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What drives consumption
tax revenues? Disentangling
policy and macroeconomic
drivers

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Michelle Harding**

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OECD Taxation Working Papers

What Drives Consumption Tax Revenues?

Disentangling policy and macroeconomic drivers

By Hannah Simon & Michelle Harding

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Abstract

This paper decomposes consumption tax revenues in OECD countries into the implicit tax rate (ITR) and consumption relative to GDP, to identify how economic downturns affect consumption tax revenues. It further considers the impact of changes in VAT efficiency and VAT rates on ITRs. The analysis finds that the observed stability in consumption tax revenues results from offsetting changes in the ITRs and in consumption as a share of GDP, arising from both macroeconomic changes and intentional policy changes. During the economic crisis in 2007-2009, lasting changes in consumption patterns, notably increases in government spending and in private consumption of necessity goods, adversely affected the efficiency of VAT systems. These changes have not since been reversed, suggesting that consumption tax revenues are now less robust to economic shocks. Broadening the VAT base and narrowing the scope of reduced rates can help to stabilise consumption tax revenues during economic downturns.

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List of Abbreviations

EU	European Union
GDP	Gross Domestic Product
ITR	Implicit Tax Rate
NA	National Account
VAT	Value-Added Taxes
VRR	VAT-Revenue-Ratio
VTTL	VAT Total Tax Liability

1 Introduction and motivation

1. During the economic crisis from 2007 to 2009, tax revenues from all sources fell considerably, with most countries experiencing the lowest point in their tax revenues as a share of GDP for several decades. Among these taxes, revenues from taxes on consumption were typically less affected than revenues from other bases such as corporate income. Over time, taxes on consumption have been seen to be less volatile and more stable than most other forms of taxation (OECD, 2018^[1]). This paper examines the reasons for this, disentangling consumption tax revenues to understand the impact of changes in the consumption tax base and the tax system applied to that base.

2. In addition, taxes on consumption¹ represent a large share of both total tax revenues and GDP in OECD countries. Over the last 40 years, revenues from taxes on consumption have been relatively stable, on average, around 11% of GDP and around one-third (32.7%) of total tax revenues. However, during the same period, the mix of consumption taxes has changed markedly due to the growing share of value-added taxes (VAT)², which have displaced other forms of consumption taxes in most OECD countries (OECD, 2018^[1]).

3. With all OECD countries strongly relying on consumption tax revenues, understanding what drives changes in revenues from consumption taxes is crucial for both policy makers and researchers. The aim of this paper is twofold: first, to identify through which channels consumption tax revenues are affected during an economic downturn, using the most recent economic crisis (2007-2009) as a case study; and second, to understand what drives fluctuations in the overall tax burden on consumption, using the implicit tax rate on consumption as the starting point.

4. The structure of this paper is as follows. Section 2 describes developments in consumption tax revenues across OECD countries. Section 3 reviews the existing literature on analysing changes in consumption tax revenues, before section 4 sets out the methodology used to address the two questions outlined above. In section 5, the presented decomposition is used to analyse the drivers of changes in consumption tax revenues in OECD countries, before Section 6 discusses the results of this analysis as well as avenues for future work.

¹ “Taxes on consumption” or “consumption taxes” refers to all items under the heading *5000 Taxes on goods and services*, less *5124 Taxes on exports*, *5125 Taxes on investment goods* and *5127 Other taxes on international trade and consumption*. For a discussion of this definition, see the section on methodology. The classifications used here refer to the OECD Classification of Taxes (OECD, 2017^[22]).

² The acronym “VAT” refers to any national value-added tax (VAT) and its equivalent in several jurisdictions (goods and services tax, or GST), as described in (OECD, 2018^[2]). Currently, 35 of the 36 OECD member countries operate a VAT, the only exception being the United States.

2 Developments in consumption tax revenues

2.1. Trends in consumption tax revenues, on average

5. Taxes on consumption are an important source of tax revenue in all OECD countries, ranging from less than 6% of GDP in the United States, Canada and Mexico to more than 15% in Greece and Hungary in 2017 (OECD, 2018^[2]).^{3,4}

6. Between 1965 and 1980, consumption taxes increased as a share of GDP, on average, but decreased as a share of total taxes, indicating that revenues from other taxes increased at a faster rate than consumption taxes. Since then, consumption taxes have remained relatively stable, both as a share of GDP and as a share of total tax revenue, as shown in Figure 2.1..

7. During the recent economic crisis, average consumption tax revenues reached their lowest point since 1992. From 2007 to 2009, consumption tax revenues as a share of GDP declined by 0.33 percentage points on average. The decline in consumption tax revenues during the crisis was almost entirely due to a fall in average VAT revenues as a share of GDP in those countries that have a VAT in place, which decreased by 0.30 percentage points over the same period, and both consumption tax and VAT revenues only returned to their pre-crisis level in 2012. Nevertheless, year-on-year changes in consumption tax revenues as a share of GDP between 2007 and 2009 were smaller than changes in revenues from taxes on corporate income, payroll and property taxes, indicating that consumption tax revenues remained more stable than taxes on most other bases during the crisis.

8. Although the overall share of taxes on consumption in total tax revenue has remained relatively stable since 1980, the composition of consumption tax revenues has changed markedly. The reliance of OECD countries on taxes on general consumption (which includes VAT) has increased by more than 50% during this period, from 4.5% to 7.0% of GDP, on average (OECD, 2018^[2]), primarily due to the introduction of VAT in most OECD countries. Over the last two decades, average VAT revenues as a share of GDP have increased from 5.9% in 1995 to 6.8% in 2017. In 2017, VAT revenues accounted for more than 60% of total revenues from taxes on consumption, on average (OECD, 2018^[2]).

³ Where possible, this section explores changes in consumption tax revenues since 1965 to make use of the full time series available in *Revenue Statistics*, but in cases where data for all OECD countries is required, 1995 is used as the starting point. The ending point of the analysis is the latest year for which comprehensive *Revenues Statistics* data is available for all OECD countries, which currently is the year 2017.

⁴ See Annex A for taxes on consumption as well as VAT (5111) as a percentage of GDP in all OECD countries over time.

Figure 2.1. Taxes on consumption as a share of GDP (left) and as a share of total tax revenues (right) and their composition, OECD average, 1965-2017

Note: The OECD average is an unweighted average of all OECD countries for which data was available during the respective year.

Source: Authors' calculations based on OECD Revenue Statistics (2018).

9. Alongside this shift towards taxes on general consumption, taxes on specific goods and services have declined relative to GDP and even more so relative to total taxes. Excise taxes⁵, which raise the second largest share of consumption tax revenues, have, on average, decreased from 3.5% of GDP in 1965 to 2.5% in 2017 (Figure 2.1.) (OECD, 2018^[1]).

10. Customs and import duties in OECD countries have, on average, decreased from 1.5% of GDP in 1965 to less than 0.1% in 2005 and have remained relatively stable since.⁶ Other consumption taxes (e.g. motor vehicle taxes and taxes on pollution) account for less than 1% of GDP on average and have been relatively stable around this level. These taxes vary considerably from one country to another. Currently, more than three-quarters of OECD countries apply lower taxes or tax exemptions to low-polluting vehicles.

2.2. Trends in consumption tax revenues in OECD countries

11. In 2017, OECD countries fell into three groups with different levels of consumption taxes as a share of GDP (Figure 2.2.): low (consumption tax-to-GDP ratios smaller than 9%); mid (between 9% and 13%) and high (greater than 13%). The high consumption tax-to-GDP group in 2017 was entirely composed of European Union (EU) countries, while all countries with low consumption tax-to-GDP ratios were non-EU countries, except for Ireland. This results partly from the EU VAT directive 2006/112/EC, which sets a minimum standard VAT rate of 15% and limits the scope of reduced and super-reduced VAT rates.

⁵ Excise taxes cover a wide range of products and their rates and structure differ significantly. Common among OECD countries are excises on alcoholic beverages, mineral oils and tobacco products (OECD, 2018^[1]).

⁶ This excludes customs duties collected by national tax administrations of EU member countries on behalf of the European Union. Including these revenues, customs and import duties in OECD countries amounted to less than 0.25% in 2017.

12. With the exception of the highest group, the composition of these groups was broadly stable between 1995 and 2017, particularly since 2000, as shown in Figure 2.2.. Across the period, countries with the most marked changes in the level of consumption tax revenues as a share of GDP included Greece and Turkey, where the consumption tax-to-GDP ratios increased by 3.7 and 4.7 percentage points respectively; and Canada, the Slovak Republic and Ireland, where consumption taxes as a share of GDP decreased by more than 3 percentage points. In Greece, Turkey and the Slovak Republic, these changes were largely driven by corresponding changes in the standard VAT rates, whereas the decrease in revenues in Ireland resulted from a change in the composition of GDP, as explained in section 5.3.

Figure 2.2. Consumption tax-to-GDP ratios in OECD countries: 1995, 2017; minimums and maximums between these dates

Note: The shaded area shows the minimum and maximum consumption tax-to-GDP ratio for each country, regardless of year.

Source: Authors' calculations based on OECD Revenue Statistics (2018).

13. VAT is the most important consumption tax in terms of revenue in all OECD countries that apply a VAT, as shown in Figure 2.3. . In 2017, VAT revenues as a share of total revenues from taxes on consumption accounted for almost two-thirds (62.3%) on average and more than 50% in all but 4 OECD countries. As a share of GDP, revenues from VAT ranged from less than 4% in Australia, Canada, Mexico and Switzerland to 9.5% and more in Denmark, Hungary and New Zealand. Excises accounted for, on average, 23.4% of total consumption tax revenues in 2017.

Figure 2.3. Composition of consumption taxes across OECD countries, 2017

Note: The OECD average is an unweighted average of all OECD member countries; the EU average is an unweighted average of all EU countries that are members of the OECD. The low, mid and high average are an unweighted average of the low, mid and high consumption tax-to-GDP group respectively.

Source: Authors' calculations based on OECD Revenue Statistics (2018).

14. The share of VAT revenues in the mid group is, on average, more than twice as high as in the low group, at 7.4% and 3.2% of GDP respectively, but only slightly below the high group at 8.7% of GDP. With VAT revenues accounting for two-thirds (65.8%) of consumption tax revenues in the mid group, compared to only half (50.6%) in the low and 60.5% in the high group, countries in the mid consumption tax-to-GDP group are, on average, more reliant on VAT as part of their consumption tax mix. Differences in the consumption tax-to-GDP ratios between the mid and the high group arise primarily from different levels of excise revenues and other consumption taxes.

3 Literature review

15. This paper builds on previous studies on changes in consumption tax revenues and in the implicit consumption tax burden, also known as implicit tax rates (ITRs) on consumption. These studies are summarised below.

3.1. ITRs on consumption

16. Several studies explore ITRs on consumption, i.e., consumption tax revenues as a share of their tax base, including in G7 countries (Mendoza, Razin and Tesar, 1994^[3]), EU countries (EU, 2019^[4]) and OECD countries (Carey and Tchilinguirian, 2000^[5]). Albeit comprising different consumption taxes and varying tax bases, these studies show similar results.

17. Mendoza et al. compute ITRs for consumption, labour and capital, which they call “average effective tax rates”, for all G7 countries from 1965 to 1988 to analyse the influence of taxes on key macroeconomic variables such as savings, investment and employment (Mendoza, Razin and Tesar, 1994^[3]). They find that ITRs in Japan and in the United States are significantly lower than in Canada and in the European countries, with a negative correlation between hours worked and consumption tax revenues. However, ITRs on consumption fluctuated without trend in all G7 countries during this period (Mendoza, Razin and Tesar, 1994^[3]).

18. Carey and Tchilinguirian updated the Mendoza et al. ITR estimates for all OECD countries between 1980 and 1997 (Carey and Tchilinguirian, 2000^[5]). In contrast to Mendoza et al., the methodology developed by Carey and Tchilinguirian does not exclude government wage consumption from the consumption tax base⁷ and includes a number of additional tax revenue items, yielding higher ITRs on consumption with a smaller dispersion from the OECD average (Carey and Tchilinguirian, 2000^[5]). In addition, Carey and Tchilinguirian tested the impact of output gaps on ITRs with a simple linear regression, suggesting that the effect of cyclical factors on these estimates is negligible (Carey and Tchilinguirian, 2000^[5]).

19. Taxation Trends (EU, 2019^[4]) calculates ITRs on consumption for all EU member countries (from 1970 onwards), Norway (from 1995 onwards) and Iceland (from 2000 onwards). In most EU countries, a period of broad stability in ITRs on consumption between 1970 and the early 1990s was followed by a trend increase. The corresponding increase in the EU average ratio of consumption taxes to consumption was interrupted only by a decrease in 2008 and 2009. Taxation Trends (EU, 2019^[4]) provides a breakdown of the ITRs on consumption into four main sub-components, VAT, energy taxes, excise duties on tobacco and alcohol, and a residual. Although the VAT component is the largest, the non-VAT component of consumption taxes is far from negligible, ranging from just below 25% of consumption in Sweden to 44.2% in Greece in 2017 (EU, 2019^[4]).

⁷ For a discussion of the different approaches to the treatment of government consumption in the literature, see section 3.2.

3.2. The treatment of government consumption in ITRs

20. The main consumption tax, VAT, is a general tax on consumption. Therefore, the conceptual consumption tax base corresponds approximately to final consumption expenditure as measured in the OECD National Accounts (NAs) under item P3, which comprises the consumption of households, non-profit institutions serving households and the general government. However, final consumption in the NAs includes items that are not subject to consumption tax in any OECD country, most notably the wages paid to government employees, which form part of government consumption.

21. Previous literature on ITRs on consumption and on the consumption tax and VAT base follow three different approaches to the treatment of government consumption in the conceptual tax base. These approaches differ in the treatment of government non-wage and government wage expenditure.

22. The first approach, used in *Taxation Trends* (EU, 2003; 2018) approximates the conceptual tax base using final consumption expenditure of households only. Although VAT is the main consumption tax, it is only one of several taxes on consumption, others of which have different (narrower) tax bases. Since any further adjustments to the VAT base would not reflect the base of the other consumption taxes, the authors refrain from undertaking other adjustments for reasons of simplicity (EU, 2003^[6]).

23. In comprising only private household consumption in the tax base, *Taxation Trends* (EU, 2008^[7]; (EU, 2019^[4])) estimates the ITR on private consumption. However, goods and services provided by the government are exempt from VAT in all but one OECD country, meaning that VAT is effectively levied on inputs bought by the government, i.e., the government is treated as a final consumer for VAT purposes. These revenues are included in Revenue Statistics, whereas the consumption expenditure of the government is recorded separately in the NAs. As data limitations preclude a differentiation of the source of consumption tax revenues by public or private bodies in some countries, revenues from taxes on final government consumption are part of the numerator and should therefore be included in the denominator. Excluding government consumption from the denominator overstates the ITR on private consumption, with the degree of overstatement varying depending on the size of the government (OECD, 2012^[8]).

24. The second approach, followed by Mendoza et al. (1994), includes government non-wage consumption but excludes the compensation of government employees from the tax base, because government wages are not subject to consumption taxes. However, many government services such as education and healthcare are also exempt from VAT when they are provided by the private sector. Therefore, an exclusion of government wage consumption from the consumption tax base overstates the ITRs on consumption in countries where these labour-intensive services are publicly provided, compared to those where they are privately provided (Mendoza et al., 1994).

25. The third approach, followed by Carey and Tchilinguirian (2000) and several other studies cited below, does not exclude government wage consumption from the consumption tax base to enhance cross-country comparability. Although wages paid by the government are not themselves subject to VAT, these costs reflect implicit subsidies in the provision of goods and services that would ultimately be embedded in the final price if provided by the private sector and could theoretically be subject to VAT (Keen, 2013^[9]). Hence, government wages should be part of the conceptual tax base. The inclusion of all final consumption expenditure, both private and public, is the most common approach in the literature, also followed by Keen (2013), Sancak et al. (2010), Bettendorf and Cnossen (2015), Ueda (2017), Cevik et al. (2019), as well as CASE and IHS (2018) for the estimation of the VAT Gap. The analysis in this paper also includes all government consumption in the tax base.

26. One caveat to this approach, noted in Keen (2013), is that wage expenditure that is attributable to the provision of pure public goods (meaning those goods that could not be provided privately or taxed) would ideally be excluded from the tax base. However, these pure public goods, compared to those that could in principle be subject to VAT, are difficult to identify both conceptually and quantitatively. To the

extent that government expenditures are attributable to pure public goods, the inclusion of all government wage consumption in the tax base overstates the conceptual VAT base (Keen, 2013^[9]).

27. In practice, the implicit VAT burden on government and private consumption have been shown to be similar, although a larger share of government wages in government consumption, *ceteris paribus*, results in a lower effective VAT rate on total government consumption. Bettendorf and Cnossen (2015) calculate the effective VAT rate, i.e., the implicit VAT burden, for each subcomponent of the VAT base of the Netherlands for the year 2010. They find that the effective VAT rate on government consumption (exclusive of education) is only slightly lower than the effective VAT rate on private consumption, at 10.0% compared to 10.7% (Bettendorf and Cnossen, 2015^[10]).⁸ With government consumption being subject to the same effective VAT rate as private consumption, government consumption forms a significant part of the VAT base and should be included in the denominator.

3.3. The VAT-Revenue-Ratio (VRR)

28. In addition to differences in standard VAT rates across countries, there is considerable diversity in the structure of VAT systems in OECD countries. Most OECD countries apply reduced rates and exemptions to various products such as basic essentials, pharmaceuticals and medical care, education, cultural events and financial services. To assess the efficiency of a VAT system, the OECD uses the VAT-Revenue-Ratio (VRR)⁹. The VRR assesses a country's ability to tax the conceptual VAT base by measuring the effect of exemptions and reduced rates ("policy gap") as well as non-compliance through fraud, evasion and tax planning ("compliance gap") on VAT revenues (OECD, 2018^[2]).

29. Several studies have looked in more detail at drivers of VAT revenues and the VRR (Sancak, Velloso and Xing, 2010^[11]), (Keen, 2013^[9]), (Price, Dang and Botev, 2015^[12]) and (Ueda, 2017^[13]). By decomposing VAT revenues into the standard VAT rate, the VRR and consumption as a share of GDP for 150 countries over the years 1993-2010, Keen finds that changes in VAT revenues as a share of GDP were driven mostly by changes in the efficiency of the VAT system (Keen, 2013^[9]). Changes in the standard VAT rate accounted for a relatively small part of the changes in VAT revenues, and, except for high-income countries between 2006 and 2010, the changes in consumption as a share of GDP accounted for even less (Keen, 2013^[9]).

30. To analyse the volatility of the VRR with regards to economic cycles, Sancak et al. estimate a fixed effects regression model using panel data for 84 advanced and developing economies from 1995 to 2008 (Sancak, Velloso and Xing, 2010^[11]). They find a positive and significant correlation of the VRR to output gaps, driven primarily by changes in the pattern of consumption. Ueda builds on this work by estimating a dynamic panel model with a series of compliance and output gaps for 26 European countries and Japan over the period 2000-2014, to analyse the drivers of cyclicity within the VRR (Ueda, 2017^[13]). The model shows a negative correlation of the compliance and the behaviour-induced policy gap (i.e., changes in the pattern of consumption) with output gaps, and a positive correlation between the share of household

⁸ Please note, however, that the share of government consumption in total consumption in the Netherlands is the second highest in the OECD, while government wages form a relatively small part of government consumption compared to other OECD countries. Further, the exclusion of government expenditure on education from the VAT base in Bettendorf and Cnossen (2015) increases the effective VAT rate on government expenditure, as a large part of government expenditure on education is attributable to wage expenditure. Nevertheless, it is reasonable to assume that a non-negligible share of VAT revenues accrues from non-refunded VAT payments from government consumption in OECD countries.

⁹ For an explanation of the VRR, see section on methodology.

consumption in total consumption and output gaps. These correlations are stronger in countries with large compliance gaps and in countries where reduced rates apply to basic goods (Ueda, 2017^[13]).

31. Price, Dang and Botev (2015) estimate the elasticity of VAT revenues with regard to output gaps for 35 OECD countries over the period 1990-2013 as part of their work on cyclically adjusted fiscal balances. They find VAT/base elasticities of 1.2 on average, which, under the assumption of a unit elasticity of consumption to output gaps, suggests a positive correlation of VAT revenues and output gaps (Price, Dang and Botev, 2015^[12]).

32. To understand how longer-term changes in the economy affect VAT revenues, (Cevik et al., 2019^[14]) use the share of services in the total value added of the economy as an indicator of structural transformation to explore how an increasing share of services in the economy affects VAT efficiency (as measured by the VRR) over time and across countries. They find that an increase in the share of services (mainly non-tradable services, such as accommodation and food services, healthcare and social services, and public administration and security-related services) in aggregate value added reduces VAT efficiency (Cevik et al., 2019^[14]).

33. Other studies have disentangled the effect of the policy and the compliance gap on VAT revenues by decomposing the VRR. The VRR can be decomposed by using either a “bottom-up” or a “top-down” approach. Under the “bottom-up” approach an estimate of VAT expenditure, i.e. the cost of departure from applying the standard rate uniformly across all goods, is used to calculate the policy gap, with the compliance gap being the residual (OECD, 2018^[2]).

34. The most common approach to decompose the VRR is the “top-down” approach, which is also used by the EU (CASE and IHS, 2018^[15]).¹⁰ This approach estimates the VAT that would be collected if all businesses and consumers were fully compliant with the law (VAT Total Tax Liability, VTTL) by applying the respective VAT rates to the relevant components of consumption expenditure (including intermediate consumption for partially exempt businesses, expenditure on housing and other country-specific adjustments) (CASE and IHS, 2018^[15]). Expressing the VAT Gap, i.e., the difference between the VTTL and actual VAT collected, as a share of the VTTL yields the compliance gap, from which the policy gap can be inferred. CASE and IHS (2018) finds that in EU countries, on average around one-eighth of VAT revenues are lost to non-compliance, and even if full compliance is assumed, almost 45% of potential VAT revenues in EU countries would be lost due to reduced rates and exemptions (“policy gap”). A similar method was used for Australia (Australian Taxation Office, 2019^[16]), where the compliance gap was found to be around two-thirds of the EU average.

35. To disentangle the drivers of changes within the VRR, the policy gap can be further decomposed into different components of revenue loss, such as the application of reduced rates (“rate gap”) and the exemption of certain activities from the VAT system (“exemption gap”), as discussed in more detail in (CASE and IHS, 2018^[15]).

¹⁰ Other studies using this approach are, for example, (Corte dei Conti, 2012^[24]) for Italy; (Instituto Nacional de Estatística, 2013^[25]) for Portugal; (Romania Fiscal Council, 2011^[26]) for Romania; (HMRC, 2019^[27]) for the United Kingdom; and (Reckon, 2009^[28]) for 25 EU countries.

4 Methodology

36. This paper explores the reasons for recent changes in consumption tax revenues in OECD countries, to identify through which channels consumption tax revenues are affected during an economic downturn, using the recent economic crisis (2007-2009) as a case study, and to understand the drivers of fluctuations in the ITR on consumption. This section outlines the approach taken to address these two questions.

4.1. Decomposing changes in consumption tax revenues

37. The first step to understanding the drivers of consumption tax revenues is to decompose consumption tax revenues as a share of GDP using the corresponding conceptual tax base, as set out in equation (1).

$$\frac{\text{consumption tax revenues}}{\text{GDP}} = \underbrace{\frac{\text{consumption tax revenues}}{\text{consumption}}}_{\text{Consumption tax revenues as a share of the corresponding conceptual tax base (the ITR on consumption)}} \times \underbrace{\frac{\text{consumption}}{\text{GDP}}}_{\text{The conceptual tax base as a share of GDP.}} \quad (1)$$

38. Expressing aggregate consumption tax revenues as a share of the conceptual tax base (i.e., consumption) measures the implicit tax rate (ITR) on consumption. The ITR on consumption demonstrates the effect of changes in the consumption tax itself, i.e., base broadening (including for domestic and cross-border trade) and changes in the headline rates, as well as the effect of changes in compliance or informality on consumption tax revenues as a share of GDP. Consumption as a share of GDP captures all other changes in the economic environment that affect the consumption tax-to-GDP ratio, i.e., changes in GDP and its components.

39. Consistent with the OECD Consumption Tax Trends publication (OECD, 2018^[2]) and with the most common approach in the literature, the conceptual tax base is approximated by using final consumption expenditure as measured in the OECD National Accounts (NAs) under item P3:¹¹

- P31-S14: Private final consumption expenditure of households.
- P31-S15: Final consumption expenditure of non-profit institutions serving households (NPISH).

¹¹ In comprising both private and public consumption expenditure, the choice of the denominator differs from *Taxation Trends* (EU, 2019^[4]), which uses final consumption expenditure of households only (P31DC). The differences in denominator mean that the ITRs on consumption calculated for this paper differ from *Taxation Trends* (EU, 2019^[4]). The exclusion of government consumption from the tax base in *Taxation Trends* overstates the ITR on consumption in countries where government consumption is exempt from VAT, i.e., where the government is treated as a final consumer for VAT purposes. However, the differences in the tax base do not lead to significant differences in the findings. See Box 1 and section 3.2 for further discussion.

- P3-S13: Final consumption expenditure of general government, including:
 - P31-S13: Individual consumption expenditure of general government.
 - P32-S13: Collective consumption expenditure of general government.

40. The analysis uses consumption expenditure measured according to the “domestic concept”, i.e., total expenditure made by all households, whether resident or not, within the economic territory. This is also consistent with the consumption base used in the OECD’s VRR estimations. Consistent with Mendoza et. al (1994) and OECD Consumption Tax Trends (OECD, 2018^[2]), the tax base is expressed in net terms, by subtracting consumption tax revenues from final consumption expenditure as provided in the NAs.

Box 4.1. The inclusion of government consumption and its impact on ITRs

The extent to which a change in the treatment of government consumption¹² affects the decomposition of consumption tax revenues depends primarily on the country’s composition of consumption expenditure. While government consumption as a share of GDP is relatively similar across countries, in most countries falling between 14% and 24%, countries differ widely with respect to their level of private consumption as a share of GDP, from 29.8% in Luxembourg to 68.7% in Greece in 2017. As a result, cross-country differences in government consumption as a share of total consumption, as well as in consumption as a share of GDP, result primarily from differences in the size of private consumption.

The inclusion of government consumption in the conceptual tax base used in this analysis affects both the ITR (as the denominator) and the level of consumption as a share of GDP (as the numerator). Relative to the conceptual tax base used in this paper, excluding government consumption from the tax base decreases consumption as a share of GDP in a linear fashion (relative to the share of government consumption in total consumption), while supra-linearly increasing the ITR.

Therefore, the higher a country’s share of government consumption in total consumption, the more strongly the exclusion of government consumption affects the conceptual tax base and hence the decomposition of consumption tax revenues: increasing the ITRs asymptotically and decreasing C/GDP linearly. All else held constant, the change in the ITR is more pronounced in countries with higher consumption tax-to-GDP ratios.

To illustrate this impact, Figure 4.1. shows the distribution of countries according to the composition of consumption and their consumption tax-to-GDP ratios, showing government consumption (left panel) and government wage consumption (right panel). The shading in this graph approximates the strength of the impact of excluding government consumption on the ITR. As explained, the impact of changes in the treatment of government consumption is most pronounced in countries with high consumption tax-to-GDP ratios and with high shares of government consumption in total consumption, such as Denmark, Finland, Hungary, Norway and Sweden.

Although changes in the treatment of government consumption affect the levels of ITRs, trends in ITRs and in consumption as a share of GDP over time are broadly unaffected by the treatment of government consumption. For example, a comparison of the ITRs in (Carey and Tchilinguirian, 2000^[5]), in Taxation Trends (EU, 2019^[4]), and in this paper shows that the observed trends in ITRs are not sensitive to changes in the treatment of government consumption. This suggests that the choice of treatment of government

¹² For a discussion of the different approaches to the treatment of government consumption in the literature, see section 3.2.

consumption does not materially affect the drivers of changes in consumption tax revenues discussed in this paper.

Figure 4.1. Government consumption and government wage consumption relative to consumption tax-to-GDP ratios, 2017

Note: For Australia, Canada, Mexico, New Zealand and Turkey, data on government wage consumption was not available. The shading in the graph indicates the approximate strength of the impact on the ITR of excluding government consumption; countries in the top right hand corner are most strongly affected.

Source: Authors' calculations based on OECD National Accounts and OECD Revenue Statistics (2018).

41. Consistent with the conceptual consumption tax base above, the consumption tax revenues included in the numerator of the ITR on consumption comprise all items under the *Revenue Statistics* heading *5000 Taxes on goods and services*, including *5111 VAT*¹³, as well as the other taxes in this category, with the exceptions of *5124 Taxes on exports*, *5125 Taxes on investment goods* and *5127 Other taxes on international trade and consumption*.¹⁴

42. The decomposition in equation (1) allows the impact of a change in the conceptual tax base, consumption, to be isolated. To understand what drives the changes in consumption as a share of GDP, this paper uses data from the NAs to illustrate changes in the different elements of GDP, such as the levels of consumption and investment (including housing investment), as well as changes in the composition of consumption, which in turn can influence the level of the ITR.

43. To understand whether changes in consumption tax revenues are primarily driven by changes in the size of the base as a share of GDP or by changes in implicit tax rates, the paper analyses variance in

¹³ The heading *5111 VAT* contains VAT revenues generated by non-zero-rated expenditure on the supply of land and buildings (i.e., housing investment). This presents a conceptual issue given that housing investment is recorded as gross fixed capital formation (GFCF) rather than consumption in the NAs, and is therefore not included in the denominator. However, the return on housing investment in the form of household expenditure on actual and imputed rents is part of final household consumption and is therefore captured in the ITR denominator.

¹⁴ The headings *5124* and *5127* are excluded because they do not correspond with the domestic approach according to which consumption expenditure is measured. The heading *5125* is not considered a tax on final consumption because investment goods do not form part of final consumption expenditure in the NAs.

annual growth rates. Following Ueda (2017), annual changes in consumption tax revenues as a share of GDP relative to the country mean can be broken down into the log deviations in the ITR and the log deviations in consumption as a share of GDP. The variation of these three variables satisfies:

$$Var\left(\frac{\widehat{5000}}{GDP}\right) = Var(\widehat{ITR}) + Var\left(\frac{\widehat{C}}{GDP}\right) + 2Cov\left(\widehat{ITR}, \frac{\widehat{C}}{GDP}\right) \quad (2)$$

whereby the respective annual log deviations in the three shares are defined as $\frac{\widehat{5000}}{GDP}$, $\frac{\widehat{5000}}{C}$, and $\frac{\widehat{C}}{GDP}$.

4.2. Decomposing changes in VAT revenues

44. With VAT being the most important source of consumption tax revenues in 35 OECD countries, a deeper analysis of changes in VAT revenues over time provides additional insights on the drivers of changes in consumption tax revenues relative to GDP. Similar to equation (1), VAT revenues as a share of GDP can be decomposed into VAT revenues as a share of consumption, multiplied by consumption as a share of GDP:¹⁵

$$\frac{VAT\ revenues}{GDP} = \frac{VAT\ revenues}{consumption} \times \frac{consumption}{GDP} \quad (3)$$

45. The VRR is a widely-used tool for evaluating the efficiency of a VAT system (see for example: (OECD, 2018_[2]), (CASE and IHS, 2018_[15]), (Madzharova, 2014_[17])).¹⁶ It normalises VAT revenues by reference to a theoretical situation where the standard VAT rate is applied to all final consumption, i.e., VAT collections divided by the standard rate multiplied by final consumption expenditure. Expanding the first term of equation (3) with the standard VAT rate τ_s yields a decomposition of VAT revenues into the standard rate and the VRR:

$$\frac{VAT\ revenues}{GDP} = \tau_s \times \underbrace{\left[\frac{VAT\ revenues}{consumption \times \tau_s} \right]}_{\text{VAT-Revenue-Ratio}} \times \frac{consumption}{GDP} \quad (4)$$

46. The disaggregation of VAT revenues according to equation (4) separates changes in the implicit VAT burden into changes in tax rates and changes in tax bases.

¹⁵ Consistent with the OECD *Consumption Tax Trends* publication (OECD, 2018_[2]), the VAT base is expressed in net terms, by subtracting VAT revenues from final consumption expenditure as provided in the NAs.

¹⁶ For a technical discussion on the factors influencing the VRR, see (OECD, 2018_[2]).

5

Analysing the drivers of consumption tax revenues in OECD countries

47. Based on the decomposition presented above, the following section analyses changes in consumption tax revenues in OECD countries over the period 1995 to 2017. The analysis begins by decomposing consumption tax revenues across countries and over time into the ITR on consumption and the consumption tax base as a share of GDP. Based on this decomposition, NAs data on expenditure aggregates is explored to understand the channels through which changes in the consumption tax base impact consumption tax revenues. Individual country results are presented separately in Annex F.

48. Secondly, a decomposition of VAT revenues into the VRR, the standard VAT rate and consumption as a share of GDP serves to assess the drivers of changes in consumption tax revenues during economic downturns. During the economic crisis from 2007 to 2009, average consumption tax revenues as a share of GDP in OECD countries fell considerably. Using this as a case study, the paper explores different channels through which VAT revenues are impacted during an economic downturn, focusing specifically on changes in VAT rates and in the pattern of consumption.

49. The results of the analysis are discussed in section 6.

5.1. Decomposition of consumption tax revenues & trends

50. Analysis of average consumption taxes as a share of GDP reveals significant variation in the drivers of consumption tax-to-GDP ratio changes in the OECD over time. Over the period from 1995 to 2017, trends relating to consumption tax-to-GDP ratios in OECD countries can be segmented into four distinct periods, as shown in Figure 5.1.¹⁷

- Between 1995 and 2003, the OECD average ITR on consumption (5000/C) remained relatively stable, with only small fluctuations in average consumption expenditure relative to GDP (C/GDP). As a result, average consumption tax revenues as a share of GDP (5000/GDP) remained relatively stable as well, at close to 11% of GDP.
- In the years leading up to the economic crisis, average consumption as a share of GDP fell sharply, from 64.6% in 2004 to 62.2% in 2007. However, a slight increase in the ITR on consumption led the average consumption tax-to-GDP ratio in OECD countries remaining relatively stable until 2007.
- Between 2007 and 2009, the ITR on consumption decreased in every OECD country in at least one year, resulting in a decrease in the OECD average ITR on consumption from 17.5% to 16%. This sharp decrease in the average ITR was partly offset by a strong increase in average consumption as a share of GDP. Nevertheless, average revenues from taxes on consumption as

¹⁷ See Annex C for ITRs on consumption for all OECD countries in selected years. Other individual country results are presented separately in Annex F.

a share of GDP fell by more than 3.5% during this period, reaching a temporary low in 2009 – the same year that average consumption as a share of GDP reached a temporary high.

- Since then, consumption tax revenues as a share of GDP have, on average, returned to their 1995 level. Average consumption as a share of GDP was 2.3 percentage points lower in 2017 than in 1995, whereas consumption taxes as a share of consumption were 0.7 percentage points higher, on average.

Figure 5.1. Consumption tax revenues as a share of GDP and its components in percentages (upper) and by an index (base year 2017) (lower), OECD average, 1995-2017

Note: Consumption tax revenues are decomposed according to equation (1). The lower panel shows the shares relative to the year 2017 (index 100 = 2017).

Source: Authors' calculations based on OECD National Accounts and OECD Revenue Statistics (2018).

51. The ITR on consumption is the primary determinant of overall levels of consumption tax revenues to GDP in most OECD countries, although its importance varies across countries (Figure 5.2.). Within the consumption tax-to-GDP groups identified in section 2, countries vary widely with respect to their levels of consumption as a share of GDP, while their implicit tax rates on consumption are more similar, with the exception of Luxembourg¹⁸ and Ireland. Nevertheless, the drivers of these ratios can differ significantly among countries with similar levels of consumption taxes as a share of GDP.

¹⁸ Until a change in the EU VAT legislation 1st January 2015, e-commerce supplies to final consumers were taxed in the member state where the supplier was established. The low standard VAT rate in Luxembourg, the lowest in the EU, incentivised suppliers of e-commerce to establish there, which generated additional VAT revenues for Luxembourg. Under the new legislation, intra-EU e-commerce sales to final consumers are subject to VAT where the

Figure 5.2. Decomposition of consumption tax revenues as a share of GDP, 2017

Note: The graph shows the decomposition of consumption tax revenues across OECD countries according to equation (1). The horizontal axis shows consumption as a share of GDP and the vertical axis shows the ITR on consumption. Consumption tax revenues as a share of GDP, given by the product of the two shares, are equal to the area under and to the left of each dot. Therefore, countries along each of the curved lines have the same level of consumption taxes as a share of GDP (as indicated on the right side of the graph). The Czech Republic and the United Kingdom, for example, have very similar levels of consumption taxes as a share of GDP, but for different reasons: the Czech Republic has a higher ITR on consumption but lower consumption as a share of GDP.

Source: Authors' calculations based on OECD National Accounts and OECD Revenue Statistics (2018).

52. Between 1995 and 2017, the primary driver of consumption tax revenue changes in OECD countries was the ITR on consumption, rather than the tax base relative to GDP. Figure 5.3. divides the cumulative change in consumption tax revenues as a share of GDP in all OECD countries into changes in ITRs and in consumption as a share of GDP. Although the results should be interpreted with care, as they are sensitive to the start and end dates of the period, interesting patterns emerge:

- Over the period 1995-2017, changes in consumption taxes as a share of GDP in OECD countries were driven primarily by changes in the ITR on consumption.
- The direction of change of the ITR on consumption determined the direction of change in consumption tax revenues as a share of GDP in three-quarters of the countries.
- Consumption as a share of GDP has increased in 14 and decreased in 22 countries, with almost two-thirds of the countries having higher growth rates in consumption tax revenues than in the tax base as a share of GDP.

53. Given that the offsetting may be a purely mechanical effect and that countries may adjust their tax rates and structures in response to economic changes, these two components cannot be expected to move in isolation. Nevertheless, the decomposition indicates that ITRs are the main drivers of changes in consumption tax revenues in OECD countries.

consumer is resident, at the rate applicable in that jurisdiction, which has led to a decline in VAT revenues in Luxembourg between 2015 and 2016. (OECD, 2018^[2]).

Figure 5.3. Decomposition of growth rates in consumption taxes as a share of GDP across OECD countries, 1995-2017

Note: The OECD average shows the average growth rates of the components of equation (1). Countries are sorted by the size of the change in consumption tax revenues as a share of GDP.

Source: Authors' calculations based on OECD National Accounts and OECD Revenue Statistics (2018).

5.2. Impact of ITR and base changes on annual fluctuations in consumption tax revenues

54. Year on year changes in the OECD average mirror these patterns, as shown in Figure 5.4..¹⁹ In all but five years, the changes in the consumption tax base and in the implicit tax rate went in opposite directions, offsetting each other. Therefore, while the direction of change in average consumption taxes as a share of GDP was the same as the ITR on consumption in almost every year, the magnitude of change in consumption tax revenues was strongly influenced by average consumption expenditure as a share of GDP.

¹⁹ See Annex C for ITRs on consumption for all OECD countries in selected years. Other individual country results are presented separately in Annex F.

Figure 5.4. Annual growth rates (logged) in consumption taxes as a share of GDP and its components, OECD average, 1995-2017

Note: Consumption tax revenues are decomposed according to equation (1).

Source: Authors' calculations based on OECD National Accounts and OECD Revenue Statistics (2018).

55. During the economic crisis, changes in consumption tax revenues were larger than in other years and significantly different in terms of composition (Figure 5.4.). In contrast to other years, the average implicit tax rate on consumption fell in 2008 and 2009 to a significant extent, whereas in almost all other years, it increased slightly. It then rose significantly after the crisis. By contrast, the share of consumption to GDP increased sharply in the same years, whereas annual changes were more typically negative, and generally much smaller in other years. This implies that the key avenue by which a macroeconomic crisis impacts consumption tax revenues is by decreasing ITRs, rather than consumption – and that in fact an increasing share of consumption in GDP offsets the fall in ITRs, contributing to the relative stability of consumption tax revenues during such a crisis.

56. This conclusion is also supported by an examination of the variance of annual changes in these components. Table 5.1. shows the average of country variances across annual changes in consumption tax revenues as a share of GDP, $Var\left(\frac{5000}{GDP}\right)$, decomposed into the sum of the variance in ITR deviations, $Var(\widehat{ITR})$, the variance in consumption as a share of GDP deviations, $Var\left(\frac{\widehat{C}}{GDP}\right)$, and the covariance of the two shares, $2 * Cov\left(\widehat{ITR}, \frac{\widehat{C}}{GDP}\right)$, according to equation (2). The table shows the results of equation (2) for the whole period considered, as well as for the four sub-periods identified in Figure 5.1..

57. Over the period as a whole, changes in consumption tax revenues as a share of GDP are primarily driven by changes in the ITR on consumption.²⁰ The negative covariance between the yearly changes in ITRs and in consumption tax revenues as a share of GDP relative to the country mean confirms that developments in the tax base as a share of GDP have partly offset the effect of changes in ITRs on consumption tax revenues in each of these periods.

58. During the crisis (2007-2009), fluctuations in consumption tax revenues as a share of GDP as well as in the ITR on consumption were, on average, around twice as large as in the years before and after the crisis (1995-2003; 2003-2007; 2009-2017). Even though fluctuations in the ITRs were, on average, also much larger during the crisis than in the pre- and post-crisis years, their effect on revenues seems to be

²⁰ Across countries, year-to-year changes in consumption tax revenues as a share of GDP were also primarily driven by changes in the ITRs, on average (Annex D).

less pronounced, as suggested by the lower share of $Var(\widehat{ITR})$ in $Var(\frac{\widehat{c}}{GDP})$. This results from the smaller (negative) covariance between the two shares during the crisis, which indicates that the offsetting effect of consumption as a share of GDP on changes in the ITRs on consumption was much smaller during the crisis than in other periods.

Table 5.1. Average of country variances in each component

		$Var(\frac{\widehat{c}}{GDP})$	$Var(\widehat{ITR})$	$Var(\frac{\widehat{c}}{GDP})$	$2Cov(\widehat{ITR}, \frac{\widehat{c}}{GDP})$
1995-2017	Var and Cov	0.0020	0.0025	0.0006	-0.0012
	Ratio to $Var(\frac{\widehat{c}}{GDP})$	100%	130%	31%	-61%
1995-2003	Var and Cov	0.0014	0.0018	0.0004	-0.0008
	Ratio to $Var(\frac{\widehat{c}}{GDP})$	100%	129%	26%	-55%
2003-2007	Var and Cov	0.0010	0.0012	0.0002	-0.0005
	Ratio to $Var(\frac{\widehat{c}}{GDP})$	100%	128%	24%	-52%
2007-2009	Var and Cov	0.0031	0.0028	0.0006	-0.0003
	Ratio to $Var(\frac{\widehat{c}}{GDP})$	100%	93%	18%	-11%
2009-2017	Var and Cov	0.0014	0.0016	0.0004	-0.0006
	Ratio to $Var(\frac{\widehat{c}}{GDP})$	100%	111%	32%	-43%

Note: The table shows the results from equation (2) on average across countries.

Source: Authors' calculations based on OECD National Accounts and OECD Revenue Statistics (2018).

59. The following two sections examine changes in each of these components in more detail.

5.3. Changes in consumption as a share of GDP during the economic crisis

60. The increase in consumption to GDP shown during the crisis (Figure 5.1.) resulted from a change in the level of other GDP aggregates, rather than due to an increase in the level of consumption. Over the observed period, GDP in OECD countries grew, on average, by almost 85% in real terms. OECD average consumption expenditure (in constant prices) grew at an annual rate of around 2.5% throughout the period, with a brief period of no growth between 2008 and 2013, which occurred against a decrease in the level of GDP in real terms, on average (Figure 5.5.). From 1995 to 2017, final consumption expenditure in OECD countries increased on average in real terms by 75.0%, and more than doubled in ten OECD countries. However, between 2008 and 2011, a majority of OECD countries (21) saw their final consumption expenditure decrease in at least one year.

Figure 5.5. Average developments in consumption tax revenues, consumption expenditure and GDP by an index (in constant prices; base year 2017), 1995-2017

Note: Each year shows the unweighted average of the indices of all OECD countries.

Source: Authors' calculations based on OECD National Accounts and OECD Revenue Statistics

61. The expenditure measure of GDP in the NAs consists of four aggregate expenditures: private (C) and general government (G) final consumption expenditure, gross capital formation (investment, I) and the external balance of goods and services (net exports, NX), which is composed of exports (EX) minus imports (IM) of goods and services (UN, 2010^[18]). Figure 5.6. shows the average composition of GDP according to the expenditure approach between 1995 and 2017, revealing marked differences in the composition prior to, during and after the economic crisis.

62. Until 2004, these expenditure aggregates were, on average, broadly stable as a share of GDP. The fall in average consumption as a share of GDP prior to the crisis resulted from a change in the relative composition of GDP rather than a decrease in consumption expenditure. Between 2004 and 2007, both GDP and consumption grew in all OECD countries, but due to higher growth in investment, the GDP growth rates were higher than the consumption growth rates in 18 to 29 of the countries, compared to, on average, only 13 countries in the three years before. During the crisis, investment decreased as a share of GDP, by 5.5 percentage points on average, while government consumption raised average total consumption as a share of GDP to a temporary high of 76.2% in 2009. On average across those countries where data is available²¹, the decrease in investment expenditure during the crisis resulted mainly from a decrease in inventories (38.6%) and in machinery investment (31.0%), with only around one-fifth (21.7%) resulting from a decrease in housing investment. This breakdown of the decrease in investment expenditure during the crisis holds in the vast majority of OECD countries.

63. After the crisis, average net exports as a share of GDP have been increasing, while both private and government consumption have, on average, slightly decreased relative to GDP, causing total consumption as a share of GDP to return to around its pre-crisis level in 2015. Total consumption as a share of GDP has remained stable over time in most OECD countries, with an average country standard deviation of 1.8% over the period. Compared to 1995, the average composition of GDP in 2017 showed

²¹ Data on the major components of investment expenditure is available from the NAs for all countries except for Chile, Israel and Turkey.

higher levels of government consumption (0.1 percentage points) and lower levels of private consumption (2.6 percentage points).

Figure 5.6. Major expenditure aggregates as a share of GDP (non-cumulative), OECD average, 1995-2017

As % of GDP

Note: Decomposition of GDP according to the expenditure approach: $GDP = C + G + I + (EX - IM)$. Private consumption expenditure includes private household and NPISH consumption expenditure. Unweighted average of all OECD countries. For Turkey, where data on Investment as a share of GDP was not available, the share was approximated as the residual of the equation.

Source: Authors' calculations based on OECD National Accounts.

64. In 2017, government expenditure as a share of GDP in OECD countries ranged from 11.7% in Mexico and 12.0% in Ireland and Switzerland to more than 25% in Sweden, with an average of 19.0%.²² Total final consumption expenditure amounted to 73.1% on average and at least half of GDP in all but two OECD countries, the exceptions being Ireland (44.1%) and Luxembourg (46.2%). Investment expenditure, on average accounting for 22.8% of GDP, ranged from 12.5% of GDP in Greece to 32.3% in Korea and 33.4% in Ireland.

65. Ireland and Luxembourg, which are both outliers in terms of low consumption expenditure to GDP, are the two OECD countries with the highest net exports relative to GDP, at 22.1% and 35.2% of GDP respectively, compared to an average of 4.1%, with half of the countries in the range between zero and +4.5%. In Luxembourg, net exports increased from 20.3% of GDP in 1995 to 35.2% in 2017, while total consumption expenditure as a share of GDP decreased simultaneously. The relatively low consumption as a share of GDP might result partly from the high share of non-resident workers in Luxembourg, who consume a significant part of their income outside of Luxembourg (Eurostat, 2019_[19]).²³

66. In Ireland, net exports and consumption as a share of GDP followed a similar trend as in Luxembourg until 2014, when net exports amounted to 18.1% of GDP and total final consumption

²² See Annex E for the shares of major expenditure aggregates in GDP for all OECD countries in 2016.

²³ From 2000 to 2008, the share of non-resident workers in total domestic employees in Luxembourg increased by 9.0 percentage points (STATEC, 2018_[29]), while non-resident consumption as a share of total domestic consumption has remained broadly stable.

expenditure to 59.0%. Between 2014 and 2015, Ireland experienced unusually high GDP growth, at 34.9% in nominal terms (35.3% in real terms), driven by transfers of intangible assets (including licences and patents) into the Irish jurisdiction by a number of multinational enterprises (OECD, 2016^[20]). The increase in the stock of intangible assets resulted in higher production that was attributable to Ireland, as well as to higher exports, depreciation and consumption of fixed capital (OECD, 2016^[20]), causing net exports to increase by more than 60%, from 18.1% of GDP in 2014 to 28.8% in 2015. Meanwhile, consumption as a share of GDP fell by 13.8 percentage points. Investment expenditure as a share of GDP reached 25.7% in 2015, which was 3.5 percentage points higher than in the previous year. In 2016, consumption expenditure remained stable as a share of GDP, while investment increased from 25.7% of GDP to a high of 37.4%. Net exports fell back to 15.6%, which is slightly below their post-crisis level, before increasing again to 22.1% in 2017. From 2016 to 2017, investment expenditure in Ireland decreased again by four percentage points to 33.4% of GDP.

5.4. Changes in the ITRs on consumption

67. The preceding analysis illustrates that changes in consumption tax revenues are typically driven by changes in implicit tax rates. During the most recent crisis, a sharp fall in implicit tax rates was partially offset by an increase in consumption as a share of GDP, limiting the fall in consumption tax revenues as a share of GDP. This section examines the causes of fluctuations in the ITR on consumption, separating out the impact of tax rate and tax base changes.

68. The main driver of changes in the OECD average ITR on consumption is VAT, which is unsurprising given that it is also the largest share of consumption tax revenues in all OECD countries that have a VAT. Until 2000, the last year when an OECD country introduced a VAT system, the OECD average ITR on consumption shifted away from other taxes on consumption towards VAT, as shown in Figure 5.7.. However, since then, the component of the ITR on consumption relating to excises and other non-VAT consumption taxes has remained relatively stable. Changes in VAT revenues have accounted for almost all of the change in the ITR on consumption in recent years.

Figure 5.7. Shares of major consumption taxes (non-cumulative), OECD average, 1995-2017

As % of consumption

Source: Author's calculations based on OECD National Accounts and OECD Revenue Statistics (2018).

69. Figure 5.8. decomposes trends in the average VAT revenues as a share of GDP (5111/GDP) in those countries that have a VAT system in place into the standard VAT rate, the VRR and consumption as a share of GDP. This separates changes in VAT revenues as a share of GDP into changes in VAT rates and structures, as well as changes in the consumption base, providing additional insights on the drivers of changes in consumption tax revenues relative to GDP:

- Between 1995 and 2007, average VAT revenues in those countries that had a VAT system in place increased by 0.7 percentage points, from 5.8% to 6.5% as a share of GDP. During the same time and especially in the years leading up to the crisis, there was a strong increase in the average VRR, which peaked at 63.1% in 2007. Meanwhile, the OECD average standard VAT rate fluctuated at around 17.9%.
- During the crisis, the average VRR dropped by 6.9 percentage points, while there was a significant drop in VAT revenues back to their level from 1995.
- Since 2009, the VRR has slowly increased, while average VAT revenues as a share of GDP exceeded their pre-crisis level in 2014. The average standard VAT rate started to increase from 2008 onwards and reached 19.3% in 2014, since then it has remained stable. In 2017, average VAT revenues reached their highest level throughout the period, at 6.8% of GDP.

Figure 5.8. VAT revenues as a share of GDP and its components in percentages (upper) and by an index (base year 2017) (lower), OECD average, 1995-2017

Note: VAT revenues are decomposed according to equation (4). The lower panel shows the shares relative to the year 2017 (index 100 = 2017).
Source: Authors' calculations based on OECD National Accounts and OECD Revenue Statistics (2018).

70. Both on average and in the individual countries, changes in the VRR have been the main driver of changes in VAT revenues as a share of GDP across the period, and can explain most of the drop in ITRs during the crisis. On average across those OECD countries that have a VAT in place, changes in standard

VAT rates as well as in the consumption base relative to GDP stabilised VAT revenues as a share of GDP in light of significant fluctuations in the VRR. Although changes in standard rates in the individual countries have been much less frequent than for the OECD average, they have contributed to the stability in consumption tax revenues as a share of GDP for the OECD average.

Figure 5.9. Annual growth rates (logged) in VAT as a share of GDP and its components, OECD average, 1995-2017

Note: VAT revenues are decomposed according to equation (4).

Source: Authors' calculations based on OECD National Accounts and OECD Revenue Statistics (2018).

71. These findings are consistent with Keen (2013), which found that changes in revenues from VAT are driven by changes in the VRR, and with studies on the influence of the economic cycle on VAT collection efficiency, which suggest a negative correlation between the economic cycle and VRRs (Sancak, Velloso and Xing, 2010^[11]), (Ueda, 2017^[13]).

72. However, what is striking from Figure 5.8. and so far remains unexplained is that the average ITR on consumption in 2017 was only slightly above its pre-crisis level, while standard VAT rates are, on average, 1.5 percentage points higher than prior to the crisis. To explore this further, the following subsections analyse changes in VAT rates and structures as well as changes in the pattern of consumption, and discuss the impact that changes in compliance may have on the VRR.

5.4.1. Changes in VAT rates and structures

73. The developments in the average standard VAT rate over time reflect a number of important policy changes in OECD countries.²⁴ Four OECD countries introduced their VAT after January 1995: Latvia and Switzerland (both in 1995), Slovenia (in 1999) and Australia (in 2000) (OECD, 2018^[2]). Prior to the crisis, the standard VAT rate remained stable in most countries, with the majority of countries maintaining a rate between 15% and 22%.

74. From 2007 to 2009, six OECD countries (Estonia, Hungary, Israel, Ireland, Latvia and Lithuania) raised their VAT rates as part of their fiscal consolidation efforts, while Portugal and the United Kingdom temporarily decreased their standard VAT rates to stimulate the economy. These changes in VAT rates

²⁴ For a table showing VAT rates over time, the year of implementation of the VAT and the VAT-Revenue-Ratio in OECD countries in 2016, see Annex B.

(both positive and negative) across OECD countries caused the OECD average standard VAT rate to decrease temporarily, from 17.8% in 2007 to 17.7% in 2008, but to increase again in the following year.

75. Between 2009 and 2014, and in large part as a response to the economic crisis, 23 countries raised their standard VAT rate at least once, 17 of which were EU member countries. This resulted in an increase in the OECD average standard VAT rate to a record level of 19.3% in 2014, since then it has remained stable. Most countries that have increased their standard VAT rate since the crisis have also increased their reduced rates, although generally to a lesser extent (OECD, 2018^[2]).

Figure 5.10. Evolution of the OECD average standard VAT rate, 1995-2017

Note: Each year shows the unweighted average as well as the interquartile range (i.e., the difference between the upper and lower quartiles. 50% of countries therefore have rates within this band.) of the OECD countries that apply a VAT in the given year; standard rates as of 1 January of the respective year.

Data source: OECD *Consumption Tax Trends* (2018).

76. During the period from 1995-2017, most OECD countries have relied primarily on increases in standard VAT rates rather than base-broadening reforms. A number of countries (France, Hungary, Ireland and the Slovak Republic) implemented new or additional reduced VAT rates between 2009 and 2014, while none of the OECD countries abolished their reduced VAT rate(s) (OECD, 2018^[2]). Base-broadening reforms, such as limiting the scope of reduced VAT rates and exemptions, could increase VAT revenues and their stability by improving the efficiency of the VAT system. However, except for Chile and Japan, all OECD countries that have a VAT system in place apply one or more reduced VAT rates (OECD, 2018^[2]).²⁵

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²⁵ In Japan, the consumption tax rate was increased from 8% to 10% in October 2019. This increase was accompanied by the introduction of a reduced rate of 8%.

²⁶ For more information on changes in the structure of VAT systems across OECD countries, please refer to (OECD, 2018^[2]) as well as previous editions of the OECD publication *Consumption Tax Trends*.

5.4.2. Changes in the composition of consumption²⁷

77. The composition of consumption reflects both structural changes in the economy and cyclical shifts in consumption patterns, which can affect consumption tax revenues in three main ways:

- In all but one OECD country, government consumption is exempt from VAT, meaning that government activities are taxed on their inputs rather than their outputs.²⁸
- Most OECD countries continue to apply reduced rates and exemptions to various products, most notably basic essentials. Relative to goods taxed at the standard rate, increases in the consumption expenditure on goods that are exempt from VAT or taxed at reduced rates reduces the efficiency of the VAT system and, *ceteris paribus*, reduces VAT revenues.
- In all OECD countries except the United Kingdom, housing investment is subject to VAT (at standard or reduced rates) or is VAT exempt, thereby generating non-refundable input VAT.²⁹ However, since housing investment is not included in the consumption tax base and any corresponding change in rent expenditure, which is included in the consumption base, will happen over a longer time period, cyclical movements in housing investment can affect VAT revenues (Price, Dang and Botev, 2015^[12]).

78. The composition of consumption varies greatly across OECD countries. In 2017, the share of government consumption ranged from 15.2% in Mexico and 17.2% in the United States to more than 35% in Luxembourg, the Netherlands and Sweden. In all countries except Chile, Mexico and the United States, government consumption represented the largest part of all consumption expenditure classifications shown in Figure 5.11. While the share of expenditure on transport and on housing is relatively similar across countries (at around 9% and 16% respectively), the share of food and non-alcoholic beverages ranges from 6% or less in the United States and the United Kingdom to more than 15% in Turkey, Lithuania and Mexico. The share of final consumption that is attributable to private health expenditure is below 6.5% in all OECD countries, with the exception of Switzerland and the United States, where private health expenditure accounts for 13.0% and 17.5% of total consumption expenditure respectively.

²⁷ This analysis includes only those OECD countries for which the breakdown was available in the NAs (i.e., all OECD countries, except for Switzerland).

²⁸ The notable exception to this is New Zealand, where all government activities are fully taxable under the VAT, which increases the VAT base and hence the VRR relative to a system where government consumption is exempt from VAT. Some countries have introduced mechanisms to balance the adverse effects of the exemption, such as targeted VAT refunds, full or partial right to deduct input VAT or budgetary compensations, which may have varied impacts on the VRR. For further details see (OECD, 2018^[2]).

²⁹ Two-fifths of OECD countries exempt new buildings from VAT and the remaining countries tax housing investment at a reduced or at the standard VAT rate. In the United Kingdom, the construction of new residential housing is zero-rated. (OECD, 2018^[2])

Figure 5.11. Composition of final consumption expenditure across OECD countries, 2017

Note: Private final consumption expenditure is broken down by the COICOP classification by groups (three-digit level) (UN, 2010_[18]). 090 Recreation and culture, 110 Restaurants and hotels and 120 Miscellaneous goods and services are grouped together, as well as 080 Communications and 100 Education, to improve the readability of the graph.

Source: Authors' calculations based on OECD National Accounts.

79. The pattern of consumption, i.e., the composition of consumption expenditure, typically changes over the economic cycle, which affects VAT revenues. First, increases in public spending during economic downturns increases the share of government consumption in total consumption expenditure and thereby increases the share of the VAT base that is input- rather than output-taxed. In those countries where government consumption is exempt from VAT, such a shift in consumption expenditure towards government consumption reduces the VRR and, ceteris paribus, decreases VAT revenues as a share of GDP.

80. As can be seen from Figure 5.12, the average composition of consumption expenditure changed markedly over the course of the crisis.³⁰ Government expenditure fluctuated between 23.8% and 24.6% of total consumption until 2007 inclusively, before it increased sharply to 26.0% in 2009. Since then, the share of government consumption has remained on a new higher level of around 25.3% of total consumption expenditure, with the majority of OECD countries (22) having higher levels of government consumption as a share of total consumption in 2017 than in 1995, by 3.2 percentage points on average.

81. Second, the composition of private consumption also changes over the economic cycle. During economic downturns, consumers typically decrease their expenditure on luxury goods and services, which increases the share of private expenditure on necessity goods (Sancak, Velloso and Xing, 2010_[11]). In the presence of reduced VAT rates on necessity goods, such shifts in private consumption can reduce the VRR by reducing the share of the tax base that is subject to the standard VAT rate.

82. To identify shifts in the composition of private consumption, the share of food and non-alcoholic beverages in consumption is used as a proxy of the share of necessity goods and services in the tax base

³⁰ See Annex C for ITRs on consumption for all OECD countries in selected years. Other individual country results are presented separately in Annex F.

(e.g., in (Sancak, Velloso and Xing, 2010^[11])).³¹ The average expenditure on necessity goods as a share of total consumption decreased in all but one year between 1995 and 2006, with average annual growth rates of -2.3%. Average private expenditure on luxury goods and services as a share of total consumption expenditure increased from 62.8% in 1995 to its peak of 65.5% in 2007, before dropping by two percentage points in the following two years and then stabilising around 64.0% after 2010. Meanwhile, the average share of expenditure on necessities in total consumption increased in every year between 2007 and 2012, resulting in a 5.5% increase in the average share across this period. Since then, expenditure on necessity goods and services has, on average, remained broadly stable relative to total consumption expenditure.

Figure 5.12. Shares of major consumption expenditures (non-cumulative), OECD average, 1995-2017

As % of total consumption expenditure

Note: The share of expenditure on food and non-alcoholic beverages in private consumption expenditure has been used as a proxy of the share of necessity goods and services. The residual has been used as a proxy for the expenditure on luxury goods and services. Data on necessity goods and services was not available for Chile until 2012, Korea until 1999 and Turkey until 2008 inclusively.

Source: Authors' calculations based on OECD National Accounts.

83. Between 2007 and 2009, when the average expenditure on necessity goods as well as government services as a share of consumption increased sharply, the average VAT collection efficiency, as measured by the VRR, dropped significantly. Even though total consumption expenditure stayed, on average, relatively stable during the crisis, these shifts in the consumption base, combined with reduced rates and exemptions in the VAT, contributed to a decrease in the VRR and thereby in consumption tax revenues. After the crisis, standard VAT rates increased in most OECD countries. Yet, the average ITR on consumption in 2017 was only slightly above its pre-crisis level, when standard VAT rates were, on

³¹ The effect of changes in the pattern of private consumption on the VRR can also be analysed using a decomposition of private consumption into consumption of durable goods, semi-durable goods, non-durable goods and services. With a large part of the service sector (e.g. financial services) currently being exempt from VAT in almost all OECD countries, an increasing share of services in the economy can, for a given VAT rate, reduce the VRR (Cevik et al., 2019^[14]). Private expenditure on services as a share of total consumption on average across OECD countries followed a trend increase from 1995 to 2016, but decreased between 2007 and 2009, when the average VRR decreased as well.

average, 1.5 percentage points lower. With total consumption as a share of GDP close to its 2007 level, this modest increase in the ITR on consumption results largely from changes in the pattern of consumption.

84. Therefore, changes in the pattern of consumption during the crisis limited the impact of increases in standard VAT rates on VAT revenues. Although expenditure on necessity goods as a share of total consumption has decreased since 2012, the share of necessity goods in consumption expenditure in 2017 is higher than prior to the crisis, as is the share of government consumption. In the presence of reduced rates and exemptions in the VAT, these lasting shifts in consumption expenditure narrow the VAT base through the channels described above. As a result, increases in standard rates do not translate fully into increases in the average implicit VAT rate, causing VAT revenues as a share of GDP to remain close to their long-run average, despite standard VAT rates in OECD countries being significantly higher now than prior to the crisis.

85. The finding that changes in the pattern of consumption have driven changes in the VRR during the crisis are consistent with (Ueda, 2017^[13]), which finds a negative correlation of the behaviour-induced policy gap (i.e., changes in the pattern of consumption) with output gaps. As expected, these correlations are stronger in countries where reduced rates apply to basic goods. This suggests that the cyclicity of the VRR is partly driven by cyclicity in the policy gap through behaviour-induced changes in the composition of household consumption and, to an even larger degree, in government consumption (Ueda, 2017^[13]).

86. In addition to changes within consumption expenditure, diverging trends in private rent expenditure and in housing investment around the crisis period (Figure 5.13.) put further downward pressure on the VRR. Between 2001 and 2007, an increase in housing investment relative to GDP of almost 20% on average generated additional VAT revenues. With rent expenditure remaining relatively stable until 2007 inclusively, the increase in housing investment was not reflected in higher rent expenditure in the conceptual tax base. During the crisis, when average housing investment and the corresponding VAT revenues decreased significantly, average rent consumption as a share of GDP showed a slight increase. Thereby, cyclical changes in housing investment and their impact on VAT revenues (Price, Dang and Botev, 2015^[12]) contributed to the decrease in the average VRR during the crisis. Since then, the levels of both housing investment and rent expenditure have remained broadly stable.

Figure 5.13. Average developments in housing investment and in rent consumption, 1995-2017

As % of GDP

Note: Rent consumption includes actual and imputed rents. The average excludes Chile, Japan, Korea, New Zealand, Switzerland and Turkey because data was not available.

Source: Authors' calculations based on OECD National Accounts.

5.4.3. Changes in VAT compliance

87. In addition to changes in the composition of consumption expenditure, (Ueda, 2017^[13]) analyses the effect of the economic cycle on compliance gaps, finding a negative correlation of compliance gaps with output gaps. This negative correlation appears to be stronger in countries with large compliance gaps (Ueda, 2017^[13]). Similarly, Sancak et al. (2010) estimate the effect of tax evasion on VAT collection efficiency using a qualitative indicator on tax evasion based on business surveys, finding that an increase in the ability to limit tax evasion increases the VRR.

88. Following (Ueda, 2017^[13]) and (Sancak, Velloso and Xing, 2010^[11]), an increase in taxpayer VAT noncompliance during economic downturns adversely affects the compliance gap and hence the VRR, which puts further downward pressure on VAT revenues. To further explore the extent to which changes in the policy gap as well as the compliance gap impact consumption tax revenues in OECD countries, future studies could complement this analysis by decomposing the VRR into compliance and policy gaps across OECD countries.

6 Conclusions

89. Consumption tax revenues are a significant percentage of GDP in all OECD countries and evidence shows that they have been stable with respect to the economic cycle, relative to other tax types. By decomposing changes in consumption tax revenues into the implicit tax rate (ITR) on consumption (i.e., consumption tax revenues as a share of consumption) and in consumption relative to GDP, this paper demonstrates that this stability partly results from these two major components offsetting each other. This offsetting effect is partly due to the impact of macroeconomic changes on both components, and partly due to intentional policy change affecting ITRs.

90. During the crisis, the ITR on consumption decreased on average and in many OECD countries, whereas the share of consumption in GDP increased. This increase in consumption as a share of GDP offset – but did not eliminate – the fall in the ITR. Across the period considered, changes in the ITR and changes in consumption as a share of GDP typically went in opposite directions, with the ITR being the cause of most of the variation in consumption tax revenues to GDP. This impact was particularly strong during the crisis period.

91. Changes in each of these components were driven by independent factors. Across the period 1995-2017, consumption as a share of GDP varied largely due to greater changes in other macroeconomic aggregates. Before the crisis, consumption increased in real terms but declined as a share of GDP, due to a larger contemporaneous increase in investment. A fall in investment during the crisis led to an increase in consumption as a share of GDP, whereas in real terms it was largely stable. Since 2009, it has again decreased as a share of GDP due to higher growth in investment and net exports. This finding suggests that the stability of consumption tax revenues as a share of GDP is largely due to the comparative stability of total consumption relative to other economic aggregates.

92. Changes in the second component, the ITR on consumption, showed the opposite trend. Across OECD countries, on average, the ITR on consumption was relatively stable until 2007, fell sharply in the following two years, and since rose steadily to return to pre-2007 levels.

93. Most of the variation in the ITR on consumption over this period was caused by changes in VAT revenues, with other revenues (predominantly excises) exhibiting considerably less variation. The sharp drop in the ITR between 2007 and 2009 was primarily due to a change in the pattern of consumption. A greater share of government consumption in total consumption, which is effectively input-taxed in all but one OECD country due to the exemption of government activities from VAT, as well as a shift towards necessity goods, which are often taxed at lower or zero rates, contributed to a decrease in VAT efficiency on average (as measured by the VAT Revenue Ratio (VRR)). Specifically, government consumption and private consumption of necessity goods were respectively 6.4% and 4.2% higher as a share of total consumption, on average, than in 2007, while the average VRR decreased by 11.0%. Taken together, these changes in the pattern of consumption were the primary driver of the fall in the VRR and hence in consumption tax revenues as a share of GDP over this time. This finding is also consistent with that of Keen (2013). Changes in taxpayer compliance during the crisis, as mentioned in Ueda (2017) and in Sancak et al. (2010), are also likely to have played a role in this decrease, although this paper does not examine their influence specifically.

94. From 2009 onwards, the increase in the ITR on consumption is explained by two factors. First, many OECD countries increased their standard VAT rates in the post-crisis period, in response to the fall in revenues during the crisis. This caused the OECD average standard rate as well as the OECD average ITR to increase. Second, there has been a slow increase in VRRs across this period as consumption shifts slowly away from necessity goods and services. However, the shares of expenditure on necessity goods and of government expenditure have remained elevated compared to pre-crisis levels. For instance, compared to their level in 1995, 28 OECD countries had higher levels of government consumption as a share of total consumption in 2016 by an average of three percentage points. Additionally, a few countries implemented new or additional reduced VAT rates between 2009 and 2014, further narrowing the VAT base. As a result, the overall ITR on consumption in 2017 is only slightly higher than it was prior to the crisis, even though there has been an increase in VAT rates since 2009 on average and in most OECD countries.

95. These findings imply that in the presence of reduced rates and exemptions in VAT systems, increases in standard rates have not increased the implicit tax rates on consumption as strongly as they did before the crisis. In light of lasting changes in the pattern of consumption post-economic crisis, VAT revenues, particularly in countries with low VRRs and high shares of government consumption, are likely to be more exposed to economic changes, as that part of the tax base that is subject to the standard VAT rate is smaller now than it was prior to the crisis. This is particularly the case if an economic crisis directly affects private consumption, rather than investment, as was the case in the most recent crisis. Accordingly, a broadening of the VAT base as well as harmonising VAT rates across the base, as discussed in (OECD, 2018^[2]), could in theory help to stabilise consumption tax revenues during economic downturns. However, caution is needed in assessing how best to do so due to the complexity of VAT systems, likely behavioural responses to changes in rate structures, and the need to consider the distributional impact of any changes and to compensate via the transfer and benefit system.

Annex A. – Data on consumption tax and VAT revenues

Table A.1. Revenues from consumption taxes and from VAT (5111) as a share of GDP

	Consumption tax revenues as % of GDP					VAT revenues as % of GDP				
	1995	2005	2010	2015	2017	1995	2005	2010	2015	2017
Australia	8.2	8.4	7.3	7.7	7.4	-	3.9	3.4	3.6	3.5
Austria	12.0	11.9	11.6	11.8	11.8	7.6	7.6	7.7	7.6	7.7
Belgium	10.8	10.8	10.8	10.7	10.8	6.5	6.9	6.9	6.7	6.8
Canada	8.2	7.5	5.1	5.1	5.1	2.3	2.5	1.9	1.9	1.9
Chile	11.4	10.7	10.0	11.0	11.0	7.4	7.8	7.5	8.3	8.4
Czech Republic	11.2	10.7	10.8	11.2	11.5	5.8	6.6	6.6	7.3	7.7
Denmark	15.2	15.9	14.9	14.5	14.5	9.1	9.7	9.4	9.2	9.5
Estonia	12.6	12.4	13.4	13.9	14.0	9.6	8.1	8.5	9.1	9.1
Finland	13.6	13.3	13.0	14.2	14.2	7.7	8.4	8.3	9.0	9.1
France	11.7	10.9	10.5	11.0	11.3	7.3	7.2	6.8	6.9	7.0
Germany	10.1	9.9	10.3	10.3	9.9	6.3	6.1	7.0	7.0	6.9
Greece	11.6	11.0	12.3	14.5	15.3	5.8	6.7	7.1	7.3	8.1
Hungary	16.6	14.4	16.0	17.0	16.4	7.3	8.2	8.5	9.6	9.5
Iceland	14.9	16.5	11.4	11.5	12.6	9.2	10.8	7.3	8.0	8.9
Ireland	12.8	11.2	9.8	7.5	7.3	6.7	7.3	6.0	4.5	4.4
Israel ²	12.9	12.0	12.1	11.8	11.3	8.2	7.5	7.5	7.8	7.4
Italy	10.5	10.3	11.0	11.6	12.0	5.3	5.7	6.1	6.1	6.2
Japan	4.1	5.1	5.0	6.4	6.6	1.4	2.5	2.5	4.2	4.1
Korea	7.8	7.7	7.9	7.1	7.5	3.4	3.9	4.1	3.8	4.3
Latvia	11.2	11.5	11.9	13.1	13.4	8.4	7.4	6.7	7.7	8.0
Lithuania	11.8	10.9	11.5	11.3	11.4	7.4	7.1	7.7	7.7	7.8
Luxembourg	8.9	10.9	10.2	9.6	9.4	4.3	6.1	6.4	6.6	6.2
Mexico	4.0	4.4	4.9	6.2	5.9	2.2	3.3	3.8	3.8	3.7
Netherlands	10.6	11.0	11.0	11.0	11.3	6.0	6.7	6.7	6.5	6.8
New Zealand	11.9	11.6	12.0	12.3	12.3	8.1	8.6	9.3	9.6	9.7
Norway	14.8	11.8	11.6	11.6	12.0	8.5	7.7	7.8	8.2	8.6
Poland	13.0	12.5	12.6	11.6	12.6	6.1	7.7	7.6	7.0	7.8
Portugal	12.9	13.5	12.2	13.3	13.8	6.8	8.2	7.5	8.5	8.6
Slovak Republic	14.1	12.3	10.1	10.8	11.0	8.2	7.7	6.2	6.8	7.0
Slovenia	14.8	13.3	13.8	14.5	14.0	-	8.4	8.1	8.3	8.1
Spain	9.1	9.9	8.5	10.1	9.9	5.0	6.2	5.3	6.4	6.4
Sweden	12.8	12.1	12.7	12.1	12.3	8.8	8.5	9.2	9.0	9.3
Switzerland	5.4	6.1	6.1	5.9	6.0	3.1	3.5	3.4	3.4	3.4
Turkey	6.2	11.5	11.8	11.1	10.8	4.0	5.1	5.4	5.2	5.0
United Kingdom	10.4	9.8	10.0	10.6	10.6	5.6	6.0	6.0	6.8	6.9
United States	4.8	4.5	4.2	4.3	4.2	-	-	-	-	-
OECD unweighted average ¹	10.9	10.8	10.5	10.8	10.9	6.4	6.7	6.6	6.8	7.0

Note:

1. The 2016 OECD average excludes the one-off revenues from stability contributions in Iceland. ² Israel: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements.

Source: OECD Revenue Statistics (2018)

Annex B. – Data on standard VAT rates and the VRR

Table B.1. Data on the year of introduction of the VAT, standard VAT rates (in %) and the VRR, selected years

	Implemented	1995	2005	2007	2009	2011	2013	2015	2017	VRR 2017
Australia	2000	-	10	10	10	10	10	10	10	0.51
Austria*	1973	20	20	20	20	20	20	20	20	0.64
Belgium	1971	20.5	21	21	21	21	21	21	21	0.50
Canada*	1991	7	7	6	5	5	5	5	5	0.51
Chile	1975	18	19	19	19	19	19	19	19	0.67
Czech Republic	1993	22	19	19	19	20	21	21	21	0.66
Denmark	1967	25	25	25	25	25	25	25	25	0.67
Estonia	1991	18	18	18	20	20	20	20	20	0.80
Finland	1994	22	22	22	22	23	24	24	24	0.61
France*	1968	20.6	19.6	19.6	19.6	19.6	19.6	20	20	0.53
Germany	1968	15	16	19	19	19	19	19	19	0.59
Greece*	1987	18	19	19	19	23	23	23	24	0.46
Hungary	1988	25	25	20	25	25	27	27	27	0.64
Iceland	1990	24.5	24.5	24.5	24.5	25.5	25.5	24	24	0.61
Ireland	1972	21	21	21	21.5	21	23	23	23	0.52
Israel*	1976	17	16.5	15.5	16.5	16	18	17	17	0.66
Italy	1973	19	20	20	20	21	22	22	22	0.42
Japan	1989	3	5	5	5	5	5	8	8	0.74
Korea	1977	10	10	10	10	10	10	10	10	0.72
Latvia	1995	18	18	18	21	22	21	21	21	0.60
Lithuania	1994	18	18	18	19.7	21	21	21	21	0.56
Luxembourg	1970	15	15	15	15	15	15	17	17	0.95
Mexico	1980	15	15	15	15	16	16	16	16	0.33
Netherlands	1969	17.5	19	19	19	19	21	21	21	0.56
New Zealand	1986	12.5	12.5	12.5	12.5	15	15	15	15	1.04
Norway	1970	23	25	25	25	25	25	25	25	0.61
Poland	1993	22	22	22	22	23	23	23	23	0.53
Portugal*	1986	17	21	21	20	23	23	23	23	0.55
Slovak Republic	1993	25	19	19	19	20	20	20	20	0.55
Slovenia	1999	-	20	20	20	20	22	22	22	0.65
Spain*	1986	16	16	16	16	18	21	21	21	0.46
Sweden	1969	25	25	25	25	25	25	25	25	0.63
Switzerland	1995	6.5	7.6	7.6	7.6	8	8	8	8	0.71
Turkey	1985	15	18	18	18	18	18	18	18	0.44
United Kingdom	1973	17.5	17.5	17.5	15	20	20	20	20	0.47
Unweighted average		17.8	17.9	17.8	18.0	18.7	19.2	19.3	19.3	0.60

Note: VAT rates are standard rates applicable as at 1 January of each year. Calculation formula $VRR = \text{VAT Revenue} / [(\text{Consumption} - \text{VAT revenue}) \times \text{standard VAT rate}]$. Consumption = Final Consumption Expenditure (Heading P3) in National Accounts. *Canada and Japan*: VRR Calculation includes federal VAT only. Annual final consumption expenditure in national accounts was adjusted to ensure matching between the fiscal year (Q2 Y to Q1 Y+1) for the GST revenue and the civil year for final consumption figures. *Israel*: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law. Country-specific notes on VAT rates: <http://www.oecd.org/tax/consumption/vat-gst-rates-ctt-trends.xlsx>

Source: OECD Consumption Tax Trends (2018).

Annex C. – Data on Implicit Tax Rates (ITRs) on consumption

Table C.1. ITRs on consumption (in %) across OECD countries, selected years

	1995	1997	1999	2001	2003	2005	2007	2009	2011	2013	2015	2017
Australia	12.2	11.7	11.5	13.2	13.4	12.8	12.1	11.4	10.8	11.8	11.1	10.9
Austria	19.2	20.5	20.6	20.1	20.1	19.4	19.1	18.7	19.1	19.2	19.5	19.6
Belgium	17.1	17.9	17.9	16.7	16.7	17.7	17.7	16.4	16.6	16.5	16.3	16.6
Canada	11.9	11.8	11.8	11.5	11.6	11.3	10.5	7.0	6.8	6.7	6.9	6.9
Chile	19.3	19.5	18.1	18.4	18.2	18.2	17.9	15.7	16.9	16.7	16.9	16.7
Czech Republic	19.2	17.0	17.6	16.6	16.4	18.6	18.5	18.2	19.3	20.2	20.3	20.8
Denmark	25.7	27.1	28.6	27.9	27.3	28.3	29.2	24.6	25.2	25.1	25.0	25.7
Estonia	18.0	20.0	17.0	19.8	19.4	20.8	23.5	23.6	23.3	22.6	24.1	24.6
Finland	23.0	24.9	24.8	23.4	23.7	22.9	22.0	20.3	21.9	22.4	21.8	22.8
France	17.7	18.3	18.2	16.7	16.2	16.4	16.0	15.1	15.7	16.0	16.4	17.0
Germany	15.6	15.0	15.5	15.4	15.5	15.1	16.7	16.5	16.6	16.5	16.7	16.0
Greece	15.6	16.2	15.9	15.9	15.5	14.7	15.5	13.6	16.8	18.2	19.2	20.9
Hungary	27.5	25.6	25.7	24.1	22.6	23.1	24.5	25.4	27.3	30.1	32.3	30.2
Iceland	23.5	23.8	25.8	21.5	21.6	25.2	24.6	17.0	17.6	17.7	18.5	20.7
Ireland	22.5	22.9	23.4	21.0	21.1	23.1	21.6	16.8	17.0	18.1	19.9	19.8
Israel ²	18.7	19.0	18.3	16.7	17.4	17.7	17.6	17.2	17.9	17.9	18.2	17.0
Italy	15.9	16.3	16.8	16.0	15.1	15.0	15.5	14.7	16.0	16.6	17.0	17.7
Japan	6.4	7.0	7.8	7.3	7.3	7.4	7.2	6.8	6.9	6.9	9.2	9.6
Korea	14.0	14.6	13.8	14.3	14.0	12.8	12.7	12.2	12.4	12.2	11.7	12.6
Latvia	14.4	15.4	15.2	14.8	15.3	16.9	16.9	16.5	16.9	18.4	20.0	21.0
Lithuania	15.5	18.2	17.5	15.5	15.4	15.1	16.4	14.4	16.3	15.7	16.6	16.9
Luxembourg	18.0	19.4	21.4	21.4	22.4	25.5	26.7	26.0	27.6	28.3	25.6	24.7
Mexico	5.6	6.1	7.3	7.0	7.0	5.9	6.1	6.4	6.5	5.9	8.6	8.2
Netherlands	17.4	18.1	17.8	18.3	17.6	18.4	18.9	17.5	17.5	17.8	18.6	19.7
New Zealand	19.3	18.5	18.4	18.6	19.2	18.2	16.9	16.8	18.6	18.9	19.7	19.8
Norway	27.0	27.6	27.6	26.3	23.1	23.8	25.5	22.1	22.3	21.9	21.1	21.2
Poland	20.0	18.9	18.4	16.1	17.1	18.2	20.0	16.8	19.0	17.3	18.0	19.9
Portugal	18.5	18.5	19.1	18.1	19.5	18.8	18.6	15.5	17.7	17.8	19.0	20.1
Slovak Republic	22.4	19.9	18.8	16.8	18.6	20.0	18.2	15.0	16.3	16.4	17.3	17.3
Slovenia	23.9	22.1	24.2	21.9	22.9	22.8	23.5	21.4	21.6	24.0	25.0	24.6
Spain	13.0	13.7	15.3	14.5	14.6	15.2	14.2	9.9	11.8	13.8	14.9	14.8
Sweden	21.0	20.2	19.5	20.1	20.0	20.4	20.9	20.6	20.5	19.8	20.1	20.8
Switzerland	8.4	8.1	9.2	9.6	9.5	9.8	10.2	9.9	10.3	10.2	10.0	10.0
Turkey	9.0	11.3	11.4	15.1	18.8	17.8	16.9	16.0	18.0	18.1	17.6	17.2
United Kingdom	14.6	14.3	14.5	13.8	13.7	13.0	12.9	11.6	14.4	14.0	14.3	14.3
United States	6.4	6.3	6.1	5.8	5.6	5.8	5.6	5.1	5.4	5.6	5.6	5.4
OECD unweighted average ¹	17.1	17.4	17.5	17.0	17.0	17.4	17.5	15.9	16.8	17.1	17.6	17.8

Note: 1. The 2016 OECD average excludes the one-off revenues from stability contributions in Iceland.

2. Israel: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements.
Source: Authors' calculations based on OECD National Accounts and OECD Revenue Statistics (2018).

Annex D. – Variance analysis across countries

Table D.1. Variance of consumption tax-to-GDP ratios, ITRs and consumption as a share of GDP against the country mean across OECD countries over the period 1995-2017

		$Var\left(\frac{5000}{GDP}\right)$	$Var(ITR)$	$Var\left(\frac{C}{GDP}\right)$	$2Cov\left(ITR, \frac{C}{GDP}\right)$
AUS	Var and Cov	0.0018	0.0018	0.0002	-0.0001
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	98%	10%	-8%
AUT	Var and Cov	0.0003	0.0004	0.0002	-0.0003
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	144%	69%	-113%
BEL	Var and Cov	0.0004	0.0009	0.0002	-0.0007
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	210%	52%	-162%
CAN	Var and Cov	0.0062	0.0069	0.0005	-0.0012
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	111%	8%	-19%
CHL	Var and Cov	0.0024	0.0016	0.0009	0.0000
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	64%	37%	-1%
CZE	Var and Cov	0.0012	0.0020	0.0006	-0.0013
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	159%	48%	-108%
DNK	Var and Cov	0.0005	0.0010	0.0004	-0.0009
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	205%	79%	-184%
EST	Var and Cov	0.0037	0.0062	0.0010	-0.0035
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	169%	26%	-95%
FIN	Var and Cov	0.0008	0.0011	0.0006	-0.0009
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	134%	76%	-110%
FRA	Var and Cov	0.0003	0.0005	0.0001	-0.0003
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	150%	37%	-87%
DEU	Var and Cov	0.0005	0.0006	0.0003	-0.0004
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	121%	66%	-87%
GRC	Var and Cov	0.0015	0.0024	0.0004	-0.0013
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	159%	24%	-83%
HUN	Var and Cov	0.0017	0.0024	0.0005	-0.0013
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	142%	32%	-74%
ISL	Var and Cov	0.0052	0.0055	0.0005	-0.0007
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	105%	9%	-14%
IRL	Var and Cov	0.0033	0.0029	0.0043	-0.0038
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	86%	128%	-114%
ISR	Var and Cov	0.0007	0.0008	0.0002	-0.0003
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	109%	28%	-37%
ITA	Var and Cov	0.0006	0.0009	0.0001	-0.0004
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	143%	17%	-60%
JPN	Var and Cov	0.0023	0.0030	0.0002	-0.0010
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	133%	11%	-44%
KOR	Var and Cov	0.0020	0.0018	0.0003	-0.0002
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	93%	17%	-10%
LVA	Var and Cov	0.0023	0.0032	0.0006	-0.0015

	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	140%	28%	-68%
LTU	Var and Cov	0.0023	0.0047	0.0011	-0.0035
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	205%	47%	-152%
LUX	Var and Cov	0.0020	0.0027	0.0012	-0.0019
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	135%	62%	-97%
MEX	Var and Cov	0.0061	0.0071	0.0002	-0.0011
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	115%	3%	-18%
NLD	Var and Cov	0.0004	0.0009	0.0002	-0.0007
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	228%	58%	-186%
NZL	Var and Cov	0.0008	0.0010	0.0004	-0.0006
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	124%	45%	-69%
NOR	Var and Cov	0.0018	0.0012	0.0026	-0.0020
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	66%	146%	-111%
POL	Var and Cov	0.0022	0.0033	0.0004	-0.0015
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	153%	18%	-71%
PRT	Var and Cov	0.0015	0.0022	0.0002	-0.0009
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	146%	11%	-57%
SVK	Var and Cov	0.0019	0.0041	0.0011	-0.0034
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	217%	60%	-176%
SVN	Var and Cov	0.0009	0.0015	0.0008	-0.0014
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	165%	86%	-151%
ESP	Var and Cov	0.0052	0.0068	0.0002	-0.0017
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	129%	3%	-33%
SWE	Var and Cov	0.0003	0.0004	0.0004	-0.0005
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	126%	117%	-143%
CHE	Var and Cov	0.0004	0.0006	0.0002	-0.0005
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	166%	63%	-129%
TUR	Var and Cov	0.0053	0.0067	0.0004	-0.0018
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	126%	8%	-34%
GBR	Var and Cov	0.0010	0.0016	0.0001	-0.0007
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	159%	13%	-72%
USA	Var and Cov	0.0003	0.0005	0.0001	-0.0004
	Ratio to $Var\left(\frac{5000}{GDP}\right)$	100%	199%	33%	-151%

Note: The table shows the results from equation (2) across the period 1995-2017.

Source: Authors' calculations based on OECD National Accounts and OECD Revenue Statistics (2018).

Annex E. – Shares of major aggregates in GDP

Table E.1. Shares of major expenditure aggregates in GDP (in %), 2017

	Final consumption			Investment	Net exports		
	Total	Private	Government		Net exports	Exports	Imports
Australia	75.3	56.5	18.8	24.3	0.4	21.7	21.3
Austria	71.7	52.2	19.5	24.8	3.3	54.0	50.7
Belgium	74.5	51.4	23.1	24.1	1.4	82.3	80.9
Canada	78.7	57.9	20.7	23.5	-2.2	31.4	33.6
Chile	77.0	63.0	14.0	21.6	1.4	28.5	27.1
Czech Republic	66.6	47.4	19.2	25.9	7.5	79.7	72.2
Denmark	71.2	46.5	24.6	21.8	7.0	55.1	48.1
Estonia	70.2	50.3	19.9	26.6	4.3	76.1	71.9
Finland	76.0	53.2	22.8	23.9	0.1	37.7	37.6
France	77.7	54.0	23.7	23.4	-1.1	30.8	31.9
Germany	72.2	52.3	19.9	20.7	7.1	47.4	40.3
Greece	88.5	68.7	19.8	12.5	-1.0	33.0	34.0
Hungary	69.9	49.5	20.3	22.8	7.3	87.1	79.9
Iceland	73.8	50.3	23.4	22.1	4.1	46.1	42.0
Ireland	44.1	32.2	12.0	33.4	22.1	121.0	99.0
Israel	77.3	54.7	22.7	21.5	1.2	28.7	27.5
Italy	79.1	60.3	18.8	17.9	3.0	30.8	27.9
Japan	75.2	55.5	19.7	23.9	0.9	17.8	16.8
Korea	63.0	47.5	15.4	32.3	4.7	40.9	36.2
Latvia	77.9	59.8	18.1	21.9	0.2	62.1	62.0
Lithuania	78.5	62.1	16.3	19.2	2.4	73.6	71.2
Luxembourg	46.2	29.8	16.4	18.6	35.2	217.6	182.5
Mexico	77.0	65.3	11.7	23.0	-1.8	37.6	39.4
Netherlands	68.7	44.3	24.3	20.6	10.8	83.4	72.6
New Zealand	75.6	57.5	18.0	23.5	0.9	27.6	26.7
Norway	68.7	44.7	24.0	27.8	3.5	36.3	32.8
Poland	76.0	58.3	17.7	19.8	4.2	54.3	50.2
Portugal	81.8	64.6	17.2	17.2	1.0	42.7	41.7
Slovak Republic	74.8	55.9	18.9	23.0	2.2	95.1	92.9
Slovenia	71.1	52.7	18.4	20.1	8.9	83.2	74.3
Spain	77.0	58.4	18.6	19.4	3.6	35.2	31.6
Sweden	71.0	45.0	26.1	25.8	3.2	44.4	41.2
Switzerland	65.7	53.7	12.0	23.7	10.6	65.0	54.5
Turkey	73.5	59.0	14.5	31.0	-4.5	24.8	29.3
United Kingdom	83.7	65.0	18.7	17.5	-1.2	30.4	31.6
United States	82.3	68.2	14.1	20.6	-2.9	12.1	15.0
OECD unweighted average	73.1	54.1	19.0	22.8	4.1	54.9	50.8

Note: The statistical discrepancy, which is not shown here, was less than 1% of GDP in all OECD countries in 2016.

Source: Authors' calculations based on OECD National Accounts.

Annex F. – Key results for individual OECD countries

The following pages show the key results for individual OECD countries.

AUS, 1995 - 2017

AUT, 1995 - 2017

BEL, 1995 - 2017

CAN, 1995 - 2017

CHE, 1995 - 2017

CHL, 1995 - 2017

CZE, 1995 - 2017

DEU, 1995 - 2017

DNK, 1995 - 2017

ESP, 1995 - 2017

EST, 1995 - 2017

FIN, 1995 - 2017

FRA, 1995 - 2017

GBR, 1995 - 2017

GRC, 1995 - 2017

HUN, 1995 - 2017

IRL, 1995 - 2017

ISL, 1995 - 2017

ISR, 1995 - 2017

ITA, 1995 - 2017

JPN, 1995 - 2017

KOR, 1995 - 2017

LTU, 1995 - 2017

LUX, 1995 - 2017

LVA, 1995 - 2017

MEX, 1995 - 2017

NLD, 1995 - 2017

NOR, 1995 - 2017

NZL, 1995 - 2017

POL, 1995 - 2017

PRT, 1995 - 2017

SVK, 1995 - 2017

SVN, 1995 - 2017

SWE, 1995 - 2017

TUR, 1995 - 2017

USA, 1995 - 2017

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