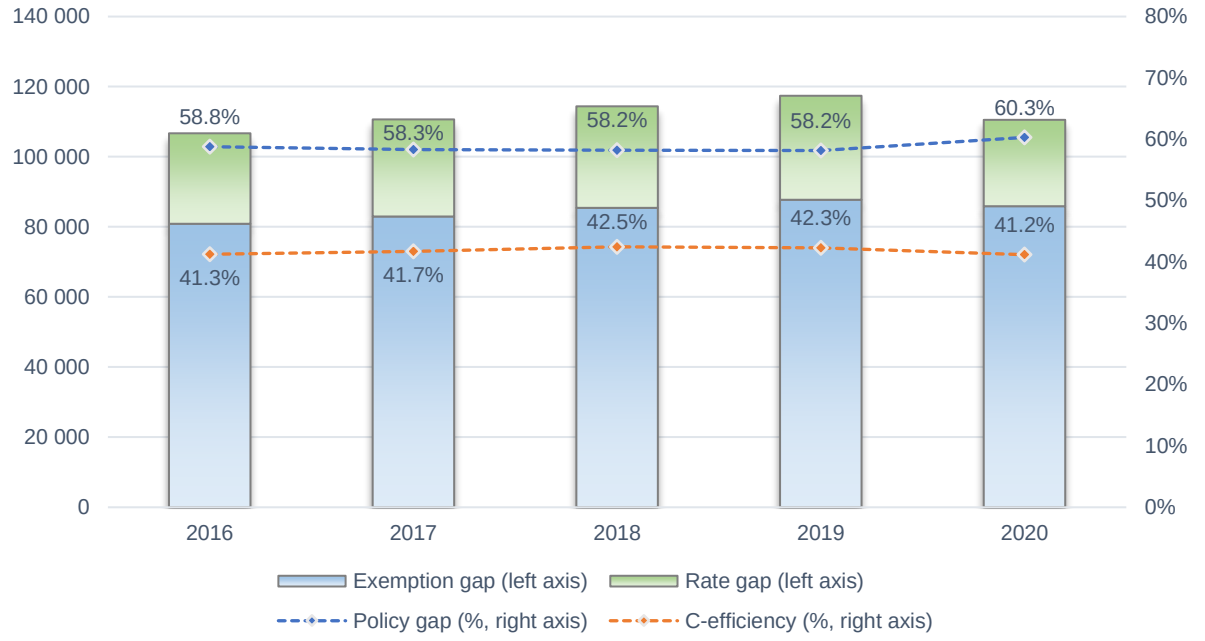
[38] Based on the adjustment of VAT revenue to an accrual recording criteria based on tax form information and adjusting the VTTL for the difference between national accounting and tax conventions in the construction sector based on the data received from Spanish tax authorities.

[39] Fast estimates for 2021 were not published due to expected large estimation error.

Table 26: ES: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**106 699**	**110 660**	**114 389**	**117 405**	**110 538**
Rate gap	25 810	27 697	28 963	29 668	24 643
Exemption gap	80 889	82 963	85 427	87 737	85 896
o/w imputed rents	*17 576*	*17 632*	*18 013*	*18 393*	*17 980*
o/w public services	*34 665*	*34 913*	*35 917*	*37 521*	*39 125*
o/w financial services	*4 964*	*4 869*	*5 547*	*5 670*	*4 479*
Actionable exemption gap	**23 683**	**25 548**	**25 950**	**26 153**	**24 311**
Actionable policy gap	**49 493**	**53 246**	**54 913**	**55 821**	**48 954**
C-efficiency	**41.3%**	**41.7%**	**42.5%**	**42.3%**	**41.2%**

Figure 30: ES: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

France

Highlights

- In 2020, the VAT compliance gap in France decreased slightly to 8 percent of the VTTL. Over the entire analysed period, the gap was relatively stable, along with the VAT policy and rate gaps. The changes introduced to VAT rates in 2020 were restricted mostly to protective clothing and products intended for personal hygiene and adapted to the fight against the spread of COVID-19.
- Two factors were correlated with the increase in compliance observed in 2020: the bankruptcy rate decreased by nearly 40 percent and the value of electronic transactions fell by over 25 percent.
- The effective VAT rate in 2020 in France declined by approximately 4 percent. Similar to many Member States, the decline in this effective VAT rate and the increase of the policy gap in 2020 were driven by increased government expenditure on goods and services.
- The estimates for France were revised compared to the 2021 study thanks to the granular information provided by the authorities.

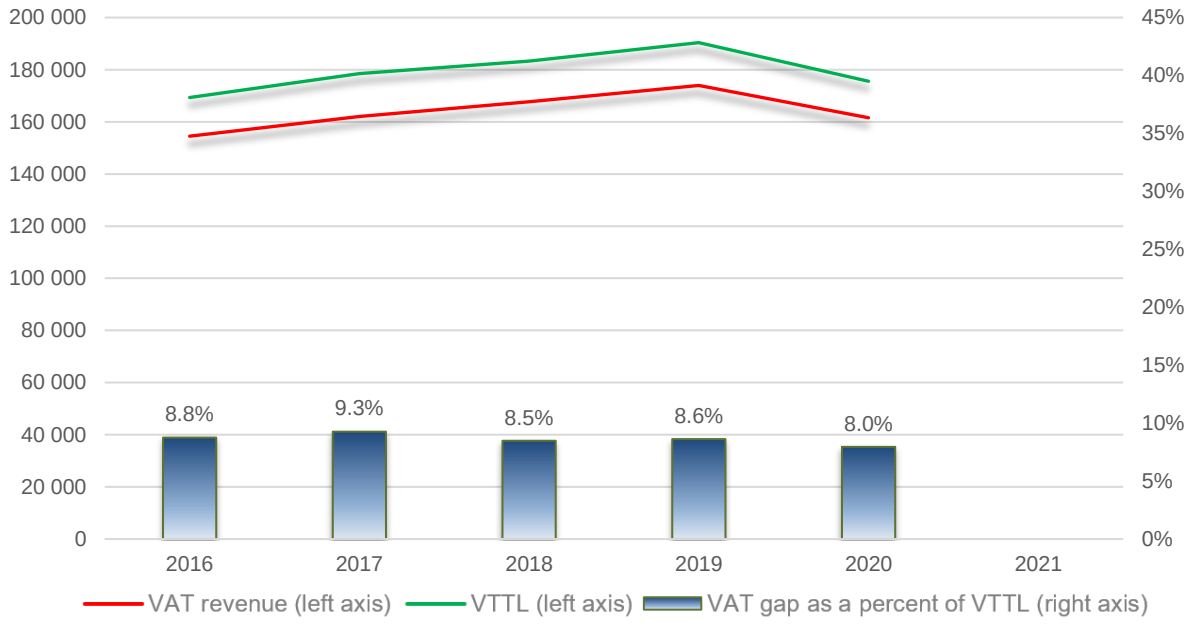
confidence in estimates:[40] 

[40] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 27: FR: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[41]

	2016	2017	2018	2019	2020	*2021*
VTTL	**169 312**	**178 555**	**183 265**	**190 372**	**175 499**	*X*
o/w liability on household final consumption	99 691	102 853	106 028	108 298	98 161	
o/w liability on gov. and NPISH final consumption	1 695	1 737	1 777	1 806	1 865	
o/w liability on intermediate consumption	30 568	32 095	32 860	33 931	32 867	
o/w liability on GFCF	32 168	36 803	37 305	40 443	36 884	
o/w net adjustments	5 190	5 067	5 296	5 894	5 721	
VAT revenue	**154 490**	**162 011**	**167 720**	**173 953**	**161 537**	*X*
VAT compliance gap	**14 822**	**16 544**	**15 545**	**16 419**	**13 962**	*X*
VAT compliance gap (percent of VTTL)	**8.8%**	**9.3%**	**8.5%**	**8.6%**	**8.0%**	*X*
VAT compliance gap change since 2016					**-0.8 pp**	*X*

Figure 31: FR: VAT compliance gap, VAT revenue, and VTTL[41]



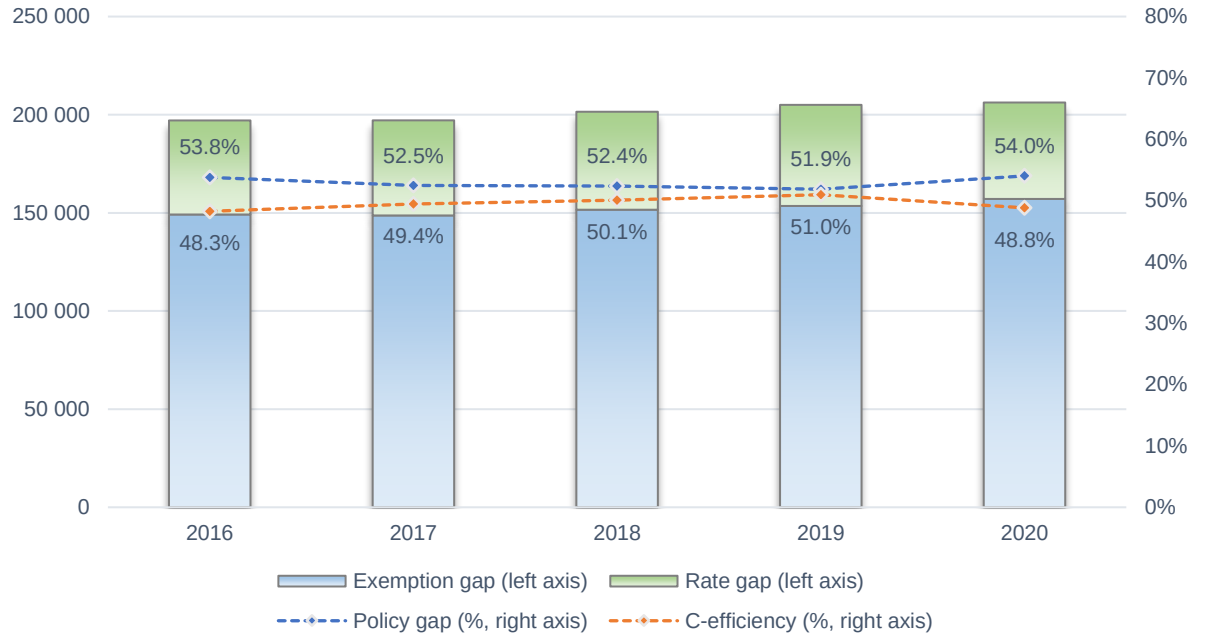
Source: own calculation, download underlying data.

[41] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 28: FR: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**197 071**	**197 126**	**201 512**	**205 015**	**206 212**
Rate gap	47 908	48 445	49 905	51 498	49 124
Exemption gap	149 163	148 682	151 607	153 517	157 089
o/w imputed rents	*34 138*	*34 581*	*35 223*	*36 286*	*36 572*
o/w public services	*81 853*	*83 728*	*84 302*	*84 756*	*87 063*
o/w financial services	*12 264*	*11 402*	*11 794*	*11 620*	*10 743*
Actionable exemption gap	**20 909**	**18 970**	**20 287**	**20 854**	**22 710**
Actionable policy gap	**68 816**	**67 415**	**70 192**	**72 352**	**71 834**
C-efficiency	**48.3%**	**49.4%**	**50.1%**	**51.0%**	**48.8%**

Figure 32: FR: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Croatia

Highlights

- The estimates for the VAT compliance gap point to a sudden increase in non-compliance in 2020. However, this large increase in the VAT compliance gap for Croatia followed a large decline in 2019 of approximately 6.5 pp, which might be related to some inaccuracy of the underlying data for 2019. The underlying reasons of the shift in the volatility of the gap could so far not be pinpointed. Except for 2019, the VAT compliance gap remained stable, oscillating between 6.9 and 8.4 percent of the VTTL.
- In 2020, the conditions for improving compliance in Croatia were particularly difficult. As tourism contributes significantly to GDP, restrictions to travel largely deteriorated the overall economic activity, which dropped by 8.1 percent. At the same time, in contrast to many other Member States, the effective VAT rate increased (by 0.6 percent).
- The policy gap in 2020 remained nearly unchanged in relative terms. In parallel to the increase in the exemption gap, the rate gap decreased, which might partially result from the lower use of hospitality services taxed at reduced rates.

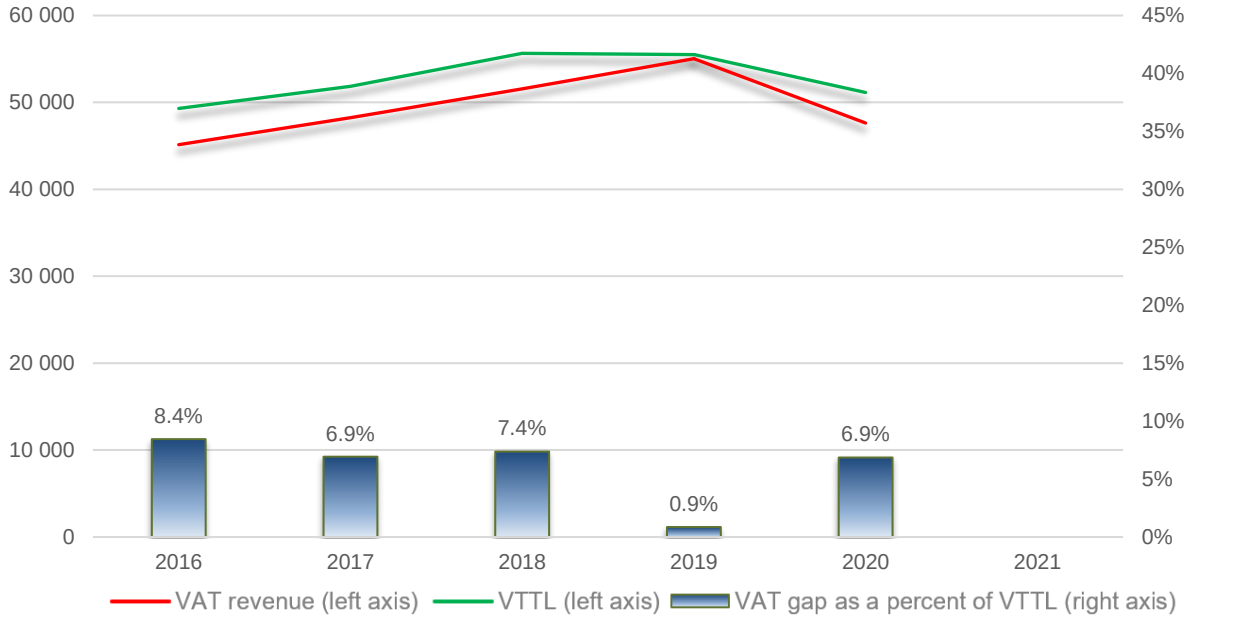
confidence in estimates:[42] 

[42] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 29: HR: VAT compliance gaps, VAT receipts, composition of VTTL (HRK million, 2016-2021)[43]

	2016	2017	2018	2019	2020	*2021*
VTTL	**49 308**	**51 845**	**55 649**	**55 515**	**51 144**	*X*
o/w liability on household final consumption	36 107	38 267	40 334	40 745	35 448	
o/w liability on gov. and NPISH final consumption	1 469	1 631	1 436	1 309	1 347	
o/w liability on intermediate consumption	7 307	7 468	7 648	7 696	7 159	
o/w liability on GFCF	4 274	4 377	6 080	5 824	6 915	
o/w net adjustments	151	102	151	-59	274	
VAT revenue	**45 143**	**48 251**	**51 546**	**55 036**	**47 634**	*X*
VAT compliance gap	**4 165**	**3 594**	**4 103**	**479**	**3 510**	*X*
VAT compliance gap (percent of VTTL)	**8.4%**	**6.9%**	**7.4%**	**0.9%**	**6.9%**	*X*
VAT compliance gap change since 2016					**-1.6 pp**	*X*

Figure 33: HR: VAT compliance gap, VAT revenue, and VTTL[43]



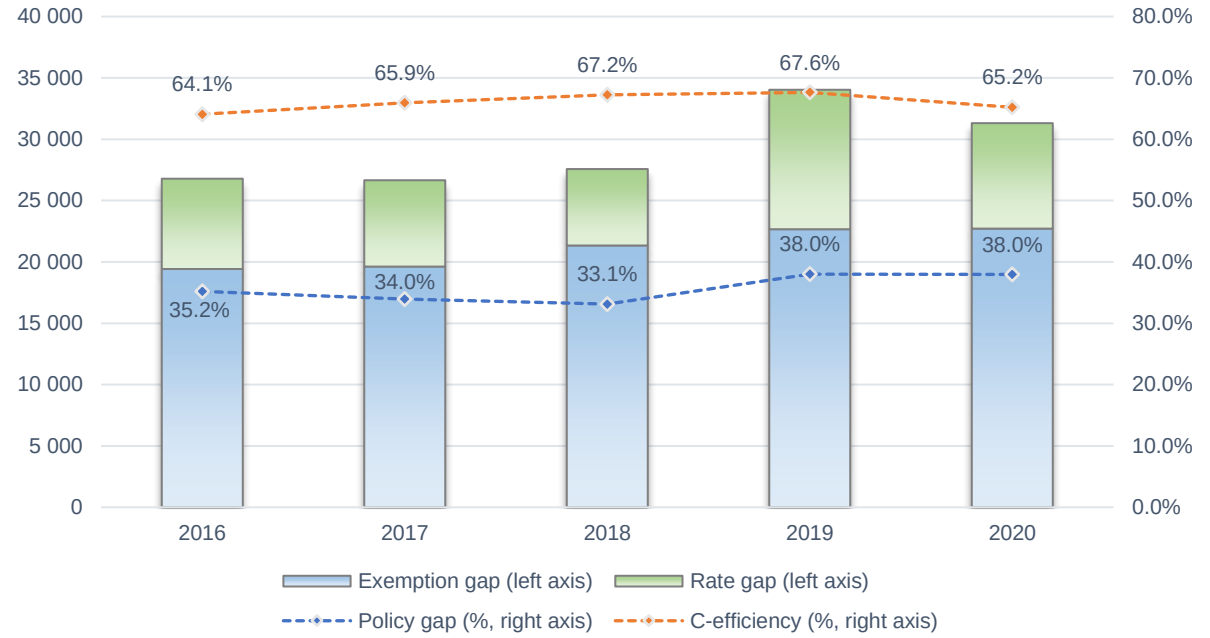
*Source: own calculation, **download underlying data**.*

[43] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 30: HR: VAT policy gap and their components (HRK million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**26 783**	**26 658**	**27 572**	**34 033**	**31 312**
Rate gap	7 362	7 036	6 231	11 367	8 594
Exemption gap	19 422	19 622	21 341	22 666	22 717
o/w imputed rents	*5 618*	*5 702*	*5 756*	*5 906*	*5 937*
o/w public services	*10 012*	*10 927*	*10 286*	*12 206*	*12 352*
o/w financial services	*1 964*	*2 030*	*482*	*2 316*	*1 679*
Actionable exemption gap	**1 828**	**963**	**4 817**	**2 238**	**2 750**
Actionable policy gap	**9 189**	**7 999**	**11 048**	**13 605**	**11 344**
C-efficiency	**64.1%**	**65.9%**	**67.2%**	**67.6%**	**65.2%**

Figure 34: HR: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Italy

Highlights

- In 2020, the VAT compliance gap fell by 1 pp down to 20.8 percent of the VTTL. The sharp fall in the gap expected for 2021 might be affected by the inability to control for late payments from 2020 registered in 2021, affecting the accuracy of estimates for both 2021 and 2022.
- Italy was hit hard by the economic consequences of the COVID-19 pandemic. In 2020, GDP fell by 9 percent in real terms. At the same time, the bankruptcy rate fell by nearly 32 percent, which likely results from the support measures, including deferred tax liabilities. The increase in compliance was also likely supported by the extended reporting obligations, as in 2019 Italy extended the requirement of mandatory e-invoicing to B2B and B2C transactions.
- In 2020, the policy gap increased by nearly 2 pp up to 55.7 percent. The gap increased due to the increased share of the exemption gap and despite a relatively large drop in the consumption of services taxed at reduced rates.

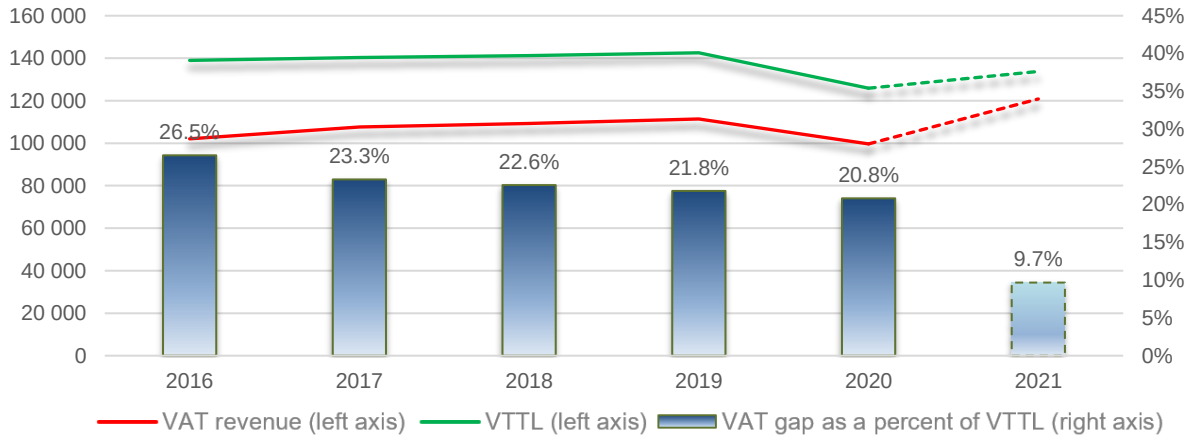
confidence in estimates:[44] 

[44] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 31: IT: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[46]

	2016	2017	2018	2019	2020	*2021*
VTTL	**138 932**	**140 310**	**141 221**	**142 549**	**125 886**	***133 778***
o/w liability on household final consumption	99 315	100 344	102 153	103 725	89 058	
o/w liability on gov. and NPISH final consumption	2 343	1 689	1 597	1 539	1 542	
o/w liability on intermediate consumption	21 634	22 324	22 332	22 737	21 658	
o/w liability on GFCF	13 883	14 342	13 389	14 405	13 659	
o/w net adjustments	1 758	1 611	1 751	143	-33	
VAT revenue	**102 086**	**107 576**	**109 333**	**111 464**	**99 669**	***120 833***
VAT compliance gap	**36 846**	**32 734**	**31 888**	**31 085**	**26 217**	
VAT compliance gap (percent of VTTL)	**26.5%**	**23.3%**	**22.6%**	**21.8%**	**20.8%**	***9.7%***
VAT compliance gap change since 2016					**-5.7 pp**	
VAT compliance gap, alternative estimates[45]	*36 424*	*35 464*	*29 396*	*27 064*	*23 696*	
VAT compliance gap alternative estimates (percent of	*26.5%*	*25.6%*	*21.1%*	*19.2%*	*19.1%*	

Figure 35: IT: VAT compliance gap, VAT revenue, and VTTL[46]



Source: own calculation, download underlying data.

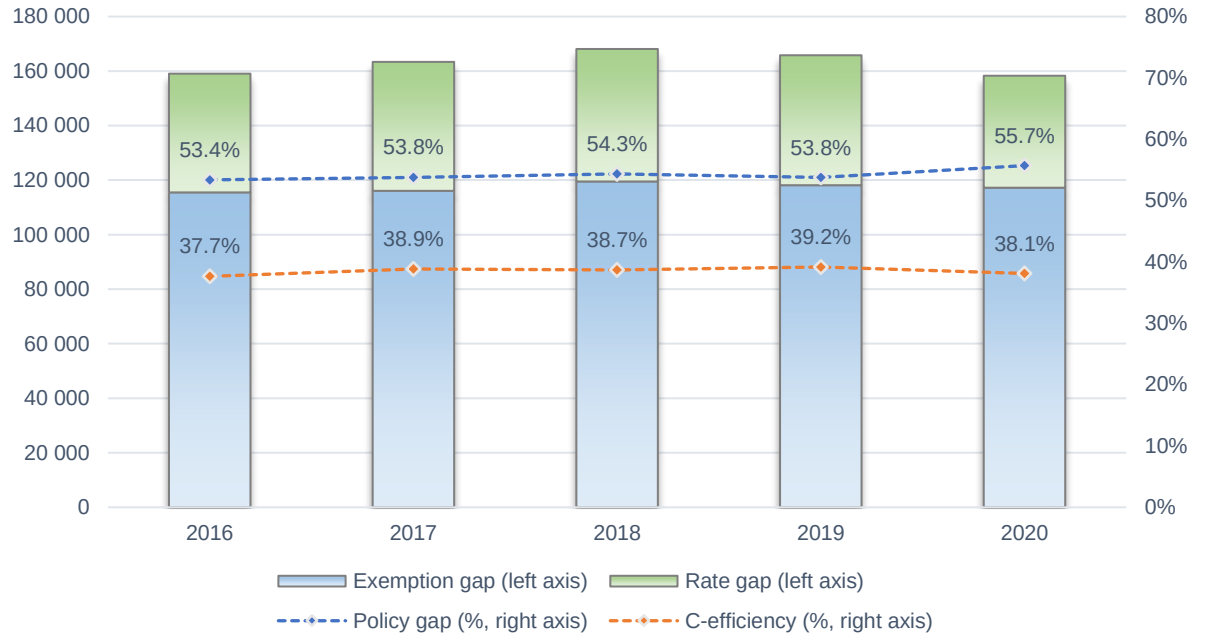
[45] The alternative estimates are based on adjusted revenues for the changes in the outstanding stocks of net reimbursement claims (to better approximate accrued revenues) and Italy's own estimates of illegal activities, namely illegal drugs and prostitution activities.

[46] The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.

Table 32: IT: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**159 063**	**163 370**	**168 106**	**165 800**	**158 298**
Rate gap	43 556	47 291	48 594	47 660	41 071
Exemption gap	115 507	116 079	119 512	118 141	117 226
o/w imputed rents	*32 212*	*32 440*	*32 879*	*32 781*	*32 476*
o/w public services	*54 500*	*55 132*	*56 485*	*54 802*	*55 912*
o/w financial services	*4 394*	*3 563*	*4 331*	*4 373*	*3 487*
Actionable exemption gap	**24 401**	**24 944**	**25 817**	**26 185**	**25 351**
Actionable policy gap	**67 958**	**72 235**	**74 411**	**73 845**	**66 422**
C-efficiency	**37.7%**	**38.9%**	**38.7%**	**39.2%**	**38.1%**

Figure 36: IT: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Cyprus

Highlights

- In 2020, the estimated VAT compliance increased by 5.0 pp up to 6.4 percent of the VTTL. This decrease in compliance was not in line with the decline in the bankruptcy rate, which fell by 17.5 percent compared to 2019. Despite having one of the largest shares of the tourism sector in GDP in the EU, economic activity in Cyprus deteriorated less than in other popular tourist destinations (by 5 percent in real terms).
- The policy gap in Cyprus was relatively low due to the low exemption gap. This is largely driven by financial services. The estimates of the exemption gap for financial services are negative, which results from the relatively large share of these services used as intermediate inputs. As a consequence of the exemption (without the right to deduct), the VAT accrued in upstream industries cannot be reclaimed, which increases VAT liability and revenue.
- Estimates for 2016-2019 were revised based on the availability of new SUT. Similarly, VAT revenue figures were revised based on the information from the authorities. Although the update of the underlying data has increased the accuracy of the estimates, the estimated VAT gap in Cyprus was relatively volatile in the analysed period.

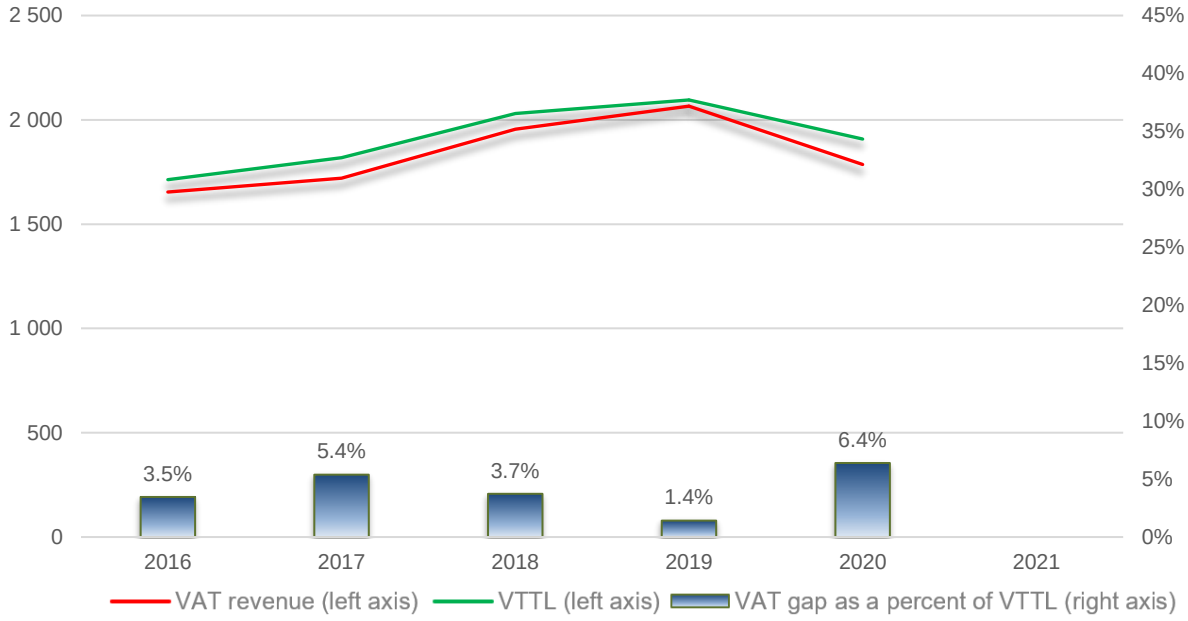
confidence in estimates:[47] 

[47] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 33: CY: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[48]

	2016	2017	2018	2019	2020	*2021*
VTTL	**1 713**	**1 818**	**2 031**	**2 095**	**1 908**	*X*
o/w liability on household final consumption	1 121	1 197	1 261	1 314	1 095	
o/w liability on gov. and NPISH final consumption	27	26	28	35	44	
o/w liability on intermediate consumption	401	411	455	524	548	
o/w liability on GFCF	159	181	280	215	214	
o/w net adjustments	5	3	6	8	6	
VAT revenue	**1 654**	**1 720**	**1 955**	**2 066**	**1 786**	*X*
VAT compliance gap	**59**	**98**	**76**	**30**	**122**	*X*
VAT compliance gap (percent of VTTL)	**3.5%**	**5.4%**	**3.7%**	**1.4%**	**6.4%**	*X*
VAT compliance gap change since 2016					**+2.9 pp**	*X*

Figure 37: CY: VAT compliance gap, VAT revenue, and VTTL[48]



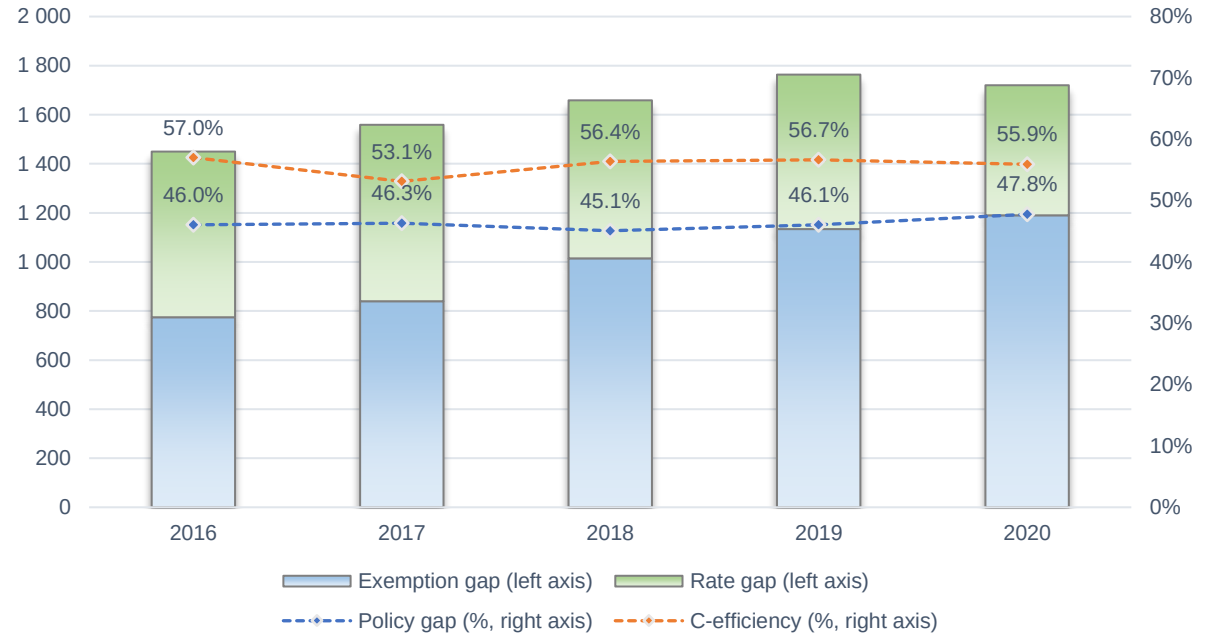
Source: own calculation, download underlying data.

[48] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 34: CY: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**1 450**	**1 559**	**1 659**	**1 763**	**1 720**
Rate gap	675	719	644	630	530
Exemption gap	774	840	1 015	1 134	1 190
o/w imputed rents	225	227	241	255	258
o/w public services	529	553	493	650	754
o/w financial services	*- 118*	*- 123*	*- 120*	*- 164*	*- 201*
Actionable exemption gap	**138**	**184**	**401**	**393**	**379**
Actionable policy gap	**813**	**903**	**1 045**	**1 023**	**909**
C-efficiency	**57.0%**	**53.1%**	**56.4%**	**56.7%**	**55.9%**

Figure 38: CY: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Latvia

Highlights

- In 2020, the VAT compliance gap fell by 3.6 pp down to 3.6 percent, one of the lowest values in the EU. This decline was a continuation of the steep downward trend observed since 2017 (12.1 pp reduction over three years).
- In 2021, VAT revenue increased by approximately 7.8 percent, which is similar to the estimated increase in the VTTL. This indicates that the gap will remain at a similarly low level in 2021. It also signals that the issues related to the inclusion of deferred payments in VAT revenue did not markedly impact the 2021 and 2022 estimates.
- A further increase in compliance was likely facilitated by the support measures that, despite a decline of GDP of 3.8 percent in real terms, reduced the bankruptcy rate by nearly 48 percent.
- The steep downward trend in the VAT compliance gap follows the reforms introduced by the Latvian administration, i.e., improvements in tax audit performance based on risk analysis and extensions of the reverse charge mechanism.
- In parallel to reducing the compliance gap, the policy gap has gradually decreased since 2017, which led to an increase in C-efficiency by approximately 7 pp.

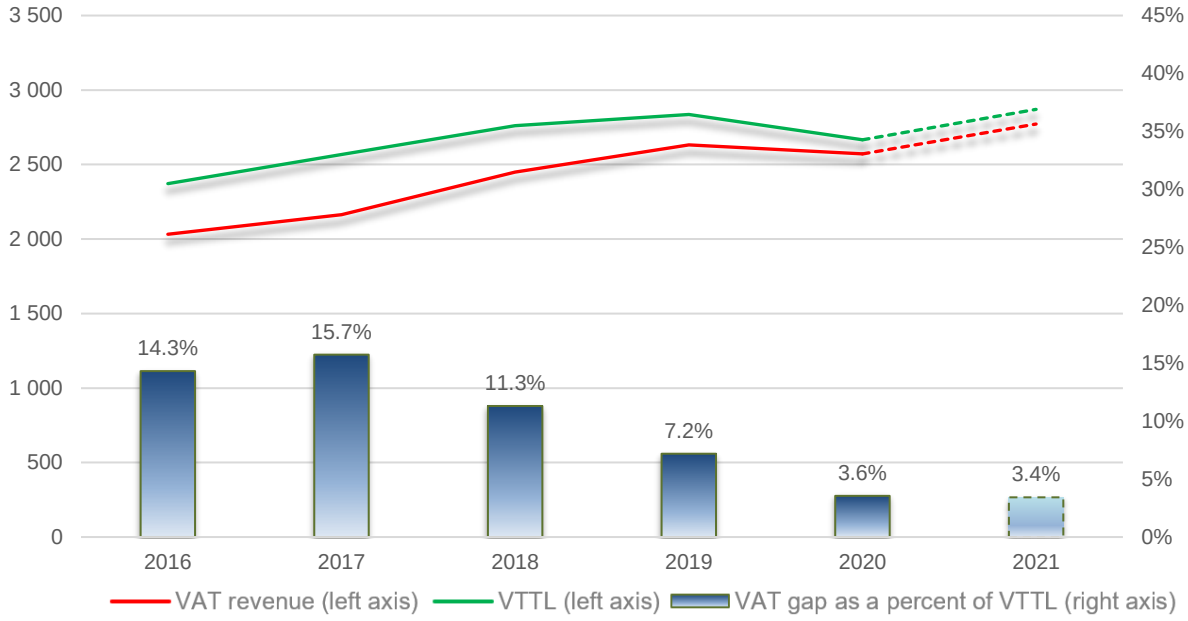
confidence in estimates:[49] 

[49] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 35: LV: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[50]

	2016	2017	2018	2019	2020	*2021*
VTTL	**2 372**	**2 568**	**2 761**	**2 836**	**2 666**	***2 870***
o/w liability on household final consumption	1 868	1 982	2 077	2 119	1 946	
o/w liability on gov. and NPISH final consumption	56	66	70	76	81	
o/w liability on intermediate consumption	323	348	368	412	392	
o/w liability on GFCF	175	217	293	278	294	
o/w net adjustments	-49	-45	-47	-49	-47	
VAT revenue	**2 032**	**2 164**	**2 449**	**2 632**	**2 571**	***2 772***
VAT compliance gap	**340**	**404**	**312**	**204**	**95**	
VAT compliance gap (percent of VTTL)	**14.3%**	**15.7%**	**11.3%**	**7.2%**	**3.6%**	***3.4%***
VAT compliance gap change since 2016					**-10.8 pp**	

Figure 39: LV: VAT compliance gap, VAT revenue, and VTTL[50]



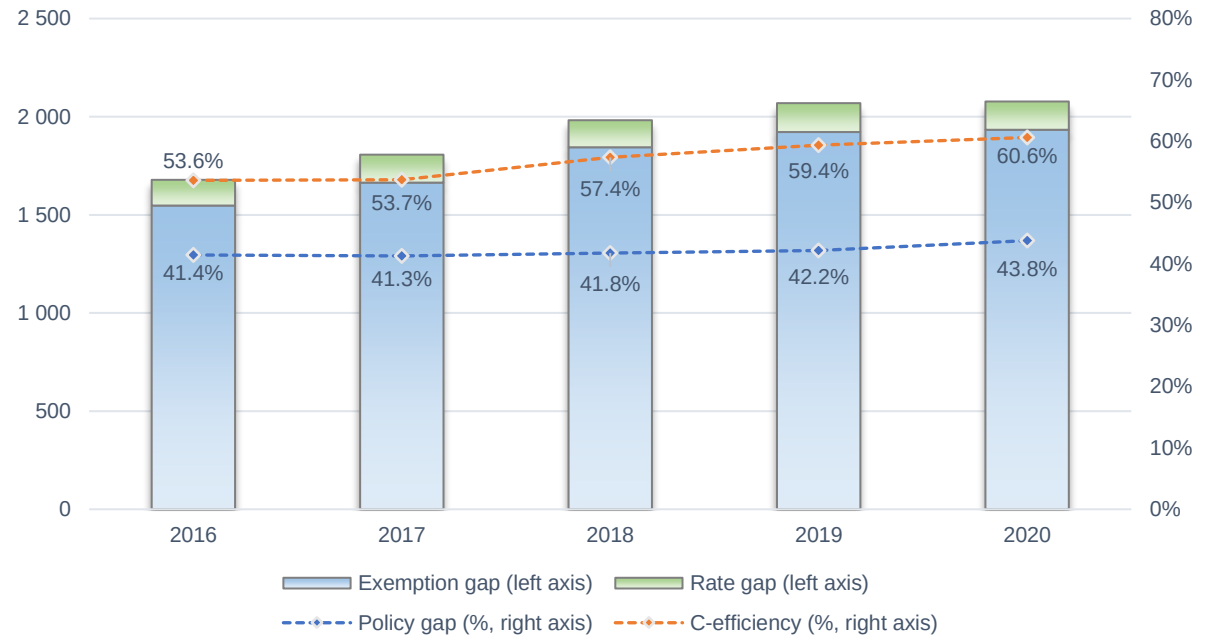
Source: own calculation, download underlying data.

[50] *The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.*

Table 36: LV: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**1 678**	**1 807**	**1 982**	**2 069**	**2 078**
Rate gap	131	142	138	147	144
Exemption gap	1 547	1 664	1 844	1 922	1 934
o/w imputed rents	*408*	*430*	*455*	*477*	*487*
o/w public services	*683*	*682*	*689*	*766*	*809*
o/w financial services	*89*	*89*	*89*	*95*	*89*
Actionable exemption gap	**368**	**464**	**611**	**584**	**548**
Actionable policy gap	**499**	**606**	**749**	**731**	**692**
C-efficiency	**53.6%**	**53.7%**	**57.4%**	**59.4%**	**60.6%**

Figure 40: LV: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Lithuania

Highlights

- The VAT compliance gap went down by from 20.9 percent to 19.3 percent compared to 2019, marking a 1.6 percent drop. Matched with other Member States, the economic situation in Lithuania was relatively stable with GDP declining by only 0.1 percent in real terms. At the same time, the Lithuanian government introduced support measures which contributed to driving the deficit up to 7.3 percent of GDP and the ratio of bankruptcies – down by nearly 16 percent. At the same time, the value of electronic transactions increased by over 22 percent.
- In 2021, VAT revenue went up by ca. 18.3 percent. As a consequence, the VAT compliance gap is forecasted to decline by approximately 5 pp. This might be a result of VAT payments deferred to 2021 which led to an overestimation of the compliance gap for 2020. The reasons behind this drop will be examined in the next update of the VAT compliance gap in the EU study, when further information on the potential determinants of the gap is available.
- The policy gap increased in both nominal and relative terms in 2020. This was driven primarily by the increase in government expenditure on goods and services.

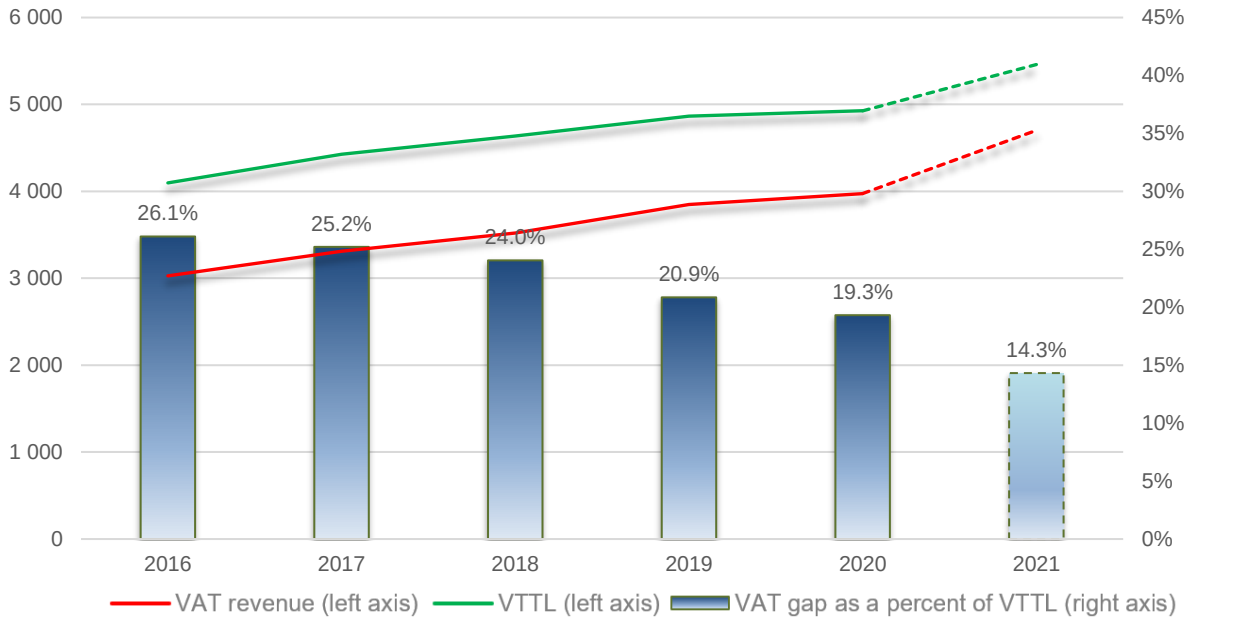
confidence in estimates:[51] 

[51] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 37: LT: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[52]

	2016	2017	2018	2019	2020	*2021*
VTTL	**4 097**	**4 426**	**4 637**	**4 865**	**4 926**	***5 459***
o/w liability on household final consumption	3 394	3 664	3 846	4 029	3 962	
o/w liability on gov. and NPISH final consumption	44	46	43	48	54	
o/w liability on intermediate consumption	409	439	456	487	500	
o/w liability on GFCF	470	526	570	623	713	
o/w net adjustments	- 220	- 249	- 279	- 322	- 302	
VAT revenue	**3 028**	**3 310**	**3 522**	**3 850**	**3 975**	***4 702***
VAT compliance gap	**1 070**	**1 116**	**1 115**	**1 015**	**952**	
VAT compliance gap (percent of VTTL)	**26.1%**	**25.2%**	**24.0%**	**20.9%**	**19.3%**	***14.3%***
VAT compliance gap change since 2016					**-6.8 pp**	

Figure 41: LT: VAT compliance gap, VAT revenue, and VTTL[52]



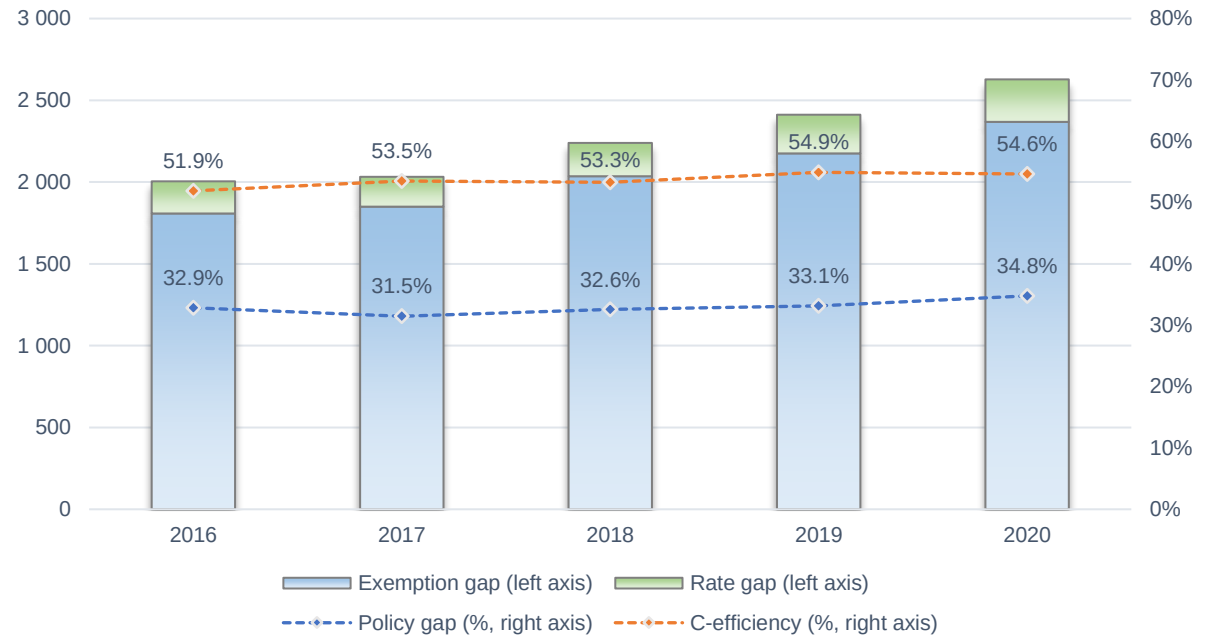
Source: own calculation, download underlying data.

[52] *The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.*

Table 38: LT: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**2 005**	**2 033**	**2 240**	**2 412**	**2 628**
Rate gap	197	182	204	236	260
Exemption gap	1 809	1 850	2 036	2 176	2 368
o/w imputed rents	277	291	312	325	331
o/w public services	889	894	980	1 106	1 235
o/w financial services	*104*	*108*	*129*	*141*	*132*
Actionable exemption gap	**538**	**557**	**614**	**604**	**670**
Actionable policy gap	**735**	**739**	**818**	**840**	**930**
C-efficiency	**51.9%**	**53.5%**	**53.3%**	**54.9%**	**54.6%**

Figure 42: LT: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Luxembourg

Highlights

- In 2020, the VAT compliance gap fell by approximately 3.7 pp and was estimated at 6 percent of the VTTL. This increase was accompanied by a sudden decline in the bankruptcy rate that, similarly to other Member States, was likely caused by government support measures to economic operators.
- The VAT compliance gap was relatively volatile during the analysed period, with a very large decline in the VTTL and VAT compliance gap observed in 2017.
- Due to low policy and compliance gaps, as well as the relatively large share of the VTTL generated by intermediate consumption liability, C-efficiency in Luxembourg was the highest in the EU (75.2 percent in 2020). Such a high collection efficiency was achieved despite the broad application of reduced rates, which accounted for over 14 percent of notional ideal revenue.

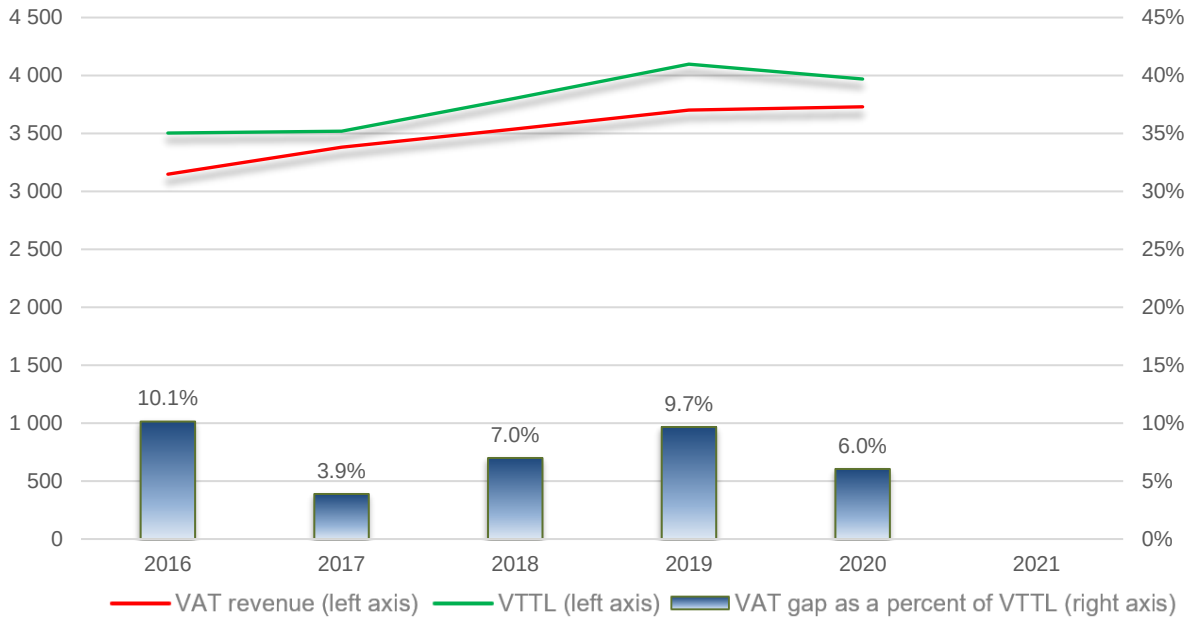
confidence in estimates:[53]

[53] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 39: LU: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[54]

	2016	2017	2018	2019	2020	*2021*
VTTL	**3 503**	**3 519**	**3 805**	**4 098**	**3 970**	*X*
o/w liability on household final consumption	1 423	1 450	1 539	1 645	1 389	
o/w liability on gov. and NPISH final consumption	33	43	91	39	82	
o/w liability on intermediate consumption	1 138	1 146	1 293	1 432	1 499	
o/w liability on GFCF	625	580	565	623	719	
o/w net adjustments	284	300	317	358	280	
VAT revenue	**3 148**	**3 382**	**3 539**	**3 702**	**3 730**	*X*
VAT compliance gap	**355**	**137**	**266**	**396**	**240**	*X*
VAT compliance gap (percent of VTTL)	**10.1%**	**3.9%**	**7.0%**	**9.7%**	**6.0%**	*X*
VAT compliance gap change since 2016					**-4.1 pp**	*X*

Figure 43: LU: VAT compliance gap, VAT revenue, and VTTL[54]



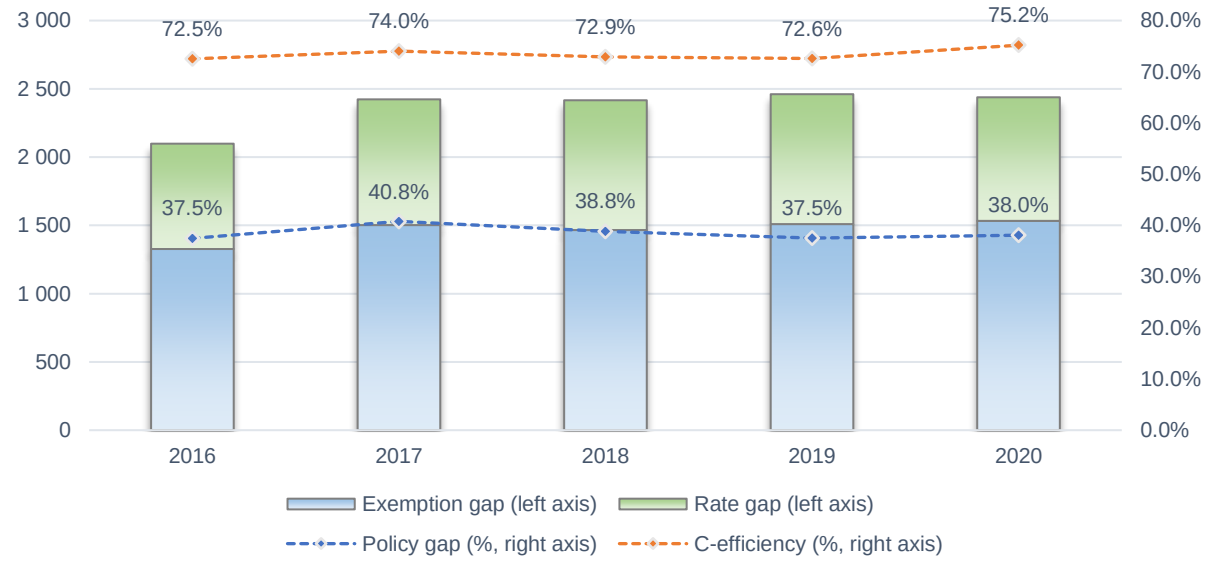
Source: own calculation, download underlying data.

[54] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 40: LU: VAT policy gap and their components (EUR million, 2016-2020) [55]

	2016	2017	2018	2019	2020
VAT policy gap	**2 098**	**2 423**	**2 416**	**2 461**	**2 438**
Rate gap	771	921	950	951	905
Exemption gap	1 327	1 502	1 466	1 509	1 533
o/w imputed rents	*456*	*476*	*488*	*500*	*500*
o/w public services	*- 98*	*- 155*	*- 121*	*- 125*	*- 161*
o/w financial services	*93*	*146*	*164*	*65*	*78*
Actionable exemption gap	**876**	**1 035**	**934**	**1 069**	**1 116**
Actionable policy gap	**1 647**	**1 956**	**1 885**	**2 020**	**2 021**
C-efficiency	**72.5%**	**74.0%**	**72.9%**	**72.6%**	**75.2%**

Figure 44: LU: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

[55] *See discussion on potential reasons of negative components of the VAT exemption gap in Section IV.*

Hungary

Highlights

- The VAT compliance gap in Hungary has followed a steep downward trend since 2017. Between 2017 and 2020, the gap fell by over 3 pp per year on average. In 2020, the gap fell by 4.7 pp down to 5.1 percent of the VTTL despite unfavourable economic conditions and a 4.5 percent decline of GDP (in real terms).
- At the same time, the economy-wide effective rate declined partially as a consequence of tax rate cuts on take away and home-delivered food and drinks as well as housing. In addition, the exemption gap attributed to public services increased. As a result, the overall policy gap went up by approximately 2 pp.
- The increase in compliance accompanied the introduction of new reporting obligations. In 2018, Hungary introduced the real-time electronic reporting of domestic B2B sales invoice data. In July 2020, the coverage of the system was extended to B2B transactions below the earlier limit of HUF 100 000.

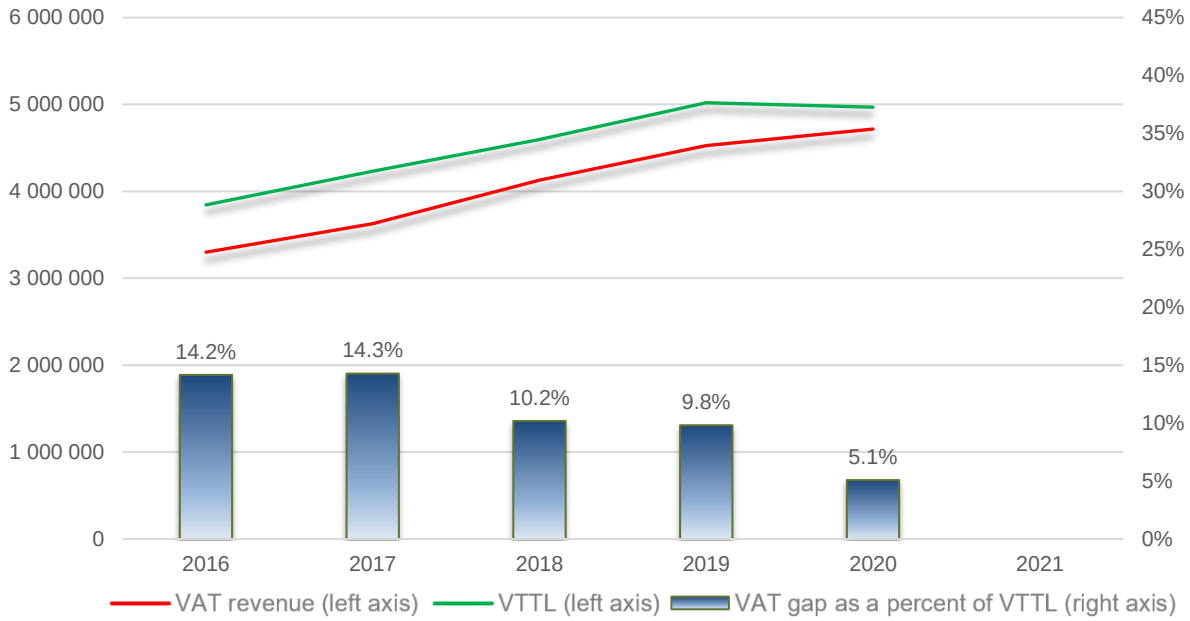
confidence in estimates:[56]

[56] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 41: HU: VAT compliance gaps, VAT receipts, composition of VTTL (HUF million, 2016-2021)[57]

	2016	2017	2018	2019	2020	*2021*
VTTL	**3 844 312**	**4 230 389**	**4 597 816**	**5 019 602**	**4 969 788**	*X*
o/w liability on household final consumption	2 813 223	2 946 099	3 042 548	3 300 236	3 155 732	
o/w liability on gov. and NPISH final consumption	112 677	130 509	151 012	168 949	184 320	
o/w liability on intermediate consumption	527 076	581 986	650 313	709 452	715 168	
o/w liability on GFCF	342 194	512 717	712 525	819 213	894 405	
o/w net adjustments	49 142	59 079	41 417	21 753	20 163	
VAT revenue	**3 299 838**	**3 626 566**	**4 129 537**	**4 526 757**	**4 717 048**	*X*
VAT compliance gap	**544 473**	**603 824**	**468 279**	**492 845**	**252 740**	*X*
VAT compliance gap (percent of VTTL)	**14.2%**	**14.3%**	**10.2%**	**9.8%**	**5.1%**	*X*
VAT compliance gap change since 2016					**-9.1 pp**	*X*

Figure 45: HU: VAT compliance gap, VAT revenue, and VTTL[57]



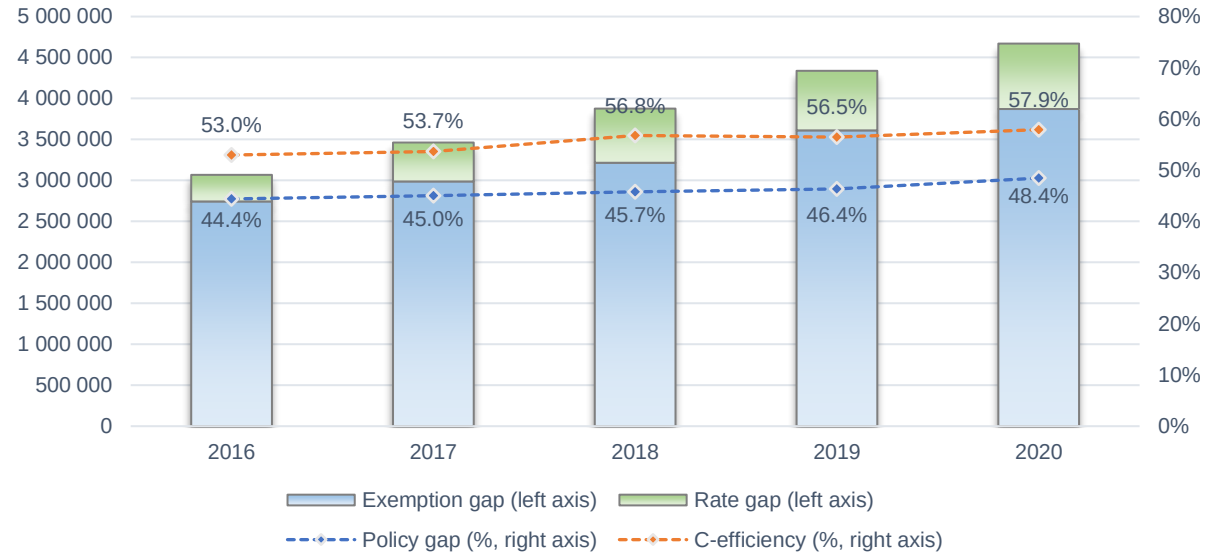
*Source: own calculation, **download underlying data**.*

[57] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 42: HU: VAT policy gap and their components (HUF million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**3 067 972**	**3 462 444**	**3 876 595**	**4 337 664**	**4 670 001**
Rate gap	324 522	475 023	661 123	726 915	798 509
Exemption gap	2 743 450	2 987 421	3 215 472	3 610 749	3 871 492
o/w imputed rents	*577 813*	*637 596*	*728 193*	*850 120*	*903 059*
o/w public services	*1 463 105*	*1 448 037*	*1 441 039*	*1 554 381*	*1 722 893*
o/w financial services	*234 209*	*257 040*	*262 485*	*292 376*	*283 980*
Actionable exemption gap	**468 322**	**644 748**	**783 754**	**913 873**	**961 560**
Actionable policy gap	**792 844**	**1 119 771**	**1 444 877**	**1 640 788**	**1 760 069**
C-efficiency	**53.0%**	**53.7%**	**56.8%**	**56.5%**	**57.9%**

Figure 46: HU: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Malta

Highlights

- The VAT compliance gap fell by approximately 1.9 pp in 2020 and is expected to decline further in 2021. As a tourist destination country, Malta experienced a significant decline in GDP of approximately 8.3 percent. Yet, the bankruptcy rate, which was negatively correlated with the VAT compliance gap, declined by approximately 16.1 percent in 2020. The deferment of VAT payments and the acceleration of VAT credit refunds was likely one of the reasons behind the improved liquidity and solvency of many economic operators.
- The policy gap and its components remained relatively stable between 2016 and 2019. In 2020, the policy gap went down which was largely driven by a decline of the rate gap. Yet, the rate gap accounted for nearly 15 percent of notional ideal revenue and remained one of the largest in the EU.
- The estimates for Malta were derived using rescaled SUT from 2016. Outdated information on the structure of intermediate consumption has likely impacted the accuracy of the presented estimates.

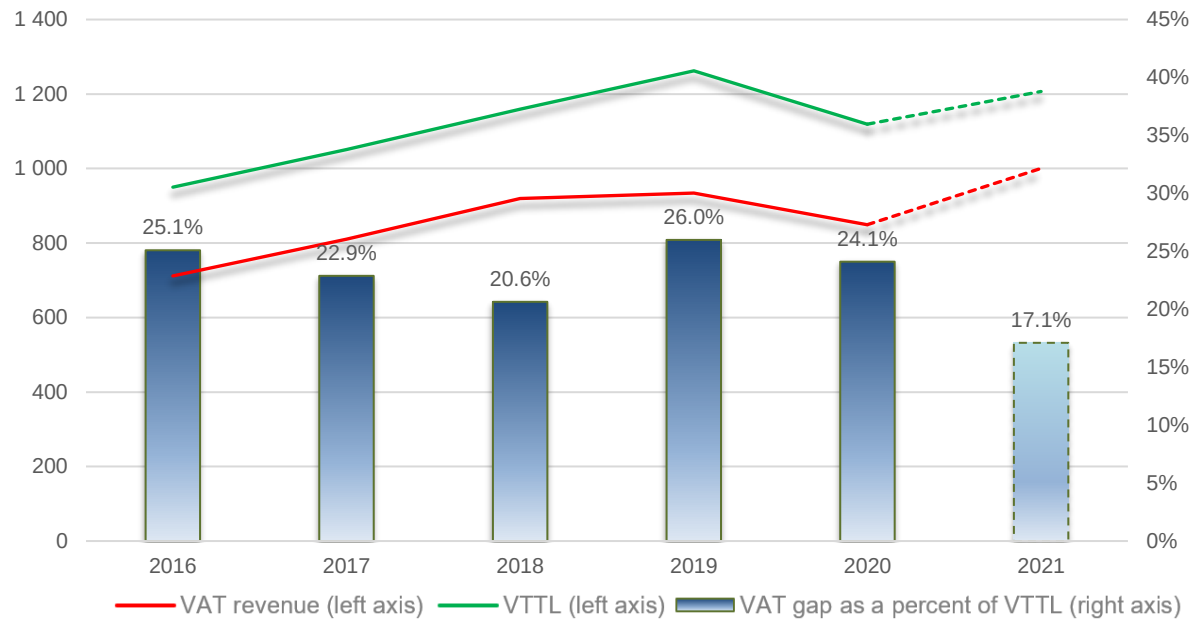
confidence in estimates:[58] 

[58] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 43: MT: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[59]

	2016	2017	2018	2019	2020	*2021*
VTTL	**950**	**1 051**	**1 159**	**1 262**	**1 119**	***1 207***
o/w liability on household final consumption	542	588	642	688	487	
o/w liability on gov. and NPISH final consumption	47	53	58	64	75	
o/w liability on intermediate consumption	277	318	336	387	434	
o/w liability on GFCF	58	71	102	114	115	
o/w net adjustments	27	21	21	8	8	
VAT revenue	**712**	**810**	**920**	**934**	**849**	***1 000***
VAT compliance gap	**238**	**240**	**239**	**328**	**270**	
VAT compliance gap (percent of VTTL)	**25.1%**	**22.9%**	**20.6%**	**26.0%**	**24.1%**	***17.1%***
VAT compliance gap change since 2016					**-1.0 pp**	

Figure 47: MT: VAT compliance gap, VAT revenue, and VTTL[59]



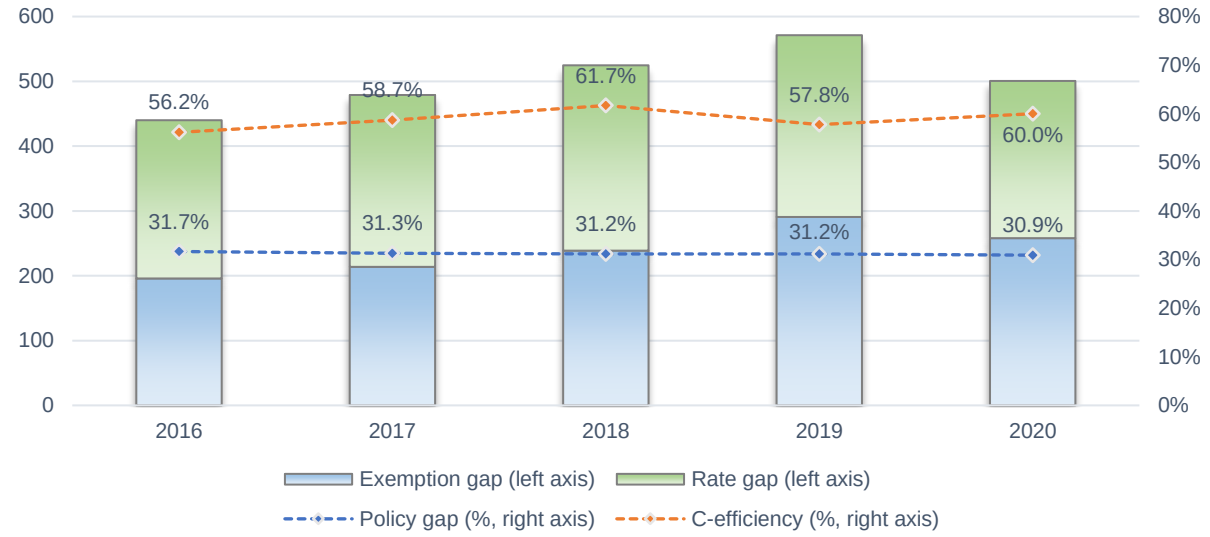
Source: own calculation, download underlying data.

[59] *The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.*

Table 44: MT: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**440**	**479**	**525**	**571**	**501**
Rate gap	244	265	286	280	243
Exemption gap	196	214	239	291	258
o/w imputed rents	*75*	*81*	*84*	*92*	*100*
o/w public services	*196*	*210*	*209*	*234*	*262*
o/w financial services	*8*	*16*	*16*	*17*	*13*
Actionable exemption gap	**- 83**	**- 94**	**- 70**	**- 52**	**- 117**
Actionable policy gap	**161**	**172**	**216**	**228**	**125**
C-efficiency	**56.2%**	**58.7%**	**61.7%**	**57.8%**	**60.0%**

Figure 48: MT: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

The Netherlands

Highlights

- The VAT compliance gap in The Netherlands fell from 6.9 percent in 2019 down to 2.8 percent in 2020. The Netherlands was one of the very few Member States where the VAT revenue increased despite a drop in the nominal tax base. In 2021, revenue increased by 9.4 percent, also much above the increase in tax base. As a result, the estimated VAT compliance gap is expected to decrease further in 2021.
- The increase in compliance is consistent with the change in the two correlated factors. In 2020, the bankruptcy rate fell by 11.8 percent and the value of electronic payments increased by 8.9 percent despite a drop in the overall value of transactions.
- The policy gap in The Netherlands followed a downward trend in the analysed period. The largest decline – in 2019 – was driven primarily by an increase of the reduced rate from 6 to 9 percent.

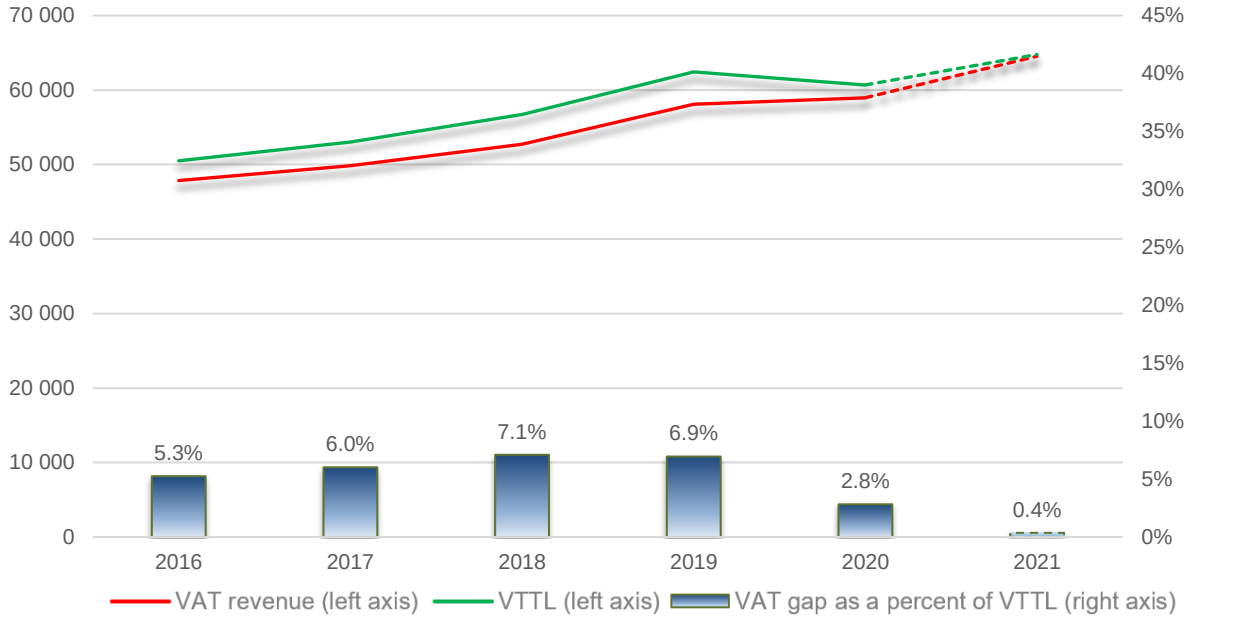
confidence in estimates:[60] 

[60] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 45: NL: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[61]

	2016	2017	2018	2019	2020	*2021*
VTTL	**50 500**	**53 024**	**56 740**	**62 452**	**60 685**	***64 773***
o/w liability on household final consumption	26 218	27 205	28 468	31 561	29 588	
o/w liability on gov. and NPISH final consumption	571	568	586	758	777	
o/w liability on intermediate consumption	13 687	14 220	15 857	17 098	16 916	
o/w liability on GFCF	9 481	10 487	11 272	12 392	12 766	
o/w net adjustments	543	545	556	642	637	
VAT revenue	**47 849**	**49 833**	**52 712**	**58 115**	**58 971**	***64 538***
VAT compliance gap	**2 651**	**3 191**	**4 028**	**4 337**	**1 714**	
VAT compliance gap (percent of VTTL)	**5.3%**	**6.0%**	**7.1%**	**6.9%**	**2.8%**	***0.4%***
VAT compliance gap change since 2016					**-2.4 pp**	

Figure 49: NL: VAT compliance gap, VAT revenue, and VTTL[61]



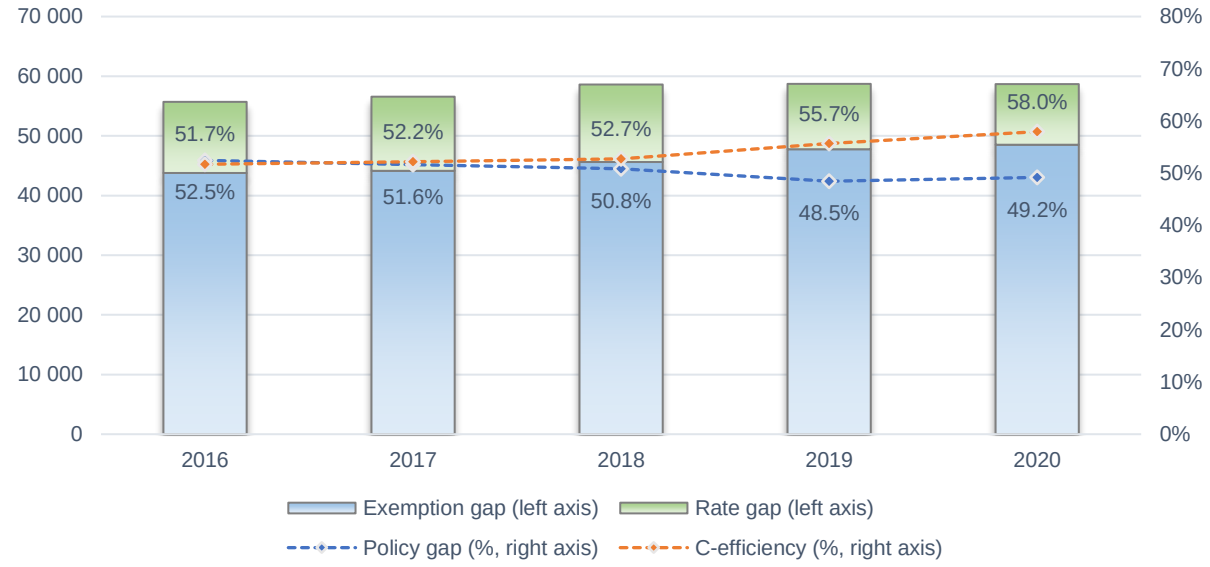
Source: own calculation, download underlying data.

[61] *The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.*

Table 46: NL: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**55 705**	**56 571**	**58 611**	**58 718**	**58 678**
Rate gap	11 920	12 426	12 989	10 956	10 161
Exemption gap	43 785	44 144	45 622	47 762	48 517
o/w imputed rents	*7 573*	*7 741*	*8 104*	*8 476*	*8 793*
o/w public services	*26 925*	*27 616*	*28 788*	*30 647*	*30 932*
o/w financial services	*7 372*	*6 881*	*6 136*	*6 290*	*6 124*
Actionable exemption gap	**1 915**	**1 907**	**2 593**	**2 349**	**2 669**
Actionable policy gap	**13 835**	**14 333**	**15 582**	**13 305**	**12 830**
C-efficiency	**51.7%**	**52.2%**	**52.7%**	**55.7%**	**58.0%**

Figure 50: NL: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Austria

Highlights

- The VAT compliance gap remained relatively stable in the analysed time period. In 2020, the VAT compliance gap went up by approximately 0.9 pp and amounted to 8.6 percent of the VTTL. An important factor supporting liquidity and compliance with VAT obligations was the postponement of VAT payment obligations beyond 2020.
- The policy gap remained relatively stable between 2016 and 2020 despite the extension of the 5 percent VAT rate to accommodation services, campsites, and e-books.
- As a consequence of the slight increase of the VAT compliance and policy gaps, C-efficiency dropped in 2020.
- The shift in 2018 between the rate and exemption gap was caused by technical reason, i.e., the increased accuracy of certain parameters as of 2018. This led to a structural break in these time series.

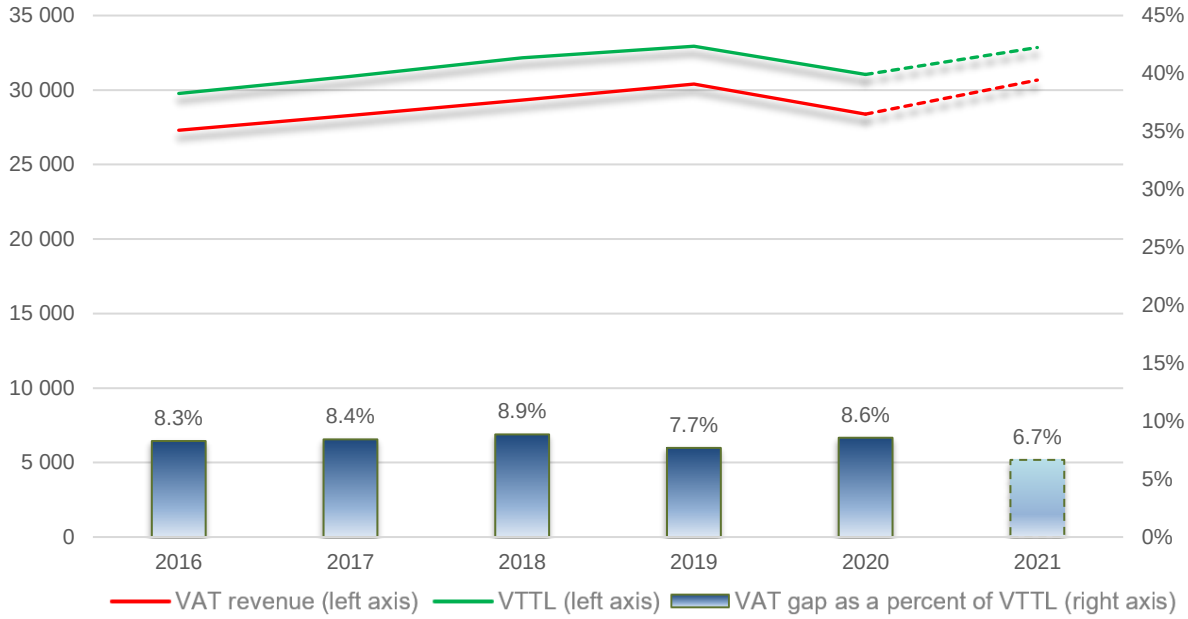
confidence in estimates:[62] 

[62] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 47: AT: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[63]

	2016	2017	2018	2019	2020	*2021*
VTTL	**29 768**	**30 909**	**32 172**	**32 939**	**31 044**	***32 856***
o/w liability on household final consumption	19 885	20 658	21 368	21 853	19 682	
o/w liability on gov. and NPISH final consumption	947	958	1 485	1 567	1 625	
o/w liability on intermediate consumption	4 183	4 317	4 345	4 551	4 712	
o/w liability on GFCF	3 284	3 437	3 416	3 524	3 611	
o/w net adjustments	1 469	1 539	1 559	1 444	1 415	
VAT revenue	**27 301**	**28 304**	**29 323**	**30 405**	**28 384**	***30 668***
VAT compliance gap	**2 466**	**2 605**	**2 849**	**2 533**	**2 660**	
VAT compliance gap (percent of VTTL)	**8.3%**	**8.4%**	**8.9%**	**7.7%**	**8.6%**	***6.7%***
VAT compliance gap change since 2016					**+0.3 pp**	

Figure 51: AT: VAT compliance gap, VAT revenue, and VTTL[63]



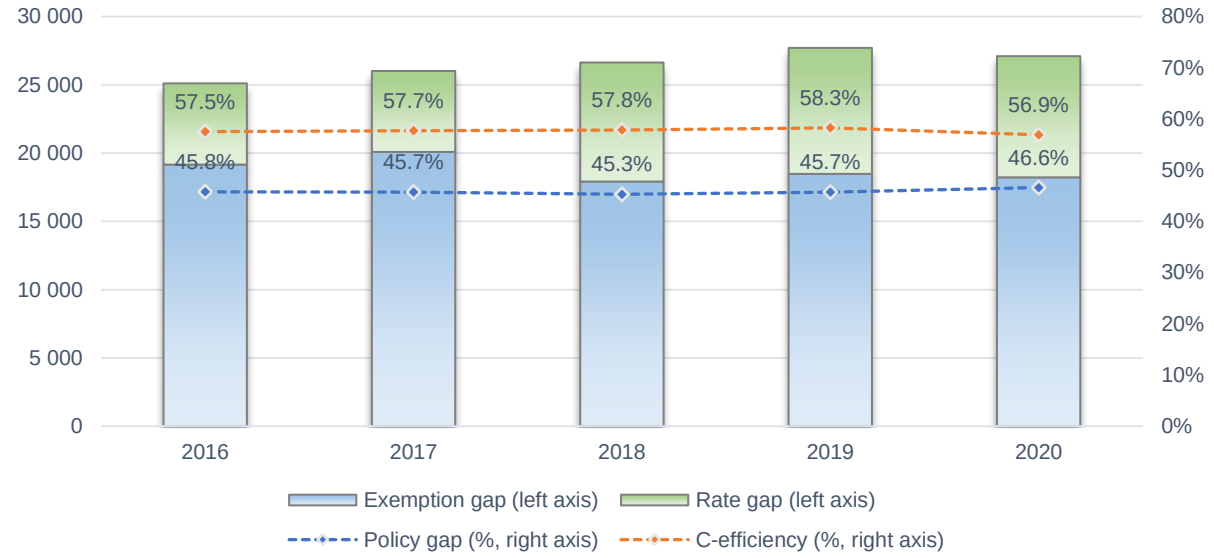
Source: own calculation, download underlying data.

[63] *The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.*

Table 48: AT: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**25 109**	**26 015**	**26 635**	**27 709**	**27 102**
Rate gap	5 948	5 929	8 716	9 230	8 877
Exemption gap	19 160	20 086	17 919	18 479	18 225
o/w imputed rents	*4 052*	*4 227*	*4 359*	*4 472*	*4 592*
o/w public services	*10 606*	*10 858*	*11 112*	*11 607*	*11 782*
o/w financial services	*1 566*	*1 571*	*1 623*	*1 652*	*1 511*
Actionable exemption gap	**2 936**	**3 430**	**825**	**748**	**340**
Actionable policy gap	**8 884**	**9 358**	**9 541**	**9 978**	**9 216**
C-efficiency	**57.5%**	**57.7%**	**57.8%**	**58.3%**	**56.9%**

Figure 52: AT: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Poland

Highlights

- In 2020, the VAT compliance gap decreased by approximately 1.4 pp down to 11.3 percent. The large increase in the value of electronic transactions of nearly 20 percent and the decline of the bankruptcy rate of approximately 8.5 percent have likely facilitated the further increase in VAT compliance.
- Between 2016 and 2018, Poland recorded one of the fastest increases in VAT compliance in the EU. During this time, Poland increased reporting obligations by implementing and extending SAF-T and introduced other measures targeting fraud and evasion.
- The policy gap slightly increased in 2020 due to increased public expenditure. The rate gap remained relatively stable and one of the largest in the EU due to the broad application of reduced rates for various services.

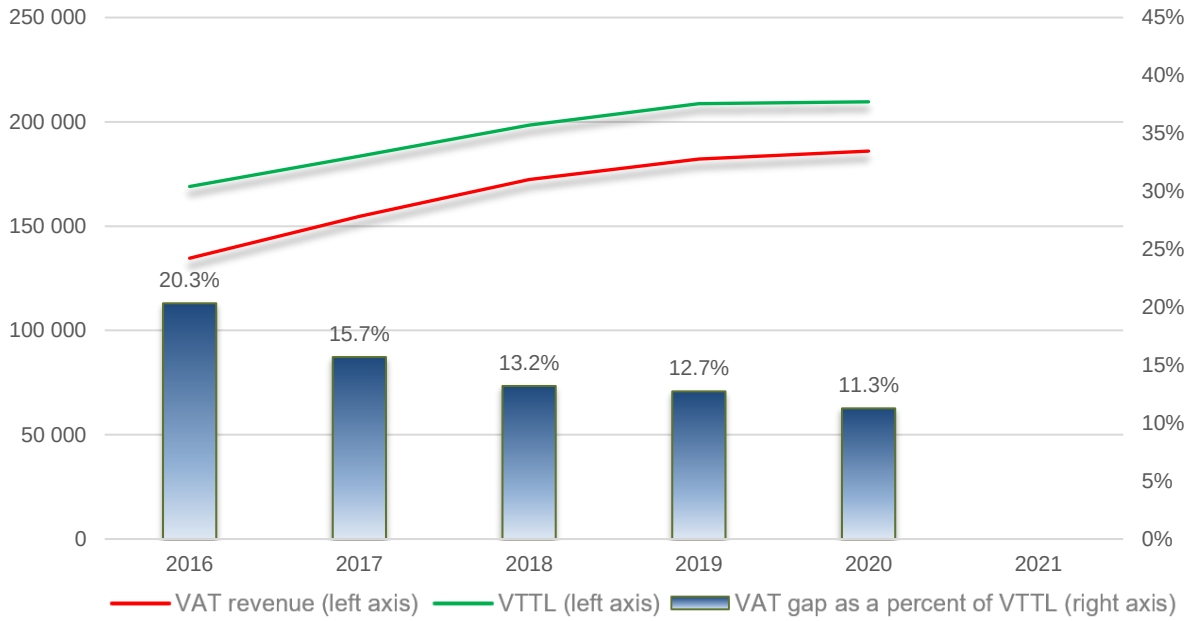
confidence in estimates:[64] 

[64] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 49: PL: VAT compliance gaps, VAT receipts, composition of VTTL (PLN million, 2016-2021)[65]

	2016	2017	2018	2019	2020	*2021*
VTTL	**169 002**	**183 518**	**198 479**	**208 743**	**209 600**	*X*
o/w liability on household final consumption	119 699	129 542	138 538	146 835	145 504	
o/w liability on gov. and NPISH final consumption	7 605	7 737	8 325	9 130	9 948	
o/w liability on intermediate consumption	25 512	27 161	28 497	29 573	30 113	
o/w liability on GFCF	13 695	16 562	20 559	20 772	21 188	
o/w net adjustments	2 491	2 515	2 560	2 434	2 848	
VAT revenue	**134 623**	**154 695**	**172 264**	**182 147**	**185 964**	*X*
VAT compliance gap	**34 379**	**28 823**	**26 215**	**26 596**	**23 636**	*X*
VAT compliance gap (percent of VTTL)	**20.3%**	**15.7%**	**13.2%**	**12.7%**	**11.3%**	*X*
VAT compliance gap change since 2016					**-9.1 pp**	*X*

Figure 53: PL: VAT compliance gap, VAT revenue, and VTTL[65]



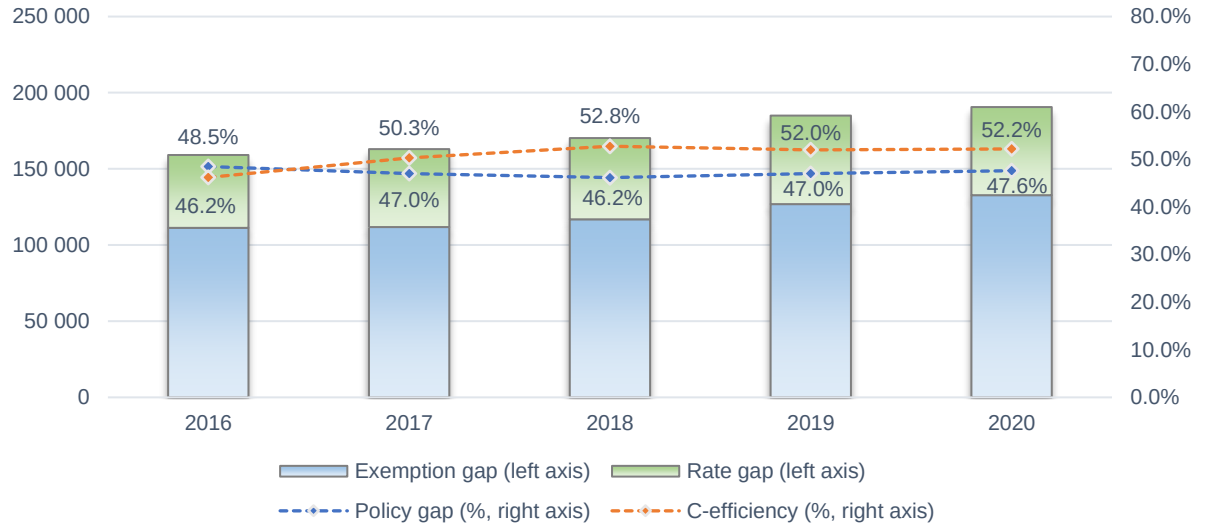
Source: own calculation, download underlying data.

[65] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 50: PL: VAT policy gap and their components (PLN million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**159 120**	**162 990**	**170 239**	**184 982**	**190 583**
Rate gap	47 822	51 167	53 340	58 110	57 841
Exemption gap	111 298	111 822	116 899	126 872	132 742
o/w imputed rents	*12 419*	*12 685*	*12 746*	*13 401*	*13 970*
o/w public services	*51 327*	*51 748*	*51 747*	*58 546*	*63 845*
o/w financial services	*11 712*	*11 995*	*11 430*	*12 157*	*11 684*
Actionable exemption gap	**35 840**	**35 395**	**40 976**	**42 769**	**43 244**
Actionable policy gap	**83 662**	**86 562**	**94 316**	**100 879**	**101 085**
C-efficiency	**46.2%**	**50.3%**	**52.8%**	**52.0%**	**52.2%**

Figure 54: PL: VAT policy gap, rate gap, and exemption gap



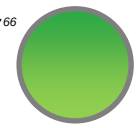
Source: own calculation, download underlying data.

Portugal

Highlights

- In 2020, the estimated VTTL for Portugal declined in parallel with revenue. As a result, the VAT compliance gap remained broadly unchanged and amounted to approximately 8 percent of the VTTL. As a tourist destination, Portugal experienced a large drop in economic activity. GDP fell by 8.4 percent, hindering improvements in compliance observed in preceding years.
- Between 2016 and 2019, the VAT compliance gap steadily decreased. Overall, the gap fell by nearly 4 pp.
- Portugal was the first country to implement the OECD's SAF-T in 2009 and in 2020 was among three Member States with such a solution in place.
- In 2020, similar to many Member States, the policy gap increased. Although the exemption gap attributed to public services dropped in nominal terms, its share in notional ideal revenue increased.

confidence in estimates:[66]

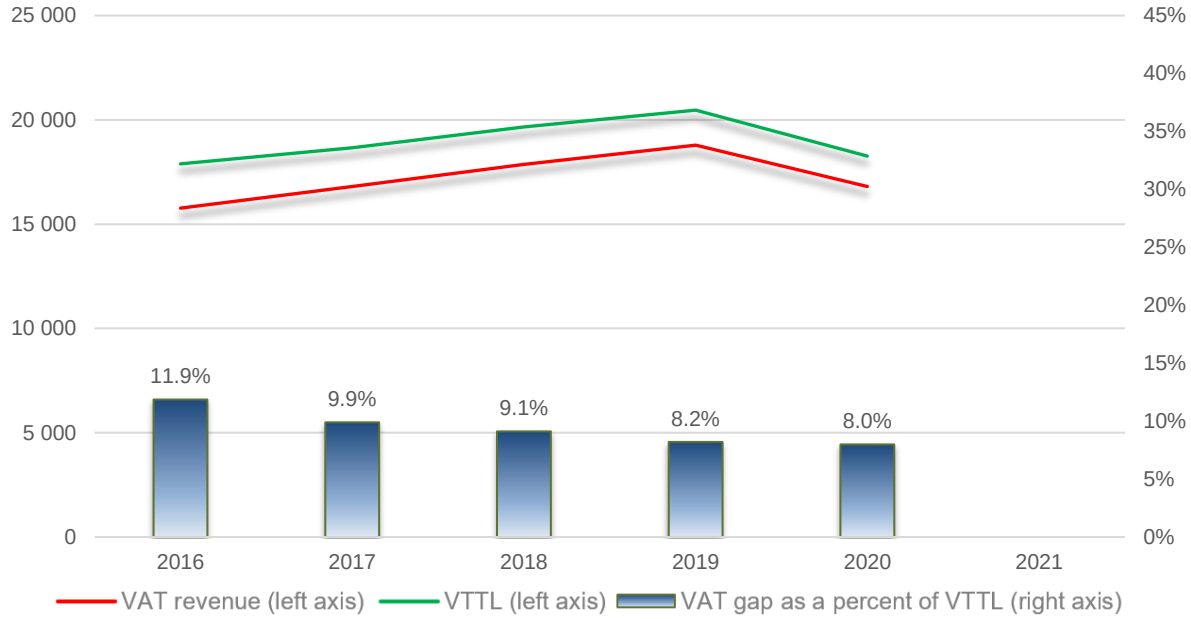


[66] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 51: PT: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[67]

	2016	2017	2018	2019	2020	*2021*
VTTL	**17 890**	**18 656**	**19 660**	**20 465**	**18 263**	*X*
o/w liability on household final consumption	13 345	13 791	14 455	15 052	12 915	
o/w liability on gov. and NPISH final consumption	487	535	550	598	621	
o/w liability on intermediate consumption	2 732	2 928	3 053	3 218	3 187	
o/w liability on GFCF	941	1 031	1 187	1 230	1 255	
o/w net adjustments	385	372	415	366	285	
VAT revenue	**15 767**	**16 810**	**17 868**	**18 786**	**16 803**	*X*
VAT compliance gap	**2 123**	**1 847**	**1 792**	**1 679**	**1 460**	*X*
VAT compliance gap (percent of VTTL)	**11.9%**	**9.9%**	**9.1%**	**8.2%**	**8.0%**	*X*
VAT compliance gap change since 2016					**-3.9 pp**	*X*

Figure 55: PT: VAT compliance gap, VAT revenue, and VTTL[67]



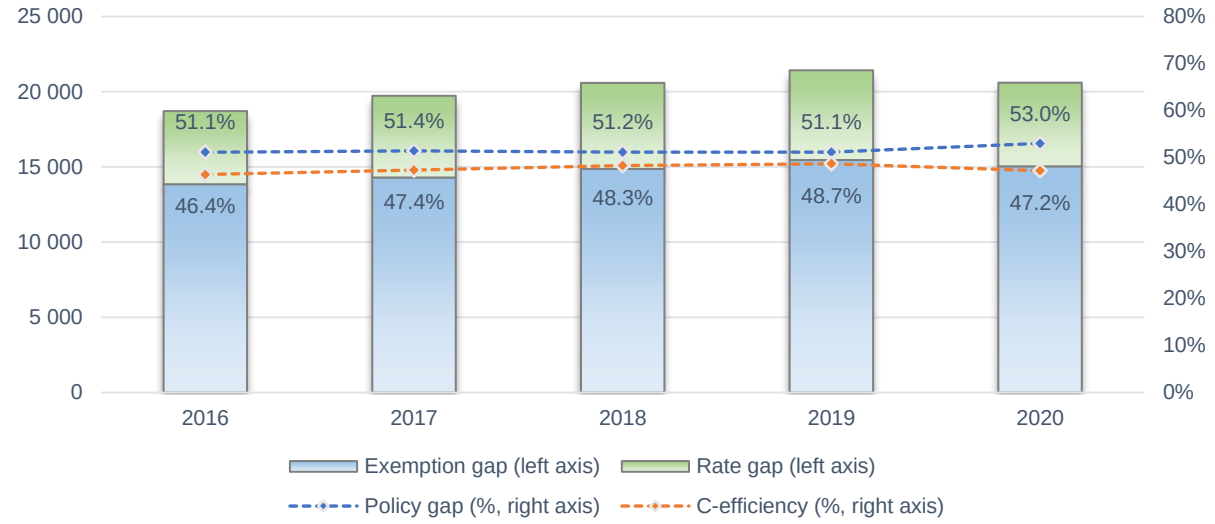
Source: own calculation, download underlying data.

[67] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 52: PT: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**18 715**	**19 733**	**20 591**	**21 428**	**20 606**
Rate gap	4 862	5 432	5 720	5 967	5 564
Exemption gap	13 853	14 300	14 871	15 460	15 042
o/w imputed rents	*3 092*	*3 164*	*3 282*	*3 421*	*3 364*
o/w public services	*7 217*	*7 405*	*7 669*	*8 030*	*7 981*
o/w financial services	*1 139*	*1 248*	*1 306*	*1 350*	*1 126*
Actionable exemption gap	**2 405**	**2 484**	**2 614**	**2 659**	**2 571**
Actionable policy gap	**7 266**	**7 916**	**8 334**	**8 627**	**8 135**
C-efficiency	**46.4%**	**47.4%**	**48.3%**	**48.7%**	**47.2%**

Figure 56: PT: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Romania

Highlights

- The estimated VAT compliance gap remained broadly unchanged year-to-year. Similarly, the economic situation was relatively stable compared to other Member States. GDP declined by 3.7 percent in real terms. This did not translate to an increased bankruptcy rate, which, instead, declined by 5.4 percent.
- In 2020, the VAT compliance gap accounted for 35.7 percent of the VTTL, which was the highest share recorded in the EU.
- In 2021, the gap is expected to decline slightly. This expected decline might be related to the introduction of various digital reporting means as of 2020, i.e., the roll out of SAF-T and VAT cash registers.
- The policy gap in 2020 decreased by approximately 1.9 pp year-to-year. It also remains the lowest in the EU due to the relatively low share of the consumption of exempt and non-taxable goods and services.

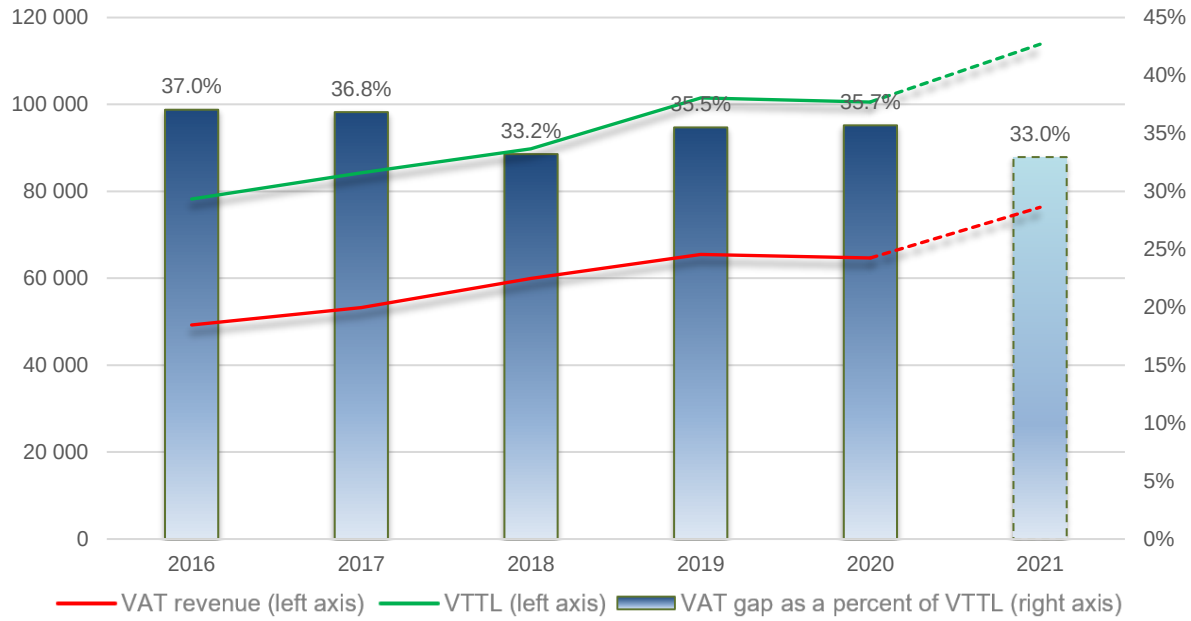
confidence in estimates:[68] 

[68] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 53: RO: VAT compliance gaps, VAT receipts, composition of VTTL (RON million, 2016-2021)[69]

	2016	2017	2018	2019	2020	*2021*
VTTL	**78 235**	**84 275**	**89 824**	**101 520**	**100 581**	***113 863***
o/w liability on household final consumption	49 150	53 365	57 708	62 736	59 860	
o/w liability on gov. and NPISH final consumption	3 560	3 377	3 623	4 350	4 404	
o/w liability on intermediate consumption	7 765	8 365	9 494	10 761	11 566	
o/w liability on GFCF	16 338	18 048	18 702	22 737	24 124	
o/w net adjustments	1 422	1 119	297	937	628	
VAT revenue	**49 253**	**53 229**	**59 990**	**65 461**	**64 677**	***76 336***
VAT compliance gap	**28 982**	**31 046**	**29 835**	**36 059**	**35 905**	
VAT compliance gap (percent of VTTL)	**37.0%**	**36.8%**	**33.2%**	**35.5%**	**35.7%**	***33.0%***
VAT compliance gap change since 2016					**-1.3 pp**	

Figure 57: RO: VAT compliance gap, VAT revenue, and VTTL[69]



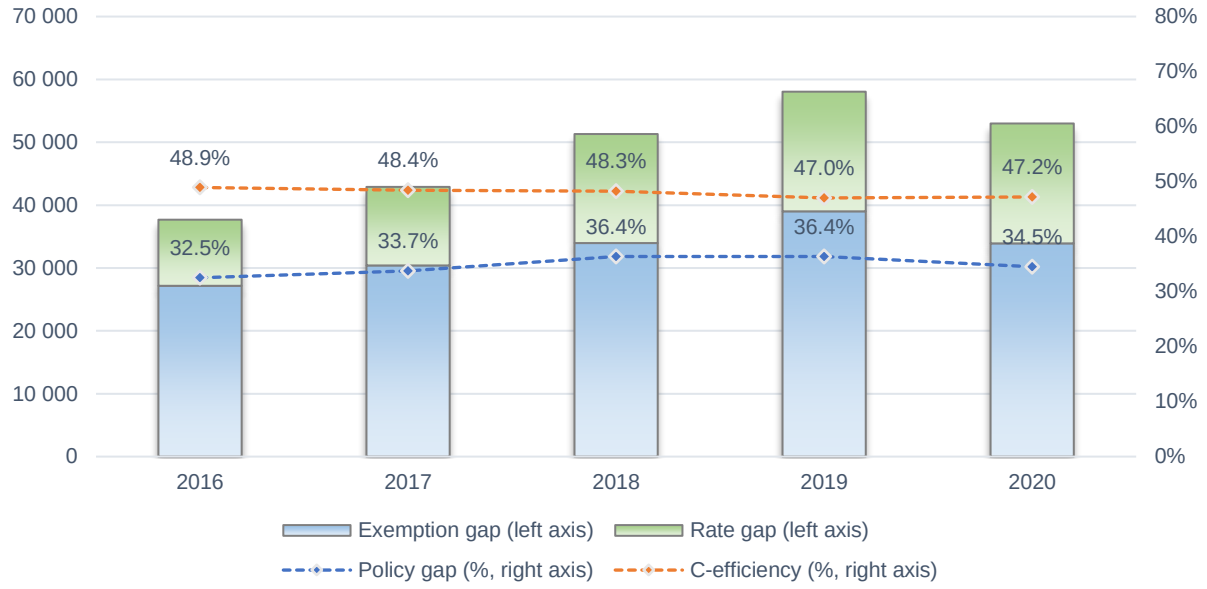
Source: own calculation, download underlying data.

[69] *The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.*

Table 54: RO: VAT policy gap and their components (RON million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**37 688**	**42 906**	**51 312**	**58 051**	**52 991**
Rate gap	10 516	12 495	17 342	19 034	19 073
Exemption gap	27 172	30 411	33 970	39 017	33 918
o/w imputed rents	*10 359*	*10 522*	*10 641*	*11 926*	*12 134*
o/w public services	*12 996*	*15 752*	*18 269*	*20 796*	*20 322*
o/w financial services	*- 278*	*- 377*	*- 50*	*- 313*	*- 133*
Actionable exemption gap	**4 095**	**4 514**	**5 109**	**6 609**	**1 595**
Actionable policy gap	**14 610**	**17 009**	**22 452**	**25 642**	**20 669**
C-efficiency	**48.9%**	**48.4%**	**48.3%**	**47.0%**	**47.2%**

Figure 58: RO: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Slovenia

Highlights

- The VAT compliance gap remained broadly unchanged in 2020 compared to 2019. At the same time, the bankruptcy rate went down by 11.7 percent, which may point to increase in other forms of non-compliance.
- The revenue figures for Slovenia are corrected for estimated values of tax unlikely to be collected (D.995a). This component in the amount of EUR 19 million for 2020 was removed from baseline revenue figures to ensure comparability with other EU Member States.
- The policy gap driven by increased public expenditure went up from 46.8 percent in 2019 to 49.8 percent in 2020.

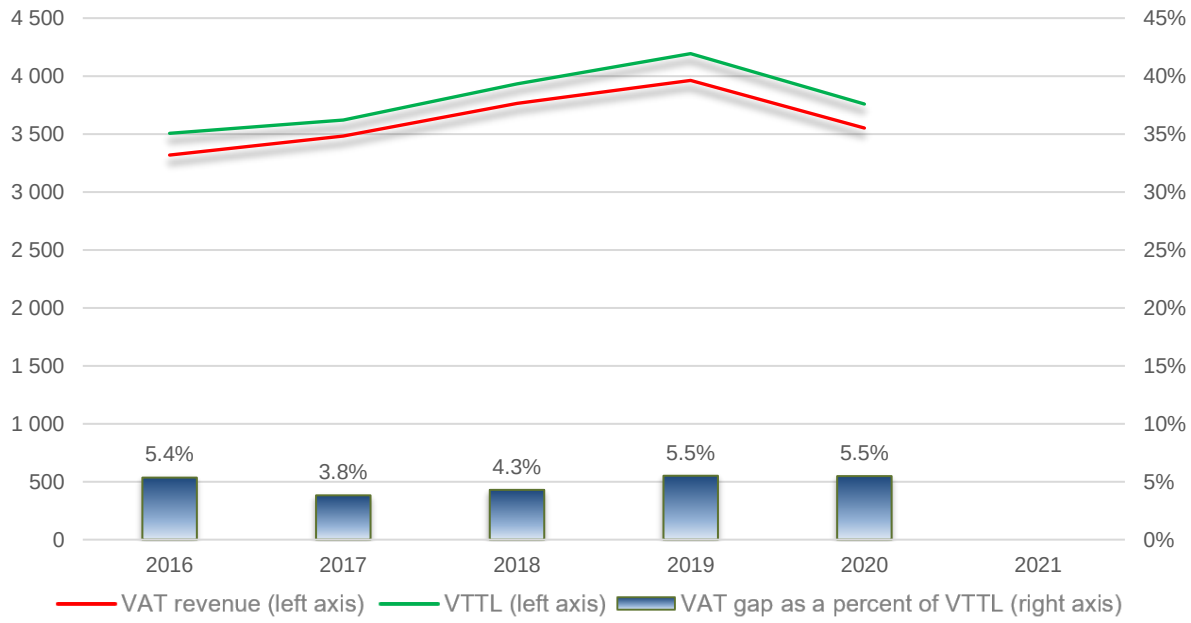
confidence in estimates:[70] 

[70] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 55: SI: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[71]

	2016	2017	2018	2019	2020	*2021*
VTTL	**3 506**	**3 620**	**3 934**	**4 194**	**3 759**	*X*
o/w liability on household final consumption	2 575	2 679	2 840	3 025	2 616	
o/w liability on gov. and NPISH final consumption	85	83	97	99	109	
o/w liability on intermediate consumption	469	461	518	559	540	
o/w liability on GFCF	303	329	402	431	431	
o/w net adjustments	74	68	77	79	63	
VAT revenue	**3 318**	**3 481**	**3 765**	**3 962**	**3 553**	*X*
VAT compliance gap	**188**	**138**	**169**	**231**	**206**	*X*
VAT compliance gap (percent of VTTL)	**5.4%**	**3.8%**	**4.3%**	**5.5%**	**5.5%**	*X*
VAT compliance gap change since 2016					**+0.1 pp**	*X*

Figure 59: SI: VAT compliance gap, VAT revenue, and VTTL[71]



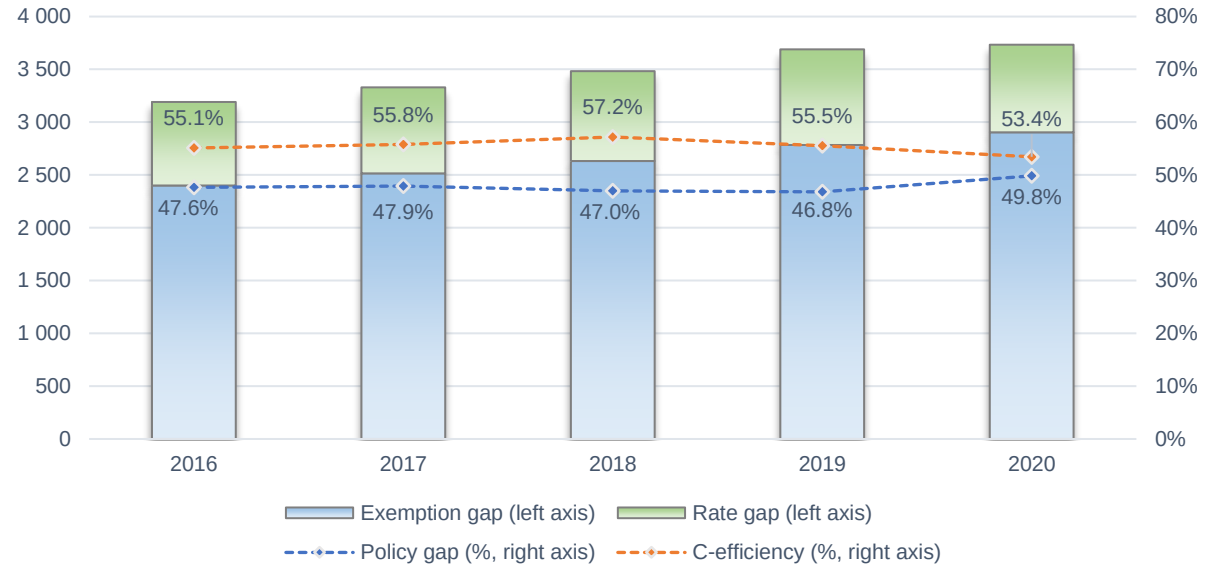
Source: own calculation, download underlying data.

[71] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 56: SI: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**3 191**	**3 330**	**3 483**	**3 690**	**3 733**
Rate gap	791	814	851	906	830
Exemption gap	2 400	2 515	2 632	2 784	2 904
o/w imputed rents	527	541	576	583	588
o/w public services	1 207	1 253	1 253	1 340	1 471
o/w financial services	*173*	*188*	*203*	*223*	*187*
Actionable exemption gap	**493**	**533**	**600**	**638**	**658**
Actionable policy gap	**1 284**	**1 348**	**1 451**	**1 543**	**1 488**
C-efficiency	**55.1%**	**55.8%**	**57.2%**	**55.5%**	**53.4%**

Figure 60: SI: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Slovakia

Highlights

- In 2020, the compliance gap in Slovakia continued its downward trend. It fell from 15 percent in 2019 down to 13.9 percent of the VTTL in 2020. The increase in compliance was accompanied by the sudden decline in the bankruptcy rate, which fell by nearly 33 percent in 2020. The measures underlying this drop include postponed deadlines for filing VAT and income tax returns and wage subsidies to employers aimed at maintaining pre-pandemic employment.
- In 2021, the VAT compliance gap is expected to shrink further and fall below 10 percent of the VTTL. Such an estimated drop may result from delayed VAT payments insufficiently accounted in 2020 accrual VAT revenue figures. The reasons for this shift will be further investigated in the next update of the study when relevant figures become available.
- The policy gap was relatively stable in 2020, compared to 2019.
- The rate gap in Slovakia remains one of the lowest in the EU despite some increase resulting, among others, from a reduction of the rate for accommodation services in 2019.

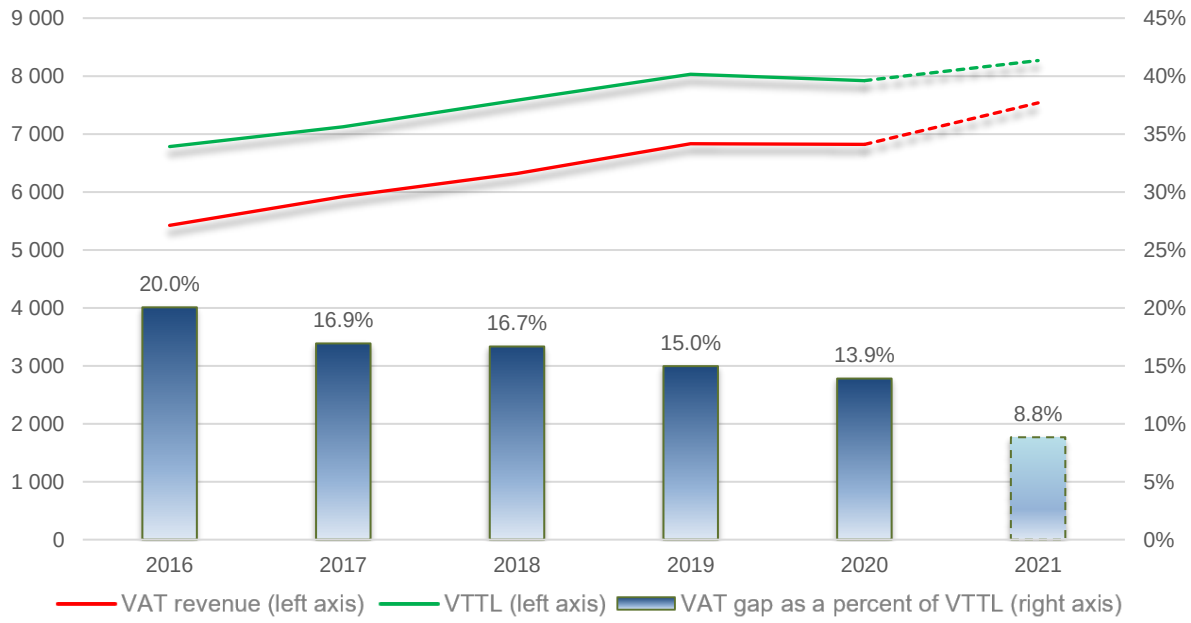
confidence in estimates:[72] 

[72] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 57: SK: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[73]

	2016	2017	2018	2019	2020	*2021*
VTTL	**6 783**	**7 125**	**7 583**	**8 033**	**7 921**	***8 268***
o/w liability on household final consumption	5 054	5 437	5 734	6 068	6 021	
o/w liability on gov. and NPISH final consumption	98	98	132	147	150	
o/w liability on intermediate consumption	877	908	962	1 031	1 042	
o/w liability on GFCF	763	680	761	799	726	
o/w net adjustments	-9	2	-6	-12	-18	
VAT revenue	**5 424**	**5 919**	**6 319**	**6 830**	**6 820**	***7 538***
VAT compliance gap	**1 360**	**1 206**	**1 264**	**1 202**	**1 101**	
VAT compliance gap (percent of VTTL)	**20.0%**	**16.9%**	**16.7%**	**15.0%**	**13.9%**	***8.8%***
VAT compliance gap change since 2016					**-6.1 pp**	

Figure 61: SK: VAT compliance gap, VAT revenue, and VTTL[73]



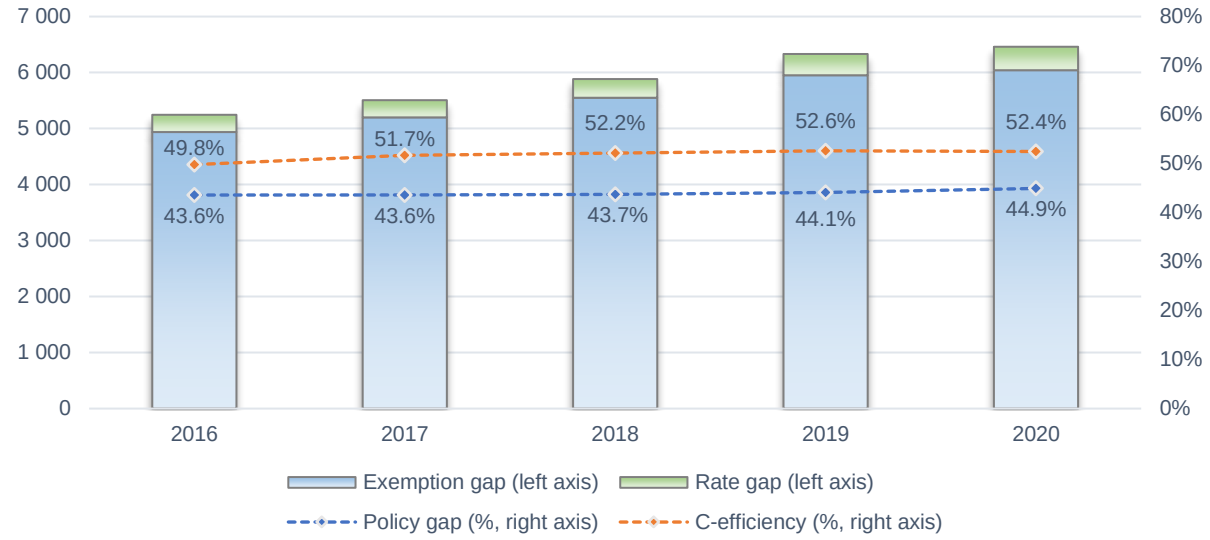
Source: own calculation, download underlying data.

[73] *The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.*

Table 58: SK: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**5 246**	**5 507**	**5 884**	**6 332**	**6 461**
Rate gap	308	307	334	380	419
Exemption gap	4 938	5 200	5 550	5 952	6 042
o/w imputed rents	*1 199*	*1 215*	*1 351*	*1 427*	*1 518*
o/w public services	*2 193*	*2 358*	*2 362*	*2 629*	*2 646*
o/w financial services	*299*	*322*	*308*	*304*	*283*
Actionable exemption gap	**1 247**	**1 305**	**1 530**	**1 593**	**1 595**
Actionable policy gap	**1 555**	**1 612**	**1 864**	**1 972**	**2 014**
C-efficiency	**49.8%**	**51.7%**	**52.2%**	**52.6%**	**52.4%**

Figure 62: SK: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Finland

Highlights

- The macroeconomic situation in Finland in 2020 was more favourable than in most Member States. GDP in real terms fell by 2.2 percent whereas the nominal tax base dropped by 0.7 percent. In addition, VAT rate cuts were more modest than in other Member States and restricted to COVID-19 prevention goods.
- In 2020, the estimated VAT compliance gap fell to 1.3 percent of the VTTL, which was the lowest share recorded in the EU.
- Overall, since 2017, the VAT compliance gap has decreased by 4.8 pp of the VTTL.
- Despite a slight increase in the policy gap driven by the increased share of the public goods exemption gap, C-efficiency increased from 57.5 percent in 2019 to 58.4 percent in 2020.

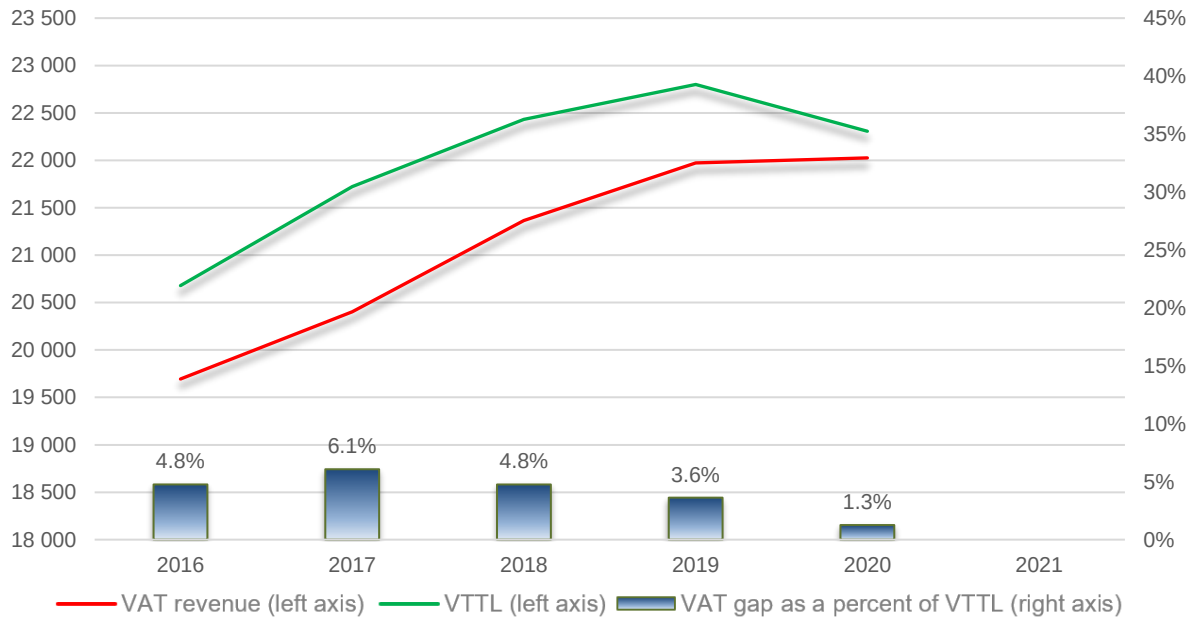
confidence in estimates:[74] 

[74] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 59: FI: VAT compliance gaps, VAT receipts, composition of VTTL (EUR million, 2016-2021)[75]

	2016	2017	2018	2019	2020	*2021*
VTTL	**20 679**	**21 723**	**22 432**	**22 800**	**22 307**	*X*
o/w liability on household final consumption	11 575	11 830	12 198	12 261	11 697	
o/w liability on gov. and NPISH final consumption	504	489	520	565	583	
o/w liability on intermediate consumption	4 396	4 651	4 711	4 824	4 821	
o/w liability on GFCF	3 513	3 987	4 300	4 368	4 427	
o/w net adjustments	691	768	703	782	779	
VAT revenue	**19 694**	**20 404**	**21 364**	**21 974**	**22 026**	*X*
VAT compliance gap	**985**	**1 319**	**1 068**	**826**	**281**	*X*
VAT compliance gap (percent of VTTL)	**4.8%**	**6.1%**	**4.8%**	**3.6%**	**1.3%**	*X*
VAT compliance gap change since 2016					**-3.5 pp**	*X*

Figure 63: FI: VAT compliance gap, VAT revenue, and VTTL[75]



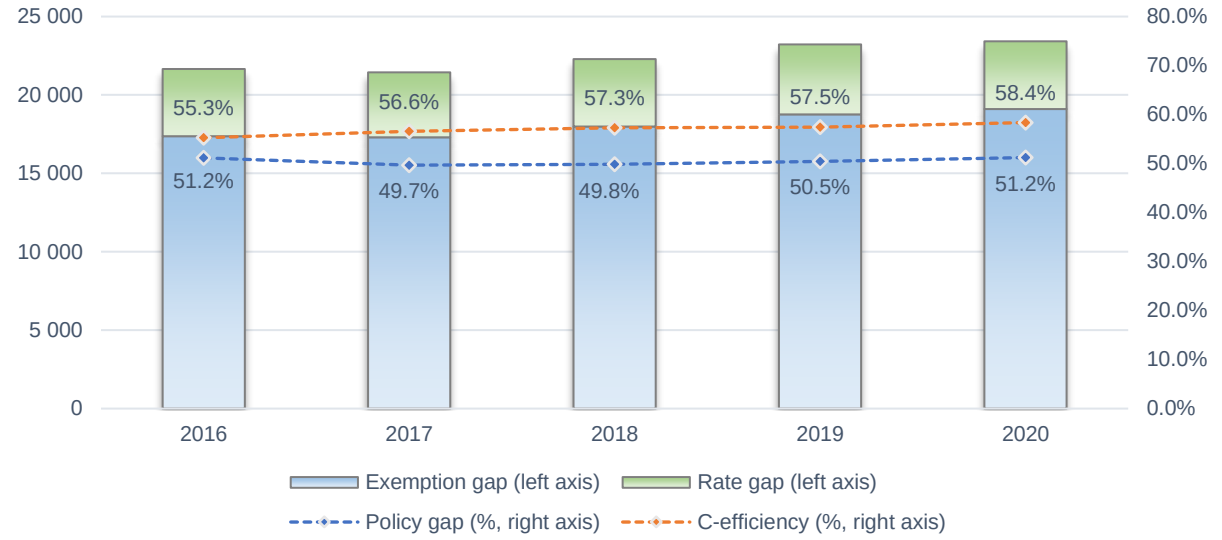
Source: own calculation, download underlying data.

[75] *Fast estimates for 2021 were not published due to expected large estimation error.*

Table 60: FI: VAT policy gap and their components (EUR million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**21 655**	**21 442**	**22 288**	**23 223**	**23 422**
Rate gap	4 285	4 142	4 300	4 462	4 320
Exemption gap	17 370	17 300	17 988	18 761	19 102
o/w imputed rents	*4 270*	*4 360*	*4 488*	*4 628*	*4 740*
o/w public services	*9 464*	*9 344*	*9 620*	*9 983*	*10 266*
o/w financial services	*1 365*	*1 225*	*1 338*	*1 345*	*1 297*
Actionable exemption gap	**2 270**	**2 371**	**2 542**	**2 805**	**2 799**
Actionable policy gap	**6 555**	**6 513**	**6 843**	**7 267**	**7 119**
C-efficiency	**55.3%**	**56.6%**	**57.3%**	**57.5%**	**58.4%**

Figure 64: FI: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

Sweden

Highlights

- The economic conditions in Sweden in 2020 were more favourable than in most Member States. GDP in real terms fell by 2.2 percent whereas the nominal tax base remained broadly unchanged compared to 2019 both in terms of the value and structure.
- In 2020, the VAT compliance gap in Sweden fell by 1.3 pp down to 2 percent of the VTTL, i.e., the second lowest value in the EU. In 2021, the VAT compliance gap is expected to decline further.
- The policy gap remained relatively stable between 2016 and 2020, with an average value slightly below 46 percent.

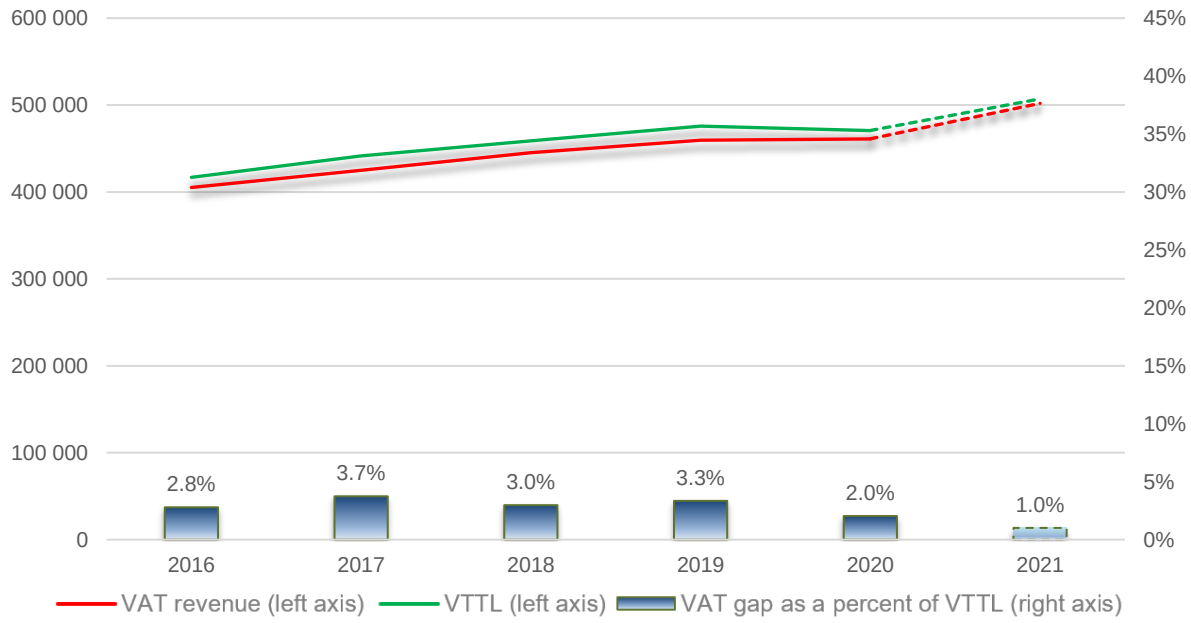
confidence in estimates:[76] 

[76] *See discussion on minimum data requirements and road signs indication in* ***Assessment of the accuracy of the top-down consumption-side approach.***

Table 61: SE: VAT compliance gaps, VAT receipts, composition of VTTL (SEK million, 2016-2021)[75]

	2016	2017	2018	2019	2020	*2021*
VTTL	**416 790**	**441 389**	**458 891**	**475 601**	**470 721**	***507 101***
o/w liability on household final consumption	214 033	224 754	234 683	241 592	233 045	
o/w liability on gov. and NPISH final consumption	16 742	17 542	18 744	20 158	20 672	
o/w liability on intermediate consumption	100 077	104 203	108 994	114 962	112 205	
o/w liability on GFCF	80 354	89 676	90 857	92 977	99 185	
o/w net adjustments	5 584	5 215	5 613	5 911	5 613	
VAT revenue	**405 160**	**424 886**	**445 241**	**459 699**	**461 132**	***501 963***
VAT compliance gap	**11 630**	**16 503**	**13 650**	**15 902**	**9 589**	
VAT compliance gap (percent of VTTL)	**2.8%**	**3.7%**	**3.0%**	**3.3%**	**2.0%**	***1.0%***
VAT compliance gap change since 2016					**-0.8 pp**	

Figure 65: SE: VAT compliance gap, VAT revenue, and VTTL[77]



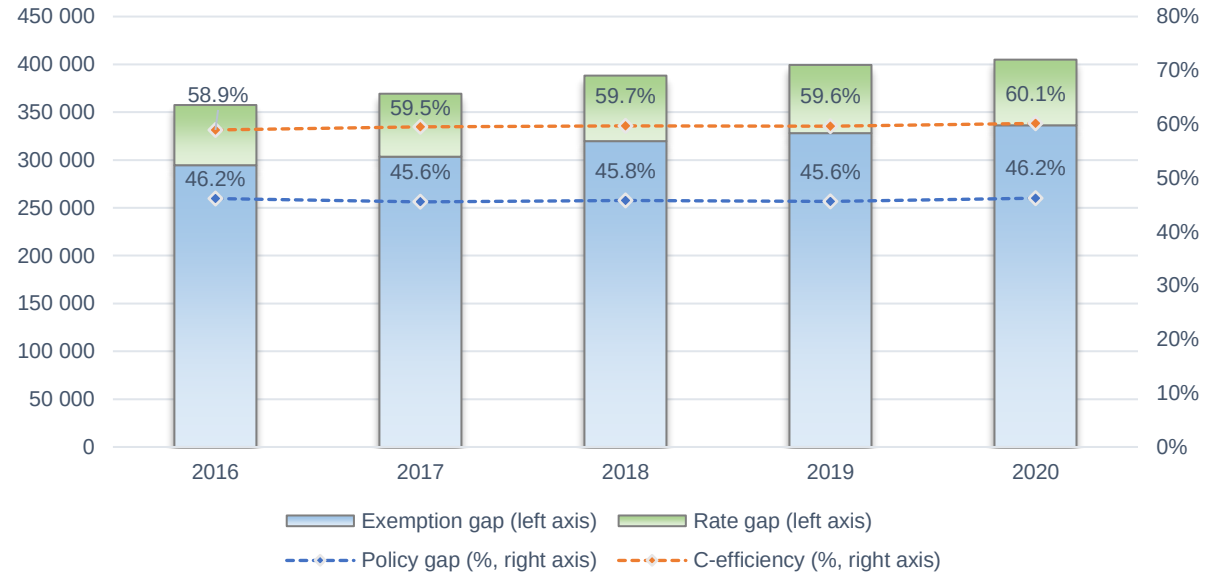
Source: own calculation, download underlying data.

[77] The fast estimates for 2021 are less accurate than estimates for the period of 2016-2020, as the fast estimates are based on a simplified methodology and more aggregate data. They are therefore likely to be subject to more extensive revision than the regular estimates once timely and more exhaustive data become available.

Table 62: SE: VAT policy gap and their components (SEK million, 2016-2020)

	2016	2017	2018	2019	2020
VAT policy gap	**357 504**	**369 315**	**388 270**	**399 412**	**404 974**
Rate gap	62 913	65 836	68 515	71 288	68 645
Exemption gap	294 590	303 480	319 755	328 124	336 329
o/w imputed rents	*36 801*	*37 401*	*39 483*	*41 249*	*42 713*
o/w public services	*206 828*	*214 233*	*221 200*	*227 311*	*236 211*
o/w financial services	*26 220*	*25 266*	*24 721*	*24 358*	*22 285*
Actionable exemption gap	**24 742**	**26 580**	**34 351**	**35 205**	**35 119**
Actionable policy gap	**87 656**	**92 416**	**102 866**	**106 494**	**103 764**
C-efficiency	**58.9%**	**59.5%**	**59.7%**	**59.6%**	**60.1%**

Figure 66: SE: VAT policy gap, rate gap, and exemption gap



Source: own calculation, download underlying data.

VI. Econometric analysis of the compliance gap

The econometric analysis outlined in this study regresses the VAT compliance gap for 27 EU Member States spanning from 2000 up to 2020. The endogenous variable originates form this and past European Commission's VAT gap studies (i.e., from edition 2013 up to the estimates presented in this report). To explain variation in the VAT compliance gap, a wide set of 65 covariates was used. A fixed effects model specification was chosen as some explanatory factors like the efforts of the tax administration or institutional variables are likely correlated with many other factors that are not included in the regressions.

The analysis incorporates all methodological improvements and novelties introduced in the earlier work: (1) "backcasting" – a novel data preparation procedure which eliminated potential bias related to revisions in subsequent vintages of the study; (2) a dummy variable adjustment to manage the scarcity of observations of exogenous variables, (3) the extended list covariates expected to be affecting VAT compliance, and (4) principal component analysis (PCA), which allows for the variability of more covariates to be accounted for in a single model specification.

The results of our regressions are shown in Table 63. The simplest model, the baseline specification, which is later used for predictions and robustness checks, is described in column (1). As can be seen in the table, GDP growth, general government surplus, IT expenditure, and the shares of the agriculture and financial sectors are all statistically significant at the 5 percent level of significance. According to the estimation results of the baseline specification, in order to decrease the VAT compliance gap by one pp, GDP needs to increase by 3 pp more, the general government balance needs to improve by 4.7 pp, or the share of IT expenditure in the overall expenditure of tax administrations needs to increase by roughly 6.5 pp.[78]

The alternative specifications (columns (2) to (10)) show that a number of variables that were suspected to be related to changes in the VAT compliance gap appeared to be statistically significant at the *p=0.05* level. This concerns: share of small companies measured by the number of employees (positive impact, see (3)), share of large companies measured by the number of employees (negative impact, see (4)), share of small and medium-sized companies, if measured by their share in gross value added (GVA) (positive and negative impact, respectively, see (5)), share of manufacturing, construction, and public administration sectors (negative impact, see (7)), and reporting obligations in place (negative impact, see (10)). These results confirm the hypothesis of the larger non-compliance of smaller taxpayers that are often less frequently targeted by audits and face higher costs to comply with VAT obligations. Non-compliance in sectors dominated by public companies and large entities mostly involved in B2B transaction, as well as in sectors where companies accrue significant deductible input VAT, appeared to be lower. On the contrary, the greater prevalence of sectors with a large share of B2C transactions, small taxpayers, and sectors more frequently using cash payments, the higher the VAT compliance gap. The statistical and economic significance of administrations' IT expenditure and reporting obligations proved the usefulness of electronic means in incentivising higher compliance and/or non-compliance detection.

[78] *The impact of changes in the value of exogenous variables is derived under the ceteris paribus assumption, by dividing one over the respective coefficient value.*

Some variables, in contrast with expectations, appeared not to be significant. This concerns some of the tax administration variables, i.e., the frequency of verification actions and electronic payments (see (2)) and the fraud proxies, namely discrepancies in Intrastat registers (see (6)) and the share in GDP of the cross-border importation of risky goods (see (8)). These results signal that there are phenomena that the econometric model cannot fully control for as the inaccuracy of fraud proxies or the qualitative aspect of audits and verification actions. The alternative specifications also show that the share of micro-sized companies, if measured by their share in gross value added (GVA) (see (5)) and other economic sectors (see (7)), is also statistically insignificant.

Importantly, out of all specifications included in Table 63, the model containing the shares of a broad list of sectors of economic activity explains the largest share of the VAT compliance gap variation, with part of the variables significant and an R-squared of approximately 42 percent. However, the specification containing the PCA components of macroeconomic environment appears also to explain a large share of the VAT compliance gap, with all three components statistically significant and an R-squared of approximately 39 percent. This underlines that the overall macroeconomic environment and structure of economies in terms of sectors and company size are very important determinants of VAT compliance. On the contrary to the macroeconomic components, the inclusion of fraud components did not increase substantially the explanatory power of the econometric model. Both components appeared not to be statistically significant. This could result from inaccuracies in these proxies or from the fact that other variables included in the specifications also account for the fraud element of the compliance gap.

As depicted by Figure 67: Contributions to VAT compliance gap change, the model is able to attribute the majority of shifts in the overall EU VAT compliance gap to specific factors. The results yield an important conclusion – much of the variation in the VAT compliance gap, especially in periods of economic stress, comes from cyclical factors, which is mostly visible between 2008 and 2010. However, the decrease in the VAT compliance gap between 2013 and 2018 is only partially related to positive economic changes. Most of the changes are attributed to year effects, which are likely related to efforts of tax administrations not captured by the baseline model specification. Additionally, in 2020, the changes in macroeconomic variables would suggest an approximate 4 pp increase in the VAT compliance gap. At the same time, the VAT compliance gap dropped, and the year effect reached approximately -5.8 pp. This strong and comparable to other years effect clearly shows that 2020 was unique and goes beyond any patterns observed in earlier series of the VAT compliance gap.

Table 63: Econometric specifications

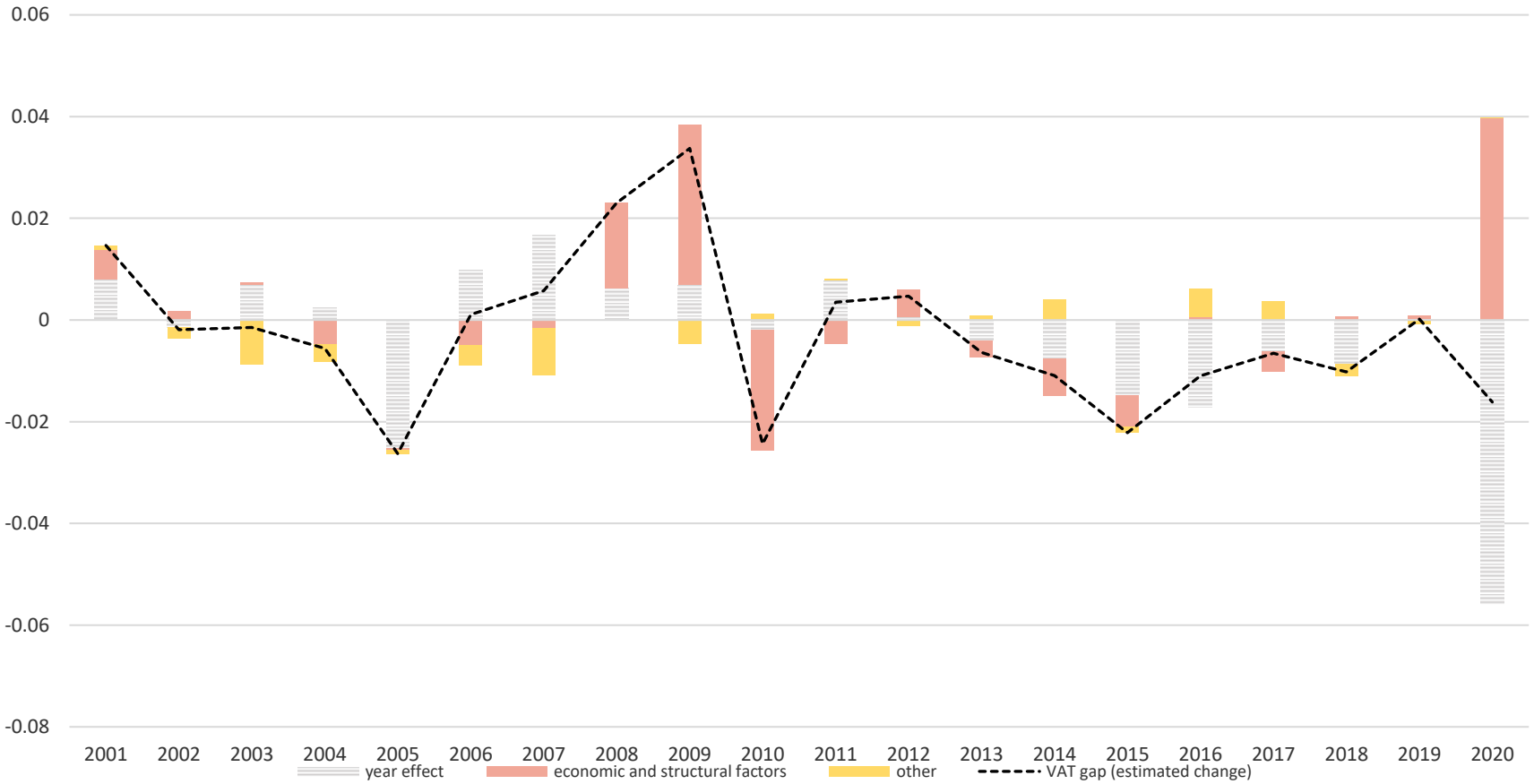
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	**Baseline**	**Verifications + Electr. Payments**	**Firm-size(1)**	**Firm-size(2)**	**Firm-size(3)**	**Trade discrepancies**	**Sectors**	**Reporting obligations**	**Fraud components**	**Macro components**
Macroeconomic variables										
Real GDP growth rate	-0.336*** (0.085)	-0.323*** (0.085)	-0.288*** (0.086)	-0.307*** (0.086)	-0.286*** (0.088)	-0.346*** (0.087)	-0.265*** (0.092)	-0.246*** (0.083)	-0.289*** (0.089)	
General gov. surplus	-0.213*** (0.076)	-0.224*** (0.076)	-0.187** (0.079)	-0.190** (0.078)	-0.152* (0.080)	-0.232*** (0.077)	-0.260*** (0.083)	-0.159** (0.069)	-0.179** (0.081)	
Macro component 1										-0.009*** (0.002)
Macro component 2										0.004*** (0.001)
Macro component 3										-0.005* (0.003)
Tax policy characteristics										
IT expenditure	-0.155*** (0.047)	-0.150*** (0.047)	-0.112** (0.048)	-0.122** (0.048)	-0.119*** (0.049)	-0.166*** (0.047)	-0.148*** (0.046)	-0.172*** (0.043)	-0.139*** (0.051)	-0.137*** (0.047)
Verification interventions		-0.037 (0.023)								
Electronic payments		-0.693 (0.552)								
Reporting obligations								-0.019*** (0.007)		
Structure of the economy										
Small-size companies (employees)			0.063*** (0.023)							
Large-size companies (employees)				-0.483*** (0.126)						
					-0.028					

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	**Baseline**	**Verifications + Electr. Payments**	**Firm-size(1)**	**Firm-size(2)**	**Firm-size(3)**	**Trade discrepancies**	**Sectors**	**Reporting obligations**	**Fraud components**	**Macro components**
Micro-size companies (GVA)					(0.088)					
Small-size companies (GVA)					0.724**					
					(0.356)					
Medium-size companies (GVA)					-0.580**					
					(0.259)					
Agriculture sector (share)	0.869***	0.771***				0.844***	0.425	0.013	0.433	1.166***
	(0.218)	(0.223)				(0.220)	(0.396)	(0.229)	(0.289)	(0.264)
Communication sector (share)	-0.341	-0.272				-0.726**	-0.981**	0.062	-0.428	-0.119
	(0.254)	(0.256)				(0.296)	(0.426)	(0.239)	(0.322)	(0.256)
Financial sector (share)	-1.041***	-0.988***				-1.088***	-1.362***	-0.507**	-0.583**	-0.869***
	(0.226)	(0.229)				(0.233)	(0.379)	(0.218)	(0.278)	(0.242)
Manufacturing sector (share)							-0.702**			
							(0.339)			
Construction sector (share)							-0.834**			
							(0.339)			
Wholesale and retail trade sector (share)							-0.484			
							(0.329)			
Real estate sector (share)							0.050			
							(0.374)			
Professional, scientific, technical service activities (share)							0.200			
							(0.429)			
Public administration (share)							-1.242***			
							(0.398)			
							-0.678			

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable	**Baseline**	**Verifications + Electr. Payments**	**Firm-size(1)**	**Firm-size(2)**	**Firm-size(3)**	**Trade discrepancies**	**Sectors**	**Reporting obligations**	**Fraud components**	**Macro components**
Arts, entertainment, and recreation sector (share)							(0.414)			
Tax fraud proxies										
Trade-at-risk						0.003 (0.013)				
Intra-EU import at risk (share in GDP)							0.493 (0.350)			
Fraud component 1									0.003 (0.002)	
Fraud component 2									-0.003 (0.002)	
Constant	0.213*** (0.024)	0.225*** (0.026)	0.142*** (0.018)	0.212*** (0.016)	0.186*** (0.029)	0.235*** (0.025)	0.768** (0.311)	0.192*** (0.022)	0.183*** (0.029)	0.099*** (0.028)
Observations	543	543	543	543	543	514	543	501	422	517
R-squared	0.379	0.390	0.329	0.339	0.326	0.366	0.417	0.347	0.382	0.390
Number of countries	26	26	26	26	26	26	26	24	25	26

*Source: own elaboration. Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.*

Figure 67: Contributions to VAT compliance gap change



Source: own elaboration, download underlying data.

Conclusion

The overall loss of revenue due to non-compliance, i.e., the VAT compliance gap, in the EU27 in 2020 was estimated at EUR 93 billion. Despite the economic troubles connected to the COVID-19 pandemic and the related restrictions to economic activity, the gap fell by approximately 2 pp of the VTTL. In nominal terms, the drop in the gap of nearly EUR 30 billion was even more pronounced as the VAT base and effective rates declined. Despite a long-term downward trend in the VAT compliance gap and optimistic results for 2020, foregone revenue in many Member States has a strong negative impact on government balances and the fairness of tax systems.

The estimates for 2020 point to an increase in compliance despite some likely overestimation of the gap resulting from the inability to fully control for the value of deferrals. The statistical analysis of the shifts in the VAT compliance gap and other developments following the outbreak of the COVID-19 pandemic indicated that the main driving force of the increased compliance were government policies. The largest decline of the VAT compliance gap was observed for the Member States that implemented the strongest support measures, often contingent upon paying taxes, and the Member States where VAT burden significantly dropped. Unexpectedly, no evidence was found confirming that the increase in the share of electronic transactions contributed to sealing VAT compliance gaps. Similarly, the analysis did not confirm that the decline in the use of services, and tourism-related services specifically, contributed to the increase in VAT compliance.

The VAT policy gap increased due to the temporary measures reducing the VAT burden which were introduced as a consequence of the pandemic. The average EU27 policy gap was estimated at approximately 46 percent in 2020. This means that VAT liability defined by tax rules accounted for 55.3 percent of the revenue that would hypothetically be collected if the simplest VAT with a standard rate and broad tax base was implemented.

The decline in the VAT compliance gap helped many Member States alleviate the strong negative impact of the COVID-pandemic on VAT revenue. Yet, in 2020, 21 of 27 Member States experienced a drop in VAT revenue. EU-wide revenue decreased by approximately EUR 71 billion and 7.1 percent in relative terms. A similar situation was observed during the financial crisis of 2008.

Part II

ASSESSMENT OF METHODOLOGICAL PATHS FOR FUTURE VAT GAP STUDIES

Background

This part of the report provides a comprehensive assessment of various aspects related to the continuation and development of the VAT gap in the EU study. It assesses possibilities for substituting or complementing the methodology that has been used up to this point. For feasible scenarios in terms of data availability, it assesses the costs and benefits of potential developments to the study using experience and knowledge shares as the main source of information in the questionnaire targeted to Member States' administrations. On top of the assessment of the alternative scenarios, we test the potential impact of the discontinuation of the main source of information – the ORS – and potential difficulties in getting access to up-to-date SUT. The result of this analysis is used in the first part of this report – we have added "road signs" in individual country chapter to illustrate the potential impact of limited data availability on the reported estimates.

The first chapter of this part presents an overview of the methodologies for estimating VAT compliance gaps. The second chapter discusses the experience of Member States' administrations in estimating the VAT compliance gap, which is used in the following chapter to assess the feasibility, costs, and accuracy of these methodologies. Based on this assessment, potential scenarios for the development of this study are drawn and compared. The last chapter presents an assessment of the accuracy of the top-down consumption-side approach.

I. Overview of methodologies for estimating VAT compliance gaps

The methodologies used for estimating tax compliance gaps, and the VAT compliance gap in particular, can be grouped into two general approaches: (1) top-down methods, also referred to as macro or indirect methods, and (2) bottom-up methods, also known as micro or direct methods. Top-down methods use aggregated data sources which allow for the estimation of the size of the entire tax base, and as a consequence, the theoretical tax liability. The difference between the theoretical tax liability and the actual collection is the estimated tax gap. On the contrary, bottom-up methods involve a detailed examination of micro-level data sources available usually for a fraction of the tax base. Such data sources include tax returns, audits, random enquiry programmes, risk registers, or surveys. They allow for a determination of the extent of non-compliance in a sample or less often – in the population. If the examination covers only a fraction of the tax base, the findings need to be "extrapolated" to the entire population using statistical methods. The bottom-up methods can be grouped by information source or modelling technique. These techniques encompass:

Statistical-based approaches, i.e.:

- extreme value theory,
- regression analysis (i.e., Heckman's and McFadden's sample bias correction models, stochastic frontier models[79]).

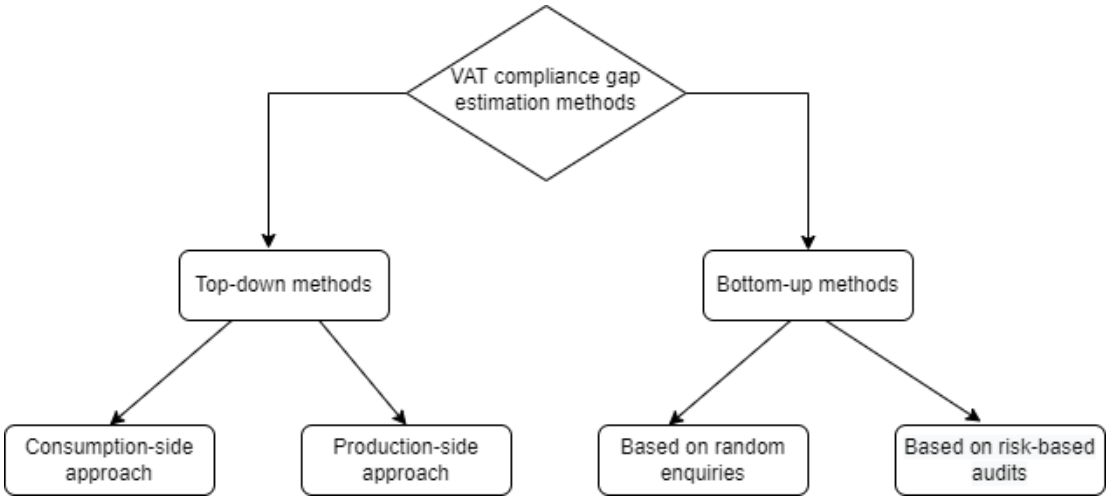
[79] *See: Nerudova and Dobranschi (2019).*

Model-based approaches, i.e.:

- micro-analytical simulation,
- channel analysis.[80]

The use of information sources and estimation techniques varies significantly depending on the tax in question. Although there are alternative methodologies for estimating the VAT gap, the "core" ones, used by administrations, are largely limited to: (1) the top-down consumption-side approach, (2) the top-down production-side approach, (3) the bottom-up approach based on targeted/risk-based audit data, and (4) the bottom-up approach based on random enquiry programmes (see Figure 68). These methods vary in terms of accuracy, possible breakdown, and resource-intensity, which is described in more detail in the following sections.

Figure 68: Core methodologies used by national administrations for estimating the VAT gap



Source: own elaboration.

The list of methodologies used by national administrations does not cover some of the approaches employed by academic studies, such as, e.g., stochastic frontier analysis.[81] The methods utilised by administrations tend to rely only on own information and their accuracy is mostly driven by input data rather than the sophistication of the methodology. Some methods used in the literature employing sophisticated econometric tools could be very useful for observing various data patterns. At the same time, they might be considered as black boxes as they are based on unobservable workings.[82] Against this backdrop, the alternative methodological approaches proposed for the *VAT gap in the EU study* and described in the remainder of this chapter are limited to the methodologies that have already gained the trust of national administrations.

[80] *See:* https://www.ato.gov.au/about-ato/research-and-statistics/in-detail/tax-gap/principles-and-approaches-to-measuring-gaps/?page=3

[81] *See e.g., Nerudova and Dobranschi (2019).*

[82] *A black box is a system which can be analysed in terms of its inputs and outputs, without sufficient knowledge of its endogenous mechanisms.*

I.a. Top-down consumption-side approach

The top-down consumption-side estimation method, which is employed in the *VAT gap in the EU* study, and which is described in more detail in Part I, uses national accounts data as a source of information about the tax base. The parameters, i.e., pro-rata coefficients and weighted average rates, are estimated using more granular figures coming predominantly from household budget surveys and fiscal registers. Despite this fact, within the study, over 10 thousand parameters need to be estimated for 27 countries, and the reliance on additional data available only to tax authorities is relatively low.

Such a low dependence on external data sources results from the fact that liability is modelled at the final stage and there is no need to model VAT liability at the intermediate level whenever there are no exemptions without the right to deduct. In other words, from the consumption-side perspective, VAT liability does not depend on the chain of VAT payments at the intermediate level if all transaction parties enjoy the right to deduct.

Since VAT liability is modelled both for groups of products (for the liability pertaining to final use categories) and for sectors of economic activity (correction for the liability at the intermediate stage), it is not possible to decompose the VAT gap. The consumption-side approach allows only for estimating the overall value of the gap. As explained in the following section, to decompose the VAT gap, the production-side approach must be applied, and sectoral revenue data needs to be available. Since it is impossible to align VAT liability components with respective VAT revenue elements, the consumption-side approach does also not provide any information about types of irregularities and their scale.

Since the method has relatively low requirements, the consumption-side approach could be applied in many countries with the main condition of available, up-to-date, and accurate national accounts figures. The advantage of the method is simplicity, the possibility to standardise the approach across Member States, and accuracy in deriving the overall size of the gap. In many countries, the consumption-side approach is treated as the most reliable source about the overall scale of the VAT gap, while their components are derived using other methods.[83]

I.b. Top-down production-side approach

The top-down production-side estimation method developed by the IMF's RA-GAP programme looks at VAT liability from the sectoral perspective.[84] The VTTL is estimated for each sector as the sum of the output and import VAT corrected by the input tax liability. The estimation of the liability, similar to the consumption-side approach, is based on national accounts' figures as a source of information about the tax base. In the case of the production-side approach, both supply and use tables are used. As the estimation needs to account for the entire policy structure, the VAT payments are modelled at all stages of production, data requirements are substantially higher than in the case of the consumption-based approach. These requirements include, among others, granular trade data broken by groups of products and sectors of economic activity, as well as a number of sector-specific parameters from fiscal registers.

[83] *To authors' knowledge such an approach is used by e.g., Denmark, Poland and the UK.*

[84] *Hutton, E. (2017).*

Since the liability is modelled at the sectoral stage, whenever sectoral revenue data is available, the gap could be decomposed by sectors of economic activity. This could also allow to pinpoint indirectly types of irregularities and their prevalence. Yet, the classifications in national accounts and fiscal registers often differ. Thus, the method often faces problems in the misalignment of the sectoral breakdown. All in all, due to problems relating to the misalignment of data sources, the unavailability of data (as detailed as e.g. values of re-export by sectors and category of goods), and the margin of error around some estimates, the method could yield negative results for the VAT compliance gap for some sectors.[85] This could be inferred from comparing estimates of the consumption- and production-side approach for countries with both methods applied. Fluctuations in time tend to be larger for the production-side approach, which signals larger time-varying error in these estimates. Moreover, the overall estimates may appear to be less accurate due to problems in the many more parameters necessary to conduct the calculations.

I.c. Bottom-up approach using risk-based audits

The bottom-up estimation methods, as discussed in the introduction, use micro-level information about the scale and types of irregularities. The largest sources of relevant information readily available for authorities are the databases containing audit assessments. Thanks to the methodologies allowing to correct for a sample selection bias, it is possible to “extrapolate” the estimates for the entire population of taxpayers.[86]

The compilation of the databases and modelling at the micro-level using statistical methods could become more resource-intensive than top-down methodologies. Yet, the bottom-up methods have a clear advantage – they allow to breakdown the VAT gap by type of irregularity. As a result, direct modelling of the sources of non-compliance is possible.

The operationalisation of the bottom-up method using risk-based audits requires using sensitive micro-level data, which include but are not limited to:

- VAT revenue and characteristics (e.g., sector of economic activity, number of employees) for all registered taxpayers,
- Risk-scores for all registered taxpayers,
- Audit assessment including the characteristics (e.g., experience of an auditor) and results (e.g., type of irregularity and penalty) of audits.

Since the primary information on irregularities comes from actual assessments, the method not only hinges on the quantitative methods used to extrapolate the results but also on the accuracy of these assessments. Since the effectiveness of audits is always constrained and the estimates might be affected by the inability to fully control sample selection bias, the method is primarily used to obtain a breakdown of the gap and, to a lesser extent, to obtain an overall estimate of the gap. As a result, administrations using hybrid approaches tend to use top-down estimates to rescale the results from the bottom-up analyses which are prone to larger errors.

[85] *See e.g., IMF (2018).*

[86] *Heckman (1974) and Dubin and McFadden (1984).*

I.d. Bottom-up approach using random enquiry programmes

Out of the four described approaches, the bottom-up approach using random enquiry programmes is the least commonly employed by administrations. Although audits and verification actions conducted for randomised groups of taxpayers have a clear advantage over the estimates based on non-random/risk-based audits, they are costly to execute. The random enquiry programmes are substantially less effective, as they also target compliant taxpayers, and running such enquiries for tax gap purposes requires additional costly efforts.

At the cost of additional control activities, the method allows to see the entire spectrum of taxpayers (not only risky ones) and reduces the errors related to the sample bias. As the resource intensity increases with the size of sample, whereas the error decreases, tax authorities could use a synthetic method based on both random and non-random samples. There is also another problem related to this approach. Compared to risk-based audits, quick verification actions are more prone to miss irregularities and the non-compliant behaviour of audited taxpayers and bias the estimates. It is also important to mention that the audit results in information that is highly sensitive and, by internal regulations, often cannot be shared externally by authorities.

I.e. Summary of methodologies

For illustrative purposes, Table 64 below summarises the main features of the outlined methods and provides a qualitative description of some of the criteria which will be used for the assessment of the potential approaches to estimating the *VAT gap in the EU* in the future. The values for other quantified criteria are reported in the following subsections.

Table 64: Comparison of VAT compliance gap estimation methods

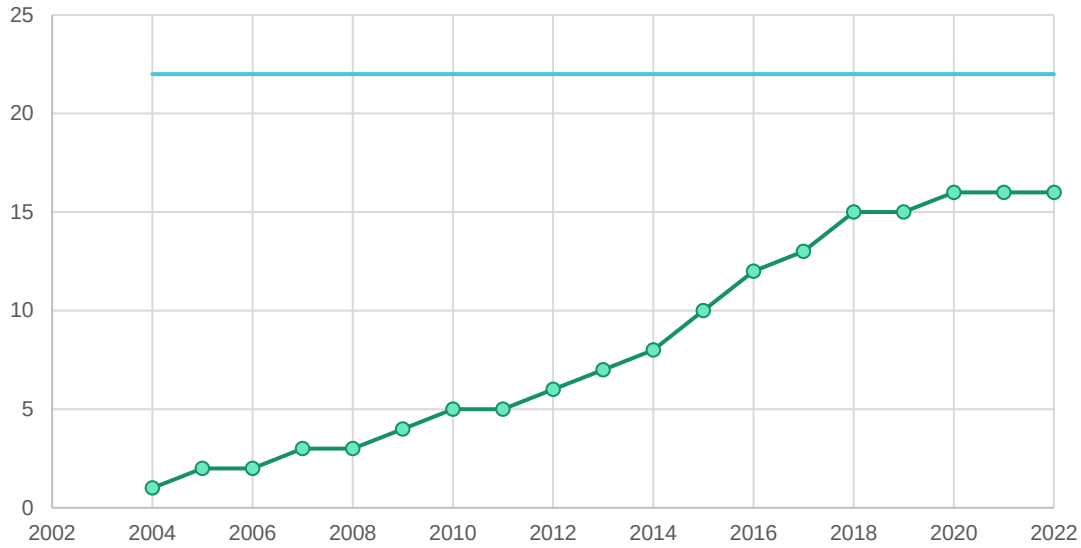
	Top-down approach		Bottom-up approach	
	Consumption-side	*Production-side*	*Based on risk-based audits*	*Based on random samples*
Main data source	*Eurostat:* Use tables. *National authorities:* household budget surveys, aggregate parameters from fiscal registers.	*Eurostat:* Supply and Use tables. *National authorities:* detailed figures underlying the compilation of the SUT, household budget surveys, sectoral parameters from fiscal registers.	*National authorities:* Individual-level data from fiscal registers for all taxpayers, individual-level data with audit results.	*National authorities:* Individual-level data from fiscal registers for all taxpayers, individual-level data with results of random enquiries.
Confidentiality/sensitivity of the information required	Low - most of the information is aggregate.	Moderate - some information pertains to sectors. The information underlying the compilation of the SUT is also sensitive (as this is working data).	High – the information is at individual level.	High – the information is at individual level.
Granularity of the information provided	Low	Moderate – sectoral breakdown is possible.	High – breakdown depends on the audit information available and number of audited taxpayers.	High – breakdown depends on the audit information available and number of audited taxpayers.

Source: own elaboration.

I.f. Experience of Member States' administrations

Based on information received from the group of 22 administrations that responded to the questionnaire, the first estimation of the VAT compliance gap was conducted in 2004 by Czechia. Since then, the number of Member States estimating the gap has gradually increased. In 2009, when the EC/Reckon[87] study was published, four out of 22 administrations had already conducted their VAT compliance gap study. Currently, 73 percent of analysed administrations have experience in conducting their own calculations (see Figure 69). Of these, 15 out of 16 administrations continue the analytical work and only one of the administrations decided not to update the estimates. As shown in Figure 69, up to this point, estimates have not been prepared by some of the largest EU economies. Of the administrations that conduct their own studies, the vast majority update their estimates every year (11 out of 16). In May and June, when the survey was returned, nearly 70 percent of the administrations conducting studies had already updated their estimates in 2022.

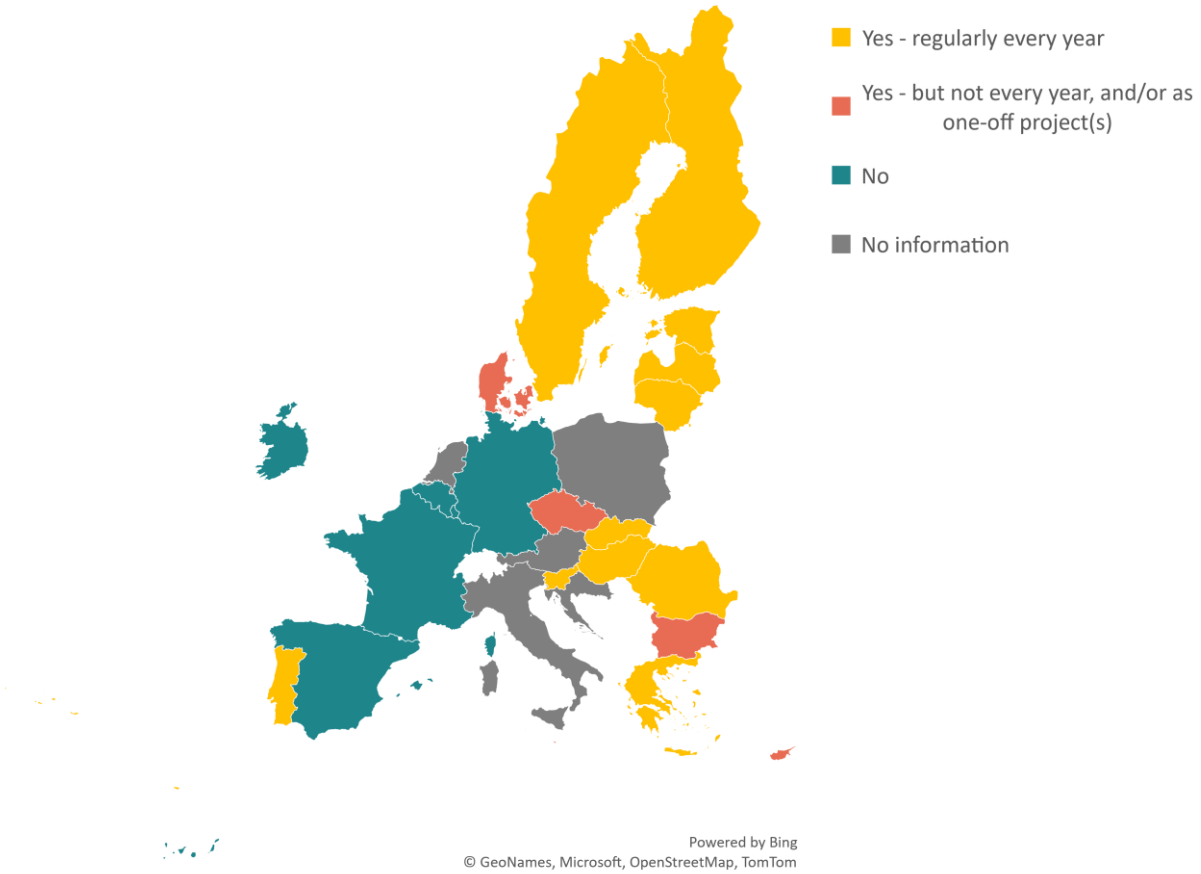
Figure 69: Member States preparing estimates of national VAT compliance gap



Source: own elaboration, based on 22 responses, download underlying data.

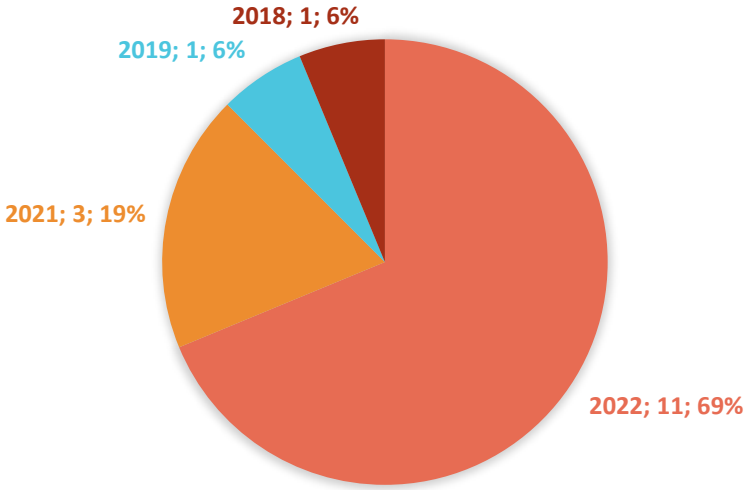
[87] *See: EC/Reckon (2009).*

Figure 70: VAT compliance gap calculations in the EU



Source: own elaboration, based on 22 responses, download underlying data.

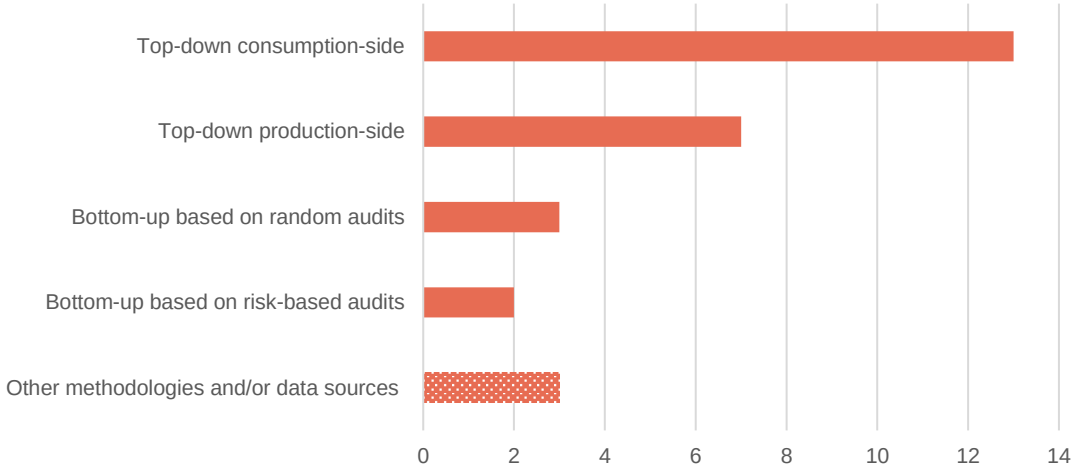
Figure 71: Year in which the latest estimates of the national VAT compliance gap were finalised, count of MS and their share



Source: own elaboration, based on 16 responses, download underlying data.

In the group of responding administrations, eight (i.e., ca. 36 percent) used more than a single approach to calculate the gap. In one Member State, Hungary, four alternative approaches were operationalised. The top-down consumption-side approach used by this study was the most popular method employed by administrations (13 Member States). In addition, or as a complement to this methodology, seven administrations also used the production-side approach. The methods based on audit results were available for four Member States. More specifically, two Member States used only random-audits in their work, one administration used risk-based audits and one administration used both random and risk-based audits (see Figure 72).

Figure 72: Methodologies used to calculate the national VAT compliance gap, count of MS



Source: own elaboration, based on 22 responses, download underlying data.

II. Evaluation of methodologies

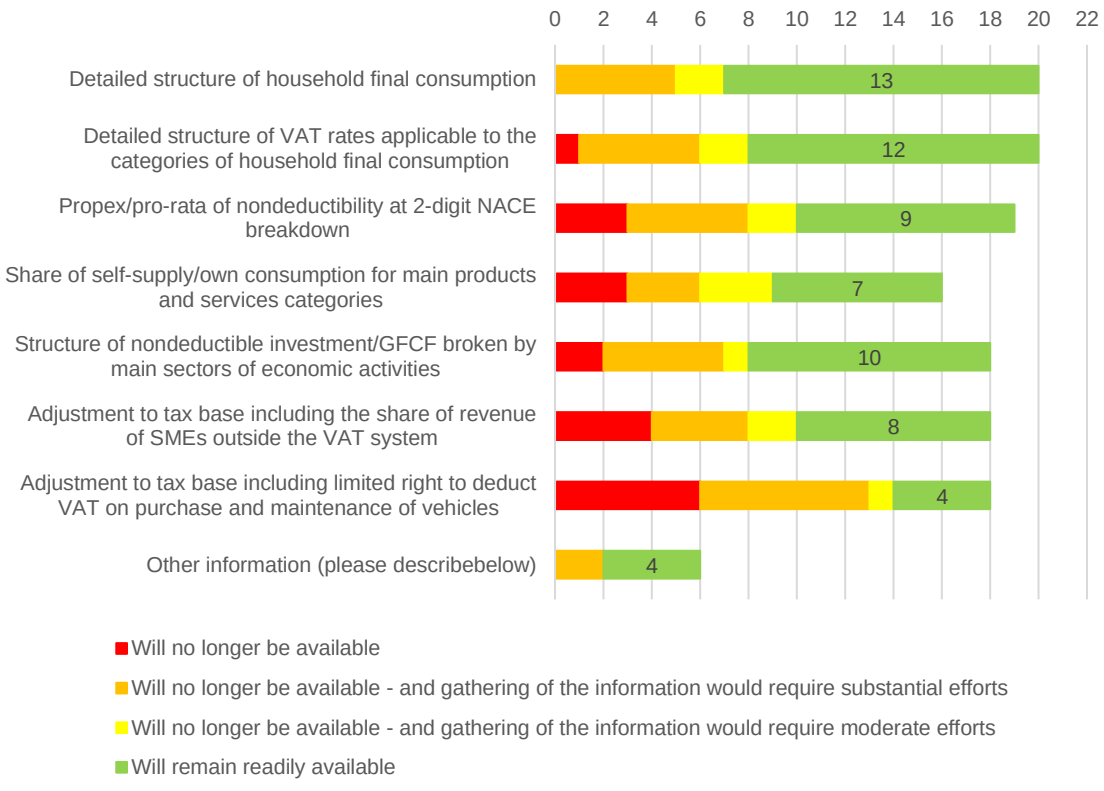
II.a. Availability of information

This section looks at the availability of information for future *VAT gap in the EU* studies. More specifically, it verifies whether the information from discontinued ORS, which was the primary source of information for estimating the parameters of the VAT compliance gap model, will remain available for Member States' administration. It also verifies the potential information base for substituting or extending the current methodological approach. The analysis is based on the responses to the questionnaire returned by 22 Member States' administrations (see the questionnaire in ***Annex C***).

As shown by Figure 73, nearly all administrations (19 out of 20 that responded to the question) expect that they will be able to share information necessary to calculate household final consumption liability (i.e., granular consumption structure and applicable rate). Among these Member States, this information will in most cases be readily available. Yet, four Member States authorities expect that the preparation of this information will require substantial effort.

The information on pro-rata/propex coefficients, GFCF, and net adjustments could also be shared by the vast majority of administrations (14 out of 17, 16 out of 18, and 12 out of 18, respectively). Except for the adjustment for the limited right to deduct VAT on the purchase and maintenance of cars, the information could be expected from over 75 percent of Member States. Yet, more effort will be required to share this information than in the case of information pertaining to household final consumption.

Figure 73: Availability of information after the discontinuation of Own Resource Submission data



Source: own elaboration, based on 22 responses , download underlying data.

Other information necessary to use alternative methodologies will likely be available for much smaller groups of Member States. Oftentimes, the respondents expected that the information cannot be shared with the Commission or contractors. Results from random audits are available only for 5 out of the 19 administrations that responded to the relevant question. Only two respondents expect that the data could be shared with the Commission. The availability of risk-based audit information was broader (13 out of 19 Member States) but a substantial fraction of respondents (4 out of 13 Member States) expect that the information cannot be shared.

Unsurprisingly, the information necessary to employ the top-down production-side approach, i.e., detailed national accounts data and sectoral revenue figures, appeared to be more accessible and less sensitive than audit results. Yet, full information sufficient to run the methodology would be available for about five Member States in the group.

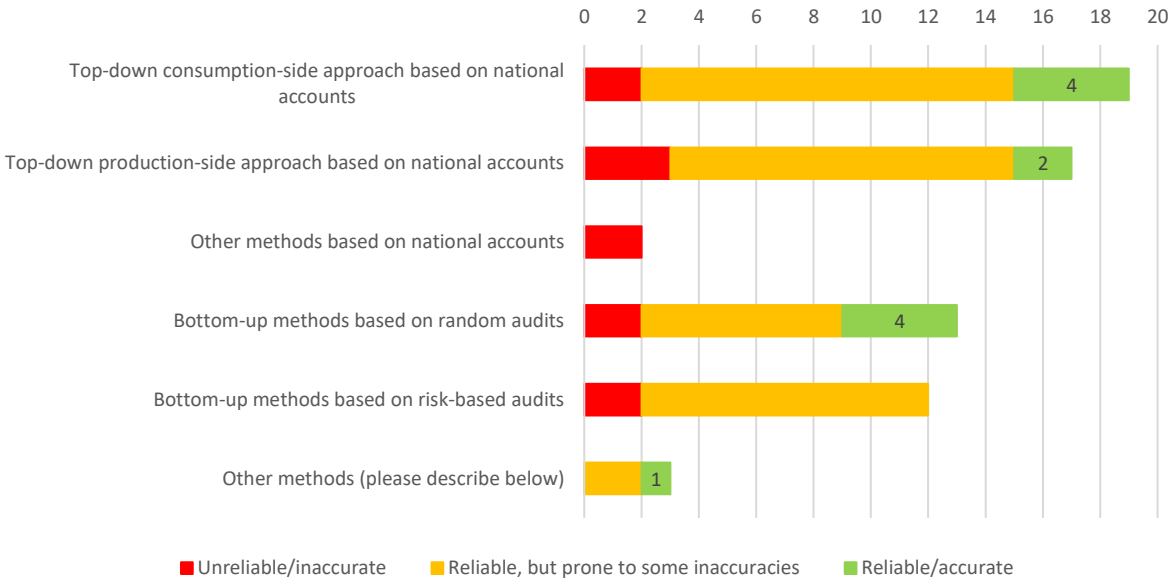
Figure 74: Availability of information that could be shared for the purpose of the calculation of estimates of the VAT compliance gap using selected alternative methods

Source: own elaboration, based on 22 responses, download underlying data.

II.b. Perception of accuracy

Responses to the questionnaire show that Member States' authorities believe that the four well-established approaches to estimating the VAT compliance gap are reliable but prone to some inaccuracies. For each methodology, two or three respondents believed the estimates are not reliable. A similar fraction believed that the estimates are reliable and not prone to estimation error. The perception of accuracy of each of the methods was rather similar with most trust in the accuracy of estimates expressed towards the top-down consumption side approach and the bottom-up approach based on random audit results (see Figure 75). Only a small fraction of respondents had experience in utilising other methods. In the view of these two respondents, the other methods were unreliable.

Figure 75: EU Member States' views on the accuracy of various alternative approaches to estimating the VAT compliance gap – at national or EU level



Source: own elaboration, based on 22 responses, download underlying data.

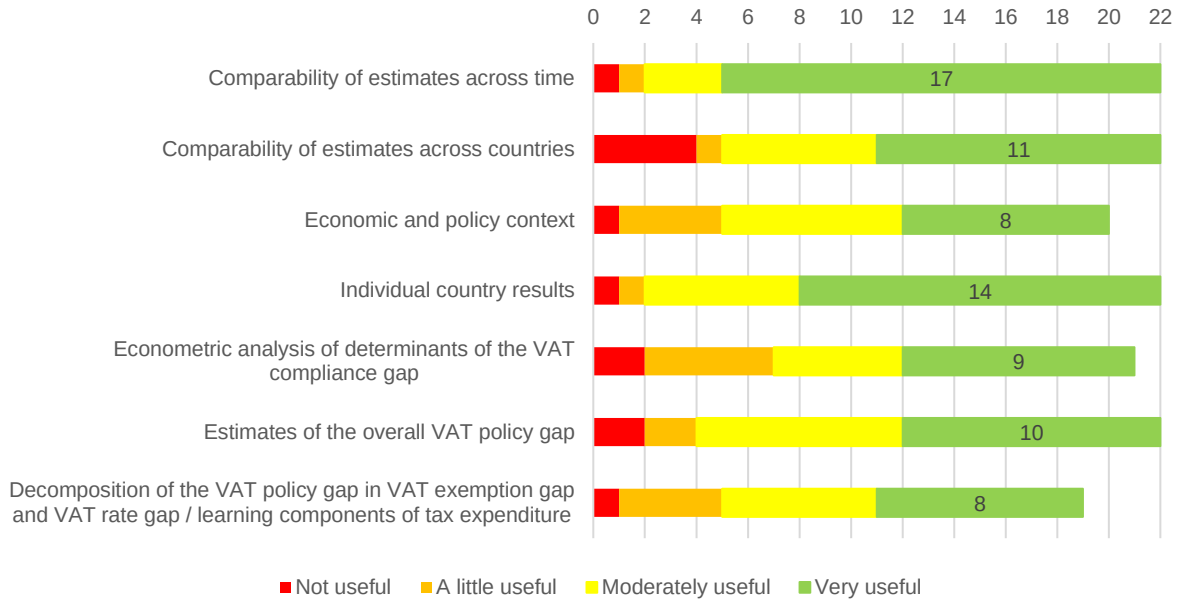
II.c. Usefulness of additional features

Responses to the questionnaire show that the vast majority of features and components of the study are useful for administrations (see Figure 76Figure 76). The most useful feature is the comparability of results across countries, with 17 out of 22 respondents of the opinion that this feature is very useful, which underlines importance of the completeness of the study in terms of Member State coverage. Overall, the aspect regarding the estimates of the scale of the compliance gap appeared to be more useful than other components of the study.

The study would provide additional information gains if the employed methodology allowed to decompose the gap by sector and type of irregularity. Both of these features were assessed as very useful by 17 out of 21 respondents (see Figure 77).

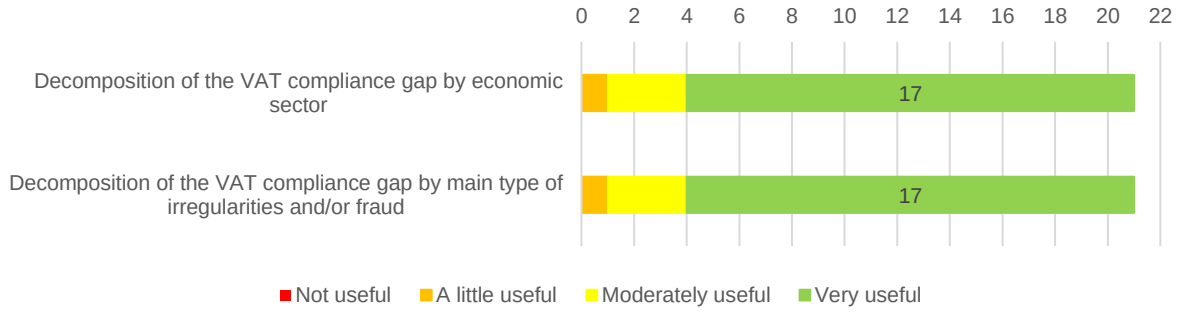
Simple factsheets and tables appeared to be most useful for the work carried out by administrations, yet more sophisticated visualisation methods could also be a useful addition to this study (see Figure 82).

Figure 76: Aspects/analytical components that were already part of past editions of the project VAT gap in the EU



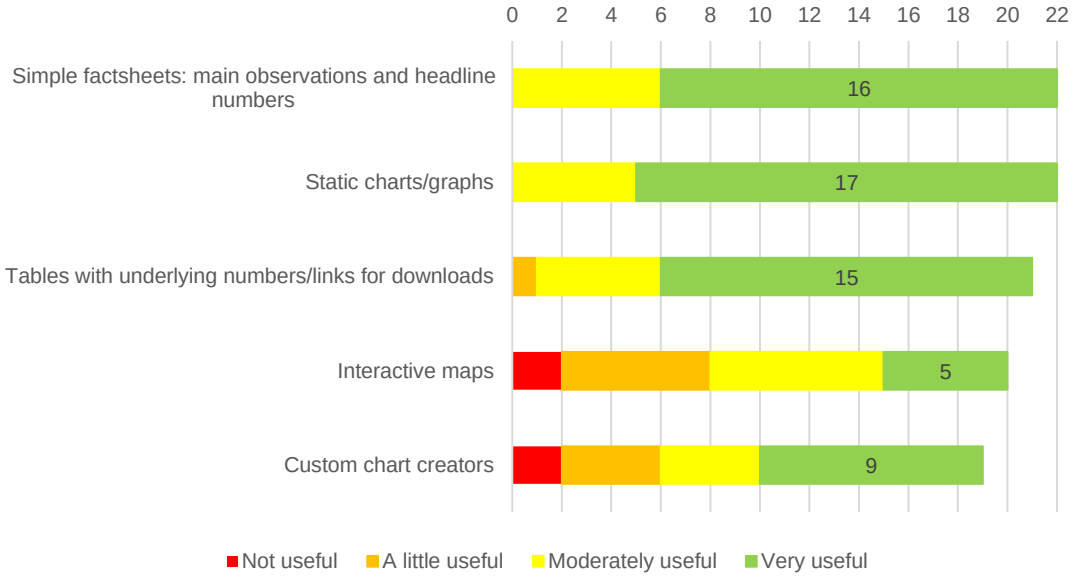
Source: own elaboration, based on 22 responses, download underlying data.

Figure 77: Aspects/analytical components that were thus far not part of past editions of the project VAT gap in the EU



Source: own elaboration, based on 21 responses, download underlying data.

Figure 78: Usefulness of various methods of presentation and visualisation



Source: own elaboration, based on 22 responses, download underlying data.

II.d. Calculation of costs

Unsurprisingly, the effort required to estimate the VAT compliance gap varied significantly by Member State and the methodology employed. This likely results from differences in data availability and granularity and in the complexities of the tax systems, among others. The estimated total effort in implementing the top-down consumption-side approach, including the compilation of additional data, calculation of parameters, and model operationalisation, varied from 0.4 to 37.5 person-months. The average effort was calculated at about 9.2 man-months, which could be translated to an overall cost of EUR 55 thousand (see

Table **65**).[88] A single update was approximately three times less costly than the implementation. The production-side approach appeared to be approximately 22 percent more costly in its first implementation and 24 percent more costly in terms of yearly updates.

Compared to the top-down approaches, respondents have less knowledge on the costs of audit-based calculations. Information on the expected cost of calculations based on random audits was made available by two administrations. One included in its calculation the cost of running a random audit programme, which required most importantly significant involvement from auditors. In this case, the effort reaches over 800 man-months, i.e., costs not comparable to top-down estimates. When the cost of the audit process is not included, the cost of implementing a bottom-up approach appears to be less than the cost of implementing a top-down approach. However, the number of responses received was too few to be compared with information on the expected costs of top-down methods.

[88] *Calculated using mean annual earnings of professionals from Eurostat and 25 percent overhead on these salaries to account for other costs (source: Mean annual earnings by sex, age, and occupation - NACE Rev. 2, B-S excluding, 2018, Eurostat).*

Table 65: Calculation of VAT compliance gap estimation effort

	Top-down consumption-side		Top-down production-side		Bottom-up based on random audits		Bottom-up based on risk-based audits	
	Implement ation	Update	Implement ation	Update	Implement ation	.	Implementation	.
Minimum person-months (FTE)	0.4	0.1	1.2	0.1	1.8	.	2	.
Average person-months (FTE)	9.2	2.9	11.1	3.6	423.9	.	2	.
Maximum person-months (FTE)	37.5	12.0	28.8	12.0	846.0	.	2	.
Average cost (EUR '000)	**55**	**17**	**67**	**21**	**2 533**	**.**	**12**	**.**
Number of respondents	12	10	8	5	2	.	1	.

Source: own elaboration.

III. Assessment of development paths/options for the study

Based on the analysis reported above, a list of options was compiled for the design of the *VAT gap in the EU study* in the future. This list of options takes into account the expected data availability and potential benefits from employing other approaches. The responses to the questionnaire made clear that the information available will be insufficient to fully substitute the current methodology. There would not be sufficient information available for all or nearly all Member States for any of the methods competing with the top-down consumption-side approach. For this reason, the top-down consumption-side approach remains the only possible method to compare estimates across all Member States. Yet, the accuracy of the method in the longer-term will highly depend on actual data availability.

The proposed Option A could be regarded as a status quo whereas Options B-E assume some changes in the scope and methodological approach. We assume that alternative methodologies to the one currently used can only be applied for a fraction of Member States as suggested by data availability and possibility of its sharing. Along these lines, it was assumed that the study will be able to use random audit data unavailable for two or three administrations. It was also assumed that the study could cover seven to nine Member States with a bottom-up analysis using targeted audits. The feasible number of Member States covered by the top-down production-side approach was set in the range of five to six Member States.

We assume that the selection of Member States for using alternative approaches will be forced by data availability and willingness to share information. In case the availability of the data is better than expected, the choice of these case study countries will aim to ensure as large variability in the dataset as possible (using e.g., geographical criteria, overall size of the gap, and GDP per capita, among others).

The proposed broad list of options retained for further selection is:

Option A. Baseline scenario. Retain current methodology without extending the study to additional methodologies.
Option B. Hybrid top-down scenario. Apply both a top-down consumption-side approach (for all Member States) and a top-down production-side approach (for a sample of Member States).
Option C. Validation with targeted audits. Apply both a top-down consumption-side approach (for all Member States) and a bottom-up approach using data from targeted audits (for a sample of Member States).
Option D. Validation with random audits. Apply both a top-down consumption-side approach (for all Member States) and a bottom-up approach using data from random audits (for a sample of Member States).
Option E. Full blend scenario. Apply a top-down consumption-side approach (for all Member States) and a top-down production-side approach and bottom-up approach using data from targeted and random audits (for a sample of Member States).

Table 66: Broad list of options and their tentative characterisation

	Top-down consumption side[89]	Top-down production side	Bottom-up using risk-based audits	Bottom-up using random audits
Option A. Baseline scenario	27	0	0	0
Option B. Hybrid top-down scenario	27	5-6	0	0
Option C. Validation with targeted audits	27	0	7-9	0
Option D. Validation with random audits	27	0	0	2-3
Option E. Full blend scenario	27	5-6	7-9	2-3

Source: own elaboration.

The options for the studies were assessed using three main criteria: (1) expected accuracy and comparability, (2) information gains/losses, and (3) costs/savings to prepare the study. More specifically, five sub-criteria relevant for the VAT gap in the EU study were distinguished:

Table 67: Criteria and sub-criteria for the assessment

Main criteria	Sub-criteria/indicators
Accuracy and comparability	Accuracy of estimates of levels (and comparability across countries) Accuracy of trends (and comparability across time)
Information gains	Granularity of breakdown
Costs	Costs borne by the Commission to operationalise calculations Costs by Member States authorities to prepare information

Source: own elaboration.

[89] *It was assumed that the UK will not be covered in future studies and the EU will not enlarge.*

Implicitly, these criteria address other relevant interconnected problems such as the delay in data availability. Completeness was not distinguished as an individual criterion as the top-down consumption side estimates included in all options are expected to cover all Member States and the full scope of the tax base and irregularities.

As shown by Table 68, none of the options supersedes other options in all criteria and there is a clear trade-off between the effort necessary to conduct the study and the information gains from using alternative methods to scrutinise components of the gap and validate the baseline estimates. Similarly, none of the options could be eliminated upfront as not meeting the basic objectives of this study. Due to the importance of the VAT compliance gap estimation and gains from using hybrid approaches, the expected benefits from expanding the current approach will likely be substantially higher than the cost involved in the study preparation. To reduce these costs and minimise the risks, gradual expansion commencing with the top-down production side approach and ending with a bottom-up approaches is recommended.

Table 68: Comparison of options

	Option A. Baseline scenario	Option B. Hybrid top-down scenario	Option C. Validation with targeted audits	Option D. Validation with random audits	Option E. Full blend scenario
Accuracy of estimates of levels (and comparability across countries)	**Moderate** The accuracy of estimates for 80 percent are expected to remain unchanged compared to this study.[90] For the remaining countries, the accuracy will drop, which creates the need to inform the readers about the expected accuracy of the estimates for specific countries (see *Assessment of the accuracy of the top-down consumption-side approach*)	**High** The alternative approach will help validate the estimates for 5-6 countries and increase the accuracy of the results for these Member States.	**High** The estimates based on random audits are perceived as very reliable. Thus, this alternative approach would help validate the estimates for a small sample of 2-3 countries covered.	**High** The alternative approach will help validate the estimates for 7-9 countries and increase the accuracy of the results for these Member States.	**Very high** The alternative approach will help validate the estimates for more than 50 percent of the countries, which will considerably increase the level of accuracy of the estimates in the study.
Accuracy of trends (and comparability across time)	**High** The estimates based on a full information set from the ORS were fully comparable and allowed for a thorough tracking of changes in VTTL components across time. Partial unavailability of the data will compromise the	**High** Validation of the estimates will help validate estimated trends, but the gains will be relatively minor.	**High** Validation of the estimates will help validate estimated trends, but the gains will be relatively minor.	**High** Validation of the estimates will help validate estimated trends, but the gains will be relatively minor.	**Very high** Validation of the estimates will help validate estimated trends. The gains will already be substantial due to the large number of Member States covered by alternative estimates.

[90] *See for the impact of discontinuation of the ORS on the accuracy of estimates.*

	Option A. Baseline scenario	Option B. Hybrid top-down scenario	Option C. Validation with targeted audits	Option D. Validation with random audits	Option E. Full blend scenario
	accuracy of estimates for Member States without data available.				
Granularity of breakdown	**Very low** Inability to provide breakdown of the gap.	**Moderate** The study would allow to break down the gap to sectors of economic activity for Member States in the sample.	**Moderate** The study would allow to break down the gap to sectors of economic activity and type of irregularity for a small sample of Member States.	**High** The study would allow to break down the gap to sectors of economic activity and type of irregularity for the relatively large sample of Member States covered.	**High** The study would allow to break down the gap to sectors of economic activity and type of irregularity for the relatively large sample of Member States covered.
Costs borne by the Commission to operationalise calculations	**Low** The costs are relatively low due to well-established methodology and thorough documentation of the model and its parameters.	**High** As suggested by the estimates of costs (see Chapter 2), the implementation of the production-side approach would increase the cost of the study about two times for the first implementation of the new methodologies.[91] Subsequent updates would increase the cost by around 30 percent compared on Option A.	**Moderate** The implementation of this approach would require a minimal effort compared to Option A as no sophisticated statistical methods would be required.	**Very high** The implementation of this approach would require substantial effort in data gathering and analysis. The effort required to implement the bottom-up estimates would increase the cost of the study over three times for the first implementation of the new methodologies. Subsequent updates would require substantial additional effort.	**Very high** The implementation of this approach would require substantial effort in data gathering and analysis. The effort required to implement the bottom-up estimates would increase the cost of the study over four times for the first implementation of the new methodologies. Subsequent updates would require substantial additional effort.

[91] *The cost of implementation of the production-side approach for a single country are expected to be four times higher than an update of consumption-side approach.*

	Option A. Baseline scenario	Option B. Hybrid top-down scenario	Option C. Validation with targeted audits	Option D. Validation with random audits	Option E. Full blend scenario
Costs borne by Member States' authorities to prepare information	**Moderate** Increased effort compared to the situation today due to the need to calculate the information from the ORS.	**Moderate to high** Increased effort needed to share additional fiscal and national accounts data (for 5-6 Member States).	**Moderate to high** Increased effort needed compile information from audits (for 2-3 Member States).	**High** Increased effort needed compile information from audits and tax returns (for 7-9 Member States).	**Very high** Increased effort needed to share additional fiscal and national accounts data and audit results for a large group of Member States.
Summary	Although the ORS will be discontinued, it is the least costly approach to execute that will allow for continued monitoring of the size and trends in the VAT compliance gap in all Member States.	Under this option the study will be extended compared to its current version to allow for a decomposition of the VAT gap by sectors in selected Member States. Employing such an approach will help validate the estimates for Member States with alternative results available.	On top of monitoring the gap in all Member States, the study will be able to track sources of fraud and evasion in the sample of countries. Alternative approaches will help validate baseline results.	On top of monitoring the gap in all Member States, the study will be able to track sources of fraud and evasion in the sample of countries. Alternative approaches will help validate baseline results.	Under this option, the study will be extended compared to its current version by three methodologies covering subsamples of Member States. This will allow to decompose the VAT gap by sector and type of irregularity in selected Member States and draw conclusions for the entire EU. Employing such an approach will help validate the estimates for Member States with alternative results available.

Source: own elaboration. Note: the options are graded using the following categories: very high, high, moderate, low, and very low.

IV. Assessment of the accuracy of the top-down consumption-side approach

Due to the varying availability of information required for VAT compliance gap estimation across Member States and the discontinuation of the ORS, we test the accuracy of estimates with respect to various scenarios of data availability (see Table 69). More specifically, the simulations are performed to verify how different quantifiable data-related issues may affect mean absolute deviations of estimates from the "first-best" estimate.[92] For this purpose, we assume that certain information is unavailable and follow the current estimation algorithm. The simulations are carried out for 2018, i.e., the year for which the information is more complete than for 2019 and 2020. Thanks to this, we control for the inaccuracies of the estimates for 2019 and 2020, which, for some Member States, use partially incomplete information. All in all, we test seven scenarios described in Table 69. On top of this, we also test the unavailability of SUT only. Although the COVID-19 pandemic is not expected to affect the timeline of Eurostat's publications, due to the varying availability of the SUT across Member States, it is worth examining the issue. This simulation is performed using from one-year lagged to four-years lagged SUT as the latest vintage available.

For the simulation, we use the broadest sample possible. Yet not all Member States could be covered by every simulation scenario. As the estimation algorithm and data sources for some Member States vary or some information was unavailable for 2018, we excluded them from simulation sample.[93]

[92] *Understood as an estimate derived using the most granular and up-to-date information as possible.*

[93] *As an example, if the SUT is unavailable for 2018, we could not test the impact of using older data on the accuracy of estimates.*

Table 69: Assumptions to simulation scenarios

		One-year lag				Two-year lag	
		Outdated parameters			Outdated SUT		
Scenario	Description	Outdated propex	Outdated WAR	Outdated share of taxable GFCF		Outdated all parameters [94]	Outdated SUT
1	Data from fiscal registers on intermediate use in sectors becomes unavailable	X					
2	Detailed data from statistical agencies on household consumption structure becomes unavailable		X				
3	Data from fiscal registers on taxable investment becomes unavailable			X			
4	Complete data unavailability for the ORS (1-year lag)	X	X	X			
5	Complete data unavailability for the ORS and unavailability of SUT (1-year lag)	X	X	X	X		
6	Due to difficulties of compiling national account data for the pandemic years, SUT becomes outdated by two years					X	
7	Complete data unavailability for the ORS and unavailability of SUT (2-year lag)					X	X

Source: own elaboration.

The results of the simulation (see Table 70) show that the unavailability of information on specific parameters or data sources with a one-year lag has a relatively low but not negligible impact on the accuracy of estimates (0.1-0.7 pp). All in all, the estimates based on one-year delayed data with only aggregate figures available for forecasting the tax base and with fixed parameters from the preceding year led to a mean absolute deviation of approximately 1.3 pp. If the data were unavailable for two years and the parameters remained unchanged for two years in row, the average inaccuracy would be approximately 1.6 pp.

[94] *i.e. propex, WAR, share of taxable GFCF.*

Table 70: Simulation results – estimated VAT compliance gap and errors (pp)

	Actual results	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
BE	11.9	12.0	12.2	11.4	11.8	11.8	11.8	11.1
BG	11.3	11.3	11.3	10.2	10.2	10.2	10.1	10.1
CZ	14.1	14.0	14.1	13.8	13.8	13.8	13.8	13.4
DK	8.6	8.6	8.6	8.2	8.2	7.8	7.7	7.1
DE	9.4	9.4	9.3	9.2	9.1	9.3	9.0	8.9
EE	4.0	3.9	4.0	3.1	3.0	3.9	3.9	5.2
IE	5.3	5.2	8.3	6.7	9.6	13.2	11.1	11.0
EL	25.6	25.7	25.7	26.6	26.8	26.2	27.9	26.2
ES	5.5	5.5	5.8	5.8	6.1	6.3	7.0	5.9
FR	8.5	8.5	8.5	8.4	8.4	8.1	7.5	6.7
HR	7.4	7.6	7.5	7.4	7.7	7.7	6.6	5.9
IT	22.6	22.7	22.9	23.2	23.6	23.4	25.1	24.5
CY	10.1	10.1	9.6	8.2	7.7	8.0	9.3	11.6
LV	11.3	11.0	12.9	10.9	12.2	11.4	12.4	11.0
LT	24.0	24.2	24.4	24.1	24.6	25.1	23.9	24.3
LU	7.0	7.0	7.0	10.0	10.0	8.1	9.7	7.4
HU	10.2	10.1	12.6	9.3	11.6	11.3	14.2	12.8
MT	20.6	20.7	20.9	19.4	19.6	18.4	20.1	15.6
NL	7.1	7.1	7.1	6.7	6.7	5.5	6.2	4.0
AT	8.9	9.1	7.3	9.5	8.2	8.1	8.1	8.0
PL	13.2	13.2	14.3	12.9	14.0	12.6	14.2	11.2
PT	9.1	9.3	9.1	8.9	9.1	9.1	10.9	10.7
RO	33.2	33.1	34.9	32.7	34.3	34.2	36.3	35.0
SI	4.3	3.6	4.3	4.1	3.4	3.4	4.4	3.8
SK	16.7	16.7	17.0	17.3	17.6	18.6	19.3	19.0
FI	4.8	4.8	4.9	4.0	4.1	4.1	3.7	3.9
SE	3.0	3.2	2.8	3.3	3.3	3.3	2.9	0.5
UK	10.5	10.5	10.4	10.6	10.5	10.5	10.2	11.7
Mean absolute error		**0.1**	**0.5**	**0.7**	**0.9**	**1.0**	**1.4**	**1.6**
Root mean squared error		**0.2**	**0.9**	**0.9**	**1.3**	**1.8**	**1.9**	**2.1**

Source: own elaboration.

The unavailability of SUT appeared to be an important factor affecting the accuracy of estimates. The average error of the estimates using one-year lagged SUT was 0.4 pp, whereas two-year lagged estimates had an average impact of 0.6 pp. In this study, for most of the countries, one-year or two-year lagged SUT are used (5 and 20 cases, respectively). For these countries, the margin of error was limited. Yet, the use of older SUT compromises accuracy and increases the mean absolute error above 1.4 (see Table 71).

Table 71: Assumptions of simulation scenarios[95]

		Forecast for 2018 based on:			
	2018 (actual)	2017 SUT	2016 SUT	2015 SUT	2014 SUT
BE	11.9	11.9	11.8	11.8	11.8
BG	.	.	.	.	.
CZ	14.1	14.3	14.1	14.1	13.3
DK	8.6	8.5	8.3	8.3	8.6
DE	9.4	9.6	9.4	9.4	10.9
EE	4.0	4.0	4.6	4.6	4.5
IE	5.3	8.8	9.4	9.4	0.0
EL	25.6	25.3	24.4	24.4	23.6
ES	5.5	5.5	3.0	3.0	2.5
FR	8.5	8.2	7.7	7.7	8.3
HR	7.4	7.4	8.3	8.3	0.0
IT	22.6	22.4	22.1	22.1	20.5
CY	10.1	9.9	10.5	10.5	15.4
LV	11.3	11.0	10.7	10.7	10.4
LT	24.0	24.3	24.6	24.6	25.0
LU	7.0	6.7	6.9	6.9	7.9
HU	10.2	10.4	10.6	10.6	11.2
MT	.	.	.	.	.
NL	7.1	6.0	6.0	6.0	5.7
AT	8.9	8.9	9.0	9.0	9.2
PL	13.2	11.8	11.5	11.5	11.1
PT	9.1	9.2	8.9	8.9	8.3
RO	33.2	33.1	31.9	31.9	31.5
SI	4.3	3.8	3.2	3.2	4.4
SK	16.7	16.8	16.4	16.4	20.3
FI	4.8	5.1	5.8	5.8	7.2
SE	3.0	2.8	2.4	2.4	1.0
UK	10.5	10.3	9.5	9.5	9.1
Mean absolute error		**0.4**	**0.6**	**0.8**	**1.4**
Root mean squared error		**0.8**	**0.8**	**1.2**	**1.8**

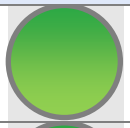
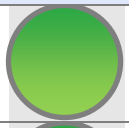
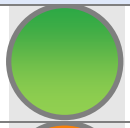
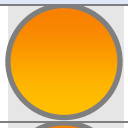
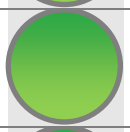
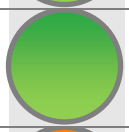
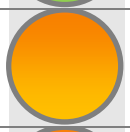
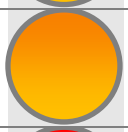
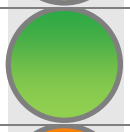
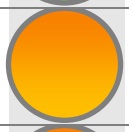
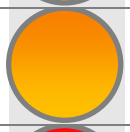
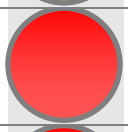
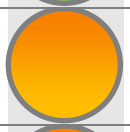
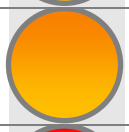
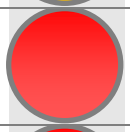
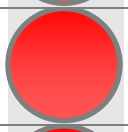
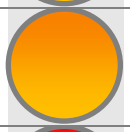
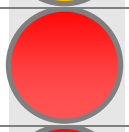
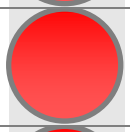
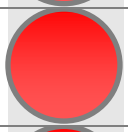
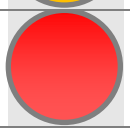
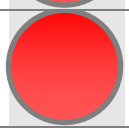
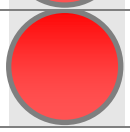
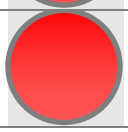
Source: own elaboration.

There is no fully objective or statistical rationale for setting the accuracy threshold for the estimates of the gap. Yet, taking a 1 pp average deviation as a subjective accuracy threshold would mean that the estimates with the primary information lagged by two years or more would be above the threshold. If an average inaccuracy of 2 pp from the best possible estimates is acceptable, the

[95] *The inclusion of Bulgaria and Malta was not possible due to unavailability of use tables for 2018.*

use of three-year lagged information would be outside the accuracy limits. The summary of the impact of different data availability is presented in Table 72.

Table 72: Accuracy thresholds for combinations of data unavailability

		Parameters[96]			
		Up to date	**One-year lag**	**Two-year lag**	**Three-year lag**
SUT	Up to date				
	One-year lag				
	Two-year lag				
	Three-year lag				
	Four-year lag				
	Five-year lag				

Source: own elaboration. Note: the green light stands for estimates with a mean average error below 1 pp, the yellow light stands for estimates with a mean average error between 1 and 2 pp, and the red light stands for estimates with a mean average error above 2 pp.

In addition to the inaccuracies related to timeliness of information, the accuracy of VAT compliance gap estimates could largely be affected by the quality of the information. However, the quality of the aggregate information received by the study cannot be fully controlled for. It is only possible to observe patterns in the data that are not in line with the theory and patterns observed in the dynamics of the VAT gap in the past. A special attention, in line with a well-established approach of filtering outliers, is required for extreme observations marked by 1 and 5 percent probability thresholds:

- **A large increase in the gap.** An increase in the gap of over 5.6 pp year-over-year was observed only in 5 percent of instances and an increase of over 11 pp – only in 1 percent of instances.
- **A large decline in the gap.** A decrease in the gap of over 5.8 pp year-over-year was observed only in 5 percent of instances and a decrease of over 9.7 pp – only in 1 percent of instances.

[96] *To reduce complexity, the analysed scenarios of data unavailability assume that all the parameters are available with the same time lag. It may happen that the time lag differs for various parameters. In such a case, the simple average of time lag in groups of parameters could be used as a proxy of the overall time lag.*

- **One-off hike**. The compliance gap higher by 4.5 pp than the average of the values in the preceding and succeeding years in only 5 percent of instances. In 1 percent of instances, the compliance gap was higher by more than 8.4 pp of the average of the values in the preceding and succeeding years.
- **One-off drop.** The compliance gap was higher by 4.6 pp than the average of the values in the preceding and succeeding years in only 5 percent of instances. In 1 percent of instances, the compliance gap was lower by more than 6.6 pp of the average of the values in the preceding and succeeding years.

As large shifts in the gap are rarely observed, all such instances are always scrutinised. In addition, if these changes cannot be explained, they are marked by the relevant traffic lights, i.e., yellow for fluctuations below the 5th and above the 95th percentile and red for fluctuations below the 1st and above the 99th percentile.

V. Assessment of the web front end for visualisation and dissemination

The *VAT gap in the EU* study derives a large set of data points for multiple variables, which are both time-series and cross-sections that could often be decomposed into several components. The overall number of data points published in the report is approximately 1 500 (excluding econometric analysis and the analytical components presented in Part B). Some of those figures are presented more than once, in various representations. For example, VAT compliance gap estimates can be presented and arranged in multiple ways, for instance as an absolute monetary value, relative to the value of the VTTL, relative to the previous years' value, or averaged over all (or some) Member States, among others. Different arrangements of the same variable allow to emphasise relationships within certain dimensions, which might be of interest for the readers and may help to draw the most relevant conclusions.

The core figures published in the *VAT gap in the EU study* are the compliance gap and the underlying VTTL and VAT revenue in each of the Member States. In order to contextualise these most important estimates, the values are presented in multiple parts of the report – in Chapter II of Part I, in Chapter IV as individual country results, and then in Annex B. In this edition of the *VAT gap in the EU* study, the study team investigated additional options for presentation of the data in the format of a web front end. During the process of this report's preparation, in the inception report, the study team presented multiple practices widely used for presenting statistical data, ranging from simple factsheets, through static charts and maps to interactive chart creators.

The choice of the specific solution used for the dissemination of the results of the study depends on the target group considered to be the primary recipient of these results. One of the primary target readers of this study are professionals, i.e., tax administrations and other public administration employees, academia, journalists, and others. Even among this narrow group, the study could seek to offer more interest through the better presentation of the results, improving awareness of the issues at stake. At the same time, it is important to keep in mind the objective of such a presentation. Based on the "Handbook of Data Visualization"[97], which describes the methodological principles for modern data visualisation, *there are two main reasons for using graphic displays of datasets: either to present or to explore data. Presenting data involves deciding what information you want to convey and drawing a display appropriate for the content and for the intended audience. […] Exploring data is a much more individual matter, using graphics to find information and to generate ideas. Many displays may be drawn*. Explorative methods are useful if the presentation is targeted primarily at professionals and the dataset is multidimensional, allowing for different cross-sections and drawing conclusions from multiple perspectives. On the other hand, presentation methods which require some user input (selecting parameters) might be discouraging for non-professional users, who are less familiar with the subject.

Considering that one of the primary target groups is Member States' tax administrations, during the consultations conducted as part of this study, representatives were asked which of the main presentation methods proposed in the Interim Report they consider the most useful. Based on the collected responses (see ***Usefulness of additional features***), we can see that the preferred

[97] *Based on Chen et al. (2008).*

methods for the presentation and visualisation of VAT gap estimates lean towards more simple solutions such as factsheets, static graphs, and the option to download the underlying data for the presented graphs. Yet, additional visualisation methods may be useful for some authorities.

As a part of the assignment, the study team reviewed the current practices used for the presentation and visualisation of similar datasets employed by four major publishing institutions (the OECD, EU agencies, the World Bank, and the International Monetary Fund). It is worth noting that none of these institutions have a completely harmonised strategy and format for the presentation of their thematic reports. The approach depends on the subject, scope, targeted audience, budget constraints, technical capabilities of the existing infrastructure, and probably many other factors. In the following review, the study team analysed the web front ends that serve as a gateway for the reports published by those institutions. Due to the scale of the published material, this review had to be based on examples (four per publishing institution) and thus it is not exhaustive. In the table below, the contents of the web front ends were summarised, indicating which elements appeared in all examples (‘yes’), in none of the examples (‘no’), or in only some cases (‘sometimes’). In a further part of this review, the team took a deeper look into three selected examples.

Table 73: Review of contents of web front ends used by major publishing institutions

	Publishing institution:			
	OECD	European Commission and other EU institutions	World Bank	IMF
Executive summary / general description of the publication	yes	yes	yes	yes
Highlights of the most important findings	yes	yes	yes	sometimes
Description of the methodology	sometimes	sometimes	no	no
Simple static graphs and tables	yes	yes	yes	sometimes
Interactive graphs and tables	sometimes	sometimes	sometimes	no
Chart creator	no	sometimes	sometimes	no
Links to source data	yes	yes	yes	yes
Links to the report in pdf format	yes	yes	yes	yes
Links to the report in other formats	sometimes	no	no	no
Report available in printed version	sometimes	no	no	sometimes
Report available through research repositories	sometimes	sometimes	sometimes	sometimes
Report cover contains a picture	yes	sometimes	sometimes	no
Video summary / video discussion / presentation	sometimes	no	no	sometimes

Source: own elaboration.

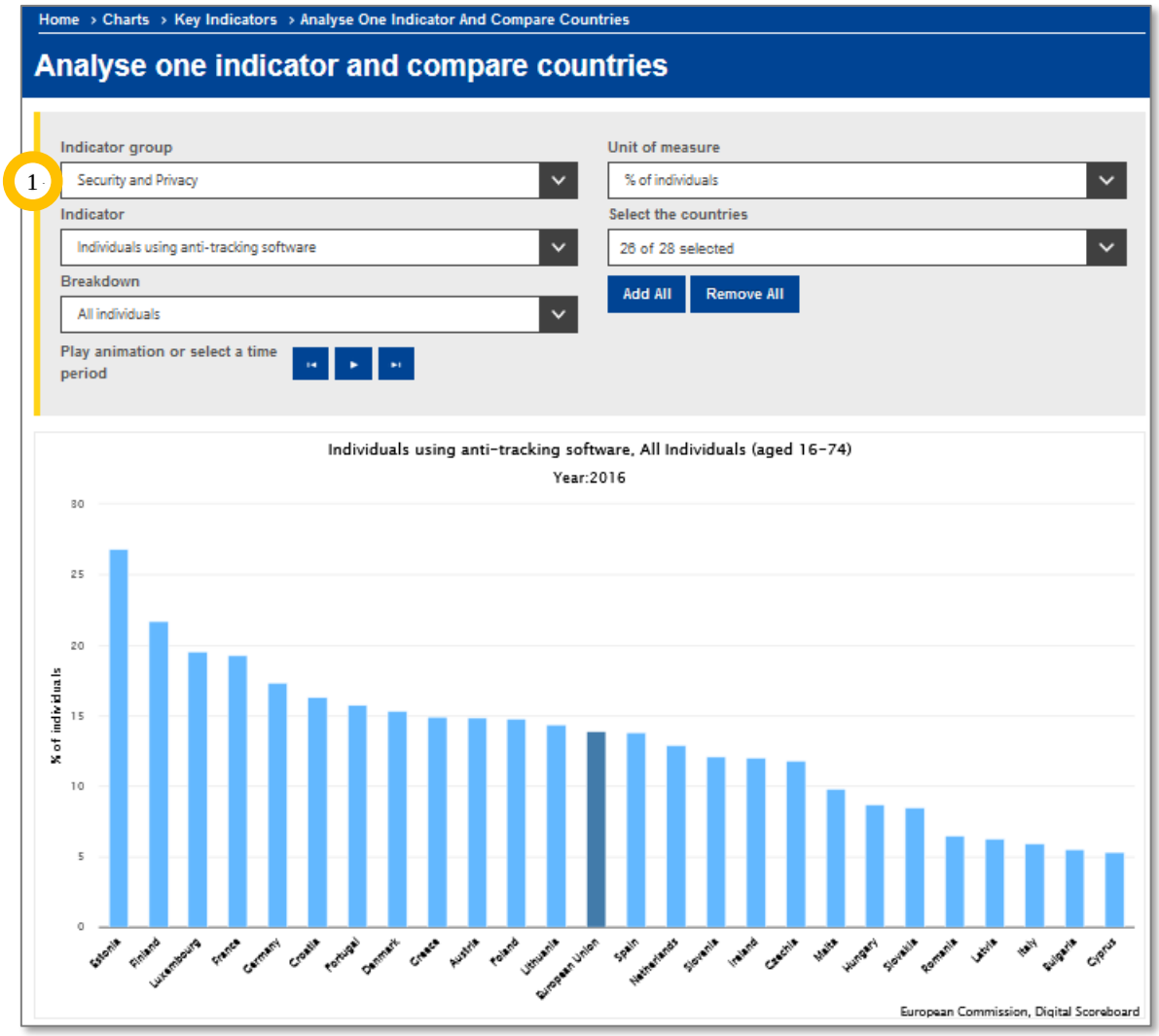
Most, if not all, of the elements used in the web front ends of major publishing institutions could be employed for *VAT gap in the EU* study dissemination as well. The most commonly used elements such as executive summary, highlights of the most important findings, graphs visualising those findings, and access to source data seem like obvious inclusions. At the same time, some of those elements are not well-suited or viable when comparing the benefits and costs required to develop such solutions. For example, chart creators or other explorative solutions shall be considered as too complex for the scale of the *VAT gap in the EU* study dataset, while also adding a substantial cost. Other more unusual solutions such as a video presentation or broadcasted discussions on the topic are an interesting new format of research promotion but the effectiveness of such content is unknown.

As suggested by the Commission, the starting point for a more in-depth review of these examples is the web front end for *The Digital Economy and Society Index*.[98] The website front page is divided

[98] *See:* https://digital-agenda-data.eu/.

into multiple sections leading to more detailed parts containing a list of produced indicators, metadata, a chart creator, and even a conversation board which allows readers to comment on the contents of the portal. The overall impression of this web front end is that it is targeted at professionals. This type of presentation is very useful for exploration of the dataset, especially if that dataset is extensive and it is difficult (or inadvisable) to single out or highlight any specific information from that dataset. The chart creator (point 1 in Figure 79) allows readers to choose from 21 indicator groups each containing up to 20 indicators, which then can be divided further into components, measures, and countries. This type of interface is very useful for researchers well acquainted with the subject; however, a person with no previous background or basic level of understanding of the subject might be intimidated by the type of language and amount of information presented without context.

Figure 79: Screenshot of *The Digital Economy and Society Index* web front end



Source: https://digital-agenda-data.eu/charts/desi-components#chart.

This type of presentation is not well suited for VAT gap estimates as the amount of data in this project does not require such an advanced interface. Furthermore, this type of interface could create some unwanted barriers to access for non-professional users. On top of this, in the *VAT gap in the*

EU study it is possible (and advisable) to highlight the most important figures first and then lead to the more detailed breakdowns or give access to the underlying data for those with a special interest.

Another example of the dissemination of statistical figures which was reviewed is the *Employment Outlook 2022* prepared by the OECD.[99] The webpage resembles a news article (with large photo illustrating the problem, point 2 in Figure 80) and it is written as such with a catchy lead, an introductory paragraph (point 4), and long sections (point 6), each with a strong message. The text is written in everyday language, avoiding specialised vocabulary. Below the introductory paragraph, some of the most interesting figures are highlighted (point 5), leading the reader from the most general information towards more that which is more detailed. Each section is accompanied by a clear and simple graph (point 7), highlighting the most important relationships (presenting only some countries while ignoring the others), which are also described in a short paragraph above. The graphs are mostly static but allow readers to highlight a specific point value with a mouse hover. This method enhances the visual appeal and usability of the page without adding complexity which might intimidate the user. The page includes a handy navigation bar (point 3) and directs individuals with a special interest to extended information, source data, and the full report in the format of webpage. This format of report is well-suited for mobile devices but, on the other hand, might not be as convenient for professional appliances as, for example, pdf format.

[99] *See: https://www.oecd.org/employment-outlook/2022/.*

Figure 80: Screenshot of *Employment Outlook 2022* web front end

Source: https://www.oecd.org/employment-outlook/2022/.

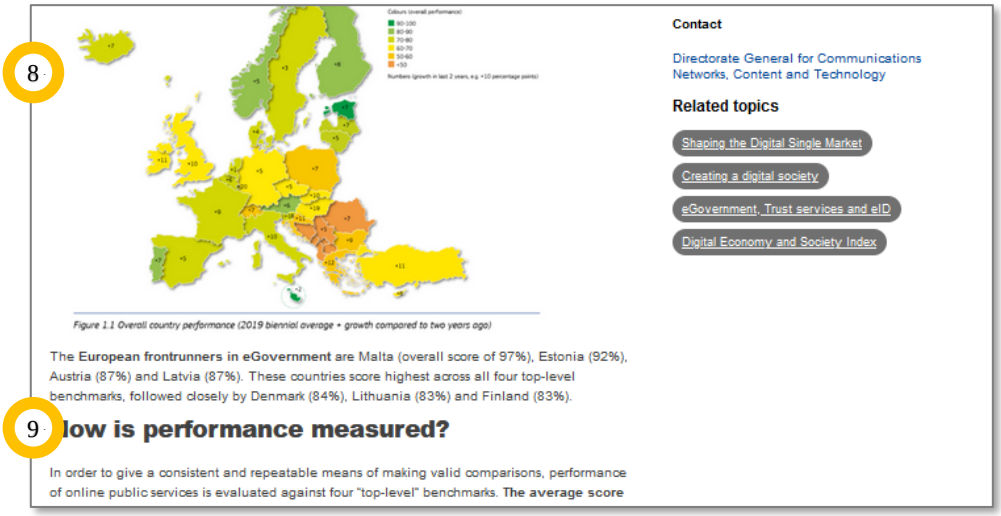
The OECD's *Employment Outlook 2022* web front end is a good example of a webpage that can help reach a wider, non-professional audience. The page uses various graphs extensively, which helps to better understand the described issues. On the other hand, it presents simplistic information which might not be suited for more experienced target groups – those groups will most likely choose to read the full body of the report or browse the source data. There are many good practices which could benefit the presentation of the VAT gap results, such as the highlighting of key figures, clear and appealing graphs, and well-structured sections. It is important to note that the subject of employment is much more relatable to non-professional users (and more understood) than the subject of the VAT compliance gap and as such it is much easier to keep to everyday language. Trying to tailor the presentation to reach the wider audience might cause it to be less useful for professionals, which should remain the main target group.

A third example of the presentation of statistical data which was reviewed as part of this assignment was the presentation of the results of the *eGovernment Benchmark 2020* study commissioned by the European Commission.[100] The subject matter of this report is fairly niche and the analysis is most likely targeted at public administration officials and academia. This is reflected

[100] See https://digital-strategy.ec.europa.eu/en/library/egovernment-benchmark-2020-egovernment-works-people.

in the form and content of the webpage – the visual design is simple and the language, while not particularly complex, is dry and does not include a lot of evaluative statements. The text is focused on the most important findings and the presentation of the key elements of the methodology (point 9 in Figure 81). The use of bold text additionally highlights the main points. The presentation is accompanied by two graphs – a map (point 8) and a bar chart. The graphs are not particularly visually appealing but break up the monotony of the text, while allowing to better understand the data. Still, a lot of the numerical findings are only described within the body of the text and are not presented in a visual form. The webpage references the document containing the full body of the report and other relevant resources such as country factsheets, infographics, and source data, among others.

Figure 81: Screenshot of *eGovernment Benchmark 2020* web front end



Source: https://digital-strategy.ec.europa.eu/en/library/egovernment-benchmark-2020-egovernment-works-people/.

The web front end created for the *eGovernment Benchmark 2020* report is a simple and elegant solution for a summarised presentation of the statistical findings. The page represents closely the contents of the report, and the style is consistent with the full version of the document – both are most likely targeted at individuals with an existing interest in the topic. The formal style of the description is well-suited for the presentation of the VAT gap estimates. On the other hand, the visual design of reviewed page is not very appealing – the graphs are not very clear and could be used more extensively, instead of (or in parallel to) the text descriptions.

Based on the reviewed cases (along with the examples presented at the stage of inception report), the study team constructed three design options for the dissemination of future *VAT gap in the EU* study results:

- **Status quo** – preservation of the current format of the web front end (simple one page factsheet) with some minor changes: additional static graphs, access to source data, more appealing visual design.

  Pros: low development cost, low risk of any technical issues.

  Cons: low appeal of the presentation, limited amount of presented information.

- **Moderate extension** – a web front end with a single page containing the description of the project and findings accompanied by interactive graphs, charts, and maps. The page

summarises the most interesting contents of the report with the view to drawing attention to the subject but without offering a high level of user customisation.

Pros: moderate cost of development, increased appeal of the presentation, higher amount of information is presented in a visual format, can be targeted at a wide range of audiences.

Cons: possibility of technical issues, must follow website administration requirements.

- **State of the art** – the web page which is an introduction to the *VAT gap in the EU* study is extensive, covering a large part of the full report's contents. The page contains interactive graphs along with a customisable chart creator. The full body of the report can be accessed on the page without the need to download the pdf file.

  Pros: allows user customisation, presents a lot of information, makes an impression of a highly advanced web front end.

  Cons: high cost and development time with potential impact on the publication date, large possibility of technical issues, must follow website administration requirements, can be intimidating to non-professional users, the amount of information in the project may not be substantial enough to make full use of the capabilities.

Based on this assessment, the study team advises a moderate extension of the current format of the web front end. Such an approach would allow to increase appeal of the presentation while making an optimal use of the available data. It would also reduce risks and time needed to implement more advanced solutions that are required by more advanced solutions. In view of potential extensions of th study to our methodologies and revisions of the estimates nearly up to the time of publication, state of the art visualisation and dissemination, would likely extend the publication date by a few weeks. The value added of such delayed publication would be limited as general audience is interested mostly in headline figures while other stakeholders value mostly simple factsheets and static charts (see ***Usefulness of additional features***).

Annexes

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Annex A. Methodological appendix

VAT gap fast estimates for 2021

The methodology used to derive fast estimates, for which full-fledged estimates could not be derived at this stage of the study due to the unavailability of VAT revenue figures, will differ markedly from the one employed to derive the full-fledged estimates for the 2016-2020 period. The reason will be scarcer availability of data for 2021 than for preceding years. The methodology for deriving fast estimates shall be regarded as an extrapolation of the main liability components of full-fledged estimates derived for 2020. Due to the unavailability of the ORS data for 2021 and insufficient information to forecast 2021 SUT, it will be assumed that:

Structure of household final consumption does not change with respect to the preceding year. Non-deductible GFCF liability changes in line with the year-over-year change in government GFCF published by AMECO.[101]

In the vast majority of cases where there are no significant changes in the statutory rates, net adjustments and intermediate consumption liability will be rescaled from the preceding year using growth rates for the entire tax base (European Commission, 2020).

VAT compliance gap backward update: 2000-2015

With the exception of the 2013 VAT gap study, each of the subsequent updates covered estimates for five-year periods. Overall, the VAT compliance gap estimates have thus far covered 2000-2019, but as explained earlier, due to revisions triggered by new information available, the estimates from different studies cannot be directly compared. As visualised by Figure 82 for the total EU-wide VAT compliance gap, despite some revisions in magnitude of the most recent year, the dynamics of the series were largely unaffected by revisions.

Every year, the estimates of the VAT gap are updated and revised backwards. There are three different sources of such revisions:

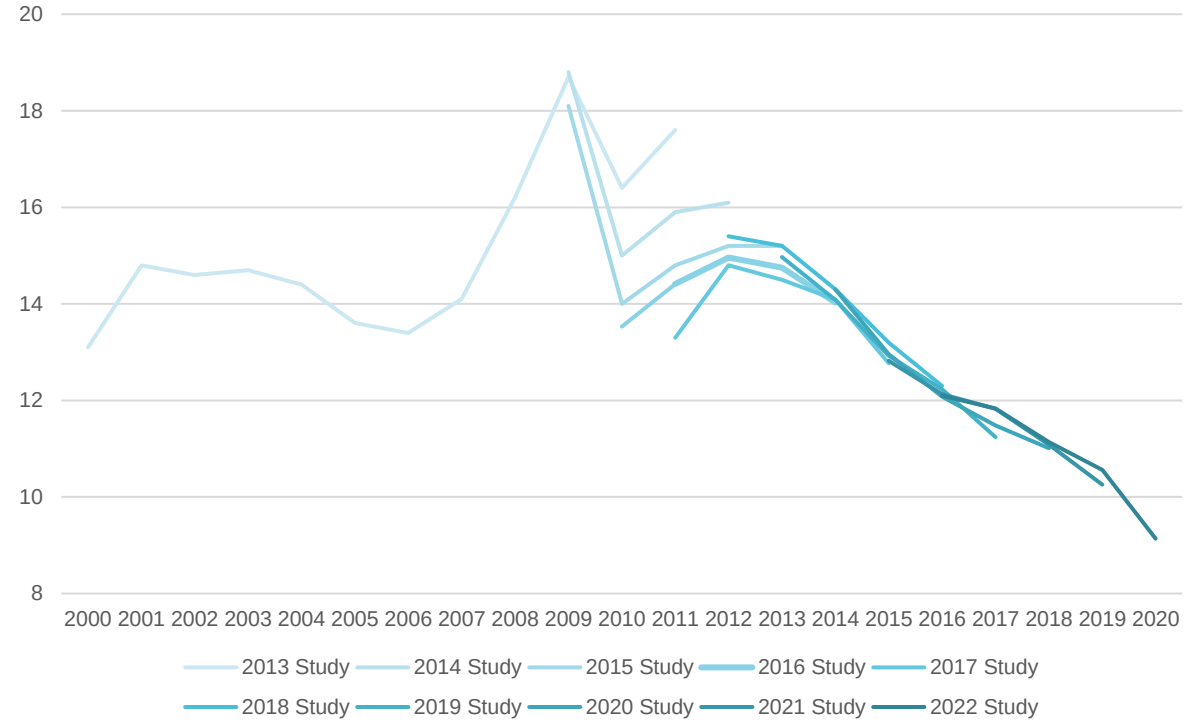
1) Updates in the underlying national accounts data published by Eurostat: updates in VAT revenues, new supply and use tables, and revised industry-specific growth rates, among others.

2) Updates in the estimated GFCF liability, based on the new information from the own resource submissions (ORS) on taxable shares of GFCF by five sectors: households, government, NPISH, and exempt financial and non-financial enterprises.

3) Revision of the parameters of the VTTL model: effective rates, pro-rata coefficients, and net adjustments, either due to new information from ORS or due to correcting errors in the previous computation.

[101] *See:* *https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/macro-economic-database-ameco_en.*

Figure 82: Comparison of results (% of the VTTL, 2000-2020)



Source: own elaboration based on European Commission, CASE (2013, 2014, 2015, 2016, 2017, 2018, and 2019).

Bearing in mind that the updates do not impact year-over-year changes in the VAT compliance gap (especially for years unaffected by a GFCF change – 2019 and 2018 in the case of 2022 VAT gap study), the study team will implement the backcasting procedure for deriving past estimates of the VAT gap for every Member State. The backcasting procedure relies on the magnitude of values for the five-year period covered by the most recent estimates. At the same time, the dynamics, i.e., year-over-year changes, for the years not covered by the full estimates would be based on previous studies (the most recent study available including the specific years). For instance, the estimates for 2000-2013 included in the 2022 study would rely on the seven studies published between 2013 and 2019 but would be adjusted to the magnitude of the full estimates for 2016-2020.

Publishing the exact values obtained in various studies in one table, without applying the backcasting procedure, could lead to a misinterpretation of year-over-changes in the VAT compliance gap resulting from structural breaks. As a result, econometric and statistical studies using the Commission's estimates as a source of information could lead to inaccurate observations.[102]

[102] *For examples of such studies see: Szczypińska (2019) and Zídková (2014).*

Limitations and challenges of the top-down approach

Table 74: Limitations and challenges of the top-down VAT gap calculation

Limitations and challenges	Impact on the accuracy of estimates and means to address the challenge
Dependence of the accuracy of estimates on the inclusion of the unobserved economy and accounting for fraud	The top-down method hinges on underlying national income accounts, respective conventions, and quality. The unavoidable inaccuracies related to the underlying data impact the accuracy of estimates. Yet, the methodological approach taken by the Statistical Authorities, in that strict rule of the ESA 10, as well as parallel use and triangulation of at least two out of the three approaches – production, expenditure, income-side – to the compilation of national accounts, reduce this error. Nevertheless, insufficient correction for the activities that are unobserved by statistical agencies could lead to underestimation of the VAT compliance gap.
Decomposition of the VAT compliance gap	Since VAT liability is modelled both for groups of products (for the liability pertaining to final use categories) and for sectors of economic activity (correction for the liability at the intermediate stage), it is not possible to decompose the VAT compliance gap. The consumption-side approach allows only for estimating the overall value of the gap. As explained in Chapter 2 od Part II, to decompose the VAT compliance gap, the production-side approach must be applied, and sectoral revenue data needs to be available. Since it is impossible to align VAT liability components with the respective VAT revenue elements, the consumption-side approach does also not provide any information about types of irregularities and their scale.
Misalignment of VTTL estimates with revenue figures	The issue of the misalignment of the timing of recording transactions in national accounts and VAT receipts has been solved to a large extent by the introduction of the ESA 10 standard by Eurostat. Under this standard, the revenue shall be presented in accrual form and account for the change in the stock of refunds and late payments. Yet, due to limitations of observing these flows, revenue published by Eurostat is imperfect accrual.
Misalignment of the place of supply rules with national accounts conventions	Specific services (e.g., transport and tourism) can be taxed not at the place of residence of taxpayer (as transactions are recorded in national accounts) but at the origin of the provider or where services are physically performed. To reduce the impact of this misalignment, particular components of consumption are adjusted to meet the place of supply rules in place.

Source: own elaboration.

Econometric analysis

The analysis of the VAT compliance gap is largely based on the methodology developed in four earlier studies (VAT gap study editions 2018, 2019, 2020 and 2021). Moreover, it contributes to a relatively large stream of research using the European Commission's *VAT gap in the EU* study to search for VAT gap determinants, in that Zídková (2017), Lešnik et al. (2018), Szczypińska (2019), and Carfora et al. (2020). The popularity of research on VAT gap determinants is driven by the increasing length of the series. For example, the available series are sufficiently long enough to include economic upturns and downturns. Importantly, the series covered in this study includes the years 2019 and 2020, i.e., the start of the COVID-19 pandemic. The increasing length of the time covered as well as the inclusion of the start of the pandemic provide new opportunities for observing the relationship between the VAT compliance gap and its covariates in a new economic environment.

The econometric analysis outlined in this study incorporates all methodological improvements and novelties introduced in the earlier work: (1) "backcasting" – a novel data preparation procedure which eliminated potential bias related to revisions in subsequent vintages of the study; (2) a dummy variable adjustment to manage the scarcity of observations of exogenous variables, (3) the extended list covariates expected to be affecting VAT compliance, and (4) principal component analysis (PCA), which allows for the variability of more covariates to be accounted for in a single model specification.

Data and variables

The endogenous variable is the VAT compliance gap of country *i* in year *t* taken from each of the European Commission's VAT gap studies (i.e., from edition 2013 up to the estimates presented in this report). To ensure the comparability of vintages across time, the data was transformed using backcasting.[103]

The wide set of covariates included in the analysis originates from the 2021 study, which included 65 explanatory variables overall. Due to the multiplicity of covariates and the enormous number of potential combinations of model specifications, we proceeded parsimoniously in selecting the variables used in the model specifications. The approach consisted of three stages. In the first stage, we ran Bayesian Model Averaging to learn which variables are not significant in the majority of the specifications' variations. In the second stage, we created a correlation matrix of the remaining variables to learn which are collinear and cannot be presented in common specifications. Finally, we eliminated specifications on the basis of various specification tests including unit root tests (Harris-Tzavalis, 1999; Levin-Lin-Chu, 2002; and Im-Pesaran-Shin, 2003), a cointegration test (Pedroni, 1999), and the Wald test for groupwise heteroskedasticity.[104] The narrow dataset obtained after the first stage consisted of 27 explanatory variables. After adding the principal components, variables included in the set contained 43 variables. A summary of the statistics of these variables including selected principal components is shown in Table 63.

The PCA was introduced to allow us to account for the variability of more covariates in a single model specification. More specifically, the objective was to estimate principal components separately for: (1) macroeconomic variables; (2) tax policy characteristics; (3) structural economic factors; and (4) tax fraud proxies. However, in the set of tax policy characteristics and structural economic factors,

[103] *Backcasting is a recursive procedure of updating information from subsequent vintages of the study. See more in EC/CASE (2020).*
[104] *See Annex A. Tests of the econometric model.*

the significant problem of missing variables precluded the use of PCA. Finally, the principal components were estimated for two groups – macroeconomic variables and tax fraud proxies.

PCA is a mathematical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables. PCA's operation can be thought of as revealing the internal structure of the data in a way that best explains the variance in the entire dataset. For this reason, it is commonly used for dimensionality reduction. By these means, PCA can reveal information on the impact of unobservable factors and eliminate unnecessary information from the dataset. PCA is often used for explaining phenomena that are difficult to quantify. The multiple indicators, multiple causes estimation method (MIMIC), which is a well-established tool for estimating the underground economy as a factor-type analysis, shares many similarities with PCA (Schneider and Dell'Anno, 2006).

Similar to the previous study, the explanatory variables were grouped into four distinct categories, which are:

- **macroeconomic variables** that aim to explain the cyclical conditions that affect taxpayer behaviour;
- variables describing the sectoral and company **structure of the economy**;
- **tax policy characteristics** expected to show how the various efforts of tax administrations relate to the VAT compliance gap in each Member State;
- **tax fraud** proxies that are suspected to be a significant component of the VAT compliance gap but are difficult to explain by the three groups of above-mentioned factors.

As shown in Table 75, the explanatory variables are often available for only a subset of observations. The nature of the missing data varies across variables. Some data sources cover only specific Member States (e.g., Eurozone, OECD) while other sources are available only for a given period of time (surveillance database) or were discontinued (e.g., verification interventions). The problem of the unavailability of observations markedly decreases the number of degrees of freedom in the models with numerous exogenous side variables introduced. This creates a trade-off between two econometric problems – omitted variables and insufficient degrees of freedom. To reduce the scale of the problem, we impute the values of the missing variables. We use a simple and intuitive method that partially controls the bias created by the non-random character of the missing data called the dummy adjustment method (Allison, 2001).

Table 75: Summary statistics of explanatory variables included in econometric specifications

Variable	Number obs.	Mean	Standard deviation	Minimum	Maximum
Block 1: Macroeconomic variables					
Real GDP growth rate	587	0.02	0.04	-0.15	0.25
Deficit to GDP ratio	584	-0.03	0.04	-0.32	0.07
Consumer Price Index	587	0.02	0.03	-0.04	0.46
General gov. surplus	584	0.59	0.34	0.04	2.06
Unemployment rate	586	0.09	0.04	0.02	0.28
Macro component 1	556	0.00	1.99	-10.44	9.26
Macro component 2	556	0.00	1.59	-9.53	12.58
Macro component 3	556	0.00	1.01	-1.78	11.22
Block 2: Structure of the economy					
Agriculture sector (share)	587	0.03	0.02	0.00	0.14
Communication sector (share)	587	0.05	0.01	0.03	0.17
Financial sector (share)	587	0.06	0.04	0.02	0.3
Manufacturing sector (share)	587	0.17	0.06	0.04	0.37
Construction sector (share)	587	0.06	0.02	0.01	0.13
Wholesale and retail trade sector(share)	587	0.21	0.04	0.09	0.32
Real estate sector (share)	587	0.09	0.02	0.05	0.19
Professional, scientific, technical service activities (share)	587	0.09	0.03	0.02	0.17
Public administration (share)	587	0.18	0.03	0.10	0.24
Arts, entertainment, and recreation sector (share)	587	0.03	0.01	0.01	0.15
Small-size companies (employees)	291	0.54	0.16	0.08	0.83
Large-size companies (employees)	291	0.07	0.03	0.03	0.14
Micro-size companies (GVA)	248	0.21	0.04	0.12	0.37
Small-size companies (GVA)	233	0.08	0.02	0.03	0.13
Medium-size companies (GVA)	233	0.11	0.02	0.05	0.16
Shadow economy[105]	532	22.38	7.02	9.39	36.9
Block 3: Tax policy characteristics					
IT expenditure	299	0.09	0.07	0.00	0.28
Statutory Standard VAT rate	582	0.2	0.03	0.1	0.27
Fiscal Rules Index	587	0.33	0.99	-1	2.95
Reporting obligations	588	0.1	0.31	0	1
Verification interventions	403	0.04	0.10	0.00	0.92
Electronic payments	152	0.01	0.01	0.00	0.04
Block 4: Fraud proxies					
Intra-EU import at risk (share in GDP)	587	0.01	0.01	0.00	0.07
Intra-EU export at risk (share in GDP)	587	0.01	0.01	0	0.07
Frequency of Customs Procedure Code 42 and 63 used	154	13.92	1.62	11.23	18.66
Trade-at-risk	555	0.07	0.16	0	2.58
Fraud component 1	457	0	1.21	-4.45	5.57
Fraud component 2	457	0	1.00	-5.91	10.27

Source: own elaboration.

[105] *In the 2020 study, the variable size of the shadow economy came from a one-time study conducted by the IMF. Since the study has not been updated during the last six years, the data source for this variable was changed to the Informal Economy Database of the World Bank.*

Model specification

In accordance with the data and variables section, the basic regression takes the form:

$$VG_{it} = \alpha_1 TAV_{it} + \alpha_2 MV_{it} + \alpha_3 ESV_{it} + \alpha_4 FP_{it} + a_t + a_i + u_{it}$$

The endogenous variable is the VAT compliance gap for country *i* in year *t*, VG_{it}, which might be explained by the variables related directly to the actions taken by tax administrations (TAV_{it}), control variables describing the current macroeconomic situation (MV_{it}), control variables describing the characteristics of specific Member States (economic structure variables – ESV_{it}), and fraud proxies (FP_{it}). These variables are characterised by a small variation over time and a relatively large variation across countries. Apart from these variables, we include fixed effects by country (a_i), such that the expression above is a fixed effects model, and year time effects (a_t) (within estimator). Finally, u_{it} is the error term with the classical statistical properties.

A fixed effects model seems particularly appropriate, as one could argue some explanatory factors like the efforts of the tax administration or institutional variables might be correlated with many other factors that are not included in the regressions. The drawback is that the estimates of the fixed effects are uninterpretable, meaning that part of the variation cannot be attributed to specific factors. We are also unable to estimate the impact of the variables that show little within-country variation, as for example, level of VAT tax rates or firm size.

Principal component analysis

In order to be reliable, the variables that undergo PCA must be sufficiently correlated.[106] Together with pairwise correlation coefficients, the Kaiser-Meyer-Olkin (KMO) statistic is a measure commonly used for testing the correlation in the dataset. The statistic is based on the concept of "anti-image", known also as a measure of sampling adequacy (Kaiser, 1970). It shows whether the correlations between variables can be explained by the other variables in the dataset. The authors of the statistic recommended threshold values for KMO (<0.5 unacceptable, 0.5-0.59 miserable, 0.6-0.69 mediocre, 0.7-0.79 middling, 0.8-0.89 meritorious, ≥ 0.9 marvellous), which should be the indicator for the final decision whether the dataset is appropriate for PCA (Kaiser, 1970).

After examining if the dataset is suitable for PCA and executing the analysis, there is the need to determine how many extracted components should be considered. The most frequently used criterion to decide the number of components is called the Kaiser Criterion, which suggests extracting all components with an eigenvalue greater than one (Kaiser, 1960). Eigenvalue describes how much variance is accounted for by a certain component, so extracted components with an eigenvalue greater than one account for more variance than a single variable, since all variables are standardised in the process in analysis and their variances are exactly one.

The interpretation of PCA results is based on the loadings which take values ranging from -1 to 1 and thus represent the correlations between components and variables. The higher is the loading, the better is the explanatory power of the component. The variable's factor loading with the extracted factor should lie above an acceptable level. Generally, there are two thresholds to facilitate the

[106] *A 0.3 pairwise correlation with all other variables is assumed to be an inclusion threshold (Shevlyakov and Oja, 2016).*

interpretation – loading above 0.5 with a few components designated or lower, namely loading above 0.3, if a high number of factors were extracted (Hair et al., 2010).

The objective of introducing PCA to the econometric analysis was the desire to account for the variability of a larger number of variables that could not be included in single model specification because of the collinearity issue. Due to this and other limitations, the number of variables included in a single specification that was reported in the 2020 study was less than or equal to 12. At the same time, the shortlist of variables with a significant correlation with the VAT gap was 27.107

To increase the explanatory power for the model, we aimed at estimating principal components for each variable group that could be characterised by high correlation within each group. More specifically, the objective was to estimate principal components separately for: (1) macroeconomic variables; (2) tax policy characteristics; (3) structural economic factors; and (4) tax fraud proxies. However, in the set of tax policy characteristics and structural economic factors, the significant problem of missing variables precluded the use of PCA. Finally, the principal components were estimated for two groups –macroeconomic variables and tax fraud proxies. Below we present the results of the estimates within each subgroup.

Macroeconomic variables

The group of macroeconomic variables included in the PCA analysis contained: GDP growth measures denoted in nominal and real terms, on a per capita and on a purchasing power basis. It also included growth of final consumption and household final consumption, specifically. In addition, deficit-to-GDP ratio, general government balance surplus, unemployment rate, and CPI were included in the analysis (see Table 76).

The KMO statistic for this set is 0.76 (middling), which suggests that the PCA is a suitable method for this group. Three extracted components that have eigenvalues greater than one were included as explanatory variables in the econometric specifications presented in Table 63 (Chapter 2, Part II).

Table 76: Eigenvalues for macroeconomic variables

Component	Eigenvalue	Difference in eigenvalue to following component	Proportion of variance explained	Cumulative variance explained
1	**3.9417**	**1.4025**	**0.3942**	**0.3942**
2	**2.5391**	**1.5155**	**0.2539**	**0.6481**
3	**1.0236**	**0.1671**	**0.1024**	**0.7505**
4	0.8564	0.2235	0.0856	0.8361
5	0.6328	0.1096	0.0633	0.8994
6	0.5232	0.2593	0.0523	0.9517
7	0.2639	0.1045	0.0264	0.9781
8	0.1593	0.1203	0.0159	0.9940
9	0.0389	0.0183	0.0039	0.9979
10	0.0206	.	0.0021	1.0000

Source: own estimates.

[107] *The shortlist of 27 variables was constructed using Bayesian Model Averaging from the initial list containing 65 potential covariates.*

Table 77: Component loadings for macroeconomic variables

Variable	Component 1	Component 2	Component 3
Deficit-to-GDP Ratio	0.3052	-0.1972	-0.2082
Consumer Price Index	0.0626	-0.0715	0.9335
Real GDP growth rate	0.4033	-0.2621	0.1084
Real GDP per capita growth rate	0.2165	-0.3161	-0.0085
GDP at market prices	0.3373	0.4531	0.0068
Government consolidated gross debt	-0.3944	0.1942	0.0797
Final consumption expenditure	0.3069	0.4873	0.0083
Final consumption expenditure of households	0.3237	0.4701	0.0328
GDP PPS	0.3523	-0.2162	0.1368
Unemployment rate	-0.3178	0.1980	0.2172

Source: own estimates.

Fraud proxies

In the set with fraud proxies, for PCA analysis we include various intensive measures of imports and imports-at-risk, specifically (see Table 78). The variable standing for the frequency of customs procedure codes 42 and 63 used was excluded due to the large number of missing observations (nearly 71 percent of all observations). The KMO statistic amounts to 0.58 (miserable), which is not substantially above the acceptable level, but high enough to be accepted. Two components have eigenvalues above one. These components with their loadings, presented in Table 79, were included as explanatory variables in the econometric specifications presented in in Table 63.

Table 78: Eigenvalues for fraud proxies

Component	Eigenvalue	Difference in eigenvalue to following component	Proportion of variance explained	Cumulative variance explained
1	**1.4747**	**0.4647**	**0.2950**	**0.2950**
2	**1.0099**	**0.0292**	**0.2020**	**0.4969**
3	0.9807	0.1354	0.1961	0.6931
4	0.8452	0.1558	0.1690	0.8621
5	0.6893	.	0.1379	1.0000

Source: own estimates.

Table 79: Component loadings for fraud proxies

Variable	Component 1	Component 2
Trade-at-risk	-0.1131	0.6856
Intra-EU import-at-risk (share in GDP)	0.6125	-0.1026
Import (only alcohol and tobacco)	0.2768	0.6489
Total import	0.4891	0.1939
Intra-EU export-at-risk (share in GDP)	0.5443	-0.2464

Source: own estimates.

Robustness checks of the econometric model

As a robustness check on the fixed effects specification, we show how the estimates of the model vary across time.[108] Table 80 shows the comparison of the baseline estimation with the estimation performed separately across different time periods: 2000-2011 (which were reported in the 2013 study) and 2006-2020 (which were reported across subsequent studies).

Table 80: Robustness check

	(1)	(2)	(3)
	FE (Baseline)	**FE (2000-2011)**	**FE (2006-2020)**
Macroeconomic variables			
Real GDP growth	-0.332***	-0.411***	-0.267***
General gov. surplus (deficit)	-0.224***	-0.441***	-0.048
Tax administration variables			
IT expenditure	-0.152***	-0.232***	-0.085*
Economic structure and institutional variables			
Agriculture share	0.848***	1.041***	0.195
Communication share	-0.373	-1.039*	0.040
Financial share	-1.077***	-0.814***	-0.085
Constant	0.224***	0.242***	0.093**
Observations	543	312	361
R-squared	0.377	0.332	0.461
Number of MS	26	26	26

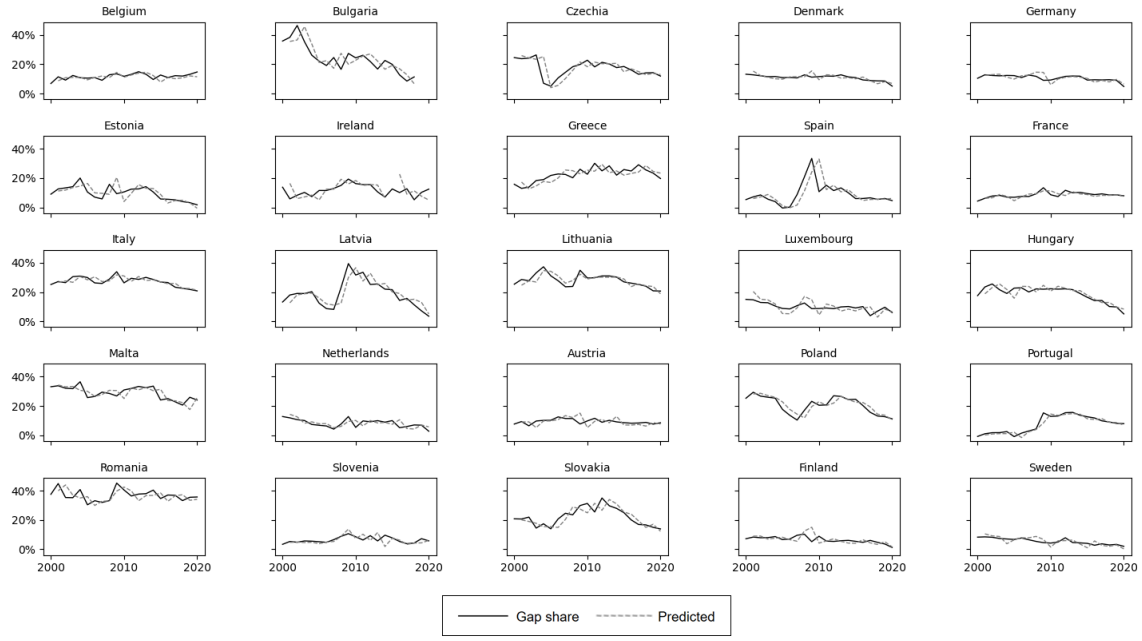
*Source: own elaboration, *** p<0.01, ** p<0.05, * p<0.1.*

The baseline model and the model estimated for the 2000-2011 period show very similar results in the values of the estimated effects. In the model estimated on the 2006-2020 time period only, the estimates of the tax administration covariate and real GDP growth remain similarly robust, while government surplus is not statistically significant for the 2006-2020 period. Somewhat larger heterogeneity is observed for the economic structure and institutional variables. The shares of agricultural, communication, and financial sectors were not statistically significant for the 2006-2020 period.

In addition to the robustness checks that were performed in order to assess the stability of the coefficients in time, we also look at the linear predictions for each Member State (see Figure 83). Although some hikes and declines of the gap could be predicted with some delay, they show that the model is accurate in predicting trends in VAT compliance gap changes.

[108] *See the 2020 study for further checks, including full-time interaction and a verification of how the parameters react to changes in the countries included in the sample.*

Figure 83: Linear predictions broken out by Member State



Source: own elaboration.

Tests of the econometric model

Within the procedure for selecting exogenous variables aiming at minimising the problems of endogeneity, multicollinearity, and the omitted variables, we created a correlation matrix of pre-selected exogenous variables. As this test proved, there was no case of pairwise correlation of above 0.65 in the specifications presented in Table 63. To test whether the data matrix could result in unstable coefficient estimates, we used the singular value decomposition method. In all of the data matrices underlying the baseline and alternative equations, condition numbers were lower than 30, which is associated with well-behaved data matrices.

Several other statistical tests were performed. The appropriateness of including time and country fixed effects was verified through the Hausmann tests. As the tests indicated that in the random effects specification, errors are correlated with the regressors, the fixed effects specification was chosen.

Since the model contains time series, we verified that the model does not suffer from the issue of spurious regression. For this purpose, we performed unit root tests – Levin-Lin-Chu (2002), Harris-Tzavalis (1999), and Im-Pesaran-Shin (2003). All tests indicated that the VAT compliance gap and explanatory variables included in the specifications are stationary. The tests showed that unemployment is non-stationary and cannot be included in levels in the equation regressing the VAT compliance gap denoted as a percent of the VTTL. In addition to unit root tests, all model specifications were tested for cointegration using the Pedroni panel-data test (Pedroni, 1999) and the Wald test for groupwise heteroscedasticity. The residuals of all model specifications appeared to be homoscedastic, stationary, and I(0).

We also verified whether there is no reverse causality between the evolution of the VAT compliance gap and tax administration variables. In other words, we tested if, relative to other Member States, the pace of improvements in VAT compliance does not affect the willingness of

Member States to increase efforts and introduce various measures. For this purpose, we employed a procedure proposed by Dumitrescu and Hurlin (2012) for testing Granger causality in panel datasets. The tests were performed on year-over-year relative changes in the VAT gap and tax administration variables. To account for some potential forward-looking impact of introducing reporting obligations, the first lag was excluded from the analysis.

Annex B. Statistical appendix

Table 81: VTTL (EUR million)

	2016	2017	2018	2019	2020
BE	32 263	33 887	35 247	36 468	34 066
BG	5 058	5 324	5 783	6 261	6 014
CZ	15 601	16 926	18 703	19 740	18 187
DK	29 497	30 776	31 947	32 617	32 561
DE	241 411	249 693	259 592	268 176	232 638
EE	2 092	2 266	2 428	2 566	2 514
IE	14 028	14 970	14 961	17 056	15 591
EL	19 075	20 663	20 549	20 095	16 103
ES	74 791	79 172	82 040	84 465	72 778
FR	169 312	178 555	183 265	190 372	175 499
HR	6 545	6 946	7 502	7 484	6 784
IT	138 932	140 310	141 221	142 549	125 886
CY	1 713	1 818	2 031	2 095	1 908
LV	2 372	2 568	2 761	2 836	2 666
LT	4 097	4 426	4 637	4 865	4 926
LU	3 503	3 519	3 805	4 098	3 970
HU	12 344	13 682	14 418	15 431	14 149
MT	950	1 051	1 159	1 262	1 119
NL	50 500	53 024	56 740	62 452	60 685
AT	29 768	30 909	32 172	32 939	31 044
PL	38 733	43 110	46 575	48 572	47 175
PT	17 890	18 656	19 660	20 465	18 263
RO	17 423	18 446	19 300	21 394	20 789
SI	3 506	3 620	3 934	4 194	3 759
SK	6 783	7 125	7 583	8 033	7 921
FI	20 679	21 723	22 432	22 800	22 307
SE	44 017	45 811	44 734	44 914	44 896
UK	187 922	183 644	188 440	191 046	-
EU28	**1 190 805**	**1 232 620**	**1 273 618**	**1 315 246**	**-**
EU27	**1 002 883**	**1 048 976**	**1 085 178**	**1 124 200**	**1 024 198**

Source: own calculations, download underlying data.

Table 82: Household VAT liability (EUR million)

	2016	2017	2018	2019	2020
BE	18 522	19 148	19 731	20 216	18 313
BG	3 735	3 988	4 223	4 540	4 254
CZ	9 900	10 661	11 457	11 855	10 492
DK	17 289	18 052	18 836	19 288	18 743
DE	145 894	149 768	153 440	157 588	130 084
EE	1 437	1 525	1 628	1 702	1 615
IE	7 816	8 786	8 060	8 952	7 693
EL	14 745	15 827	16 349	15 867	12 092
ES	55 178	58 709	60 170	61 371	49 696
FR	99 691	102 853	106 028	108 298	98 161
HR	4 793	5 127	5 437	5 493	4 702
IT	99 315	100 344	102 153	103 725	89 058
CY	1 121	1 197	1 261	1 314	1 095
LV	1 868	1 982	2 077	2 119	1 946
LT	3 394	3 664	3 846	4 029	3 962
LU	1 423	1 450	1 539	1 645	1 389
HU	9 033	9 528	9 541	10 145	8 984
MT	542	588	642	688	487
NL	26 218	27 205	28 468	31 561	29 588
AT	19 885	20 658	21 368	21 853	19 682
PL	27 434	30 430	32 509	34 167	32 749
PT	13 345	13 791	14 455	15 052	12 915
RO	10 946	11 680	12 400	13 221	12 372
SI	2 575	2 679	2 840	3 025	2 616
SK	5 054	5 437	5 734	6 068	6 021
FI	11 575	11 830	12 198	12 261	11 697
SE	22 604	23 327	22 877	22 815	22 227
UK	124 841	122 972	126 962	127 831	-
EU28	**760 170**	**783 208**	**806 229**	**826 688**	**-**
EU27	**635 328**	**660 236**	**679 268**	**698 857**	**612 636**

Source: own calculations, download underlying data.

Table 83: Intermediate consumption and government VAT liability (EUR million)

	2016	2017	2018	2019	2020
BE	8 289	8 732	9 187	9 501	9 373
BG	731	797	906	977	972
CZ	3 739	3 993	4 400	4 686	4 597
DK	7 619	7 923	8 141	8 300	8 480
DE	54 242	56 199	59 143	61 828	58 250
EE	327	349	377	419	408
IE	4 022	4 131	4 642	5 154	5 174
EL	2 694	2 922	2 865	2 846	2 617
ES	11 046	11 958	12 562	13 405	13 531
FR	32 263	33 831	34 636	35 737	34 732
HR	1 165	1 219	1 225	1 214	1 128
IT	23 977	24 013	23 928	24 276	23 201
CY	428	438	483	559	592
LV	379	414	438	488	473
LT	453	485	500	534	554
LU	1 171	1 189	1 384	1 471	1 581
HU	2 054	2 304	2 513	2 700	2 561
MT	324	370	394	451	509
NL	14 259	14 788	16 443	17 856	17 693
AT	5 130	5 275	5 830	6 118	6 337
PL	7 590	8 198	8 641	9 006	9 017
PT	3 218	3 463	3 603	3 817	3 808
RO	2 522	2 570	2 819	3 184	3 301
SI	554	544	615	659	648
SK	975	1 006	1 094	1 178	1 192
FI	4 900	5 139	5 231	5 389	5 404
SE	12 337	12 635	12 452	12 760	12 673
UK	44 337	41 968	42 235	43 722	-
EU28	**250 745**	**256 854**	**266 686**	**278 237**	**-**
EU27	**206 408**	**214 886**	**224 452**	**234 515**	**228 805**

Source: own calculations, download underlying data.

Table 84: GFCF VAT liability (EUR million)

	2016	2017	2018	2019	2020
BE	4 808	5 319	5 653	6 016	5 748
BG	585	532	641	736	763
CZ	1 971	2 275	2 786	3 132	3 105
DK	3 828	4 025	4 225	4 254	4 496
DE	39 483	41 422	44 735	46 612	42 714
EE	318	381	420	442	488
IE	1 995	1 839	2 073	2 556	2 360
EL	1 355	1 605	1 047	1 061	1 112
ES	7 891	7 758	8 464	8 782	8 714
FR	32 168	36 803	37 305	40 443	36 884
HR	567	586	820	785	917
IT	13 883	14 342	13 389	14 405	13 659
CY	159	181	280	215	214
LV	175	217	293	278	294
LT	470	526	570	623	713
LU	625	580	565	623	719
HU	1 099	1 658	2 234	2 518	2 546
MT	58	71	102	114	115
NL	9 481	10 487	11 272	12 392	12 766
AT	3 284	3 437	3 416	3 524	3 611
PL	3 139	3 890	4 824	4 833	4 769
PT	941	1 031	1 187	1 230	1 255
RO	3 638	3 950	4 018	4 791	4 986
SI	303	329	402	431	431
SK	763	680	761	799	726
FI	3 513	3 987	4 300	4 368	4 427
SE	8 486	9 307	8 857	8 780	9 460
UK	17 396	16 997	17 269	18 516	-
EU28	**162 383**	**174 216**	**181 910**	**193 262**	**-**
EU27	**144 987**	**157 219**	**164 641**	**174 746**	**167 995**

Source: own calculations, download underlying data.

Table 85: VAT revenues (EUR million)

	2016	2017	2018	2019	2020
BE	28 750	29 763	31 053	31 702	29 282
BG	4 417	4 873	5 128	5 656	5 635
CZ	13 101	14 703	16 075	16 931	16 022
DK	26 770	28 049	29 199	29 832	30 918
DE	218 779	226 582	235 130	244 111	221 562
EE	1 975	2 149	2 331	2 483	2 469
IE	12 603	13 060	14 175	15 301	13 644
EL	14 333	14 642	15 288	15 390	12 925
ES	70 214	73 970	77 536	79 301	69 382
FR	154 490	162 011	167 720	173 953	161 537
HR	5 992	6 465	6 949	7 419	6 319
IT	102 086	107 576	109 333	111 464	99 669
CY	1 654	1 720	1 955	2 066	1 786
LV	2 032	2 164	2 449	2 632	2 571
LT	3 028	3 310	3 522	3 850	3 975
LU	3 148	3 382	3 539	3 702	3 730
HU	10 595	11 729	12 950	13 916	13 429
MT	712	810	920	934	849
NL	47 849	49 833	52 712	58 115	58 971
AT	27 301	28 304	29 323	30 405	28 384
PL	30 854	36 339	40 423	42 383	41 856
PT	15 767	16 810	17 868	18 786	16 803
RO	10 968	11 650	12 890	13 795	13 368
SI	3 318	3 481	3 765	3 962	3 553
SK	5 424	5 919	6 319	6 830	6 820
FI	19 694	20 404	21 364	21 974	22 026
SE	42 788	44 098	43 403	43 412	43 981
UK	167 827	162 724	168 703	176 317	-
EU28	**1 046 470**	**1 086 519**	**1 132 021**	**1 176 623**	**-**
EU27	**878 643**	**923 796**	**963 319**	**1 000 306**	**931 466**

Source: Eurostat, download underlying data.

Table 86: VAT gap (EUR million)

	2016	2017	2018	2019	2020
BE	3 513	4 124	4 194	4 766	4 784
BG	641	451	654	606	379
CZ	2 499	2 223	2 628	2 809	2 164
DK	2 727	2 728	2 748	2 785	1 643
DE	22 632	23 111	24 462	24 065	11 076
EE	117	118	97	84	45
IE	1 426	1 911	785	1 755	1 947
EL	4 742	6 021	5 261	4 705	3 178
ES	4 577	5 202	4 504	5 164	3 396
FR	14 822	16 544	15 545	16 419	13 962
HR	553	482	553	65	466
IT	36 846	32 734	31 888	31 085	26 217
CY	59	98	76	30	122
LV	340	404	312	204	95
LT	1 070	1 116	1 115	1 015	952
LU	355	137	266	396	240
HU	1 748	1 953	1 468	1 515	720
MT	238	240	239	328	270
NL	2 651	3 191	4 028	4 337	1 714
AT	2 466	2 605	2 849	2 533	2 660
PL	7 879	6 771	6 151	6 189	5 320
PT	2 123	1 847	1 792	1 679	1 460
RO	6 454	6 795	6 411	7 599	7 421
SI	188	138	169	231	206
SK	1 360	1 206	1 264	1 202	1 101
FI	985	1 319	1 068	826	281
SE	1 228	1 713	1 331	1 502	915
UK	20 095	20 920	19 737	14 728	-
EU28	**144 335**	**146 100**	**141 597**	**138 623**	**-**
EU27	**124 241**	**125 180**	**121 860**	**123 894**	**92 732**

Source: own calculations, download underlying data.

Table 87: VAT compliance gap (percent of VTTL)

	Backcasted series																Full estimates					Forecast
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Belgium	6.8%	11.4%	9.1%	12.3%	10.8%	10.5%	10.8%	9.0%	12.8%	13.4%	11.7%	13.1%	14.9%	13.1%	9.6%	12.6%	10.9%	12.2%	11.9%	13.1%	14.0%	6.1%
Bulgaria	35.8%	38.3%	46.4%	35.3%	26.1%	22.0%	19.1%	24.6%	16.5%	27.3%	24.3%	26.1%	21.8%	16.7%	22.5%	19.9%	12.7%	8.5%	11.3%	9.7%	6.3%	-
Czechia	24.5%	23.7%	24.1%	26.3%	7.0%	5.0%	10.6%	14.5%	18.3%	19.8%	22.7%	18.2%	21.3%	20.2%	17.7%	18.4%	16.0%	13.1%	14.1%	14.2%	11.9%	10.0%
Denmark	13.1%	12.7%	12.1%	11.5%	11.6%	10.9%	10.9%	10.6%	12.7%	11.1%	11.5%	11.9%	11.8%	12.7%	11.3%	10.9%	9.2%	8.9%	8.6%	8.5%	5.0%	5.7%
Germany	10.4%	12.8%	12.3%	12.1%	12.3%	12.2%	10.9%	12.6%	11.7%	9.0%	9.2%	10.5%	11.7%	11.9%	11.8%	9.2%	9.4%	9.3%	9.4%	9.0%	4.8%	-
Estonia	9.1%	12.6%	13.4%	14.2%	20.1%	10.5%	7.0%	5.8%	15.8%	9.4%	10.6%	12.5%	12.6%	14.2%	10.5%	5.8%	5.6%	5.2%	4.0%	3.3%	1.8%	-
Ireland	13.8%	5.8%	8.3%	10.3%	7.4%	11.6%	11.6%	13.0%	15.0%	19.4%	16.3%	15.6%	15.6%	10.6%	7.1%	12.6%	10.2%	12.8%	5.3%	10.3%	12.5%	9.0%
Greece	15.8%	13.0%	13.9%	18.4%	19.0%	21.9%	22.8%	22.5%	20.3%	26.1%	22.7%	30.2%	24.9%	28.4%	22.0%	25.9%	24.9%	29.1%	25.6%	23.4%	19.7%	14.0%
Spain	5.4%	7.2%	8.5%	5.7%	4.0%	-0.4%	0.2%	8.8%	20.9%	33.4%	10.7%	15.1%	11.5%	13.3%	10.0%	6.0%	6.1%	6.6%	5.5%	6.1%	4.7%	-
France	4.3%	6.2%	7.8%	8.3%	7.1%	7.0%	7.5%	7.5%	9.3%	13.5%	8.7%	7.4%	11.7%	10.0%	10.3%	9.4%	8.8%	9.3%	8.5%	8.6%	8.0%	-
Croatia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.0%	8.4%	6.9%	7.4%	0.9%	6.9%	-
Italy	25.2%	27.2%	26.5%	30.5%	30.9%	29.9%	26.3%	25.9%	28.8%	33.9%	26.3%	29.4%	28.7%	30.0%	28.6%	26.9%	26.5%	23.3%	22.6%	21.8%	20.8%	9.7%
Cyprus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.5%	5.4%	3.7%	1.4%	6.4%	-
Latvia	13.2%	18.0%	19.1%	19.0%	20.3%	12.4%	8.7%	8.2%	23.1%	39.4%	31.6%	33.5%	25.2%	25.5%	22.0%	21.6%	14.3%	15.7%	11.3%	7.2%	3.6%	3.4%
Lithuania	25.4%	28.6%	27.7%	33.1%	37.3%	31.1%	27.8%	23.6%	23.9%	34.9%	29.6%	29.8%	31.0%	31.0%	30.2%	26.9%	26.1%	25.2%	24.0%	20.9%	19.3%	14.3%
Luxembourg	15.0%	14.7%	12.9%	12.7%	10.5%	8.8%	8.5%	10.7%	12.6%	8.7%	8.8%	9.1%	8.7%	9.9%	10.2%	9.2%	10.1%	3.9%	7.0%	9.7%	6.0%	-
Hungary	17.6%	23.5%	25.5%	21.6%	19.1%	22.7%	23.0%	20.1%	22.2%	22.0%	22.3%	22.0%	22.2%	21.6%	19.1%	16.5%	14.2%	14.3%	10.2%	9.8%	5.1%	-
Malta	33.2%	33.8%	32.2%	31.9%	36.6%	25.8%	26.5%	29.5%	28.6%	26.9%	31.0%	32.0%	33.4%	32.5%	33.6%	24.1%	25.1%	22.9%	20.6%	26.0%	24.1%	17.1%
Netherlands	12.8%	11.9%	10.7%	10.1%	7.4%	6.9%	6.4%	4.2%	7.7%	12.8%	5.4%	9.9%	9.3%	10.0%	9.0%	10.1%	5.3%	6.0%	7.1%	6.9%	2.8%	0.4%
Austria	7.7%	9.4%	6.5%	9.8%	10.2%	10.3%	12.6%	11.5%	11.5%	7.8%	9.9%	11.7%	8.9%	10.3%	9.2%	8.7%	8.3%	8.4%	8.9%	7.7%	8.6%	6.7%
Poland	25.3%	29.4%	26.8%	26.0%	25.4%	17.7%	13.7%	10.4%	17.1%	23.2%	20.5%	20.8%	27.0%	26.6%	24.4%	24.6%	20.3%	15.7%	13.2%	12.7%	11.3%	-
Portugal	-0.7%	1.1%	1.8%	1.9%	2.6%	-0.9%	1.5%	3.0%	4.4%	15.3%	12.9%	13.2%	15.4%	15.7%	13.7%	12.7%	11.9%	9.9%	9.1%	8.2%	8.0%	-
Romania	37.5%	44.9%	35.4%	35.2%	40.8%	30.4%	33.2%	32.0%	33.2%	45.2%	40.5%	36.4%	37.7%	38.0%	40.4%	34.6%	37.0%	36.8%	33.2%	35.5%	35.7%	33.0%
Slovenia	3.4%	5.3%	4.8%	5.7%	5.6%	5.2%	4.8%	6.6%	8.8%	10.7%	8.6%	6.3%	9.3%	5.7%	9.6%	7.8%	5.4%	3.8%	4.3%	5.5%	5.5%	-
Slovakia	20.8%	20.7%	22.0%	14.5%	17.4%	14.0%	20.7%	24.6%	23.5%	29.9%	31.3%	25.5%	35.0%	29.7%	27.9%	25.0%	20.0%	16.9%	16.7%	15.0%	13.9%	8.8%
Finland	7.2%	8.4%	7.9%	8.0%	8.7%	6.6%	7.0%	9.6%	10.3%	5.2%	8.9%	5.6%	5.4%	5.9%	6.1%	5.5%	4.8%	6.1%	4.8%	3.6%	1.3%	-
Sweden	8.3%	8.5%	8.2%	7.4%	7.1%	6.7%	7.7%	6.5%	5.4%	4.6%	4.3%	5.0%	7.9%	4.6%	4.4%	4.1%	2.8%	3.7%	3.0%	3.3%	2.0%	1.0%
United Kingdom	12.7%	13.6%	13.1%	10.2%	11.4%	11.6%	13.0%	13.1%	15.0%	13.9%	12.2%	10.9%	11.9%	10.8%	10.9%	9.9%	10.7%	11.4%	10.5%	7.7%	-	-
EU-27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.4%	11.9%	11.2%	11.0%	9.1%	-
EU-28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.1%	11.9%	11.1%	10.5%	-	-

Source: own calculations, download underlying data.

Annex C. Questionnaire to tax and statistical authorities

Questionnaire.pdf

Annex D. Reviews and responses to reviews

Review of the inception report by Richard Murphy

14 February 2022

Dear Grzegorz

Study and Reports on the VAT Gap in the EU-28 Member States - TAXUD/2021/AO-07

1. Comments on Inception Report

I write further to our agreement dated 28 January 2022 which sets out the terms of agreement for the supply of these comments.

I have now read the Inception Report that you have prepared. In this letter I set out my over-arching concerns and in the attached report, which is an appendix to it, some more detailed observations.

2. Approach to these comments

I think it important that I make clear the approach that I have adopted to the comments that I make.

You are familiar with my work on EU tax gaps because you have cited my most recent publication on this issue in your report (Murphy 2019). I would also draw your attention to my most recent paper on methodological approaches to this issue, which explains my five-tier approach to tax gap appraisal (Murphy 2021). It is important to note that both now fit within an overall approach to tax system appraisal that I have developed with my colleague, Professor Andrew Baker at the University of Sheffield, where I am Professor of Accounting Practice at Sheffield University Management School (Baker and Murphy 2019). This has now been expanded within a new framework for fiscal transparency that we are creating, working with the Global Initiative for Fiscal Transparency which is funded by the World Bank and International Monetary Fund and is partnered by the Organisation for Economic Cooperation and Development (Murphy and Baker 2021).

The approach that I adopt is both qualitative and quantitative. This is particularly relevant in the context of your Inception Report. As is apparent from what follows, I have relatively little comment to make with regard to the quantitative approaches that you adopt, some details and some points with regard to the quality of data used excepted. My primary concerns relate to the contextualization of your data and the discussions within your report

concerning the development of the methodologies, the presentation and interpretation of data, and related issues.

I stress that my intention in making these comments is to be a critical friend. In my opinion the EU VAT Gap Reports have proved, since their inception, to be the most reliable measures of tax gaps likely to be produced anywhere in the world. However, thinking on tax gaps and the way in which they are of use has developed, and not only statistically during their period of production, and my intention is to suggest ways in which the value of the data produced can be enhanced by particularly focusing upon its ability to inform decision making.

3. Issues arising

I have reviewed your suggested quantitative approaches to this analysis, many of which are familiar. I provide some detailed comments in the attached appendix but consider them to be of relatively low overall significance. The more important issues that I wish to highlight are addressed in the sections that follow under this broad heading.

a. National income accounting

My biggest quantitative concern with regard to the work to be undertaken is with regard to its dependence upon national income accounting, and the potential conflicts that arise between the estimated VAT gap for each jurisdiction and the approach that jurisdictions take to accounting for fraud within their national income accounting.

I am, of course, aware that the VAT gap is estimated on the basis of the consumption measure of GDP. In principle this might suggest that there should be no conflict between this measure and any estimates for fraud included within GDP accounting for income. However, in practise it is commonplace to reconcile the three potential bases for measurement of GDP to provide assurance that a reliable estimate is produced.

I have discussed this reconciliation process with some national accounting authorities and with Eurostat. Each has confirmed that it is commonplace for such estimates of fraud in the economy to be included in the income estimate of GDP. I gather that this is usually required because the consumption basis of estimation would otherwise tend to suggest a higher overall level of GDP then the income basis does. Some of these estimates, such as those relating to trade in narcotics and within the illicit sex trade, are meant to be identified and disclosed within national accounting. I do however understand that other estimates are commonly also included to allow for there being unrecorded trading activity, whether that absence of records is intended to result in a tax loss or not. Unfortunately, no authority that I have discussed this issue with has been willing to disclose how large these estimates

might be. That does not, however, abate my concern about the dependence of the calculation that you are making upon unadjusted GDP data that is, almost certainly, influenced by these estimates of fraud. In essence, the problem is that the data that you are producing may not be independent of the data you are using to produce that information because that source data may itself include an estimate of the unrecorded income that drives the VAT gap.

It is my suggestion that this concern does, at the very least, need to be acknowledged within your work and does at the same time need to be highlighted as an issue of concern. If there are undisclosed estimates of fraudulent activity within economies included within estimates of GDP then this is decision useful information that should be made available. Extrapolation of this information would also enhance any explanation that you might be able to offer of the VAT gap that arises by jurisdiction because that estimate included within the national income accounts when multiplied by the standard rate of VAT applicable in the jurisdiction could be used as a partial explanation of the VAT gap arising.

b. Accounting by component element of the VAT gap

It is my suggestion that there are five component elements to any tax gap (Murphy 2021):

- The tax base gap
- The tax expenditure gap
- The tax evasion gap
- The tax avoidance gap
- Bad debt

Two issues arise from this approach and are addressed in the next two sections.

c. VAT bad debt

Firstly, in your report you suggest that it is not possible to breakdown the VAT gap that you calculate into its component elements. When doing so I think that you refer to the last three of these gaps i.e. you do not differentiate tax evasion, tax avoidance and bad debt. In practise I am not sure that this is appropriate.

As is apparent from the literature on tax avoidance, VAT tax avoidance is rare. Experience within countries like the United Kingdom where the disclosure of tax avoidance schemes is required by law also suggests that to be the case. The number of such schemes disclosed has also fallen over time. Therefore, it is likely, although not certain, that tax avoidance is a very small part of the overall VAT gap and that part which arises as the consequence of deliberate taxpayer action is most likely to be the consequence of tax evasion or the non-

payment of tax declared to be owing as a result of insolvency or deliberate malfeasance. The report could suggest that this is the case, using UK analysis to support this suggestion.

I have already noted, above, a way in which a part of the VAT gap relating to fraud might also be identified, and so be disclosed within your report.

I also believe that at least some disclosure with regard to bad debt should be possible. Many tax authorities do publish data, either in their own accounts or in their tax gap reports, with regard to the bad debts that they suffer as a result of the non-payment of taxes owing. Some, at least, seem to refer to this by tax. Where this data is available it would appear to be appropriate to highlight this within your report as it will, in all cases, be a partial explanation for the VAT gap arising. It is also a useful further indicator of tax authority efficiency.

The fact that information might not be available for all tax authorities should not, I suggest, be an impediment to publication of this information where it is available. The absence of data is, itself, decision useful information that needs to be reported so that pressure might be brought to bear for an improvement in the quality of that information available to decision makers on issues such as this.

Where this information is available there is an important point to add. A priori it would seem likely that the scale of VAT bad debt arising might be related to the proportion of VAT registered business entities that are limited liability corporations. It would seem worthwhile exploring this relationship to determine whether the quality of company regulation within the jurisdiction has a relationship with the level of VAT bad debt arising. A number of indices on the quality of company administration within jurisdictions are available, including in particular the Tax Justice Network's Financial Secrecy Index (the prototype iteration of which I directed, but with which I now have no association).

d. VAT base and expenditure gaps and C-efficiency

Second, what I describe as the tax base and tax expenditure gaps are combined within your work into what is described as a tax policy gap. This is then combined with what you describe as the tax compliance gap into a ratio you describe as the C-efficiency ratio. None of these seem sufficiently well explored in your work, which is important since to the lay reader this information may well be the most accessible data within your findings. I believe they all need more attention to make them more decision useful.

In particular, the tax base gap, which relates to the proportion of the theoretical VAT yield not collected arising as a consequence of the exemption of certain parts of the available base, and the tax rate gap, which represents tax expenditures willingly undertaken by the

tax jurisdiction as a consequence of policy decisions taken, both exist within an EU dictated framework of what is permissible. In the way in which the data is presented this is not readily apparent. The current data presentation implies that these are freely chosen variables when they are in fact decidedly constrained. If the data supplied is to be of greater use it would appear to be appropriate to split both the tax exemption, or base, gap and the tax expenditure, or rate, gap into component elements.

I suspect that given the data available with regard to the economies of member states it should not be difficult to estimate the potential ranges within which such gaps should exist for each individual European member state. In other words, the size of the tax base or exemption gap at its minimum, given the EU's expectations with regard to these issues could be estimated, as could that gap at the maximum possible level of exemption that might be available within available limits also be capable of estimation. A fairly similar exercise could be undertaken with regard to the tax expenditure, or rate gap, in this case applying minimum and maximum levels of rate deduction permitted within EU directives to provide the relevant measure of available range. The actual rates of both gaps could then be reported within these ranges.

It is, of course, entirely reasonable to expect that the proportions of the tax base exemptions, whether at minimum or maximum permissible rates, will vary between member states because of their different economic circumstances. This is also likely to be true with regard to tax foregone to tax expenditures, or reduced rates. The existing measures, which imply an expectation of homogeneity, are therefore misleading without this explanation being made available. The information that is really required for any country is the degree to which it has used its autonomy to minimise or maximise both exemptions and tax expenditures, then noting the overall impact upon revenue generated.

The overall ranking then resulting may be quite different to the presentation made, but will, I suggest, be significantly more useful. Firstly, the impact of the VAT on differing economies will be easier to appraise. Secondly, the reaction of different governments to VAT within their chosen tax mix will be better understood. Thirdly, the latitude for discretion with regard to these issues will be better understood. Fourthly, as a consequence, the possibility for further change can then be appraised. All of this appears to be significant decision useful information that is currently absent from the report, but which could be added with, I suspect, relatively little difficulty.

There is another particularly important to mention with regard to the tax expenditure or tax rate gap arising. I am aware that there is an EU requirement for each member state to publish annually an estimate of its tax expenditures in the form of tax reliefs and allowances provided for each major tax with explanation as to cause. I am also aware that some member states (for example, Ireland) seem to be diligent with regard to this issue, although

I have had great difficulty in tracking this data in other jurisdictions. Eurostat do not, apparently, either monitor this information, or publish it. There would, however, appear to be considerable advantage in comparing whatever data jurisdictions do publish with regards to overall VAT tax expenditures arising as a consequence of both exemptions and tax rate reductions and then comparing this published data with the estimates that you make. Doing so would provide a useful comparison of outcome against expectation, and encourage better forecasting, better control of those expenditures, and a higher degree of scrutiny of them. As noted previously, the absence of data in some jurisdictions should not be an impediment to publishing this data for the states in which it is available, but should instead be taken as an opportunity to highlight the need for this information to be made available, as is seemingly required by EU directive.

e. Net imports and exports

The analysis of overall consumption within an economy referred to in your report appears to place too little emphasis upon the significance of net imports and exports upon the economy for which the estimate is being prepared. This is despite the fact that it is noted in the 2019 report that the size of these two variables, and their composition, can have a significant impact on the C-efficiency of the jurisdiction and, by implication, to its VAT gap. The example used was that of Luxembourg.

I do, of course, understand that in principle the VAT charge on final consumption should in a theoretically ideal VAT system not be impacted by imports and exports, but the reality is that we do not have ideal VAT systems and the high levels of available exemptions, in particular, can distort the apparent levels of end consumption within the jurisdiction because of disallowable input VAT charges on exported exempt goods or services, with consequent adjustment in other states. In addition, the relative openness of the economy, and the degree to which it is exposed to VAT adjustments arising on borders, where it is known that fraud is a particular issue of concern, would seem to be a variable that needs consideration when assessing the overall level of the VAT gap arising within a jurisdiction. A measure of the potential impact of these two variables, would at a minimum, appear to be of use in improving the quality of the reporting made and should not, I suspect, be difficult given the overall level of data already available to you.

f. Alternative methodologies

I have noted the discussion within the report on alternative methodologies available for the calculation of VAT gaps, and in particular the possibility of using a bottom-up approach to calculation as an alternative to the top-down approach currently used. I caution against the use of any such approach.

Using evidence from the UK tax gap, where excluding the rate of loss on corporation tax due from smaller companies the VAT gap is almost always stated to give rise to the highest overall rate of loss, and where all tax gaps excluding that arising on VAT are calculated on bottom-up bases, I would suggest that these bottom up calculations are inherently unreliable.

There is, firstly, a problem with sample size. Within the UK, and I suspect many other jurisdictions, the number of taxpayer audits has fallen dramatically over time, most particularly with regard to VAT. I am anecdotally advised by many current and former VAT inspectors in the UK that for most VAT registered businesses the rate of audit has fallen from once every two to three years or once every 200 to 300 years. There is no evidence that the replacement desk-based audits are anything like as effective either in terms of tax recovered or in terms of deterrence as previous, on site, methods.

There is, secondly, no evidence that these audits discover all error. It would be quite exceptional if they did. Inherently the process is, therefore, flawed.

Third, there is the problem of extrapolation. To suggest that a small sample could, unless extraordinarily carefully stratified, be representative of the economy as a whole is a Herculean assumption, but even if that were to be the case, the resulting data would not reflect the level of activity undertaken in the illicit economy in any meaningful way. That activity might, for example, be very different in its nature from that undertaken within the legally recorded economy. Until the level of automatic information exchange from banks, other financial services providers, internet payment platforms and internet trading platforms reaches the levels now enjoyed (paradoxically) from supposed tax havens, and until the rates of cash usage in economies is suppressed much further than it has been to date then the likelihood of a tax authority being able to create a meaningful sample of apparently unrecorded business activity worthy of investigation for the purposes of determining the VAT gap would appear to be very low indeed. As a result any extrapolation of bottom up audit results would, almost certainly, be inherently flawed.

The existing EU VAT gap methodology does face issues with regards to data availability, and flaws within those data sets, many of which you already highlight in your report, and some of which I note above or in the attachment to this letter. Despite this it remains econometrically, in my opinion, the most reliable method for estimation of this tax gap. I would not recommend serious exploration of alternative methodologies for that reason. What I do suggest are the extensions to the existing analysis noted in this letter which would, I think, add considerably to the value in use of this data.

g. Presentation of data

The comments made in this letter have focused upon those areas where I think that the quality of decision useful information that could be extracted from the existing work without significant additional effort being expended could be maximised. My object has been to increase the transparency and usefulness of the data produced to encourage its use by all stakeholders of the VAT system, including most especially legislators and those who hold them to account. As such these comments represent my suggestions for improvements in the presentation of data, and I have nothing further to add in this regard.

4. Attached note

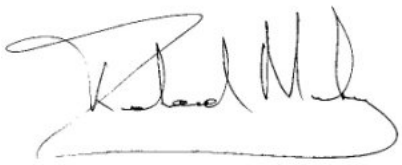
In the attached note I raise a number of additional points of detail with regard to the comments made in your report concerning data, methods or assumptions implicit within the methodology that you propose to use. These are not intended as criticisms, but in most cases raise points where clarification might be a benefit in the final report, or where I think the constraints upon the work need to be made clear if the limitations under which you are working are to be understood.

5. Conclusion

These comments are intended to assist the robustness, usefulness and ease of interpretation of the EU VAT tax gap data that you will be producing. I trust that they help in this regard. I shall be pleased to discuss them, and the comments in the attached note, with you.

Best regards

Yours sincerely



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Director, Tax Research LLP

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Appendix

Additional notes are rising as a consequence of the review of the Inception Report relating to the Study and Reports on the VAT Gap in the EU-28 Member States - TAXUD/2021/AO-07

Purpose of this note

This note refers to points arising from a review of the above Inception Report. The issues referred to are either questions with regard to clarification being required, or points where it is thought worthwhile suggesting that emphasis will be needed to ensure that the reader of this work will understand the issues that have had to be addressed in the course of its preparation.

Each note will refer to the page in which it arises and will then copy the text to which I refer, before adding my comment.

1. Page 6

Text referred to:

> *Households' consumption values, similar to other components of the use tables, are recorded in purchaser's prices, thus they require correction for the included VAT component. Moreover, the calculation requires adjustment for non-taxable consumption, in particular self-supply and imputed rents.*

Comment:

> As noted in the covering letter, estimates of consumption may be adjusted for estimates of fraud reflected in the income basis of estimation of GDP. If that is the case, this would appear to be the location for this matter to be referred to.

2. Page 7

Text referred to:

> *The small business correction (2) is estimated by multiplying the share of small companies' output in the overall output of economic operators by the gross VTTL before the adjustment.*

Comment:

> Is any comment with regard to fraudulent nonregistration required, and is any adjustment necessary?

3. Page 7

Text referred to:

> *It is worth noting that completeness of information in the ORS varies across Member States (see summary in Table 2); for some Member States specific information will be requested directly from Authorities or imputed using other, readily available information.*

Comment:

> Is a discussion on the materiality of missing information required? Is an indication of the impact that imputation might have upon confidence in the resulting estimates necessary?

4. Page 8

Text referred to:

> *As national accounts figures do not always correspond to the tax base, two corrections to the base are applied: (1) adjustments for the self-supply of food and agricultural products and (2) adjustments for the intermediate consumption of construction work due to the treatment of construction activities abroad.*

Comment:

> This adjustment is appropriate within the context of a measure of consumption but as I noted in the covering letter, that measure of GDP has to be reconciled with the income and production bases of measurement in the course of the reconciliation of national income and there are other adjustments which impact the VAT base within those reconciliations which would seem to need acknowledgement here, particularly with regard to the self-consumption of owner occupied property, but also with regard to fraud and maybe other issues.

5. Page 10

Text referred to is the table on this page.

Comment:

> Some of the missing data appears to be material, particularly with regard to Denmark. How will the missing data be addressed within the report and will an impact assessment to appraise the materiality of any consequent necessary estimates be included?

6. Page 13

Text referred to:

Structure of household final consumption does not change with respect to the preceding year.

Comment:

Given events that happened during the course of 2020 this assumption appears hard to sustain because it is known that there was a decide a change in consumption patterns. I have not considered the issue further, but I would suspect that there are indices available that might suggest the consequences of this for the calculations being made. The assumption appears to be too material to not be tested.

7. Page 13

Text referred to:

In the vast majority of cases where there are no significant changes in the statutory rates, net adjustments and intermediate consumption liability will be rescaled from the preceding year using growth rates for the entire tax base (EC, 2020).

Comment:

Evidence from the UK, at least, suggests a substantial growth in fraud during the course of the coronavirus pandemic lockdown periods. I suspect that this was commonplace. In that case is this assumption sustainable or should allowance for this, based upon evidence of changes in fraudulent activity resulting in increased nonrecording of activity within the economy, be taken into consideration?

8. Page 14

Text referred to is the chart at the top pf the page on fast estimates.

Comment:

This chart appears to confirm the existence of significant data issues in countries such as Spain, Sweden, Malta and Cyprus, some of which have been acknowledged in previous reports, and others of which I have discussed with some relevant authorities. The flipping from negative to positive rates of difference would appear to suggest this, excepting the case of Luxembourg, where I think other factors come into play. How are these issues to be addressed in the report because they appear to be significant?

9. Page 16

Text referred to:

The methodology of estimating Policy Gaps and its components will follow the formula presented in the previous updates of the VAT Gap Study:

$$Policy\ Gap\ = \frac{Notional\ Ideal\ Revenue\ -\ VTTL}{Notional\ Ideal\ Revenue}$$

where the Notional Ideal Revenue stands for the revenue levied at a uniform rate in the *where the Notional Ideal Revenue stands for the revenue levied at a uniform rate in the environment of perfect tax compliance.*

Comment:

There is an implicit assumption here that we know the level of national income but that is not the case if estimates of fraud are incomplete and are, despite that fact reconciled with measures of consumption, as I have noted in my covering letter. As such, should this issue be emphasised here to explain that there is a limitation upon this calculation if that level of fraud included in estimates of national income is not known?

10. Page 18

Text referred to:

$$E^C = \frac{VR}{tC}$$

Comment:

I could not find a defintion of E^c in the text.

11. Page 19

Text referred to:

The Study Team suggests to not include the estimate of the Policy Gap from earlier studies. As older vintages contained figures for specific years only, the backcasting procedure used for recalling the VAT Gap, could not be applied for the Policy Gap. As a result, it is not possible to account for the revisions in the VTTL introduced over the years due to changes in the methodology and information sources.

Comment:

I am not sure that the approach of exclusion is very helpful to the user. I think it more useful to include the data but with explanation as to the nature of the discontinuity over time making comparison something to be undertaken with considerable care.

12. Page 20

Text referred to is the table on this page.

Comment:

There appears to be no measure here of the number of VAT registered entities within the jurisdiction, perhaps in proportion to its population. This appears to be an omission, since the relative density of registered entities within the population as a whole would appear to

be, prima facie, a factor in explaining the likely VAT gap. I have already noted in my covering letter that the proportion of these registered entities that might be limited liability corporations is also a factor that might be taken into account.

Remaining issues of concern that arose during the course of my review are referred to in my covering letter.

Review of the inception report by Danuše Nerudová

The review of suggested methodology in inception report

In the CASE case studies (2015-2018) based on which is planned the new VAT gap investigation, the VAT gap is determined as the difference between theoretical tax liability and the actual revenues collected. The data are gained from Eurostat/ORS or the MS itselfs and as the research of the team shows, in some MS the data are limited. According the report, the study of VAT gap will be based on the calculation of the VAT theoretical tax liability (VTTL) by top-down approach. The top-down consumption-side method for calculating the VAT gap applies the VAT rates from each MS countries to six main determinants of VAT revenues: final consumption of households; final consumption of governments; final consumption of nonprofit institutions serving households (NPISH); intermediate consumption; gross fixed capital formation (GFCF); and country-specific adjust-ments such as rebates, reductions, and VAT exemptions. Looking on this method from the taxation theory point of view, the main criticism of this approach lies in the fact that for the calculation of the VTTL by a top-down method based on national account data requires some degree of approximation. One example of the limitation of the methodology can be the large differences between the results in the CASE studies 2017 and 2018 the results of HRMC VAT tax gap estimate for 2017 and 2018.

The solution of the limitations of top-down approach or an alternative how to reach more precise estimation of VAT gap could be a stochastic tax frontier model. It is very robust and can estimate the level pf VAT inefficiency and also the impact of the main determinants on VAT gap in one step.

The stochastic tax frontier model can use for the empirical analysis the data which are employed in CASE studies (panel data for EU MS based on yearly observations). On top of it the model also employees the exogenous variables, which are assumed to influence the inefficiency of VAT revenues, as for example the Corruption Perception Index and the shadow economy to GDP ratio and other indicators. Taking into account a comparative advantage, contrary to top-down approach, stochastic tax frontier model provides more options for determining VAT gap and for investigating the main determinants of inefficiency related to VAT revenues. Moreover, the model allows the user to disentangle country heterogeneity, time-varying inefficiency and country-specific or persistent inefficiency. Separation between time-varying and persistent inefficiency has different policy implications and could therefore be addressed from different perspectives. While time-varying inefficiency is caused by exogenous factors that are not necessarily country-specific and occur randomly, persistent inefficiency is country-specific and depends on particular issues that can be addressed by appropriate policy measures.

To sum up, the estimates of stochastic tax frontier model are more relevant to policy than those of the top-down method. STFM model generates impact estimations of other external

factors on the VAT inefficiency term that are not included in the input set of variables. Application of this model would enable MS to identify the measures necessary to increase the VAT efficiency and reduce the VAT gap. The stochastic tax frontier model would allow to estimate the effect of exogenous factors on the technical inefficiency of the Value Added Tax and propose appropriate policy recommendations, i.e. its application enables the formulation of more targeted regulations to increase VAT efficiency collection. Therefore I do suggest, to employ also STFM.

Therefore I do suggest to enlarge the variants by variant H which would cover top-down consumption –side method for EU MS plus STFM model.

Review of the draft final report by Richard Murphy

1 September 2022

Dear Grzegorz

VAT gap in the EU - 2022 Draft Final Report

1. Comments on Draft Final Report

I write further to our agreement dated 28 January 2022 which sets out the terms of agreement for the supply of these comments.

I have not revisited issues referred to in my comments submitted on the Inception Report.

2. Approach to these comments

I think it important that I make clear the approach that I have adopted to the comments that I make.

As I noted in February when commenting on the Inception Report, I am aware that you are familiar with my work on EU tax gaps because you have cited my most recent publication on this issue in your report (Murphy 2019). I would also draw your attention to my most recent paper on methodological approaches to this issue, which explains my five-tier approach to tax gap appraisal (Murphy 2021). It is important to note that both now fit within an overall approach to tax system appraisal that I have developed with my colleague, Professor Andrew Baker at the University of Sheffield, where I am Professor of Accounting Practice at Sheffield University Management School (Baker and Murphy 2019). This has now been expanded within a new framework for fiscal transparency that we are creating, working with the Global Initiative for Fiscal Transparency which is funded by the World Bank and International Monetary Fund and is partnered by the Organisation for Economic Cooperation and Development (Murphy and Baker 2021). That framework has now been published after extensive peer review and consultations with Treasuries, tax authorities and others. I attach a copy of the resulting Principles for Tax Transparency as I will be referring to them amongst the approaches to alternative methodologies for use in future EU VAT gap appraisals to which I refer below.

As was the case when looking at the Inception Report, my primary concerns relate to the contextualization of your data and the discussions within your report concerning the development of the methodologies, the presentation and interpretation of data, and related issues.

I stress that my intention in making these comments is to be a critical friend. In my opinion the EU VAT Gap Reports have proved, since their inception, to be the most reliable measures of tax gaps likely to be produced anywhere in the world. However, thinking on tax gaps and the way in which they are of use has developed, and not only statistically during their period of production, and my intention is to suggest ways in which the value of the data produced can be enhanced by particularly focusing upon its ability to inform decision making, most especially as a new iteration of this work now appears to be inevitable.

3. Issues arising

I have reviewed your quantitative approaches to this analysis, many of which are familiar. Excepting comments on the new econometric analysis that you include in the report I have no significant comments to make on the data or methodologies included in the report that would not repeat those I made on the Inception Report. The more important issues that I wish to highlight are addressed in the sections that follow:

a. The report's introduction

The report's summary fails to highlight the substantial impact of Covid on the VAT gap during the period being reported upon and is in my opinion potentially misleading as a result. In my opinion, it needs significant redrafting to make clear the impact of this issue, which is only apparent to those willing to read the report as a whole at present. This is especially true in the paragraph that begins:

> *One of the main findings of this report is that in 2020 the VAT compliance gap in the EU27 dropped sharply year-over-year.*

The matters referred to in part VI of the report do not have sufficient attention drawn to them in the comments that follow. In particular, the important observations in the final paragraph before the conclusions on page 109 do, in my opinion, need to be highlighted in the summary to the report because of all the observations in the report these seem amongst the most important.

I also note that on page 99 of the report it is said that:

> *This strong and comparable to other years effect clearly shows that 2020 was unique and goes beyond any patterns observed in earlier series of the VAT compliance gap.*

This is, again, not appropriately emphasised in the report's summary, which is the cause of my concern since most readers are, unfortunately, only going to read that section.

b. The use of language in the report

Some of the language used in the report is in my opinion inappropriate, particularly when it relates to the VAT policy gap. The suggestion used in the report (e.g. page 19) that there is an ideal VAT system that countries do not use is, I think, pejorative language that is inappropriate: if all the democratic governments of Europe choose not to use this supposed 'ideal' system then it is safe to assume that this system is not ideal, and so this language and anything equivalent to it should not be used in my opinion.

c. New econometric analysis

The new econometric analyses provided in this report and not in previous versions is problematic. If, as the report itself confirms, the data produced annually is unable to explain the types of abuse that contribute to the VAT gap it is an ambitious claim to suggest that analysing five years of that same data using a reduced collection of variables can then provide a useful econometric explanation of other causes of this gap. This claim might be true, and I have read the section referring to this analysis with care, but having done so think it would be appropriate to highlight the experimental nature of this analysis to provide due warning to those seeking to rely upon it. In my opinion the experimental nature of this data might also make it more appropriate for inclusion in an appendix to the report, most especially as it is unlikely to be repeated in future reports.

d. Issues needing to be addressed

In the sense that this is a valedictory report as it is the last that can be prepared using the current methodology it would, I think, have been appropriate to refer in this report to a number of issues that are not discussed. In particular, there is no appraisal of the overall success of this methodology despite it having been in use for a number of years now. This would not refer to the data but would instead refer to the impact that the report has had in closing the VAT gap. I think a summary and discussion of the following might have been appropriate:

i. The recommendations for action made in the reports prepared using this methodology over the period that this approach has been in use;
ii. The response of member states to those recommendations;
iii. The estimated improvement in tax gaps that might have arisen as a result.

In my opinion such a discussion is important as the precursor for discussion of methodologies to be used relating to this issue in the future, which discussion does not appear to be informed by an analysis of this type at present.

e. Alternative methodologies

The discussion of alternative methodologies included in the report is very narrowly focussed. The implicit assumption is that the existing econometric approach to the study of this issue should be the basis for its perpetuation. It is certainly not my role to argue against the importance of econometric analysis. However when it is apparent that there will be significant issues arising with regard to the availability of suitable data on which it undertake future analysis of this sort I suggest that this is the moment to consider alternative or additional approaches that might contribute to the future developments of this issue. I suggest a number of approaches:

i. A more comprehensive review of the tax gap methodologies of those states undertaking such analyses would appear to be of use. When a significant number are now moving in this direction, with varying experiences and lessons to learn, the development of a rigorous appraisal technique to form the basis of development of comparison of results both in those states that are undertaking tax gap analyses and those that have not embraced this issue as yet would seem to be important.

ii. New methods of in-state appraisal that might also be used as the basis for intra-state comparison need to be developed. The newly published GIFT Principles for Tax Transparency (about which I declare my interest) is one basis for developing such an in-state and intra-state comparison on a normative basis that would recreate, for example, elements of the well-established OECD peer review process of tax system appraisal.

iii. An alternative basis for appraisal would be to undertake in-state and intra-state tax spillover analyses (and again, I declare my interests). The objective of such analysis is to understand the way in which the tax systems of a jurisdiction are undermined by contradictions, conflicts and a lack of resources within the tax system (as broadly defined) of a jurisdiction and between that system and the tax systems of other jurisdictions.

In each of these cases the objective is to create a systemised, normative appraisal mechanism that might be consistently applied as a basis for comparison and analysis within and between states. Importantly, both the second and third processes are intended to create programmes for recommended change as a direct result of the work undertaken.

It is my suggestion that alternatives of these sort should be referred to in the report to indicate that there are broader bases for tackling this appraisal going forward. In addition, I suggest that before any new methodology is adopted a review of the success of the

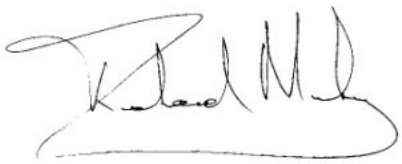
existing methodology in effecting change in behaviour should be undertaken and that this be compared with the alternatives methods that I note.

4. Conclusion

These comments are intended to assist the robustness, usefulness and ease of interpretation of the EU VAT tax gap data that you will be producing. I trust that they help in this regard. I shall be pleased to discuss them with you.

Best regards

Yours sincerely



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Review of the draft final report by Danuše Nerudová

VAT gap in the EU – evaluation of final study

The study measuring the VAT gap in the European Union represents already tenth study on this topic, covering the period of 2016-2020. The first study established the methodological approach, which is consistently used since that time. It represents the advantage for the comparability of the results, for due to this, there is quite long time series available. However, I consider as very valuable that the research team developed the methodological approach further and introduced some improvements, which contributes to the more accurate results. As the researched period also covers the time of COVID19 pandemic period, the VAT gap was affected by the long period of lockdowns and connected measurements introduced in the EU Member States. Therefore, I do welcome covering observing of the relationship between the VAT compliance gap and its covariates in a new economic environment in the chapter VI. A valuable part also represents estimates using a simplified methodology (so called fast estimates) for the year immediately preceding the publication date. All these improvements are helping policy makers to understand how their tax policy should be better formulated in order to close the VAT gap.

PART II aimed at the evaluation of possible methodological approaches in the future represents a very important part of the study. It covers not only the description of the methods, but also their evaluation from different perspectives. Moreover, it also covers the review of methodological approaches applied by EU Member States. Even though I fully understand the human and finance limitation of Member States in application of the methodological approaches, I think that the ambition of the future study might be to come up with non-traditional methods in order to increase the usefulness of the results for the tax policy makers.

To sum up, there are remarkable methodological improvements since the tenth edition of the study. This study is fully complex, taking into account the specificities of COVID19 economics and it provides the suggestion of methodological improving of future research studies.

Author's response to comments by external reviewers

The study team acknowledges and thanks the reviewers for their valuable comments and observations that helped improve the quality of the presentation of findings. In cases when the comments went beyond the scope of this study (as envisaged by the Terms of Reference), we believe that the reviewers' suggestions shall be considered in future *VAT gap in the EU* studies or other complementary analyses. Responses to the main comments are presented in Table 88.

Table 88: Response to comments

Comment	Authors' response
Response to the review of the Inception Report by Richard Murphy	
Comment 1 (Concerns with regard to the dependence of estimates upon national income accounting and the potential conflicts that arise between the estimated VAT gap for each jurisdiction and the approach that jurisdictions take to account for fraud within their national income accounting)	As noted by the Reviewer, the top-down method used by the *VAT gap in the EU* study hinges on underlying national income accounts, respective conventions, and quality. We keep in mind that there are unavoidable inaccuracies related to the underlying data. Yet, the methodological approach taken by the Statistical Authorities, in that, the strict rules of the ESA 10 as well as the parallel use and triangulation of at least two out of the three approaches – production, expenditure, income-side – to the compilation of national accounts minimises this error. Importantly, nearly all Member States use an expenditure-side approach as one of the methods to compile national accounts. Thus, the impact of fraud on the accuracy of final consumption estimates, the main components of the tax base, is relatively low. Due to difficulties related to estimating the size of the underground economy and the relatively low contribution of the unobserved economy assumed by some statistical agencies, we believe that the potential underestimation of consumption due to the inability to control for the underground economy has a larger impact on the estimates than the overestimation due to fraud. The study team has ensured that these issues are properly acknowledged in the final report.
Comment 2 (Applying the convention of the VAT gap split into: 1) tax base gap, 2) tax expenditure gap, 3) tax evasion gap, 4) tax avoidance gap, and 5) bad debt gap)	The policy gap and the compliance gap could theoretically be decomposed further and there are alternative dimensions of such decompositions. Yet, the top-down approach employed in the study would not allow for such a decomposition. In our view, the proposed decomposition of the compliance gap (tax evasion gap, tax avoidance gap, bad debt) may not grasp the entire spectrum of the problem and there might be some overlap between the components (e.g., bad debt and evasion). As an example, there is no component that would grasp errors and omissions (parts of non-compliance) or fraud (e.g., foregone revenue from the large-scale smuggling of excise goods). As obliged by the Terms of Reference of this study, the study team will maintain the current division of the gap.

Comment	Authors' response
	The feasibility and practicality of the proposed decomposition shall be taken into account when designing the future updates of the study.
Comment 3 (possibility of estimating bad debt gap and suspicion that the avoidance gap is low)	We are of the opinion that the assumption that the avoidance gap is low could be not true for many jurisdictions. There are, among others, frequent cases of misalignment or rates that could be considered as part of tax avoidance. The study team does not have access to information that would allow for a decomposition of the compliance gap. Regarding the bad debt gap, most administrations use actual revenue data (cash flow rather than assessment) to compile yearly revenue figures in the ESA 2010 standard. For the vast majority of Member States, the tax unlikely to be collected (Eurostat's code D995) is not readily available. Apart from technical difficulties regarding its estimation, in our view, decomposing the "bad debt gap" might be of a somewhat limited use as it will contain, for instance, both "natural" bankruptcies but also missing trader fraud.
Comment 4 (decomposition of the policy gap and C-efficiency, limited usefulness of both measures)	A full decomposition of the tax base and expenditure gap is a very time-consuming exercise well beyond the capacity of this project. As mentioned by the Reviewer, Member States often conduct their own work or take advantage of technical assistance projects that tackle the issue of tax expenditure monitoring. To estimate tax expenditure, the study team would need to set 27 benchmarks for each country (as there could not be a single benchmark for all countries). We concur with the limitation of the policy gap measure. The estimates of the "actionable policy gap" were included in the study to address these limitations. They intend to proxy tax expenditures, as a complete estimation of the tax expenditure gap cannot be covered.
Comment 5 (net imports and exports and their impact on estimates)	The estimates of the compliance gap (under the intermediate consumption component) fully take into account the VAT accrued at the intermediate level (regardless of if it is exported or not). The openness to trade is, in our view, not a component of the gap *per se*, but its determinant. Thus, such a variable was among the list of determinants employed in the econometric study. Wherever possible and when data is available, we adjust the estimates of the VTTL for legitimate cross-border trade. Illegitimate trade shall not be accounted for as it is a component of non-compliance (it may have both a positive and negative impact depending on the direction of such flows).

Comment	Authors' response
Response to the review of the Inception Report by Danuše Nerudová	
Comment 1 (degree of approximation involved in top-down approaches)	To the Study team's knowledge, there is no method of VAT gap/VTTL calculation that would not require any degree of approximation. In the vast majority of cases, our estimates proved to be in line with the estimates derived by the tax authorities using similar approaches. Estonia, Hungary, Italy, Poland, and Slovenia are a few examples of Member States where the difference between alternative estimates was below 1 pp. The difference between our and the HMRC's estimates (approximately 3 pp) results predominantly from a different definition of tax base. The estimates of the nominal foregone revenue are relatively closer.
Comment 2 (use of the stochastic frontier method)	In our view, using the stochastic frontier method will likely not solve the issue of slightly varying estimates. The method proposed by the reviewer is based on top-down estimates of the VTTL (see Nerudova, 2019, using the estimates of the VTTL shared with the authors of the article by the Study team). In other words, without the VTTL estimated in a consistent manner across time and countries, the method proposed by the reviewer cannot be operationalised. The main assumption for the proposed method (or rather correction to the estimates of the VTTL) is that there is an error in the estimates of the VTTL that could be corrected using econometric models and by imposing restrictions to the distribution of the error term. Then, the accuracy of the method rests on the ability to explain the variation of the VAT compliance gap in time using basic determinants, the assumption that inaccuracies in the VTTL estimates are a "white noise", and that there is a "persistent gap" that cannot be affected even in the long term. In our view, none of these conditions/assumptions are met: 1) As the econometric study shows, changes in the gap could only be explained to a limited extent even with a very broad list of explanatory variables (controlling for fixed effects for time and countries) and thus the method is likely insufficiently robust; 2) The estimates of the VAT gap are more prone to an error in the magnitude rather than year-to-year change; 3) Large changes in the VAT gap observed in recent years in countries like Hungary prove that the assumption of persistent gaps might be dangerous. In the case of Hungary, the estimates (Nerudová, 2019) point to a "persistent gap" of around 20%, whereas the VAT gap

Comment	Authors' response
	estimated both by CASE and the Hungarian authorities is currently around 8%.
Response to the review of the draft Final Report by Richard Murphy	
Comment 1 (the report's summary fails to highlight the substantial impact of Covid on the VAT gap)	The introduction included in the Draft Final Report contained a paragraph describing the impacts of the COVID-19 pandemic. In the Final Report, we extended both the analysis and the description of its results in the introduction.
Comment 2 (the use of language in the notion of "notional ideal revenue")	The notions used in the Report are in line with earlier studies, in that Keen (2013) used the concept of notional ideal revenue. To make sure the wording of this concept is not misleading, the study team included additional explanations
Comment 3 (low proportion of VAT gap variability in 2020 explained by the econometric model)	We concur with the comment that an ideal model should also be able to explain the variability of the endogenous variables in extraordinary times. We extended the analysis of the COVID-19 impacts by scrutinising the correlation between the mediating factors and the VAT compliance gap. The analysis proved that the observed variables could only explain to a limited extent what drove the shifts in the VAT compliance gaps in 2020. This, in the Authors' view, proved that there are country and year specific factors in 2020 that were largely unobserved.
Comment 4 (necessity of analysing the impact of past studies on reducing the gap)	In the Study team's view, the impact of the *VAT gap in the EU* study cannot be quantified as its magnitude cannot be distinguished from other factors that affected the gap in all Member States (included as time effects in the econometric model). This impact could only be assessed qualitatively, and this task is beyond the scope of this study.
Comment 5 (broader analysis of alternative methodologies including a more complex appraisal of tax systems)	We concur with the opinion that tax systems should be assessed in a complex manner going beyond the quantification of foregone revenue due to non-compliance and policy decisions. Yet, the assessment of broader appraisal methods was beyond the scope of this Study as described by the terms of reference.
Response to the review of the draft Final Report by Danuše Nerudová	
Comment 1 (inclusion of non-traditional methodologies in subsequent studies)	The Study team concurs with this recommendation. The development of non-traditional methodologies and data availability may create an opportunity in the future for the use of methods that are not employed for estimating the gaps by Member States' administrations today.

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