

Cobham, Alex; Garcia-Bernardo, Javier; Jansky, Petr; Palansky, Miroslav

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Statistical Measurement of Illicit Financial Flows in Sustainable Development Goals: Tax Avoidance by Multinational Corporations

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OF ECONOMIC STUDIES
Faculty of Social Sciences
Charles University

STATISTICAL MEASUREMENT OF ILLICIT FINANCIAL FLOWS IN SUSTAINABLE DEVELOPMENT GOALS: TAX AVOIDANCE BY MULTINATIONAL CORPORATIONS

Alex Cobham
Javier Garcia-Bernardo
Petr Janský
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$$\frac{1!}{(m-1)!} p^{m-1} (1-p)^{n-m} = p \sum_{\ell=0}^{n-1} \frac{\ell+1}{n} \frac{(n-1)!}{(n-1-\ell)! \ell!} p^{\ell} (1-p)^{n-1-\ell} = p \frac{n-1}{n} \sum_{\ell=0}^{n-1} \left[\frac{\ell}{n-1} + \frac{1}{n-1} \right] \frac{(n-1)!}{(n-1-\ell)! \ell!} p^{\ell} (1-p)^{n-1-\ell} = p^2 \frac{n-1}{n} +$$

Institute of Economic Studies,
Faculty of Social Sciences,
Charles University in Prague

[UK FSV – IES]

Opletalova 26
CZ-110 00, Prague
E-mail : ies@fsv.cuni.cz
<http://ies.fsv.cuni.cz>

Institut ekonomických studií
Fakulta sociálních věd
Univerzita Karlova v Praze

Opletalova 26
110 00 Praha 1

E-mail : ies@fsv.cuni.cz
<http://ies.fsv.cuni.cz>

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Statistical Measurement of Illicit Financial Flows in Sustainable Development Goals: Tax Avoidance by Multinational Corporations

Alex Cobham^a

Javier Garcia-Bernardo^{a,b}

Petr Janský^{b,c}

Miroslav Palanský^{a,b}

^aTax Justice Network

^bInstitute of Economic Studies, Faculty of Social Sciences, Charles University

^ccorresponding author: jansky.peta@gmail.com

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Abstract:

Illicit financial flows (IFFs) threaten countries' ability to achieve the Sustainable Development Goals (SDGs). Progressing on the IFFs target is thus crucial, as is the ability to measure achieved progress. In this paper we explore how to best statistically measure tax avoidance by multinational corporations (MNCs) as the SDGs IFFs target. Our main research question is how the best available methods for the statistical measurement of tax avoidance by MNCs reconcile with the Balance of Payments (BoP) statistics. We answer the research question using a combination of approaches, arriving at three main findings. First, we show that the three leading methods for estimating tax avoidance by MNCs are closely related to each other, theoretically as well as empirically. Second, the profit misalignment method applied to the country-by-country reporting (CBCR) data of large MNCs emerges as the most suitable method from a critical review of existing approaches and a range of available statistical data sources. Third, in their current state the BoP statistics are not suitable for estimating tax avoidance by MNCs for many countries due lacking country coverage and missing data. On the basis of our findings, we recommend piloting the use of confidential MNC-level CBCR data to estimate tax avoidance by MNCs as the SDGs IFFs target.

JEL: H25; H26; O23; O24

Keywords: illicit financial flows; multinational corporations; tax avoidance; balance of payments; country-by-country reporting; Sustainable Development Goals

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1 Introduction

Illicit financial flows (IFFs) threaten countries' ability to achieve the Sustainable Development Goals (SDGs) (FACTI, 2021). Progressing on the IFFs target is thus crucial, as is the ability to measure achieved progress. Tax avoidance by multinational corporations (MNCs), in particular their profit shifting to tax havens, has been agreed, after some discussion (Cobham & Janský, 2020), to constitute one type of IFFs (UNODC & UNCTAD, 2020). This tax avoidance by MNCs is responsible for around \$200 billion in tax revenue losses worldwide every year (Tørsløv et al., 2020), although the exact estimated scale differs across studies (Garcia-Bernardo & Janský, 2021). However, even if we subscribe to this emerging consensus that tax avoidance constitutes an IFF – and such a large one at that – it is hardly simple to identify the best approach to estimating tax avoidance by MNCs and, in particular, to track its development over time and for lower income countries.

In this paper we propose how to best statistically measure tax avoidance by multinational corporations as the SDGs IFFs target. Due to its illicit nature, tax avoidance by MNCs cannot generally be directly observed; however, its indirect estimation also faces a number of inherent challenges including in particular the absence of suitable data and the limitations of available data. It is also unclear how best to analyse existing data to arrive at tax avoidance. Moreover, the choices surrounding data availability, selection and analysis might influence the resulting estimates, which makes for a difficult, multidimensional exercise. An increasing number of economists, statisticians and other researchers are attempting to overcome these challenges and we critically review the methods, and ultimately build on them, below. In addition, one data source which should, at least in theory, serve as a direct record of shifted profit is the Balance of Payments (BoP) statistics. In practice, however, the BoP is not very useful, as we show in this paper, mostly due to its insufficient disaggregation of statistical classifications and poor data coverage and reporting by individual countries (tax havens in particular).

In this paper our main research question is: How do the best available methods for a statistical measurement of tax avoidance by MNCs as IFFs in the SDGs reconcile with BoP statistics? To address this main research question, we first focus on answering the following sub-questions: What are the best available methods for a statistical measurement of tax avoidance by multinational corporations as IFFs in the SDGs and how do they compare theoretically as well as empirically? How are these methods and their estimates consistent conceptually and

empirically with BoP statistics? If this reconciliation is imperfect, how can either the available methods or the BoP statistics be improved to achieve consistency? In the light of these answers, what can individual countries, including low-income and African ones, and the international community do to obtain a statistical measurement of tax avoidance by multinational corporations as IFFs in the SDGs? We answer these interlinked questions using a combination of approaches including a review of existing theory and literature as well as, most importantly, empirical analysis.

We analyse how the best available methods for the statistical measurement of tax avoidance by MNCs reconcile with BoP statistics. First, based on our own review of literature as well as on existing reviews, we identify the three broad groups of existing methods for estimating tax avoidance by MNCs. Second, we outline these three methods within a unifying theoretical framework and compare their various advantages and disadvantages. Third, we compare them empirically with each other as well as with the BoP statistics. Fourth, we develop the abnormal income method, a new simplified approach designed to estimate tax avoidance by MNCs using the BoP statistics, and we compare the resulting estimates with those yielded by the three existing methods.

In answering the research question using the above outlined combination of approaches, we arrive at three main findings. First, we show that the three leading methods for estimating tax avoidance by MNCs are closely related to each other, theoretically as well as empirically. The broadly considered methods of profit misalignment (e.g. OECD, 2015, Cobham & Janský, 2017, Cobham & Janský, 2018, Cobham & Janský, 2019, Cobham & Janský, 2020, Garcia-Bernardo et al., 2021, Garcia-Bernardo & Janský, 2021), tax semi-elasticity (e.g. Hines & Rice, 1994, Huizinga & Laeven, 2008, Dharmapala, 2014, Clausing, 2016, Dowd et al., 2017, Reynolds & Wier, 2019, Beer et al., 2020, Fuest et al., 2021, Garcia-Bernardo & Janský, 2021), and comparison with domestic firms (e.g. Fuest & Riedel, 2012, Finke, 2014, Janský & Prats, 2015, Bilicka, 2019, Sallusti, 2019, Tørsløv et al., 2020) may all be considered as arising from a basic theoretical framework. Despite some inherent methodological differences, the three approaches yield broadly similar estimates of the scale of profit shifting at both aggregated and country level.

Second, the profit misalignment method applied to the country-by-country reporting (CBCR) data of large MNCs emerges as the most suitable method from a critical review of existing approaches and a range of available statistical data sources (Cobham & Janský, 2020). Not only are country-level results of the scale of tax avoidance by MNCs for around 190 countries

available for this method, there is also a prospect of these being available on an annual basis. As such, these results could be used for the regular statistical measurement of the SDGs IFFs target (Garcia-Bernardo & Janský, 2021). Similarly, the tax semi-elasticity method may also be applied to the CBCR data. However, for the objective at hand (e.g. SDGs), the profit misalignment method is preferable to the tax semi-elasticity method for a number of reasons. It is simpler and involves fewer methodological choices and, as we show in this paper for several such choices, the results are robust. Furthermore, the profit misalignment method has a more nuanced way of redistributing profits from tax havens to other countries.

Third, the Balance of Payments (BoP) statistics is not in its current state suitable for estimating tax avoidance by MNCs for many countries due to the lacking country coverage and missing data. On the one hand, as the BoP statistics are embedded in the statistical frameworks of countries worldwide, the argument for using them is strong. Consequently, we estimated the newly developed abnormal income method, applying a regression analysis only to the BoP statistics and the gross domestic product information. The results show that it can be informative, albeit only for a total of seven tax havens. On the other hand, BoP statistics for the remaining tax havens are either missing or inconsistent with other data sources or other estimates of tax avoidance by MNCs. Overall, we do not recommend using the BoP statistics until the data source quality, level of aggregation and the reporting by tax havens improve.

Our paper contributes to at least three different areas of existing literature. First, we focus on the investigation of tax avoidance by MNCs in lower income countries, which has been hampered by data availability and related methodological challenges previously addressed by researchers using a variety of methods (e.g. Johannesen et al., 2020, Reynolds & Wier, 2019, Janský & Palanský, 2019). We provide a comprehensive comparison of the leading methods. In addition, in comparison to some previous reviews (Johannesen & Pirttilä, 2016, Beer et al., 2020, Brandt, 2020, Cobham & Janský, 2020, Collin, 2020), we focus on the Sustainable Development Goals perspective and include in our review several only recently circulated research papers (e.g. Garcia-Bernardo & Janský, 2021, Koivisto et al., 2021).

Second, we examine BoP statistics as a tool for measuring tax avoidance by MNCs. Our proposed abnormal income method follows in the recent tradition of using BoP statistics to estimate the scale of profit shifting of MNCs to tax havens. For example, studies by Bolwijn et al. (2018a), Tørsløv et al. (2020), and Hebous et al. (2021) all exploit the BoP statistics in some way; we thus add a simple way of doing so which might be suitable in particular for lower income countries, as practically no additional data are needed once the BoP statistics

themselves are sufficiently improved. Additionally, we systematically compare the estimates produced using the existing leading methods with BoP statistics data, which has not been done before, and provide new insights using the aggregate results while also focusing on the case studies of Bermuda and Mauritius.

Third, we refine the profit misalignment method: we discuss and empirically test several refinements with potential for further improving this approach. We conclude that the profit misalignment method might be kept in its simplicity as earlier proposed and applied (UNODC & UNCTAD, 2020, Cobham & Janský, 2020, Garcia-Bernardo & Janský, 2021) and that it is relatively robust to potential changes in methodology.

The rest of the paper is structured as follows. Section 2 describes three leading approaches to estimating tax avoidance by MNCs and situates all three of them within one conceptual framework before describing these methodologies in more detail and comparing their advantages and disadvantages. From this critical comparison, the profit misalignment methodology emerges not as the perfect approach, but as the preferred one. We also propose and test new refinements of the profit misalignment methodology, including implementing formulaic substance-based carve outs and considering different measures of the location of economic activity (detailed in the Appendix). Section 2 also includes a discussion of existing statistical frameworks and how profit shifting aligns with the System of National Accounts and the Balance of Payments Statistics. Section 3 then briefly introduces the data sources used throughout the paper. Section 4 is devoted to an empirical investigation of the balance of payments statistics, the development of a new method and its comparison with the leading methods. Section 4 concludes with brief case studies of Bermuda and Mauritius using the balance of payments statistics and other data sources. In final section 5, we provide brief recommendations for piloting in African countries.

2 Methodology

Tax avoidance by MNCs is included in the definition of IFFs (UNODC & UNCTAD, 2020) and has been variously labelled as profit shifting (Dowd et al., 2017), offshore profit shifting (Güvener et al., 2021), international corporate tax avoidance (Beer et al., 2020) or aggressive tax planning (Loretz et al., 2017).

We propose a conceptual framework which integrates these methodological approaches to estimating tax avoidance by MNCs. The unifying framework can be described using the

following equation which is firmly rooted in existing economic theory and has been used by numerous researchers, ranging from Hines & Rice (1994) to Garcia-Bernardo & Janský (2021):

$$\pi_i = p_i + S_i \#(1)$$

where π_i is the value of all MNCs' gross profits declared in jurisdiction i ; p_i is the value of all MNCs' real unobserved profits in jurisdiction i ; and S_i is the value of all MNCs' profits shifted in jurisdiction i (we assume these shifted profits are net of any costs of profit shifting incurred by the MNCs (c_i)).

Although the three approaches vary in the empirical strategies they employ, all of them can be discussed, with some simplifications, using Equation (1). We also provide examples of the most important, mostly academic, references for each of the methods.

1. **Profit misalignment** estimates p_i by assuming that the share of MNCs' economic activities in jurisdiction i is equal to the jurisdiction's share in the MNCs' global profits p . The estimated p_i is then subtracted from π_i to arrive at S_i . (For example, OECD, 2015, Cobham & Janský, 2017, Cobham & Janský, 2018, Cobham & Janský, 2019, Cobham & Janský, 2020, Garcia-Bernardo et al., 2021, Garcia-Bernardo & Janský, 2021).
2. **Tax semi-elasticity** derives S_i by regressing π_i on tax rates while controlling for MNCs' economic activities representing p_i . (For example, Hines & Rice, 1994, Huizinga & Laeven, 2008, Dharmapala, 2014, Clausing, 2016, Dowd et al., 2017, Reynolds & Wier, 2019, Beer et al., 2020, Fuest et al., 2021, Garcia-Bernardo & Janský, 2021).
3. **Comparison with domestic firms** assumes that any uncontrolled-for difference in observed profitability between domestic firms and MNCs is equivalent to comparing p_i and π_i and the observed difference is therefore S_i . (For example, Fuest & Riedel, 2012, Finke, 2014, Janský & Prats, 2015, Bilicka, 2019, Sallusti, 2019, Tørsløv et al., 2020).

Ultimately, in practice, each method relies on the observation of extreme values of π_i in some countries – the so-called tax havens. These extremely high reported profits, or profitability, can be shown to be inconsistent with the volume of economic activity (profit misalignment) or driven by low tax rates (tax semi-elasticity) or incomparably higher than for domestic firms (comparison with domestic firms) – or all at the same time. If these three claims are true at the same time, we would expect even more strongly to observe a positive correlation between the estimated profit shifting scales across the three methods.

We now introduce each of these methods briefly before providing a comparison. First, the profit misalignment method compares reported profits by MNCs with economic activity in the same country, judging any misalignment between the global shares of these as possibly due to profit shifting. Tax havens often have high profits reported by MNCs, but not a proportionate volume of economic activity; in that case the misaligned profits could be considered as profit shifted into them, i.e. inward IFFs. To estimate the profit misalignment method, one needs data on economic activity, which is often proxied with a weighted combination of labour (employees, wages), capital (tangible assets) and consumption (final sales, revenue). The profit misalignment can be estimated at company level or country level or even aggregated for a group of countries or globally. The profit misalignment method has previously been discussed in detail and proposed as a tool for the statistical measurement of IFFs by Cobham & Janský (2020); more recently Garcia-Bernardo & Janský (2021) applied the approach to CBCR data and arrived at an estimate of both inward and outward profit shifting for approximately 190 countries. At the more aggregated country level we argue below that this method can be compared with data contained in the Balance of Payments Statistics, which enables us to directly compare the two data sources with regard to their potential use for the statistical measurement of IFFs.

Second, the tax semi-elasticity method begins with a regression of reported profits on the left-hand side and tax rate on the right-hand side, controlling for proxies of capital and labour and potentially also for additional characteristics. While the data requirements are thus similar to the profit misalignment method, information on corporate income tax rates is also required (as is a decision regarding what data source are to be used and whether they should be statutory or backward-looking or forward-looking effective tax rates, as discussed by Janský, 2020). With the regression estimated, the scale of profit shifting is derived by removing the effect of tax rates or, in other words, simulating hypothetical scenarios in which tax rates did not differ. The tax semi-elasticity approach has been refined over the past three decades (Hines & Rice, 1994, Huizinga & Laeven, 2008, Dharmapala, 2014, Clausing, 2016, Dowd et al., 2017) and applied recently by Garcia-Bernardo & Janský (2021) for approximately 190 countries.

Third, the method of comparing MNCs with domestic firms builds on the idea that, absent profit shifting, the profitability of MNCs should be similar to that of domestic firms; any systematic differences between the two are then attributed to profit shifting. This method of estimating the scale of their profit shifting has the benefit of being able to reflect some perhaps inherent differences in profitability across countries. It attempts to do so by taking

into account country-specific information included in the data on domestic firms, which are, however, not always comparable even in a developed country such as the United Kingdom (Bilicka, 2019) or of good quality, in particular in lower income countries (Fuest & Riedel, 2012, Janský & Prats, 2015). The research papers and associated methodologies grouped under this method are, by definition, slightly more diverse (including the influential paper by Tørsløv et al., 2020) than the previous two methods, i.e. profit misalignment and tax semi-elasticity, and they use different ways of drawing on the potentially useful control group of domestic firms. Within the context of SDGs, Sallusti (2019) has recently proposed a version of this method, applying it to Italy.

2.1 Comparison of the three methods

For each of the three methodological approaches we provide a list of both advantages and disadvantages with regard to their application for the statistical measurement of IFFs within the SDG framework (Table 1). The comparison focuses on the quality and robustness of the estimation as well as on the number of countries which the estimates are feasible for and on the comparability of the estimates across countries and over the years. The latter aspect of tracking the development over time is of particular importance for tracking progress towards the SDGs.

Method	Advantages	Disadvantages
Profit misalignment	<ul style="list-style-type: none"> ▪ Enables control of a variety of economic activities (e.g. various types of assets or technologies). ▪ Facilitates the use of CBCR data as suggested by UNODC & UNCTAD (2020). 	<ul style="list-style-type: none"> ▪ Requires available data and indicators defined for economic activities. ▪ Identified misalignment might not necessarily constitute tax-induced profit shifting.
Tax semi-elasticity	<ul style="list-style-type: none"> ▪ Enables control of a variety of economic activities (e.g. various types of assets or technologies). ▪ Facilitates the use of CBCR data as suggested by UNODC & UNCTAD (2020). 	<ul style="list-style-type: none"> ▪ Sensitive to tax rates source selection (e.g. statutory, backward-looking and forward-looking effective tax rates). ▪ Sensitive to the selection of a functional form (linear, quadratic, logarithmic) to model the relationship between profits and tax rates. ▪ Requires available data and indicators defined for economic activities. ▪ Only captures tax effects by design, whereas profit shifting might take place due to other than tax-motivated

		<p>reasons (e.g. headquarter countries, financial secrecy).</p> <ul style="list-style-type: none"> ▪ Only accurately estimates the profit shifting destination but not its origin. This implies that it underestimates profit shifting in the locations where a higher fraction of profits are shifted (countries with above average tax rates, mostly developing countries).
Comparison with domestic firms	<ul style="list-style-type: none"> ▪ May be applied even when data is available only for one country for both MNCs' affiliates and domestic firms. ▪ Possibly advantageous (relative to other methods) when cross-country differences in profitability due to non-tax factors (e.g. technological differences) are considered important or difficult to model using available cross-country data (e.g. R&D). 	<ul style="list-style-type: none"> ▪ Suffers from a lack of comparable domestic firms facilitating a comparison with MNCs active in the country (likely to occur, in particular for smaller and lower income countries).

Table 1: Advantages and disadvantages of individual methodological approaches to estimate the scale of profit shifting.

The three methods also share some additional advantages and disadvantages. First, one shared advantage is that all three methods are established in academic literature and have been applied in studies for many countries as well as in country-specific analyses. Second, for each of the three methods, it is possible to set a baseline above the estimated zero – i.e. each of the methods provides a flexibility for when a corporate tax avoidance by MNCs is deemed to be too high (e.g. profit misalignments can be allowed to differ by up to 20% without being considered tax avoidance; a similar approach can also be applied to relatively low tax semi-elasticities or to the relatively small differences between domestic firms and MNCs). We empirically investigate this possibility for the profit misalignment method below. Shared disadvantages include the fact that each of the three approaches provides only an approximate estimation of tax avoidance by MNCs. Furthermore, for each of the three methods, the alignment with statistical frameworks is only approximate.

Overall, each of the methodologies has its own pros and cons and the extent of these depends, among other things, on the specific implementation of each of these methodologies. For the

profit misalignment, the main methodological choices include the selected economic activity indicators and how much misalignment to allow generally and for specific activities. We discuss alternatives to these two choices below as a robustness check of this methodology. For the tax semi-elasticity approach, the methodological choices include which function is used to model the relationship between profits, tax rates, economic activity indicators, and control variables, as well as how to redistribute the shifted profits across countries. For the comparison with domestic firms, the main methodological choices include what exactly will be the control group of domestic companies and the manner in which the comparison is conducted, e.g. using averages or propensity score matching.

2.2 Profit shifting in the System of National Accounts

Our main aim in this paper is to analyse how the existing measurement of tax avoidance by MNCs can be reconciled with the BoP statistics. We argue that the shifted profits S_i should, at least in theory, be observable in national accounting data and thereby also measurable using the profit misalignment method. This is because any difference between reported and real profits must, by definition, be a result of the artificial relocation of the MNC's tax base from one jurisdiction to another. This reasoning is in agreement with the definition of the category of IFFs from aggressive tax avoidance by MNCs, which “can take place through the manipulation of transfer pricing, strategic location of debt and intellectual property, tax treaty shopping and the use of hybrid instruments and entities.” (UNODC & UNCTAD, 2020, p. 14).

Depending on the specific method of profit shifting applied, the associated IFFs may be captured in different variables defined by the System of National Accounts (SNA) and the Balance of Payments and International Investment Position Manual (BPM) on which the BoP is built. In this section, we focus on each of the most important methods of profit shifting and discuss how they should, in theory, be captured in the SNA and BPM.

To reconcile the profit misalignment methodology with national accounting data, a useful classification of the methods of profit shifting by MNCs is to separate them into methods which (i) strategically relocate related companies and with them the underlying assets, liabilities, or risk (e.g. an implementation of an intra-group loan); and (ii) strategically misprice goods and services transferred between related parties which face different tax rates (e.g. inflating management or royalty fees). This classification is aligned with the two key

challenges that international corporate profit shifting poses for the treatment of MNCs' behaviour, as identified by Bruner et al. (2018, p. 6).

Importantly for our purposes, this classification is useful because it is also aligned with the accounting principles in the SNA and BPM: the techniques that involve the relocation of assets or liabilities to tax havens will be reflected in the Primary Income account, while the techniques that involve the mispricing of goods and services will be reflected in the Goods and Services account. In Table 2 we provide an overview of how the specific profit shifting methods can be linked to the concepts included in SMA and BPM.

Profit shifting method	Corresponding concept in BPM	Reasoning
Strategic location of intangible assets	Primary income account / Investment income / Direct investment / Income on equity and investment fund shares	Profit shifting enabled by the mobility of intangible capital
Strategic location of liabilities	Primary income account / Investment income / Direct investment / Interest	Profit shifting enabled by debt shifting (earning stripping)
Transfer mispricing in trade in goods	Goods and services account / Total goods	Profit shifting enabled by the vagueness of arm's length pricing rules
Transfer mispricing in trade in services	Goods and services account / Other business services Goods and services account / Financial services Goods and services account / Charges for the use of intellectual property n.i.e.	Profit shifting enabled by the mobility of intangible capital

Table 2: Overview of Balance of Payments Statistics variables associated with channels of profit shifting by multinational companies.

Together, the concepts listed in the middle column of Table 2 should capture most illicit financial flows comprising profit shifting by multinational companies. In the SNA and BPM frameworks, multinational corporations' profits are captured as income on foreign direct investment. This income is directly observable in the BoP data as direct investment income. This variable may be higher than shifted profits (as measured using the misalignment method) for two reasons. First, it overstates shifted profits because it includes, in addition to shifted profits, also the real profits (i.e. genuine profits of multinationals arising in each jurisdiction). In the abnormal income method to estimate profit shifting described above, we filter these real profits away, making use of the strong relationship between profits and GDP in countries that

are not tax havens. Second, Direct investment income may overstate shifted profits because it includes, in addition to profits shifted into the jurisdiction, also the income that is passed on to entities in other jurisdictions and ultimately reported for tax purposes elsewhere.

The relationship between the BoP and profit shifting has also been discussed recently by Hebous et al. (2021). They argue that, in theory, profit shifting distorts the components of the current account and bilateral current account balances but leaves a country's aggregate net balance unaffected. There is, however, a real effect on current account balances, because taxes are paid to different jurisdictions. Moreover—in practice—the measured current account could change, because not all transactions are equally easy to track. Their panel empirical results broadly confirm that the current account balance tends to be, on average, unaffected by profit shifting, but, taking heterogeneity into account, they find that both the real tax effect and mismeasurement strengthen income balances—and thus the current account—in investment hubs. We provide our own empirical analysis of the BoP below.

2.3 Abnormal income method

As we describe above, the Balance of Payments statistics do, at least in theory, include profit shifting. However, there is no way to directly distinguish in the BoP data the flows that are the result of profit shifting and those that are the result of genuine operations by MNCs. In the terms of the unifying framework described above, in the BoP data we observe π_i , but not its decomposition into p_i and S_i . To separate these, we can approximate p_i using existing macroeconomic measures of economic activity. We refer to this approach as the abnormal income method.

In the abnormal income method, we predict p_i using regression analysis for non-haven countries, i.e. countries where S_i is likely to be close to zero. We use GDP as a measure of economic activity in country i and estimate the following simple OLS regression for non-haven countries:

$$\pi_i = \alpha + \beta * GDP_i + \epsilon \#(2)$$

To derive S_j for each tax haven j , we calculate the difference between the reported profits π_j observed in the BoP data and the estimated real profits $p_j = \beta * GDP_j$. We refer to this difference as abnormal income, which we assume to be the result of profit shifting.

3 Data

To facilitate estimates of the scale of profit shifting, the profit misalignment method requires two main categories of data, i.e. on reported profits and on economic activity, both of which must be broken down by jurisdiction. Most papers which employ the profit misalignment method make use of the recently increasingly available CBCR data, which includes both data on profits and on the economic activity of MNCs. Earlier studies relied on data limited to US MNCs as published by the Bureau of Economic Analysis (e.g. Cobham & Janský (2019)). In July 2020, for the first time, global CBCR data were published by the OECD (2020b) with information on the activity and financial results of companies for the year 2016. Garcia-Bernardo et al. (2021) complement this data with CBCR data for the year 2017 for US MNCs and provide global estimates.

With some limitations, data on reported profits is also available in the Balance of Payments Statistics (IMF, 2019) as we describe in detail in Section 3. This data has been previously used to estimate profit shifting by indirectly comparing MNCs with and without tax haven presence (Bolwijn et al., 2018a; Janský & Palanský, 2019), corporate income taxation by MNCs (Bolwijn et al., 2018b; Tørsløv et al., 2020), and tax avoidance due to tax treaties (Janský et al., 2021; Janský & Šedivý, 2019). We argue that, in combination with data on economic activity, the BoP data are also potentially usable in the profit misalignment method. To illustrate that, in a variation of the profit misalignment method, we proxy the volume of economic activity by GDP in Section 4. To differentiate this variation of the method from the original one, we call this adjustment the abnormal income method.

The BoP data we use in this paper come from the IMF's Balance of Payments Statistics and, to ensure direct comparability to the profit shifting estimates, we focus on data from 2016. Lastly, in the abnormal income method we use data on GDP which we source from the World Bank, United Nations and the CIA's World Factbook.

4 Results

In this section we aim to explore how the BoP may be used to estimate the scale of profit shifting and how those measures compare to the best available estimates obtained using the misalignment methodology, as described above. We start by comparing BoP data with estimates of profit shifting at country level. Next, we develop a simple methodology which provides an approximation of the profit shifting estimates solely based on BoP and GDP data. Finally, we focus in more detail on the cases of Bermuda and Mauritius, two jurisdictions identified by the misalignment method as ranking among tax havens most frequently used by

multinationals for profit shifting. Each of these two countries represents a different group of tax havens with respect to what is included in the BoP data, as we describe below.

4.1 Comparing BoP data with estimates of profit shifting

We compare the BoP data with estimates of profit shifting for the most important tax havens. We primarily focus on tax havens where inward shifted profits simultaneously account for an estimated USD 1 billion or more (to exclude very small countries) and represent at least 2% of GDP (to exclude large non-havens) and where the effective tax rate is below 12% (to only include aggressive tax havens). We thus obtain a list of 17 tax havens for which we have estimates of the scale of profit shifting from the profit misalignment method: Barbados, Bermuda, British Virgin Islands, Cayman Islands, Curacao, Cyprus, Gibraltar, Hong Kong, Ireland, Isle of Man, Jersey, Luxembourg, Mauritius, Netherlands, Puerto Rico, Singapore, and Switzerland.

We start by comparing the highest-level variables in the Primary Income Account as observed in the BoP statistics of these tax havens with the profit misalignment-based estimates of profit shifting (as a plausible benchmark of the true scale of profit shifting). Since profit shifting should only be a subset of this total primary income (because it includes also flows such as compensation of employees, rent, etc., as we describe above), we would expect the amounts to be larger than the misalignment estimates. In Figure 1a, we show that this is the case only for seven countries (highlighted in blue). For these countries, the reported primary income is around one order of magnitude higher than the profit shifting estimates, which makes sense as these economies derive income from a large amount of licit (in addition to illicit) financial flows. For Barbados, Bermuda, Cayman Islands, and Curacao, the primary income is lower than the amount of profit shifting, suggesting that the BoP data misses large amounts of illicit financial flows into these countries. The BoP does not include any data for British Virgin Islands, Gibraltar, Isle of Man, Jersey, and Puerto Rico.

We next move to the level of investment income (Figure 1b), i.e. excluding non-investment income such as compensation of employees. This amount still includes portfolio investment income, which is not related to multinational companies, and we thus again expect these values to be higher than the misalignment estimates. We observe that this is the case for the same seven tax havens with the sole exception of Singapore, which does not report data at this level of detail.

Excluding portfolio investment income and thus focusing solely on direct investment income, which is the closest concept in the BPM to the estimates of profit shifting, in Figure 1c we observe that the two are well-aligned, with Direct investment income values being slightly larger, which is expected because these include the sum of real and shifted profits, as we explain above. In Section 5.2 we use the abnormal income method to filter the real profits away from the Direct investment income values to arrive at even more directly comparable estimates of the scale of profit shifting.

Importantly, this analysis shows that using the BoP for this purpose is only suitable for six tax havens. This is a mixed conclusion: while the number of tax havens is thus limited, the BoP can still be useful for precisely these six tax havens. For Barbados, Bermuda, Cayman Islands and Curacao, the data on Direct investment income in the BoP, though reported, seems to be missing significant shares of profit shifting.

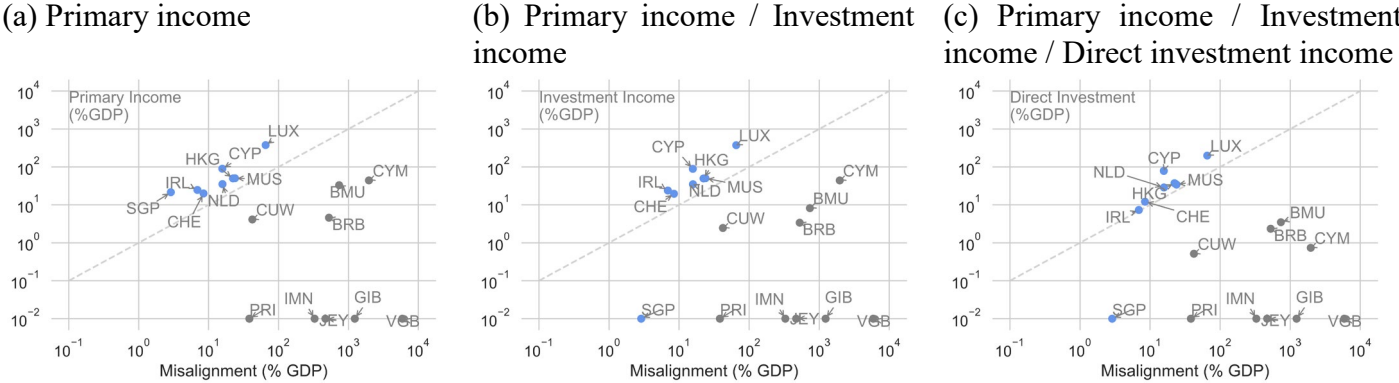


Figure 1: Comparison of estimates of profit shifting and primary income variables reported in the BoP data.
Source: Authors.

The BoP data facilitates a breakdown of the direct investment income into its component parts: (a) income on equity and investment fund shares and (b) interest (Figure 2a and 2b). We observe that income on equity dominates in five of the six tax havens that provide this breakdown (i.e. excluding Singapore) with only Luxembourg exhibiting interest income flows comparable in size to the income on equity. Luxembourg is also the only tax haven to provide a breakdown for interest between fellow enterprises, as seen in Figure 2c.

- (a) Income on equity and investment fund shares
- (b) Interest
- (c) Interest between fellow enterprises

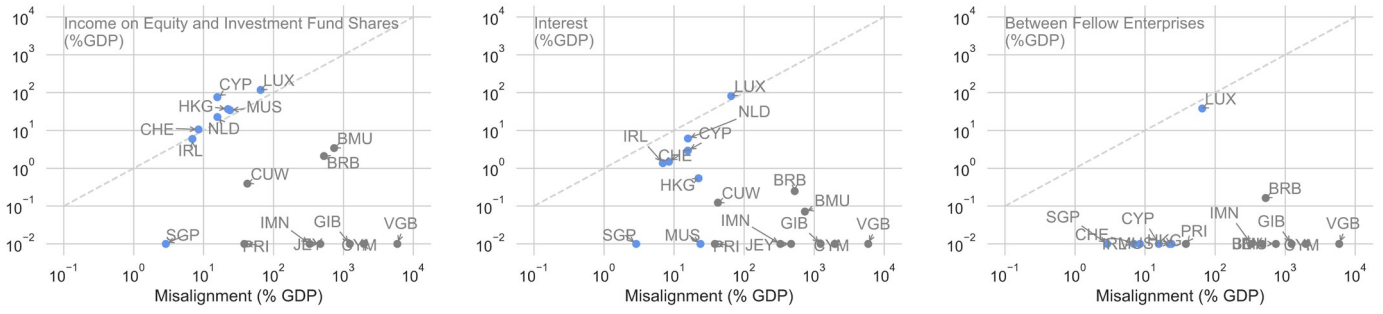


Figure 2: Comparison of estimates of profit shifting and direct investment income variables reported in the BoP data.

Source: Authors.

Next, we focus on the Goods and Services account which includes payments for services, i.e. one of the main channels of profit shifting. In Figure 3 we again observe that the seven tax havens (highlighted in blue) and in this case also Curacao report higher amounts of flows of services than our estimates of profit shifting. As explained above, the observation that these flows are higher than the estimates of profit shifting is expected: they also include genuine payments for services (which we filter away using the abnormal income method below). On the other hand, these flows do not include any profit shifting via the debt shifting channel.

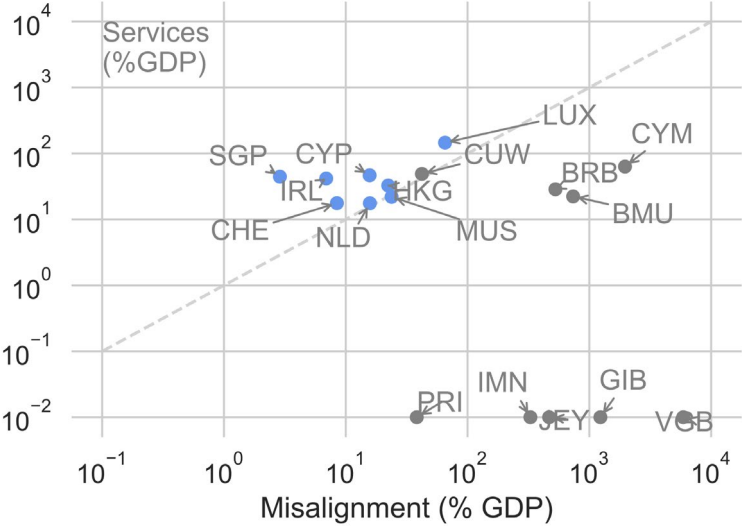
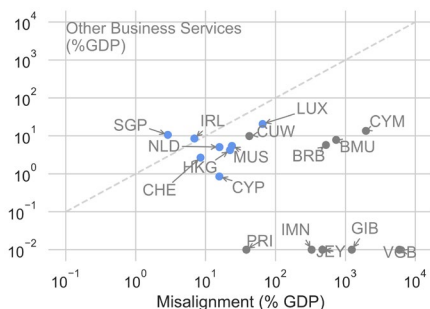


Figure 3: Comparison of estimates of profit shifting with flows of services reported in the BoP data.

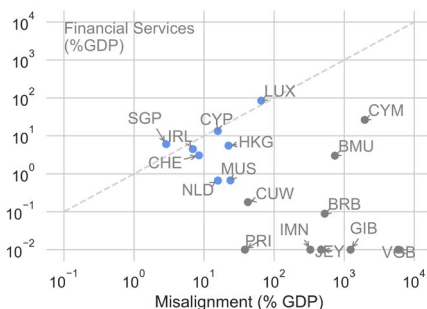
Source: Authors.

In Figure 4 we decompose the services payments into three categories: other business services (including management fees), financial services, and charges for the use of intellectual property (including royalties). Based on our analysis above, these three concepts should capture the most important channels of profit shifting by multinational companies.

(a) Other business services



(b) Financial services



(c) Charges for the use of intellectual property

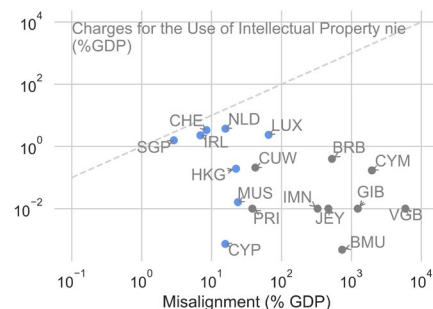


Figure 4: Comparison of estimates of profit shifting with flows of different types of services, as reported in the BoP data.

Source: Authors.

4.2 Estimating profit shifting using BoP data: the abnormal income method

In this section we use the abnormal income method, a simple methodology described above, to estimate profit shifting using BoP data; we then compare the obtained results with estimates of profit shifting acquired using the misalignment method.

We first run a simple regression of direct investment income, as observed for each country in the BoP data, on GDP. From this regression we exclude the countries identified as tax havens above. We argue that for non-haven countries this regression constitutes a good first-order approximation of the relationship between direct investment income and GDP; the R-squared of the regression is 0.656.

For tax havens we calculate the difference between the actual direct investment income and the predicted value and attribute that difference to profit shifting by multinational corporations. Figure 5 illustrates the abnormal income methodology and shows that the vast majority of the direct investment income reported in all the tax havens with available data is identified as abnormal.

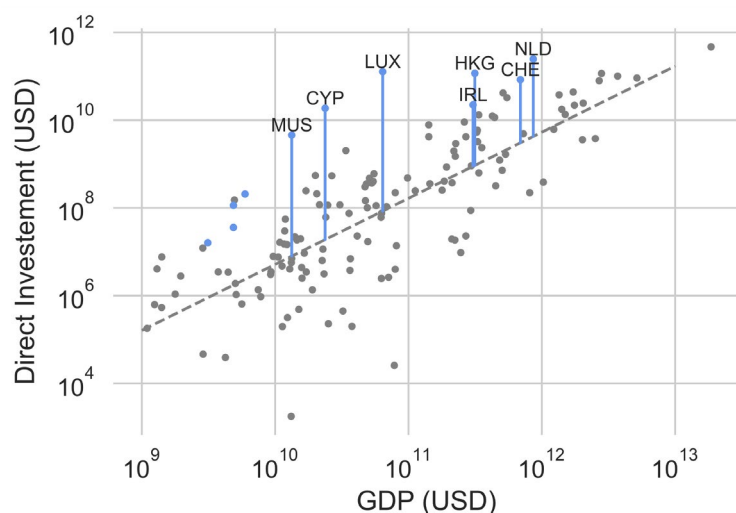


Figure 5: Estimates of profit shifting using the abnormal income method.

Source: Authors.

We then evaluate the results of the abnormal income method, which relies solely on BoP data, to estimate the scale of profit shifting. We do so by comparing the country-level results of this method with the results of the misalignment method (Figure 6). We find that the results of the two methods are highly correlated for the seven tax havens identified above as reporting plausible data in the BoP. In terms of scale, the abnormal income method yields higher estimates of profit shifting, which is expected, as some of the investment income reported in the BoP data is composed of returns on pass-through investment and therefore not ultimately booked in the tax haven in question. For some tax havens, such as the Netherlands, Luxembourg or Cyprus, the income passed through is close to or in excess of 50% of all reported direct investment income.

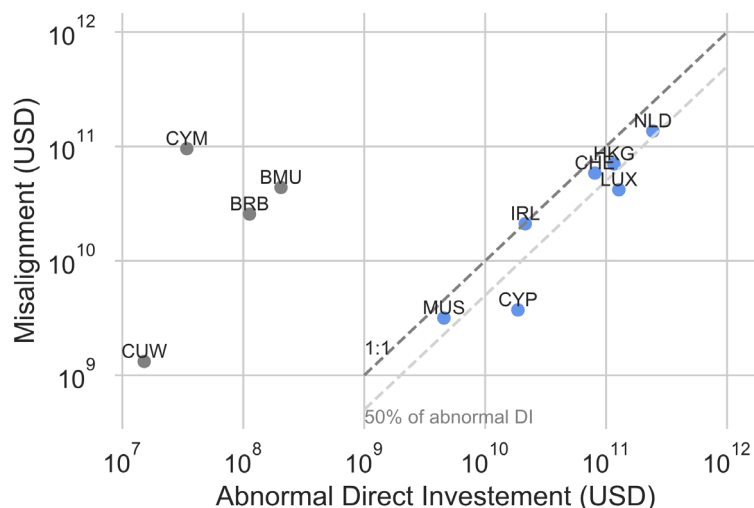


Figure 6: Comparison of the estimates of profit shifting derived by the abnormal income method and the misalignment method.

Source: Authors.

In Table 3 we provide the detailed results of the abnormal income method for the 11 countries that reported values of direct investment income in the BoP data. We find that for all of these tax havens the share of abnormal income on total income is over 90%. In Figure 7 we provide a comparison of the estimates of the scale of profit shifting for all 17 tax havens in our sample. As six of these (marked with a star) do not report data in the BoP, no estimates of the scale of profit shifting using the abnormal income method are available. We find that for four countries (marked with a dagger in Figure 7: Cayman Islands, Bermuda, Barbados and Curacao) the BoP data likely grossly underreport the direct investment income that arises in these countries as the estimates of abnormal income are close to zero despite other methods assigning significant values of inward shifted profits to these countries. We conclude that the BoP data are not suitable for estimating the scale of profit shifting for these countries.

Country	Shifted profits (USD billion, misalignment method)	Total income (USD billion, BoP data)	Abnormal income (USD billion)	Abnormal income as % of total income
Netherlands	136.71	258.56	253.54	98.06%
Cayman Islands	132.69	0.05	0.05	95.86%
Hong Kong	76.28	122.87	121.78	99.11%
Switzerland	60.57	92.83	89.24	96.13%
Bermuda	57.16	0.17	0.17	98.42%
Barbados	25.63	0.11	0.11	98.22%
Ireland	24.13	22.98	21.93	95.45%
Cyprus	3.84	19.78	19.76	99.89%
Luxembourg	3.64	123.63	123.53	99.92%
Mauritius	3.20	5.40	5.39	99.83%
Curacao	1.43	0.02	0.02	94.56%

Table 3: Comparison of the estimates of profit shifting as derived by the abnormal income method and the misalignment method.

Source: Authors.

For Luxembourg, Cyprus, Mauritius, Netherlands, Switzerland, Ireland, and Hong Kong, we find higher values of abnormal income than is estimated by the misalignment method to be shifted profits, which is in line with the fact that the direct investment income in the BoP data includes also returns on pass-through investment (which is likely to be particularly salient in the Netherlands' estimate). Using the BoP data in its current form does not allow us to separate pass-through investment, and we thus conclude that the BoP is not usable for estimating the scale of profit shifting into these countries, either.

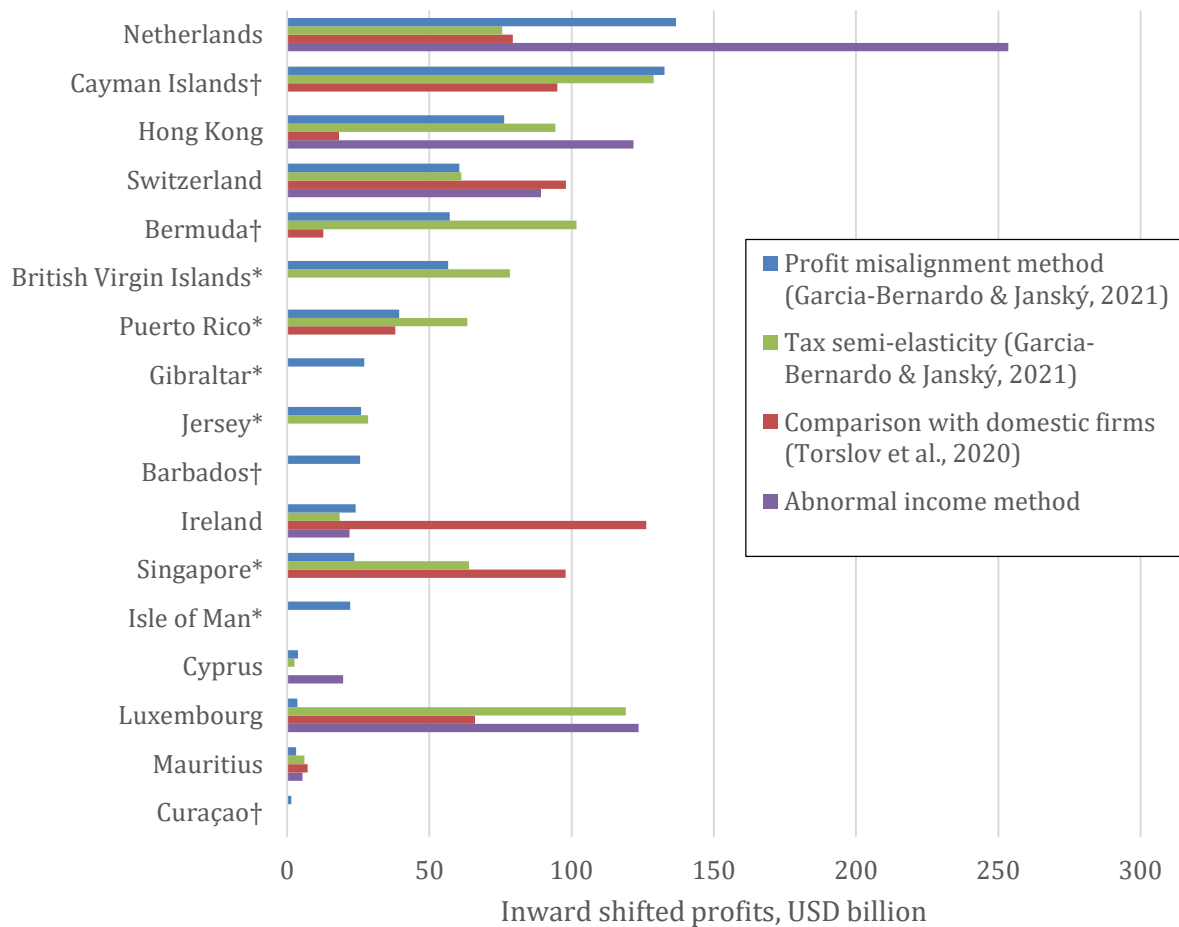


Figure 7: Inward shifted profits as estimated by representative studies of the three leading methods in comparison with the abnormal income method.

Source: Authors.

Notes: Countries marked with a star do not report data in the BoP and no estimates obtained using the abnormal income method are thus available. Countries marked with a dagger report data in the BoP; however, as we explain in the text, these data are likely missing most of the profits shifted into these countries.

4.3 Case examples: Bermuda and Mauritius

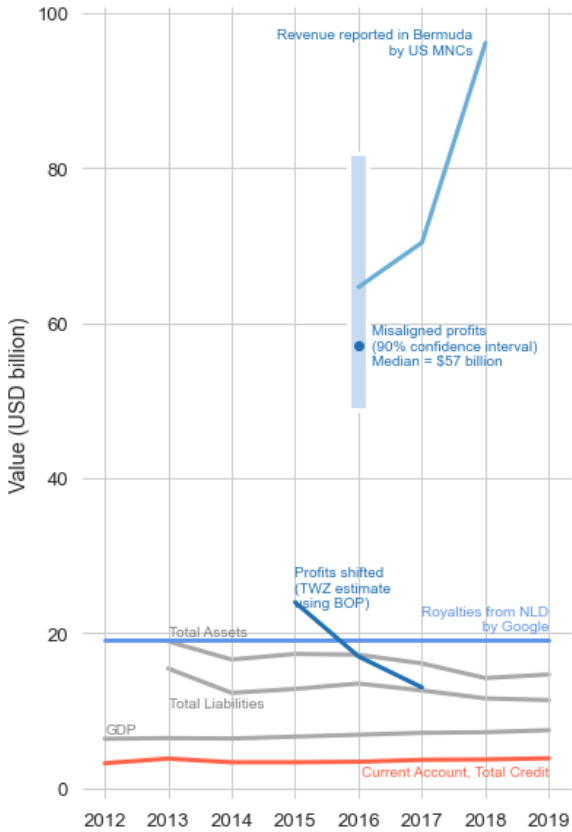
In this section we examine in closer detail the cases of Bermuda and Mauritius, which emerge from our analysis of the BoP as representative countries of two groups of tax havens. First, Bermuda is a country for which we find that the BoP data is likely missing large amounts of direct investment income. Second, Mauritius is one of seven tax havens for which the BoP data reports direct investment income in amounts that can be reconciled with the profit misalignment estimates. For both countries we compare the numbers we observe in the BoP data with what we know from other sources about the use of these tax havens by multinational corporations (Figure 8).

For example, we know that Bermuda received EUR 128 billion in royalties from the Netherlands between 2012 and 2019 (NOS, 2021). In Figure 8a we show the estimate of royalties paid by Google to its Bermudan subsidiary (\$19 billion annually), our estimate of profit misalignment in Bermuda (\$57 billion, 90% confidence interval \$49—\$82 billion), and the revenue reported in Bermuda by US MNCs (\$65—\$96 billion).

We compare those estimates of profit shifting with the total credit in the current account (\$2.3—\$3.0 billion), the GDP of Bermuda (\$6.3—\$7.5 billion) and the total assets and liabilities reported in the BoP (\$11.4—\$19.0 billion). We conclude that the BoP data are missing significant amounts of direct investment income and that, subsequently, profit shifting indeed cannot be estimated for Bermuda using BoP statistics in their current form. As we report in Table 3, these conclusions apply not only to Bermuda but also to the Cayman Islands, Barbados, and Curacao.

In Figure 8b we show a similar comparison for Mauritius. We find that the amounts of direct investment income reported in the BoP statistics are larger than the estimates of misaligned profit, which is in agreement with what we would expect if the BoP data were indeed accurate. In fact, the estimates obtained using the abnormal income method are larger than those from the profit misalignment method. Similar conclusions also hold true for Luxembourg, Cyprus, the Netherlands, Switzerland, Ireland, and Hong Kong.

(a) Bermuda



(b) Mauritius

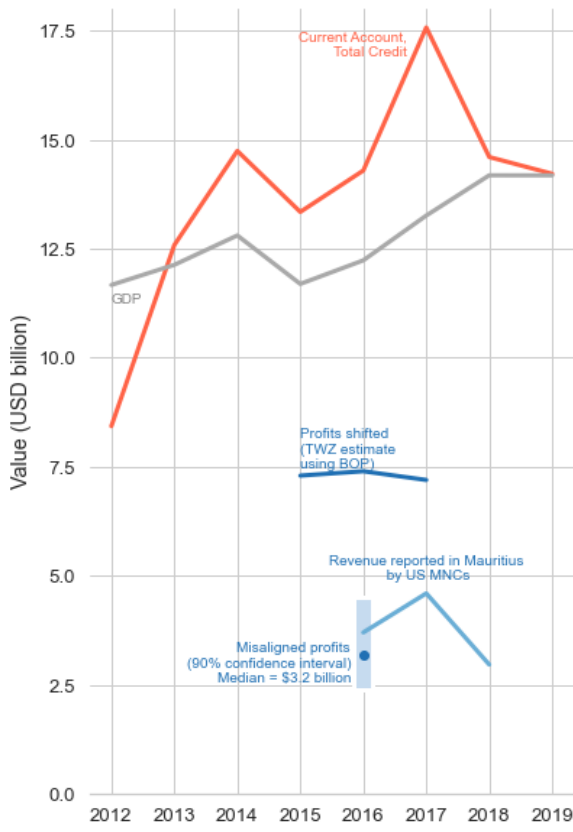


Figure 8: Comparison of Balance of Payments data and estimates of profit shifting in Bermuda and Mauritius.

Source: Authors.

5 Conclusion

In this paper we show how the preferred profit misalignment method is conceptually as well as empirically related to the other two leading approaches, i.e. tax semi-elasticity and comparison with domestic firms, as well as to the abnormal income method that we develop in this paper using the Balance of Payments (BoP) statistics data.

Our findings suggest that the BoP data in its current form are unsuitable for estimating the scale of profit shifting by MNCs. This is mainly due to their low country coverage: some of the most important tax havens (as identified using the other methodologies) do not report the relevant data in the BoP while a number of others report values close to zero despite other estimates assigning significant amounts of MNCs’ profits shifted into these countries.

We conclude that CBCR data are currently the most suitable data source for estimating the scale of profit shifting by MNCs and we recommend piloting the use of confidential MNC-level CBCR data to estimate tax avoidance by MNCs. These MNC-level data are confidential

CBCR data received by both the tax authorities of the countries where these MNCs are headquartered as well as the tax authorities of other countries in which the MNCs are active.

Pilot studies conducted in African countries could learn from existing studies using similar data. To the best of our knowledge MNC-level CBCR data have only been used in a small number of research papers on high-income countries: Germany (Fuest et al., 2021) and Italy (Bratta et al., 2021). More aggregated data was published and used for the United States (Clausing, 2020, Garcia-Bernardo et al., 2021) as well as for countries worldwide on the basis of the data set published by the OECD for the first time in July 2020 (OECD, 2020a) and thus far used only rarely (OECD, 2020a, Garcia-Bernardo & Janský, 2021).

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7 Appendix

Table 4: Overview of the Goods and Services Account. Source: Balance of Payments and International Investment Position Manual, Sixth edition (BPM6)

Table 10.1. Overview of the Goods and Services Account

	Exports (Credits)	Imports (Debits)
General merchandise on a balance of payments basis		
<i>Of which: Re-exports</i>		
Net exports of goods under merchandising		
<i>Goods acquired under merchandising (negative exports)</i>		n.a.
<i>Goods sold under merchandising (exports)</i>		n.a.
Nonmonetary gold		
Total goods		
Balance on trade in goods		
Manufacturing services on physical inputs owned by others		
Maintenance and repair services n.i.e.		
Transport		
Travel		
Construction		
Insurance and pension services		
Financial services		
Charges for the use of intellectual property n.i.e.		
Telecommunications, computer, and information services		
Other business services		
Personal, cultural, and recreational services		
Government goods and services n.i.e.		
Total services		
Balance on trade in services		
Total goods and services		
Balance on goods and services		

Note: This table is expository; for Standard Components, see Appendix 9.

Source: Balance of Payments and International Investment Position Manual, Sixth edition (BPM6)

Table 5: Overview of the Primary Income Account.

Table I I.1. Overview of the Primary Income Account

	Credits	Debits
Balance of goods and services		
Compensation of employees		
Investment income		
Direct investment		
Income on equity and investment fund shares		
Dividends and withdrawals from income of quasi-corporations		
Reinvested earnings		
Interest		
Portfolio investment		
Income on equity and investment fund shares		
Dividends on equity other than investment fund shares		
Investment income attributable to investment fund shareholders		
Dividends on investment fund shares		
Reinvested earnings on investment fund shares		
Interest		
Other investment		
Income on equity and investment fund shares		
Interest		
Investment income attributable to policyholders in insurance, standardized guarantees, and pension funds		
Reserve assets		
Income on equity and investment fund shares		
Interest		
Other primary income		
Rent		
Taxes on production and imports		
Subsidies		
Total primary income credits and debits		
Balance on primary income		
Balance on goods, services, and primary income		

Note: This table is expository; for Standard Components, see Appendix 9.

Source: *Balance of Payments and International Investment Position Manual, Sixth edition (BPM6)*

8 The refined profit misalignment methodology

The profit misalignment methodology has been recently applied to CBCR data with results for more than 190 countries available in the paper by Garcia-Bernardo et al. (2021). The method has been critically reviewed and compared above and we propose and empirically implement and test some refinements for this method below.

8.1 Addressing profitability differences due to other reasons than profit shifting

8.1.1 Allowing for a certain amount of profit misalignment equal to $\alpha \pi_i$ (similar allowance for Pillar Two)

$$\chi_i = \begin{cases} \pi_i - \omega_i \Pi & \text{if } (\chi_i < 0) \text{ or } (\chi_i > \alpha \pi_i) \\ 0 & \text{otherwise} \end{cases}$$

General results

The inclusion of a threshold has little effect on the general results. The total net misaligned profits are reduced from \$937 billion in the general case to \$893 billion including a 20% threshold (Figure 8, where the bars represent 90% confidence intervals and the dot the median estimate). This is the case because profit misalignment is either lower than zero (profits are shifted out) or much larger than zero (the majority of profits are shifted in). For example over 95% of profits in Cayman Islands or Bermuda are estimated to be shifted in, so including a 20% threshold does not significantly change the total estimate.

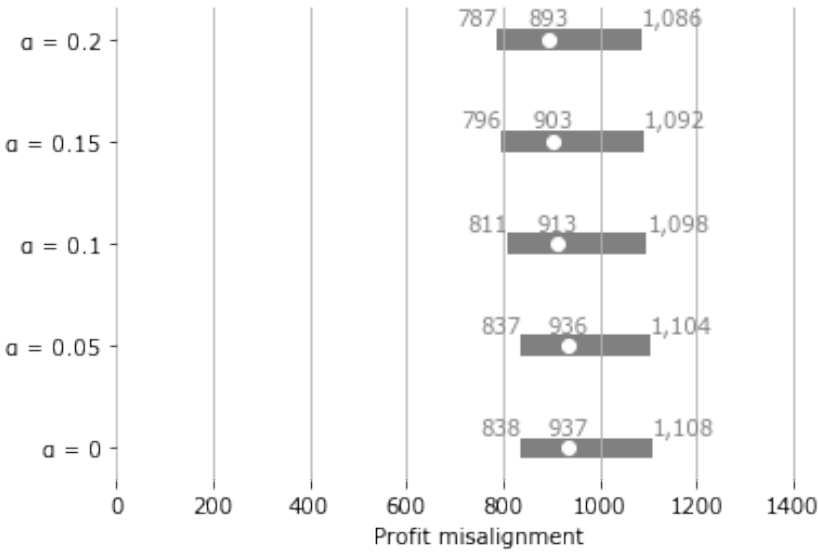


Figure 9: Global estimates of profit shifting using different misalignment thresholds. Source: Authors.

Results for representative countries

Similar results are found at country level.

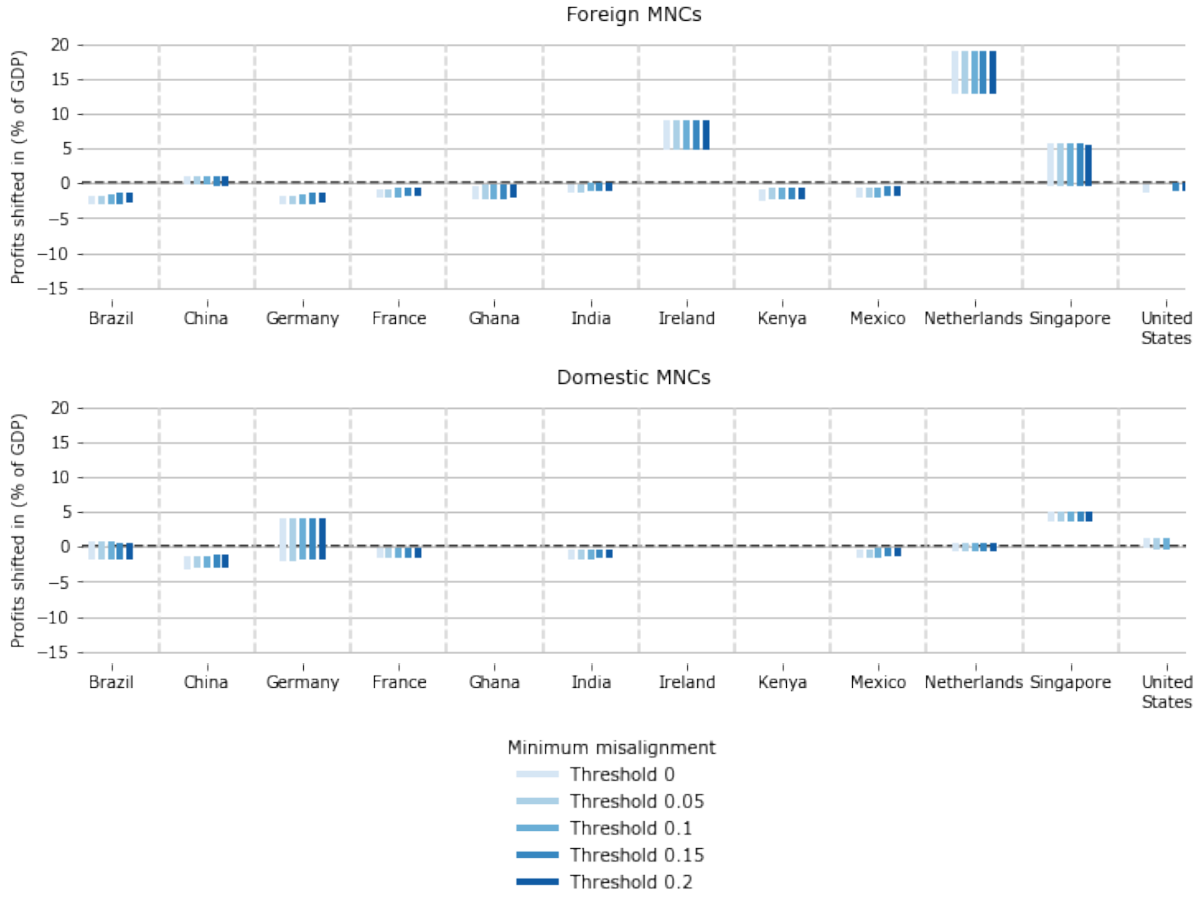


Figure 10: Estimated profit shifting using different misalignment thresholds, selected countries.

Source: Authors.

8.1.2 Use of formulaic substance-based carve-outs

As a refinement of the profit misalignment method, we propose a following carve-out. A carve-out excludes part of the profits ($\beta_i g_i$) from the calculation of profit misalignment, where g_i are wages or tangible assets.

$$\pi'_i = \begin{cases} \pi_i - \beta_i g_i & \text{if } (\pi_i > \beta_i \pi_i) \\ 0 & \text{otherwise} \end{cases}$$

$$\chi_i = \pi'_i - \omega_i \Pi$$

General results

The results are generally robust to the inclusion of a carve-out. Profit misalignment increases for carve-outs of 100% of wages from \$937 billion to \$1,072 billion. The inclusion of carve-outs of tangible assets increases profit misalignment (for carve-outs of 5—10%) and then decreases it (carve-outs of 15—20%).

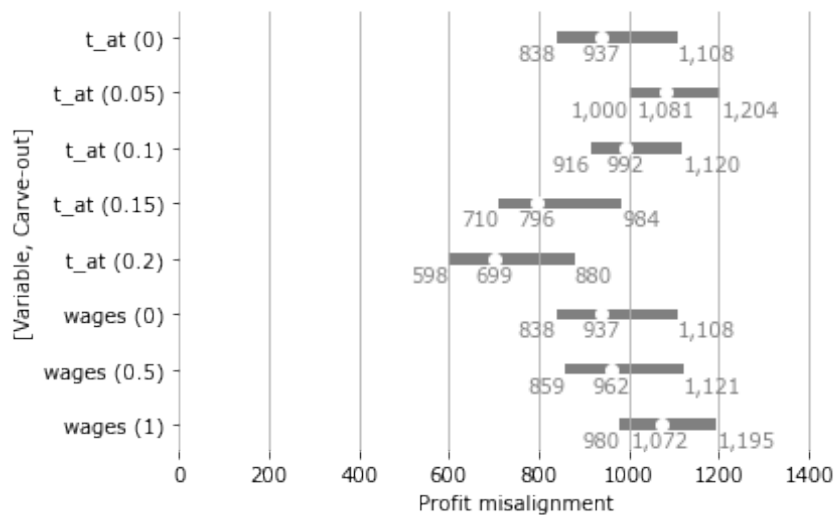


Figure 11: Global estimates of profit shifting using different substance-based carve-outs.
Source: Authors.

Results for representative countries

The increase and further decrease of profit shifting is dominated by China. Low carve-outs increase profit misalignment out of China, since the country has a low ratio of profit to tangible assets. As the carve-out increases the profits of other countries are eroded with higher ratios of profit to tangible assets, again reducing profit shifting.

	Tangible assets					Wages		
	0	0.05	0.1	0.15	0.2	0	0.5	1
Bermuda	57	55	53	51	48	57	58	59
Cayman Islands	132	128	123	117	112	132	134	136
Netherlands	136	140	137	128	116	136	132	124
Ireland	24	22	16	7	0	24	26	27
Singapore	23	29	26	17	5	23	24	19
United States	-34	70	51	-14	-138	-34	-284	-516
China	-243	-510	-401	-251	-155	-243	-35	105
France	-62	-43	-41	-46	-28	-62	-88	-77

Table 6: Estimates of profit shifting using different substance-based carve-outs, selected countries. *Source: Authors.*

In general, profit shifting decreases in most countries if a carve-out is introduced due to two reasons: (i) as a result of an increase in profit shifting to China, and (ii) due to the equalizing effect of a large carve-out.

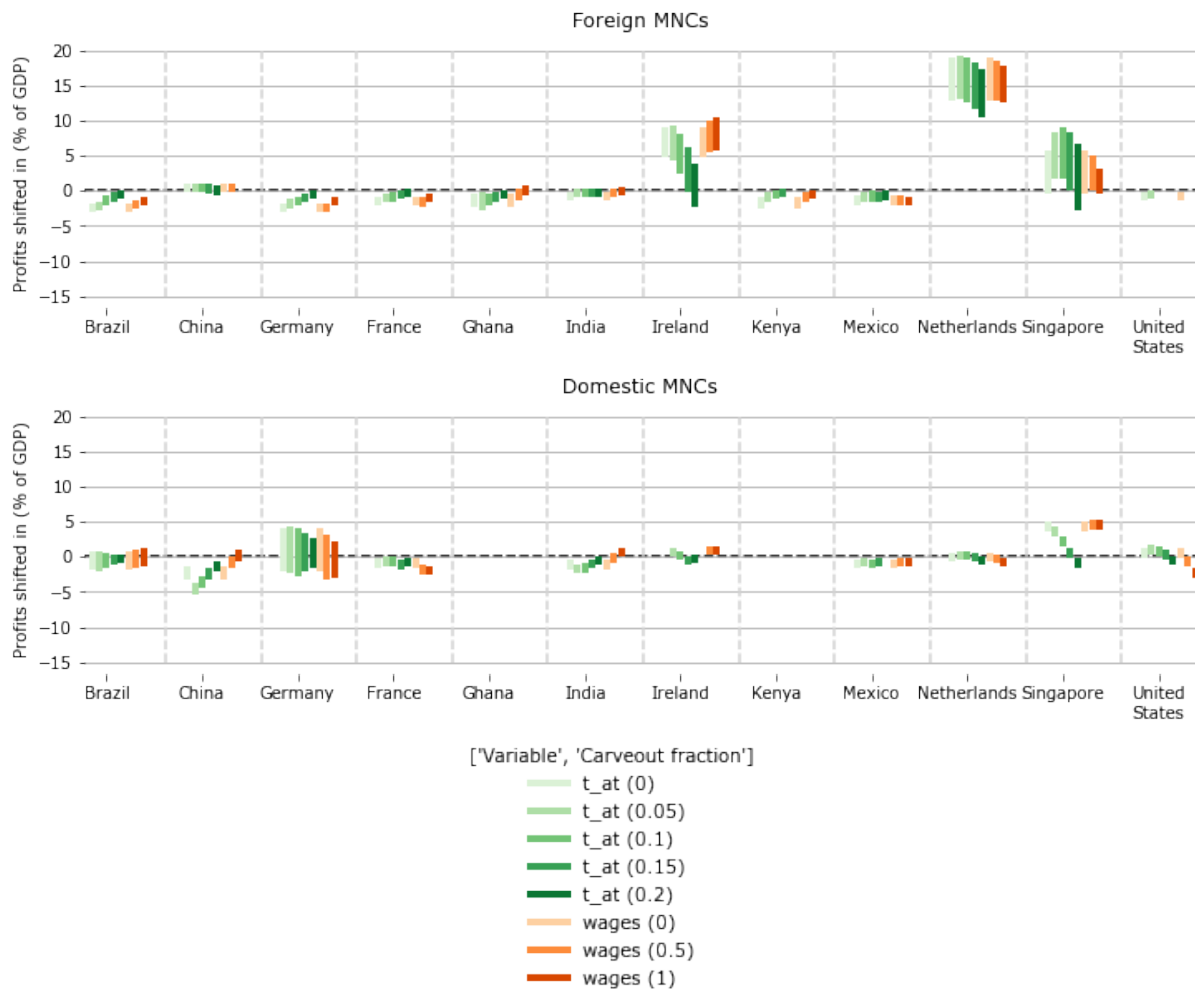


Figure 12: Estimates of profit shifting using different substance-based carve-outs, selected countries. Source: Authors.

8.2 Considering different measures of the location of economic activity

We use different combinations of unrelated party sales, employees, wages, and tangible assets to calculate the share of economic activity. In particular, we use formulas giving all the weight to each component, the CCCTB formula ($\frac{1}{3}$ sales, $\frac{1}{6}$ employees, $\frac{1}{6}$ wages, $\frac{1}{3}$ assets), the formula used in Garcia-Bernardo & Jansky ($\frac{1}{2}$ sales, $\frac{1}{4}$ employees, $\frac{1}{4}$ wages), and the formula calculated using a regression analysis (79% sales, 4% employees, 14% wages, 3% wages)

General results

The general results are dominated by unrelated party sales. Formulas using only employees, wages, or tangible assets estimate profit misalignment at \$1,506—\$1,651 billion, while formulas including sales estimate it at \$932—\$990 billion.

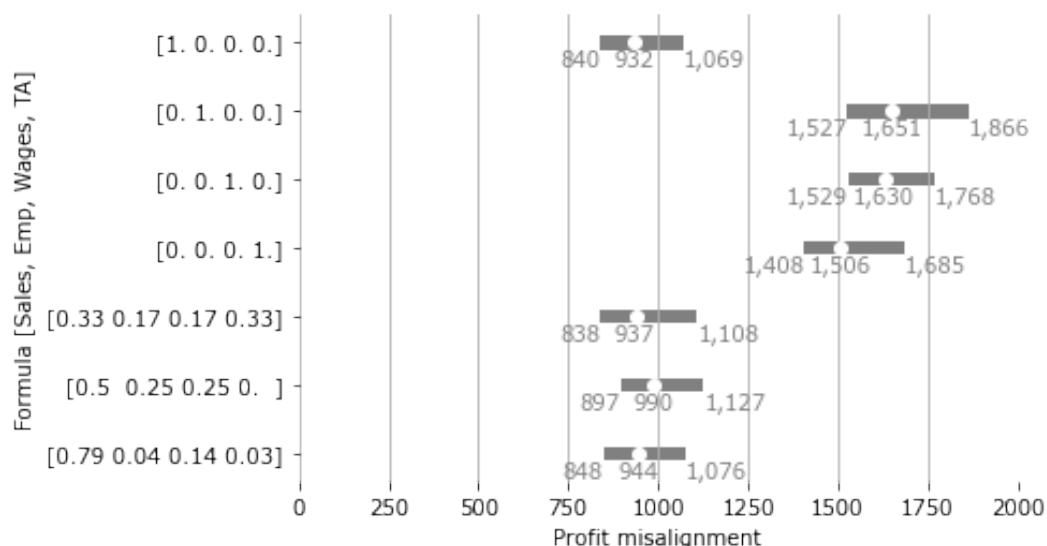


Figure 13: Global estimates of profit shifting using different measures of the location of economic activity. Source: Authors.

Results for representative countries

A large degree of heterogeneity exists at country level, dominated by the results for the United States and China. The United States suffers much higher losses if profit shifting is estimated using wages, and does not suffer losses if profit shifted is estimates using employees or tangible assets. The results are reversed for China.

	Weights applied for sales, employees, wages, and tangible assets						
	(1, 0, 0, 0)	(0, 1, 0, 0)	(0, 0, 1, 0)	(0, 0, 0, 1)	(0.33, 0.17, 0.17, 0.33)	(0.5, 0.25, 0.25, 0)	(0.79, 0.04, 0.14, 0.03)
Bermuda	57	61	60	52	57	59	58
Cayman Islands	134	140	140	121	132	137	135
Netherlands	117	154	128	150	136	129	121
Ireland	11	47	35	20	24	26	15
Singapore	-16	58	31	43	23	14	-4
United States	-216	266	-666	330	-34	-213	-248
China	125	-290	469	-931	-243	105	125
France	-75	-60	-155	0	-62	-92	-84

Table 7: Estimates of profit shifting using different measures of the location of economic activity, selected countries. Source: Authors.

In general, wealthier countries lose more profits if we use wages, and poorer countries if we use employees. The total profits in tax havens are only slightly affected by the measure—irrespective of which economic measure is used, most profits are misaligned in tax havens.

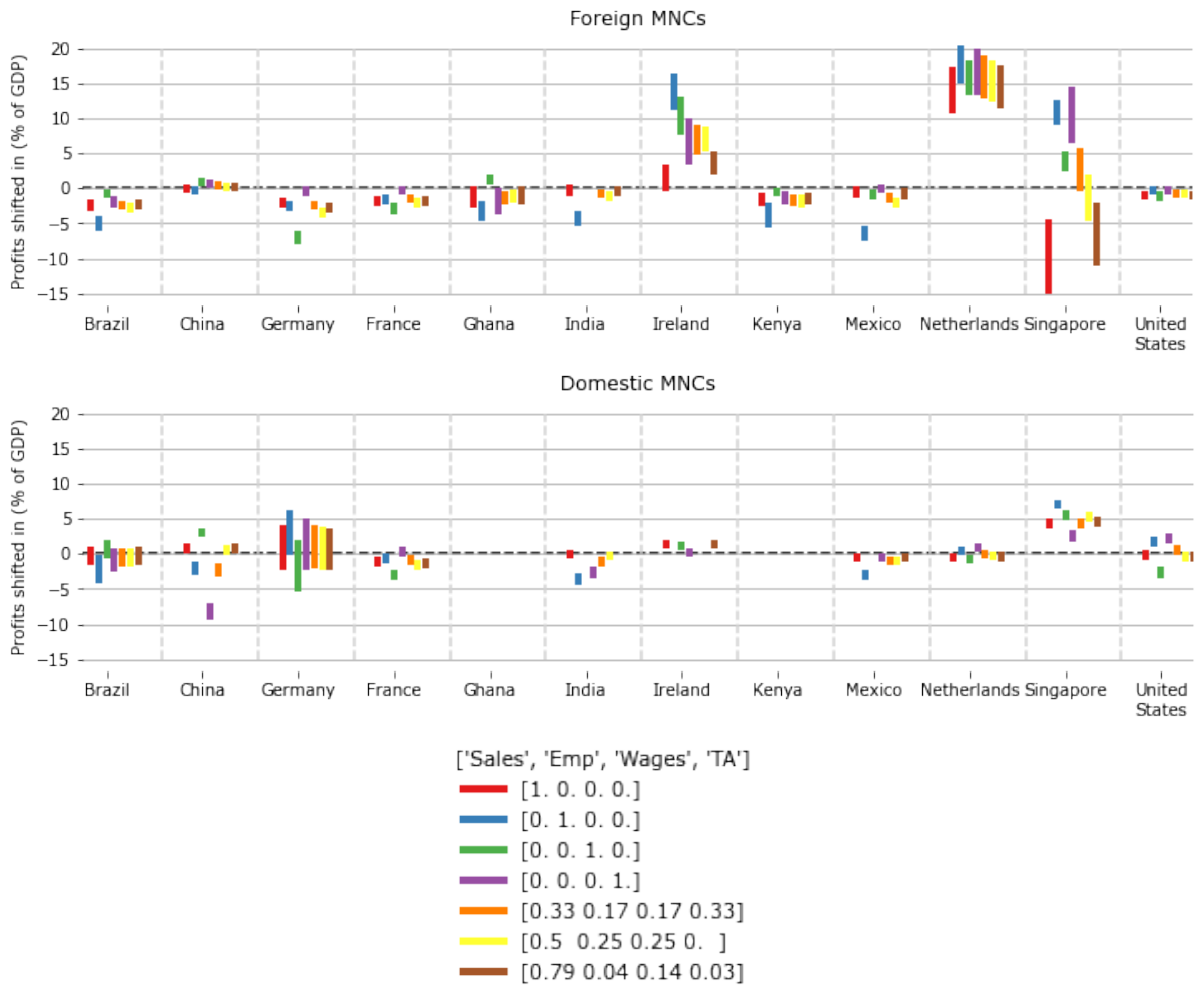


Figure 14: Estimates of profit shifting using different measures of the location of economic activity, selected countries. Source: Authors.

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