CASE Reports

Study and Reports on the VAT Gap in the EU-28 Member States: 2020 Final Report

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List of Acronyms and Abbreviations

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 (EC) 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**
EU-28	**Member States of the European Union, UK inclusive**
FE	**Fixed Effects**
GDP	**Gross Domestic Product**
GFCF	**Gross Fixed Capital Formation**
IC	**Intermediate Consumption**
MFI	**Monetary Financial Institution**
MOSS	**Mini One Stop Shop**
MTIC	**Missing Trader Intra-Community**
NAC	**National Currency**
NPISH	**Non-Profit Institutions Serving Households**
OECD	**Organisation for Economic Cooperation and Development**
ORS	**Own Resource Submissions**
o/w	**of which**
pp.	**percentage points**
SUT	**Supply and Use Tables**
TAXUD	**Taxation and Customs Union Directorate-General of the European Commission**
VAT	**Value Added Tax**
VTTL	**VAT Total Tax Liability**

Executive Summary

This Report has been written for the European Commission, DG TAXUD, for the project TAXUD/2019/AO-14, "Study and Reports on the VAT Gap in the EU-28 Member States", and is a follow-up to the seven reports published between 2013 and 2019.

This Study contains Value Added Tax (VAT) Gap estimates for 2018, fast estimates using a simplified methodology for 2019, the year immediately preceding the analysis, and includes revised estimates for 2014–2017. It also includes the updated and extended results of the econometric analysis of VAT Gap determinants initiated and initially reported in the 2018 Report (Poniatowski et al., 2018). As a novelty, the econometric analysis to forecast potential impacts of the coronavirus crisis and resulting recession on the evolution of the VAT Gap in 2020 is reported.

In 2018, most European Union (EU) Member States (MS) saw a slight decrease in the pace of gross domestic product (GDP) growth, but the economic conditions for increasing tax compliance remained favourable. We estimate that the VAT total tax liability (VTTL) in 2018 increased by 3.6 percent whereas VAT revenue increased by 4.2 percent, leading to a decline in the VAT Gap in both relative and nominal terms. In relative terms, the EU-wide Gap dropped to 11 percent and EUR 140 billion. Fast estimates show that the VAT Gap will likely continue to decline in 2019.

Of the EU-28, the smallest Gaps were observed in Sweden (0.7 percent), Croatia (3.5 percent), and Finland (3.6 percent), the largest – in Romania (33.8 percent), Greece (30.1 percent), and Lithuania (25.9 percent). Overall, half of the EU-28 MS recorded a Gap above 9.2 percent. In nominal terms, the largest Gaps were recorded in Italy (EUR 35.4 billion), the United Kingdom (EUR 23.5 billion), and Germany (EUR 22 billion).

The Policy Gap and its components remained stable. For the EU overall, the average Policy Gap level was 44.24 percent. Of this, in 2018, 10.07 percentage points were due to the application of various reduced and super-reduced rates (the Rate Gap) and 34.17 were due to the application of exemptions without the right to deduct.

The results of the econometric analysis show that the VAT Gap is influenced by a group of factors relating to the current economic conditions, institutional environment, and economic structure as well as to the measures and actions of tax administrations.

Out of a broad set of tested variables, GDP growth and general government balance appeared to explain a substantial set of VAT Gap variation across time and countries. Within the control of tax administrations, share of IT expenditure proved to have the highest statistical significance in explaining the size of the VAT Gap. In addition, the VAT Gap appeared to be inter-related with the values of risky imports of goods, indicating the role of fraud in driving the overall share of the VAT Gap.

Since the COVID-19 recession will likely have a dire impact on the EU economies, the VAT Gap in 2020 is forecasted to increase. If the EU economy contracts by 7.4 percent in 2020 and the general government deficit jumps as forecasted in the Spring Forecast of the European Commission, the Gap could increase by 4.1 percentage points year-over year up to 13.7 percent and EUR 164 billion in 2020. The hike in 2020 could be more pronounced than the gradual decrease of the Gap observed over the three preceding years. Moreover, a return to the VAT Gap levels observed in 2018 and 2019 will take time and require significant action from tax administrations.

Introduction

This Report presents the findings of the 2020 "Study to quantify the VAT Gap in the EU Member States", which is the seventh publication following the original Study conducted by Barbone et al. in 2013[1].

We present Value Added Tax (VAT) Gap estimates for 2018, fast estimates using a simplified methodology for 2019, the year immediately preceding the analysis, and include revised estimates for 2014–2017[2]. We also include updated and extended results of the econometric analysis of VAT Gap determinants initiated and initially reported in the 2018 Report (Poniatowski et al., 2018). As a novelty, we operationalise the econometric analysis to forecast potential impacts of the coronavirus crisis and resulting recession on the evolution of the VAT Gap in 2020 and 2021.

The VAT Gap, which is addressed in detail by this Report shall be understood as the Compliance Gap. It is the difference between the expected and actual VAT revenues and represents more than just fraud and evasion and their associated policy measures. The VAT Gap also covers VAT lost due to, for example, insolvencies, bankruptcies, administrative errors, and legal tax optimisation. It is defined as the difference between the amount of VAT collected and the VAT Total Tax Liability (VTTL) – namely, the tax liability according to tax law. The VAT Gap can be expressed in absolute or relative terms, commonly as a ratio of the VTTL or gross domestic product (GDP). In this Report, we refer to the VAT Gap as the ratio of the VTTL.

In addition to the analysis of the Compliance Gap, this Report also updates the Policy Gap estimates from 2018 as well as the contribution that reduced rates and exemptions made to these theoretical VAT revenue losses.

The structure of this Report builds on the previous publications. Chapter 1 presents the main economic and policy factors that affected European Union (EU) Member States (MS) during the course of 2018. It also includes a decomposition of the change in VAT

1 The first study of the VAT Gap in the EU was conducted by Reckon (2009); however, due to differences in methodology, it cannot be directly compared to these latter studies.

2 The estimates for 2019 are referred to as "fast" since they use different method described in Section d in Annex A and could be associated with larger estimation error.

revenues. The overall results are presented and briefly described in Chapter 2. Chapter 3 provides detailed results and outlines trends for individual countries coupled with analytical insights. In Chapter 4, we examine the Policy Gap and the contribution that VAT reduced rates and exemptions have made to this Gap. Chapter 5 is devoted to the econometric analysis. It provides an overview of the literature, highlights the most important novelties introduced with this update, and discusses and visualises the results which are complemented by a robustness check. The final chapter presents the impact of the coronavirus recession on the evolution of the VAT Gap. Annex A contains the methodological considerations underlying all components of the analysis. Annex B provides statistical data and a set of comparative tables, whereas Annex C provides additional graphs.

1. Background: Economic and Policy Context in 2018

a. Economic Conditions in the EU during 2018

In 2018, most EU MS saw a moderate decrease in the pace of GDP growth. Overall, growth of the EU economy fell from 2.5 percent in 2017 down to 2.0 percent in 2018 in real terms. Positive economic tailwinds provided particularly good conditions for an increase in VAT collections in Ireland (GDP growth of 8.2 percent), Poland (5.3 percent), and Hungary (5.1 percent). The lowest GDP growth rates were observed in Italy (0.8 percent) and the United Kingdom (1.5 percent).

In nominal terms, GDP increased by 3.3 percent and consumer prices by 1.9 percent. Final consumption, which is the core of the VAT base (68 percent of the VTTL in 2018), ncreased by 3.1 percent in total. Investment in gross fixed capital formation (GFCF, which made up 14 percent of the VTTL in 2018) increased by 4.2 percentage points for the entire EU.

The change in GFCF was volatile across countries and varied from −18.7 percent in Ireland to 24.4 percent in Hungary. Due to the volatility and frequent revisions of GFCF figures by Statistical Offices, GFCF is the main source of VAT Gap revisions. Whenever new information on the actual investment figures of exempt sectors becomes available, the estimates of VAT Gap are revised backwards.

General government budgets and the labour markets remained relatively sound. The average general government balance amounted to −0.7 percent with half of EU MS observing a nominal surplus. The unemployment rate fell in nearly all EU MS and by −0.9 percent on average.

Table 1.1. Real and Nominal Growth in the EU-28 in 2018 (in national currencies [NAC])

Member State	Real GDP Growth (%)	General Government Balance (%)	Change in Unemployment Rate (pp)	Nominal Growth (%)		
				GDP	Final Consumption	GFCF
Belgium	1.5	−0.8	−1.1	3.0	3.3	6.2
Bulgaria	3.1	2.0	−1.0	7.2	7.7	9.7
Czechia	2.8	0.9	−0.7	5.5	6.6	9.1
Denmark	2.4	0.7	−0.7	3.3	3.0	7.3
Germany	1.5	1.9	−0.4	3.1	2.9	6.3
Estonia	4.8	−0.6	−0.4	9.5	8.1	5.3
Ireland	8.2	0.1	−0.9	9.1	6.0	−18.7
Greece	1.9	1.0	−2.2	2.5	0.9	−12.0
Spain	2.4	−2.5	−1.9	3.5	3.4	7.7
France	1.8	−2.3	−0.4	2.8	2.2	4.6
Croatia	2.7	0.2	−2.7	4.5	4.5	4.7
Italy	0.8	−2.2	−0.6	1.7	2.0	3.8
Cyprus	4.1	−3.7	−2.7	5.5	5.0	−4.5
Latvia	4.3	−0.8	−1.3	8.4	7.3	18.0
Lithuania	3.6	0.6	−0.9	7.1	6.8	10.1
Luxembourg	3.1	3.1	0.1	5.7	6.1	−5.3
Hungary	5.1	−2.1	−0.5	9.9	7.6	24.4
Malta	7.3	1.9	−0.3	9.5	10.2	0.8
Netherlands	2.4	1.4	−1.1	4.9	4.6	6.3
Austria	2.4	0.2	−0.6	4.2	3.3	6.0
Poland	5.3	−0.2	−1.0	6.6	6.4	10.8
Portugal	2.6	−0.4	−1.9	4.3	3.9	9.0
Romania	4.4	−2.9	−0.7	11.0	13.2	3.9
Slovenia	4.1	0.7	−1.5	6.4	5.4	11.4
Slovakia	3.9	−1.0	−1.6	6.0	6.0	4.9
Finland	1.5	−0.9	−1.2	3.4	3.1	6.6
Sweden	2.0	0.8	−0.3	4.4	4.4	4.6
United Kingdom	1.3	−2.2	−0.3	3.5	3.8	1.6
EU-28 (EUR)	**2.0**	**−0.7**	**−0.9**	**3.3**	**3.1**	**4.2**

Source: Eurostat.

b. VAT Regime Changes

2018 was another stable year in terms of both EU-wide and country-specific changes affecting the VTTL.

The temporary measure of the Mini One Stop Shop (MOSS) retention fee, which is the revenue retained in the country of origin of service providers obliged to pay VAT in the country of residence of their customers, was maintained in 2018 at the level of 15 percent. For this reason, the rule for estimating the VTTL of electronic services remained unchanged.

As for country-specific changes, only one MS implemented significant changes to the structure of its VAT rates in 2018. As of January 2018, Latvia introduced a super-reduced rate of 5 percent applicable to a range of common vegetables and fruits. There were also a few examples of the reclassification of rates applicable to certain products. Among those, Lithuania applied a reduced rate of 9 percent on accommodation services (down from 21 percent). Similarly, starting from November, Romania applied a reduced rate of 5 percent to accommodation, restaurants, and catering services. In Hungary, the rate applicable to Internet access services was reduced from 18 percent to 5 percent.

Overall, the average effective rate remained unchanged compared to 2017 and accounted for 12 percent[3].

3 Changes in the effective rat compared to the 2017 Report also result from the revision of the VTTL estimates and the statistical data underlying the estimates.

Table 1.2. VAT Rate Structure as of 31 December 2017 and Changes during 2018 (%)

Member State	Standard Rate (SR)	Reduced Rate(s) (RR)	Super–Reduced Rate	Parking Rate	Changes during 2018	Effective Rate [4]
Belgium	21	6 / 12	–	12		10.1
Bulgaria	20	9	–	–		14.0
Czechia	21	10 / 15		–		12.6
Denmark	25	–	–	–		14.9
Germany	19	7	–	–		10.6
Estonia	20	9	–	–		12.9
Ireland	23	9 / 13.5	4.8	13.5		12.3
Greece	24	6 / 13	–	–		13.1
Spain	21	10	4	–		8.8
France	19.6	5.5 / 10	2.1	–		9.6
Croatia	25	5 / 13	–	–		16.4
Italy	22	10	4 / 5	–		10.2
Cyprus	19	5 / 9	–	–		10.5
Latvia	21	12	5	–	Super–Reduced Rate introduced (5%)	11.8
Lithuania	21	5 / 9	–	–		13.6
Luxembourg	17	8	3	14		12.2
Hungary	27	5 / 18	–	–		14.8
Malta	18	5 / 7	–	–		12.1
Netherlands	21	6	–	–		10.0
Austria	20	10 / 13	–	12		11.3
Poland	23	5 / 8	–	–		12.1
Portugal	23	6 / 13	–	13		11.5
Romania	20	5 / 9	–	–		12.1
Slovenia	22	9.5	–	–		11.8
Slovakia	20	10	–	–		11.6
Finland	24	10 / 14	–	–		12.2
Sweden	25	6 / 12	–	–		13.4
United Kingdom	20	5	–	–		9.6

Source: TAXUD, VAT Rates Applied in the Member States of the European Union: Situation of 1st January 2018.

4 The effective rate is the ratio of the VTTL and the tax base. See methodological considerations in Section c in Annex A.

c. Sources of Change in VAT Revenue Components

The value of the actual VAT revenue can be decomposed into components, which is helpful in understanding the underlying sources of its evolution. Since revenue is a product of the VTTL and the compliance ratio[5], VAT collection could be expressed as:

Actual Revenue = VTTL × Compliance Ratio,

where Compliance Ratio is: 1 – VAT Gap (%).

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

Actual Revenue = Net Base × Effective Rate × Compliance Ratio,

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 actually collected.

Table 1.3 and Figure 1.1 present the decomposition of the total changes in nominal VAT revenues into these three components: change in net taxable base, change in the effective rate applied to the base, and change in the compliance ratio.

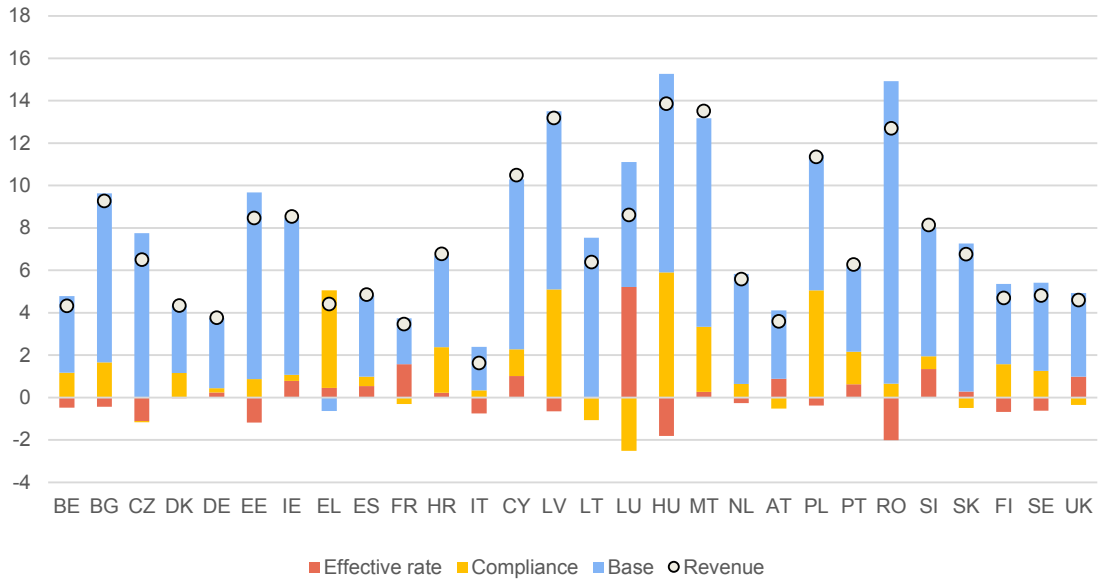
5 In other words, VAT collection efficiency.

Table 1.3. Change in VAT Revenue Components (2018 over 2017)

Member State	Change in Revenue	Change in the VTTL			Change in Compliance
			Change in Base	Change in Effective Rate	
Belgium	4.3%	3.1%	3.6%	−0.5%	1.2%
Bulgaria	9.3%	7.5%	8.0%	−0.4%	1.7%
Czechia	6.5%	6.6%	7.8%	−1.1%	−0.1%
Denmark	4.3%	3.1%	3.2%	0.0%	1.2%
Germany	3.8%	3.6%	3.3%	0.2%	0.2%
Estonia	8.5%	7.5%	8.8%	−1.2%	0.9%
Ireland	8.5%	8.2%	7.4%	0.8%	0.3%
Greece	4.4%	−0.2%	−0.6%	0.5%	4.6%
Spain	4.9%	4.4%	3.8%	0.5%	0.4%
France	3.5%	3.8%	2.2%	1.6%	−0.3%
Croatia	6.8%	4.5%	4.3%	0.2%	2.1%
Italy	1.6%	1.3%	2.0%	−0.7%	0.3%
Cyprus	10.5%	9.1%	8.0%	1.0%	1.3%
Latvia	13.2%	7.7%	8.4%	−0.7%	5.1%
Lithuania	6.4%	7.5%	7.5%	0.0%	−1.0%
Luxembourg	8.6%	11.4%	5.9%	5.2%	−2.5%
Hungary	13.9%	7.5%	9.4%	−1.8%	5.9%
Malta	13.5%	10.1%	9.8%	0.3%	3.1%
Netherlands	5.6%	4.9%	5.2%	−0.3%	0.7%
Austria	3.6%	4.1%	3.2%	0.9%	−0.5%
Poland	11.4%	6.0%	6.4%	−0.4%	5.1%
Portugal	6.3%	4.7%	4.0%	0.6%	1.5%
Romania	12.7%	12.0%	14.3%	−2.0%	0.7%
Slovenia	8.1%	7.5%	6.1%	1.3%	0.6%
Slovakia	6.8%	7.3%	7.0%	0.3%	−0.5%
Finland	4.7%	3.1%	3.8%	−0.7%	1.6%
Sweden	4.8%	3.5%	4.2%	−0.6%	1.3%
United Kingdom	4.6%	5.0%	4.0%	1.0%	−0.3%
EU-28 (total)	4.2%	3.6%	3.3%	0.4%	0.5%

Source: own calculations.

Figure 1.1. Change in VAT Revenue Components (2018 over 2017, %)



Source: own calculations.

As depicted by Table 1.3 and Figure 1.1 and highlighted in the preceding section, the growth of the base was the main driver of VAT revenue growth in 2018. An increase in the base contributed to approximately 78 percent of the total VAT revenue growth in the EU. The effect of increased compliance contributed to approximately 10 percent of the growth, which translated to 0.4 percent of the overall VAT revenue.

For the vast majority of EU MS, both the tax base and compliance effect were positive. In five countries, namely Hungary, Romania, Latvia, Malta, and Poland, the overall effect of the increase in the tax base and compliance exceeded 10 percent of VAT revenue.

2. The VAT Gap in 2018

The estimates of the VAT Gap presented in this section were derived using the same methodology as in the previously cited VAT Gap Studies. The VAT Gap is defined as the difference between the VTTL and the amount of VAT actually collected over the same period. We compute the VTTL using a top-down "consumption-side" approach by deriving the expected VAT liability from the observed national accounts data, such as supply and use tables (SUT). For this reason, the methodology used in this Study relies on the availability and quality of SUT data, which vary country to country.

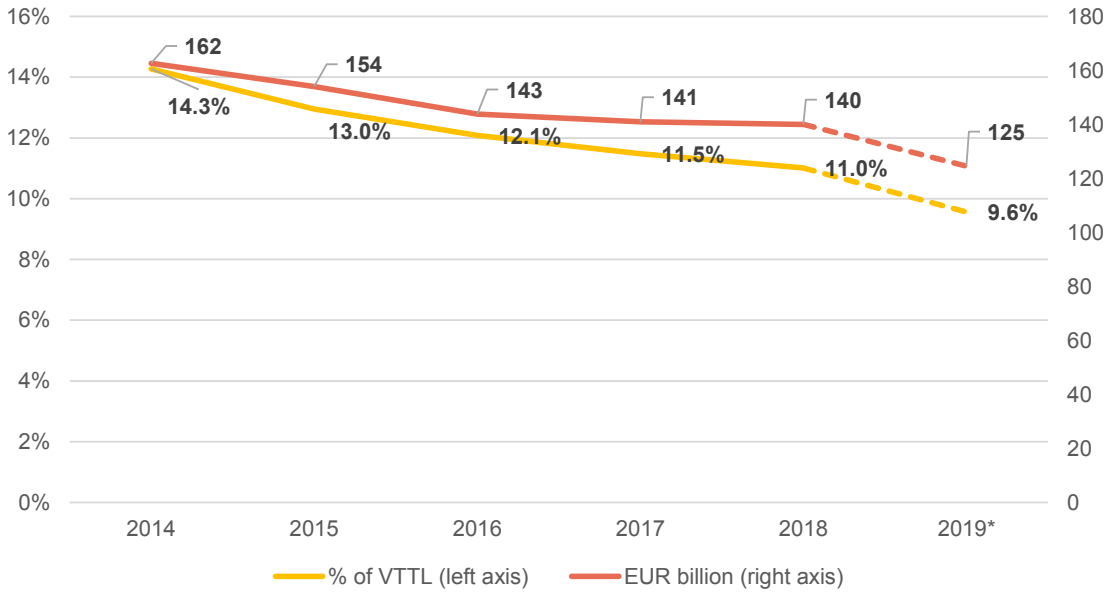
The VAT liability is estimated for final household, government, and NPISH expenditures; non-deductible VAT from the intermediate consumption of exempt industries; and VAT from the GFCF of exempt sectors. We also account for country-specific tax regulations, such as exemptions for small businesses under the VAT thresholds (if applicable); non-deductible business expenditures on food, drinks, and accommodation; and restrictions to deduct VAT on leased cars, among others. The precise formula is given in Section c in Annex A.

The results presented in this report are not fully comparable with the results presented in the earlier Reports, as each year some figures are revised backwards. The main source of the revisions are the updates of national accounts and revenue figures compiled by Member States. Moreover, in the course of our computations, some expenditure and investment figures that are not available for the most recent years are estimated. Thus, whenever actual national accounts data is published or new information on taxable investment becomes available, VAT Gap estimates need to be revised. A detailed discussion on the sources of the revisions is presented in Section a in Annex A.

In nominal terms, in 2018, the VTTL and VAT revenue amounted to EUR 1,272 billion and EUR 1,132 billion, respectively. Compared to 2017, VAT revenue increased by 4.2 percent whereas the VTTL increased by 3.6 percent, leading to decline in the VAT Gap in both relative and nominal terms. In relative terms, the EU-wide Gap dropped to 11 percent. Fast estimates show that the VAT Gap will likely continue to decline in 2019 and could fall below EUR 130 billion and 10 percent of the VTTL[6].

6 As discussed in Section d in Annex A fast estimates use a simplified methodology and their accuracy is lower.

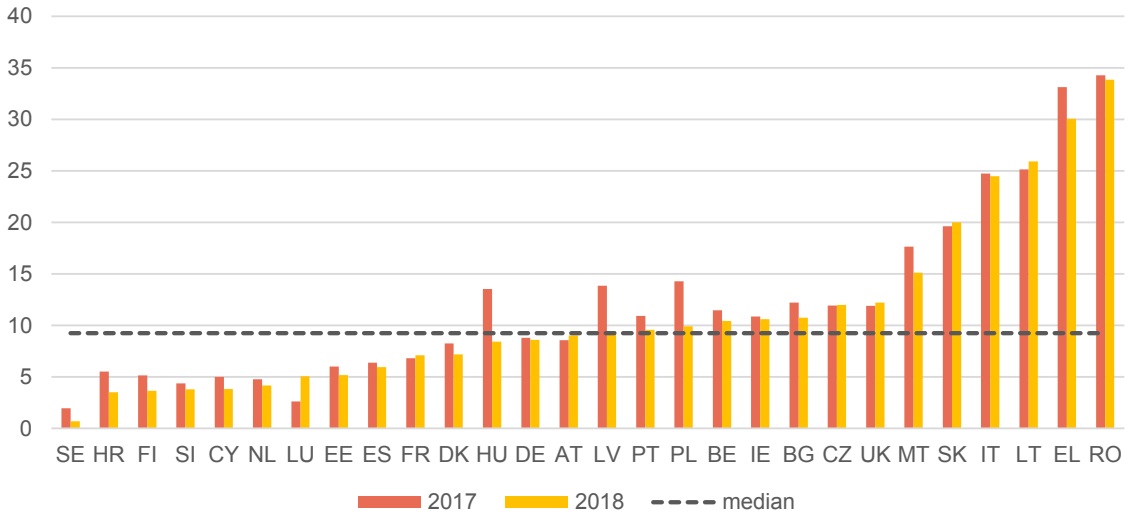
Figure 2.1. Evolution of the VAT Gap in the EU, 2014–2018 and Fast Estimate for 2019



Source: own calculations.

The smallest Gaps were observed in Sweden (0.7 percent), Croatia (3.5 percent), and Finland (3.6 percent), the largest – in Romania (33.8 percent), Greece (30.1 percent), and Lithuania (25.9 percent). Overall, half of the EU-28 MS recorded a Gap above 9.2 percent (see Figure 2.2 and Table 2.1). In nominal terms, the largest Gaps were recorded in Italy (EUR 35.4 billion), the United Kingdom (EUR 23.5 billion), and Germany (EUR 22.1 billion).

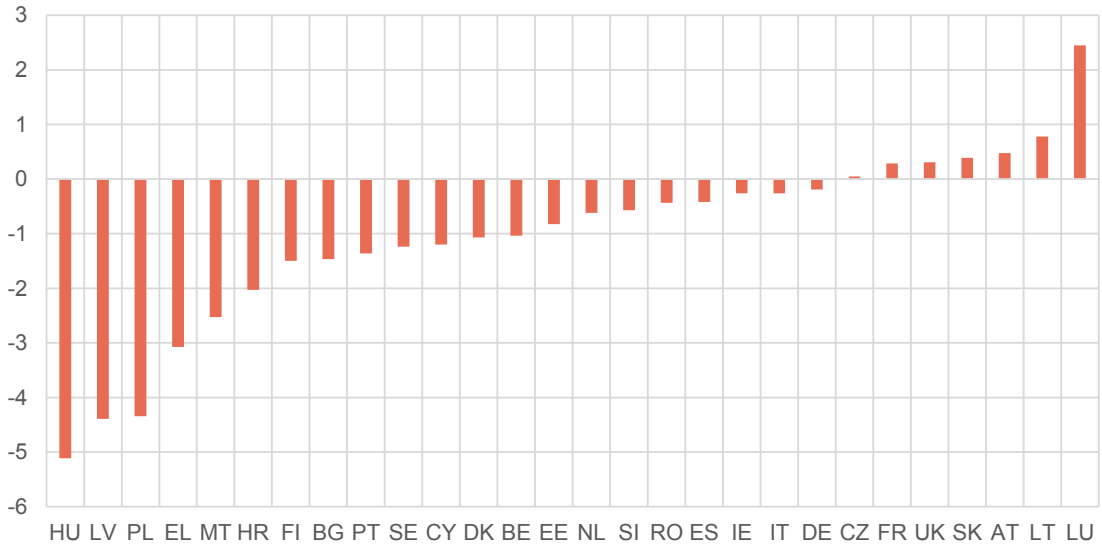
Figure 2.2. VAT Gap as a percent of the VTTL in EU-28 Member States, 2018 and 2017



Source: own calculations.

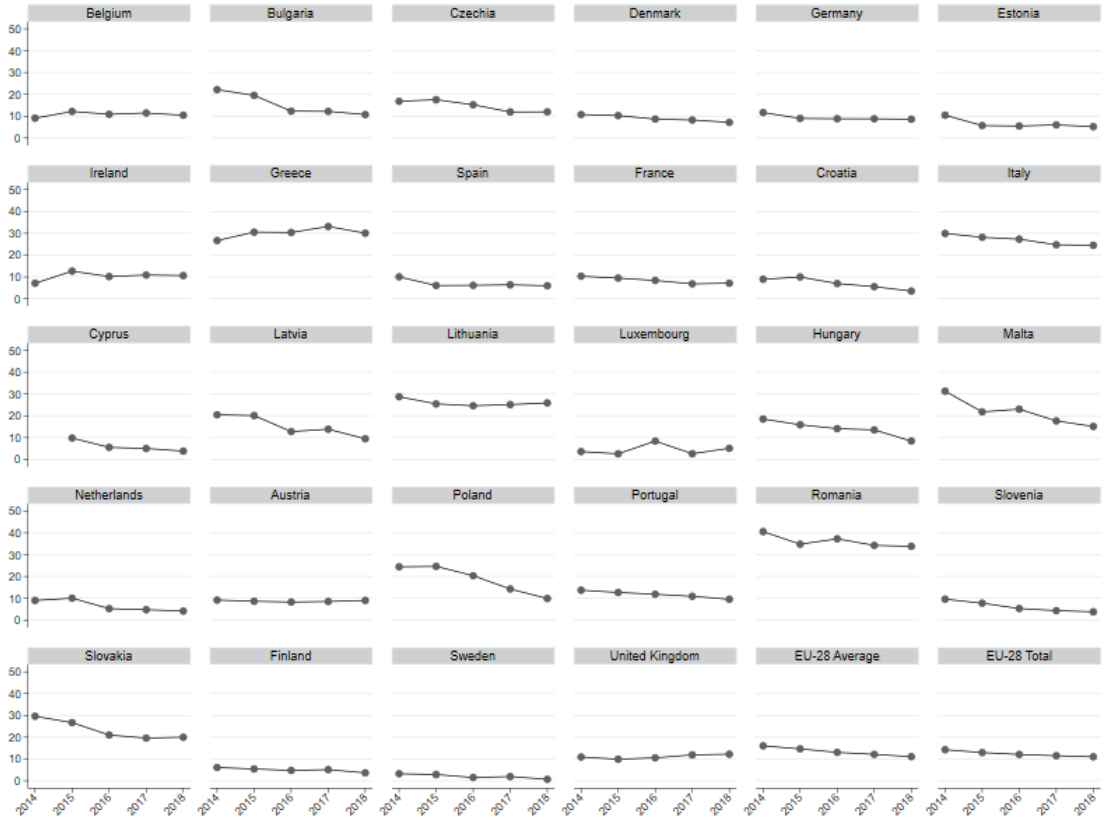
The rank of MS with respect to the relative size of the Gap remained relatively stable, with the largest changes in position observed for Hungary and Latvia (improvement by eight and six positions, respectively). The VAT Gap share decreased in 21 countries. The most significant decreases in the VAT Gap occurred in Hungary (–5.1 percentage points), Latvia (–4.4 percentage points), and Poland (–4.3 percentage points), whereas the biggest increases were observed for Luxembourg (+2.5 percentage points), Lithuania (+0.8 percentage points), and Austria (+0.5 percentage points) (see Figure 2.3).

Figure 2.3. Percentage Point Change in VAT Gap, 2018 over 2017



Source: own calculations.

Figure 2.4. VAT Gap in EU Member States, 2014–2018



Source: own calculations.

Table 2.1. VAT Gap as a percent of the VTTL in EU-28 Member States, 2018 and 2017

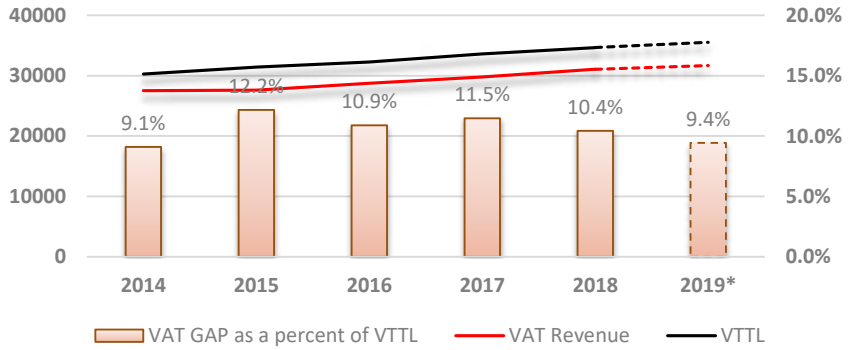
MS	2017				2018				VAT Gap Change (pp)
	Revenues	VTTL	VAT Gap	VAT Gap (%)	Revenues	VTTL	VAT Gap	VAT Gap (%)	
BE	29,763	33,619	3,856	11.5%	31,053	34,670	3,617	10.4%	−1.0
BG	4,664	5,313	649	12.2%	5,097	5,711	614	10.8%	−1.5
CZ	14,703	16,694	1,991	11.9%	16,075	18,261	2,187	12.0%	0.0
DK	27,966	30,475	2,509	8.2%	29,121	31,369	2,248	7.2%	−1.1
DE	226,582	248,382	21,800	8.8%	235,130	257,207	22,077	8.6%	−0.2
EE	2,149	2,286	137	6.0%	2,331	2,458	127	5.2%	−0.8
IE	13,060	14,652	1,592	10.9%	14,175	15,857	1,682	10.6%	−0.3
EL	14,642	21,898	7,256	33.1%	15,288	21,858	6,570	30.1%	−3.1
ES	73,970	79,003	5,033	6.4%	77,561	82,470	4,909	6.0%	−0.4
FR	162,011	173,840	11,829	6.8%	167,618	180,406	12,788	7.1%	0.3
HR	6,465	6,843	378	5.5%	6,946	7,198	252	3.5%	−2.0
IT	107,576	142,939	35,363	24.7%	109,333	144,772	35,439	24.5%	−0.3
CY	1,765	1,859	93	5.0%	1,951	2,028	77	3.8%	−1.2
LV	2,164	2,512	348	13.9%	2,449	2,705	256	9.5%	−4.4
LT	3,310	4,422	1,111	25.1%	3,522	4,754	1,232	25.9%	0.8
LU	3,433	3,525	92	2.6%	3,729	3,928	199	5.1%	2.5
HU	11,729	13,564	1,835	13.5%	12,950	14,140	1,190	8.4%	−5.1
MT	810	984	174	17.7%	920	1,084	164	15.1%	−2.5
NL	49,833	52,329	2,496	4.8%	52,619	54,897	2,278	4.2%	−0.6
AT	28,304	30,949	2,645	8.5%	29,323	32,231	2,908	9.0%	0.5
PL	36,330	42,374	6,044	14.3%	40,411	44,862	4,451	9.9%	−4.3
PT	16,810	18,872	2,062	10.9%	17,865	19,754	1,889	9.6%	−1.4
RO	11,650	17,727	6,077	34.3%	12,890	19,485	6,595	33.8%	−0.4
SI	3,482	3,640	159	4.4%	3,765	3,913	148	3.8%	−0.6
SK	5,919	7,362	1,443	19.6%	6,319	7,899	1,579	20.0%	0.4
FI	20,404	21,510	1,106	5.1%	21,364	22,171	807	3.6%	−1.5
SE	44,115	44,987	872	1.9%	43,433	43,739	306	0.7%	−1.2
UK	162,724	184,706	21,982	11.9%	168,674	192,126	23,452	12.2%	0.3
Total EU−28	**1,086,332**	**1,227,266**	**140,935**	**11.5%**	**1,131,912**	**1,271,953**	**140,042**	**11.0%**	**−0.5**
Median				**10.9%**				**9.2%**	

Source: own calculations.

3. Individual Country Results

Table 3.1. Belgium: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Belgium	2014	2015	2016	2017	2018	2019*
VTTL	30,272	31,416	32,263	33,619	34,670	35,534
o/w liability on household final consumption	17,326	17,714	18,522	19,230	19,688	
o/w liability on government and NPISH final consumption	1,424	1,435	1,272	1,317	1,358	
o/w liability on intermediate consumption	6,103	6,675	7,017	7,289	7,520	
o/w liability on GFCF	4,739	4,957	4,808	5,106	5,440	
o/w net adjustments	680	634	644	676	663	
VAT Revenue	27,518	27,594	28,750	29,763	31,053	31,679
VAT GAP	2,755	3,822	3,513	3,856	3,617	
VAT GAP as a percent of VTTL	9.1%	12.2%	10.9%	11.5%	10.4%	9.4%
VAT GAP change since 2014					+1.3 pp	



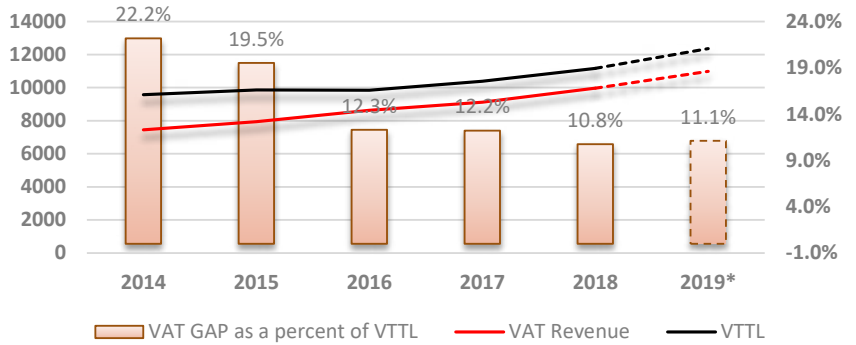
Highlights

· In 2018, the VAT Gap accounted for 10.4 percent of the VTTL (a decline of 1.1 percentage points compared to 2017).

· The VAT revenue reported by Eurostat contains VAT assessed but unlikely to be collected. This component was removed from the reference figures to ensure comparability with other EU MS.

Table 3.2. Bulgaria: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (BGN million)

Bulgaria	2014	2015	2016	2017	2018	2019*
VTTL	9,576	9,867	9,852	10,391	11,169	12,363
o/w liability on household final consumption	6,910	7,071	7,257	7,779	8,279	
o/w liability on government and NPISH final consumption	302	275	284	298	341	
o/w liability on intermediate consumption	1,111	1,110	1,151	1,256	1,413	
o/w liability on GFCF	1,174	1,328	1,143	1,044	1,110	
o/w net adjustments	79	82	16	14	25	
VAT Revenue	7,451	7,940	8,639	9,121	9,968	10,988
VAT GAP	2,124	1,927	1,213	1,270	1,201	
VAT GAP as a percent of VTTL	22.2%	19.5%	12.3%	12.2%	10.8%	11.1%
VAT GAP change since 2014					–11.4 pp	



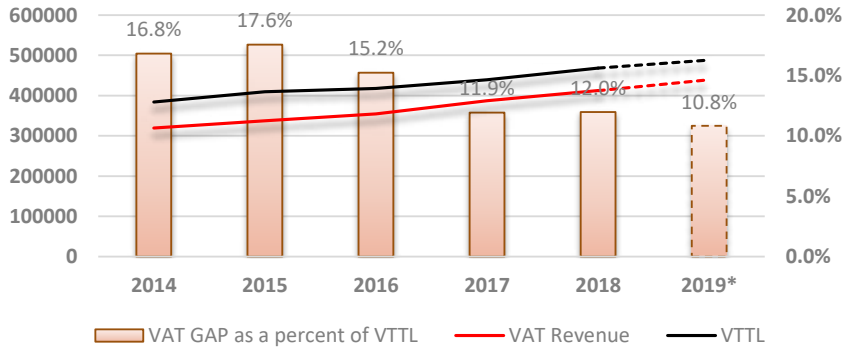
Highlights

· The VAT Gap in Bulgaria in 2018 amounted to 10.8 percent, which is about the EU total.

· After a considerable improvement in 2016, the VAT Gap in Bulgaria has remained stable and is expected to remain so in 2019 based on fast estimates.

Table 3.3. Czechia: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (CZK million)

Cech Republic	2014	2015	2016	2017	2018	2019*
VTTL	384,062	409,703	417,820	439,493	468,350	488,365
o/w liability on household final consumption	245,538	253,991	264,293	277,353	291,006	
o/w liability on government and NPISH final consumption	19,387	21,179	21,705	21,091	23,755	
o/w liability on intermediate consumption	71,811	75,118	78,614	83,448	88,367	
o/w liability on GFCF	48,021	59,799	53,287	57,802	64,161	
o/w net adjustments	−695	−384	−78	−201	1,061	
VAT Revenue	319,485	337,774	354,181	387,074	412,271	439,441
VAT GAP	64,577	71,929	63,639	52,419	56,079	
VAT GAP as a percent of VTTL	16.8%	17.6%	15.2%	11.9%	12.0%	10.8%
VAT GAP change since 2014					−4.8 pp	



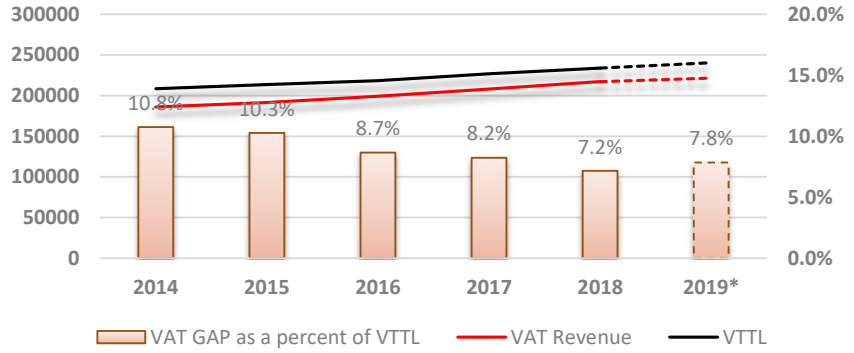
Highlights

- The VAT Gap in Czechia as a percent of the VTTL remained nearly unchanged in 2018 as compared to 2017.

- The revenue was amended to more accurately reflect tax accrued to taxation period on the basis of information received from the Tax Authorities. For 2018, VAT revenue reported by Eurostat was revised upwards by CZK 3.8 billion.

Table 3.4. Denmark: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (DKK million)

Denmark	2014	2015	2016	2017	2018	2019*
VTTL	208,401	213,396	218,207	226,691	233,799	240,382
o/w liability on household final consumption	120,503	123,843	128,717	132,514	137,422	
o/w liability on government and NPISH final consumption	5,283	5,395	5,114	5,198	5,308	
o/w liability on intermediate consumption	52,826	53,321	51,615	54,632	561,47	
o/w liability on GFCF	24,421	25,372	27,095	28,457	28,991	
o/w net adjustments	5,368	5,465	5,668	5,890	5,931	
VAT Revenue	185,994	191,479	199,306	208,025	217,046	221,523
VAT GAP	22,407	21,917	18,901	18,666	16,753	
VAT GAP as a percent of VTTL	10.8%	10.3%	8.7%	8.2%	7.2%	7.8%
VAT GAP change since 2014					-3.6 pp	



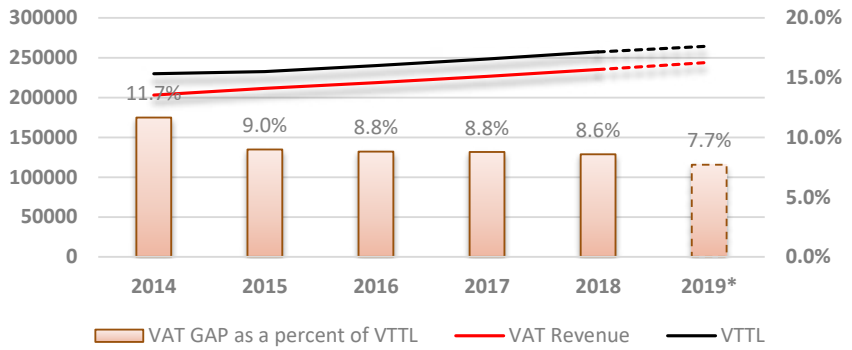
Highlights

· The VAT Gap in Denmark fell down to 7.2 percent of the VTTL in 2018.

· Since 2014, the VAT Gap has followed a slight downward trend of about 1 percentage point per year.

Table 3.5. Germany: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Germany	2014	2015	2016	2017	2018	2019*
VTTL	229,881	232,507	239,911	248,382	257,207	264,502
o/w liability on household final consumption	142,430	141,011	144,979	149,029	152,971	
o/w liability on government and NPISH final consumption	6,207	6,553	6,823	7,039	7,382	
o/w liability on intermediate consumption	42,450	44,876	46,857	48,567	50,544	
o/w liability on GFCF	37,176	37,843	39,483	41,458	44,070	
o/w net adjustments	1,618	2,223	1,769	2,290	2,239	
VAT Revenue	203,081	211,616	218,779	226,582	235,130	244,111
VAT GAP	26,800	20,891	21,132	21,800	22,077	
VAT GAP as a percent of VTTL	11.7%	9.0%	8.8%	8.8%	8.6%	7.7%
VAT GAP change since 2014					–3.1 pp	



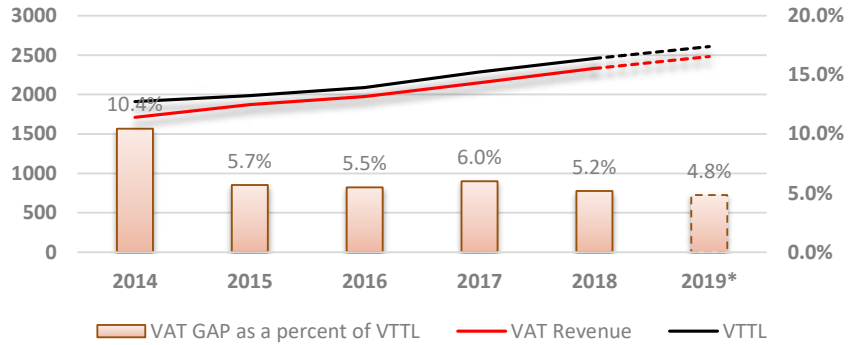
Highlights

- Over the period 2015–2018, the VAT Gap in Germany has remained nearly constant, amounting to ca. 9 percent of the VTTL.

- The estimates for Germany were revised backwards due to an improved methodology for imputing missing and confidential values in Eurostat's SUT.

Table 3.6 Estonia: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Estonia	2014	2015	2016	2017	2018	2019*
VTTL	1,911	1,986	2,090	2,286	2,458	2,609
o/w liability on household final consumption	1,338	1,374	1,436	1,530	1,652	
o/w liability on government and NPISH final consumption	34	35	64	69	77	
o/w liability on intermediate consumption	232	244	262	282	305	
o/w liability on GFCF	298	323	318	392	418	
o/w net adjustments	9	9	10	12	5	
VAT Revenue	1,711	1,873	1,975	2,149	2,331	2,483
VAT GAP	200	113	115	137	127	
VAT GAP as a percent of VTTL	10.4%	5.7%	5.5%	6.0%	5.2%	4.8%
VAT GAP change since 2014					–5.3 pp	

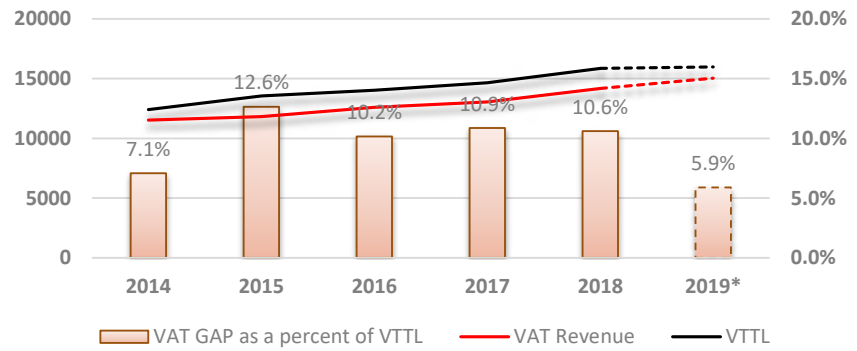


Highlights

- Over the period 2015–2018, the VAT Gap in Estonia has remained stable in the range between 5 and 6 percent of the VTTL.
- No substantial change in the size of the VAT Gap is expected based on fast estimates.

Table 3.7. Ireland: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Ireland	2014	2015	2016	2017	2018	2019*
VTTL	12,406	13,543	14,027	14,652	15,857	15,978
o/w liability on household final consumption	7,418	7,732	7,815	8,101	8,522	
o/w liability on government and NPISH final consumption	173	183	202	207	187	
o/w liability on intermediate consumption	3,200	3,808	3,820	3,957	4,446	
o/w liability on GFCF	1,443	1,649	1,995	2,173	2,498	
o/w net adjustments	173	172	195	214	205	
VAT Revenue	11,528	11,831	12,603	13,060	14,175	15,037
VAT GAP	878	1,712	1,425	1,592	1,682	
VAT GAP as a percent of VTTL	7.1%	12.6%	10.2%	10.9%	10.6%	5.9%
VAT GAP change since 2014					+3.5 pp	



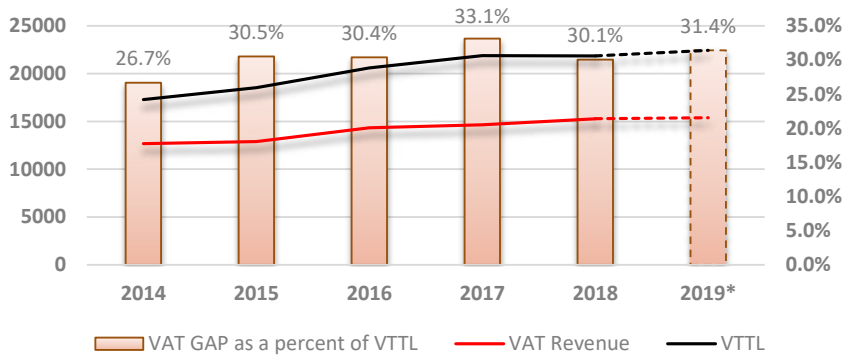
Highlights

· The estimates for Ireland were revised backwards due to an improved methodology for imputing missing and confidential values in Eurostat's SUT.

· The VAT Gap in Ireland is expected to fall substantially in 2019 due to increased revenues. This might be an overestimation as previous years' fast estimates were eventually revised upwards by 2 percentage points because of more precise revenue numbers.

Table 3.8. Greece: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Grece	2014	2015	2016	2017	2018	2019*
VTTL	**17,287**	**18,545**	**20,591**	**21,898**	**21,858**	**22,441**
o/w liability on household final consumption	**12,750**	**13,695**	**15,673**	**16,386**	**16,653**	
o/w liability on government and NPISH final consumption	**424**	**603**	**673**	**691**	**689**	
o/w liability on intermediate consumption	**1,759**	**1,858**	**2,008**	**2,115**	**2,196**	
o/w liability on GFCF	**2,114**	**2,143**	**1,948**	**2,404**	**2,012**	
o/w net adjustments	**239**	**246**	**290**	**302**	**308**	
VAT Revenue	**12,676**	**12,885**	**14,333**	**14,642**	**15,288**	**15,390**
VAT GAP	**4,611**	**5,660**	**6,258**	**7,256**	**6,570**	
VAT GAP as a percent of VTTL	**26.7%**	**30.5%**	**30.4%**	**33.1%**	**30.1%**	**31.4%**
VAT GAP change since 2014					**+3.4 pp**	

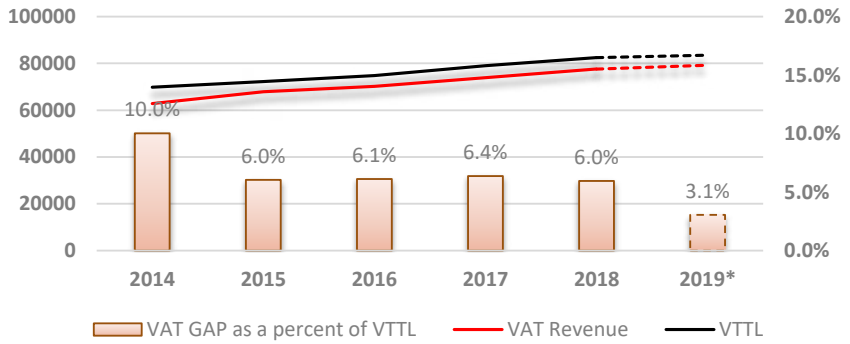


Highlights

- VAT compliance in Greece showed a significant improvement in 2018 (a decrease of the VAT Gap by 3.1 percentage points down to 30.1 percent).
- Fast estimate suggests that next year the VAT Gap will increase above 31%.

Table 3.9a. Spain: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Spain a	2014	2015	2016	2017	2018	2019*
VTTL	69,824	72,283	74,791	79,003	82,470	83,515
o/w liability on household final consumption	50,920	52,864	55,178	57,795	59,613	
o/w liability on government and NPISH final consumption	2,413	2,433	2,494	2,567	2,667	
o/w liability on intermediate consumption	8,525	8,451	8,552	9,229	9,881	
o/w liability on GFCF	7,311	7,777	7,891	8,708	9,576	
o/w net adjustments	655	759	675	704	733	
VAT Revenue	62,825	67,913	70,214	73,970	77,561	79,224
VAT GAP	6,999	4,370	4,577	5,033	4,909	
VAT GAP as a percent of VTTL	10.0%	6.0%	6.1%	6.4%	6.0%	3.1%
VAT GAP change since 2014					–4.1 pp	



Highlights

- Between 2015 and 2018, the VAT Gap has remained relatively stable at a level of 6 percent of the VTTL.
- The results were revised due to the update of Eurostat's revenue figures.

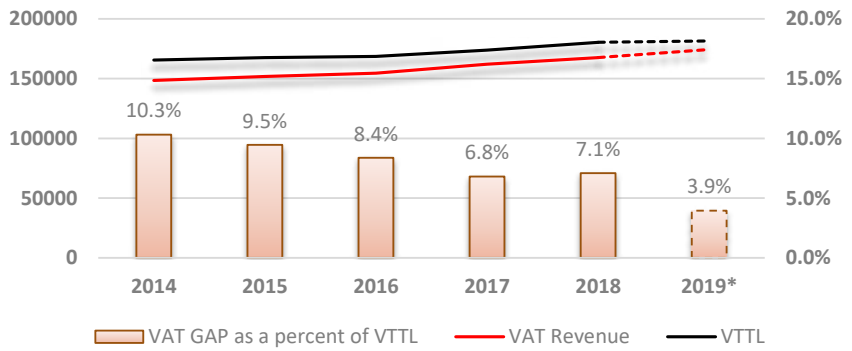
Table 3.9b. Spain: Alternative Estimates

Spain	2014	2015	2016	2017	2018
VAT Gap based on alternative data	2,946	2,177	2,680	2,925	1,737
VAT Gap based on alternative data, as a percent of VTTL	4.3%	3.1%	3.7%	3.8%	2.2%

Note: Adjusting revenues for the continuing reduction in the stock of claims 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 led to a downward revision of the VAT Gap for the entire period 2014–2018.

Table 3.10. France: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

France	2014	2015	2016	2017	2018	2019*
VTTL	165,520	167,521	168,611	173,840	180,406	181,524
o/w liability on household final consumption	98,441	98,826	100,505	102,189	105,477	
o/w liability on government and NPISH final consumption	1,606	1,631	1,695	1,734	1,750	
o/w liability on intermediate consumption	27,176	30,159	30,503	31,365	32,205	
o/w liability on GFCF	32,852	31,667	30,719	33,308	35,550	
o/w net adjustments	5,445	5,238	5,189	5,244	5,424	
VAT Revenue	148,454	151,680	154,490	162,011	167,618	174,356
VAT GAP	17,066	15,841	14,121	11,829	12,788	
VAT GAP as a percent of VTTL	10.3%	9.5%	8.4%	6.8%	7.1%	3.9%
VAT GAP change since 2014					–3.2 pp	



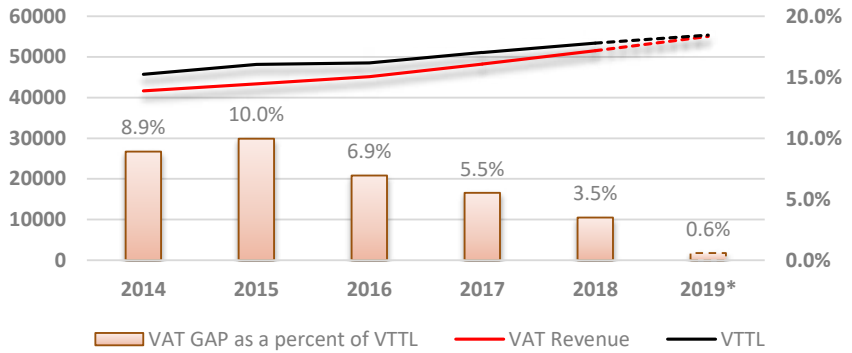
Highlights

- The VAT Gap in 2018 remained stable compared to 2017 and amounted to 7.1 percent of the VTTL and EUR 12.8 billion.

- In 2019, the VAT Gap is likely to decline.

Table 3.11. Croatia: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (HRK million)

Croatia	2014	2015	2016	2017	2018	2019*
VTTL	45,718	48,187	48,511	51,073	53,394	55,366
o/w liability on household final consumption	33,715	34,679	35,333	37,098	38,876	
o/w liability on government and NPISH final consumption	1,596	1,615	1,644	1,874	1,953	
o/w liability on intermediate consumption	5,667	6,722	7,025	7,158	7,356	
o/w liability on GFCF	4,485	4,508	4,274	4,737	4,958	
o/w net adjustments	255	663	234	205	251	
VAT Revenue	41,647	43,387	45,143	48,251	51,526	55,040
VAT GAP	4,071	4,800	3,368	2,822	1,868	
VAT GAP as a percent of VTTL	8.9%	10.0%	6.9%	5.5%	3.5%	0.6%
VAT GAP change since 2014					–5.4 pp	



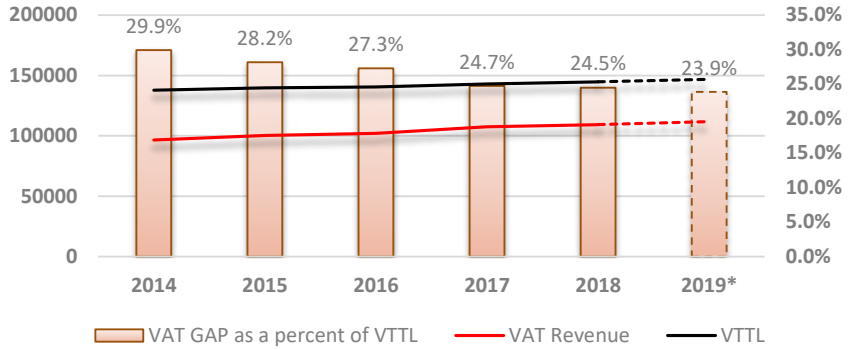
Highlights

- The VAT Gap in Croatia fell in 2018 by 2 percentage points down to 3.5 percent of the VTTL.

- Since 2015, the Gap has followed a downward trend and is expected to do so in 2019 as well.

Table 3.12a. Italy: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Italy	2014	2015	2016	2017	2018	2019*
VTTL	137,817	139,703	140,400	142,939	144,772	146,855
o/w liability on household final consumption	97,232	99,621	99,890	100,918	102,246	
o/w liability on government and NPISH final consumption	2,054	2,207	2,269	2,281	2,308	
o/w liability on intermediate consumption	21,543	21,350	21,086	22,350	22,440	
o/w liability on GFCF	13,305	13,318	13,883	14,005	14,366	
o/w net adjustments	3,682	3,208	3,272	3,385	3,412	
VAT Revenue	96,567	100,345	102,086	107,576	109,333	111,793
VAT GAP	41,250	39,358	38,314	35,363	35,439	
VAT GAP as a percent of VTTL	29.9%	28.2%	27.3%	24.7%	24.5%	23.9%
VAT GAP change since 2014					–5.5 pp	



Highlights

- Over the analysed period, the VAT Gap in Italy has followed a downward sloping trend, reaching 24.5 percent of the VTTL in 2018.

- Thanks to information provided by the Tax Authorities, the time break in the intermediate consumption of public administration in Eurostat's SUT was corrected.

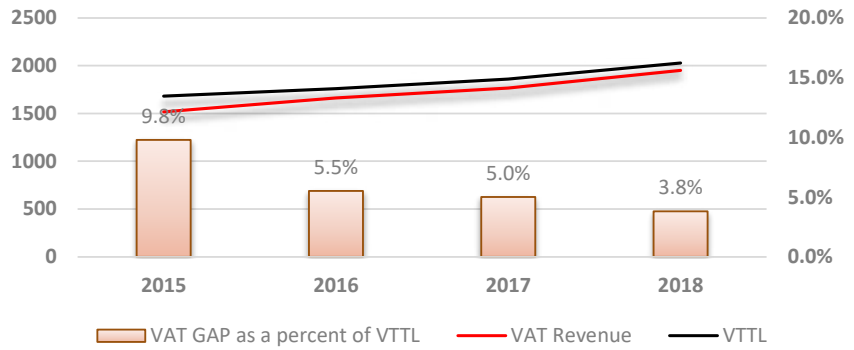
Table 3.12b Italy: Alternative Estimates

38,194	2014	2015	2016	2017	2018
VAT Gap based on alternative data	38,256	38,880	38,294	38,194	34,743
VAT Gap based on alternative data, as a percent of VTTL	28.1%	28.1%	27.0%	27.0%	24.0%

Note: The estimates above are based on adjusted revenues for the changes in 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.

Table 3.13. Cyprus: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2015–2018 (EUR million)

Cyprus	2014	2015	2016	2017	2018	2019*
VTTL	N/A	**1,681**	**1,761**	**1,859**	**2,028**	
o/w liability on household final consumption	N/A	**1,079**	**1,130**	**1,188**	**1,245**	
o/w liability on government and NPISH final consumption	N/A	**28**	**27**	**30**	**29**	
o/w liability on intermediate consumption	N/A	**437**	**452**	**447**	**485**	
o/w liability on GFCF	N/A	**108**	**134**	**172**	**243**	
o/w net adjustments	N/A	**29**	**17**	**22**	**25**	
VAT Revenue	N/A	**1,517**	**1,664**	**1,765**	**1,951**	
VAT GAP	N/A	**165**	**97**	**93**	**77**	
VAT GAP as a percent of VTTL	N/A	**9.8%**	**5.5%**	**5.0%**	**3.8%**	
VAT GAP change since 2014					**–6.0 pp**	



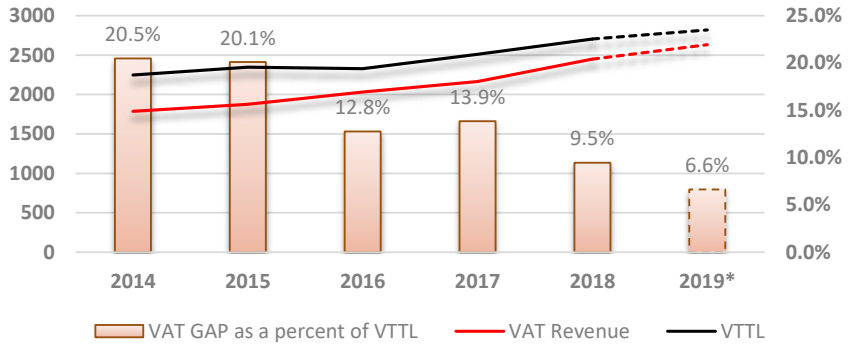
Highlights

· Thanks to information from the Tax Authorities, revenue figures were corrected to account for the expected backward revisions of Eurostat's figures.

· Due to expected revision of national accounts and an important component of the country-specific adjustments and a potentially large estimation error, fast estimates for Cyprus are not published.

Table 3.14. Latvia: VAT Revenue VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Latvia	2014	2015	2016	2017	2018	2019*
VTTL	2,248	2,348	2,329	2,512	2,705	2,819
o/w liability on household final consumption	1,748	1,801	1,847	1,965	2,074	
o/w liability on government and NPISH final consumption	43	49	53	58	63	
o/w liability on intermediate consumption	293	317	316	325	342	
o/w liability on GFCF	211	238	175	227	290	
o/w net adjustments	−47	−57	−61	−63	−64	
VAT Revenue	1,787	1,876	2,032	2,164	2,449	2,632
VAT GAP	460	472	297	348	256	
VAT GAP as a percent of VTTL	20.5%	20.1%	12.8%	13.9%	9.5%	6.6%
VAT GAP change since 2014					−11.0 pp	



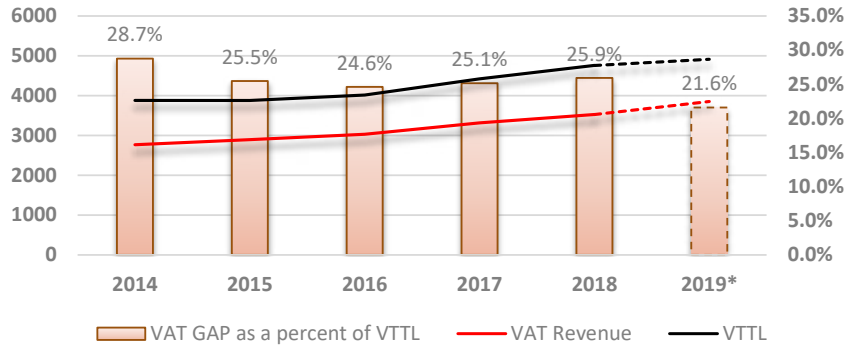
Highlights

· In 2018, Latvia recorded the second fastest decline of the VAT Gap in the EU by 4.4 percentage points down to 9.5 percent.

· It is expected to fall further in 2019 by around 2 percentage points.

Table 3.15. Lithuania: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Lithuania	2014	2015	2016	2017	2018	2019*
VTTL	3,879	3,876	4,015	4,422	4,754	4,910
o/w liability on household final consumption	3,168	3,164	3,315	3,590	3,839	
o/w liability on government and NPISH final consumption	41	43	44	48	50	
o/w liability on intermediate consumption	373	403	404	434	463	
o/w liability on GFCF	442	461	470	505	552	
o/w net adjustments	−145	−195	−218	−155	−150	
VAT Revenue	2,764	2,889	3,028	3,310	3,522	3,850
VAT GAP	1,115	987	988	1,111	1,232	
VAT GAP as a percent of VTTL	28.7%	25.5%	24.6%	25.1%	25.9%	21.6%
VAT GAP change since 2014					−2.8 pp	



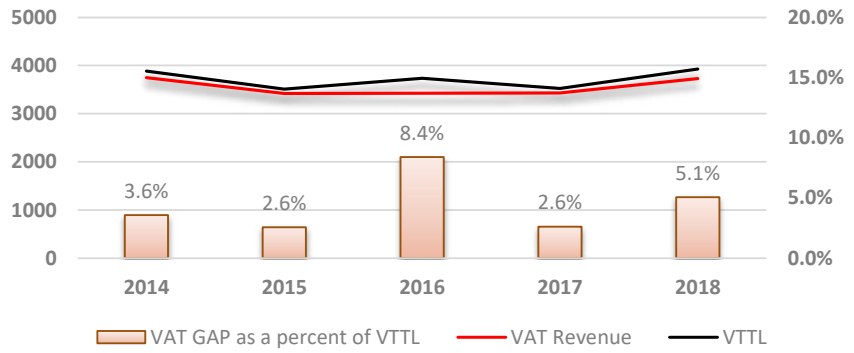
Highlights

- Over the period 2015–2018, the VAT Gap in Lithuania remained stable, amounting to 25 percent of the VTTL, on average.

- Based on fast estimates, it is expected that the VAT Gap will fall significantly in 2019 – by about 4 percentage points.

Table 3.16. Luxembourg: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Luxemburg	2014	2015	2016	2017	2018	2019*
VTTL	3,888	3,510	3,736	3,525	3,928	
o/w liability on household final consumption	1,237	1,289	1,331	1,361	1,469	
o/w liability on government and NPISH final consumption	30	32	33	44	89	
o/w liability on intermediate consumption	875	1,070	1,138	1,160	1,215	
o/w liability on GFCF	348	411	626	541	726	
o/w net adjustments	1,398	709	608	419	429	
VAT Revenue	3,749	3,420	3,422	3,433	3,729	
VAT GAP	139	90	314	92	199	
VAT GAP as a percent of VTTL	3.6%	2.6%	8.4%	2.6%	5.1%	
VAT GAP change since 2014					+1.5 pp	



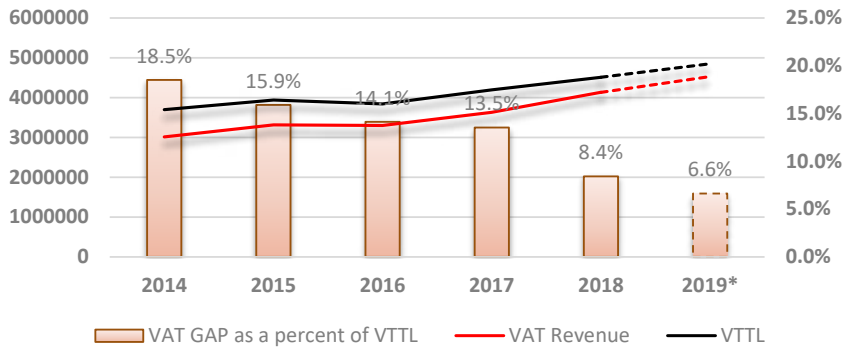
Highlights

- In 2018, the VAT Gap was 5.1 percent of the VTTL, which was a 2.5 percentage point incline year-over-year.

- Due to an important component of the country-specific adjustments related to e-commerce and financial intermediation services and a potentially large estimation error, fast estimates for Luxemburg are not published.

Table 3.17. Hungary: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (HUF million)

Hungary	2014	2015	2016	2017	2018	2019*
VTTL	3,695,038	3,934,985	3,842,561	4,193,962	4,509,050	4,847,886
o/w liability on household final consumption	2,561,233	2,667,644	2,813,513	2,928,236	3,037,227	
o/w liability on government and NPISH final consumption	114,447	121,681	112,677	123,619	131,027	
o/w liability on intermediate consumption	495,980	529,845	527,033	562,286	608,761	
o/w liability on GFCF	464,953	560,845	340,200	520,047	690,748	
o/w net adjustments	58,426	54,969	49,138	59,774	41,287	
VAT Revenue	3,011,162	3,309,540	3,299,838	3,626,566	4,129,537	4,526,757
VAT GAP	683,876	625,445	542,723	567,396	379,513	
VAT GAP as a percent of VTTL	18.5%	15.9%	14.1%	13.5%	8.4%	6.6%
VAT GAP change since 2014					–10.1 pp	

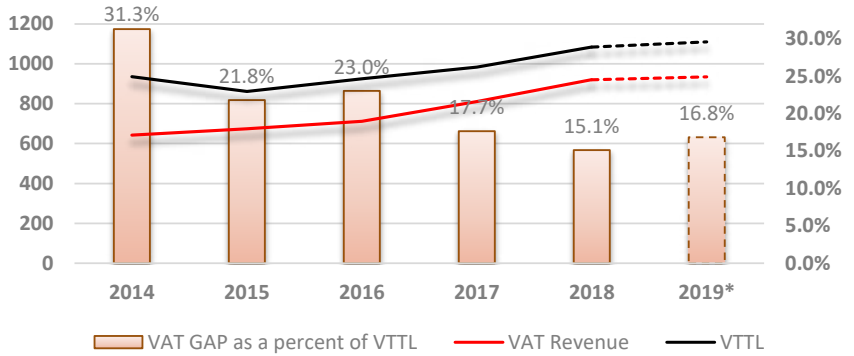


Highlights

- In 2018, Hungary recorded the fastest decline of the VAT Gap in the EU – 5.1 percentage points down to 8.4 percent.
- It is expected to decline further in 2019, but only by 1 percentage point.

Table 3.18 Malta: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Malta	2014	2015	2016	2017	2018	2019*
VTTL	935	861	925	984	1,084	1,110
o/w liability on household final consumption	460	488	517	538	582	
o/w liability on government and NPISH final consumption	16	18	49	55	60	
o/w liability on intermediate consumption	393	253	277	301	337	
o/w liability on GFCF	63	82	58	72	88	
o/w net adjustments	2	20	24	18	18	
VAT Revenue	642	673	712	810	920	934
VAT GAP	293	188	213	174	164	
VAT GAP as a percent of VTTL	31.3%	21.8%	23.0%	17.7%	15.1%	16.8%
VAT GAP change since 2014					–16.2 pp	



Highlights

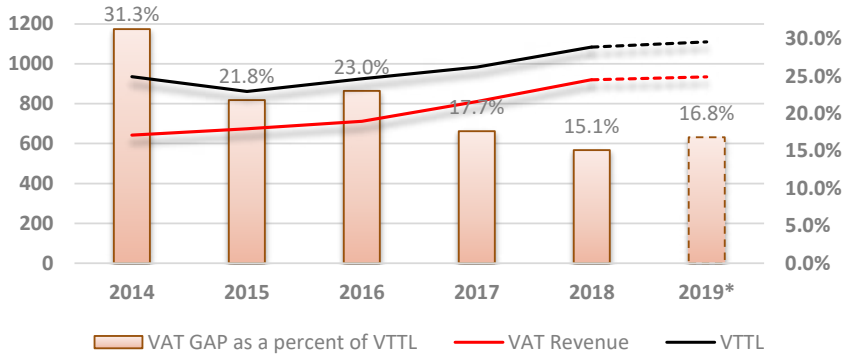
- The VAT Gap in Malta fell by approximately 2.5 percentage points in 2018 down to 15.1 percent of the VTTL.

- As a net exporter of electronic services, VTTL and revenue in Malta was affected by the withdrawal of the MOSS retention fee as of 2019.

- The VTTL in Malta was revised significantly upwards thanks to the availability of data from fiscal registers allowing for more accurate estimations of the effective rates and propexes for financial and gambling services.

Table 3.19. Netherlands: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Netherlands	2014	2015	2016	2017	2018	2019*
VTTL	47,199	49,756	50,500	52,329	54,897	
o/w liability on household final consumption	25,363	25,953	26,218	27,101	28,290	
o/w liability on government and NPISH final consumption	556	595	571	590	621	
o/w liability on intermediate consumption	12,853	13,718	13,687	14,052	14,696	
o/w liability on GFCF	7867	8962	9481	10,038	10,744	
o/w net adjustments	560	528	543	547	546	
VAT Revenue	42,951	44,746	47,849	49,833	52,619	
VAT GAP	4,248	5,010	2,651	2,496	2,278	
VAT GAP as a percent of VTTL	9.0%	10.1%	5.3%	4.8%	4.2%	
VAT GAP change since 2014					–4.8 pp	



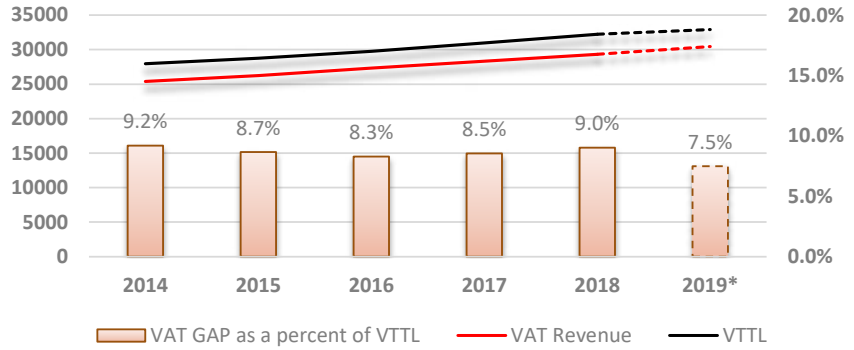
Highlights

- In 2018, the VAT Gap fell by 0.6 percentage points down to nearly 4 percent of the VTTL.

- Due to a substantial change in the VAT rates in 2019 and a potentially large estimation error, fast estimates for the Netherlands are not published.

Table 3.20. Austria: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Austria	2014	2015	2016	2017	2018	2019*
VTTL	27,955	28,736	29,768	30,949	32,231	32,910
o/w liability on household final consumption	18,992	19,259	19,885	20,623	21,321	
o/w liability on government and NPISH final consumption	957	943	947	954	1,493	
o/w liability on intermediate consumption	4,093	4,188	4,183	4,322	4,176	
o/w liability on GFCF	2,585	2,890	3,284	3,467	3,676	
o/w net adjustments	1,328	1,456	1,469	1,583	1,566	
VAT Revenue	25,386	26,247	27,301	28,304	29,323	30,446
VAT GAP	2,569	2,489	2,466	2,645	2,908	
VAT GAP as a percent of VTTL	9.2%	8.7%	8.3%	8.5%	9.0%	7.5%
VAT GAP change since 2014					+0.2 pp	



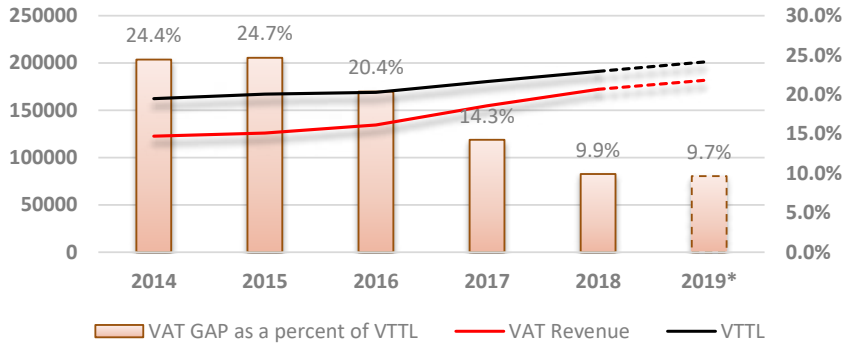
Highlights

· Over the period 2014–2018, the VAT Gap in Austria remained nearly constant, amounting to ca. 8-9 percent of the VTTL, on average.

· In 2019, the VAT Gap is expected to decrease by about 1.5 percentage points.

Table 3.21. Poland: VAT Revenue VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (PLN million)

Poland	2014	2015	2016	2017	2018	2019*
VTTL	162,348	167,037	168,993	180,386	191,180	201,610
o/w liability on household final consumption	112,465	115,495	119,692	127,010	132,706	
o/w liability on government and NPISH final consumption	7,103	7,356	7,605	8,007	8,626	
o/w liability on intermediate consumption	22,939	24,786	25,508	27,079	27,866	
o/w liability on GFCF	16,875	17,038	13,695	15,757	19,397	
o/w net adjustments	2,967	2,361	2,493	2,534	2,585	
VAT Revenue	122,671	125,836	134,554	154,656	172,210	182,147
VAT GAP	39,678	41,201	34,439	25,730	18,970	
VAT GAP as a percent of VTTL	24.4%	24.7%	20.4%	14.3%	9.9%	9.7%
VAT GAP change since 2014					–14.5 pp	



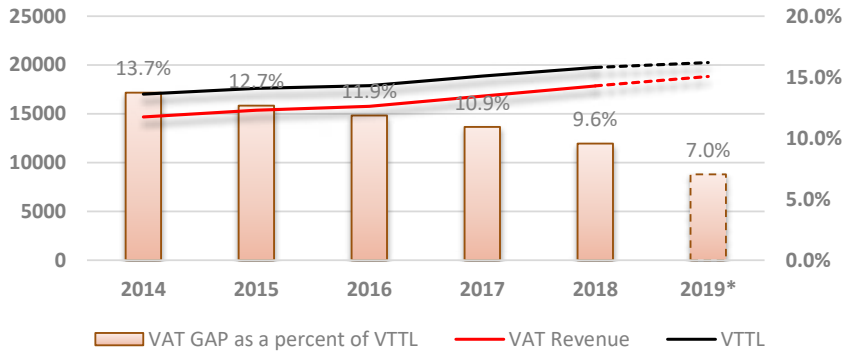
Highlights

· In 2018, Poland recorded the third most significant decline of the VAT Gap in the EU of 4.3 percentage points down to 9.9 percent.

· The trend of significant decreases in the VAT Gap started in 2015 is expected to end in 2018 as the rate in 2019 will remain nearly identical.

Table 3.22. Portugal: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Portugal	2014	2015	2016	2017	2018	2019*
VTTL	17,020	17,598	17,890	18,872	19,754	20,253
o/w liability on household final consumption	12,823	13,190	13,345	13,843	14,397	
o/w liability on government and NPISH final consumption	229	444	487	535	554	
o/w liability on intermediate consumption	2,625	2,433	2,732	2,928	3,088	
o/w liability on GFCF	1,017	1,170	941	1,194	1,295	
o/w net adjustments	326	361	385	372	420	
VAT Revenue	14,682	15,368	15,767	16,810	17,865	18,828
VAT GAP	2,338	2,230	2,123	2,062	1,889	
VAT GAP as a percent of VTTL	13.7%	12.7%	11.9%	10.9%	9.6%	7.0%
VAT GAP change since 2014					**–4.2 pp**	

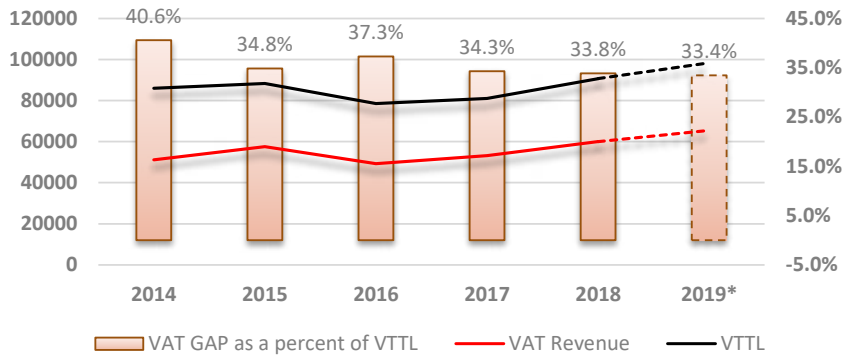


Highlights

· The VAT Gap in Portugal was just below the EU total (9.6 percent of the VTTL). It followed a downward trend over the analysed period. Between 2014 and 2018, the Gap fell by approximately one percentage point yearly, on average.

Table 3.23. Romania: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (RON million)

Romania	2014	2015	2016	2017	2018	2019*
VTTL	**85,971**	**88,269**	**78,520**	**80,993**	**90,682**	**98,353**
o/w liability on household final consumption	**51,889**	**53,728**	**48,986**	**51,803**	**59,786**	
o/w liability on government and NPISH final consumption	**4,177**	**3,745**	**3,560**	**3,541**	**4,027**	
o/w liability on intermediate consumption	**9,760**	**9,646**	**7,765**	**8,478**	**9,230**	
o/w liability on GFCF	**16,978**	**18,640**	**16,338**	**15,890**	**16,479**	
o/w net adjustments	**3,167**	**2,510**	**1,871**	**1,281**	**1,160**	
VAT Revenue	**51,086**	**57,520**	**49,253**	**53,229**	**59,990**	**65,461**
VAT GAP	**34,885**	**30,750**	**29,267**	**27,764**	**30,693**	
VAT GAP as a percent of VTTL	**40.6%**	**34.8%**	**37.3%**	**34.3%**	**33.8%**	**33.4%**
VAT GAP change since 2014					**–6.7 pp**	

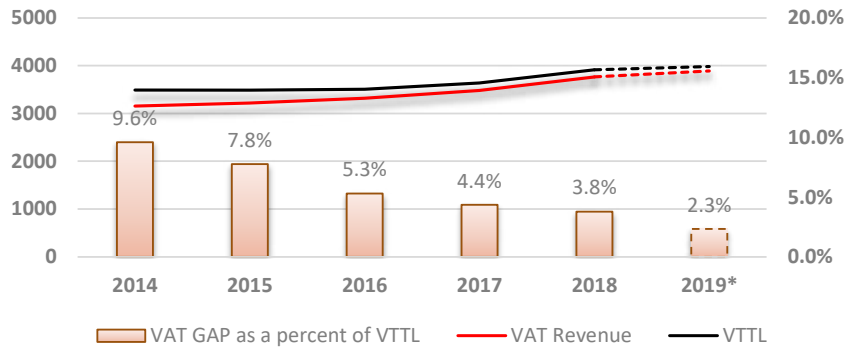


Highlights

- In 2018, the VAT Gap remained nearly unchanged.
- Overall, between 2014 and 2018, the Gap fell by roughly 7 percentage points.
- The effective rates for certain categories (such as agricultural products, restaurants, and hotels) were modified based on legislation in order to improve consistency with other countries.

Table 3.24. Slovenia: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Slovenia	2014	2015	2016	2017	2018	2019*
VTTL	3,490	3,491	3,504	3,640	3,913	3,982
o/w liability on household final consumption	2,442	2,448	2,573	2,682	2,820	
o/w liability on government and NPISH final consumption	69	76	85	83	89	
o/w liability on intermediate consumption	491	468	469	461	523	
o/w liability on GFCF	401	419	303	346	406	
o/w net adjustments	87	79	74	68	76	
VAT Revenue	3,155	3,220	3,319	3,482	3,765	3,889
VAT GAP	335	271	186	159	148	
VAT GAP as a percent of VTTL	9.6%	7.8%	5.3%	4.4%	3.8%	2.3%
VAT GAP change since 2014					-5.8 pp	



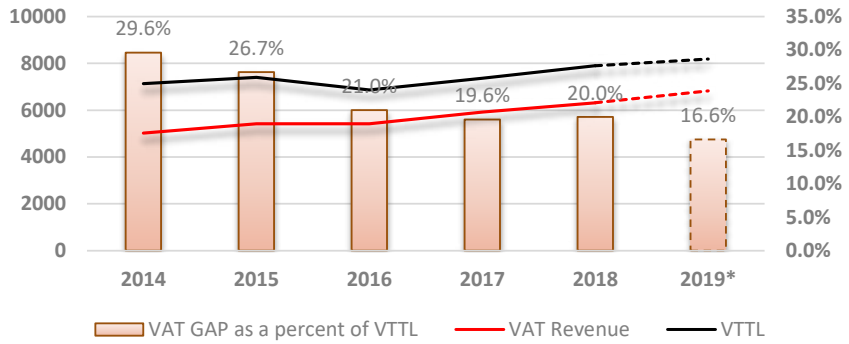
Highlights

- The VAT Gap in Slovenia followed a downward trend over the analysed period. Between 2014 and 2018, the Gap fell by six percentage points, in total.

- This trend is expected to continue into 2019 with a decrease of another 2 percentage points.

Table 3.25 Slovakia: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Slovakia	2014	2015	2016	2017	2018	2019*
VTTL	7,133	7,398	6,866	7,362	7,899	8,187
o/w liability on household final consumption	5,303	5,136	5,111	5,421	5,744	
o/w liability on government and NPISH final consumption	93	96	98	101	107	
o/w liability on intermediate consumption	883	971	904	930	1,051	
o/w liability on GFCF	869	1,206	763	916	992	
o/w net adjustments	-14	-12	-10	-6	4	
VAT Revenue	5,021	5,423	5,424	5,919	6,319	6,826
VAT GAP	2,112	1,975	1,443	1,443	1,579	
VAT GAP as a percent of VTTL	29.6%	26.7%	21.0%	19.6%	20.0%	16.6%
VAT GAP change since 2014					**–9.6 pp**	

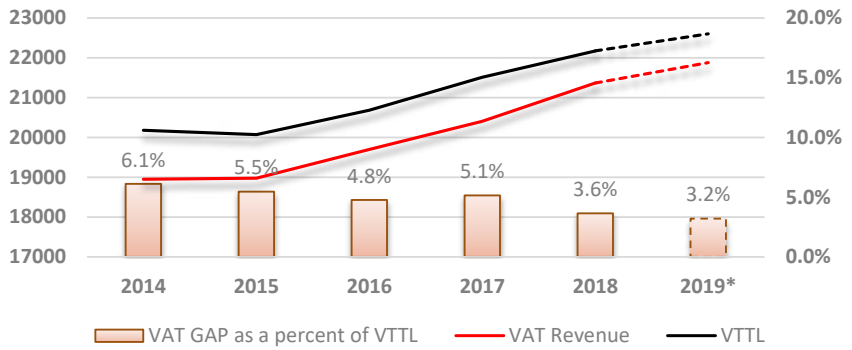


Highlights

- The VAT Gap in Slovakia remained stable in 2018 at just below 20 percent of the VTTL.
- Over the 2014-2018 period, the Gap fell by approximately 10 percentage points.

Table 3.26. Finland: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (EUR million)

Finland	2014	2015	2016	2017	2018	2019*
VTTL	20,181	20,069	20,679	21,510	22,171	22,599
o/w liability on household final consumption	11,074	11,386	11,575	11,830	12,198	
o/w liability on government and NPISH final consumption	465	478	504	490	506	
o/w liability on intermediate consumption	4,545	4,276	4,396	4,589	4,654	
o/w liability on GFCF	3,498	3,316	3,513	3,839	4,096	
o/w net adjustments	598	613	691	761	717	
VAT Revenue	18,948	18,974	19,694	20,404	21,364	21,876
VAT GAP	1,233	1,095	985	1,106	807	
VAT GAP as a percent of VTTL	6.1%	5.5%	4.8%	5.1%	3.6%	3.2%
VAT GAP change since 2014					–2.5 pp	

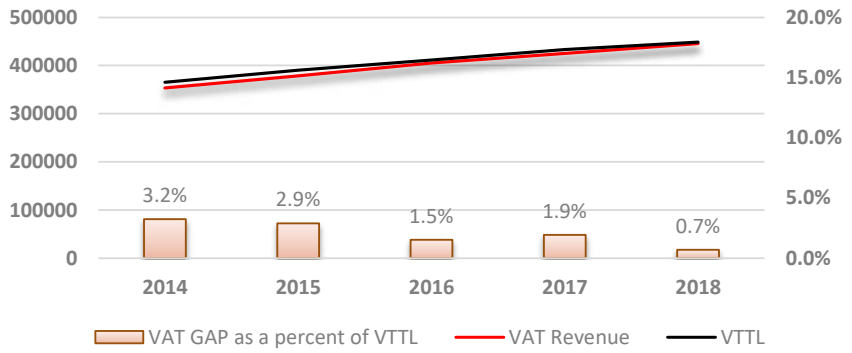


Highlights

· The VAT Gap in Finland has fallen gradually throughout the entire analysed period. In 2018, it fell below 4 percent of the VTTL and EUR 1 billion.

Table 3.27. Sweden: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (SEK million)

Sweden	2014	2015	2016	2017	2018	2019*
VTTL	365,287	390,123	411,285	433,453	448,689	
o/w liability on household final consumption	188,086	197,435	203,952	213,174	222,949	
o/w liability on government and NPISH final consumption	19,872	20,547	22,014	22,671	23,703	
o/w liability on intermediate consumption	89,135	95,434	98,416	102,223	103,940	
o/w liability on GFCF	62,428	70,346	80,354	88,311	90,937	
o/w net adjustments	5,766	6,360	6,548	7,075	7,160	
VAT Revenue	353,439	378,830	404,987	425,053	445,550	
VAT GAP	11,848	11,293	6,298	8,400	3,139	
VAT GAP as a percent of VTTL	3.2%	2.9%	1.5%	1.9%	0.7%	
VAT GAP change since 2014					–2.5 pp	

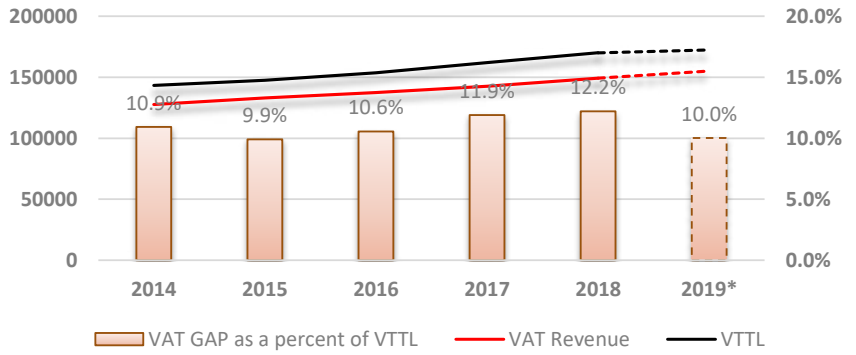


Highlights

- Sweden recorded the lowest VAT Gap in the EU in 2018 of about 0.7 percent of the VTTL.
- Fast estimates are not reported for Sweden as they suggest a slightly negative VAT Gap.

Table 3.28. United Kingdom: VAT Revenue, VTTL, Composition of VTTL, and VAT Gap, 2014–2018 (GBP million)

United Kingdom	2014	2015	2016	2017	2018	2019*
VTTL	143,308	147,570	153,759	161,926	169,976	172,377
o/w liability on household final consumption	95,192	97,237	102,317	108,064	112,940	
o/w liability on government and NPISH final consumption	2,560	3,420	3,045	3,085	3,159	
o/w liability on intermediate consumption	31,681	32,604	33,037	33,957	35,972	
o/w liability on GFCF	12,255	13,468	14,255	14,923	15,654	
o/w net adjustments	1,621	840	1,105	1,898	2,252	
VAT Revenue	127,647	132,948	137,531	142,655	149,228	155,104
VAT GAP	15,661	14,622	16,228	19,271	20,748	
VAT GAP as a percent of VTTL	10.9%	9.9%	10.6%	11.9%	12.2%	10.0%
VAT GAP change since 2014					+1.3 pp	



Highlights

- The VAT Gap in the United Kingdom remained relatively stable over the 2014–2018 period.
- Effective rates were revised based on the new treatment of illegal goods smuggling and the rate of exemption for education services.

4. Policy Gap Measures for 2018

In this chapter, we present an update of the series of estimates of the Policy Gap and its components for the EU-28.

As discussed in the previous Reports, the Policy Gap captures the effects of applying multiple rates and exemptions on the theoretical revenue that could be levied in a given VAT system. In other words, the 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. Due to the idealistic assumption of perfect tax compliance and a very broad base that captures entire final consumption and households' GFCF, the practical interpretation of the Policy Gap draws criticism. Nonetheless, the assumption of perfect VAT collectability is indispensable, as interdependencies between tax compliance and rate structure are not straightforward.

In order to learn how different components contribute to revenue losses, we compose the Policy Gap into different components of revenue loss, as we show in Annex A.e. Such lements are, for instance, the Rate Gap and the Exemption Gap, which capture the loss in VAT liability due to the application of reduced rates and the loss in liability due to the implementation of exemptions, respectively.

Moreover, following Barbone et al. (2013), the Policy Gap and its components could be further adjusted to address the issue of the extent to which the loss of theoretical revenue depends on the decisions of policymakers. Measures that 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.

The estimates of the Policy Gap, Rate Gap, Exemption Gap, Actionable Policy Gap, and Actionable Exemption Gap for the EU-28 MS for 2018 are presented in Table 4.1.

For the EU overall, the average Policy Gap level was 44.24 percent. This means that the VAT that could currently be levied in the case of full compliance generates 44.24 percent of what could have been generated if all the exemptions and reduced rates were

abolished and all final use according to national accounts' definition was taxed. Of this 44.24 percent, in 2018, 10.07 percentage points were due to the application of various reduced and super-reduced rates (the Rate Gap) and 34.17 were due to the application of exemptions without the right to deduct.

According to the Rate Gap estimates, reduced rates are least applied in Denmark (0.77 percent), Latvia (2.37 percent), and Estonia (2.68 percent). On the other side of spectrum are Cyprus (25.97 percent) and Italy (15.86 percent). The MS with the highest values of the Exemption Gap are Spain (43.59 percent), due to the application of other than VAT indirect taxes in the Canary Islands, Ceuta, and Melilla, and the United Kingdom (43.18 percent). The lowest value of the Exemption Gap was observed in Malta (15.79 percent).

The largest part of the Exemption Gap is composed of exemptions on services that cannot be taxed in principle, i.e. imputed rents and the provision of public goods (26.06 percent). The remaining level of the Exemption Gap is financial services (2.33 percent) and the "Actionable" Exemption Gap, which is 5.77 percent, on average.

The Actionable Policy Gap – a combination of the Rate Gap and the Actionable Exemption Gap – is 15.85 percent on average. This figure shows the combined reduction of Ideal Revenue due to reduced rates (10.07 percent) and exemptions (5.77 percent) which could possibly be removed.

In three cases, i.e. the financial services Gaps in Cyprus, Ireland and Malta and the Actionable Exemption Gap in Malta, negative gaps were observed. Although theoretically possible, this likely results from a measurement error[7].

7 The Exemption Gap could become negative 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.

Table 4.1. Policy Gap, Rate Gap, Exemption Gap, and Actionable Gaps

	A	B	C	D	E	F	G	H
	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) (%)
BE	52.32	11.91	40.42	7.39	25.49	3.69	3.84	15.75
BG	29.74	3.18	26.56	10.13	14.61	1.75	0.06	3.24
CZ	39.21	5.57	33.64	8.22	17.02	2.10	6.31	11.87
DK	40.90	0.77	40.13	7.54	24.27	4.98	3.35	4.12
DE	44.15	6.76	37.39	6.72	21.30	2.78	6.58	13.35
EE	35.27	2.68	32.59	6.86	15.69	1.94	8.10	10.78
IE	48.63	12.23	36.40	10.44	23.58	-1.20	3.57	15.80
EL	45.84	8.44	37.39	9.22	16.65	1.28	10.24	18.68
ES	58.17	14.57	43.59	9.67	18.74	2.78	12.40	26.97
FR	52.92	12.93	39.99	9.37	22.01	3.14	5.47	18.39
HR	34.30	8.82	25.48	7.61	11.90	2.29	3.68	12.49
IT	53.79	15.86	37.93	10.82	18.45	1.34	7.31	23.17
CY	44.55	25.97	18.58	6.93	13.84	-5.49	3.29	29.26
LV	42.12	2.37	39.75	10.00	15.61	2.14	12.00	14.37
LT	32.97	3.83	29.14	4.49	14.52	1.73	8.40	12.23
LU	35.84	11.86	23.98	8.65	3.72	2.71	8.90	20.76
HU	45.31	8.01	37.30	7.06	17.91	3.32	9.01	17.02
MT	32.39	16.60	15.79	4.24	16.98	2.36	-7.80	8.80
NL	52.46	11.16	41.30	7.30	25.44	5.99	2.56	13.72
AT	45.07	14.76	30.32	7.66	18.76	2.74	1.15	15.91
PL	48.06	14.91	33.15	3.84	14.49	3.64	11.18	26.09
PT	50.75	14.11	36.64	8.22	19.33	3.25	5.84	19.95
RO	36.49	14.23	22.27	8.79	11.21	0.10	2.17	16.40
SI	46.94	11.71	35.23	7.66	17.27	2.70	7.60	19.31
SK	41.60	2.34	39.26	10.06	17.01	2.82	9.37	11.71
FI	50.29	9.73	40.57	10.10	21.27	3.20	6.00	15.72
SE	46.67	7.90	38.77	5.47	26.69	3.19	3.42	11.32
UK	51.97	8.78	43.18	11.70	19.79	4.00	7.68	16.47
EU-28	44.24	10.07	34.17	8.08	17.98	2.33	5.77	15.85

Source: own calculations.

5. Econometric Analysis of VAT Gap Determinants

a. Introduction

The examination of tax non-compliance determinants is not new to the economic literature. Most of the literature dealing with such factors focuses on personal income taxes, voluntary tax compliance, and deterrence effects. This focus is clearly related to data availability. The empirical studies are based mostly on micro-data gathered in surveys and audit statistics. Thus, they concentrate on the impact of individuals' characteristics (see e.g. Feinstein [1991]). Similarly, studies scrutinising the determinants of compliance in corporate and consumption taxation usually look at micro-level revenue figures from fiscal registers or audit data (see e.g. Casey and Castro [2015]). The studies based on fiscal registers and audit and survey data face an important limitation, i.e. the inability to observe the variability of determinants across tax systems and economies. A rather limited number of studies looking at such cross-country variations focus on the variation of dynamics in tax revenue (see e.g. Aizenman and Jinjarak, [2018]) or have a qualitative nature (see e.g. Keen and Smith [2007]).

The European Commission's VAT Gap Study made available a large set of standardised data on tax compliance from a group of countries with varying economic and institutional characteristics. The series are available across a time period long enough to cover economic upturns and downturns. As a result, the Study provides an opportunity to conduct econometric analyses looking at the determinants of tax non-compliance from a new perspective. The panel data derived from the VAT Gap Study have already been used by a number of researchers – such as Barbone et al. (2013), Zídková (2017), Lešnik et al. (2018), Poniatowski et al. (2018 and 2019), Szczypińska (2019), and Carfora et al. (2020).

The econometric analysis outlined in this Study extends the above-mentioned studies several-fold. Concerning the data preparation procedure, we eliminate potential bias in the data by correcting the VAT Gap series for each country for revisions in subsequent vintages of the Study. Moreover, we account for measurement errors, i.e. changes in the VAT Gap not related to change in compliance but rather to specific one-off factors. To deal with the scarcity of observations of exogenous variables, we perform a dummy

variable adjustment. Although this operation rises the number of explanatory variables, overall it increases the degrees of freedom due to higher number of observations included in the estimation. In regard to the specification of the models, we extend the list of covariates relating to tax policy characteristics, macroeconomic variables, variables describing the structure of the economy, and proxies of tax fraud.

b. Data and Variables

Our endogenous variable is the VAT Gap of country i in year t taken from each of the European Commission's VAT Gap Studies (i.e. the 2013, 2014, 2015, 2016, 2017, 2018, and 2019 Studies). To ensure the comparability of vintages across time, the data was transformed using the methodology described in the following section.

The wide set of covariates included in the analysis originates from the 2019 Study but includes around 16 new variables[8]. The covariates could be grouped as those describing tax policies, indicators of the macroeconomic situation, variables describing the exogenous factors to the tax administration economic characteristics of a country, and proxies of VAT fraud.

The inclusion of **tax policy characteristics** is expected to show how the various efforts of tax administrations relate to the VAT Gap in each country. It could be expected that the greater the efforts of the administration are, the higher the level of tax compliance, both voluntary and involuntary. Expenditure on tax administration in relation to GDP alone might not be enough to capture how effectively the funds are used – the "IT expenditure" variable is expected to pick up the effect of innovative processes introduced into administrative processes. Similarly, the "Administrative effectiveness" variable, meaning the independence of the tax administration from political pressures as well as the quality of policy formulation and implementation, should account for general proficiency in collecting taxes and the credibility of government.

The set of **macroeconomic variables** aims to explain the cyclical conditions that affect taxpayer behaviour. For example, the "Unemployment" variable should be able to capture situations when taxpayers face stronger incentives to evade tax liabilities due to the increased number of bankruptcies and liquidity constraints. Similarly, "GDP per capita" is expected to capture periods of economic stress as well as decreasing with wealth incentives not to comply. We also expect that the level of government debt could complement the list of core determinants by accounting for the economic constraints and prudence of public finance.

8 See Table 5.1, EC (2019).

We suspect that certain economic characteristics which show large variation across countries and rather low variation in time are also related to VAT compliance. Thus, we include variables describing the sectoral and company **structure of the economy**. In particular, we distinguish the retail sector, which could be the key sector, along with other labour-intensive sectors, as well as real estate, construction, industry, telecommunications, and art. The moel also takes into consideration the structure of companies by size of employment and the relative size of the shadow economy. One of the newly introduced variables is the value of credit transfer payments involving non-MFIs – this variable should help to explain how advanced the financial system is in terms of cashless transactions, which are more secure and easier to control by the tax administration.

Since the variability of **tax fraud**, a significant component of the VAT Gap, may be related to very specific factors not included in the covariates list, we proxy the scale of fraud using three alternative approaches9. As one of the possible indicators of fraud, we look at international trade, as sudden changes – mostly in intra-Community purchase figures – may indicate an increasing scale of Missing Trader Intra-Community (MTIC) fraud. We also create a more refined indicator of trade at risk. This indicator was constructed by applying an algorithm which examined the differences over time in the reported values of traded goods known for being targeted by fraud (we used a list of goods that were placed under a reverse charge procedure). The relative differences between the values of trade reported by both sides were first smoothed using a moving average to limit the influence of short-term fluctuations. In the next step, this time series were treated with the k-means algorithm in order to identify possible "odd" values. In the last step, a set of filters was applied to these values in order to make sure that the discrepancies were significant and not an isolated event. The goal of this process was to identify periods where these differences were non-systematic, which in turn may indicate the emergence of fraud. In the final step, the values of the discrepancies were aggregated for each country and related to the total value of trade for goods under scrutiny. In addition, we look at the frequency of use of specific customs procedures (CPCs 42 and 63) which could be regarded as risky[10]. The full list of variables is included in Table 5.1 below.

9 For a detailed analysis of fraud indicators, see EC (2018).

10 Customs Procedure Codes 42 and 63 are the regimes an importer uses in order to obtain a VAT exemption when the imported goods will be transported to another MS.

Table 5.1. Variables

Variable	Source	No. of Obs.	Remarks	Expected Relationship
Endogenous variable				
VAT Gap	VAT Gap reports, EC	Yearly data of 26–28 MS observed between 2000 and 2017	The data will be gathered from published VAT Gap reports utilising the most recent vintage available	-
Tax administration variables				
Standardised fiscal rules index	EC	Full coverage		Negative
Number of staff	OECD	Available from 2003 but with missing data	Data available with two-year lag (https://www.oecd-ilibrary.org/taxation/tax-administration_23077727)	Negative
Number of audits completed	OECD			Unclear
Other verification actions	OECD			Unclear
Total administrative costs	OECD			Negative
VAT electronic filing rate %	OECD			Negative
IT expenditure share	OECD			Negative
Dispersion of statutory tax rates	EC	Full coverage	Taxation trends (https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en)	Positive
Policy Gap	EC	2012–2017		Positive
Rate Gap	EC	2012–2017		Positive
Exemption Gap	EC	2012–2017		Positive
Macroeconomic variables				
Real GDP Growth	EUROSTAT	Full coverage		Negative
Debt-to-GDP Ratio	EUROSTAT	Full coverage		Unclear
General gov. surplus (deficit)	EUROSTAT	Full coverage		Negative
GDP at market prices	EUROSTAT	Full coverage		Negative
GDP per capita	EUROSTAT	Full coverage		Negative
Final consumption expenditure	EUROSTAT	Full coverage		Negative
Final consumption expenditure of households	EUROSTAT	Full coverage		Negative
Unemployment rate	EUROSTAT	Full coverage		Positive
Output gap	OECD	Full coverage		Positive

Variable	Source	No. of Obs.	Remarks	Expected Relationship
Economic structure and institutional variables				
Economic Risk Rating	ICRG	Full coverage	https://epub.prsgroup.com/products/icrg/countrydata, the higher the risk the lower the value of the indexes	Negative
Financial Risk Rating	ICRG	Full coverage		Negative
Political Risk Rating	ICRG	Full coverage		Negative
Population	EUROSTAT	Full coverage		Unclear
Age structure	EUROSTAT	Full coverage		Unclear
Immigration	EUROSTAT	Full coverage		Unclear
Political Regime Characteristics: Political Competition	INSCR	Full coverage	https://www.systemicpeace.org/inscrdata.html	Negative
Political Regime Characteristics: Constraint on Executive Power	INSCR	Full coverage		Negative
The Worldwide Governance Indicators: Voice and Accountability	World Bank	Full coverage	The Worldwide Governance Indicators (https://info.worldbank.org/governance/wgi/Home/Reports)	Negative
The Worldwide Governance Indicators: Political Stability	World Bank			Negative
Government effectiveness	World Bank			Negative
The Worldwide Governance Indicators: Regulatory Quality	World Bank			Negative
The Worldwide Governance Indicators: Rule of Law	World Bank			Negative
The Worldwide Governance Indicators: Control of Corruption	World Bank			Negative
Population at risk of poverty	EUROSTAT	Full coverage		Positive
Share of companies with no employees	EUROSTAT	2006–2017		Overall negative relation to firm size
Share of companies with 1-4 employees	EUROSTAT	2006–2017		
Share of companies with 5-9 employees	EUROSTAT	2006–2017		
Share of companies with over 10 employees	EUROSTAT	2006–2017		

Variable	Source	No. of Obs.	Remarks	Expected Relationship
Share of Gross Value Added – companies with 0-9 employees	EUROSTAT	Full coverage		Overall negative relation to firm size
Share of Gross Value Added – companies with 10-19 employees	EUROSTAT	Full coverage		
Share of Gross Value Added – companies with 20-49 employees	EUROSTAT	Full coverage		
Share of Gross Value Added - companies with over 50 employees	EUROSTAT	Full coverage		
Agriculture, forestry, and fishing - sector share	EUROSTAT	Full coverage		Unclear
Industry - sector share	EUROSTAT	Full coverage		Unclear
Manufacturing - sector share	EUROSTAT	Full coverage		Unclear
Construction - sector share	EUROSTAT	Full coverage		Unclear
Wholesale and retail trade, transport, accommodation, and food service activities - sector share	EUROSTAT	Full coverage		Unclear
Information and communication - sector share	EUROSTAT	Full coverage		Unclear
Financial and insurance activities - sector share	EUROSTAT	Full coverage		Unclear
Real estate activities - sector share	EUROSTAT	Full coverage		Unclear
Professional, scientific, and technical activities; administrative and support service activities - sector share	EUROSTAT	Full coverage		Unclear
Public administration, defence, education, human health, and social work activities - sector share	EUROSTAT	Full coverage		Unclear
Arts, entertainment and recreation...- sector share	EUROSTAT	Full coverage		Unclear

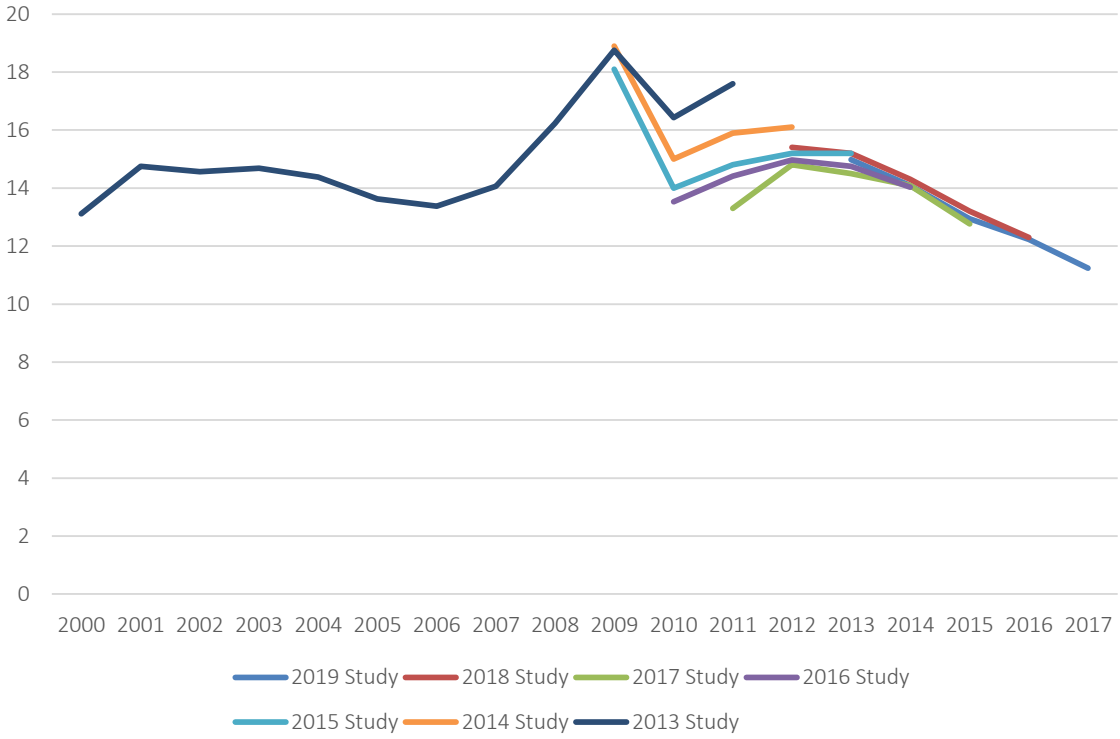
Variable	Source	No. of Obs.	Remarks	Expected Relationship
Size of the shadow economy	IMF	2000–2016	https://www.imf.org/en/Publications/WP/Issues/2019/12/13/Explaining-the-Shadow-Economy-in-Europe-Size-Causes-and-Policy-Options-48821	Positive
Gini Index	World Bank	Full coverage		Unclear
Electronic payments	ECB	Available from 2014	https://sdw.ecb.europa.eu/reports.do?node=1000001961	Negative
Corruption Perception Index	Transparency International	Full coverage	Higher values are related to lower perceived corruption https://www.transparency.org/cpi2018	Negative
Fraud proxies				
Imports with Customs Procedure Codes 42 and 63	EC	2007–2017	EC's Surveillance Database	Positive
Intra-EU import at risk (share in GDP)	EUROSTAT	Full coverage		Positive
Intra-EU export at risk (share in GDP)	EUROSTAT	Full coverage		Positive
Total import	EUROSTAT	Full coverage		Positive
Import (only alcohol and tobacco)	EUROSTAT	Full coverage		Positive
Trade-at-risk	Own calculation	2000-2017	Broken to importation, intra-Community acquisition, export and intra-Community supply.	Positive

Source: own elaboration; expected relationships based on analysis of descriptive statistics, intuition, and literature review including summary by Carfora et al. (2020).

c. Methods and Approach

The VAT Gap estimates presented in each release of the Study have been updated recursively whenever new information became available. Specifically, there are three different sources of VAT Gap revisions11. However, the revisions have one important property. As shown in Figure 5.1, they have a minor impact on the dynamics of the Gap for periods when full information is available.

Figure 5.1. Comparison of Results (VAT Gap as % of the VTTL in EU-28)



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

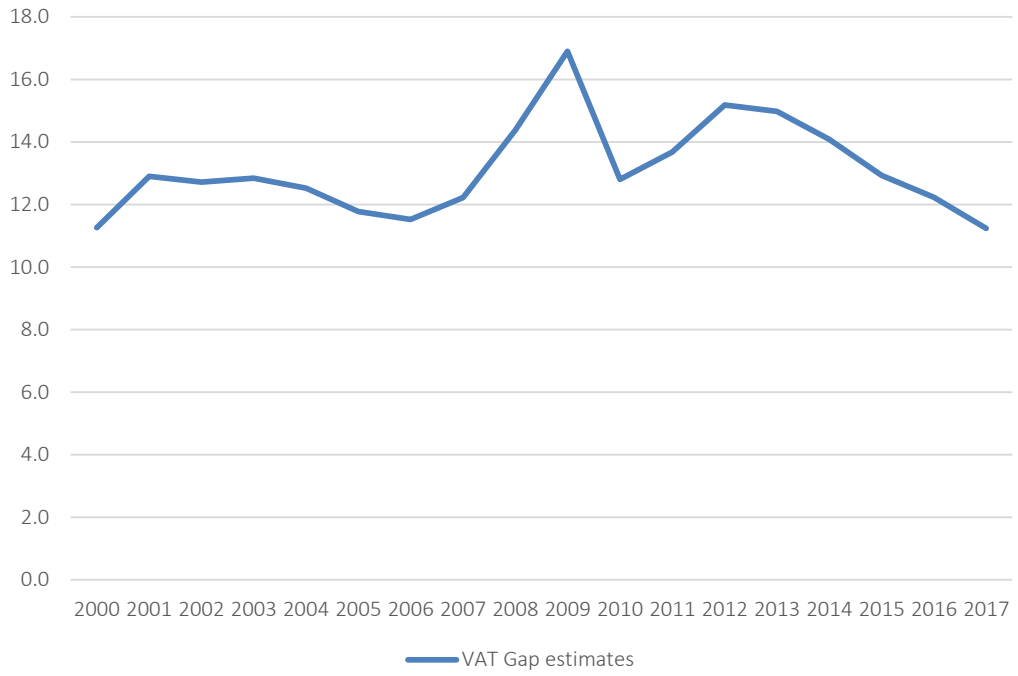
11 See Annex A.a. for more details.

As the updates do not impact year-over-year changes in the VAT Gap, but only in magnitudes, we derived past estimates of the VAT Gap for each and every MS using a backcasting procedure. The backcasting procedure relies on the magnitude of values for a period of 5 years covered by the most recent estimates. At the same time, the dynamics, i.e. year-over-year changes in percentage points, for the years not covered by the full estimates are based on previous Studies (the most recent Study available including specific years). For instance, the estimates for 2000–2013 included in 2020 Study rely on the seven studies published between 2013 and 2019 but were adjusted to the magnitude of full estimates for 2014–2019.

Such a procedure has not been used in any of the previous studies. In our view, despite using fixed effects specifications, such a procedure eliminates potential problems stemming from the revisions, which might be correlated both in time and across entities.

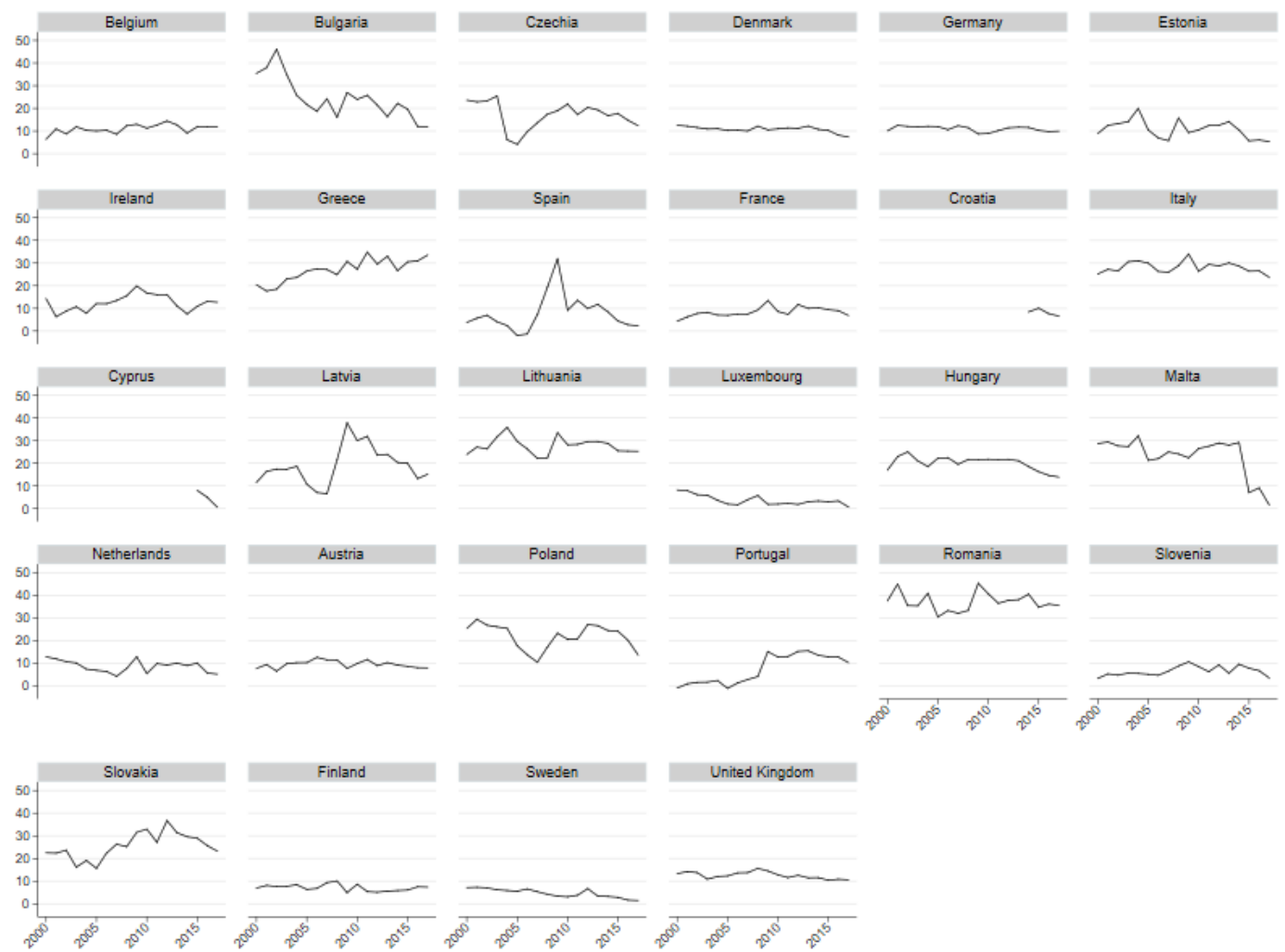
For aggregate EU-wide figures, this backcasting is depicted by Figure 5.2, whereas the time series for each country are depicted by Figure 5.3. Figure 5.4 shows estimates for each country published in consecutive vintages of the Study.

Figure 5.2. Backcasting of EU-wide Estimates Presented in Figure 5.1 (VAT Gap as % of the VTTL)



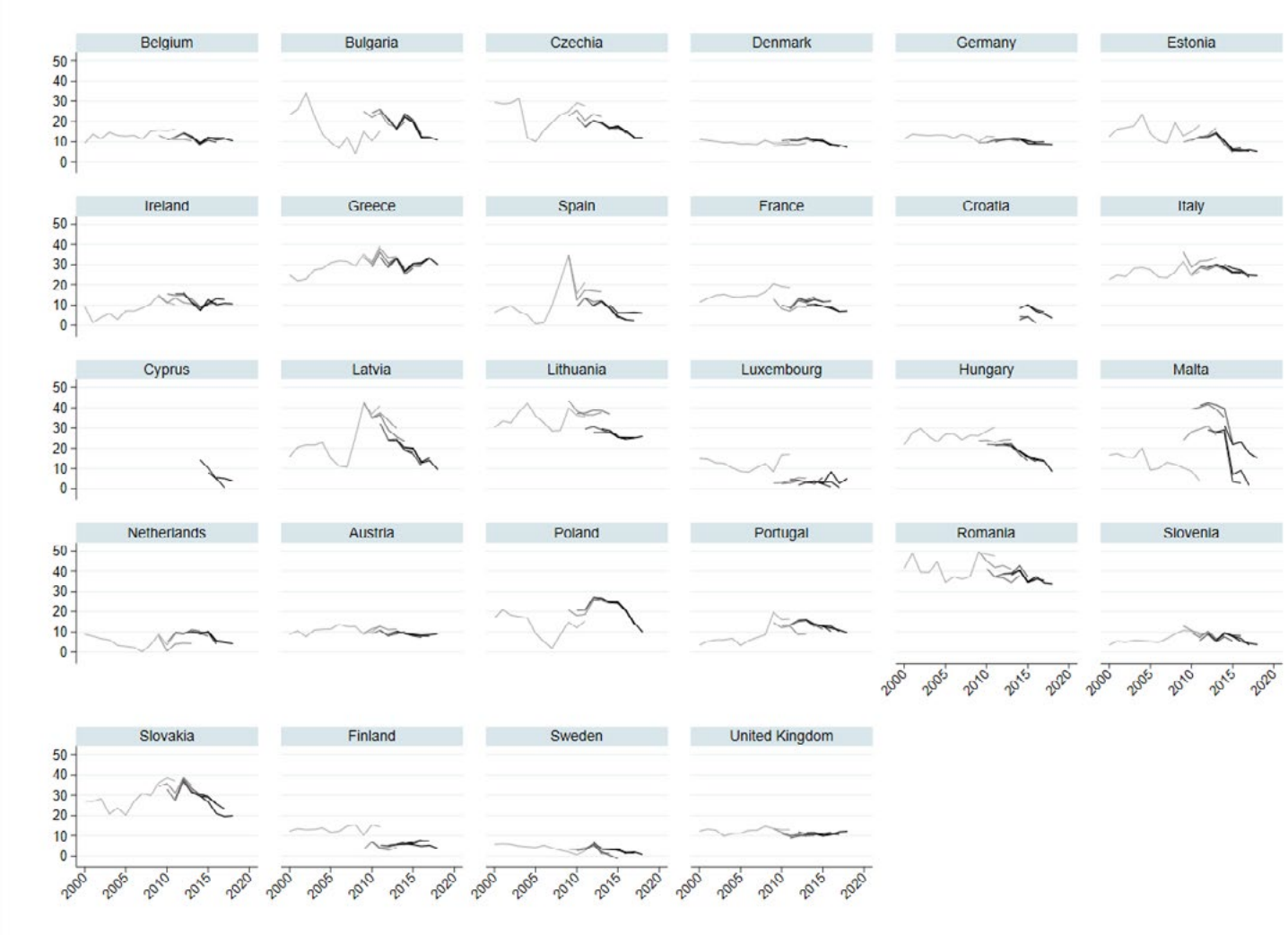
Source: own elaboration based on EC (2013, 2014, 2015, 2016, 2017, 2018, and 2019).

Figure 5.3 Backcasting of Individual Estimates (VAT Gap as % of the VTTL)



Source: own elaboration based on EC (2013, 2014, 2015, 2016, 2017, 2018, and 2019)

Figure 5.4 Individual Estimates in Consecutive Studies (VAT Gap as % of the VTTL)



Source: own elaboration based on EC (2013, 2014, 2015, 2016, 2017, 2018, and 2019)

As shown in Table 5.1, the explanatory variables are often available for only a subset of observations. The nature of missing data varies across variables. Some data sources cover only specific MS (e.g. OECD), other sources are available for the most recent years only (Surveillance database) or were discontinued (e.g. Verification actions). However, there is one important similarity – data is not missing at random in most instances.

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 (Allison, 2001). The procedure for missing predictors in regression analysis that we use is called dummy variable adjustment or the missing indicator method. In this approach, if X is an incompletely observed predictor in a regression model, then a binary response indicator for X is created (RX = 1, if the value in X is missing; RX = 0, if the corresponding value in X is present). Then, it is included in the regression model together with missing values in X, which are filled in with any constant value c.

The method that we use increases the number of observations substantially but also creates a bias (Kleinke et al., 2011). Allison (2001) concluded that the method generally yields biased coefficient estimates and should only be applied in certain situations, for example when the unobserved value simply could not exist. The imputation could not use more refined techniques like the procedure proposed by Little and Rubin (1987) since the multivariate data are neither missing completely at random nor the conditionality of missing data could be controlled.

In accordance with the Data and variables section, the basic regression takes the form[12]:

$$VG_{it}=a_1TAV_{it}+a_2MV_{it}+a_3ESV_{it}+a_4FP_{it}+a_t+a_i+u_{it}$$

The endogenous variable is the VAT 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 MS (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

12 We also tested the alternative structure of the equation, i.e. the logarithmic form. However, the measures of the model's fit pointed to selecting the non-log form of the model.

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, 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.

As some of the listed variables are significantly correlated with others, we bear in mind the potential collinearity and endogeneity problem, which is tackled by the careful selection of variables for each specification.

d. Results

Due to the multiplicity of covariates and the enormous number of potential combinations of model specifications, we have proceeded parsimoniously. The approach consisted of three stages. In the first stage, we have run Bayesian Model Averaging to learn which variables are not significant in the majority of 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 tests presented in Annex A.

The narrow dataset obtained after the first stage consisted of 27 explanatory variables. A summary of the statistics of these variables is shown in Table 5.2.

Table 5.2. Descriptive Statistics

	n	Mean	Minimum	Maximum	Standard Deviation
VAT Gap (endogenous)	471	0.16	0.01	0.46	0.10
Real GDP Growth	485	0.02	−0.15	0.12	0.04
Unemployment rate	485	0.09	0.02	0.28	0.04
Debt–to–GDP Ratio	483	0.57	0.04	1.79	0.33
General gov. surplus (deficit)	485	−0.03	−0.32	0.07	0.04
IT expenditure share	246	0.09	0	0.28	0.07
Policy Gap	135	0.44	0.12	0.60	0.09
Effective rate	471	0.13	0.08	0.21	0.03
Size of the shadow economy	440	0.23	0.09	0.40	0.08
Share of companies with no employees	233	0.54	0.09	0.82	0.16
Share of companies with 1–4 employees	233	0.33	0.10	0.72	0.13
Share of companies with 5–9 employees	233	0.13	0.06	0.27	0.05
Share of Gross Value Added – companies with 0–9 employees	181	0.22	0.12	0.37	0.04
Share of Gross Value Added – companies with 10–19 employees	170	0.08	0.04	0.12	0.01
Share of Gross Value Added – companies with 20–49 employees	172	0.11	0.05	0.16	0.02
Share of Gross Value Added – companies with over 50 employees	170	0.59	0.39	0.73	0.06
Agriculture, forestry and fishing – sector share	485	0.03	0.00	0.14	0.02
Construction – sector share	485	0.06	0.01	0.13	0.02
Industry – sector share	485	0.21	0.06	0.39	0.06
Wholesale and retail trade, transport, accommodation, and food service activities – sector share	485	0.21	0.10	0.32	0.04
Wholesale and retail trade, transport, accommodation, and food service activities – sector share	485	0.05	0.03	0.11	0.01
Financial and insurance activities – sector share	485	0.06	0.02	0.30	0.04
Real estate activities – sector share	485	0.09	0.05	0.19	0.02
Professional, scientific, and technical activities; administrative and support service activities – sector share	485	0.08	0.02	0.15	0.02
Public administration, defence, education, human health, and social work activities – sector share	485	0.17	0.10	0.24	0.03
Arts, entertainment, and recreation… – sector share	485	0.03	0.01	0.15	0.01
Imports with Customs Procedure Code 42 and 63 (log)	150	0.16	−2.58	4.85	1.60
Intra–EU import at risk (share in GDP)	485	0.01	0.00	0.07	0.01

Source: own elaboration.

The results of our regressions are shown in Table 5.3. 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, trade at risk, and the shares of the agriculture, communication services, 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 Gap by one percentage point, GDP needs to increase by 3.6 percentage points more, the general government balance needs to improve by 3.4 percentage points, the share of IT expenditure in the overall expenditure of tax administrations needs to ncrease by roughly 5.4 percentage points, or the share of risky imports of goods in GDP needs to increase by one percentage point[13].

The alternative specifications (columns (2) to (9)) show that a number of variables that were suspected to be related to changes in the VAT Gap appeared to be statistically insignificant at the p=0.05 level. This concerns some of the tax administration variables, i.e. the frequency of verification actions, the Fiscal Rules Index, and the frequency of electronic payments. The alternative fraud proxies, namely discrepancies in Intrastat registers and the frequency of using CPCs 42 and 64 appeared to be more weakly inter-related with the Gap as compared to the cross-border trade in risky goods. The alter native specifications also show that the share of small and medium-sized companies if measured by their share in overall employment could have a positive impact on the VAT Gap. However, due to the inter-relation between the sectoral structure of the economy and firm size, we decided to remove the firm size variable from the baseline equation. The equation with sectoral share variables appeared to translate larger proportion of variation than the equation with firm-size variables (column (5) and (6)).

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

Table 5.3. Econometric Specifications[14]

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	FE[15] (Baseline)	FE (Shadow economy)	FE (Sectors)	FE (Tax admin-istration)	FE (Firm size, employees)	FE (Firm size, GVA)	FE (CPC)	FE (Trade discrepancies)	FE (Fiscal prudence)
Macroeconomic variables									
GDP growth	−0.279***	−0.264***	−0.216**	−0.275***	−0.322***	−0.285***	−0.294***	−0.308***	−0.277***
General gov. surplus (deficit)	−0.291***	−0.279***	−0.309***	−0.302***	−0.226***	−0.206**	−0.254***	−0.241***	−0.295***
Tax administration variables									
IT expenditure	−0.184***	−0.173***	−0.182***	−0.190***	−0.148***	−0.147***	−0.172***	−0.17532***	−0.18532***
Verification actions				−0.034					
Electronic payments				−0.838					
Fiscal Rules Index									0.001
Economic structure and institutional variables									
Agriculture share	0.817***	0.796***	0.896**	0.850***			0.836***	0.819***	0.840***
Manufacturing share			−0.696*						
Construction share			−0.458*						
Retailers share			−0.103						
Communication share	−1.174***	−1.117***	−1.534***	−1.202***			−1.142***	−1.159***	−1.184***
Financial share	−0.889***	−0.898***	−0.746*	−0.852***			−0.797***	−0.826***	−0.887***
Real estate share			0.649						
R&D share			0.903*						
Public administration share			−0.641						
Shadow economy size		0.163*							

14 For illustrative purposes, Table 5.3 does not report the coefficients of fixed effects as well as two dummies that were introduced to account for the shifts of the VTTL in Malta and Ireland unrelated to a change in actual tax compliance (i.e. to filter VAT Gap measurement errors).

15 Fixed Effects (FE) specification.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	FE[15] (Baseline)	FE (Shadow economy)	FE (Sectors)	FE (Tax admin-istration)	FE (Firm size, employees)	FE (Firm size, GVA)	FE (CPC)	FE (Trade discrepancies)	FE (Fiscal prudence)
Small–size companies (employees)					0.272***				
Medium–size companies (employees)					0.271**				
Micro–size companies (GVA)						0.059			
Small–size companies (GVA)						0.363			
Medium–size companies (GVA)						−0.161			
Fraud proxies									
Import of risky products	1.006***	1.047***	1.312***	1.007***	0.413	0.747*			0.973**
CPC							−0.004*		
Intra–EU import at risk								0.021	
Constant	0.239***	0.201***	0.310	0.249***	−0.063	0.145***	0.238***	0.24005***	0.23962***
Observations	468	468	468	468	468	468	468	468	468
R–squared	0.384	0.388	0.429	0.388	0.334	0.316	0.378	0.376	0.384
Number of id	26	26	26	26	26	26	26	26	26

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

As a robustness check on the fixed effects specification, we show how the estimates of the model vary across time and countries. Table 5.4 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 2006–2017 (which were reported across subsequent studies). Columns 4 and 5 report the estimates for low and high VAT Gap countries. The last column shows the model estimated with the full interaction of the time period dummy and explanatory variables. In other words, such a specification allowed to differentiate the value of parameters between low and high VAT Gap Member States.

Table 5.4. Robustness Check

	(1)	(2)	(3)	(4)	(5)	(6)
	FE (Baseline)	F E(2000-2011)	FE (2006-2017)	FE (LOWVG)	FE (HIVG)	FE(INTERX_ LOWVG)
Macroeconomic variables						
GDP growth	−0.279***	−0.381***	−0.182**	0.359*	−0.384***	−0.360***
General gov. surplus (deficit)	−0.291***	−0.470***	−0.098	−0.346***	−0.273**	−0.299***
Tax administration variables						
IT expenditure	−0.185***	−0.229***	−0.142***	−0.209***	−0.089	−0.123*
Economic structure and institutional variables						
Agriculture share	0.817***	1.077***	−0.847	−4.191***	1.006***	0.867***
Communication share	−1.174***	−1.106*	−1.395***	−2.181***	−0.847*	−0.846*
Financial share	−0.889***	−0.850***	−0.180	−0.686**	−1.101***	−0.968***
Fraud proxies						
Import of risky products	1.006***	1.310	0.285	0.247	0.914**	1.209***
Constant	0.240***	0.229***	0.237***	0.330***	0.265***	0.277***
Observations	468	312	286	216	252	468
R-squared	0.384	0.333	0.469	0.355	0.479	0.422
Number of id	26	26	26	12	14	26

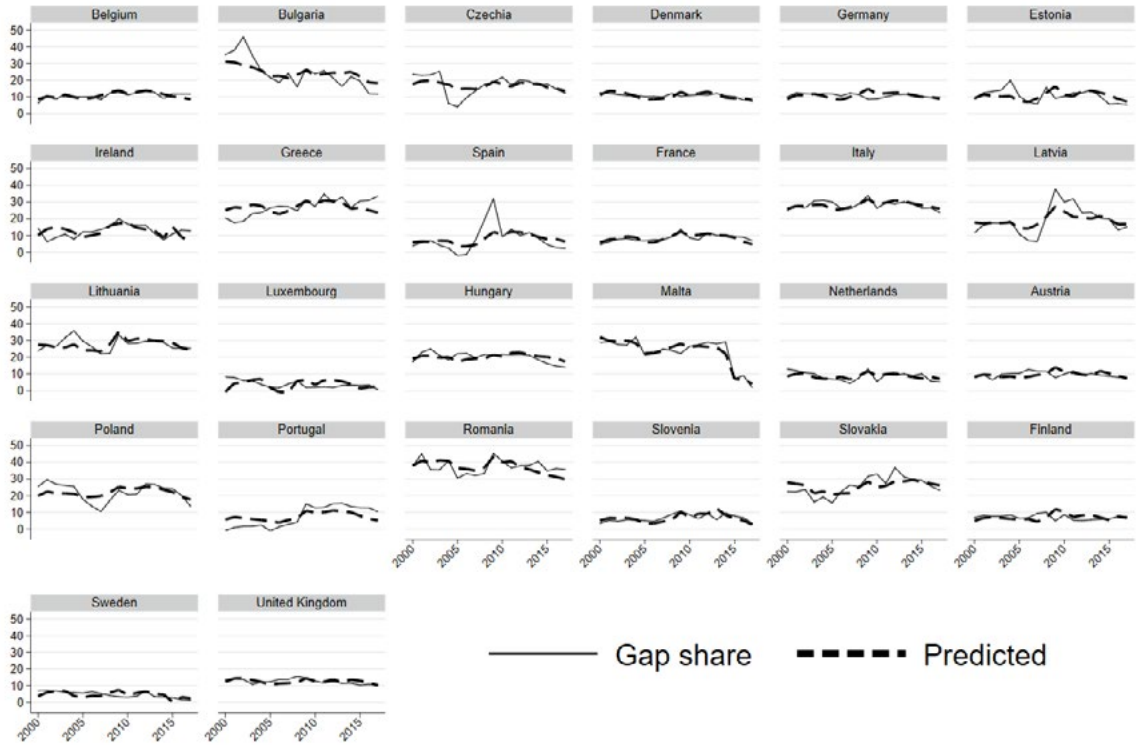
Source: own elaboration, *** p<0.01, ** p<0.05, * p<0.1

Table 5.4 shows that the baseline model and the model estimated on the 2000–2011 period show very similar results in the values of the estimated effects. In the model estimated on the 2006–2017 time period only (reducing the observations by half), the estimates remain similarly robust. In the equations estimated on different subgroups of countries, general government balances, IT expenditure, communication, and financial sectors, as well as import of risky products remain robust as well. The largest heterogeneity is observed for the share of agricultural sector, which changes sign in the models estimated on the 2006–2017 period and low VAT Gap Member States. Moreover, GDP growth coefficient appeared not to be significant for low VAT Gap counties at the p=0.05 level.

Aside from several robustness checks that were performed in order to assess the stability of the coefficients, we also look at the linear predictions for each MS (see Figure 5.5). They show that the model is accurate in predicting trends in VAT Gap changes.

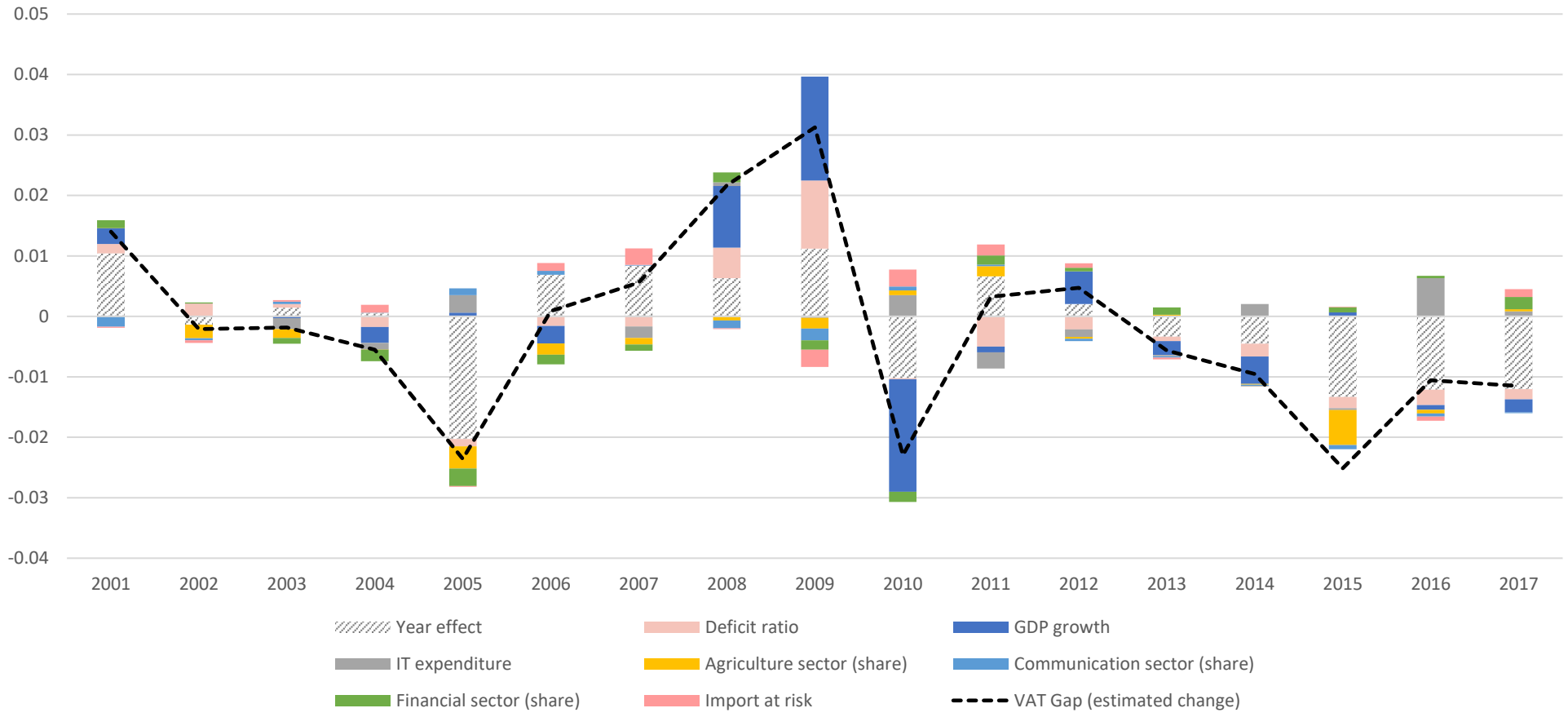
As Figure 5.6 shows, the model is able to attribute the majority of shifts in the overall EU VAT Gap to specific factors despite the time-effects used in the model (see Figure 5.6). The results yield an important conclusion – much of the variation in the VAT Gap, especially in periods of economic stress, comes from cyclical factors. The decrease in the VAT Gap in recent years is however only partially related to positive economic tailwinds. Most of the changes are attributed to year effects, which are likely related to efforts of tax administrations not captured by the model.

Figure 5.5. Linear Predictions Broken Out by Member State



Source: own elaboration. Cyprus and Croatia were not included as the estimates were unavailable for the entire analysed period.

Figure 5.6. Contributions to VAT Gap Change



Source: own elaboration.

6. The Potential Impact of the Coronavirus Recession on the Evolution of the VAT Gap

In this chapter, we examine the potential impact of the coronavirus recession on future VAT collections. The objective is to illustrate that both a decrease in the base as well as an increase in VAT non-compliance will negatively affect VAT revenue over the 2020–21 period.

To conduct our forecasts, we operationalise the numerical evidence from the econometric analysis presented in the preceding chapter. We use the coefficients of the interrelations between the VAT Gap and the macroeconomic indicators in the baseline model specification and the Spring Commission's macroeconomic forecasts as inputs. The predictions are based on the number of assumptions. Not only do we assume that the macroeconomic forecasts will be accurate, but we also assume that the control variables unrelated to the economic situation will not change. For this reason, prediction intervals are relatively large. The results for the EU are reported in the previous section, whereas the indicative results for each EU MS are shown in Annex C.

The ongoing COVID-19 recession that will be covered by future VAT Gap Studies is rapidly changing the conditions for collecting VAT, which have remained favourable in recent years. Due to the pandemic, in May 2020, the European Commission significantly revised its forecast of the main economic indicators[16]. It was estimated that the EU's GDP as a whole could contract by 7.4 percent in 2020 and grow by 6.1 percent in 2021 if the following scenario materialises:

a) the number of infections in the EU will remain under control even after the loosening of containment measures,
b) most of the lockdown measures will be gradually lifted and economic activity will not be affected greatly by the measures that will be kept in place, and
c) economic policies put in place by MS governments and the EU will prove to be effective in preventing high unemployment and mass bankruptcies.

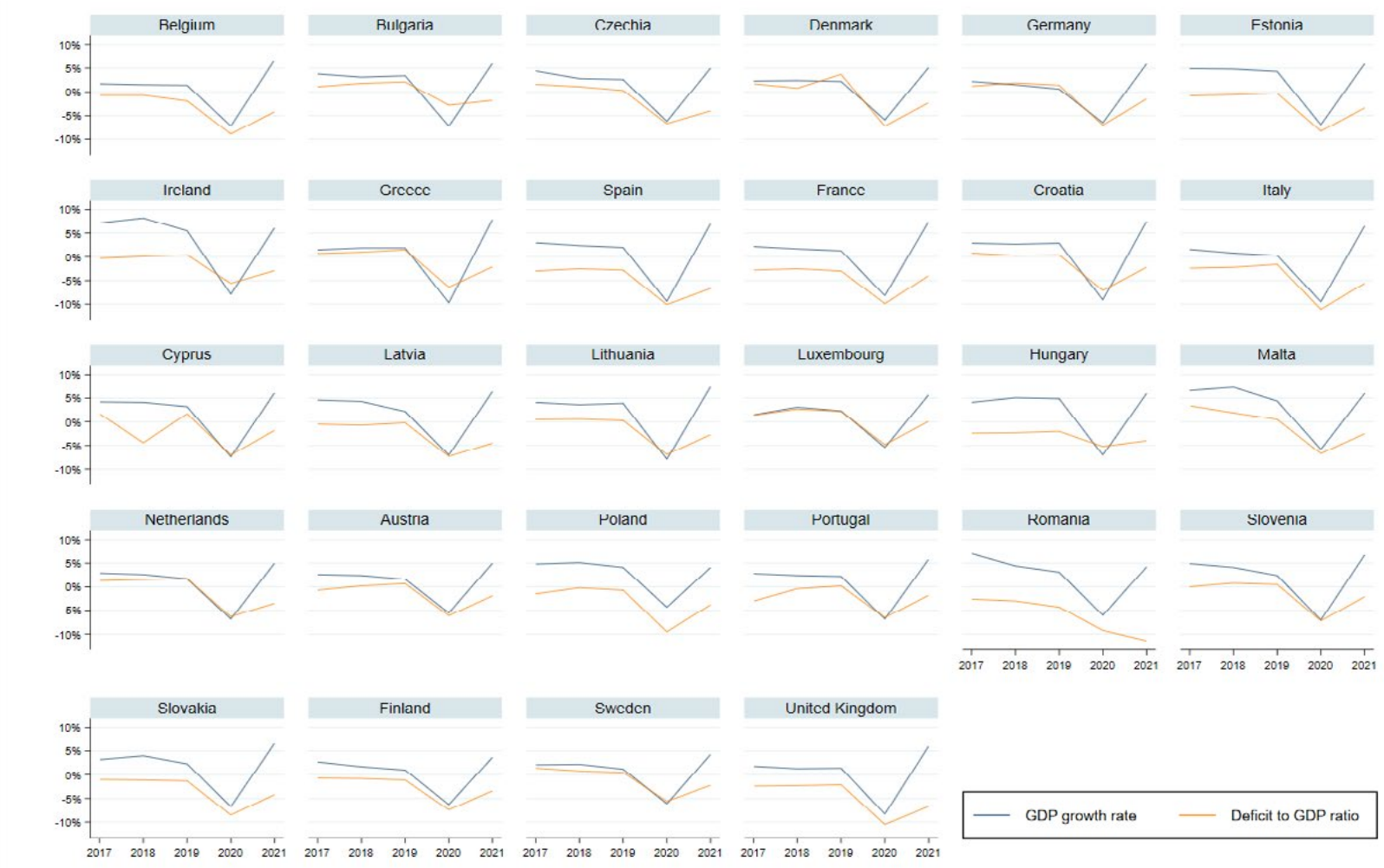
16 At the moment of publication of this Study, more up to date (interim) Summer Forecasts became available. However, as they did not include projections of government balances necessary for our projections, they were not included herein.

As shown in Figure 6.1, the estimates point to a rapid decline in GDP growth and a deterioration of general government balances in 2020. As a result of the recession, the VAT Gap in 2020 is forecasted to increase by 4.1 percentage points up to 13.7 percent (Figure 6.2 and 6.3). The hike in 2020 could be more pronounced than the gradual decrease of the Gap over the three preceding years. This means that the VAT Gap, as a percent of the VTTL, will be higher than in 2016 (Figure 6.3). In nominal terms, the VAT Gap is expected to reach over EUR 164 billion in 2020. A relatively smaller increase of the nominal VAT Gap is related to the sudden decline in the base over the forecasting period. Similarly, to aggregate results, the VAT Gap in most MS will fall rapidly in 2020 and will not fully recover by 2021. The least significant decline in compliance is expected in the EU MS predicted to be least affected by the economic crisis, such as Slovakia and Poland (see Annex B, Table B7 and Annex C)[17].

In 2021, the EU economies are expected to recover but only partially. It is expected that despite the stimulus measures introduced, the level of GDP in all EU MS will remain below 2019 nominal values and general government balances will be substantially worse than in 2019. If this scenario materialises, the VAT Gap in the EU would fall in relative terms compared to 2020 but would be unlikely to reach the 9.6 percent estimated for 2019. The scenario for 2021 still poses a number of uncertainties. For this reason, the model forecasts were not visualised herein.

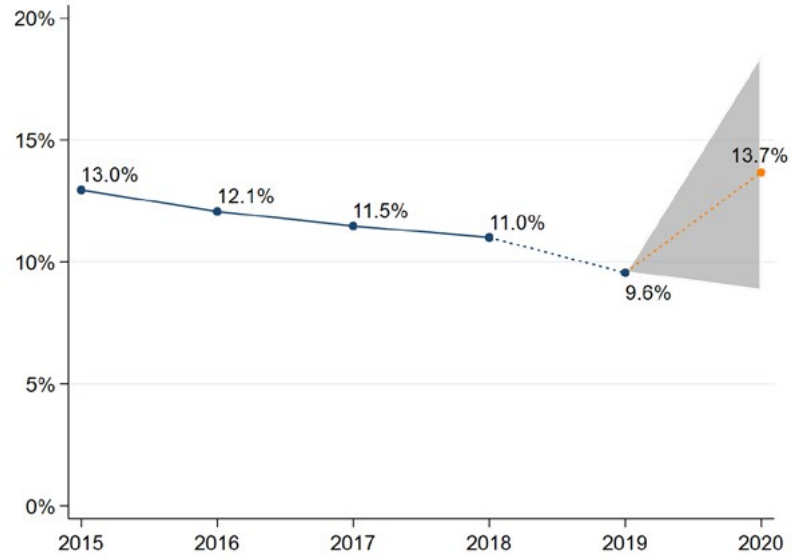
17 The forecasts are presented only for Member States, for which fast estimates for 2019 were available, namely EU28 excluding Cyprus, Luxembourg, Malta and the Netherlands.

Figure 6.1. 2020 Spring Forecasts of the European Commission (%)



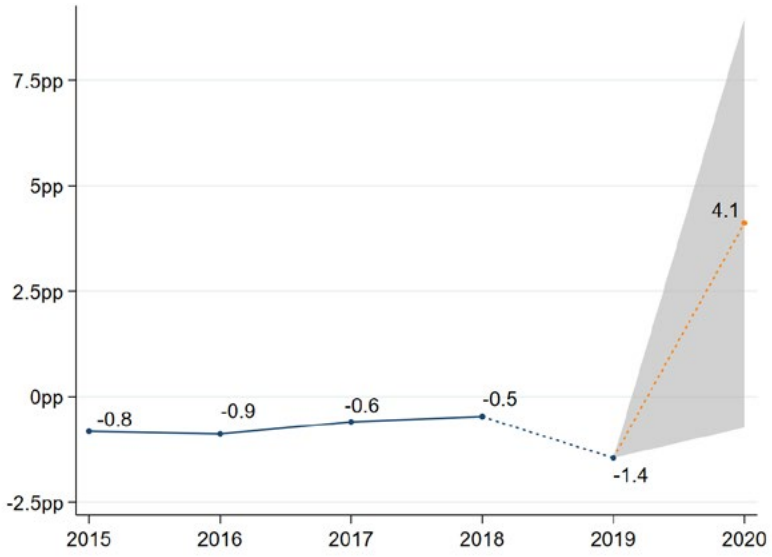
Source: European Commission.

Figure 6.2. Change in the VAT Gap and Prediction Intervals (increments, percentage points)



Source: own calculations.

Figure 6.3. VAT Gap and Prediction Intervals[18] (% of the VTTL)



Source: own calculations.

18 The prediction intervals were estimated for 95% on the basis of the standard errors of the actual VAT Gap estimates for 2016 and 2017 and the estimates of the model using a 2001–2015 series.

Annex A.
Methodological Considerations

This section of the Annex is based to a large extent on the methodological considerations already presented in earlier VAT Gap Reports. More detailed considerations regardingthe approaches to estimate the VAT Gap are presented in the seminal VAT Gap Report (Barbone et al., 2013).

a. Source of Revisions of VAT Gap Estimates

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.

In nominal terms, the most significant revisions in 2018 concerned Malta. The revision of the VTTL in Malta resulted from the availability of data from fiscal registers allowing for a more accurate estimation of the effective rates and propexes for four sectors crucial for the Maltese economy and its output, namely *Financial services, except insurance and pension funding* (NACE and CPA 64), *Insurance, reinsurance and pension funding services, except compulsory social security* (NACE and CPA 65), *Services auxiliary to financial services and insurance services* (NACE and CPA 66), and *Gambling and betting services* (NACE and CPA 92). Another noteworthy revision concerned Ireland and Germany. The estimates for these two countries were revised backwards due to an improved methodology for imputing missing and confidential values in Eurostat's SUT.

b. Decomposition of VAT Revenue

As VAT Revenue (VR) is the difference between the VTTL and the VAT Gap ($VR = VTTL - VAT\ Gap$, and the VTTL is a product of the effective rate and the base ($VTTL = effective\ rate \times base\ VAT\ Gap$), VAT revenue could be decomposed using the following formula:

$$VR = VTTL \times VAT\ compliance = effective\ rate \times base \times \left(1 - \frac{VAT\ Gap}{VTTL}\right)$$

$$\frac{\Delta VR}{VR} = \frac{\Delta(effective\ rate)}{effective\ rate} \times \frac{\Delta base}{base} \times \Delta\left(1 - \frac{VAT\ Gap}{VTTL}\right) \Big/ \left(1 - \frac{VAT\ Gap}{VTTL}\right)$$

Thus, the year-over-year relative change in revenue is denoted as:

where $\frac{\Delta(effective\ rate)}{effective\ rate}$ denotes change in effective rate, $\frac{\Delta base}{base}$ denotes change in base, and $\Delta\left(1 - \frac{VAT\ Gap}{VTTL}\right) \Big/ \left(1 - \frac{VAT\ Gap}{VTTL}\right)$ denotes change in VAT compliance.

c. Data Sources and Estimation Method

The method used to estimate the VAT Gap in this report uses a "top-down" approach. Top-down approaches rely on national accounts, which cover the full tax base and are an exhaustive description of all productive activities. On the contrary, "bottom-up" approaches use data gathered by tax administrations including audits, surveys, and enquiry programmes. This enables us to estimate non-compliance in VAT for specific taxpayer groups as well as types of non-compliance.

Within top-down approaches, VAT liability can be calculated using a "consumption-side" approach focused on the last link in the VAT chain (including intermediate consumption for exempt services) or a "production-side" approach that considers VAT due by each sector of economic activity*19*. If the choice of underlying observations is random or if it is possible to estimate selection bias, a "bottom-up" approach might be used to derive the economy-wide tax gap figure.

19 For more details see IMF (2017).

Aside from the different methodologies used, estimates of tax gaps could also be differentiated by the treatment of the tax collected by audit activities and assessed but finally not collected. The estimates presented herein show a "net" gap, meaning that they account for all revenue, including late payments and VAT collected in audit procedures. Estimates of a "gross gap" containing only the liabilities paid on time would be larger.

In the "top-down consumption-side" method that is utilised in this Report, the VTTL is estimated as the sum of the liability from six main components: household, government, and NPISH final consumption; intermediate consumption; GFCF; and other, largely country-specific, adjustments.

In the "top-down" approach, the VTTL is estimated using the following formula:

$$VTTL = \sum_{i=1}^{N} (rate_i \times Value_i) + \sum_{i=1}^{N} (rate_i \times propex_i \times IC\ Value_i) + \sum_{i=1}^{N} (rate_i \times propex_i \times GFCF\ Value_i) + net\ adjustments$$

Where:
Rate is the effective rate,
Value is the final consumption value,
IC Value is the value of intermediate consumption,
Propex is the percentage of output in a given sector that is exempt from VAT,
GFCF Value is the value of gross fixed capital formation, and
index *i* denotes sectors of the economy.

To summarise, the VTTL is a product of the VAT rates and the propexes multiplied by the theoretical values of consumption and investment (plus country-specific net adjustments).

For the purpose of VAT Gap estimation, roughly 10,000 parameters are estimated for each year, including the effective rates for each 2-digit CPA (i.e. $rate_i$ in the VTTL formula presented above) group of products and services and the percentage of output in a given sector that is exempt from VAT for each type of consumption (i.e. $propex_i$ in the VTTL formula presented above). For instance, for *Education services* (CPA no. 85) in Croatia, like for any other country and group of products and services, we estimated effective

rates in household, government, and NPISH final consumption, as well as the percentage of output that is exempt from VAT. The main source of information is national accounts data and ORS, i.e. VAT statements provided by MS to the European Commission. In a number of specific cases where ORS information was insufficient, additional data provided by MS were used. As these data are not official Eurostat publications, we decline responsibility for inaccuracies related to their quality.

A complete description of data and sources is shown in Table A1.

Table A1. Data Soures

	DESCRIPTION	PURPOSE	SOURCE	COMMENT
1	Household expenditure by CPA/COICOP category.	Estimation of effective rates for household final consumption for each 2-digit CPA category.	1ORS / HBS[20]	...
2	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 / assumptions common for all EU MS	...
3	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.
4	Government expenditure by CPA/COICOP category.	Estimation of effective rates for government final consumption for each 2-digit CPA category of products and services.	ORS	Only individual government consumption and social transfers in kind specifically are a part of the tax base. However, the effective rate is estimated using a broad definition of the base that includes entire government consumption.
5	NPISH expenditure by CPA/COICOP category.	Estimation of effective rates for NPISH final consumption for each 2-digit CPA category of products and services.	ORS	...
6	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.
7	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 RAS method[21].
8	VAT revenue.	VAT revenue.	Eurostat	...

Source: own.

20 Household Budget Survey, Eurostat.

21 The RAS method is an iterative proportional fitting procedure used in a situation when only row and column sums of a desired input-output table are known.

d. Fast VAT Gap Estimates

The methodology used to estimate the VTTL for 2019 differs markedly from the one employed to estimate the VTTL for 2014–2018. The main simplifications and assumptions include:

1 Structure of household final consumption does not change with respect to 2017. In fact, due to the unavailability of up-to-date figures, it relies in most cases on a three-year lagged series.
2) Non-deductible GFCF liability changes in line with the year-over-year change in government GFCF published by AMECO [22].
3) In the vast majority of cases where there are no significant changes in the statuary rates, net adjustments and intermediate consumption liability are rescaled from 2017 using growth rates for the entire tax base.

Due to the simplified methodology, uncertainty around the "fast estimates" is substantially larger than for the full estimates. For four MS, namely Cyprus, Luxembourg, the Netherlands, and Sweden, the estimation error was exceptionally large due to the considerable role of country-specific adjustments or to significant changes in the policy structure; hence, we decided not to publish these estimates. The "fast estimates" for 2019 are to be found in the Individual Country Results pages (Tables 3.1 to 3.28) and Annex B.

The accuracy of the fast estimates depends on the stability of the structure of the liability components, which results, among others, from economic conditions and tax policies. Regarding the "fast estimates" for 2018 published in the 2019 Report, the direction of year-over-year change was 78 percent in line with the change in sign indicated by the full estimates in the this Report. The mean prediction error was 1.05 percentage points. This relatively small error margin validates our approach and encourages us to continue the publication of the "fast estimates".

22 Source: https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/macro-economic-database-ameco_en

e. Derivation of the Policy Gap

This section of the Annex defines the concepts used in Chapter 5 for estimating foregone revenue due to policies introduced and discusses some of the methodological considerations.

We begin with the **Notional Ideal Revenue** that, by definition, should indicate an upper limit of VAT revenue (i.e. the revenue levied at a uniform rate in the environment of perfect tax compliance). As shown in Figure A1, ideal revenue is larger than the VTTL and subsequently larger than VAT collection. However, due to the existence of exemptions, it does not capture the entire VTTL and tax collection. If no exemptions were applied, neither intermediate consumption nor the GFCF of the business sector would be the base for computing the VTTL.

The problem arises when deciding whether investment by the non-business sector should be part of the VAT base. According to the OECD (2014), Notional Ideal Revenue is defined as the standard rate of VAT times the aggregate net final consumption. Multiplying the standard rate and final consumption would yield, however, lower liability than in the case where a country applied no exemptions, no reduced rates, and was able to enforce all tax payments. In real life, the VTTL is comprised partially from VAT liability from investment made by households, government, and NPISH. In the case of the non-inclusion of this investment to the base, the VTTL would be partially extended beyond the ideal revenue despite "no exemptions" present in the system (see Figure A1 (c)).

Policymakers can see the upper limit of VAT revenue by considering all final use categories of the household, non-profit, and government sectors. Thus, in this Report, Notional Ideal Revenue is defined as the standard rate of VAT times the aggregate net final and net GFCF of the household, non-profit, and government sectors, as recorded in the national accounts (interdependence among the various concepts presented is shown in Figure A1)[23].

The **Policy Gap** is defined as one minus the ratio of the "legal" tax liability (i.e. the chunk of the Notional Ideal Revenue that, in the counterfactual case of perfect tax compliance, is not collected due to the presence of exemptions and reduced rates). The Policy Gap is denoted by the following formula:

$$\textit{Policy Gap} = (\textit{Notional Ideal Revenue} - \textit{VTTL})/\textit{Notional Ideal Revenue}$$

23 National accounts for most countries report final consumption on a gross (i.e. VAT-inclusive) basis. Net consumption is estimated on the basis of the gross consumption recorded in the use tables, from which VAT revenues are subtracted.

The Policy Gap could be further decomposed to account for the loss of revenue. Such components are the **Rate Gap** and the **Exemption Gap**, which capture the loss in VAT liability due to the application of reduced rates and the loss in liability due to the implementation of exemptions.

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, and zero rates, is applied to final consumption. Thus, the Rate Gap captures the loss in revenue that a particular country incurs by adopting multiple VAT rates instead of a single standard rate (Barbone et al., 2015).

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[24]. Thus, the Exemption Gap captures the amount of revenue that might be lost because of exempted goods and services. Note that the Exemption Gap is composed of the loss in the VAT on the value added of exempt sectors, minus the VAT on their inputs, minus the VAT on GFCF inputs for these sectors. Thus, in principle, the Exemption Gap might be positive or negative (if the particular sector had negative value added, or if it had large GFCF expenditures relative to final consumption) (Barbone et al., 2015).

In algebraic terms, we have the following:

Definitions:

$T_i^{*,E} = \frac{VTTL_i^{*,E}}{C_i}$ – 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 the 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.

24 The additive decomposition of the Policy Gap into the Exemption and Rate Gap presented in this Report differs from that in Keen (2013). Keen (2013) defines the Rate Gap as the loss from applying reduced and zero rates to the final consumption liability, measured as a percentage of the Notional Ideal Revenue. The Exemption Gap measures unrecovered VAT accumulated in the production process as a percentage, on the contrary, of final consumption liability. Due to these definitions, the Policy Gap can be split multiplicatively into gaps attributable to reduced rates and exemptions. Since the numerator of the "[1 – Rate Gap]" and denominator of the "[1 – Exemption Gap]" are equal, multiplication of these two components yields – VAT revenue as a percentage of Notional Ideal Revenue, which equals "[1 – Policy Gap]" (Barbone et al., 2015).

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

τ_s – statutory rate.

$i \in (1; 65)$ – sectors of the economy.

Policy Gap:

$$1 - P = \left(\frac{\sum_{i=1}^{N} T_i C_i}{\tau_s \sum_{i=1}^{N} C_i}\right)\left(\frac{\sum_{i=1}^{N} T_i^* C_i}{\sum_{i=1}^{N} T_i C_i}\right) = \left(\frac{\sum_{i=1}^{N} T_i^* C_i}{\tau_s \sum_{i=1}^{N} C_i}\right)$$

Exemption Gap:

$$1 - P_E = \left(\frac{\sum_{i=1}^{N} T_i C_i}{\tau_s \sum_{i=1}^{N} C_i}\right)\left(\frac{\sum_{i=1}^{N} T_i^{*,E} C_i}{\sum_{i=1}^{N} T_i C_i}\right) = \left(\frac{\sum_{i=1}^{N} T_i^{*,E} C_i}{\tau_s \sum_{i=1}^{N} C_i}\right)$$

Rate Gap:

$$1 - P_R = \left(\frac{\sum_{i=1}^{N} T_i C_i}{\tau_s \sum_{i=1}^{N} C_i}\right)\left(\frac{\sum_{i=1}^{N} T_i^{*,R} C_i}{\sum_{i=1}^{N} T_i C_i}\right) = \left(\frac{\sum_{i=1}^{N} T_i^{*,R} C_i}{\tau_s \sum_{i=1}^{N} C_i}\right)$$

By definition we have:

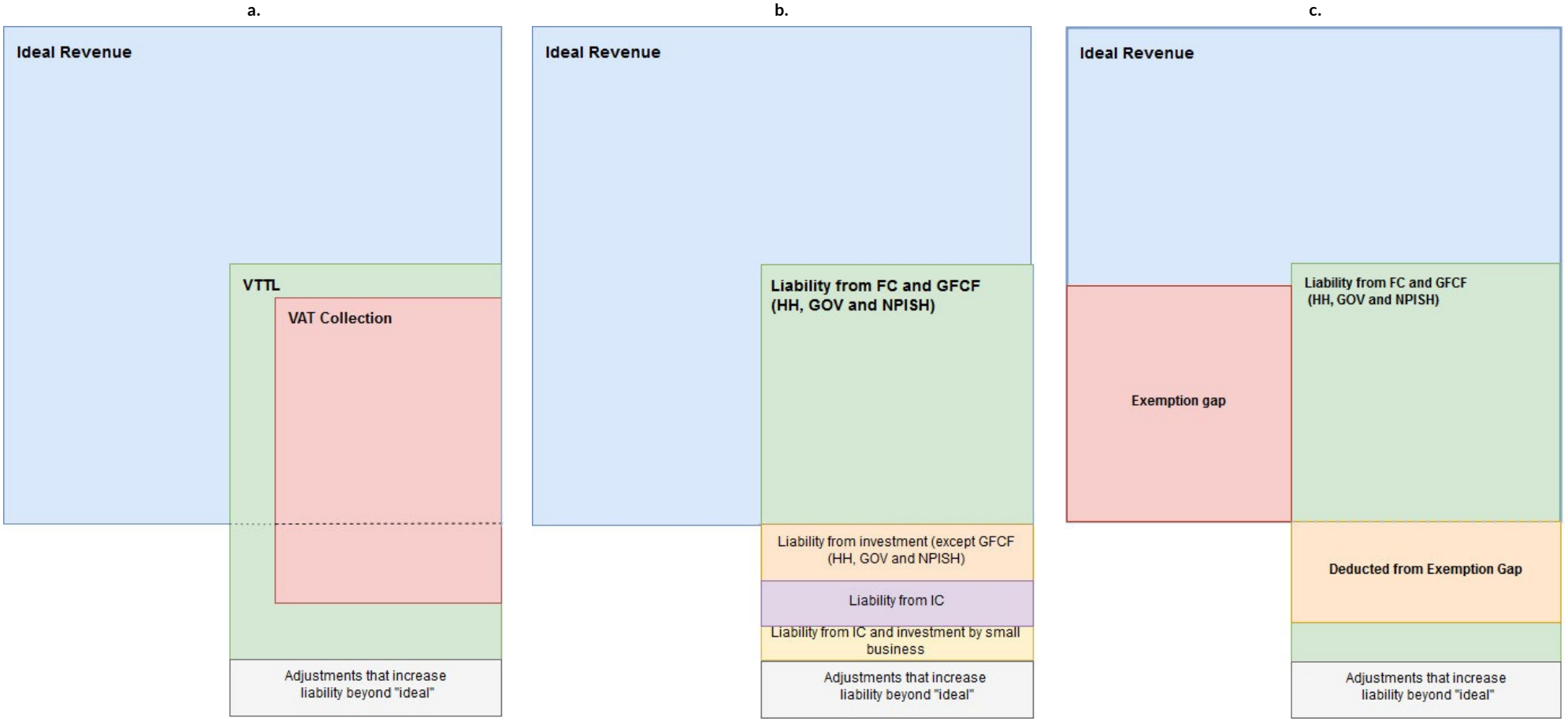
$$\tau_s \sum_{i=1}^{N} C_i = \sum_{i=1}^{N} T_i^* C_i + \left(\tau_s \sum_{i=1}^{N} C_i - \sum_{i=1}^{N} T_i^* C_i\right)$$
$$= \sum_{i=1}^{N} T_i^* C_i + \left(\tau_s \sum_{i=1}^{N} C_i - \sum_{i=1}^{N} T_i^{*,R} C_i\right) + \left(\tau_s \sum_{i=1}^{N} C_i - \sum_{i=1}^{N} T_i^{*,E} C_i\right)$$

Thus:

$$P = 1 - \left(\frac{\sum_{i=1}^{N} T_i^* C_i}{\tau_s \sum_{i=1}^{N} C_i}\right) = \left(\frac{\tau_s \sum_{i=1}^{N} C_i - \sum_{i=1}^{N} T_i^* C_i}{\tau_s \sum_{i=1}^{N} C_i}\right) = \left(\frac{2\tau_s \sum_{i=1}^{N} C_i - \sum_{i=1}^{N} T_i^{*,E} C_i - \sum_{i=1}^{N} T_i^{*,R} C_i}{\tau_s \sum_{i=1}^{N} C_i}\right)$$
$$= P_R + P_E$$

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 Barbone et al. (2015), the Actionable Exemption Gap, which excludes the services and notional values that are unlikely to be taxed even in an ideal world.

Figure A1. Components of Ideal Revenue, VTTL, and VAT Collection



Source: own.

f. 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 5.4. To test whether the data matrix could result in unstable coefficient estimates, we used singular value decomposition method. In all of the data matrices underlying 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 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 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 heteroskedasticity. The residuals of all model specifications appeared to be homoscedastic, stationary, and I(0).

Annex B.
Statistical Appendix

Table B1. VTTL (EUR million)

	2014	2015	2016	2017	2018
Belgium	30,272	31,416	32,263	33,619	34,670
Bulgaria	4,896	5,045	5,037	5,313	5,711
Czechia	13,948	15,019	15,455	16,694	18,261
Denmark	27,955	28,610	29,308	30,475	31,369
Germany	229,881	232,507	239,911	248,382	257,207
Estonia	1,911	1,986	2,090	2,286	2,458
Ireland	12,406	13,543	14,027	14,652	15,857
Greece	17,287	18,545	20,591	21,898	21,858
Spain	69,824	72,283	74,791	79,003	82,470
France	165,520	167,521	168,611	173,840	180,406
Croatia		6,329	6,440	6,843	7,198
Italy	137,817	139,703	140,400	142,939	144,772
Cyprus			1,761	1,859	2,028
Latvia	2,248	2,348	2,329	2,512	2,705
Lithuania	3,879	3,876	4,015	4,422	4,754
Luxembourg	3,888	3,510	3,736	3,525	3,928
Hungary	11,969	12,693	12,338	13,564	14,140
Malta	935	861	925	984	1,084
Netherlands	47,199	49,756	50,500	52,329	54,897
Austria	27,955	28,736	29,768	30,949	32,231
Poland	38,799	39,922	38,731	42,374	44,862
Portugal	17,020	17,598	17,890	18,872	19,754
Romania	19,347	19,856	17,486	17,727	19,485
Slovenia	3,490	3,491	3,504	3,640	3,913
Slovakia	7,133	7,398	6,866	7,362	7,899
Finland	20,181	20,069	20,679	21,510	22,171
Sweden	40,148	41,709	43,435	44,987	43,739
United Kingdom	177,775	203,309	187,630	184,706	192,126
EU-28, EU-27 (2015), EU-26 (2014)	**1,133,681**	**1,187,640**	**1,190,518**	**1,227,266**	**1,271,953**

Source: own calculations.

Table B2. Household VAT Liability (EUR million)

	2014	2015	2016	2017	2018
Belgium	17,326	17,714	18,522	19,230	19,688
Bulgaria	3,533	3,615	3,711	3,977	4,233
Czechia	8,917	9,311	9,776	10,535	11,347
Denmark	16,165	16,604	17,289	17,814	18,438
Germany	142,430	141,011	144,979	149,029	152,971
Estonia	1,338	1,374	1,436	1,530	1,652
Ireland	7,418	7,732	7,815	8,101	8,522
Greece	12,750	13,695	15,673	16,386	16,653
Spain	50,920	52,864	55,178	57,795	59,613
France	98,441	98,826	100,505	102,189	105,477
Croatia		4,555	4,690	4,970	5,241
Italy	97,232	99,621	99,890	100,918	102,246
Cyprus			1,130	1,188	1,245
Latvia	1,748	1,801	1,847	1,965	2,074
Lithuania	3,168	3,164	3,315	3,590	3,839
Luxembourg	1,237	1,289	1,331	1,361	1,469
Hungary	8,297	8,605	9,034	9,471	9,524
Malta	460	488	517	538	582
Netherlands	25,363	25,953	26,218	27,101	28,290
Austria	18,992	19,259	19,885	20,623	21,321
Poland	26,878	27,603	27,432	29,835	31,141
Portugal	12,823	13,190	13,345	13,843	14,397
Romania	11,677	12,086	10,909	11,338	12,846
Slovenia	2,442	2,448	2,573	2,682	2,820
Slovakia	5,303	5,136	5,111	5,421	5,744
Finland	11,074	11,386	11,575	11,830	12,198
Sweden	20,672	21,108	21,539	22,125	21,734
United Kingdom	118,086	133,965	124,855	123,266	127,658
EU-28, EU-27 (2015), EU-26 (2014)	**724,690**	**754,404**	**760,080**	**778,654**	**802,964**

Source: own calculations.

Table B3. Intermediate Consumption and Government VAT Liability (EUR million)

	2014	2015	2016	2017	2018
Belgium	7,528	8,110	8,289	8,606	8,878
Bulgaria	722	708	734	794	897
Czechia	3,312	3,530	3,711	3,971	4,372
Denmark	7,795	7,872	7,619	8,043	8,246
Germany	48,657	51,429	53,680	55,605	57,926
Estonia	266	279	326	352	382
Ireland	3,372	3,991	4,022	4,164	4,633
Greece	2,183	2,461	2,681	2,807	2,885
Spain	10,938	10,884	11,046	11,796	12,547
France	28,782	31,790	32,198	33,099	33,955
Croatia		1,095	1,151	1,210	1,255
Italy	23,597	23,556	23,355	24,631	24,748
Cyprus			479	476	514
Latvia	336	366	369	383	405
Lithuania	415	446	448	482	512
Luxembourg	905	1,102	1,171	1,204	1,304
Hungary	1,977	2,102	2,054	2,218	2,320
Malta	410	271	326	356	396
Netherlands	13,409	14,313	14,259	14,642	15,317
Austria	5,050	5,131	5,130	5,276	5,668
Poland	7,180	7,682	7,589	8,242	8,563
Portugal	2,853	2,877	3,218	3,463	3,642
Romania	3,136	3,012	2,522	2,631	2,848
Slovenia	560	544	554	544	612
Slovakia	976	1,067	1,002	1,031	1,158
Finland	5,010	4,754	4,900	5,080	5,160
Sweden	11,981	12,400	12,719	12,962	12,443
United Kingdom	42,476	49,632	44,030	42,253	44,230
EU-28, EU-27 (2015), EU-26 (2014)	**233,826**	**251,403**	**249,582**	**256,323**	**265,817**

Source: own calculations.

Table B4. GFCF VAT Liability (EUR million)

	2014	2015	2016	2017	2018
Belgium	4,739	4,957	4,808	5,106	5,440
Bulgaria	600	679	585	534	568
Czechia	1,744	2,192	1,971	2,196	2,502
Denmark	3,276	3,402	3,639	3,826	3,890
Germany	37,176	37,843	39,483	41,458	44,070
Estonia	298	323	318	392	418
Ireland	1,443	1,649	1,995	2,173	2,498
Greece	2,114	2,143	1,948	2,404	2,012
Spain	7,311	7,777	7,891	8,708	9,576
France	32,852	31,667	30,719	33,308	35,550
Croatia		592	567	635	668
Italy	13,305	13,318	13,883	14,005	14,366
Cyprus			134	172	243
Latvia	211	238	175	227	290
Lithuania	442	461	470	505	552
Luxembourg	348	411	626	541	726
Hungary	1,506	1,809	1,092	1,682	2,166
Malta	63	82	58	72	88
Netherlands	7,867	8,962	9,481	10,038	10,744
Austria	2,585	2,890	3,284	3,467	3,676
Poland	4,033	4,072	3,139	3,701	4,552
Portugal	1,017	1,170	941	1,194	1,295
Romania	3,821	4,193	3,638	3,478	3,541
Slovenia	401	419	303	346	406
Slovakia	869	1,206	763	916	992
Finland	3,498	3,316	3,513	3,839	4,096
Sweden	6,861	7,521	8,486	9,166	8,865
United Kingdom	15,202	18,555	17,396	17,022	17,693
EU-28, EU-27 (2015), EU-26 (2014)	**153,583**	**161,849**	**161,308**	**171,109**	**181,482**

Source: own calculations.

Table B5. VAT Revenues (EUR million)

	2014	2015	2016	2017	2018
Belgium	27,518	27,594	28,750	29,763	31,053
Bulgaria	3,810	4,059	4,417	4,664	5,097
Czechia	11,602	12,382	13,101	14,703	16,075
Denmark	24,950	25,672	26,770	27,966	29,121
Germany	203,081	211,616	218,779	226,582	235,130
Estonia	1,711	1,873	1,975	2,149	2,331
Ireland	11,528	11,831	12,603	13,060	14,175
Greece	12,676	12,885	14,333	14,642	15,288
Spain	62,825	67,913	70,214	73,970	77,561
France	148,454	151,680	154,490	162,011	167,618
Croatia		5,699	5,992	6,465	6,946
Italy	96,567	100,345	102,086	107,576	109,333
Cyprus			1,664	1,765	1,951
Latvia	1,787	1,876	2,032	2,164	2,449
Lithuania	2,764	2,889	3,028	3,310	3,522
Luxembourg	3,749	3,420	3,422	3,433	3,729
Hungary	9,754	10,676	10,595	11,729	12,950
Malta	642	673	712	810	920
Netherlands	42,951	44,746	47,849	49,833	52,619
Austria	25,386	26,247	27,301	28,304	29,323
Poland	29,317	30,075	30,838	36,330	40,411
Portugal	14,682	15,368	15,767	16,810	17,865
Romania	11,496	12,939	10,968	11,650	12,890
Slovenia	3,155	3,220	3,319	3,482	3,765
Slovakia	5,021	5,423	5,424	5,919	6,319
Finland	18,948	18,974	19,694	20,404	21,364
Sweden	38,846	40,501	42,770	44,115	43,433
United Kingdom	158,347	183,164	167,827	162,724	168,674
EU-28, EU-27 (2015), EU-26 (2014)	**971,566**	**1,033,741**	**1,046,721**	**1,086,332**	**1,131,912**

Source: Eurostat.

Table B6. VAT Gap (EUR million)

	2014	2015	2016	2017	2018
Belgium	2,755	3,822	3,513	3,856	3,617
Bulgaria	1,086	985	620	649	614
Czechia	2,345	2,637	2,354	1,991	2,187
Denmark	3,006	2,938	2,539	2,509	2,248
Germany	26,800	20,891	21,132	21,800	22,077
Estonia	200	113	115	137	127
Ireland	878	1,712	1,425	1,592	1,682
Greece	4,611	5,660	6,258	7,256	6,570
Spain	6,999	4,370	4,577	5,033	4,909
France	17,066	15,841	14,121	11,829	12,788
Croatia		630	447	378	252
Italy	41,250	39,358	38,314	35,363	35,439
Cyprus			97	93	77
Latvia	460	472	297	348	256
Lithuania	1,115	987	988	1,111	1,232
Luxembourg	139	90	314	92	199
Hungary	2,215	2,018	1,743	1,835	1,190
Malta	293	188	213	174	164
Netherlands	4,248	5,010	2,651	2,496	2,278
Austria	2,569	2,489	2,466	2,645	2,908
Poland	9,483	9,847	7,893	6,044	4,451
Portugal	2,338	2,230	2,123	2,062	1,889
Romania	7,850	6,917	6,518	6,077	6,595
Slovenia	335	271	186	159	148
Slovakia	2,112	1,975	1,443	1,443	1,579
Finland	1,233	1,095	985	1,106	807
Sweden	1,302	1,207	665	872	306
United Kingdom	19,427	20,144	19,802	21,982	23,452
EU-28, EU-27 (2015), EU-26 (2014)	**162,115**	**153,899**	**143,798**	**140,935**	**140,042**

Source: own calculations.

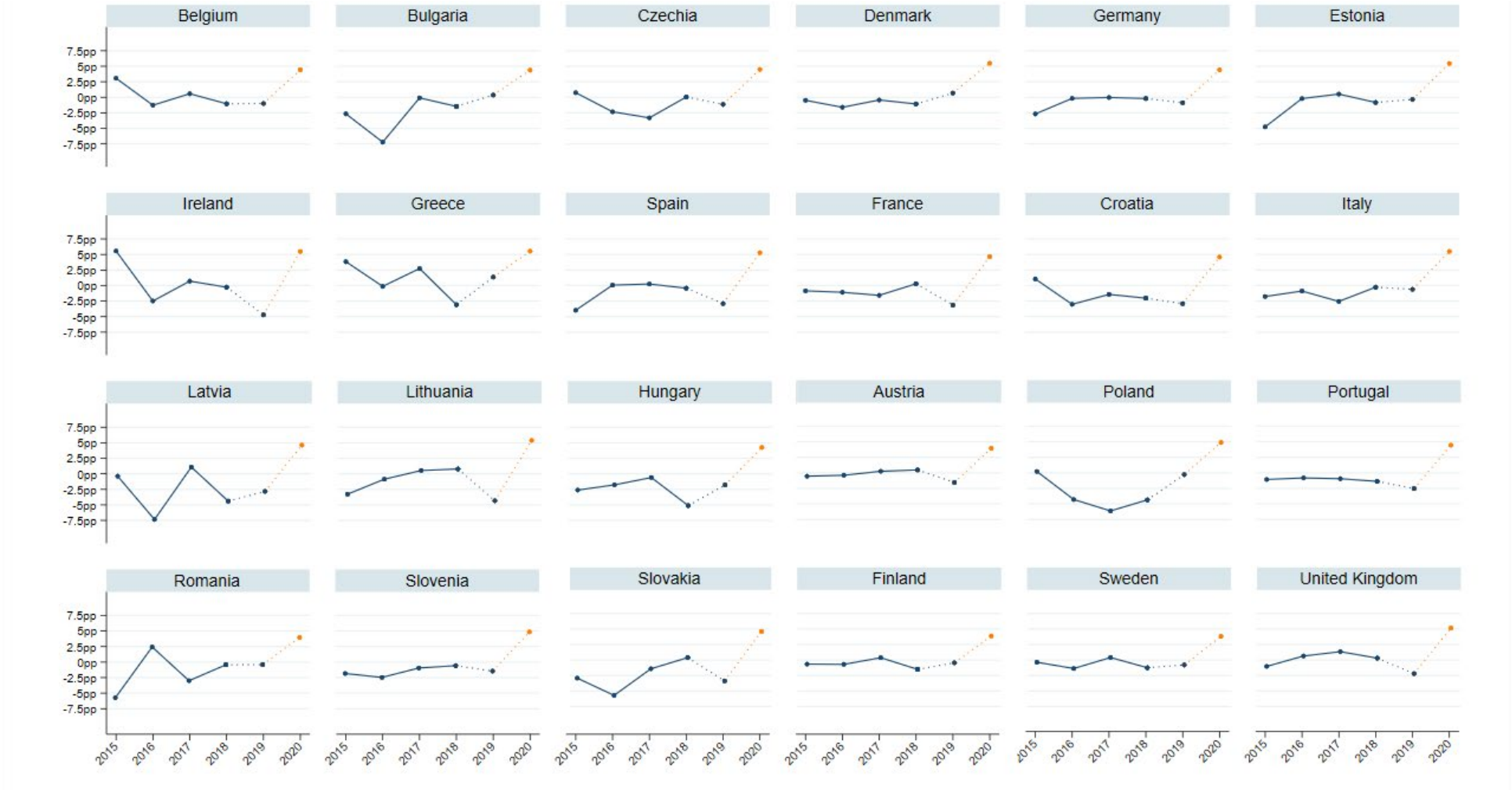
Table B7. VAT Gap (percent of VTTL)

	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
Belgium	6.4%	10.9%	8.7%	11.9%	10.3%	10.0%	10.3%	8.6%	12.3%	13.0%	11.3%	12.6%	14.4%	12.7%	9.1%	12.2%	10.9%	11.5%	10.4%	9.4%	13.9%
Bulgaria	35.4%	38.0%	46.0%	34.9%	25.8%	21.7%	18.7%	24.2%	16.1%	27.0%	24.0%	25.7%	21.4%	16.3%	22.2%	19.5%	12.3%	12.2%	10.8%	11.1%	15.5%
Czechia	23.6%	22.9%	23.3%	25.5%	6.1%	4.2%	9.7%	13.6%	17.4%	19.0%	21.9%	17.3%	20.4%	19.3%	16.8%	17.6%	15.2%	11.9%	12.0%	10.8%	15.3%
Denmark	12.6%	12.1%	11.5%	10.9%	11.0%	10.3%	10.4%	10.0%	12.1%	10.6%	11.0%	11.4%	11.2%	12.2%	10.8%	10.3%	8.7%	8.2%	7.2%	7.8%	13.3%
Germany	10.2%	12.6%	12.1%	11.9%	12.2%	12.0%	10.7%	12.4%	11.6%	8.8%	9.0%	10.3%	11.5%	11.8%	11.7%	9.0%	8.8%	8.8%	8.6%	7.7%	12.1%
Estonia	9.0%	12.5%	13.3%	14.1%	20.0%	10.4%	6.9%	5.7%	15.7%	9.3%	10.5%	12.4%	12.5%	14.1%	10.4%	5.7%	5.5%	6.0%	5.2%	4.8%	10.3%
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%	10.9%	10.6%	5.9%	11.4%
Greece	20.5%	17.7%	18.5%	23.0%	23.7%	26.5%	27.5%	27.2%	24.9%	30.7%	27.3%	34.8%	29.6%	33.0%	26.7%	30.5%	30.4%	33.1%	30.1%	31.4%	36.9%
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%	6.4%	6.0%	3.1%	8.4%
France	4.4%	6.3%	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%	9.5%	8.4%	6.8%	7.1%	3.9%	8.6%
Croatia																10.0%	6.9%	5.5%	3.5%	0.6%	5.2%
Italy	26.5%	28.5%	27.8%	31.8%	32.3%	31.2%	27.6%	27.2%	30.1%	35.2%	27.6%	30.7%	30.0%	31.3%	29.9%	28.2%	27.3%	24.7%	24.5%	23.9%	29.4%
Cyprus																	5.5%	5.0%	3.8%		
Latvia	11.7%	16.5%	17.5%	17.5%	18.7%	10.9%	7.2%	6.7%	21.6%	37.9%	30.1%	32.0%	23.7%	24.0%	20.5%	20.1%	12.8%	13.9%	9.5%	6.6%	11.3%
Lithuania	23.9%	27.1%	26.3%	31.6%	35.8%	29.6%	26.3%	22.1%	22.4%	33.4%	28.1%	28.3%	29.5%	29.5%	28.7%	25.5%	24.6%	25.1%	25.9%	21.6%	27.0%
Luxembourg	8.4%	8.1%	6.3%	6.1%	3.9%	2.2%	1.9%	4.1%	6.0%	2.1%	2.2%	2.5%	2.1%	3.3%	3.6%	2.6%	8.4%	2.6%	5.1%		
Hungary	17.0%	22.9%	25.0%	21.0%	18.5%	22.2%	22.4%	19.5%	21.6%	21.4%	21.7%	21.5%	21.7%	21.1%	18.5%	15.9%	14.1%	13.5%	8.4%	6.6%	10.9%
Malta	30.9%	31.5%	29.8%	29.5%	34.3%	23.5%	24.2%	27.2%	26.3%	24.6%	28.7%	29.7%	31.1%	30.2%	31.3%	21.8%	23.0%	17.7%	15.1%	16.8%	21.8%
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%	4.8%	4.2%		
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%	8.5%	9.0%	7.5%	11.4%
Poland	25.4%	29.4%	26.8%	26.1%	25.4%	17.8%	13.7%	10.5%	17.1%	23.3%	20.6%	20.8%	27.1%	26.6%	24.4%	24.7%	20.4%	14.3%	9.9%	9.7%	14.6%
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%	10.9%	9.6%	7.0%	11.5%
Romania	37.7%	45.0%	35.5%	35.4%	40.9%	30.6%	33.4%	32.2%	33.4%	45.4%	40.7%	36.6%	37.9%	38.1%	40.6%	34.8%	37.3%	34.3%	33.8%	33.4%	37.4%
Slovenia	3.4%	5.3%	4.8%	5.7%	5.5%	5.1%	4.7%	6.5%	8.8%	10.6%	8.5%	6.3%	9.3%	5.7%	9.6%	7.8%	5.3%	4.4%	3.8%	2.3%	7.2%
Slovakia	22.5%	22.4%	23.7%	16.2%	19.1%	15.7%	22.4%	26.3%	25.2%	31.6%	33.0%	27.2%	36.7%	31.4%	29.6%	26.7%	21.0%	19.6%	20.0%	16.6%	21.2%
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%	5.1%	3.6%	3.2%	7.1%
Sweden	7.2%	7.3%	7.1%	6.2%	5.9%	5.6%	6.6%	5.4%	4.2%	3.4%	3.1%	3.8%	6.7%	3.4%	3.2%	2.9%	1.5%	1.9%	0.7%		

Source: own calculations.

Annex C. Additional Graphs

Figure C1. VAT Gap Forecasts for 2020 (increments, pp)



Source: own calculations.

References

Aizenman, J., Y. Jinjarak (2008), The collection efficiency of the Value Added Tax: Theory and international evidence, *Journal of International Trade & Economic Development*, 17(3): 391–410.

Allison, P.D. (2001), *Missing Data*, Sage, Thousand Oaks.

Barbone, L., M. Belkindas, L. Bettendorf, R. Bird, M. Bonch-Osmolovskiy, M. Smart (2013), *Study to quantify and analyse the VAT Gap in the EU-27 Member States*, Final Report of project TAXUD/2012/DE/316.

Barbone, L., M. Bonch-Osmolovskiy, G. Poniatowski (2014), *2012 Update Report to the Study to quantify and analyse the VAT Gap in the EU-27 Member States*, Report of project TAXUD/2013/DE/321.

Barbone, L., M. Bonch-Osmolovskiy, G. Poniatowski (2015), *2013 Update Report to the Study to quantify and analyse the VAT Gap in the EU Member States*, Report of project TAXUD/2013/DE/321.

Carfora, A., S. Dongiovanni, A. Marabucci, S. Pisani (2020), *The Impact of Domestic Factors and Spillover Effects on EU Countries VAT Gap*, Agenzia Entrate, Discussion Papers, N. 1/2020.

Casey, P., P. Castro (2015), *Electronic Fiscal Devices (EFDs) An Empirical Study of their Impact on Taxpayer Compliance and Administrative Efficiency?*, IMF Working Paper No. 15–73.

European Commission (2016), *The Concept of Tax Gaps: Report on VAT Gap Estimations*, FISCALIS Tax Gap Project Group (FPG/041).

European Commission (2018), *The concept of Tax Gaps Report III: MTIC Fraud Gap estimation methodologies*.

Feinstein, J. S. (1991), An Econometric Analysis of Income Tax Evasion and its Detection, *RAND Journal of Economics*, 22(1): 14–35.

Harris, R. D. F., E. Tzavalis. (1999), Inference for unit roots in dynamic panels where the time dimension is fixed, *Journal of Econometrics*, 91: 201–226.

Im, K. S., M. H. Pesaran, Y. Shin. (2003), Testing for unit roots in heterogeneous panels, *Journal of Econometrics*, 115: 53–74.

Keen, M. (2013), *The Anatomy of the VAT*, IMF Working Paper, WP/13/111, May.

Keen, M., S. Smith (2007), *What Do We Know, and What Can be Done?* IMF Working Paper No. 07/31.

Kleinke, K., M. Stemmler, J. Reinecke, F. Lösel (2011), Efficient ways to impute incomplete panel data, *AStA Advances in Statistical Analysis*, 95(4): 351–373.

Lešnik, T., T. Jagrič, V. Jagrič (2018), VAT gap dependence and fiscal administration measures, *Naše gospodarstvo/Our economy*, 64(2): 43–51.

Levin, A., C.-F. Lin, C.-S. J. Chu. (2002), Unit root tests in panel data: Asymptotic and finite-sample properties, *Journal of Econometrics*, 108: 1–24.

Little, R. J. A., D. B. Rubin, (1987), *Statistical analysis with missing data*, New York, NY: Wiley.

OECD (2014), *VAT Revenue Ratio (VRR), in Consumption Tax Trends 2014: VAT/GST and excise rates, trends and policy issues*, OECD Publishing, Paris.

Pedroni P. (1999), *Critical values for cointegration tests in heterogeneous panels with multiple regressors*, Oxford. B. Econ. Stat., 61: 653–670.

Poniatowski, G., M. Bonch-Osmolovskiy, A. Śmietanka (2017), *Study and Reports on the VAT Gap in the EU-28 Member States: 2017 Final Report*, TAXUD/2015/CC/131.

Poniatowski, G., M. Bonch-Osmolovskiy, J. Durán-Cabré, A. Esteller-Moré A. Śmietanka (2018), *Study and Reports on the VAT Gap in the EU-28 Member States: 2018 Final Report*, TAXUD/2015/CC/131.

Poniatowski, G., M. Bonch-Osmolovskiy, J. Durán-Cabré, A. Esteller-Moré A. Śmietanka (2019), *Study and Reports on the VAT Gap in the EU-28 Member States: 2019 Final Report*, TAXUD/2015/CC/131.

Poniatowski, G., M. Bonch-Osmolovskiy, M. Belkindas (2016), *2014 Update Report to the Study to quantify and analyse the VAT Gap in the EU Member States*, Report of project TAXUD/2015/CC/131.

Sczypińska, A. (2019), What drives the VAT gap in the European Union?, *Roczniki Kolegium Analiz Ekonomicznych*, 55: 69–72.

Slemrod, J., S. Yitzhaki (1987), The optimal size of a tax collection agency, *Scandinavian Journal of Economics*, 89: 25–34.

Zídková, H (2014), Determinants of VAT gap in EU, *Prague Economic Papers*, 23(4): 514–530.