

Effective Tax Rates of Multinational Enterprises in the EU

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Executive summary and recommendations

A new research commissioned by the Greens/EFA Group in the European Parliament shows that many companies do not pay much tax in many EU countries – in absolute values or in comparison to nominal rates or to some other countries.

Effective tax rates (ETRs) estimated from companies' balance sheet data are useful indicators for the tax system. To estimate the ETRs of multinational enterprises (MNEs), the research used unconsolidated data of MNEs from Orbis, the imperfect (so these ETRs should not be used as the only evidence for decisions), but best available company-level data for the EU. It analyses ETRs and nominal rates for the period from 2011 to 2015 for EU countries.

The research shows that the effective tax rates in the European Union are much lower than nominal tax rates. **ETRs and nominal rates are positively related, but for the EU countries less so.** At the country level, the correlation between ETRs and nominal rates for the 63 countries is 0.63, while it is almost a half of that, 0.33, for EU countries only. In addition, most countries appear to tax MNEs regressively: the larger the MNE, the lower the effective tax rate.

According to the available data, MNEs can expect to pay anything between 6% and 30% (and as little as 2% or as much as 49% in the most extreme cases) of their profit in taxes. Luxembourg has the lowest ETR (2.2%) and Norway the highest ETR (48.7%) among the 63 countries in the final sample. In the EU, in addition to Luxembourg, the lowest ETRs are to be found in Hungary (7.5%), Bulgaria (9.5%), Cyprus (9.6%) as well as in the Netherlands (10.4%) and Latvia (10.6%). Within the EU, Italy and Greece have the highest ETR (30.4% and 28.4% respectively), with the third and fourth highest being Spain and Slovakia (21.8% and 20.2% respectively). The remaining 18 EU countries (out of 28 current EU member states) have ETRs between 12% and 20%. Some of the biggest EU economies are within this range, including the United Kingdom (14.9%), France (16.7%) and Germany (19.6%). The unweighted average of 28 EU countries' ETRs of 15% (in contrast the statutory rate average is 23%) is lower than the other countries' average ETR of 22% within the sample of 63 countries (in contrast their statutory rate average is 24%). The five countries with the highest ETRs (as well as some of the highest statutory tax rates) are all non-EU member states: Peru, Columbia, Pakistan, Argentina and Norway.

ETRs are lower than nominal rates in most countries, in particular for some EU countries. A case in point is, again, Luxembourg (2.2% vs 29.1%), but the nominal rate is not very illuminating in terms of providing information about the tax burden that MNEs face in many other EU countries. Indeed, nine out of ten countries with the highest percentage point differences between the two rates are EU members: Luxembourg, Belgium, Malta, France, the Netherlands, Austria, Hungary, Finland and Sweden. In addition, Germany, the biggest EU economy, has one of the highest percentage point differences (19.6% vs 29.5%). On the other hand, some countries exhibit ETRs comparable to their nominal rates,

including Ukraine (ETR of 20.2% vs nominal rate of 20.2%), Bulgaria (9.5% vs 10%), or Slovakia (20.2% vs 21%). The fact that ETRs are mostly lower than statutory rates is natural given by tax holiday and other tax provisions that make the ETRs lower than nominal rates and, interestingly, the results reveal how big the differences are across countries. In addition, most countries appear to tax MNEs regressively: the larger the MNE, the lower the ETR. For most countries, there is a negative relationship between size and ETR as measured by a correlation coefficient between the size of MNEs by total assets and their ETRs. Overall, there are some tentative conclusions about a race to the bottom in ETRs from the evidence that has been presented. These include that some EU countries do not seem to tax MNEs much and these EU countries cannot lower their rates much lower since they are already close to the bottom. These results are based on the best available, but imperfect company-level data, and therefore we call for better data, for example, in the form of MNEs' public country-by-country reporting data.

In the past years, the EU has proposed key reforms to reduce the tax avoidance of big multinational companies in Europe - such as public Country-by-Country Reporting and Common Consolidated Corporate Tax Base - but these are blocked in Council by the member states. The Greens/EFA group in the European Parliament calls on the EU member states to end this blockade and approve the necessary reforms without any further delay.

In the view of extremely low corporate tax rates in some EU member states, the European Commission should make a proposal to introduce minimum effective corporate tax rates in the EU to stop the existing race to the bottom and end the unhealthy tax competition in the European Union

The European Commission should also be ready to use the article 116 of the Treaty on Functioning of the European to propose legislation in this respect.

Table 1. ETR and nominal rates for the period from 2011 to 2015 for EU countries

Country	ETR (all)	Nominal rate
Italy	30%	31%
Greece	28%	24%
Spain	22%	30%
Slovakia	20%	21%
Germany	20%	30%
Denmark	19%	24%
Portugal	18%	24%
Romania	17%	16%
Poland	17%	19%
France	17%	33%
Malta**	16%	35%
Ireland	16%	13%
United Kingdom	15%	23%
Czech Rep.	15%	19%
Croatia	15%	20%
Belgium	14%	34%
Slovenia	14%	18%
Estonia	14%	21%
Sweden	13%	24%
Austria	13%	25%
Lithuania	12%	15%
Finland	12%	23%
Latvia	11%	15%
Netherlands	10%	25%
Cyprus*	10%	12%
Bulgaria	10%	10%
Hungary	8%	19%
Luxembourg	2%	29%

Source: Author

1 Introduction

This paper aims at contributing to ongoing policy debates about taxes paid by multinational enterprises and about changes in the system of international corporate taxation. It assesses the current state of play in the potential race to the bottom in the effective tax rates of multinational enterprises in the EU and it presents new findings on effective tax rates (ETRs) of multinational enterprises (MNEs), showing differences between countries and over a number of years, with the focus on the EU and how much corporate tax multinational enterprises really pay. The level of taxation of MNEs in the EU is the key research question underpinning this paper. Only the future will properly answer the question, but it aims to contribute to it with new evidence on ETRs in the EU and elsewhere.

The research found that there are differences in observed ETRs across countries and that many MNEs do not pay much tax in many countries. This is the case sometimes in absolute values, in comparison to nominal rates, or to some other countries. Among the 63 countries in the final sample, Luxembourg has the lowest ETR of 2.2% and Norway the highest ETR of 48.7%. In the EU, in addition to Luxembourg, the lowest ETRs are in Hungary (7.5%), Bulgaria (9.5%), Cyprus (9.6%) as well as in the Netherlands (10.4%) and Latvia (10.6%). Within the EU, Italy and Greece have the highest ETR (30.4% and 28.4% respectively), with the third and fourth highest being Spain and Slovakia (21.8% and 20.2% respectively). The remaining 18 EU countries (out of the current 28 EU member states) have ETRs between 12% and 20%. ETRs are lower than nominal rates in most countries, in particular for some EU countries. A case in point is, again, Luxembourg (2.2% vs 29.1%), but the nominal rate is not very illuminating in terms of providing information about the tax burden that MNEs face in many other EU countries. In addition, most countries appear to tax MNEs regressively: the larger the MNE, the lower the ETR. These results are based on the best available, but imperfect company-level data and we therefore call for better data, for example, in the form of MNEs' public country-by-country reporting data.

In the rest of the policy paper, we follow this structure. In the second section, the paper discusses new evidence on data-based effective tax rates, focusing on the development of the ETRs in the EU. In the final section, it concludes with policy recommendations for the EU.

Table 2. Number of companies for different country samples

Country	Number of companies - all	Country	Number of companies - all
Norway	6568	Romania	4169
Argentina*	37	Iceland	172
Pakistan*	26	Poland	5988
Colombia	830	France	20498
Peru*	60	Malta**	1141
Italy	14135	Ireland	1646
Japan	7188	Switzerland*	56
Morocco*	61	United Kingdom	15749
Sri Lanka*	24	Czech Rep.	6231
Australia	2100	Croatia	1987
Greece	721	Belgium	7999
India	1571	Slovenia	1179
New Zealand	591	Estonia	751
Mexico	107	Sweden	9591
Ecuador*	43	Austria	2217
Algeria*	48	Lithuania	655
Panama*	9	Finland	3735
Brazil	573	Taiwan Province of China	564
Kazakhstan	212	Moldova*	16
Spain	11092	Latvia	1419
Philippines	648	Netherlands	3571
Korea, Rep.	15433	Cyprus*	93
Ukraine	2869	Bulgaria	1613
Slovakia	3809	Serbia	1125
Germany	10346	Montenegro*	26
Denmark	6626	Hungary	1831
Chile*	32	Singapore	771
Turkey	537	Uruguay*	48
Portugal	4682	Bosnia and Herzegovina	457
Thailand*	17	Macedonia	503
China People's Rep.	14296	Luxembourg	1011
Russia	13558		

Source: Author

2 New evidence on data-based effective tax rates

Effective tax rates (ETRs) estimated from the companies' balance sheet data are useful indicators for the tax system. Such ETRs show how much individual companies pay in corporate income tax relative to their profits and their average values show how much all companies or their specific groups pay in taxes as a share of their incomes. In particular, the ETRs of multinational enterprises (MNEs) can shed new light on important questions. They show how much MNEs pay in corporate income tax and, in turn, what is the share of their profits that governments receive in the form of corporate income tax revenues. By contrast with statutory rates, ETRs estimate how much tax is actually paid rather than what the headline rate is in the law. ETRs empirically indicate the rate for a selected group of companies rather than a rate for hypothetical companies for which effective rates are modelled via the existing and prevailing approaches to the effective taxation of companies. In this paper, analysis of the existing ETRs in the EU member states, the US and other countries can serve as an evidence base concerning a potential race to the bottom in terms of how little MNEs pay worldwide. As clarified below, the label of ETRs, or an average thereof (and thus becoming AETRs or EATRs in abbreviation; also see Fullerton, 1983, for earlier classifications and Mendoza, Razin, & Tesar (1994) for macroeconomic discussion), has been applied to a number of concepts and estimates and the paper distinguishes the data-based one developed here from the others. Despite the usefulness of the ETRs estimated from the companies' data, their use has been limited by their availability.

There is no established source of such ETRs for MNEs that would be widely used. As far as it is known, there are no reliable or continually updated databases of ETRs estimated using companies' data, and even less so specifically for MNEs. One of the understandable reasons why there are no such ETRs is that both data and methodology, as discussed below, put numerous obstacles in the way of this objective. For example, the best available data still suffer from poor quality and coverage. Also, even if the data were perfect, there are various methodological approaches one can use to arrive at ETRs and there is thus naturally less consensus on how to estimate ETRs than on how to determine the statutory tax rate from the law. The research took up on these challenges and filled in this gap in joint research work that was carried out with Javier Garcia-Bernardo and Thomas Tørsløv that is drawn on below (Garcia-Bernardo, Janský, & Tørsløv, forthcoming).

We use a straightforward empirical approach to estimate the ETRs of MNEs with the best available company-level data and provide new findings. We describe the related literature, including alternative methodologies and data sources, in a subsection that is now located, to help ensure brevity in this main text, in the Appendix. In the following subsections, we first discuss data, then methodology, and, finally, the results. In the conclusion section we discuss the implications of the findings for policy and future research.

2.1 Data

The research used Orbis database to estimate ETRs across countries and over the years. Orbis is the best available firm-level balance sheet data. It is provided as a commercial product by a private company, Bureau van Dijk. At the level of individual companies this is the most extensive data set. It has offered a good level of coverage since the mid-2000s and information for some companies goes back to the 1980s. Orbis has been used in a number of research papers, recently, for example, by Clifford (2017) to examine MNEs' financial and locational responses to controlled foreign corporation (CFC) rules. Orbis aims to contain both consolidated and unconsolidated data. With unconsolidated data (of which coverage in Orbis is limited), we estimate ETRs for individual subsidiaries and thus, for example, estimate how much tax MNEs pay in individual countries. With consolidated data (with better coverage in Orbis), we estimate ETRs, mainly by headquarter countries - information which is also available in Orbis. Despite its detail and coverage, which is superior to any other comparable alternatives, Orbis has significant limitations.

Orbis is the best available, but far from perfect, data source and it has a number of shortcomings. They are discussed at some length by Cobham and Loretz (2014), Clausing (2016), and recently acknowledged by Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych, & Yesiltas (2015), Schimanski (2017), Garcia-Bernardo et al. (2017) or Garcia-Bernardo & Takes (2018). The coverage of individual firms is not universal and differs from country to country - it is, for example, biased against tax havens and developing countries. Even when firms are included, the amount of information which is available for them differs and is often limited. Tørsløv, Wier, & Zucman (2018) show that only a weighted average of 17% of global profits is included in Orbis. The data is not able to properly take into account some specific characteristics of various tax systems such as deferred taxes in the US (deferred taxes are available only in consolidated data and the US data are of relatively low quality) or the system of corporate income taxes (a large share of them, e.g. six sevenths) being claimed as refunds to shareholders in Malta (which is why we label it in the results with two asterisks **) and our analysis thus naturally largely neglects these features. In response to these limitations of Orbis, these ETRs should not be used as the only evidence for decisions and we examined alternative data sources and discuss them together with other rates in the related literature section below.

One specific challenge of the Orbis data is that the balance sheet includes data on the basis of financial accounting rather than on the basis of tax accounting. We thus see in the data what they paid in taxes according to financial accounting rather than what they really paid and reported as such to the tax authority. Whether we have data on taxes paid according to financial or tax accounting is important because these often differ. There is tax and accounting literature on this topic, for example, there is a review of research in accounting for income taxes by Graham, Raedy, & Shackelford (2012).

They argue that this research is a complex area of financial reporting because the rules and principles that govern accounting principles are sometimes different from those that govern income tax reporting.

Book-tax conformity is a measure of the scale of the alignment between tax and financial reporting. Proposals for increasing book-tax conformity argue that the current dual system in the US allows firms to simultaneously manage their taxable income downwards whilst managing their book income upwards. Hanlon & Maydew (2009) discuss its implications for MNEs. Their simulations with the US data indicate that, under book–tax conformity, the tax base would be broadened. Hanlon, Maydew, & Shevlin (2008) acknowledge that increasing book-tax conformity could curtail both earnings management and aggressive tax planning, but empirically find that it could also result in a decrease in how informative the firms’ accounting earnings are. With only financial reporting data in the Orbis and no information on the basis of tax accounting, we are left with a potential bias in the data that we use for tax, but that we cannot quantify or control with the available data.

We now clarify the data sample selection from the Orbis company database. We focus on MNEs and, for most of the results, we leave out companies without any ownership links to foreign companies. We exclude all financial companies because of their specific behaviour and distribution across countries. The Orbis data that we use are from December 2017 and the latest year with data is 2016, with the best five-year period coverage being 2011 to 2015. For the time being we limit the study of ETRs to one period to partially offset the limitations of the data and the lack of coverage of companies in particular for some countries and years. The later years generally have better data coverage in Orbis and it also enables us to compare the coverage with other sources of data that are available only in recent years. Given the number of observations and firms in the sample and the desire to have a robust sample, we present results for the five-year period between 2011 and 2015 for all firms that have at least three year observations during this period (and we disregard the rest). To improve the quality and robustness of the data, a company needs to be observed a minimum of three times during the period from 2011 to 2015 in order to be included in our sample. When a company has negative profits in the period, we remove the company from the sample (the upside is that we do not need to deal with negative ETRs and other problematic consequences; the drawback is the potential selection bias). We delete all observations with negative taxes or ETRs above the value of one (the upside is that negative taxes or taxes higher than profits do not make good sense unless there is a merger of two firms or other forms of restructuring that we are not able to capture properly with the current data; the drawbacks are that deleting observations with negative taxes might inflate the ETRs and that deleting observations with ETRs above one might deflate the ETRs). To reduce the effects of losses from earlier years carried forward (which often lead to positive taxation, i.e. taxes received rather than paid, in subsequent years), we drop any company for which we observe a loss in the year 2010, the last year before our sample period of 2011 to 2015 starts.

The main results are based on the following data sample. The final sample consists of 63 countries for which there is a minimum of nine companies out of the 107 countries with at least one company fulfilling the conditions above. For 15 out of these 63 countries, the data is available for less than 100 firms. Among the EU countries, only Cyprus has less than 100 (or, for that matter, 300) firms. For these 15 countries, but also for the other countries, the sample is small and we should thus be careful with our interpretation of the results. The final sample includes all EU member states but unfortunately does not include the US (with only four companies included in the end) due to its poor coverage in the Orbis database.

To present the results, we use total assets as an indicator of the scale of the firm. This indicator has better coverage in the data than one of the alternatives, tangible assets (whereas profits would be endogenous as a categorisation variable and this partly holds for turnover as well). The categorisation according to total assets delivers similar results to the categorisation by tangible assets. In addition, in contrast to tangible assets, total assets includes the intangible assets that are becoming more important over time and are used in tax planning strategies. (A potential downside of the total assets indicator might be that the assets are exceptionally high for financial institutions, but we do not include these in our sample.) For each country we divide the MNE affiliates active there according to their total assets located there into three groups: small (total assets lower than 10 million US dollars), medium (total assets between 10 and 100 million US dollars) and large (total assets higher than 100 million US dollars).

In addition to Orbis company data, we use other data sources. To roughly assess the (non-) representativeness of our sample, we compare our Orbis sample with the information from Eurostat’s foreign affiliates’ statistics (FATS) (Eurostat, 2018). It is only a rough comparison in terms of turnover and number of companies because the definitions and samples differ across the two samples. For comparisons, the research uses the statutory corporate income tax rate that we refer to mostly only as the nominal rate. The major source for these nominal rates is the corporate income tax database published by KPMG (2018), supplemented by additional sources when needed (Janský & Palanský, 2018). The nominal rates are usually the mostly applied rates or the highest rates applied.

2.2 Methodology

We apply the following methods to the data described above to estimate ETRs. As our main approach for this paper, we estimate ETRs using unconsolidated data of companies by location of the entity such as an affiliate of an MNE. For each affiliate of an MNE, we divide corporate income tax by its gross income to arrive at its ETR and we use a weighted average of these ETRs to arrive at a country-level ETR for all MNE affiliates in a country. We estimate ETRs using the unconsolidated companies’ data u for each country i and year t in the following way:

$$ETR_{uit}(\text{unconsolidated}) = \frac{\sum \text{Corporate income tax}_{uit}}{\sum \text{Gross income}_{uit}}$$

where the sum of corporate income taxes are unconsolidated taxes accounted for in the balance sheets of the local companies or MNE affiliates located in country i and the sum of gross incomes are a sum of these taxes and unconsolidated net income accounted for in the balance sheets of the local companies or MNE affiliates located in country i (we focus on corporate income tax and sometimes refer to it only as tax). In effect, this is a weighted average of company-level ETRs of companies registered in country i , either local companies or MNE affiliates located there.

ETRs estimated using unconsolidated data enable us to study how much ETRs differ across countries or from their statutory rates. When compared with nominal rates, ETRs show the effect of tax deductions (including tax holidays and any other *ad hoc* arrangements) and other tax provisions that codetermine the tax paid by firms and how they differ across countries. For example, if an MNE affiliate receives a tax holiday or a tax ruling in a given country then its tax is bound to be lower than that set by the relevant statutory rate. How much MNEs' affiliates pay in taxes in various countries can only be answered using unconsolidated ETRs. In addition to this aggregation at the country level, the company-level ETRs can be aggregated for MNEs only for specific sectors or across other characteristics. With respect to sectors, in unconsolidated data we have only information about the affiliate's sector rather than the whole MNE (which might be of more interest and in that case consolidated ETRs discussed below are more useful). Unfortunately, the data availability, both coverage and quality, of unconsolidated data, as we discuss below, is quite poor and limits the practical use of unconsolidated ETRs. Still, if one is interested in the overall effects of the corporate income tax systems of countries, unconsolidated ETRs uncovers the effect of exemptions such as tax rulings offered to MNE affiliates. But there is another indicator for estimating how much an MNE group pays in taxes overall.

As an alternative, it is possible to estimate ETRs using the consolidated data of companies via a home country for domestic companies or via a headquarter country for MNEs. ETRs using the consolidated companies' data c for each headquarter country i and year t can be estimated in the following way:

$$ETR_{cit}(consolidated) = \frac{\sum Corporate\ income\ tax_{cit}}{\sum Gross\ income_{cit}}$$

where the sum of corporate income taxes are consolidated taxes accounted for in the balance sheets of the companies headquartered in country i and the sum of gross incomes are a sum of these taxes and consolidated net income accounted for in the balance sheets of the companies headquartered in country i . In effect, this is a weighted average of company-level ETRs of companies headquartered in country i .

ETRs estimated using consolidated data enable us to study whether ETRs differ systematically by various characteristics. Similarly to consolidated ETRs, the company-level ETRs can be aggregated only for MNEs or for specific sectors or across other characteristics. The value of ETRs estimated in this way reflects the overall, worldwide taxation of MNEs headquartered in a given country.

To the extent that the location of headquarters is important or of interest to the research questions at hand, this is the first best estimate. The data availability for consolidated data is good. Table 3 sums up the comparison of ETRs using unconsolidated and consolidated data. Ultimately, we estimate both consolidated and unconsolidated ETRs and in the results section we use one or the other according to their relative strengths and the purpose at hand.

Table 3. Comparison of ETRs using unconsolidated and consolidated data

ETR	Data	MNE	Sector	Data availability
ETR (unconsolidated)	Unconsolidated	Individual affiliates	Of the affiliate	Poor
ETR (consolidated)	Consolidated	The whole group	Of the whole group	Good

Source: Author

In this paper we focus on ETRs using unconsolidated data only. Due to time and space constraints as well as due to the focus of this paper on taxes paid by individual affiliates of MNEs, we present results only for the ETRs using unconsolidated data. From now on and especially in the results section, we refer to ETRs using unconsolidated data by simply referring to ETR or ETRs as these are the only estimates of ETRs presented below. In its results, this paper focuses on ETRs using unconsolidated data only.

2.3 Results

We provide estimates of ETRs of non-financial MNEs for individual countries. We estimate ETRs across countries using the best available firm-level balance sheet data, Orbis. We thus create a database of ETRs for research by us as well as other researchers (Garcia-Bernardo, Janský, & Tørsløv, forthcoming). For both ETRs and nominal rates, we present information for the five year period between 2011 and 2015.

The results table displays estimates of ETRs and other important country-level information.

It includes the information for all 63 countries for which we have at least nine companies in the sample. The country's name and membership of the EU is followed by ETRs for all (using a profit-weighted mean that we use as the main indicator in the following discussion), large, medium and small MNEs. The table then provides nominal rates (for the period from 2011 to 2015) as well as their percentage point and proportional differences with ETRs (Nominal-ETRs percentage point difference; Nominal-ETRs % difference), followed by the nominal rates for the most recent year with a good coverage of data (2017). Confidence intervals for ETRs in the form of 25th unweighted percentile, median, and 75th unweighted percentile, a number of companies and sum of profits in the sample are displayed for all, large, medium and small MNEs. At the end of the results' table there are unweighted and weighted correlation coefficients between size and ETR and coverage in terms of turnover and number of companies with respect to Eurostat FATS.

The results presented here are based on ETRs estimated for companies as observed in the Orbis data. We show the ETR estimated for all MNEs in our Orbis sample. There are some inherent data limitations described above, including the fact that the estimates are not based on a representative sample. For 20 out of 32 countries for which we have data from Eurostat’s foreign affiliates’ statistics (FATS) on turnover (operating revenue), our Orbis sample covers between 91% and 136% of the turnover of the FATS. For 12 out of 30 countries for which we have data from Eurostat’s foreign affiliates’ statistics (FATS) on a number of companies, our Orbis sample covers between 79% and 154% of the number of companies reported in the FATS. The ranges are quite wide even for the these relatively more well-behaved countries and they seem to make little sense for some other countries. Also, we might be aware that the sample is not representative, but we can hardly know anything about the size or characteristics of sample selection biases at work here (such as when the size of company would affect both its ETR and whether it is included in the data). Therefore, more research into the representativeness of this data is needed. Still, we observe existing companies and many of them do not pay much tax in the countries in which they operate.

Many MNEs do not pay much tax in many countries. In ten countries we observe the ETR to be lower than 10%. Our approach does not enable us to say whether this is a fair share that the MNEs are paying, but, as we describe below, it is not much in comparison to nominal rate or to some other countries. A case in point is Luxembourg with the lowest ETR of 2.2%. There is some evidence that tax rulings have played an important role in Luxembourg’s low ETR. For example, European Commission (2018a) argued that Luxembourg gave illegal tax benefits to Engie, which artificially reduced the company's tax burden and it paid an effective corporate tax rate of 0.3% on certain profits in Luxembourg for about a decade. Another Luxembourg’s tax ruling agreed to McDonald's paying no tax on their European royalties either in Luxembourg or in the US, although, in contrast with Engie, the investigation did not find it to be a case of illegal state aid (European Commission, 2018b).

Table 4. Ten countries in sample with Effective tax rates for MNE’s under 10 %

Country	Effective Tax Rates	Country	Effective Tax Rates
Cyprus*	9,60%	Cyprus*	9,60%
Bulgaria	9,50%	Bulgaria	9,50%
Serbia	8,50%	Serbia	8,50%
Montenegro*	8,00%	Montenegro*	8,00%
Hungary	7,50%	Hungary	7,50%

Source: Author

There are differences in observed ETRs across countries. According to the available data, MNEs can expect to pay anything between 6% and 30% (and as little as 2% or as much as 49% in the most

extreme cases) of their profit in taxes. Graphs 1 and 2 confirm that Luxembourg has the lowest ETR (2.2%) and Norway the highest ETR (48.7%) among the 63 countries in our final sample. In the EU, in addition to Luxembourg, the lowest ETRs are in Hungary (7.5%), Bulgaria (9.5%), Cyprus (9.6%) as well as in the Netherlands (10.4%) and Latvia (10.6%). Within the EU, Italy and Greece have the highest ETR (30.4% and 28.4% respectively), with the third and fourth highest being Spain and Slovakia (21.8% and 20.2% respectively). The remaining 18 EU countries (out of the current 28 EU member states) have ETRs between 12% and 20%. Some of the biggest EU economies are within this range, including the United Kingdom (14.9%), France (16.7%) and Germany (19.6%). The unweighted average of 28 EU countries' ETRs of 15% is lower than the other countries' average of 21% within the sample of 63 countries. The available data for the companies in the sample show that MNEs in the EU pay, on average, lower taxes than elsewhere. The five countries with the highest ETRs (as well as some of the highest statutory tax rates) are all non-EU member states: Peru, Columbia, Pakistan, Argentina and Norway.

ETRs are, as expected, lower than nominal rates in most countries. This is natural given the tax holiday and other tax provisions that make the ETRs lower than nominal rates. Only for ten countries are ETRs higher than the nominal rates. We observe the only substantial difference for Norway, where the ETR is 48.7%, whereas the nominal rate is far lower 27.6% (and this is likely due to the special tax provisions for the petroleum sector in Norway, which is subject to a marginal tax rate of up to 78%, The Norwegian Tax Administration, 2018). For the other two highest differences (of around 4 percentage points) in Greece and Colombia we observe increases in nominal rates in recent years. Perhaps the most intriguing case among the other countries is Ireland, with an ETR of 15.7% and a nominal rate of 12.5%, but even this result is consistent with the existing literature given the data limitations. The case of the company Apple is not present in our data (Tørsløv et al., 2018) and the Irish public audit body has recently found ETRs of similar magnitude (Comptroller and Auditor General, 2017, in particular pages 294, 298 and 299). They also counter the evidence of low taxation in Ireland by, for example, Cobham & Janský (2017b), by arguing that the Bureau of Economic Analysis data used in this approach includes financial data from their operations everywhere, not just in Ireland, and, as such it is not necessarily a reflection of their operating activities in Ireland or corporation tax paid in Ireland (Comptroller and Auditor General, 2017, p. 294).

There are sizeable differences across countries in terms of how far ETRs are lower than nominal rates. On the one hand, some countries exhibit ETRs comparable to their nominal rates, including Ukraine (ETR of 20.2% vs nominal rate of 20.2%), Bulgaria (9.5% vs 10%), or Slovakia (20.2% vs 21%). For these countries, the nominal rate is, on average, informative about the corporate income tax that MNEs can expect to pay. On the other hand, there are substantial differences between the two rates. A case in point is again Luxembourg (2.2% vs 29.1%), but the nominal rate is not very informative about the tax burden that MNEs face in many other EU countries. Indeed, nine out of ten countries with the highest percentage point differences between the two rates are EU members (sorted by the size of

this difference): Luxembourg, Belgium, Malta, France, the Netherlands, Austria, Hungary, Finland and Sweden. The only non-EU country is Uruguay, for which we have data only for 48 companies. Also, Germany, the biggest EU economy, has one of the highest percentage point differences (19.6% vs 29.5%). Many EU countries show substantially lower ETRs than statutory rates. For many EU and other countries there seems to be quite a wide divergence between ETRs and nominal rates. **ETRs and nominal rates are positively related, but for the EU countries less so.** At the country level, the correlation between ETRs and nominal rates for the 63 countries is 0.63, while it is almost a half of that, 0.33, for EU countries only. One interpretation is that nominal rates are informative about ETRs worldwide to some extent, but to a lower extent for EU countries. Overall, we find a positive relationship between ETRs and nominal rates, but the relationship is much weaker for EU countries only.

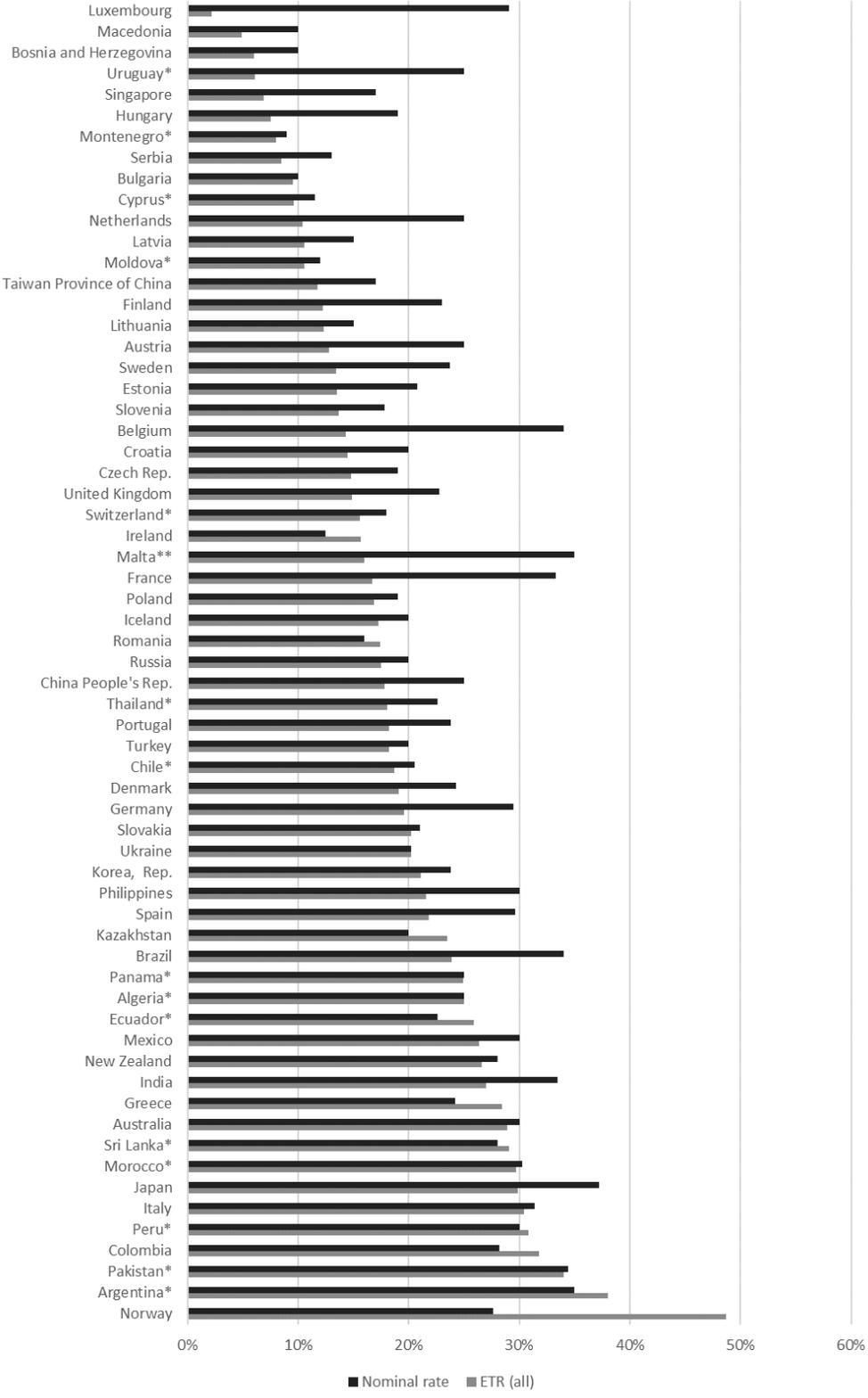
Most countries appear to tax MNEs regressively: the larger the MNE, the lower the ETR.

In our data we observe both the ETR and the size of many individual companies and we investigate how ETR differ by the size of the companies. To observe the nature of the relationship we estimate a correlation coefficient between the size of MNEs by total assets and their ETRs (for this we use the so called Kendall's tau coefficient, which is a measure of rank correlation that captures the similarity of the orderings of the data when ranked by each of the quantities). Using the correlation coefficients (both their size-weighted and unweighted versions), we found that, for most countries, there is a negative relationship between size and ETR. The weighted and unweighted correlations are negative for 41 and 43 out of 63 countries, respectively (0 is no relationship, whereas 1 is a perfect relationship and -1 is a perfect inverse relationship). Our preferred correlation measure is the weighted correlation coefficient because it accounts for the size of the companies and we use it to highlight the most interesting results.

Some of the countries that appear to tax MNEs regressively have some of the lowest ETRs.

The countries that tax MNEs most regressively are Belgium, Uruguay, Luxembourg, the Taiwan Province of China, Slovenia, Italy, Croatia, and Iceland, all having a correlation lower than -0.25. Also, Lithuania, Finland and Hungary have both low ETR and high negative correlations between size and ETR and therefore regressive taxation of MNEs. With the exception of Korea (a positive correlation of 0.6 and therefore evidence of progressive taxation of MNEs, which is in line with Korea's progressive tax schedule starting at 10% for small companies, OECD, 2018b), the ten countries with the highest positive correlation are countries for which we have less than 100 companies in the sample and all other countries have a correlation of 0.1 or lower. Also, for most countries, ETR for all is higher than ETR for large firms and the median ETR is higher than the weighted average ETR (that we use as the main indicator in this discussion), both of which is consistent with larger MNEs having lower ETR. In a related piece of research, Egger, Strecker, & Zoller-Rydzek (2018) observe a similar pattern for an Orbis sub-sample of French firms and argue that it is because of bargaining-related tax advantages of MNEs (the threat of relocation implies higher deductions etc.). Therefore, in line with existing literature, we observe that MNEs in most countries seem to face regressive taxation.

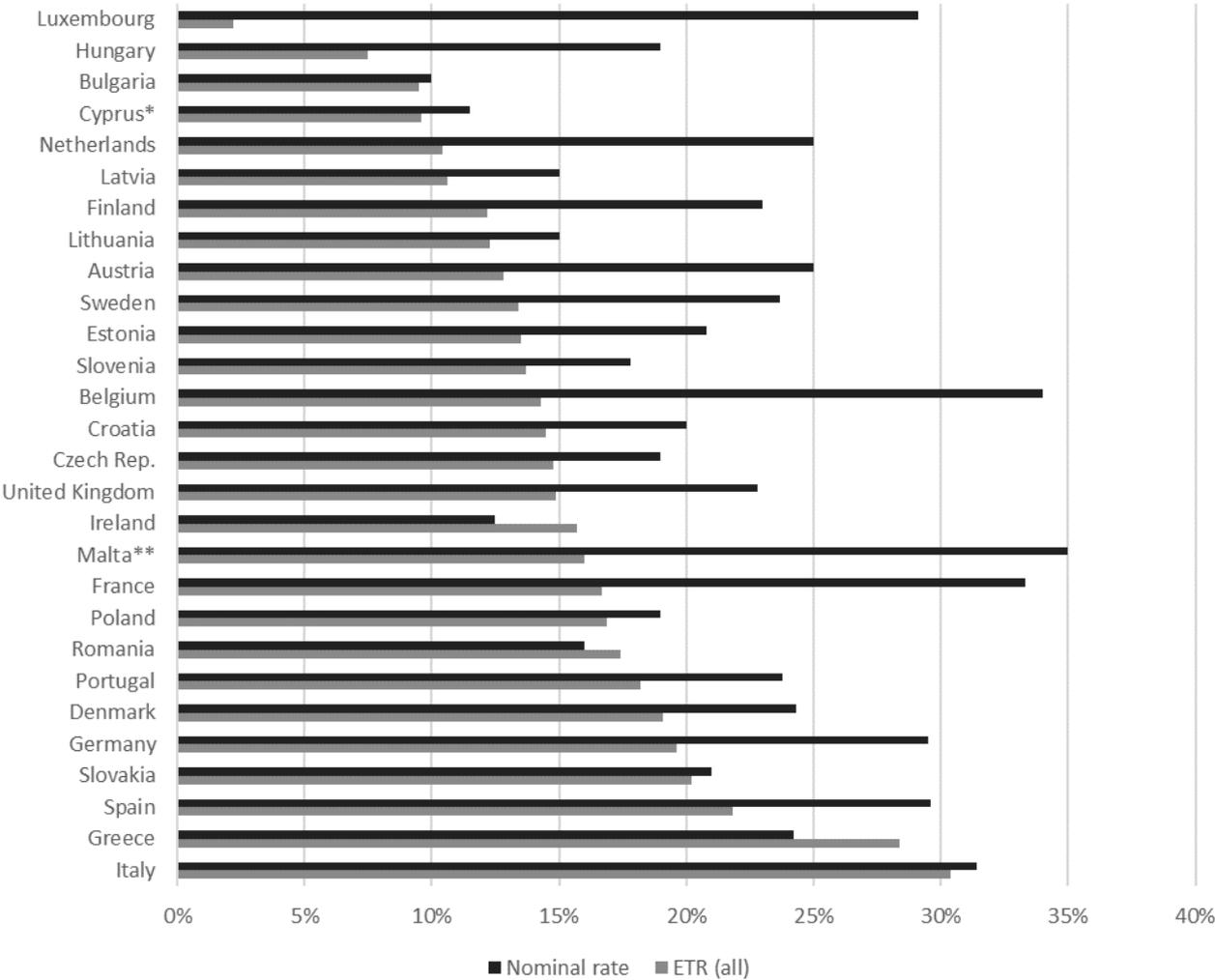
Graph 1. ETR and nominal rates for the period from 2011 to 2015



Source: Garcia-Bernardo, Janský, & Tørsløv (forthcoming)

Notes: For countries with an asterisk (*) there are less than 100 firms in the sample. In addition, the special case of Malta described in the text has been highlighted with two asterisks **.

Graph 2. ETR and nominal rates for the period from 2011 to 2015 for EU countries



Source: Garcia-Bernardo, Janský, & Tørsløv (forthcoming)

Notes: For countries with an asterisk (*) there are less than 100 firms in the sample. . In addition, the special case of Malta described in the text has been highlighted with two asterisks **.

3 Conclusions

Effective tax rates (ETRs) estimated from companies' balance sheet data are useful indicators for the tax system. ETRs of MNEs in the EU are of particular interest in the light of recent changes in the taxation of MNEs worldwide. For example, the OECD launched its BEPS Action Plan in 2015 and, a year later, the European Council agreed the Anti Tax Avoidance Directive. More recently, the US passed a landmark tax reform in late 2017 with effect from 2018. For example, to discuss what the effects of the US reform on the taxation of MNEs in the EU might be, we first need to establish what the current state of play is, starting with how much tax MNEs pay in the EU. However, there is no established source of such ETRs for MNEs that would be widely used and therefore the report aimed to fill this gap.

To estimate ETRs of MNEs we used the best available company-level data for the EU and provide new findings. we used the Orbis database to estimate ETRs across countries and over the years. Orbis is the best available, but far from perfect, data source and it has a number of shortcomings. For example, one specific challenge of the Orbis data is that the balance sheet includes data on the basis of financial accounting rather than on the basis of tax accounting. ETRs estimated using unconsolidated data enable us to study how much ETRs differ across countries or from their statutory rates. We provided estimates of ETRs of non-financial MNEs for individual countries. The results' table displays estimates of ETRs and other important country-level information. The results presented here are based on ETRs estimated for companies as observed in the Orbis data. For better informed policy decisions and for more reliable estimates of ETRs, better data are needed, for example, in the form of public country-by-country reporting data (e.g. some aggregate data from tax authorities on the biggest MNEs are going to be made public by the OECD in 2019). The newly estimated ETRs could also have implications for other existing research that relies heavily on statutory tax rates.

From the databases of ETRs of MNEs we found that there are differences in observed ETRs across countries and many MNEs do not pay much tax in many countries. ETRs are lower than nominal rates in most countries as expected, but there are sizeable differences across countries in how much ETRs are lower than nominal rates. ETRs and nominal rates are positively related, but for the EU countries less so. Most countries appear to tax MNEs regressively: the larger the MNE, the lower the ETR. From the presented evidence there are tentative conclusions about the race to the bottom in ETRs: some EU countries do not seem to tax MNEs much and these EU countries cannot lower their rates much lower since they are already close to the bottom. The EU has proposed key reforms to reduce the tax avoidance of big multinational companies in Europe - such as public Country-by-Country Reporting and Common Consolidated Corporate Tax Base - but these are blocked in Council by the member states. The Greens/EFA group in the European Parliament calls on the EU member states to end this blockade and approve the necessary reforms without any further delay. Also, some of these very same EU member

states are using their rights to block some of the tax reforms discussed at the EU level and, therefore, the European Commission should consider using Article 116 of the Treaty on Functioning of the European Union to propose legislation in this respect. Furthermore, the EU should give proper consideration to a proposal to introduce minimum effective corporate tax rates in the EU to stop the current race to the bottom and end the unhealthy tax competition in the European Union.

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5 Appendix

5.1 Related literature

In this section, we compare the data-based ETRs estimated here to a range of other similar measures that have been used by existing research. We discuss conceptual differences between statutory corporate income tax rates and various versions of ETRs. An earlier comparison of various rates is provided by Gravelle (2014) or, with the example of Ireland, by Coffey & Levey (2014), while Nicodème (2001) and Ruiz & Gerard (2008) provide comparisons of various ETRs for the EU. Table 5 below sums up some of the main research contributions to the development of various ETRs and their selected applications. In economics the basic distinction of ETRs is between so called forward-looking (ex ante) or, a term we use, law-based, which have been used much more in academic literature so far, and backward-looking (ex post) or, again a term we are going to use, data-based ETRs, one of which we develop here. The values of rates can be derived either from the law or from actual data on companies' economic activities, including their profits and taxes. There is a spectrum of the rates, ranging from statutory tax rates and so-called effective average tax rates (EATR) based on the law to ETRs estimated using a variety of data sources. This spectrum, in the order set out in Table 5, goes from the law to the reality, which is likely to be best captured by the tax returns of companies. The statutory or nominal tax rate are important and binding legally (a good source of the statutory rates is, for example, OECD, 2018b), but “tax provisions may limit the rate effectively applied” (European Commission, 2018, p. 34) and that is why we focus on data-based ETRs here. Some of such tax provisions within the EU are reviewed by the European Commission report on aggressive tax planning (European Commission, 2015). While the headline statutory corporate income tax rate as set out in the law is often straightforward to find (it might be a sum of relevant rates if more of them apply, for example, at subnational levels as in the case of the US), the law-based EATR are more difficult to derive.

The law-based EATR are estimated using the provisions of the tax code for a hypothetical investment project or a company. The often-used methodology by Devereux & Griffith (2003) calculates law-based EATR for rent-earning investments (in terms of terminology, they also write about other measures of average tax rates, in which observed tax payments are divided by a measure of pre-tax income or profit, which we describe here as data-based ETRs when estimated with company data). EATR is the ratio of the present value of taxes to the present value of profits. EATR is obtained by constructing a forward-looking hypothetical investment project and calculating the impact of the tax system (CIT rate, depreciation allowances, holidays etc.) on the cost of capital of a profit-making value-maximising firm (Abbas and Klemm, 2013). They consider the effective marginal tax rate (which is not the focus of this paper) a special case of the EATR with a project just breaking even (i.e. yielding a post-tax economic rent of zero). Law-based ETRs are forward-looking (there are exceptions, e.g. Egger, Loretz, Pfaffermayr, & Winner (2009b) use company data to estimate them) and data-based ETRs are

backward-looking. Bolwijn, Casella, & Rigo (2018) recognise the differences in methodology as well as the results obtained and explain that the forward-looking, law-based ETRs are calculated on a stylised hypothetical investment and incorporate all the tax payments due over the lifetime of an investment along with all the other cash flows of the investment projects. Backward looking metrics are calculated as the plain ratio between corporate income tax payments and pre-tax income from reported accounting data. Data-based ETRs are backward-looking and endogenous, which has been highlighted by economists as major disadvantages, discussed, for example, by Devereux and Griffith (2002). Also mostly relying on US data, Clausing (2009) argues that the statutory tax rate does not and ETRs do account for the many subtleties such as tax holidays that determine the true tax treatment of firms (that in particular MNEs are likely to make use of) and that the difference between the two depends on provisions of particular country tax codes that create divergences between statutory and effective tax rates (Clausing, 2016). The law-based, or forward-looking, EATRs are available for many mostly developed countries and this relatively good availability has contributed to their use in research.

Table 5. Comparison of various measures of corporate income tax rates, with the focus on MNEs

Name	Basis	Type of data	Methodology	References
Statutory	Law	Law	The headline statutory rate as set out in the law on corporate income tax	(OECD, 2018b)
Effective average tax rates (EATRs)	Law	Law and hypothetical investment project	Devereux & Griffith (2003) calculate law-based EATR for rent-earning investments as the ratio of the present value of taxes (accounting for the rate, depreciation allowances, holidays etc.) to the present value of profits of a forward-looking hypothetical investment project.	Devereux & Griffith (1999), Devereux & Griffith (2003), Abbas and Klemm (2013)
Effective tax rates	Data	National statistics	Slemrod (2004a) estimates average corporate tax rate as the ratio of corporation income tax revenues to GDP using country-level data. Tørsløv, Wier, & Zucman (2018) estimate the ratio of corporate income tax payments to corporate profits in national accounts.	Slemrod (2004a), Tørsløv, Wier, & Zucman (2018)
Effective tax rates	Data	Foreign affiliates statistics	Cobham and Janský (2017b) estimate ETRs or average effective tax rates (AETRs) as the ratio of corporate income tax to gross profit (net income and the tax) of MNEs affiliates located in a given country.	Desai, Foley, & Hines (2004), Clausing (2016), Cobham and Janský (2018)
Effective tax rates (ETRs)	Data	Companies' balance-sheets	Garcia-Bernardo, Janský, & Tørsløv (forthcoming) estimate ETRs as the ratio of corporate income tax to gross income either with consolidated or unconsolidated data.	Markle & Shackelford (2012a), Cobham & Janský (2018)
Effective tax rates	Data	Country-by-country reporting	The data is currently not available in a consistent form for many companies. For European banks, country-by-country reporting data were recently used to estimate bank-specific ETRs by dividing taxes by gross profits (Janský, forthcoming).	OECD (2018)
Effective tax rates	Data	Confidential tax returns	Dowd et al. (2017) create country-year average tax rates as the profit-weighted averages of the firm-specific rates within a country and year.	Dowd et al. (2017), Habu (2017)

Source: Author

Law-based EATRs have been used in much of research on effective taxation of companies.

Recent examples with a good discussion of related literature applies the methodology of Devereux & Griffith (2003) to EU member states (Spengel et al., 2014), to G20 countries (Congressional Budget Office, 2017) and to 36 OECD and other countries (Hanappi, 2018), with the latter estimates also used by Dressler, Hanappi, & Dender (2018). While these law-based EATRs can be useful, for example, when comparing real investment climate in a country over time, they are not so helpful for other purposes. For example, Egger & Stimmelmayer (2017) argue that using EATRs to explain MNEs' behaviour is problematic because these tax rates are computed for firms that are held and operating in one country and are thus national rather than multinational in scope. Bösenberg & Egger (2017) compute EATRs on profits from R&D investment, while Bösenberg, Egger, & Zoller-Rydzek (2018) use them to study the effects of broad capital taxation on economic growth in small open economies. Egger, Loretz, Pfaffermayer, & Winner (2009a) computed EATRs at the country-pair level to account for bilateral aspects of taxation. They thus show the bias when EATRs are computed only at the country level. These law-based EATRs are frequently used also in policy publications. For example, PwC and World Bank (2016) have been using a version of it for years in the Doing Business Paying Taxes report (Stewart, 2014) and the European Commission (2018) uses these EATRs as an additional indicator of the tax burden on corporations and reports that the EU-28 average EATR in 2017 was 20.1%. with considerable variation across countries - the EATR is lowest in Bulgaria (9%), Hungary (11.1%) and Cyprus (13%) and highest in France (33.4%), Malta (32.2%) and Spain (30.1%). Similar estimates of law-based ETRs on the basis of stylised business models, by ZEW (2016) and ZEW (2017), have been used by European Commission (2018c) in their assessment of taxation of digital economy. When studying MNEs, with their complex tax structures and the considerable role played by profit shifting, the data-based ETRs are likely to provide more realistic estimates of the tax rates that MNEs face.

Data-based ETRs have often been estimated using information sources about the foreign affiliates of MNEs.

The foreign affiliates' statistics are often provided by governments and include all the companies that should be included and therefore do not suffer from a selection bias. The Bureau of Economic Analysis (BEA) publishes these country-level statistics annually for US-headquartered MNEs and includes foreign taxes paid in many countries worldwide. Desai, Foley, & Hines (2004) use the BEA data to estimate ETR as the ratio of foreign income taxes paid to foreign pre-tax income for each affiliate and employ the medians of these rates as country-level observations for each country and year. This source has also been used to estimate ETRs by Stewart (2014), Clausing (2016), Cobham and Janský (2017b), Wright & Zucman (2018) and Tørsløv, Wier, & Zucman (2018). For example, Cobham and Janský (2017b) estimate ETRs at the country level as the ratio of corporate income tax to gross profit (net income and the tax) of MNEs affiliates located in a given country. Bosworth, Collins, & Chodorow-Reich (2007) use the BEA data to estimate ETRs in a similar way and their results are consistent with

the hypothesis that US MNEs artificially shift profits to low-tax places. They also observe that ETRs are often different from statutory rates and they highlight the low ETRs applied to foreign direct investment (FDI) in the Netherlands and Luxembourg. It is also possible to combine the BEA data with other sources – for example, Zucman (2014) computes ETRs by dividing all the corporate taxes paid to the US and foreign governments by US corporate profits, as recorded in the national accounts. Another US-centred data source, the US Treasury on Form 5471 by US controlled foreign corporations in manufacturing, is used by Mutti & Grubert (2004) to estimate country average effective corporate income tax rates. While the good quality and coverage of the BEA data allows for interesting research findings, it is only limited to MNEs headquartered in the US.

There are data sources on foreign affiliates of MNEs published by other countries than the US.

Some of the data is published by governments and for many countries they are published by the OECD or Eurostat. These databases often lack all the data needed for estimating ETRs, such as corporate income tax. This is also the case with German's MiDi data, which has been used, for example, by Weichenrieder (2009), Hebous & Johannesen (2015) and Gumpert et al. (2016). In addition to tax data that is often missing, another drawback of foreign affiliates' statistics is that it often aggregates the information from the company to the country level and presents the data publicly only in its aggregated form, which lowers the precision of estimating the ETRs and does not allow for an estimation of the ETRs for different groups of companies (e.g. classified by sectors).

Both of the two leading global companies' balance sheet databases, Orbis and Compustat, have been used to estimate data-based ETRs. They are comparable in a number of aspects and both provided by private companies, Orbis by Bureau van Dijk, which grew out of Europe and is now owned by US-based Moody's, and Compustat by Standard and Poor's, another major US-based financial services company. To my knowledge, there is no definitive comparison of these two leading company balance sheet databases, definitely not one that would compare them quantitatively in detail. One of the good comparisons is provided by Fuest & Riedel (2012), who compare Orbis (its Europe-only version is named Amadeus) and Compustat (its Global version, which goes beyond the Compustat's US focus) characteristic by characteristic. The number of companies covered is much higher in Orbis than in Compustat, which contains information only for companies listed on a stock exchange. Also, Orbis has ownership information, whereas Compustat does not allow linking subsidiaries and parent company information (and that is why researchers working with Compustat sometimes combine it with ownership information from Orbis and also likely a reason why there are no ETR studies explicitly using the unconsolidated Compustat data and, for example, Markle & Shackelford (2012a) exclude all unconsolidated firm years from their sample to avoid potentially including both parents and their subsidiaries as separate observations.). A crucial advantage of Compustat is that, for US firms, cash taxes are available and it is thus possible to estimate cash ETRs (whereas with Orbis – and for most non-US firms in Compustat as well - only accounting taxes are available and it is thus possible to estimate

only accounting ETRs). Overall, Orbis, comes out as the best currently available database of balance sheet data if ownership information and company coverage are important for the research question at hand. If cash taxes and ETRs are considered as more important than coverage, Compustat seems the preferred data source. Despite some advantages of Orbis over Compustat, Orbis, and its consolidated data in particular, has been the more under-used data source for estimation of ETRs so far. In Table 6, we summarise the existing estimates of data-based ETRs using the two databases (in Table 6, we thus study one row of Table 5 in detail) and we discuss them in more detail below.

The unconsolidated Orbis data have been used by researchers to estimate ETRs. While we describe Orbis data in detail in the data section below, here we discuss its use for the estimation of ETRs by the existing literature. The research papers have so far preferred to use unconsolidated data. Egger, Loretz, Pfaffermayr, & Winner (2009b) are an exception in using a combination of unconsolidated (most of the observations) and consolidated data. They compute average (and marginal as well) forward-looking effective tax rates for a sample of more than 650,000 firms in and outside Europe using Bureau van Dijk's ORBIS data-base (of all observations in their sample, 2,399,703 are based on unconsolidated balance sheets and 122,965 refer to consolidated ones). They find that the firm-level component of the effective tax burden is generally more important than the one at the country level and that the results about the nexus between firm level investment and corporate taxation differ according to whether they use firm- or country-level rates. Egger, Eggert, & Winner (2010) use Bureau van Dijk's Amadeus, i.e. Orbis, for European companies only, observe that tax payments of foreign-owned firms are lower than those of domestic firms in high-tax countries but higher in low-tax countries. In a recent addition to the literature, Egger, Strecker, & Zoller-Rydzek (2018) argue that bargaining power may explain the tax differences between MNEs and local companies beyond MNEs' profit shifting. Larger firms (mostly MNEs) are more valuable for tax authorities for various reasons. In threatening relocation, larger firms extract greater deductions, resulting in a regressive ETR schedule and lower ETRs for size-related reasons. MNEs face lower relocation costs than local companies, which enhances their bargaining position. Using French firm-level Orbis data and entropy balancing, they find that the regressive nature of the French tax schedule reduces MNEs' ETRs by 2.52 percentage points (size effect), while their relocation threat leads to a 3.58 percentage point reduction. MNEs usually have lower ETRs, but this is not the only systematic difference reported in the existing research.

Some of the ETR estimates using the unconsolidated Orbis data are a part of research on profit shifting by MNEs. The OECD researchers estimated that around 100-240 billion USD in annual government tax revenue is lost due to profit shifting (Johansson, Skeie, Sorbe, & Menon, 2017). They use ETRs estimated using the unconsolidated Orbis data as a part of their empirical strategy. Specifically, (Johansson, et al., 2017).estimated ETRs as the ratio of tax expense to the profit reported in the financial statements of the firm at an unconsolidated level. They compared the ETR of a multinational entity in a given country and year to the ETR of a domestic entity. The comparison is

based on a regression analysis controlling for other firm characteristics that may influence the ETR. Other recent studies have also used these ETRs as indicators of profits shift. Cobham & Janský (2018) used the unconsolidated Orbis data to estimate ETRs and employed these in a model to estimate the scale of profit shifting across countries with the methodology developed by Crivelli et al. (2016). Fuest & Riedel (2012) show that MNEs differ with respect to their ability to shift profit depending on their ownership links with tax havens, using the taxes to profits ratio as one indicator, and a similar empirical strategy has been more recently applied by Janský and Prats (2015) and Janský and Kokeš (2015, 2016).

So far, there is a lack of research exploiting the consolidated Orbis data to estimate ETRs.

As far as is known, there is no research focusing on estimation of ETRs with the use of the consolidated Orbis data. Together with co-authors, we aim to fill this gap. While we, Garcia-Bernardo, Janský, & Tørsløv (forthcoming), use the consolidated Orbis data to estimate ETRs, we also use the unconsolidated Orbis data to estimate ETRs and we make use of these latter estimates in this paper.

In the existing literature, Compustat has been used more often than Orbis for estimation of data-based ETRs. This is perhaps because of its US focus and a recent interest in these ETRs by the accounting academics in the US. Kemsley (1998) uses Compustat to estimate average foreign tax rates of US MNEs by dividing current foreign taxes by pre-tax foreign earnings to study the effect of taxes on the location of production. The Compustat database was also used earlier in a New York Times article with analysis by S&P Capital IQ that showed that ETRs vary substantially across companies and by sector (Bostock, Ericson, Leonhardt, & Marsh, 2013). In one of the most intensive uses of Compustat database of US firms, Dyreng, Hanlon, Maydew, & Thornock (2017) estimate what they call cash ETR, which is computed as the ratio of cash taxes paid to pre-tax accounting income. While they focus on the development of ETRs over time for US firms, they also provide comparison for a few selected countries.

Perhaps the most comprehensive estimates of cross-country data-based ETRs so far come from a 2012 paper. Markle & Shackelford (2012a) use Compustat financial statement databases information for 11,602 public corporations from 82 countries from 1988 to 2009 to estimate country-level ETRs. They further use Orbis, but only for information about the location of ultimately-owned subsidiaries. To estimate ETRs, they use net income before income taxes as a denominator and three different numerators: actual cash taxes paid (what they call cash ETR and their preferred indicator), current worldwide income tax expense (current ETR) and total worldwide income tax expense (total ETR). They find that the location of a multinational and its subsidiaries substantially affects its worldwide ETR. Japanese firms always faced the highest ETRs. While US MNEs are among the highest taxed, MNEs in tax havens face the lowest taxes. They find that ETRs have been falling over the period, but that the ordinal rank from high-tax countries to low-tax countries has changed little. By contrast with other research, they find little difference between the ETRs of MNEs and domestic firms. The same

authors also investigated the correlations between these firm-level ETRs and leverage, intangible assets and tax havens (Markle & Shackelford, 2012b).

A more recent paper focuses on differences between US and European MNEs. Overesch, Schenkelberg, & Wamser (2018) suggest that US MNEs have paid significantly less foreign taxes (measured as a foreign effective tax rate, Foreign ETR; 9.6 percentage points lower) but have reported significantly higher total tax expenses (measured by GAAP ETR; 2.1 percentage points higher) compared to their European counterparts. They use consolidated financial information taken from the Compustat and Compustat Global databases. European MNEs are not obligated to disclose foreign taxes and foreign pre-tax income and therefore, for estimation of foreign ETR for European MNEs, they use approximation with the help of the Amadeus database (they approximate the Foreign ETRs for European MNEs by subtracting domestic taxes and domestic pre-tax income from the overall tax expenses and pre-tax income. They obtain the domestic information for European MNEs by combining ownership information with financial information taken from the Amadeus database).

Other researchers also estimate ETRs using Compustat data. For example, they find that around one quarter of their sample firms maintain lower ETRs and that annual cash effective tax rates are not very good predictors of long-run cash effective tax rates (Dyreng, Hanlon, & Maydew, 2008) or that family firms are less tax aggressive than their non-family counterparts (Chen, Chen, Cheng, & Shevlin, 2010) or that corporate tax avoidance is positively associated with firm-specific stock price crash risk (Kim, Li, & Zhang, 2011) or that equity risk incentives are a significant determinant of corporate tax aggressiveness (Rego & Wilson, 2012) or that tax avoidance is increasing in the separation of ownership and control (Badertscher, Katz, & Rego, 2013) or that there is a negative association between firms' tax aggressiveness (Chyz, Ching Leung, Zhen Li, & Meng Rui, 2013), or that there are personally tax aggressive executives (Chyz, 2013), or that entering a tax haven country for the first time results in a slight reduction in the firm's ETR and that ETR changes vary depending on whether the subsidiary is a financial conduit or an operating subsidiary and by country (Markle & Shackelford, 2014).

There are a few other alternative sources that provide company-level data that can be used to estimate ETRs. After comparing various measures of ETRs, Nicodème (2001) also computes effective corporate taxation for eleven European countries, the US and Japan using financial statements of companies and shows large differences between statutory and effective taxation, as well as between countries for different sectors and companies' sizes. Also official reporting of the companies to the US Securities and Exchange Commission (10-K filings) can be used to derive average effective tax rates, for example, as done recently for Apple (Clancy & Christensen, 2018).

There are a few recent promising alternative data sources. One is national accounts data, with information on corporate income tax payments and corporate profits, which can be used to estimate ETRs (Tørsløv, Wier, & Zucman, 2018). Another emerging alternative is data available from country-

by-country reporting. Large MNEs are now required to report to their headquartered country's tax authority information on their activities worldwide on a country-by-country basis. The data are not accessible to the public or researchers, but should be made available by the OECD in an aggregate and anonymised form for the first time in 2019. Annex C of OECD (2018) reviews what kind of information is going to be published in 2019 with the second out of only three main tables to provide an overview of MNE activities based on the tax rate faced by MNEs (information is to be broken down at the jurisdiction level, but reporting countries may aggregate jurisdictions into geographic groupings where they deem it necessary to preserve the confidentiality of the data). Although the timing makes it unworkable at the moment for an estimation of ETRs, the aggregate ETRs that are due out in 2019 should be of interest.

Perhaps even more promising in terms of the accuracy is the use of confidential corporate tax returns. These have been used recently to estimate ETRs by the Government Accountability Office (2008) and Dowd et al. (2017) for the United States or Habu (2017) for the United Kingdom. Using the US data from the Internal Revenue Service, the Government Accountability Office (2008) shows that effective tax rates on the foreign operations of US MNEs vary considerably by country and that effective tax rates are correlated with where income is reported. Dowd et al. (2017) estimate average tax rates as averages weighted by positive profits (they then winsorize them at the 5% level on both tails to minimise outliers). This kind of data often includes the tax really paid (in the tax rather than accounting sense, as in Orbis), but are not easily accessible or comparable across countries. Overall, these alternative data sources, ranging from foreign affiliates' statistics to tax returns, do not provide such a combination of coverage and detail (usually better in only one of these desired characteristics) as Orbis, but they are often superior to Orbis in at least one aspect and can thus complement it well and be used for comparison with the Orbis-based ETRs.

Table 6. Data-based ETRs using global companies' balance sheet databases, Orbis and Compustat

Reference	Data	Focus	The estimation of ETRs	Results
As far as we know, no study uses consolidated Orbis data to estimate ETRs, except for Garcia-Bernardo, Janský, & Tørsløv (forthcoming)	Orbis (consolidated)	ETRs	The sum of taxes divided by the sum of gross incomes of the companies headquartered in a country (i.e. a weighted average of company-level ETRs)	ETRs differ by headquartered country as well as over time.
Egger, Loretz, Pfaffermayr, & Winner (2009b)	Orbis (mostly unconsolidated, but also consolidated)	ETRs	Firm-level backward looking effective tax rates are profit tax payments as a fraction of earnings before interest and taxation	The firm-level component of the effective tax burden is generally more important than the one at the country level
Johansson, et al. (2017)	Orbis (unconsolidated)	Profit shifting	The ratio of tax expense to the profit reported in the financial statements of the firm	100-240 billion lost in government revenues worldwide annually
Cobham & Janský (2018)	Orbis (unconsolidated)	Profit shifting	The weighted and non-weighted averages of company-level ETRs	ETRs are relevant for profit shifting of MNEs
Fuest & Riedel (2012), Janský and Prats (2015) and other research on profit shifting.	Orbis (unconsolidated)	Profit shifting	The taxes to profits ratio	MNEs differ in their ability to shift profit depending on their ownership links with tax havens
Markle & Shackelford (2012a), Markle & Shackelford (2012b)	Compustat (consolidated)	ETRs	Their preferred indicator is actual cash taxes paid to net income before income taxes.	Falling ETRs over time; the location of MNEs affects their worldwide ETRs
Dyreng, Hanlon, Maydew, & Thornock (2017)	Compustat (consolidated)	ETRs	Cash ETR, the ratio of cash taxes paid to pre-tax accounting income.	US and some cross-country results of ETRs over time
Overesch, Schenkelberg, & Wamser (2018)	Compustat (consolidated)	ETRs	GAAP ETR as tax expenses divided by pre-	In contrast to European MNEs, US

			tax income (Foreign ETR only tax expenses of foreign operations)	MNEs pay less foreign taxes, but have higher total tax expenses
Other research – e.g. rates Dyreng, Hanlon, & Maydew (2008)	Compustat (consolidated)	ETRs	e.g. long-run cash ETR excludes payments to and refunds from tax authorities upon settling of tax disputes that arose years ago	The studies examine various aspects of the ETRs (e.g. annual ETRs not being good predictors of long-run ETRs)

Source: Author

The data-based ETRs are suitable for use by other researchers. One research area where the use of these data-based ETRs is relevant is the expanding literature on base erosion and profit shifting. Most of the studies there use statutory rather than effective tax rates, as reviewed by Dharmapala (2014) or more recently by Beer, De Mooij, & Liu (2018). On the one hand, ETRs seem generally more suitable for these estimates than nominal tax rates since they reflect better the actual tax paid on average, which is what is usually relevant for the profit shifting estimates. Since ETRs differ substantially from statutory tax rates for some countries, this can have implications for empirical estimates of profit shifting. Overall, good practice might be to report results using both statutory tax rates and AETRs or ETRs as done by Crivelli et al. (2016) or Cobham & Janský (2018), respectively. Also, data-based ETRs of MNEs can be useful to test hypothesis about the development of tax revenue paid by MNEs, which might stay stable as a share of GDP, while MNEs' profits increase as a share of overall corporate profits (or GDP) and MNEs pay lower effective tax rates on their increased profits. Overall, data-based ETRs are a useful data source in studies on profit shifting and other research.

ETRs differ for local firms and MNEs. Vandebussche & Tan (2005) argue that lower ETRs of Belgian MNEs versus local firms is due to their better position to bargain for lower taxes with governments as a result of their "footloose" nature and outside location options. Egger, Eggert, & Winner (2010) use Bureau van Dijk's Amadeus, i.e. Orbis for European companies only, observe that tax payments of foreign-owned firms are lower than those of domestic firms in high-tax countries but higher in low-tax countries. Huesecken & Overesch (2015) show that tax rulings, tailor-made for ETRs, contribute to lower ETRs of MNEs versus other companies. In a recent addition to the literature, Egger, Strecker, & Zoller-Rydzek (2018) argue that bargaining power may explain the tax differences between MNEs and local companies beyond MNEs' profit shifting. Larger firms (mostly MNEs) are more valuable for tax authorities for various reasons. In threatening relocation, larger firms extract greater deductions, resulting in a regressive ETR schedule and lower ETRs for size-related reasons. MNEs face lower relocation costs than local companies, which enhances their bargaining position. Using French firm-level Orbis data and entropy balancing, they find that the regressivity of the French tax schedule

reduces MNEs' ETRs by 2.52 percentage points (size effect), while their relocation threat leads to a 3.58 percentage point reduction. MNEs usually have lower ETRs, but this is not the only systematic difference reported in the existing research. By contrast, Dyreng, Hanlon, Maydew, & Thornock (2017), use a sample of US firms to suggest that domestic companies pay higher taxes than MNEs. Similarly, Fuest & Riedel (2012) show, using Orbis data for a few large developing countries in Asia, that domestic firms have higher tax payments per profit or per asset than MNEs (in Table B2, although it is not its focus). Using information on European companies from Orbis, Egger, Eggert, & Winner (2010) shows that the ETRs of MNEs are lower than domestic firms in high-tax countries but higher in low-tax countries.

ETRs differ for MNEs with and without links to tax havens. Fuest & Riedel (2012) show that MNEs differ with respect to their ability to shift profit depending on their ownership links with tax havens, using the taxes to profits ratio as one indicator and similar empirical strategy has been more recently applied by Janský and Prats (2015) and Janský and Kokeš (2015, 2016). A number of papers on profit shifting discussed above reveal a similar pattern with MNEs having lower ETRs such as Clausing (2016) and Cobham and Janský (2017b), while Tørsløv, Wier, & Zucman (2018) rely on this observation in their estimates.

ETRs differ by firm size. The usually large scale of MNEs makes some fixed costs of tax avoidance (e.g. Grubert & Slemrod, 1998, Slemrod, 2004b) or lobbying (e.g. Richter, Samphantharak, & Timmons, 2009) more affordable that might lead to lower ETRs. Grubert & Slemrod, (1998) argue that Puerto Rico is attractive to those MNEs that can take advantage of income shifting opportunities offered by ownership of intangible assets, while Slemrod (2004b) discusses economies of scale in the consumption of tax shelters, among other tax non-compliance topics. Richter, Samphantharak, & Timmons (2009) estimate for the US that increasing registered lobbying expenditures by 1% appears to lower effective tax rates by somewhere in the range of 0.5 to 1.6 percentage points for the average firm that lobbies. With the use of a theoretical model, Irlacher & Unger (2018) provide a new explanation as to why effective tax rates are smaller for larger firms even in the absence of common channels like profit shifting and lobbying. They argue that a tax system which allows for a partial deductibility of production costs in combination with heterogeneous firms could generate such a result when mark-ups are endogenous. These results suggest that larger firms, and MNEs in particular, can benefit from their scale in the form of lower ETRs.

Existing literature has employed various empirical strategies to explain lower ETRs of MNEs. A number of them employed firm-level or aggregate panel data that included a change in tax rates across countries (for a literature review see, for example, Dharmapala, 2014, who also argues that statutory rates might be a better proxy for the marginal incentive to shift income) or a comparison between ETRs of MNEs and other companies within countries (e.g. Jog & Tang, 2001, Buettner & Wamser, 2009, Egger et al., 2010, Fuest & Riedel, 2012).