Research School of International Taxation

The ITI Database: New Data on International Tax Institutions

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Abstract

This article introduces the new *International Tax Institutions* (ITI) database, a unique attempt to collect the most relevant statutory tax indicators for the whole world. It includes taxes on corporate and personal (earned and capital) income, consumption taxes, as well as anti-tax avoidance rules (thin-capitalization and earnings-stripping rules, CFC rules and transfer pricing regulations). Our main objective is to provide a broad overview on key features, (time- and cross-sectional) variation, and regularities in the data, with a focus on international tax issues. We present a vast number of new variables – such as effective tax and institutional measures – that allow for a comprehensive description and comparison of countries' taxes and tax systems.

1 Introduction

In 2020, the Tübingen *Research School of International Taxation* (RSIT) started to collect a large dataset called the *International Tax Institutions* (ITI) database. This database contains (sometimes novel) measures of tax and regulatory policies related to international taxation. In addition to introducing the new dataset, the aim of this paper is to provide a broad overview of the main features and regularities of the data.

At the heart of the ITI database is the corporate income tax data. Section 2.1 provides a description thereof, including not only countries' statutory tax rates but also forward-looking effective tax measures that take into account the rules that determine the tax base. While tax rates are usually country- and time-specific, the wealth of data we have collected allows us to calculate country- and industry-specific (marginal and average) effective tax rates for more than 200 jurisdictions and 20 years.

The focus of the ITI database is on international tax institutions and tax measures that are particularly relevant to the activities of multinational enterprises (MNEs). However, we additionally provide data on (top and average) personal income rates (Section 2.2) and on commodity taxes (Section 2.3), which allow for interesting international comparisons. The ITI database also includes information on anti-tax-avoidance rules (ATARs), which have become an important part of countries' tax codes. ATARs are implemented by jurisdictions to combat international profit shifting and tax avoidance by MNEs. We present data on the following rules: (i) transfer pricing (TP) rules (Section 2.4); (ii) controlled foreign corporation (CFC) rules (Section 2.5); and (iii) interest deduction rules – thin-capitalization (TC) and earnings-stripping (ES) rules (Section 2.5).

In Section 3, we combine the ITI dataset with tax revenue data and provide a number of examples on how variation in the data can be exploited to learn about interesting correlations at the country level. Our analysis documents some interesting patterns. For example, while most countries raise a significant share of total tax revenue by using a value added tax, in high-income countries, taxes on personal income clearly contribute most to total tax revenue. The share of revenue raised by personal income taxes substantially increases with income. Low-income countries rely heavily on corporate tax revenue, on average. We also look at some simple conditional correlations suggesting that raising statutory tax rates significantly reflects in total revenue only when countries increase their top income tax rate. The ITI database is particularly relevant for researchers interested in the empirical analysis of MNE activity, as it captures all relevant tax incentives that determine foreign direct investment activity.

To the best of our knowledge, this paper provides the most comprehensive overview of the major types of taxes and tax institutions around the world. Separate data surveys are available for some of the sub-datasets presented in Sections 2.1 to 2.5 (we refer to these papers in the respective subsections). In addition to the information below, these surveys include precise descriptions of tax measures and specific tax regimes, detailed information on the calculation of tax measures, data sources, additional correlations and statistics highlighting interesting patterns and relationships between different indicators in the data. Moreover, we provide a data handbook (Hiller, Merlo, and Wamser, 2024) that contains a detailed list of all variables included in the ITI dataset, information on data sources, and time and country coverage.

The ITI database collected by the RSIT contains a unique amount of international tax information that we make available to the research community with the goal of promoting research in international taxation. Please note that collecting and maintaining the ITI data is a difficult and time-consuming process. It has required considerable dedication and effort of quite a few researchers from the RSIT who were and are involved in this process. Interested researchers who would like to access our data should visit https://www.rsit-uni-tuebingen.de/data/ to learn more about how to get access to the ITI database.

Let us finally mention that after releasing the first version of the ITI data in 2024, we plan to provide regular updates and revisions to the data. In addition, we will add different aspects of international taxation to future versions of the dataset (data on bilateral tax incentives, additional measures of personal income taxes, and institutional details on CFC rules).[1]

2   Data

2.1   Corporate income taxes

This section introduces the corporate tax data compiled for the ITI database. The data contain information for an unbalanced panel of 221 countries[2] from 2001 to 2020. The following tax measures are included: First, statutory corporate income tax rates (SCITRs). Second, effective marginal tax rates (EMTRs). Third, effective average tax rates (EATRs).

Let us first focus on the SCITR. The SCITR is the tax that applies to

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[1]Note that these data will be collected over the next few years and will be published once they have passed basic quality checks.

[2]Note that we use the term country loosely including all jurisdictions that have the autonomy to raise taxes (e.g., Guernsey or the Isle of Man).

the respective tax base (taxable profits) and is the most salient and relevant corporate tax measure describing countries' tax systems. Figure 1 plots the mean SCITR over time. It shows that the average SCITR has decreased by 6.54 percentage points (or approximately by 23.2%) from 28.21% in 2001 to 21.67% in 2020.[3]

Figure 2 depicts the distribution of the SCITR using box plots. It suggests that there is substantial variation across countries and time. Countries with SCITRs above 45% (e.g. Kuwait, French Polynesia, Colombia, and Iran) have decreased their SCITRs in the early to mid 2000s – which has reduced the number of outliers. Additionally, the entire distribution has shifted to the left as indicated by the change in the median. This illustrates that the decline in the average SCITR is not driven by outliers or some specific countries, but is a global phenomenon.

Both the EMTRs and EATRs are forward-looking effective tax rates (FLETRs) calculated following the Devereux-Griffith method (see OECD, 1991; Devereux, and Griffith, 1998; Devereux, Griffith, and Klemm, 2002) using information on SCITRs and depreciation rules. A new contribution is that we calculate the FLETRs at the country-industry-year level by weighting asset-specific depreciation allowances, which are per se country-specific determinants of the tax base, with industry-specific asset weights. The idea is to capture the the typical asset composition in a given country and industry (for more information, see Mc Auliffe, Thunecke, and Wamser, 2024).[4]

The EMTR is a measure of the marginal tax burden on a hypothetical marginal investment project. The EATR is a measure of the average tax burden of investment. In our dataset, we provide two versions of the FLETRs. First, country-c-year-t specific measures: $EMTR_{ct}$ and $EATR_{ct}$. Second, country-c-industry-i-year-t specific ones: $EMTR_{cit}$ and $EATR_{cit}$. The core difference between the country-year (ct) and country-industry-year (cit) specific FLETRs is the type of weighting scheme used to capture the asset composition, and thus the weight attached to each asset-, country-, and year-specific net present value of tax depreciation, as a determinant of the tax base (see Mc Auliffe, Thunecke, and Wamser, 2024). For the country-year-specific EMTRs and EATRs, we assume the same asset and financing structure across countries.[5]

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[3]The figure is based on a balanced panel of 167 countries, for which the SCITR is available over all 20 years. Note that we base all statistics where mean values of tax measures are depicted over time on balanced country samples to avoid selection effects.

[4]We consider seven different asset categories (buildings, machinery, intangible fixed assets, office equipment, computers, vehicles, and inventories) and that industries are defined based on the NACE Rev. 2 (ISIC Rev. 4) sections.
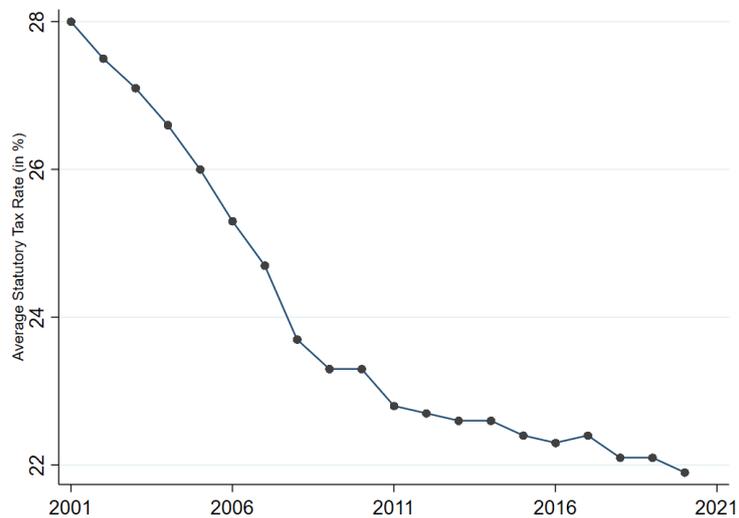
[5]For a more detailed description of the calculation, see Steinmüller, Thunecke, and

In the following, we present the country-year and country-industry-year-specific EMTRs and EATRs. To learn about the variation in these new tax measures, we plot year-specific means over all countries for each industry in Figures 3 and 4. For the sake of comparison, we add year-specific means of the country-industry-year as well as country-year-specific EMTRs over all countries to the plot.

Figure 3 suggests that the country-industry-year-specific EMTRs follow, on average, the same downward trend as their country-year-specific counterparts. There is, however, substantial variation in the average EMTRs across industries. For example, firms operating in the sections *construction*, *manufacturing*, as well as *wholesale and retail trade* face among the highest average EMTRs.[6] On the other hand, firms engaged in *arts, entertainment, and recreation*, *financial and insurance activities*, as well as *human health and social work activities* face the lowest effective tax burden.

Figure 4 finally plots the country-industry-specific EATRs. While we find basically the same pattern (also over time), the more significant drop in the mean reflects the fact that the EATR approaches the SCITR for highly profitable projects, so that the pattern over time is primarily driven by the changes in the statutory rate.

Figure 1: Mean SCITR over time

[6]The largest EMTRs are the ones for *wholesale and retail trade*. This can in large parts be explained with the high inventory shares that we find for this industry and the fact that inventories are not subject to depreciation.
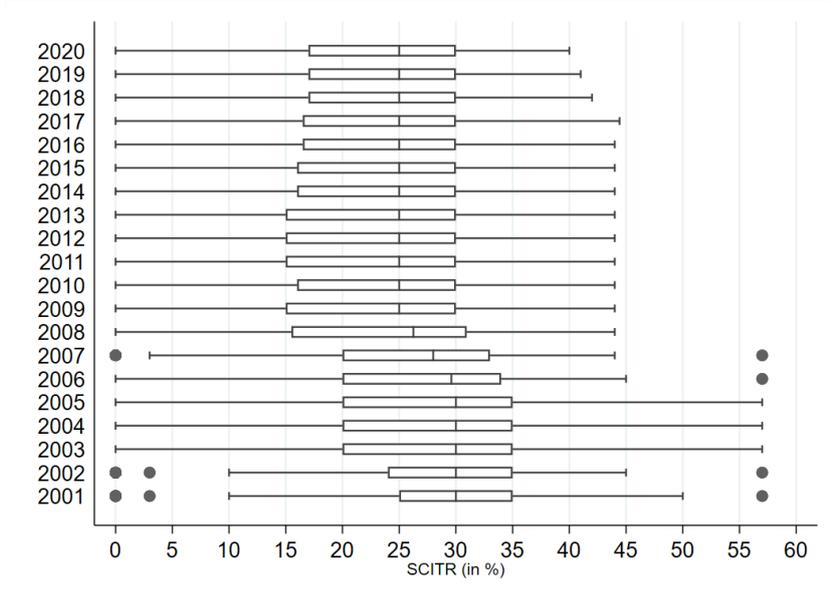
Figure 2: Variation of the SCITR over time

Figure 3: Comparison of country-year and country-industry-year-specific effective marginal tax rates
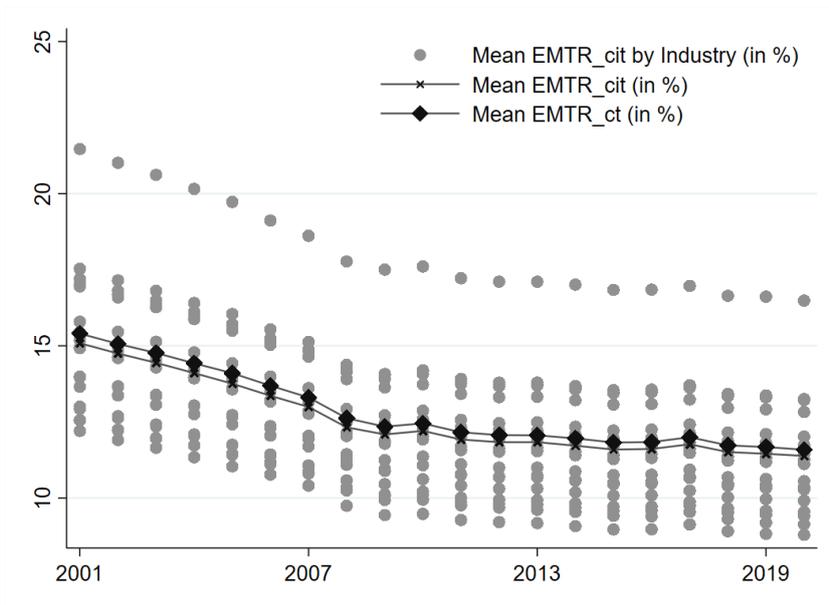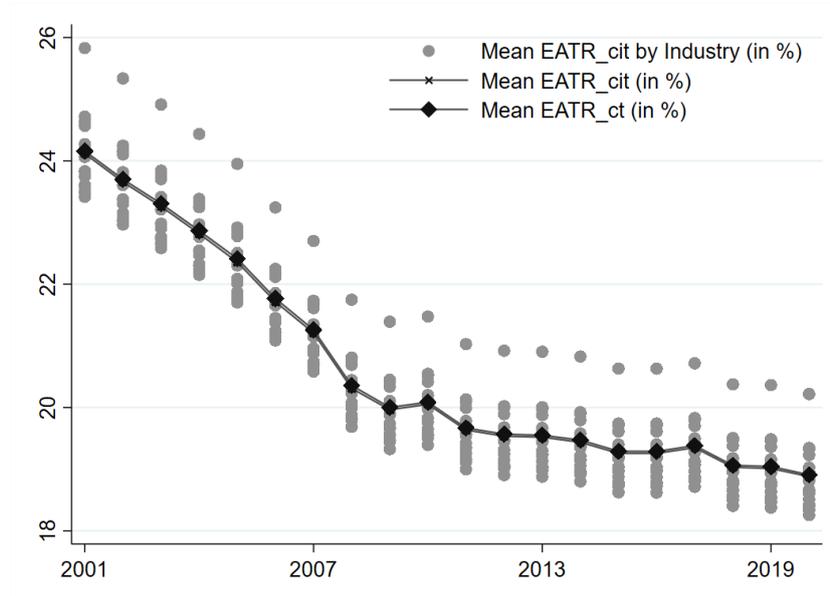
Figure 4: Comparison of country-year and country-industry-year-specific effective average tax rates

2.2 Personal income taxes

Personal income taxes are a major source of fiscal revenue – in many countries, the single most important one. For example, as of 2019, individual income taxes (federal, state, local) have contributed to about 41% of total U.S. government tax revenue, while corporate income taxes have accounted for only about 4% of total U.S. tax revenue in the same year (OECD Revenue Statistics).

Apart from their importance for raising revenue, most countries design their personal income tax systems consistent with goals of equity and redistribution. Accordingly, tax schedules observed in practice are usually progressive – with marginal tax rates increasing in income – and a vast number of rules determine taxable income, allowing for personal deductions, tax allowances or tax credits.[7]

Many economists highlight that a guiding principle to achieve a horizontally and vertically fair income tax system should be based on the *ability-to-*

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[7]The income tax base usually takes into account individual characteristics such as marital status, number of children, extraordinary expenses and other obligations affecting individuals' *ability to pay*. Note that the ITI data do not include such information. For example, the study by Egger and Strecker (2017) distinguishes among 12 different broadly defined household types.

pay concept. Individuals with a *high ability* (in this case high income) should therefore be contributing more to tax revenue compared to those with a *low ability*. Since, however, the income tax also creates disincentives to earning more, contributions to the optimal tax policy literature are concerned with different trade-offs as well as restrictions of imperfect information – as ability to pay is unobserved.[8]

This section introduces three different tax measures on personal income (earned and capital income). Note that a detailed description of the data (including data sources and definitions, additional tax measures and indicators on personal income) is provided in Eklund, Strohmaier, and Wamser (2024). In the following, we present a brief summary on: the (i) top marginal income tax rate, denoted TITR (on earned income); the (ii) average income tax rate, denoted AITR (on earned income);[9] and the (iii) dividend tax rate, denoted DTR (on dividend income). We have collected these taxes for 165 countries and 15 years.

The main insights of our descriptive analysis on the three tax measures (TITR, AITR and DTR) can be summarized as follows: The mean values of TITR, AITR and DTR have hardly changed over the last 15 years (2006 to 2020). There is, however, substantial cross-sectional variation in all tax measures.[10] Furthermore, there is a strong negative cross-sectional correlation of -0.32 between the TITR and countries' Gini coefficient.[11] We provide the latter statistic as an example of how the data can be used to learn about interesting cross-country correlations and patterns.[12]

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[8]High taxes affect different margins of labor supply, especially labor market participation and work effort. Moreover, taxes discourage private investments in education, et cetera. The literature on optimal income taxation, which particularly considers the equity-efficiency trade-offs of income taxes, as well as the imperfect information problem associated with unobserved ability, basically started with the seminal contribution of Mirrlees (1971).

[9]The AITR is the average tax burden that applies exactly at the top income tax rate bound. It thus measures the average tax burden for an individual that just earns income equal to the amount at which the TITR becomes effective. See Eklund, Strohmaier, and Wamser (2024) for a precise definition.

[10]Note that, while the mean value is relatively stable, single countries are cutting or increasing their taxes quite regularly (see Eklund, Strohmaier, and Wamser, 2024, and Section 3).

[11]Note that we use the Gini coefficient from the World Inequality Database, which is based on gross income, i.e. inequality before taxes.

[12]The relationship between the TITR and the Gini coefficient may be interesting as many economists argue that the income tax system plays a central role in addressing concerns of an increasingly unequal distribution of income (e.g., Piketty, 2014). According to the German Council of Economic Experts, an advisory body to the federal government of Germany, the income tax has reduced the German Gini coefficient from well above 40%

Note that the TITR is a key measure of countries' income tax systems. It is typically levied on earned income (or labor income) above a certain income threshold (which we refer to as the *upper income bound*; see Eklund, Strohmaier, and Wamser, 2024). A more detailed view on the variation in TITRs over time is provided in Figure 5. The yearly boxplots show substantial variation across countries. While the highest value of the TITR is almost 70%, some countries do not tax earned income at all. In particular, the TITR is equal to zero in oil-rich countries like Qatar and the United Arab Emirates, and also in tax haven countries like the Cayman Islands. The group of countries with the highest TITRs include high-tax Scandinavian countries such as Sweden (about 61%) and Finland (about 54%). As mentioned above, the average value of the TITR of about 30% hardly changes between 2006 and 2020. While the interquantile range in Figure 5 has also not changed significantly, some countries such as Iceland have increased their TITR substantially (by about 14 percentage points). Figure 6 shows a very similar pattern for the AITR. Compared to the TITR, however, the whole distribution is shifted to the left, reflecting the progressivity of the countries' tax schedules. The grand mean of the AITR is about 10 percentage points lower than the mean TITR.

When comparing groups of countries, an interesting pattern emerges when separately plotting the TITR densities of OECD and non-OECD countries, such as in Figure 7. While the two densities overlap to some extent, the figure suggests that the TITR distribution of OECD countries is clearly located to the right of the group of non-OECD countries.

Among the countries with non-zero tax rates on labor income, almost half use alternative taxes to raise tax revenue, such as taxes on capital income (e.g., dividend taxes). These taxes tend to vary considerably across countries in terms of rates (but also in terms of the tax base). However, Figure 8, a histogram of the distribution of dividend taxes in 2016, shows that quite a few countries do not tax dividend income at all (for example, in 2020, 51 countries have a zero tax rate on dividend income).[13]

Finally, let us examine the relationship between TITR and the Gini coefficient. In Figure 9, the vertical axis corresponds to the (pre-tax) Gini coefficient of the countries;[14] the horizontal axis corresponds to the TITR.

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(gross income) to about 30% (net income after tax) in 2014.

[13]There are usually many different rates that apply to dividend income. Some countries have separate rates, for example, depending on whether dividend income comes from a domestic or foreign corporation. Many tax systems also take into account the residency status of the person receiving the dividend income (see Eklund, Strohmaier, and Wamser, 2024, for more details).

[14]Note that higher values of the Gini coefficient indicate that income is more unequally

The dotted line represents a quadratic fit through the data points, and the size of a circle indicates the GDP per capita of a given country. There is a strong pattern where rich countries (high GDP per capita, i.e. large circles) are located on the lower right – where the Gini is low, i.e. the distribution of income is more equal, and the TITR is high. Interestingly, all the countries lined up on the vertical axis are relatively rich countries (in terms of GDP per capita), such as Qatar, Saudi Arabia, Oman, or the Bahamas, a tax haven jurisdiction. What they have in common is that the TITR is zero. However, in terms of inequality (as measured by the Gini), these countries are very different.

A more detailed look at the personal income tax data (including additional tax measures, calculation of tax measures, data sources, additional correlations and patterns in the data, as well as a detailed description of specific tax regimes, etc.) is provided in Eklund, Strohmaier, and Wamser (2024).

Figure 5: Variation in TITR over time
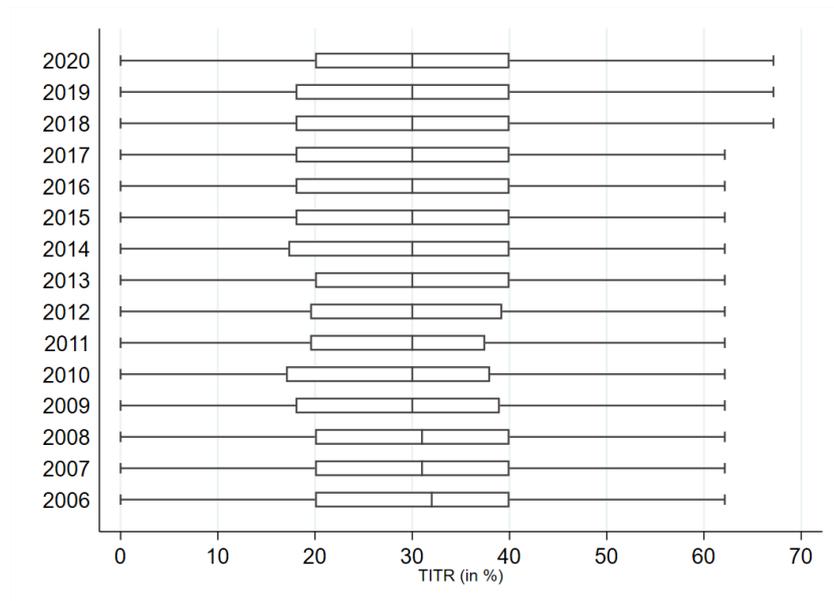
distributed, i.e., there is greater inequality. The Gini data are taken from the World Inequality Database.
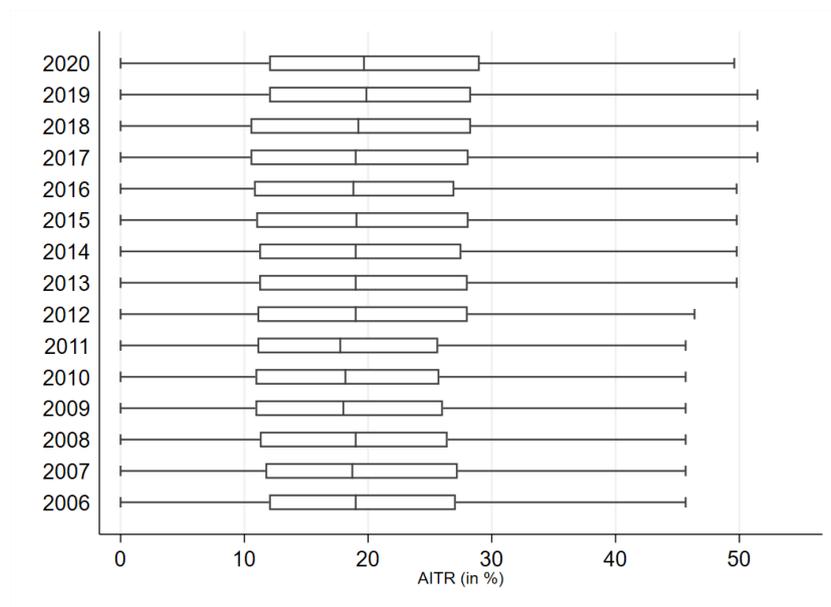
Figure 6: Variation in AITR over time

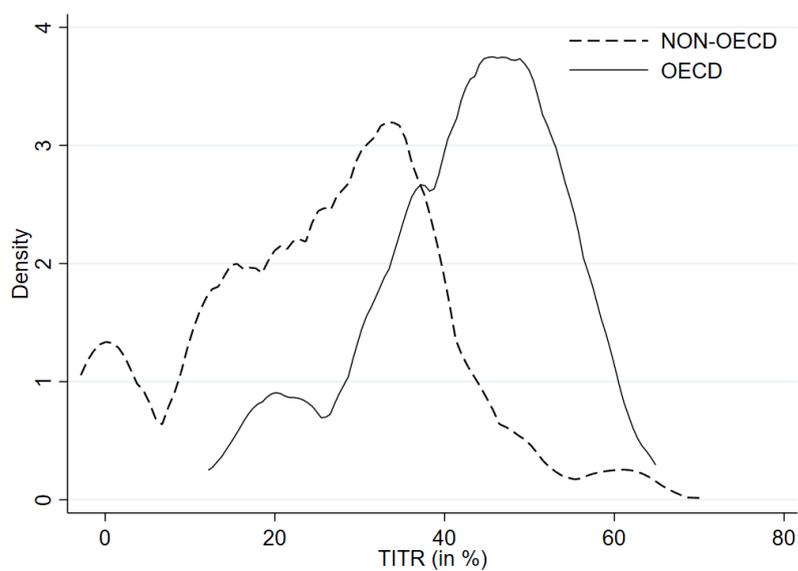Figure 7: *TITR* distribution of OECD vs. non-OECD countries
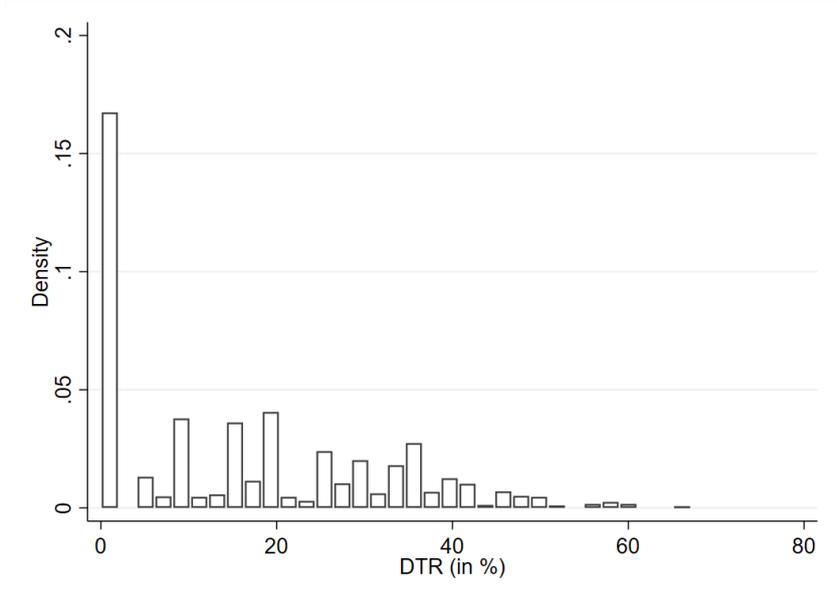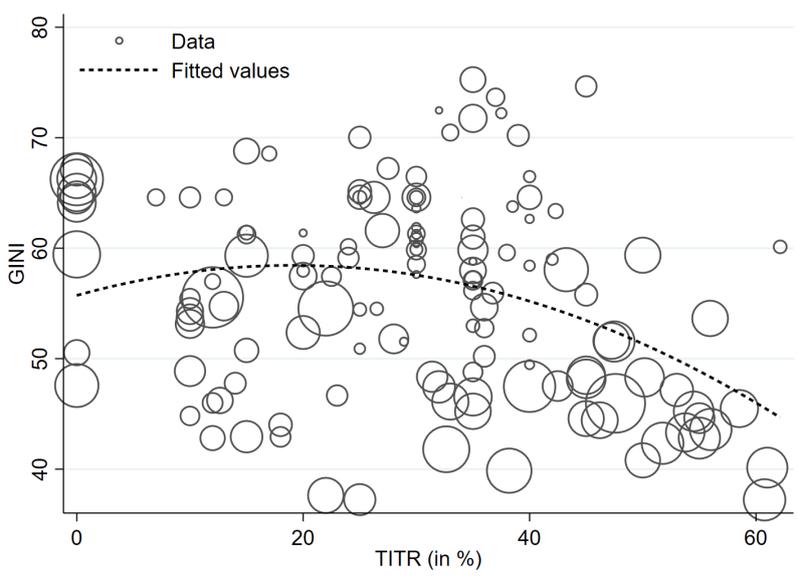
Figure 8: *DTR* distribution in 2016

Figure 9: Gini coefficient and TITR in 2019

2.3 Consumption taxes

Consumption taxes in general, and the value-added tax (VAT) in particular, have grown remarkably in importance and coverage throughout the past century. Whereas in the early 1960s almost no country had a VAT, by the early 2000s some 120 countries had introduced one (see Keen, and Lockwood 2010). In 2020, 196 countries levy consumption taxes and 154 countries have a VAT regime. Taxes on goods and services account for an average of 45 percent of total tax revenue, with an increasing trend over the past two decades (IMF World Revenue Longitudinal data).

Apart from their importance in raising revenue, consumption taxes are often designed in a way that they should not distort consumption and/or input choices. In particular, the VAT is designed to ensure horizontal and vertical efficiency. Horizontal efficiency implies that products within the same category are taxed at the same rate. To achieve this, the VAT is subject to border adjustments, where exports are exempt from the VAT and imports are taxed at the destination country's VAT. Vertical efficiency is achieved by allowing for a full deduction of taxes on input costs, so that only the value added at each stage of the production process is taxed. In practice, this often means that the VAT paid on inputs and services is credited against the tax burden of multiplying the sales price by the applicable rate (see Schneider, Stähler, and Thunecke, 2023).

Recent policy discussions have highlighted the benefits of destination-based taxation to curb corporate tax avoidance. In particular, shifting from origin-based corporate taxation to a destination-based cash-flow tax could yield significant efficiency gains (see Auerbach and Devereux, 2018). In theory, a destination-based cash-flow tax is equivalent to a VAT extended to labor costs (see Auerbach, Devereux, Keen, and Vella, 2017). Since destination-based corporate taxation is rarely implemented in practice, VAT reforms may be a second-best solution. This is exemplified by Boadway, Sato, and Tremblay (2021), who argue that a VAT can complement origin-based corporate taxation and improve a country's ability to tax rents. Auerbach, Devereux, Keen, and Vella (2017) show that a VAT increase combined with labor tax relief can have the same effect as a destination-based cash flow tax.

This section presents the data on consumption tax regimes collected for the ITI database. These data contain information on an unbalanced panel of 204 countries from 2003 to 2020. It includes a number of consumption tax variables. First, the standard consumption tax rate (CTR), which is the rate applied to the broadest range of goods and services. Second, the most commonly applied reduced consumption tax rate (RCTR). The reduced rate

reported in the data applies mainly to food.[15] Third, the number of different consumption tax rates which approximates the complexity of the tax regime. Fourth, the type of consumption tax rate levied. In general, the types of taxes levied can be divided into VAT-type consumption taxes and general sales taxes.

The most relevant variable regarding consumption tax regimes is the standard CTR. Between 2003 and 2020, the average CTR increases by 17.6% (2.54 percentage points), from 11.91% to 14.45%. Looking at Figure 10, we observe considerable variation across countries with CTRs ranging from 0% to 27%. In particular, small Caribbean island states and resource-rich countries in the Middle East and Africa levy low or even no consumption taxes. The Scandinavian countries, Hungary and Croatia have the highest rates. Despite the overall increase in the average CTR, the overall distribution hardly changes over time. Turning to the RCTR, we observe a small increase of about 7.9% (0.29 percentage points) between 2003 and 2020.[16] Figure 11 shows that the RCTR ranges from 0% to 18%. Interestingly, the distribution has a zero median RCTR for the entire sample period and significantly more outliers. The overall distribution shows little variation over time.

Figure 12 provides a more detailed picture of the CTR development over time. Surprisingly, the lowest CTRs on average are charged in North America. This is due to the fact that both Canada and the U.S. levy sales taxes at the state and local level.[17] Interestingly, most countries show an increase in the standard CTR during and after the financial crisis in 2009. This suggests that countries turned to consumption taxes to consolidate public budgets due to the comparatively inelastic but broad tax base (see de Mooij, and Keen, 2012; Thunecke, 2023).

Comparing the standard CTRs for OECD and non-OECD countries in Figure 13 provides novel insights. The two densities overlap for a wide range of CTRs, but it seems that many non-OECD countries levy CTRs between 15% and 20%. Surprisingly, the RCTR in Figure 14 has a much less centered distribution in OECD countries. While the majority of OECD and non-OECD countries set a zero RCTR, many governments appear to impose non-negligible rates on preferentially treated product and service types.

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[15]If food is not subject to a reduced rate, a different reduced rate was chosen (e.g. accommodation and restaurant services or books and magazines). The specific rate is documented in the data handbook (see Hiller, Merlo, and Wamser, 2024).

[16]Note that the RCTRs may apply to different types of goods in our panel, allowing only a cautious interpretation of the descriptive results.

[17]We only include state-level sales taxes in our data and disregard additional local taxes. This is relevant only for a few countries. The U.S. CTR rate in our data is the sales tax rate of California.

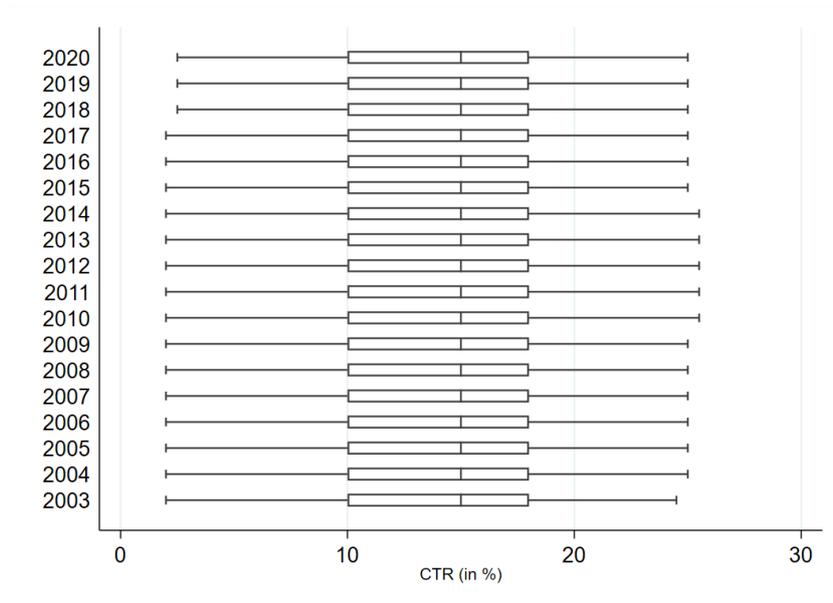Figure 10: Variation in CTR over time (standard rate)

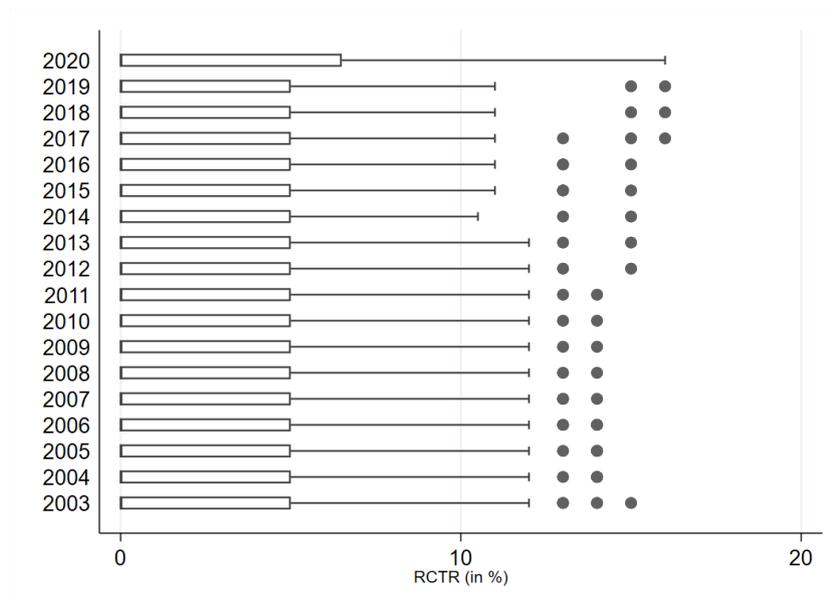Figure 11: Variation in RCTR over time (reduced rate)

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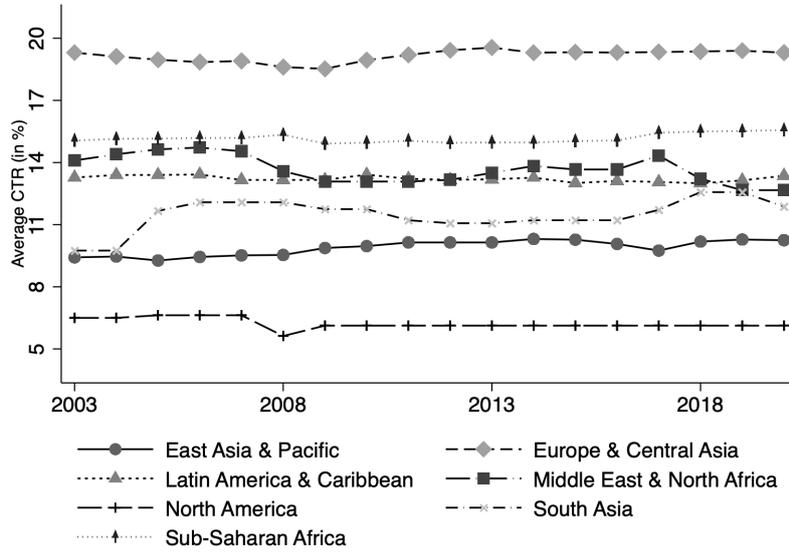Figure 12: Mean CTR development by region over time

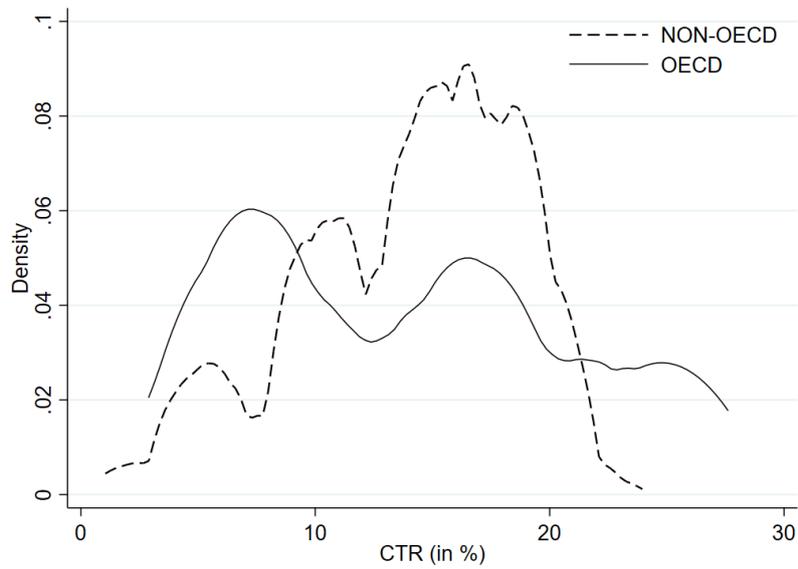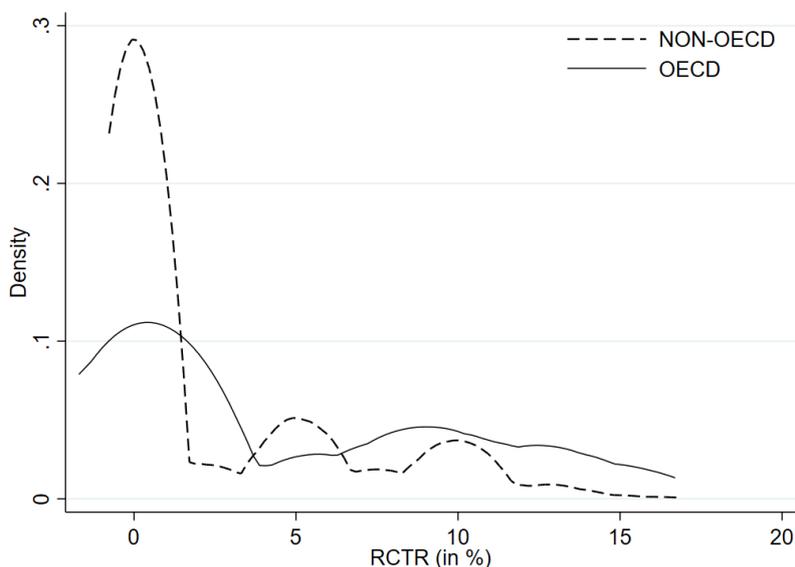Figure 13: CTR distribution of OECD vs. non-OECD countries

16

Figure 14: RCTR distribution of OECD vs. non-OECD countries

2.4 Transfer pricing regulations

The ITI database contains detailed information on transfer pricing (TP) regulations for 225 countries and 21 years (2001-2021). While early adopters of TP regulations formulated only basic legislation based on the arm's length principle, more detailed transfer pricing regulations have evolved over time, including documentation requirements, advanced pricing agreements (APAs), and penalties for non-compliance. Although many TP regimes are based on the OECD Transfer Pricing Guidelines, first published in 1995, the design of this anti-avoidance measure varies considerably across and within countries over time. This section provides a brief overview of TP regulations worldwide and a first insight into their institutional details. A detailed description and analysis of the data can be found in Laudage Teles, Merlo, Riedel, and Strohmaier (2024).

The first transfer pricing rules date back to the post-World War I era, with the United States being the first country to adopt basic rules for taxing cross-border trade and investment in 1921. From the 1930s to the 1950s, the League of Nations developed the arm's length principle as the guiding standard for taxing cross-border transactions. Sweden (1928) and France (1933) were among the first to adopt basic TP legislation. Some non-OECD countries were also among the early adopters of TP legislation (e.g., Argentina

in 1932, Philippines in 1939, Sint Maarten in 1940). From 1996 onwards, countries began to amend their TP legislation to include TP documentation requirements. These can take the form of guidelines or mandatory requirements for MNEs to document the calculation of their transfer prices and provide them to the tax authorities annually or upon request. TP documentation requirements are intended to increase transparency and facilitate TP audits. The first countries to introduce mandatory TP documentation requirements as part of their TP regimes were South Korea (1996), Brazil and Mexico (1997), Canada (1998), Argentina and Denmark (both in 1999).

Figure 15 provides a more detailed look at the evolution of TP regulations worldwide. The bars show the number of countries that have introduced TP legislation (in gray) and mandatory TP documentation requirements (in black) per year over the period 1960 to 2019. The line graphs show the cumulative number of countries with the respective TP regulations in force (right axis). The figure suggests a clear upward trend in the adoption of TP regulations since 2000: While only 25 countries had basic TP legislation before 1990, 28 countries introduced TP legislation in the 1990s, 69 countries in the 2000s, and 55 countries in the 2010s. As expected, a closer look at the data shows that, on average, OECD countries adopted TP legislation earlier than non-OECD countries. In 2019, 177 out of 223 countries have TP legislation in their domestic tax law (all 38 OECD countries and 139 non-OECD countries). As for TP documentation requirements, Figure 15 highlights that their adoption generally lags behind, yet has increased dramatically in recent years. In 2021, 116 out of 223 countries have implemented them in their TP regulations (30 OECD countries and 86 non-OECD countries).

Figure 16 presents the results of a cluster analysis on the details of TP regulations for the year 2019. The goal of this exercise is to identify groups of countries that are similar in their implementation and design of TP regulations. To identify these groups, we use 29 TP characteristics, including information on TP methods, APAs, penalties, and others. Applying a k-modes clustering algorithm results in three clusters as shown in Figure 16.

Cluster one includes countries with the least detailed TP regulations, which were introduced only in the last decade and are still poorly enforced. This cluster consists of low-income countries with high corporate tax rates and small (island) states with high levels of financial secrecy and rather low tax rates. Cluster two contains countries with the most detailed TP rules, including documentation requirements and APAs, and high average enforcement. Since most of these countries are OECD or G20 members and have been among the pioneers in adopting TP rules, their TP regimes all follow the OECD TP Guidelines. Cluster three consists of various middle- and high-income countries with detailed TP regulations, most of which include

documentation requirements but no APAs. The TP regimes of these countries differ in some respects from the OECD TP Guidelines.

In summary, about 80% of all countries have adopted TP legislation to limit aggressive profit shifting by multinational firms. It should be noted, however, that the implemented TP rules vary widely in their design and scope, suggesting that there is still room for international coordination on these rules. A more detailed look at TP regulations (including more information on cluster analysis and the investigation of drivers of similarity in TP regulations) is provided in Laudage Teles, Merlo, Riedel, and Strohmaier (2024). An overview of all available variables (e.g. additional information on TP characteristics such as TP methods, comparables and sanctions) is provided in the ITI Data Handbook (see Hiller, Merlo, and Wamser, 2024).

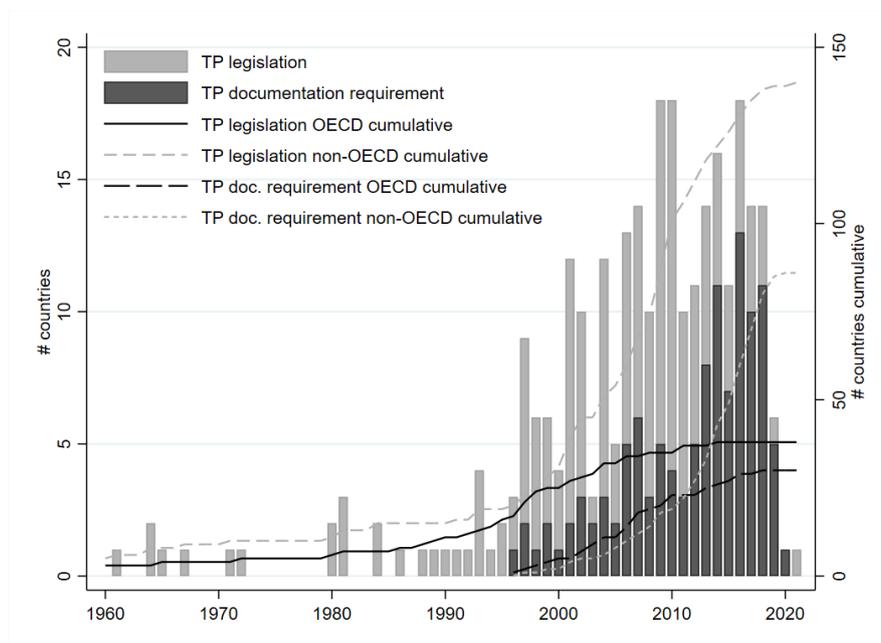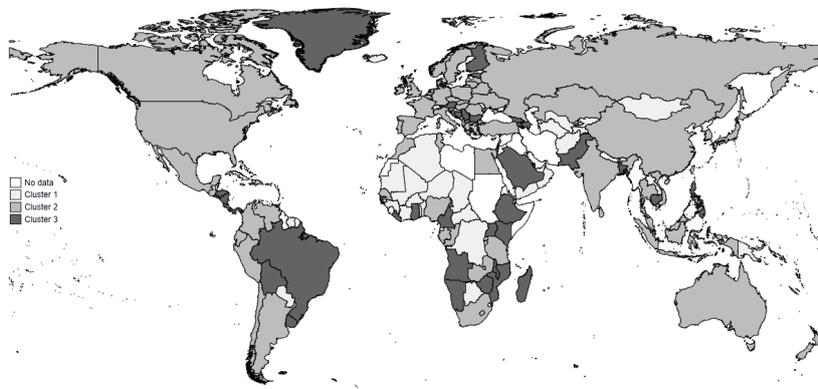Figure 15: Evolution of transfer pricing legislation

Figure 16: World map on TP regulation clusters in 2019

2.5 Interest deduction and CFC rules

This section presents data on three anti-tax-avoidance rules (ATARs), commonly adopted by countries to combat profit shifting of MNEs.[18] We first provide a brief introduction on controlled foreign corporation (CFC) rules, which directly aim at taxing low-tax income of MNEs associated with profit shifting. We then explain how countries use thin-capitalization (TC) as well as earnings-stripping (ES) rules to limit excessive debt financing and interest deduction.

Let us first explain some of the key features of CFC rules. The first country to adopt CFC legislation was the U.S. by implementing anti-tax-avoidance provisions in Subpart F of its Internal Revenue Code in 1962 (U.S. Revenue Act of 1962, Sections 951-964). In the 1970s, some large countries added CFC rules to their tax law: Germany in 1972, Canada in 1976, and Japan in 1978 (see OECD Data Explorer). Since then, many countries have adopted or changed their CFC legislation, particularly since the OECD formulated Action 3 ("Strengthen CFC Rules") in its 2013 BEPS action plan. Action 3 specifically recommends that countries should implement CFC rules with the aim of "reducing the incentives of taxpayers to shift income from a market country into foreign subsidiaries in a low-tax jurisdiction" (see OECD BEPS Actions).

The objective of CFC rules is to tax income of (low-tax) foreign affiliates of MNEs that is otherwise exempt from taxation at the level of the (high-tax)

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[18]Recent studies suggest that the amount of shifted profits is substantial. For example, Tørsløv, Wier and Zucman (2022) show that about 36% of multinational profits are shifted to tax haven countries, which corresponds to approximately 616 billion US dollars, annually.

investor (the parent firm or shareholder of the foreign affiliate). CFC rules usually distinguish between active and passive income, where the latter is often associated with profit shifting and tax avoidance. The consequence of CFC rule application is that passive income is included in the investor's tax base and therefore taxed at the level of the high-tax investor. Effective CFC rules should thus eliminate incentives to allocate profits to low-tax countries and tax havens.

Of the 220 countries in our data for which we have information, 156 do not have a CFC rule in the year 2020, while 64 countries have one. From all OECD countries, Switzerland is the only country without CFC legislation. All other 36 OECD countries have some form of CFC provisions. Interestingly, following the adoption of the EU's Anti-Tax Avoidance Directive (ATAD) in 2016, European countries in particular have adopted CFC rules. This is illustrated in Figure 17, which shows the number of countries with some form of CFC legislation over time. As noted above, the spike in 2019 is mainly related to European countries following the ATAD.

Besides CFC rules, two important policy tools to combat profit shifting are thin-capitalization (TC) and earnings-stripping (ES) rules. One of the key channels through which MNEs shift profits is related to debt shifting through the internal capital markets of MNEs. Differences in tax rates across countries provide incentives for MNEs to thinly capitalize affiliates located in high-tax countries and to rely extensively on debt financing.[19] In particular, when affiliates in low-tax jurisdictions lend to related affiliates in high-tax jurisdictions, the interest is tax deductible in the high-tax jurisdiction, while the interest income is subject to low taxes in the lending jurisdiction. Debt financing can thus be used to shift profits and avoid taxes within MNEs (see Buettner and Wamser, 2013).

Both TC rules and ES rules aim at restricting excessive interest deduction in high-tax countries. The OECD's action plan addresses this channel of profit shifting in Action 4 ("Limitation on Interest Deduction", see OECD BEPS Actions) and recommends adopting adequate rules to prevent base erosion (OECD, 2017). Although the specific rules implemented by countries often differ in scope and application, we may broadly distinguish between TC and ES regulation. TC rules deny interest deduction if the debt-to-equity ratio of a foreign affiliate of an MNE is above a certain threshold. For example, our data show that Albania relies on a fixed ratio approach with a safe harbor debt-to-equity ratio of 4:1. This means that interest remains deductible as long as the debt-to-equity relation stays below 4 to 1.

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[19]Note that "thinly capitalized" refers to the financial structure of firms using little equity relative to debt financing.

For the ITI database, we translate this relation into a threshold $T = \frac{4}{4+1} = 0.8$ (see Merlo and Wamser, 2014). The definition of T suggests that for all countries that do not restrict interest deduction using a TC rule, we set T equal to 1. If a TC rule exists and there is some restriction, T takes on values below 1. In our data, taking for example the year 2010, 81 countries use some fixed debt-to-equity rule, while 128 countries do not. The mean safe haven ratio measured by T, over all years and countries, is equal to about 0.89. Conditional on having TC legislation, i.e. $T_{|T<1}$, our measure equals 0.70.

Following the OECD's BEPS action plan as well as the European Union's ATAD, many countries have recently adopted ES rules, which also aim at restricting excessive interest deduction. Let us look at the example of Lithuania to better understand how ES rules work. In 2019, Lithuania adopted a typical ES rule following the suggestions of the ATAD. According to this ES rule, the deductibility of net interest expense (interest expenses exceeding interest income) is limited to 30% of a taxpayer's earnings before interest, taxes, depreciation and amortization (EBITDA).

Our data reflect two major developments in rules limiting interest deductibility. First, the general development, that more and more countries are implementing such rules. Second, there is a trend towards reforming legislation to adopt more ES rules (often replacing earlier TC legislation). Figure 18 illustrates these developments by depicting the number of countries using TC or ES rules. An interesting fact is, that while countries adopt more and more ATARs (see Figures 17 and 18), the mean SCITR has gone down over the same time (see Figure 1 in Section 2.1).

Using our data, we can compare high- to low-tax countries to show that it is naturally the high-tax countries that use ATARs. Table 1 presents unconditional probabilities for country groups to have a CFC, a TC, or a ES rule in the year 2020. To be precise, columns 2 and 3, as well as 5 and 6, indicate whether countries are high- or low-tax countries, given the distribution of the statutory tax rate, SCITR. For example, columns $p90$ and $p95$ refer to the 90- and 95-percentiles of the tax rate distribution, i.e. the 10% and 5% of the countries with the highest statutory tax rates, respectively. Columns $p10$ and $p5$ correspond to the countries with the lowest tax rates. The respective value in a cell then represents the unconditional probability that high- or low-tax countries put into practice a given rule. For example, the unconditional probability that a high-tax country has implemented a CFC rule is 0.37 ($p90$) or 0.22 ($p95$). The unconditional probability that a low-tax country has implemented a TC rule is 0.05 ($p10$) or 0.00 ($p5$). It is thus very unlikely that low-tax and tax haven countries use TC rules. We find this pattern consistently for all three rules.

We also compare the probability of implementing each rule between high-tax and low-tax countries. For example, focusing on CFC, high-tax countries ($p90$) are 28 percentage points more likely to use a CFC rule than low-tax countries ($p10$) (i.e., 0.37-0.09). The difference is particularly pronounced for TC. Here, the 5% of the countries with the highest tax rate ($p95$) are 53 percentage points more likely to put into action a TC rule than the 5% of the countries with the lowest tax rate ($p5$). This is clearly what we would expect, since profit-shifting activities by MNEs come at the expense of high-tax countries.

Table 1: Unconditional probability to implement a RULE depending on the statutory tax rate (SCITR) distribution

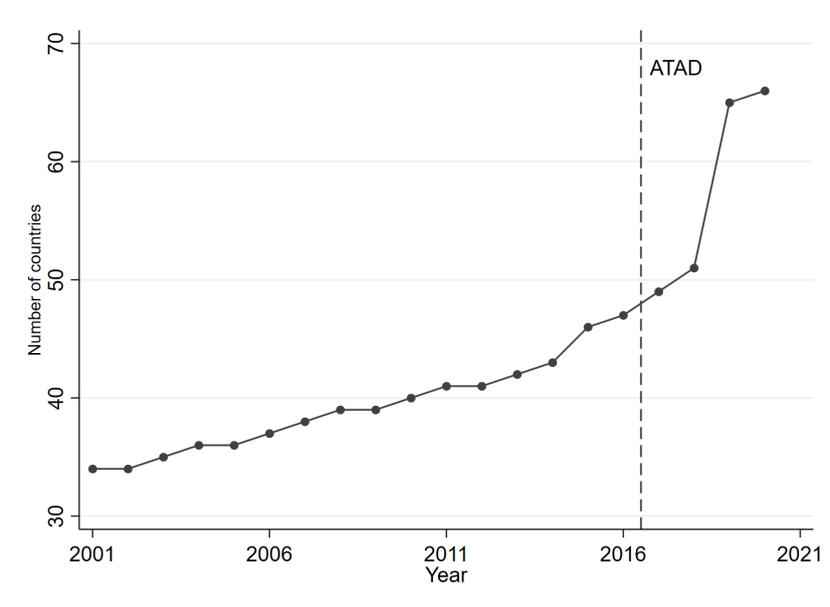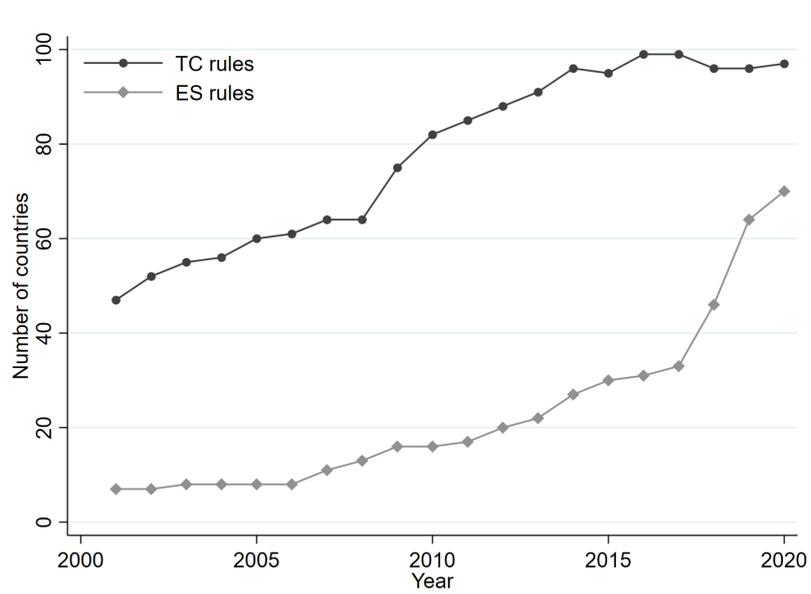| RULE	SCITR			SCITR		
	$p90$	$p10$	Δ	$p95$	$p5$	Δ
CFC	0.37	0.09	0.28	0.22	0.06	0.16
TC	0.62	0.05	0.57	0.53	0.00	0.53
ES	0.36	0.14	0.22	0.41	0.13	0.28

Figure 17: Number of countries with CFC rules

Figure 18: Number of countries with TC and ES rules

3 A global perspective on tax revenue and tax rates

In this section we present interesting correlations between tax rate changes and their effect on tax revenue. To do so, we combine our data with data on tax revenue by the tax types included in the ITI database (see Sections 2.1, 2.2, and 2.3). We begin with a description of tax revenues from the taxation of corporate and personal income, as well as consumption. We take the revenue data from the UNU-WIDER Government Revenue Dataset.

Figure 19 shows aggregate tax revenue over time. The dotted line corresponds to the cross-country average of the sum of personal, corporate, and consumption tax revenue over all countries for which we have revenue data. The solid line corresponds to total tax revenue. The figure suggests that the sum of tax revenue from the three central taxes we analyze in this survey is about 15% of GDP, which is a substantial share of total revenue. Moreover, while revenues increase slightly over time, what we can also learn from Figure 19 is that the average revenue from these taxes is relatively stable over the 20 years in the sample (from 2001 to 2020).

Figure 20 shows the composition of tax revenue for the year 2020, distinguishing between quartiles of the distribution of countries' GDP per capita. The idea of this statistic is to learn about the composition of tax revenue depending on whether countries are low-, low-middle, high-middle, or high-income countries. The pattern we find suggests that the share of revenue raised by personal income taxes increases with income. Low-income countries raise only about 13% from personal income taxes, while high-income countries raise more than 35% from this type of tax, i.e. about 22 percentage points more than the low-income group. The share of VAT revenue is about 13 to 15 percentage points lower for the high-income countries, compared to the other three groups. With more than 17% of total revenue, the share of corporate revenue is relatively large in case of the low-income countries.

We then focus on each of the four groups of countries and plot stacked bar charts from 2009 to 2019.[20] Figure 21 first shows the composition of tax revenue for high-income countries over time. Figures 22 to 24 show the composition of tax revenue for high-middle-, low-middle-, and low-income countries, respectively. The key insight here is that the shares of revenue remain relatively stable over time. For all groups, it appears that the three sources of revenue – income, corporate and value added – together gain a bit

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[20]Note that the focus on this time span allows us to have the best country coverage as we want this statistic to be based on a balance sample.

in importance when comparing 2009 to 2019.[21]

Let us return to the tax rates we collected in the ITI database and the three top rates on personal income (TITR), corporate income (SCITR), and consumption (CTR). Similar to before, adding the rates and normalizing their sum to 100% allows us to learn about the relative importance of the level of the top tax rates. Figure 25 illustrates the comparison between tax rates and tax revenue. Of course, tax revenue is a combination of tax rate and tax base, so the comparison is somewhat incomplete. However, the figure suggests that a relatively low VAT rate seems to be sufficient to raise a relatively large share of tax revenue. The opposite is true for corporate income tax. And while we again emphasize the differences in tax bases, this pattern is consistent with the notion of a very high elasticity of the corporate income tax base.[22]

Table 2 shows the variation in the TITR, SCITR, and CTR rates over time.[23] Column "*max.change*" contains the largest (maximum) change in the respective tax measure; column "*avg.change*" measures the average change over time (based on an unbalanced panel of countries); column "*# changes*" counts the total number of changes, column "*# (+) changes*" counts the number of tax increases (positive changes), and "*# (−) changes*" finally counts the number of tax cuts (negative changes). Note that all changes are unweighted.

The most notable tax reforms in our data (in terms of tax rate changes) are the following ones. First, in 2008 Kuwait cut its SCITR from 57% to 15%. The Republic of Chad cut its TITR in half in 2019, from 60% to 30%. Another country in Central Africa, the Republic of South Sudan, implemented various tax changes in 2017: the consumption tax rate increased by 13 percentage points, from 5% to 18%; in the same year, the country cut its SCITR from 25% to 18%.

It is also interesting to note that, on average, only the change in the SCITR has a negative sign. However, the average changes in rates are close to zero for all three types of taxes. Whilst the TITR changes 306 times in our dataset, the consumption tax does so only 216 times. With 522 changes, the SCITR changes most frequently, although we should note that the changes in the SCITR are often very small ones. Occasionally this is related to local tax setting and regional tax changes within countries.[24] As we would expect,

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[21]When we start plotting the data in 2001, there is a clear tendency to less revenue from "other taxes" over the last 20 years.

[22]This finding is also consistent with the results in Tables 3 and 4 below.

[23]Note that the TITR is only available from 2006 until 2020, while the other variables are available from 2001 to 2020.

[24]For example, in Germany, municipalities set a local business tax. For the ITI data, we

most of the changes in the SCITR are tax cuts (418 out of 522 or about 80%
of all changes). In contrast, consumption taxes go up in more than 70% of
the cases.

Table 2: Changes in statutory tax rates

RATE	max. change	avg. change	# changes	# (+) changes	# (−) changes
TITR	−0.30	+0.0003	306	146	160
SCITR	−0.42	−0.0034	522	104	418
CTR	+0.13	+0.0006	216	153	63

Finally, we exploit the frequent changes in tax rates to run a simple fixed
effects regression model with the ratio of total tax revenue to GDP as the
dependent variable. The linear regression includes both country-specific and
time-specific effects. We are interested in whether changes in tax rates are
reflected in total tax revenue (in % of GDP). Table 4 suggests that only an
increase in the TITR leads to more (total) tax revenue. Increasing corporate
taxes is also positively associated with more revenue, although the estimates
are statistically insignificant.

While we certainly do not claim any causality here, we can interpret our
findings in the following way. First, an increase in the TITR means that
particularly high incomes are taxed. Hence, the contribution to total tax
revenue should be large (in absolute as well as in relative terms). This result
is supported when including the AITR and the TITR simultaneously, as only
the TITR turns out to be significant (see the results in Table 4). Second,
increasing the corporate income tax does not lead to more revenue. This is
consistent with the notion that many countries are close to the maximum of
the Laffer curve (see Steinmüller, Thunecke, and Wamser, 2019).[25] Third,
we are not claiming that the VAT as well as the SCITR do not contribute
to tax revenue (see our description above). Of course, the findings in Tables

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add the average local business tax published by the German statistical office to the federal
corporate income tax. This implies that the SCITR in Germany changes frequently, even
though the federal rate stays constant.

[25]Note that it is not the goal of our analysis to model the Laffer-curve relationship more
precisely.

3 and 4 have to be interpreted conditional on country-specific effects.[26] In sum, our results seem to be consistent with the argument that, conditional on different types of taxes and country heterogeneity, increasing the TITR pays off in terms of raising total tax revenue.

Table 3: Tax revenue and tax rates (I)

	(1)	(2)	(3)
TITR	9.121***	9.095***	9.002***
	(2.588)	(2.593)	(2.612)
CTR	-5.736	-5.754	-5.918
	(9.509)	(9.523)	(9.603)
SCITR	0.973		
	(4.096)		
EATR		1.567	
		(4.895)	
EMTR			4.049
			(7.679)
N	1,758	1,758	1,758
R^2	0.922	0.922	0.922
Year FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: Dependent variable is tax revenue excluding social contribution in % of GDP. The data is taken from the UNU-WIDER Government Revenue Dataset.

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[26]Naturally, cross-country variation explains a lot of variation in the revenue data, which explains the high R^2, which accounts for this type of variation.

Table 4: Tax revenue and tax rates (II)

	(1)	(2)	(3)	
AITR	5.598**	-0.526	-0.505	-0.448
	(1.933)	(2.133)	(2.137)	(2.142)
TITR		9.529**	9.488**	9.350**
		(3.107)	(3.117)	(3.140)
CTR	-5.361	-5.699	-5.717	-5.884
	(9.600)	(9.504)	(9.519)	(9.600)
SCITR	2.079	0.932		
	(4.131)	(4.162)		
EATR			1.522	
			(4.968)	
EMTR				4.005
				(7.751)
N	1,758	1,758	1,758	1,758
R^2	0.921	0.922	0.922	0.922
Year FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Notes: Dependent variable is tax revenue excluding social contribution in % of GDP. The data is taken from the UNU-WIDER Government Revenue Dataset.
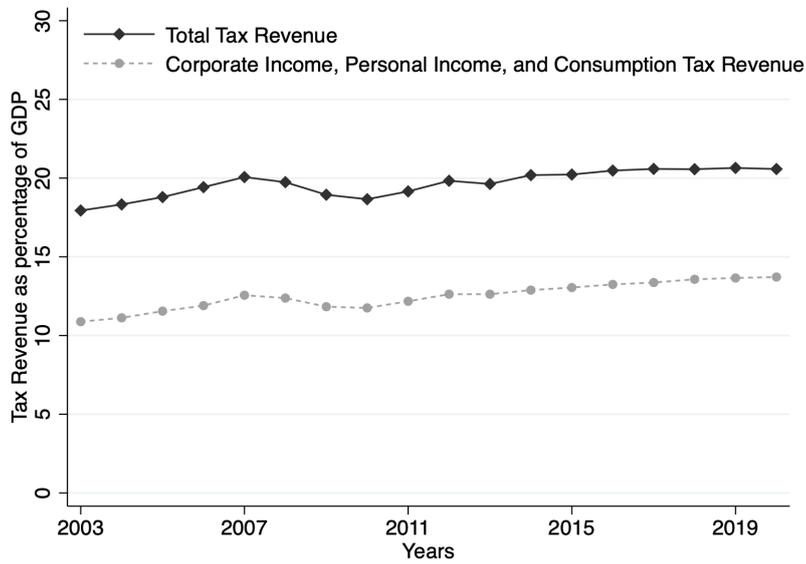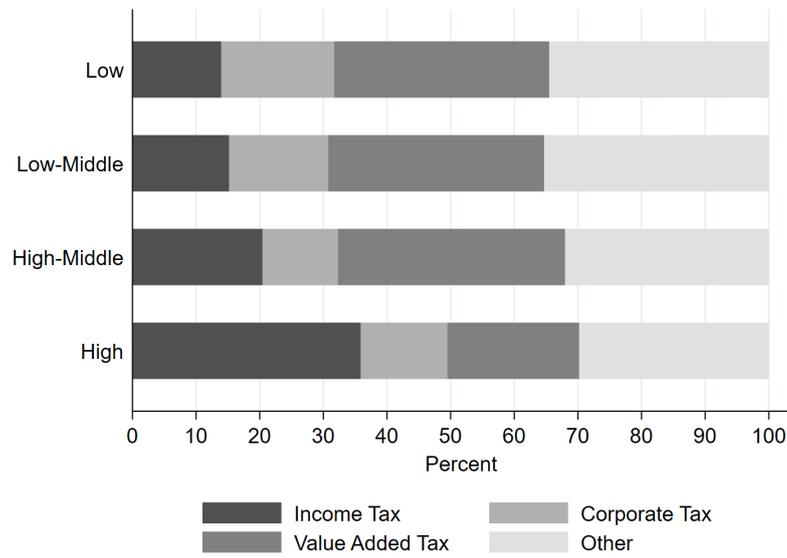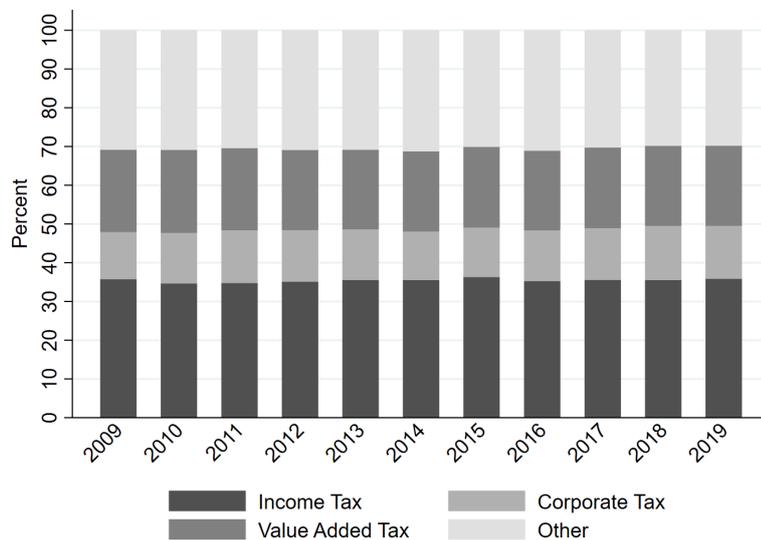
Figure 19: Tax revenue over time

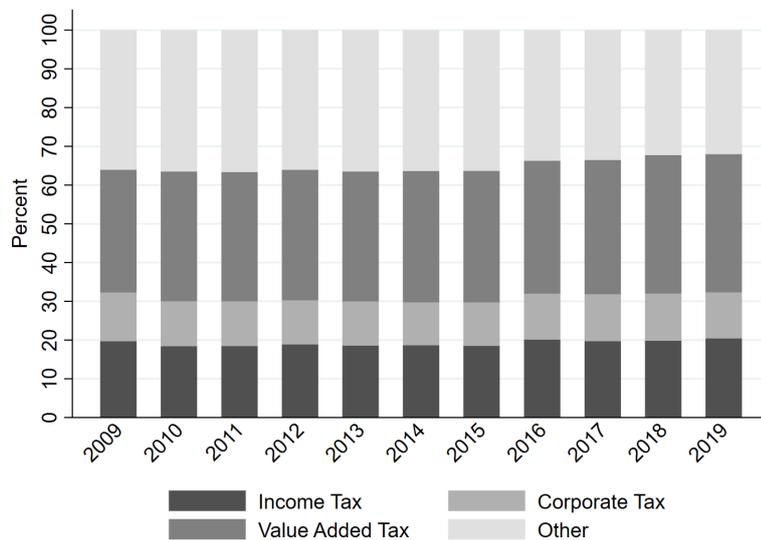Figure 20: Tax revenue composition by income group in 2020

Notes: The figure displays the relative shares of income tax revenue, corporate tax revenue and revenue of the value added tax. The data are taken from the UNU-WIDER Government Revenue Dataset.

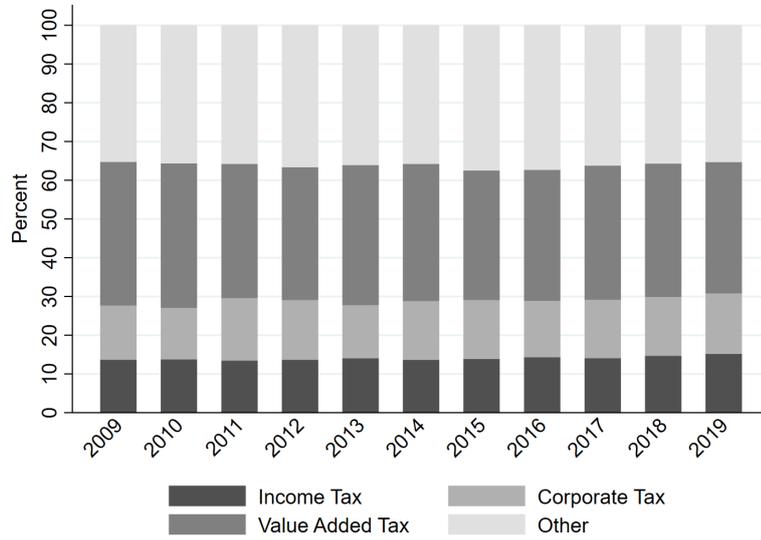Figure 21: Tax revenue composition of high-income countries over time

Notes: The figure displays the relative shares of income tax revenue, corporate tax revenue and revenue of the value added tax (for the high-income countries over time). The data are taken from the UNU-WIDER Government Revenue Dataset.

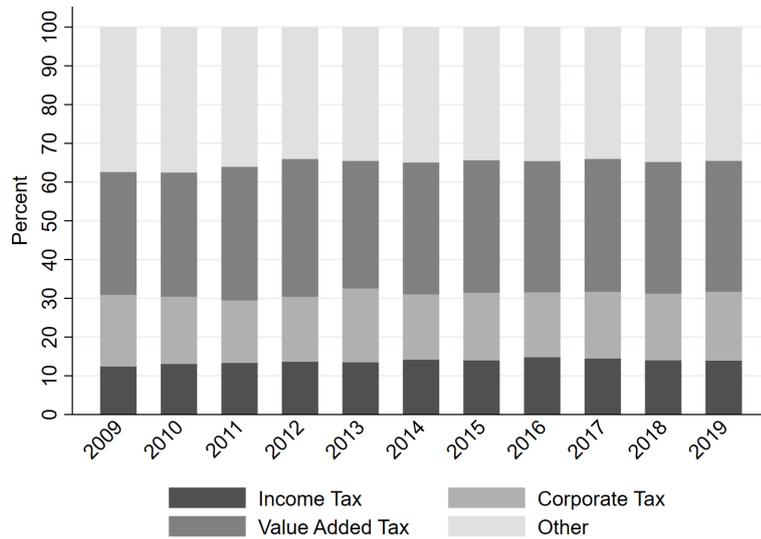Figure 22: Tax revenue composition of high-middle-income countries

Notes: The figure displays the relative shares of income tax revenue, corporate tax revenue and revenue of the value added tax (for the high-middle-income countries over time). The data are taken from the UNU-WIDER Government Revenue Dataset.

31

Figure 23: Tax revenue composition of low-middle income countries

Notes: The figure displays the relative shares of income tax revenue, corporate tax revenue and revenue of the value added tax (for the low-middle-income countries over time). The data are taken from the UNU-WIDER Government Revenue Dataset.

Figure 24: Tax revenue composition of low-income countries

Notes: The figure displays the relative shares of income tax revenue, corporate tax revenue and revenue of the value added tax (for the low-income countries over time). The data are taken from the UNU-WIDER Government Revenue Dataset.

Figure 25: Tax revenue vs tax rates in 2020
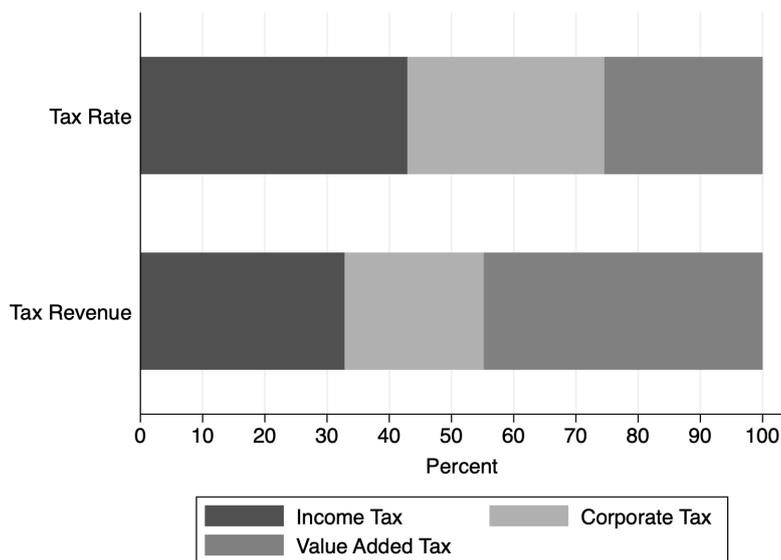
Notes: The figure displays the relative shares of tax rates (upper bar), i.e. TITR, SCITR, and CTR, and tax revenue (lower bar). The data are taken from the ITI database and the UNU-WIDER Government Revenue Dataset.

4 Conclusions

This paper presents a new dataset on international tax institutions, the International Tax Institutions (ITI) database, which is a unique attempt to collect the most relevant country-level tax indicators. The tax data can be used for descriptive comparisons and better understanding of countries' tax systems, as well as for empirical studies using international micro-level data. Let us highlight again that collecting and maintaining the ITI data is a difficult and time-consuming process. It has required substantial dedication and effort from a number of RSIT researchers who have been and continue to be involved in this process. Interested researchers who wish to access our data should visit https://www.rsit-uni-tuebingen.de/data/ to learn more about how to access the ITI datasets.

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