

# The Missing Profits of Nations\*

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## Abstract

By exploiting new macroeconomic data known as foreign affiliates statistics, we show that affiliates of foreign multinational firms are an order of magnitude more profitable than local firms in low-tax countries. By contrast, affiliates of foreign multinationals are less profitable than local firms in high-tax countries. Leveraging this differential profitability, we estimate that close to 40% of multinational profits are shifted to tax havens globally. We analyze how the location of corporate profits would change if all countries adopted the same effective corporate tax rate, keeping the global effective tax rate and global profits constant. Profits would increase by about 20% in non-haven European Union countries, 15% in the United States, and 10% in developing countries, while they would fall by about half in today's tax havens. We provide a new international database of GDP, trade balances, and factor shares corrected for profit shifting, showing that the rise of the corporate capital share is significantly under-estimated in high-tax countries.

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# 1 Introduction

Perhaps the most striking development in tax policy throughout the world over the last few decades has been the decline in corporate income tax rates. Between 1985 and 2018, the global average statutory corporate tax rate has fallen by more than half, from 49% to 24%. In 2018, most spectacularly, the United States cut its rate from 35% to 21%.

One major reason for this decline is international tax competition. By cutting their tax rates, countries can attract capital and profits (see Keen and Konrad, 2013, for a survey of the large literature on tax competition). Despite the prominence of tax competition in both the academic literature and the public debate, however, we do not currently have comprehensive estimates of how much profit each country loses or attracts because of international differences in corporate tax rates. Although there are excellent data on U.S. multinationals, which have been used extensively to study the location and tax-optimization choices of U.S. firms,<sup>1</sup> until recently there was no similar data covering the multinationals of other countries. As a result, we do not currently have a clear view of the extent to which globalization and tax competition are redistributing profits across nations.

Our paper attempts to fill this gap by drawing on new data. In recent years, the statistical institutes of most of the world's developed countries—including the major tax havens—have started releasing new macroeconomic data known as foreign affiliates statistics. Following new international guidelines, these statistics record the wages and profits of foreign firms (defined as firms more than 50% owned by foreign shareholders, i.e., typically subsidiaries of foreign multinational companies). By combining these data with existing national accounts aggregates (which cover all firms incorporated in a given country), we can decompose the national accounts aggregates of each country and estimate the profits made and wages paid by foreign firms and local firms separately. This makes it possible to obtain a comprehensive view of where multinational companies book their profits, and in particular to estimate the amount of profit booked in tax havens globally.

Using our new database, we consider the following thought experiment. Imagine that all countries agreed tomorrow to apply the same effective tax rate to corporate profits, i.e., agreed to a perfect international tax coordination. By how much would profits booked in the United States, the European Union, and developing countries increase compared to today's situation—and by how much would they fall in low-tax places like Ireland? And would a lot of tangible capital move back to today's high tax-countries (with potentially significant effect on wages,

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<sup>1</sup>See, e.g., Gravelle (2009), Clausing (2009, 2016), Guvenen et al. (2018).

depending on the elasticity of substitution between capital and labor), or would firms merely change the location of paper profits without many tangible assets moving across borders? In other words, how does tax competition redistribute profits internationally and what is the relative importance of tax competition for tangible capital vs. tax competition for paper profits? Answering these questions is important to better understand the redistributive impacts of globalization, that is, which countries (and social groups) have gained most from it, and which have gained less or lost.

The new foreign affiliates statistics exploited in this paper have a number of strengths to address these questions. They are more comprehensive than financial accounting data on which a lot of the literature is based (see Section 2). They provide direct information on the profits booked in tax havens. They do not double-count the profits of indirectly-held affiliates (see Section 3). We stress at the outset, however, that we are well aware of the deficiencies of existing foreign affiliates statistics. In many ways, these statistics are still in their infancy. Not all countries publish them, which means we have to sometimes rely on imputations. Despite these limitations, these macro data are at present the most comprehensive to study the activities of multinational corporations in a global perspective. In addition, we feel that a useful way for scholars to contribute to future data improvement is to use the existing statistics in a systematic manner, so as to better identify their limits and how these limits could be overcome. Our article, therefore, can also be viewed as an attempt to assess the internal consistency of the foreign affiliates statistics of all the world's countries, and to pinpoint the areas in which progress needs to be made.

Using our new database, we document a simple but striking fact. Foreign firms are systematically more profitable than local firms in low-tax countries, while the opposite is true in high-tax countries. More precisely, for local firms (i.e., firms that are not subsidiaries of a foreign multinational group) the ratio of pre-tax profits to wages is typically around 30%–40% in both high-tax and low-tax countries. For foreign firms, the ratio of pre-tax profits to wages is an order of magnitude higher than 30%–40% in low-tax countries, while it is lower than 30%–40% in high-tax countries. For example, foreign firms in Ireland (a low-tax country) have a profits-to-wage ratio of 800%: for \$1 of wage paid to Irish employees, foreign multinationals report \$8 in pre-tax profits in Ireland.<sup>2</sup> In the UK by contrast, foreign firms have a profits-to-wage ratio of 26% only. Global macro data thus show a large redistribution of profits within divisions of multinational companies, away from high-tax countries and towards low-tax places. (Figure 5

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<sup>2</sup>This corresponds to a capital share of corporate value-added of 80%–90% in foreign firms operating in Ireland, vs. around 25% in local Irish firms.

illustrates this key result.)

To better understand the high profits booked in tax havens, we provide decompositions into real effects (more tangible capital used by foreign firms in tax havens) and profit shifting effects (above-normal returns to capital and receipts of interest). This distinction matters because these two processes have different distributional implications. Movements of tangible capital across borders affect wages, since tangible capital has a finite elasticity of substitution with labor. By contrast, movements of paper profits (i.e., profit shifting) don't: for a given global profitability, whether profit is booked in the United States or in Bermuda has no reason to affect workers' productivity in either of these places. Our results show that the high profits-to-wage ratios of multinationals in tax havens are essentially explained by shifting effects. Tangible capital is internationally mobile—and there is evidence that this mobility has become slightly more correlated with tax rates over the last twenty years—but globally, machines have not massively moved to low-tax places; paper profits have.

Using the differential profitability of foreign firms in high- vs. low-tax countries, and new bilateral balance of payments data recently published by tax havens, we develop a methodology to estimate the amount of profit shifted into each haven and the profit loss for individual high-tax countries. Our computations are relative to a benchmark in which all countries had the same effective corporate tax rate keeping everything else (in particular world profit and investment) fixed. Globally, we find that close to 40% of multinational profits—defined as profits made by multinational companies outside of the country where their parent is located—are shifted to tax havens in 2015. The governments of the (non-haven) European Union countries appear to be the prime losers of this shifting, with a reduction in profit of about 20% relative to our benchmark. The governments of tax havens derive sizable benefits from this phenomenon: by taxing the large amount of paper profits they attract at very low rates (less than 5%), they generate more tax revenue, as a fraction of their national income, than the United States and non-haven European countries that have much higher rates. We also find that U.S. multinationals shift comparatively more profits than multinationals from other countries. The shareholders of U.S. multinationals thus appear to be the main winners from global profit shifting (again relative to our benchmark).

We discuss two main implications of these findings. First, our results suggest that the headline economic indicators—including GDP, trade balances, and corporate labor and capital shares—of a number of countries are significantly distorted. The flip side of the profits shifted to tax havens is that output, net exports and profits recorded in non-haven countries are too

low. We provide a new database of corrected macro statistics for all OECD countries and the largest emerging economies. Adding back the profits shifted out of high-tax countries increases the corporate capital share significantly. By our estimates, the rise in the European corporate capital share since the early 1990s is twice as large as recorded in the national account data used, e.g., by Karabarbounis and Neiman (2014). This finding has implications for current debates about the changing nature of technology and inequality.

Second, our results can be used to quantify the tax revenue that individual countries could gain under different corporate tax reform scenarios. We consider one such scenario, the taxation of shifted profits by source countries, and find that corporate tax receipts could increase by up to 15% in the United States and 20% in a number of European countries compared to today. Looking forward, our data could be used to quantify the revenue implications of more fundamental reforms, such as the use of a formulary apportionment system (e.g., Gordon and Wilson, 1986; Avi-Yonah and Clausing, 2007), or a destination-based corporate cash flow tax (Auerbach, 2010). We also plan to update our database and estimates annually, making it possible for researchers and policy-makers to track the effects of ongoing policy efforts aimed at reducing corporate profit shifting, such as the OECD “base erosion and profit shifting” (BEPS) initiative, or the effect of the 2017 US tax reform.<sup>3</sup>

The rest of this paper proceeds as follows. In Section 2 we relate our work to the literature. Section 3 outlines our conceptual framework and data. We present our estimates of the amount of profits shifted to each tax haven in Section 4, before analyzing the implications of this phenomenon for non-haven countries in Section 5. Section 6 discusses our corrected estimates of GDP, trade balances, and factor shares. We provide concrete proposals to improve economic statistics and the monitoring of global activity in the conclusion (Section 7). This paper is supplemented by an Online Appendix that enables the reader to reproduce all our estimates step by step starting from publicly available data. All the data used in this research are available online.<sup>4</sup>

## 2 Related Literature

We start by relating our work to previous attempts to estimate global profit shifting. The main difference between our work and previous studies is that while most of the literature uses an indirect method to estimate profit shifting, we base our analysis on the directly observable

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<sup>3</sup>Preliminary updated estimates for 2016 are available in Tørsløv et al. (2019).

<sup>4</sup>The Appendix and dataset, as well as updated estimates and visualizations, are available at <http://missingprofits.world>.

profits booked by multinationals in each country (including tax havens).

## 2.1 Microeconomic Estimates of Profit Shifting

A large body of work studies profit shifting using accounting micro-data, collected in the Orbis database of Bureau van Dijk.<sup>5</sup> Profit shifting is estimated by running regressions of the following form:

$$\log(\pi_{ic}) = \alpha + \beta(\tau_p - \tau_c) + \delta Firm_i + \gamma Country_c + \epsilon_{ic} \quad (1)$$

where  $\pi_{ic}$  denotes the pre-tax profits booked by company  $i$  in country  $c$ ,  $\tau_c$  the tax rate in country  $c$ ,  $\tau_p$  the tax rate in the company's parent's country, and  $Firm_i$  and  $Country_c$  firm and country controls. A positive  $\hat{\beta}$  is interpreted as evidence of profit shifting, and the global amount of profits shifted for tax reasons is extrapolated from the estimated  $\beta$ . The OECD (2015) uses this methodology for its official estimate of the size of base erosion and profit shifting (Johansson et al., 2017).<sup>6</sup>

Although this methodology has generated important insights, it also faces limitations. First, little micro-data exists about the profits booked by multinationals in low-tax countries. Orbis provides accurate information about the global consolidated profits of most of the world's multinationals (see, e.g., Cobham and Loretz, 2014). Multinational companies, however, are generally not required to publish their profits country by country or subsidiary by subsidiary. Orbis relies on administrative information in public business registries to record the profits made by multinationals in their various subsidiaries. Because countries such as France maintain comprehensive registries, almost all the profits made by French resident firms (including subsidiaries of foreign multinationals) can be seen in Orbis.<sup>7</sup> But in many countries public registries either do not exist (e.g., Bermuda), or contain no income information (e.g., United States, Ireland, Switzerland).<sup>8</sup> Profits booked by multinationals in these countries are not visible in Orbis.

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<sup>5</sup>See Kalemli-Özcan et al. (2015) for a presentation of these data.

<sup>6</sup>The literature considers four measures for the incentives to shift profits: (1) the differential with the tax rate of the parent's country (e.g., Dharmapala and Riedel, 2013); (2) the weighted tax rate differential with all other subsidiaries (e.g., Huizinga and Laeven, 2008); (3) the unweighted tax rate differential with other subsidiaries (e.g., Johansson et al. 2017), and (4) the simple corporate tax rate (e.g., Lohse and Riedel, 2013). On a priori ground, it is unclear which of these measures is preferable. Heckemeyer and Overesch (2013) give an overview of 26 studies using this approach; see also Wier (2018).

<sup>7</sup>In 2010 for instance, the national accounts of France report that French resident corporations made \$240 billion in pre-tax profits after net interest payments. In Orbis one finds a very close figure, \$237 billion.

<sup>8</sup>In the Spring of 2017, the United Kingdom announced that it would mandate its overseas territories (e.g., Bermuda, the British Virgin Islands, and the Cayman Islands) to develop public registries of the owners of companies formed there by the end of 2020. This initiative doesn't capture the Crown Dependencies (such as Jersey, Guernsey and Isle of Man). It is unclear whether income or balance sheet information will be made

For instance, as shown by Figure 1, Orbis correctly reports that the worldwide consolidated profits of Apple were 55.3 billion euros in 2016. If one adds up all the profits recorded in Orbis by all of Apple’s subsidiaries throughout the world, however, then one finds only 2.0 billion euros. None of the profits made by Apple in the United States or in Ireland, Jersey, or similar tax havens are visible.<sup>9</sup> Similarly large discrepancies are observed for Google Alphabet, Facebook, and Nike. In Figure 2, we compare the consolidated global profits of each multinational in Orbis to the sum of its subsidiary-by-subsidary profits. In 2012, 17% of the global profits of multinationals could be traced in Orbis. That is, 83% were booked in subsidiaries unknown to Orbis, or for which no profits data was available. The problem is particularly acute for low- and zero-tax countries.<sup>10</sup>

The limited reporting of data in tax havens has two main implications. First, it means that estimating equation 1 with publicly available accounting micro-data is likely to deliver estimates of  $\beta$  that are downwards biased. It is only in the special case where the semi-elasticity of profit shifting with respect to tax rate differentials is constant that the estimated  $\beta$  is unbiased.<sup>11</sup> There is evidence in the literature that the shifting elasticity is highly nonlinear, with far more responsiveness at lower tax rates than at higher ones.<sup>12</sup> One may also imagine that multinational companies try to shift profits in a discreet manner (e.g., for public relation reasons). In the extreme case where they only shift profits to subsidiaries that do not publish income statements, the estimated  $\beta$  in Orbis is zero, while in actual facts it is positive and possibly large.<sup>13</sup> Second, estimating equation 1 with accounting micro-data can lead to biased inferences about the location of shifted profits. If only high-tax countries have public registries, then one can find that all profit shifting takes place between high-tax countries, whereas in actual facts this shifting may be second-order relative to the shifting to low-tax countries.

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available in these registries.

<sup>9</sup>The use of tax havens by Apple is documented in, e.g., the U.S. Senate (2014) investigation on Apple’s corporate tax structure.

<sup>10</sup>A number of papers study shifting by U.S. multinationals using data from the Bureau of Economic Analysis on the activities of U.S. multinationals abroad (see, e.g., Clausing, 2009; Guvenen et al., 2018) and IRS data (e.g., Altshuler and Grubert, 2005; Grubert, 2013; Dowd, Landefeld and Moore, 2017, and De Simone, Mills and Stomberg, 2017). These data do not suffer from the problems in Orbis, as U.S. multinationals have to (confidentially) report information on all their subsidiaries to the BEA and to the IRS. These data can only be used to study shifting by U.S. multinationals, while we are interested in shifting by all multinationals.

<sup>11</sup>Even in this case, extrapolating the global amount of profits shifted from  $\hat{\beta}$  requires to be able to observe in which countries multinationals have subsidiaries—which is not possible in Orbis, since subsidiaries in countries with no public corporate registry are not visible.

<sup>12</sup>For instance, using U.S. corporate income tax data, Dowd et al. (2017) find tax semi-elasticities of 4.7 at corporate tax rates of 5 percent and 0.6 at tax rates of 30 percent. See also Wier and Reynolds (2018).

<sup>13</sup>Relatedly, Bilicka (2019) studies profit shifting outside of the United Kingdom using UK tax data, and finds that accounting data underestimate the true size of profit shifting relative to more comprehensive tax data.

The main difference between our work and the micro-econometric estimates of profit shifting is that we rely on direct (macro) data on the profits booked by multinationals in tax havens, namely foreign affiliates statistics and national accounts data. These macro data are more comprehensive than the data available in Orbis or similar databases, for one simple reason. While Orbis has to rely on publicly available corporate registries, statistical authorities have access to a much broader set of information to compile their foreign affiliates and national account statistics: corporate income tax returns, censuses of the activities of domestic and foreign corporations, and private income statements and balance sheets. As a result, the flow of profits recorded in these macro data is much larger than the one in Orbis. These macro data are not perfect however; they have limitations and sometimes need to be corrected, as we discuss in Section 3.2 below.

## 2.2 Macro Estimates of Profit Shifting

A nascent literature takes a macro perspective to study profit shifting. The OECD (2015) itself, although it used Orbis for its official BEPS estimate, suggested that global macro data be used to estimate profit shifting.

Most of this macro literature uses U.S. statistics, hence focuses on U.S. multinationals only (Clausing, 2009, 2016; Gravelle, 2009; Zucman, 2014; Guvenen et al., 2018). In this paper, we take a global perspective: we estimate profit shifting by all the world's multinationals and the implications of this phenomenon for each OECD country, the main emerging economies, and tax havens. This global perspective allows us to estimate how tax competition (for capital and profits) redistributes profits internationally, thus shedding light on the overall redistributive effects of globalization. Our database and results are relevant for policy-makers across the world and make it possible to put the United States in an international perspective. For example, we can study whether U.S. multinationals shift more profit than multinationals from other countries.

Two recent studies, Crivelli, de Mooij and Keen (2015) and Bolwijn et al. (2018), use global macro data to study profit shifting and are the most closely related to our work. The main difference is that we rely on different data (foreign affiliates statistics and bilateral balances of payments) and use a different methodology.<sup>14</sup> The foreign affiliates statistics we use allow us to

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<sup>14</sup>Bolwijn et al. (2018) rely on the balance of payments and FDI statistics of non-haven countries; Crivelli, de Mooij and Keen use corporate income tax revenue data. A number of papers in international finance (e.g., Lane and Milesi-Ferretti, 2018) use tax havens' international investment positions, but this literature attempts to characterize patterns in international investment, not to estimate the size of profit shifting as we do here.

directly observe the profits booked by multinationals in tax havens and to compute factor shares in foreign vs. local firms across the world (Figure 5). This enables us to produce an estimate of profit shifting based on the abnormally high capital share reported by foreign firms in tax havens.<sup>15</sup> One advantage of this methodology is that it produces estimates of profit shifting that can be easily tracked by policy makers on a year-to-year basis. Moreover, the new bilateral balance of payments we use enable us to provide bilateral estimates of profit shifting (i.e., how much profits are shifted by French firms to Luxembourg, by German firms to the Netherlands, etc.), which was not possible with earlier approaches. Bilateral estimates are a necessary input to calibrate quantitative models of international tax competition and multinational production with profit shifting (e.g., Wang, 2018). Our database could be used to calibrate such models in the future.

### 2.3 Literature on Tax Competition

Our paper is also related to the large theoretical literature on international tax competition. A large body of work focuses on competition for tangible capital (see Keen and Konrad, 2013). A number of studies also consider competition for paper profits, its interaction with competition for tangible capital, the incentives of tax havens, and the costs involved for non-haven countries.<sup>16</sup> Our contribution to this literature is to provide a first empirical quantification of the international redistribution of profits due to tax competition.

## 3 Conceptual Framework and Methodology

There are three main steps in our analysis. We first show that there are large, systematic differences in the profitability of local vs. foreign firms: foreign firms are much more profitable than local firms in low-tax countries, while the opposite is true in high-tax countries. Second we show that these differences mainly reflect profit shifting (rather than higher capital intensities in low-tax places). Third we apportion the shifted profits to the countries where they would

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<sup>15</sup>Crivelli, de Mooij and Keen (2015) infer the tax revenue losses due to international corporate tax avoidance for developing vs. advanced economies from the correlation between corporate tax revenue collected and the statutory tax rates of other countries estimated in a panel model. We view their approach and ours as complementary. Using the methodology in Crivelli, de Mooij and Keen (2015), Cobham and Janský (2018) estimate country-level tax revenue losses due to international corporate tax avoidance. As in Crivelli, de Mooij and Keen (2015), these estimates are based on the estimated cross-country correlation between corporate income tax revenue and foreign countries' tax rates. A systematic reconciliation of their findings with ours is a fruitful avenue for future research.

<sup>16</sup>See Slemrod and Wilson (2009); Hong and Smart (2010); Johannesen (2010); the application of the Kanbur and Keen (1993) model of commodity tax competition to profit shifting in Keen and Konrad (2013).

have been booked absent international differences in tax rates. We discuss each step in turn.

### 3.1 Macroeconomic Profitability Ratios

We base our profitability analysis on macro corporate profit data that we collected for the world’s largest economies and all tax havens. Our key statistic of interest is the ratio  $\pi$  of pre-tax corporate profits to wages. We are interested in how this statistic varies across countries, and how it varies within countries but across foreign-owned ( $\pi_f$ ) vs. local ( $\pi_l$ ) firms.

We define  $\pi$  at the country level as follows. Using standard notations, we denote by  $Y$  the corporate output of a country, obtained by combining effective labor  $AL$  and capital  $K$ . We include in the corporate sector all resident corporations, both non-financial and financial. Part of corporate output is paid to workers, and the rest, operating surplus, accrues to the owners of capital:  $Y = F(K, AL) = rK + wL$ . In this framework,  $r$  includes both the normal return to corporate capital and any above-normal return (i.e.,  $r$  is not necessarily equal to the marginal product of capital). The capital share of corporate output is  $\alpha = rK/Y$  and the ratio of operating surplus to wages is  $\alpha/(1 - \alpha)$ . Corporations pay  $p$  percent of their operating surplus  $rK$  in net interest. We define (pre-tax) corporate profits as  $(1 - p) \cdot rK$ . Our ratio of interest  $\pi$  measures the profits made by resident firms per dollar of wage paid:  $\pi = (1 - p) \cdot \alpha/(1 - \alpha)$ .<sup>17</sup> We subtract net interest paid from corporations’ operating surplus because interest payments are typically deductible from the corporate tax base while interest received (e.g., by banks) is typically taxable. At the country level, net interest paid by corporations is generally small (interest paid by non-financial corporations is offset by interest received by financial corporations), so  $\pi$  is usually close to  $\alpha/(1 - \alpha)$ . As we shall see, the main exception involves tax havens which receive net interest from foreign countries; for them  $\pi > \alpha/(1 - \alpha)$ . We also subtract capital depreciation from profits, because depreciation is deductible from taxable profits. Thus  $Y$ ,  $\alpha$ ,  $r$ , and  $\pi$  are all net of capital depreciation.

Our main objective is to study how the profits-to-wage ratio differs for foreign corporations ( $\pi_f$ ) vs. local firms ( $\pi_l$ ) within each country. We compute  $\pi_f$  and  $\pi_l$  using the same concepts and methods as for  $\pi$ . That is,  $\pi_f$  is equal to the pre-tax profits (after net interest payments) made by foreign firms divided by the wages paid by these firms:  $\pi_f = (1 - p_f) \cdot \alpha_f/(1 - \alpha_f)$ , where  $\alpha_f$  is the net-of-depreciation capital share of the net value-added of foreign firms. Following internationally-agreed guidelines, foreign firms include all firms where foreign investors own

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<sup>17</sup>Our measure of wage always include non-wage employee compensation (such as retirement benefits, health benefits, payroll taxes, etc.). That is, “wage” in this article always refers to what is called “employee compensation” in the national accounts (SNA code D.1).

more than 50% of shares with voting rights. This condition is sufficient but not necessary: there are a few other ways firms can be classified as “foreign-controlled” (see Eurostat, 2012). Local firms are all firms that are not foreign. By definition,  $\pi = s \cdot \pi_f + (1 - s) \cdot \pi_l$ , where  $s$  is the share of wages paid by foreign firms.

We compute  $\pi$  in all tax havens, all OECD countries, and the main developing countries using harmonized national accounts data that follow the 2008 System of National Accounts (United Nations, 2009). The basic data source is the OECD’s detailed national accounts by sector (Table 14A). This source covers all OECD countries (which includes prominent corporate tax havens: Ireland, Luxembourg, Netherlands, Belgium, and Switzerland) and a number of large developing non-OECD countries (Brazil, China, Colombia, Costa Rica, India, Russia, and South Africa). We extend the OECD database to non-OECD tax havens (such as Singapore, Hong Kong, and Puerto Rico) by manually collecting the official national accounts published by tax havens’ statistical institutes and central banks. We include all the tax havens listed by Hines and Rice (1994) in our database.

The OECD detailed national accounts include all the necessary inputs needed to compute the profits-to-wage ratio  $\pi$ : corporate operating surplus  $rK$ , net interest payments  $p$ , and wages paid  $wL$ , for both financial and non-financial corporations. A few countries only provide gross-of-depreciation operating surplus series, in which case we impute depreciation based on observed depreciation rates in similar economies.<sup>18</sup> Some (essentially non-OECD tax havens) also do not isolate the corporate sector from other sectors of the economy (government and households) official national accounts. In that case, we impute the share of all domestic wages that are paid by corporations based on the share observed in countries with similar level of development.<sup>19</sup>

We compute profitability for foreign vs. local firms within each country using harmonized foreign affiliates statistics (FATS) recently released by the world’s largest economic and financial centers. Although such data have been compiled in the United States as far back as the 1960s, in most European countries—including key countries such as Ireland, Luxembourg, and the Netherlands—the publication of these statistics started only around 2010. These data are disseminated by Eurostat and the OECD. There are both inward and outward FATS. The inward FATS of, say, France record the value-added, profits, wages (among other indicators) of foreign-controlled firms operating in France and are tabulated by country of the foreign parent

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<sup>18</sup>See Appendix Section A.2.2. Capital depreciation amounts to around 15% of corporate gross value-added with relatively little variation across countries, see Appendix Table A.2.

<sup>19</sup>See Appendix Section A.2.1 and Appendix Table A.1. By definition all profits originate from the corporate sector so generally speaking no imputation is required for profits (see, however, Section 3.2 below for the case of Ireland, Netherlands, and Luxembourg).

company. The outward FATS of France record the value-added, profits, wages (etc.) of the affiliates of French multinationals operating abroad and are tabulated by country of affiliate.<sup>20</sup> In contrast to other data sources sometimes used in the literature (Blouin and Robinson, 2019), there is no double-counting of profits (or other indicator) in these statistics.<sup>21</sup>

We create our database as follows. If a country  $j$  publishes inward FATS (which is the case for the main OECD economies including key havens, such as Ireland, Luxembourg, the Netherlands), we compute  $\pi_f^j$  using its inward FATS. If no inward FATS are available (which is the case for non-OECD havens, e.g., Bermuda, the Cayman Islands, Hong Kong), we estimate  $\pi_f^j$  using the outwards FATS of counterpart countries  $i \neq j$ .<sup>22</sup>

### 3.2 How we Address Discrepancies in FATS

If foreign affiliates statistics were perfect, the inward FATS of host countries (where affiliates are located) would be fully consistent with the mirror outwards FATS of partner countries (where parents are headquartered). We conducted a systematic comparison of the available data to assess the consistency of existing FATS.<sup>23</sup> We found that while inward and outward data are generally consistent, there is one notable discrepancy. In the inward FATS of Ireland, the Netherlands, and Luxembourg one finds less profit made by US affiliates than in the mirror outwards FATS of the United States. A similar gap is observed in bilateral balance of payments data, where less direct investment income is paid to the United States by affiliates located in Ireland, Netherlands, and Luxembourg than received by the United States from these havens.<sup>24</sup>

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<sup>20</sup>This is in contrast to balance of payments statistics that are tabulated by country of the immediate counterpart. For instance, if a French parent owns a German affiliate through a holding company in Luxembourg, direct investment income received by the French parent is recorded as coming from Luxembourg in the French balance of payment. FATS, by contrast, are tabulated by country of affiliates' primary activity. In the above example, profits are recorded as made in Germany (not Luxembourg).

<sup>21</sup>In the United States, outward FATS correspond to Tables II-F1-F9 of the BEA "Activities of US Multinational Enterprises" data. The profit measure in these tables, "profit-type return," does not double-count profits (or wages or value-added), because it does not count as profit equity income received. For instance, a U.S.-owned Bermuda holding company that receives dividends from affiliates in Europe has 0 "profit-type return." This is in contrast to other profit measures sometimes used in the literature, such as "net income" (in Tables II-D1 to II-D13 of the BEA data), which double-counts the profits of U.S. affiliates going through chains of holding companies. Following international guidelines (Eurostat 2012), the profit measure in the foreign affiliates statistics compiled internationally (and used in this paper) always excludes equity income received.

<sup>22</sup>Appendix Section A.3 provides a detailed description of the computation of the foreign profit-to-wage ratio  $\pi_f$  for the countries that do not publish inward FATS. We rely particularly on the outward FATS of the United States which provide data on the foreign operations of US multinationals in small tax havens in isolation, such as Barbados, Bermuda, Panama, etc.

<sup>23</sup>See Appendix A.4.1 (results summarized in Appendix Table A.8) and Appendix Section B.3.3 (results summarized in Appendix Table B.11).

<sup>24</sup>See Appendix Section A.3.2. for a detailed discussion of the link between FATS and balance of payments statistics. Conceptually, direct investment income reported in the balance of payments is close to the profit measure reported in FATS. Direct investment income is the net-of-depreciation, net-of-corporate income tax

There are two possible interpretations for this discrepancy. One is that Ireland, Netherlands, and Luxembourg underestimate the profits that affiliates of US multinationals book in their territory. In particular, these three countries may miss some of the profits booked in special purpose entities due to a lack of comprehensive enough corporate registries, non-response to surveys, or other data issues (Angulo and Hierro, 2017; Damgaard and Elkjaer, 2017). The other possible interpretation is that the United States overestimates the profits booked by its multinationals in Ireland, Netherlands, and Luxembourg. For example, U.S. statisticians may wrongly assign to Ireland profits that in fact have been booked in other tax havens such as Bermuda (CSO, 2016). Although it is not possible to settle this issue definitively with the available data, the evidence suggests that Ireland, Netherlands, and Luxembourg under-estimate the profits booked by US multinationals, for one main reason. The “excess” profits recorded by the US in Ireland, Luxembourg, and the Netherlands are not offset by a lack of profits recorded by the US in other parts of the world. In fact, the profits of US affiliates recorded by US statisticians in all foreign countries combined (as measured in the US balance of payments) significantly exceed the profits of US affiliates recorded by all foreign countries combined (as measured in their balances of payments).<sup>25</sup> This suggests that a number of host countries do under-estimate the profits of US affiliates. The United States has a sophisticated system for recording the activities of its multinationals abroad (based on exhaustive census-like surveys conducted every five years since the 1960s, and quasi-exhaustive, detailed surveys conducted annually since 1982) which has been used extensively for research and statistical purposes. It seems plausible that the US FATS are more accurate at this stage than the FATS of Ireland, the Netherlands, and Luxembourg, which are more recent and have been subject to less scrutiny.

To address the gap between the US outward FATS and the inward FATS of Ireland, Luxembourg, and the Netherlands, we upgrade the US affiliates profits recorded in the inward FATS of Ireland, Luxembourg, and the Netherlands so that they match the data reported by the United States. We implement and discuss alternative corrections in the Appendix. We show in particular that taking the inward FATS of Ireland, Luxembourg, and the Netherlands at face

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profits of firms that are more than 10% owned by foreign investors, pro-rated by the ownership stake of the foreign investor. Profit in FATS is the net-of-depreciation, gross-of-corporate-income-tax profit of firms that are “foreign-controlled” (typically more than 50% owned by foreign investors) with no pro-rating. See Wright and Zucman (2018) for a detailed reconciliation of FATS and balance of payments statistics in the U.S. case.

<sup>25</sup>See Appendix Figure A.14. This imbalance is the main driver of the imbalance in global direct investment income recorded in the world balance of payments. Globally, more direct investment income is received (in the form of dividends and reinvested earnings) by the parents of multinational firms than paid by affiliates. This direct investment income gap reaches about \$200 billion in 2015 (Appendix Figure B.3b). In Appendix B, we decompose this gap by leveraging the bilateral direct investment income data of all the world’s countries and find that the bulk of the gap comes from missing payments made by affiliates of US multinationals.

value (i.e., making no correction at all) would still leave a difference of an order of magnitude between the profitability of foreign firms ( $\pi_f$ ) and the profitability of local firms ( $\pi_l$ ) in these three havens.<sup>26</sup> We also note that if US statistics were wrong and mistakenly assigned to (say) Ireland profits in fact booked in havens with no inward FATS (say, Bermuda), then we would over-estimate the profits shifted to Ireland but under-estimate the profits shifted to Bermuda by the same amount. Our estimate of the amount of profits globally shifted would be unaffected; only the geography of where profits are shifted would be affected. We stress that more work needs to be done to obtain a full reconciliation of international investment data, and in the Conclusion we suggest concrete steps that statistical agencies could take.

### 3.3 Decomposing Tax Havens Profits: Tangible Capital vs. Shifting

In a perfectly competitive model where factors are paid their marginal product (an assumption we relax below), a high recorded profits-to-wage ratio  $\pi$  in tax havens can have two reasons: either paper profits are being shifted to tax havens, or there's a lot of capital used in production and the elasticity of substitution between capital and labor is high. We are interested in quantifying the relative contributions of profit shifting vs. movements of tangible capital to the high profit-to-wage ratios  $\pi$  of tax havens.

There are three forms of profit shifting (see Heckemeyer and Overesch, 2013, for a survey), and each affects the recorded profit-to-wage ratio  $\pi$ . First, multinational groups can manipulate intra-group exports and import prices: subsidiaries in high-tax countries can try to export goods and services at low prices to related firms in low-tax countries, and import from them at high prices.<sup>27</sup> Such transfer price manipulations increase the recorded  $\pi_f$  (hence  $\pi$ ) in tax havens. Second, multinationals can shift profits using intra-group interest payments: affiliates in high-tax countries can try to borrow money (potentially at relatively high interest rates) from affiliates in low-tax countries, which again increase  $\pi_f$  in tax havens.<sup>28</sup> Last, multinationals can move intangibles—such as proprietary trademarks, patents, logos, algorithms, or financial portfolios—produced in high-tax countries (e.g., the United States) to affiliates in low-tax countries (e.g., Bermuda). These affiliates then receive royalties (or payments from final customers) which boost  $\pi_f$ .<sup>29</sup> Movements of intangibles can be analyzed like transfer price manipulations and

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<sup>26</sup>See Appendix Figure N.1.

<sup>27</sup>There is extensive evidence of such transfer price manipulations in the literature; see, e.g., Clausing (2003); Bernard, Jensen and Schott (2006), Cristea and Nguyen (2016).

<sup>28</sup>See, e.g., Huizinga, Laeven, and Nicodeme (2008).

<sup>29</sup>See Faulkender et al. (2017) for evidence suggestive of profit shifting by U.S. multinationals through the location of intangibles in low-tax countries.

intra-group borrowing because they have the same distributional implications. Like transfer pricing and intra-group borrowing, movements of intangibles (away from where R&D takes place towards tax havens) relocate profits across countries without affecting wages (for a given stock of intangibles), since intangibles can be used in many locations simultaneously. By contrast, if the elasticity of substitution between labor and tangible capital is finite, movements of tangible capital across borders affect wages.<sup>30</sup>

To identify which part of the high profits reported by foreign firms in tax havens reflect profit shifting, it is convenient to start by considering the simple case where all countries—havens and non-havens—have the same aggregate Cobb-Douglas production function  $Y = K^\alpha(AL)^{1-\alpha}$  and factors are paid their marginal product. If net interest paid ( $p$ ) is zero and  $\alpha = 25\%$ , then all countries have a true  $\pi = 33\%$  and any deviation of the recorded  $\pi$  from this value reflects profit shifting. Specifically, countries with recorded  $\pi$  above 33% attract paper profits from abroad (they have  $\pi_f > \pi_l = 33\%$ ), while countries with recorded  $\pi$  below 33% shift profits abroad (they have  $\pi_f < \pi_l = 33\%$ ). With Cobb-Douglas production, the stock of tangible capital does not affect  $\pi$ , because any increase in the capital stock is perfectly offset by a corresponding fall in the marginal product of capital.

In the more general case where countries have a constant elasticity of substitution (CES) production function, the effect of the capital stock on the profits-to-wage ratio is ambiguous. Namely,  $\pi$  varies with the capital stock depending on the value of the capital-labor elasticity of substitution  $\sigma$ . If  $\sigma > 1$ , then countries with a high capital intensity  $K/AL$  have high profit-to-wage ratios  $\pi$ . Conversely, if  $\sigma < 1$ , then countries with a high capital intensity have low  $\pi$ , as the marginal product of capital becomes very low. To identify the contribution of capital intensity to the high reported profits-to-wage ratios of tax havens, we decompose the measured  $\pi_f$  of these countries into three components:

$$\pi_f = \left(\frac{K}{wL}\right)_f \cdot r_f \cdot (1 - p_f) \quad (2)$$

where  $r_f$  is the measured return to capital used by foreign firms, including any abnormal return (above the marginal product of capital) due to tax-induced profit shifting. We then make assumptions about the value of the elasticity of substitution  $\sigma$  in foreign firms to infer

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<sup>30</sup>There is a view among some policy-makers (e.g., underlying “patent box” policies as in the United Kingdom and the related “foreign-derived intangible income” provisions introduced in the 2017 U.S. tax reform) that encouraging companies to locate intangible assets domestically, while benefiting the tax base, may also benefit domestic productivity. One way to rationalize this view is that firms may be more likely to locate tangible assets in places where they book their intangibles. But it is hard to come up with a plausible reason to believe that the location of intangibles *per se* may significantly affect productivity (for a given global stock of intangible assets).

what fraction of the high  $\pi_f$  of tax havens can be attributed to high capital intensities. A large micro literature finds  $\sigma < 1$ , while a nascent macro literature finds  $\sigma > 1$  (Karabarbounis and Neiman, 2014; Piketty and Zucman, 2014).

In our benchmark scenario we estimate the amount of profits shifted into each tax haven by making two assumptions. First, we assume that the reported profitability of local firms in tax havens  $\pi_l$  is not inflated by profit shifting. This assumption is supported by our finding, described below, that local firms in tax havens are generally as profitable as local firms in non-haven countries. Second, we assume that the elasticity of substitution between capital and labor  $\sigma$  is equal to 1 (i.e., Cobb-Douglas production). We do not assume that countries have similar Cobb-Douglas parameters  $\alpha$ . That is, we allow for the possibility, for instance, that tax havens have structurally higher  $\alpha$  than non-haven countries due, e.g., to pro-capital policies, rents generated by specific institutional features such as financial secrecy or lax regulation, or other deviations from perfect competition. Under these assumptions, within a given tax haven, any excess of  $\pi_f$  over  $\pi_l$  reflects inward profit shifting.

As we shall see, the results we obtain will be robust to relaxing these two assumptions. First, our estimate of the amount of profits shifted to tax havens will not significantly depend on the assumed capital-labor elasticity of substitution  $\sigma$ , because it turns out that foreign firms in tax havens have similar capital intensity as local firms (and foreign firms in high-tax countries). As a result, whatever assumption one makes about  $\sigma$ , differences in capital intensity cannot explain more than a small fraction of the high  $\pi_f - \pi_l$  gap observed in tax havens. Second, relaxing the assumption that the measured profitability of local firms in tax havens  $\pi_l$  broadly reflects their actual profitability will lead us to find even more profit shifting than in our benchmark scenario—but only slightly so.

### 3.4 How we Allocate the Shifted Profits

We allocate the shifted profits to the countries where they would be booked if all countries had the same effective corporate tax rate as follows. First, we collect all the *bilateral* balances of payments made available recently. While balance of payments statistics traditionally only reported transactions with all non-residents as a total, following the adoption of the 6<sup>th</sup> edition of the IMF (2009) Balance of Payments Manual, most countries have started publishing bilateral balances of payments, which in particular include bilateral service trade by type of service, and bilateral foreign direct investment income (including bilateral intra-group interest payments and

receipts).<sup>31</sup>

We then allocate the shifted profits proportionally to the bilateral service exports and bilateral intra-group interest receipts recorded in the balances of payments of tax havens. Among services, we focus on the specific types of services which have been found in the literature to be most conducive of profit shifting: exports of the rights to use intellectual property (patents and trademarks), headquarter services (administration, management and advertising), information and communication technology services, and financial services (Hebous and Johannesen, 2016).<sup>32</sup>

We focus on the bilateral data reported by tax havens because they are more comprehensive than those recorded by counterpart countries. As shown in Appendix B, the service exports recorded by the 6 E.U. tax havens (Ireland, Luxembourg, Netherlands, Belgium, Malta, Cyprus) to the 22 non-haven E.U. countries exceed the recorded imports by more than 30% (and more than 50% for Luxembourg). One likely explanation for this gap is that importers' data miss (at least some of) the services that are exported by tax-haven corporations directly to foreign customers, such as digital music subscriptions, ride-sharing services, and various Internet services (server space, voice over IP, etc.).<sup>33</sup> There is evidence that the typical business structure of digital services multinationals involves shifting intellectual property to tax haven subsidiaries and then directly selling services to final customers without involving any non-haven subsidiary (see, e.g., Pomeroy, 2016). Tax haven data capture such profit shifting, which cannot be quantified by looking at intra-group transactions as in the transfer pricing literature, since there is no intra-group transaction (except at the time of the initial transfer of the intellectual property).

Our procedure to allocate the shifted profits is consistent with how profit shifting is perceived by policy-makers globally. Many countries have anti-avoidance policies known as controlled-

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<sup>31</sup>Among tax havens, the data are particularly good for Switzerland and the European Union tax havens (Ireland, Luxembourg, Belgium, Netherlands, Malta, and Cyprus) which must report detailed statistics to Eurostat, the European statistical institute, complying with the latest international guidelines. When no bilateral data are available (as is the case for a number of non-E.U. tax havens), we impute data using counterpart country statistics (i.e., service imports and intra-group interest payments reported by non-haven countries), see Appendix Section B.

<sup>32</sup>We disregard goods exports, which are typically less conducive of profit shifting because reference prices are usually observable by tax authorities. See Appendix Section D, where we discuss the evidence in the literature on the magnitude of profit shifting through the mis-pricing of intra-group goods trade vs. other channels.

<sup>33</sup>When a firm incorporated in Luxembourg directly exports digital services to French customers without going through a French subsidiary, French statistical authorities cannot rely on corporate income statements to capture such flows, and have to use other—typically less comprehensive—data sources, such as household consumption surveys. Beginning 2014, value-added taxes have started to be imposed in France (and other E.U. countries) on direct foreign-business-to-consumer sales. In principle, VAT returns could be used as inputs to better estimate French imports of services. Looking forward, systematically using VAT returns could help fix the imports-exports service mismatch between havens and non-havens countries.

foreign corporations provisions, whereby specific cross-border transactions thought to be conducive of profit shifting (such as certain royalty payments, interest, or services) are presumed to be motivated by tax avoidance and taxed in the source country.<sup>34</sup> Our procedure is also consistent with Clausing (2009), who estimates how much of the profits booked offshore by U.S. multinationals are shifted out of the United States by apportioning the offshore profits of U.S. firms proportionally to the amount of affiliate intra-firm transactions that occur with the United States.<sup>35</sup> Our approach does not involve the use of an apportionment formula. We keep the current international tax system of subsidiary-by-subsidiary accounting and arm’s length pricing as is, and consider how the geography of global profits would change if effective tax rates were harmonized (which would remove incentives to shift profits).<sup>36</sup> Because many of the transactions we consider are intra-group (not to final customers), our allocation of the shifted profits is not equivalent to a sales-based apportionment of shifted profits.

We also provide an alternative allocation in which we assign the profits shifted offshore to the countries where the ultimate parents of the offshore affiliates are incorporated. To do so, we draw on the bilateral direct investment statistics on an ultimate ownership basis compiled by Damgaard and Elkjaer (2017), who exploit the data recently made available by OECD countries following the implementation of the 6<sup>th</sup> edition of the IMF (2009) Balance of Payments Manual.<sup>37</sup> This allocation makes it possible to estimate what fraction of the globally shifted profits ultimately accrue to the shareholders of U.S. multinationals, European multinationals, etc.<sup>38</sup>

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<sup>34</sup>Similarly, in 2017, the United States introduced a “base-erosion anti-avoidance tax” (BEAT) that presumes that services transactions by multinational firms with related parties are motivated by tax avoidance.

<sup>35</sup>We generalize this approach in three ways: (i) we apportion the profits shifted by all (not only U.S.) multinationals; (ii) we use balance of payments data which capture all cross-border transactions (not only transactions within divisions of multinationals); (iii) we focus on the types of transaction identified in the literature as being particularly conducive of shifting.

<sup>36</sup>Our approach differs from Guvenen et al. (2018), who apportion the worldwide profits of U.S. multinationals proportionally to labor compensation and sales to unaffiliated parties in each country. Their allocation approximates how the profits of U.S. firms would be split under a formulary apportionment system (with labor and sales as apportionment factors). We view both their benchmark (formulary apportionment) and ours (tax rate harmonization) as relevant. One advantage of the Guvenen et al. (2018) approach is that the adoption of apportionment formulas by individual countries may be more politically realistic than a full tax harmonization in the short run. One advantage of our approach is that it does not require us to model how firms would change their behavior if countries adopted apportionment systems.

<sup>37</sup>See Appendix Section C.2 for a detailed presentation and discussion of these data.

<sup>38</sup>Yet another approach to allocate the shifted profits would involve trying to figure where production has “truly” taken place and apportion profits accordingly. However in many cases, it is impossible to determine where production takes place (e.g., the creation of intangibles occurs through the cooperation and interaction of subsidiaries in various countries). See Devereux and Vella (2017) for a discussion.

## 4 The Level and Rise of Global Profit Shifting

### 4.1 The Amount of Globally Shifted Profits

Table 1 presents our database of corporate profits by showing its global totals in 2015, our benchmark year. In 2015, global gross value-added (i.e., global GDP) reached \$75 trillion and global net value-added (i.e., after capital depreciation) about \$63 trillion. About 54% of global net value-added was produced by corporations; the rest was produced by governments, households, and non-corporate businesses. Within corporations, the capital share of net value-added was about 1/3 and the labor share about 2/3. Out of the \$11.5 trillion in net-of-depreciation corporate profits, close to 15% (\$1.7 trillion) were made in foreign firms. This \$1.7 trillion number includes all the profits made by, say, Apple in France, Germany, Ireland, Jersey, etc., but not by Apple in the United States (where its headquarter is located). It is what we call “multinational profits.” That is, multinational profits include all the profits made by multinational companies outside of the country where their parent is located. Out of these multinational profits, we estimate that more than \$600 billion, i.e., 36%, were shifted to tax havens.<sup>39</sup> Another way to present this result is that about 5% of global corporate profits (multinational plus local) are shifted to tax havens (\$600 out of \$11.5 trillion). To analyze how the location of profits would change if all countries had the same tax rate—our purpose in this paper—multinational profits are a more relevant focus point, because local profits would be virtually unaffected by such a change. More precisely, all the profits currently recorded as local would be unaffected, with the potential exception of some of the local profits of multinationals headquartered in tax havens.<sup>40</sup>

Table 1 also shows that corporations paid \$2.15 trillion in corporate income taxes globally in 2015.<sup>41</sup> Thus the global effective corporate income tax rate was 19% (2.15 trillion divided by

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<sup>39</sup>Our list of tax havens is the one in Hines and Rice (1994) to which we add Belgium and the Netherlands. The Netherlands was not considered as a tax haven by Hines and Rice (1994) because U.S. multinationals reported paying relatively high tax rates there in 1982; but as we show in Appendix Table A.11, this is not the case anymore: the tax rate paid by affiliates of U.S. multinationals in the Netherlands was 12% in 2015. Belgium is a borderline case that is sometimes considered a tax haven in the literature (e.g., because of the deductibility of notional interest on equity). As shown in Figure 3 below, Belgium’s profitability ratio is only barely higher than that of non-havens, and we estimate that only \$13 billion were shifted to Belgium in 2015 (Table 2 below). Hence excluding Belgium from our list of tax havens would not make any significant difference to our results.

<sup>40</sup>That is, if all countries had the same rate, then Nestle might book less profits in Switzerland and more in Germany. As we show below, however, the current profitability of local firms in tax havens is similar to the profitability of local firms in non-haven countries, so changes in the local profits of haven firms would likely be small. By contrast, profits currently recorded as multinational would be affected in two ways: (i) their location would change (less would be booked in, say, Ireland, and more in Germany); (ii) some of the profits currently recorded as multinational would become local (e.g., Apple would maybe book more profits in the United States and less in offshore tax havens).

<sup>41</sup>Corporate income tax data also come from OECD detailed national accounts (current taxes on income and wealth paid by non-financial and financial corporations, code D.5 in the System of National Accounts) and

net-of-depreciation, pre-tax global corporate profits of \$11.5 trillion). This rate is smaller than the global GDP-weighted statutory tax rate of about 26% because the tax base in most countries is smaller than the full economic base (e.g., due provisions such as accelerated depreciation) and because of tax credits (e.g., for R&D expenditure). If all countries jointly adopted an effective corporate tax rate of 19% (as a fraction of the full economic base), the taxation of global corporate income would be unchanged, hence global investment and the global capital stock would not change, at least to a first order approximation.<sup>42</sup> What would change is the location of capital and profit—which is what we are concerned with in this paper.

## 4.2 Profitability in Tax Havens vs. Non-Haven Countries

We start the analysis by displaying in Figure 3 how the profit-to-wage ratio  $\pi$  varies across countries in 2015. Among the main non-haven countries displayed in Figure 3,  $\pi$  average 36% in 2015. That is, for any dollar of wage paid, corporations made 36 cents in pre-tax profits. This corresponds to a capital share of net corporate value-added  $\alpha = 26\%$ , and net interest paid  $p = -3\%$  of net operating surplus. The profits-to-wage ratio  $\pi$  does not vary much across developed, non-haven countries; for instance it is 31% in the United States, 39% in Sweden, 42% in the United Kingdom.<sup>43</sup> These results are consistent with existing studies of corporate capital shares, which find net-of-depreciation corporate capital shares  $\alpha$  of about 25% (corresponding to profits-to-wage ratio  $\pi$  of 33% if net interest  $p$  is zero), with modest variation across time and across countries, of the order of 5–10 percentage points (e.g., Blanchard, 1997; Karabarbounis and Neiman, 2014b; Cetto, Koehl and Philippon, 2019).

Tax havens, by contrast, are abnormally profitable. In Singapore and Hong Kong, the macroeconomic profit-to-wage ratio exceeds 100%; in Ireland, Puerto Rico, and Luxembourg, it exceeds 200%. That is, tax havens appear to have extraordinarily high profit-to-wage ratios  $\pi$ . As shown by Appendix Table A.2, the high  $\pi$  of tax havens are mostly driven by their high

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individual countries' statistical authorities and central banks. Note that some countries include central bank profits under D.5; we always exclude central bank profits and our series thus only include corporate income taxes paid (see Appendix Table A.3). Business property taxes are treated as taxes on production in the SNA (code D2–D3).

<sup>42</sup>In practice small changes in investment are possible if elasticities of corporate investment are highly non-linear. In this paper we do not attempt to compute the harmonized effective tax rate that would keep global investment perfectly constant, but simply note that such a rate exists (and is probably close to 19%). The level of the global harmonized tax rate that would keep global investment constant is not relevant for our purposes.

<sup>43</sup>As reported in Appendix Table A.2., profitability ratios are higher in developing countries. This reflects the fact that the capital share of corporate output is typically higher in poorer countries, potentially due, e.g., to the presence of rents generated by natural resources and to lower labor bargaining power (lower unionization rates, low or no minimum wages).

recorded capital shares, not by net interest.<sup>44</sup> For instance, the net capital share of net corporate value-added is 62% in Ireland, 68% in Puerto Rico, 66% in Panama. The main exception is Luxembourg, where net intra-group interest receipts are the key driver of the high recorded  $\pi$ .

Next, we analyze how the profitability of tax havens has changed over time. Due to data availability constraints, our global database is for the year 2015, and we cannot (yet) present time series of  $\pi$  for all countries (future releases of FATS will allow us to build comprehensive time series starting in 2015). However, we can already provide time series of  $\pi$  for specific tax havens. The tax haven for which the longest and highest quality time series exist is Ireland. As shown in the top panel of Figure 4, in Ireland  $\pi$  was around 25–30% in the early 1970s, a level similar to that recorded in the United States. Profitability started rising in the 1980s and then increased sharply in the mid-1990s and then again in the 2010s to reach 250% in 2015.<sup>45</sup> By contrast, in the United States  $\pi$  never dramatically varies. Profitability has tended to slightly increase since the 1980s (from 18% in 1980 to 31% in 2015), driven by the rise in the capital share of corporate value-added. But this increase pales in comparison to the upsurge in the profitability of tax havens' corporations. Trends are similar for other non-haven countries for which time series are available.<sup>46</sup>

In the bottom panel of Figure 4, we can see that the rise in the profitability of tax havens over time is not specific to Ireland. When we look at all the majority-owned affiliates of U.S. multinationals throughout the world (using the outward FATS of the United States, which as already noted have been compiled since the 1960s), a similar pattern emerges. In the early 1970s, the haven and non-haven affiliates of U.S. multinationals were as profitable. In both cases, the profits-to-wage ratio was around 50%. Since the 1970s, profitability for haven affiliates has sharply increased. In 2015, the profits-to-wage ratio of US affiliates located in tax havens exceeds 350%, while the profits-to-wage ratio of US affiliates located in high-tax countries has stayed constant since the 1970s (45% in 2015).

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<sup>44</sup>Throughout this article, we exclude offshore mutual funds (i.e., mutual funds with mostly foreign investors and foreign investments) from our  $\pi$ ,  $\pi_f$ , and  $\pi_l$  ratios, because offshore mutual funds otherwise distort the profitability ratios of tax havens. By convention mutual funds have an apparently high profitability as defined in our paper (i.e., after net interest payments), but for purely accounting reasons. All income paid by mutual funds to their shareholders is recorded as dividends in the national accounts, even for mutual funds that only invest in bonds; as a result bond funds are large receivers of net interest. Among OECD countries offshore mutual funds are only significant in Luxembourg, Ireland, and to a much lesser extent the Netherlands. Estimating the net interest received by mutual funds involves a margin of error, but this uncertainty is very small compared to the large  $\pi$  and  $\pi_f$  of tax havens; see Appendix Section A.3 for a discussion.

<sup>45</sup>In 2015, the profits-to-wage ratios recorded by Ireland increased particularly strongly. That year, recorded real GDP grew 26.3%—largely reflecting transfers of multinational intangible assets to the island (see e.g., OECD, 2016).

<sup>46</sup>See, e.g., Karabarbounis and Neiman (2014) and Piketty and Zucman (2014).

### 4.3 Profitability in Local vs. Foreign Firms

Figure 5 displays the profits-to-wage ratios for foreign firms ( $\pi_f$ ) and local firms ( $\pi_l$ ) separately within each country in 2015. By construction the aggregate profit-to-wage ratio  $\pi$  shown in Figure 3 for a given country is the average of  $\pi_f$  and  $\pi_l$  shown in Figure 5, with  $\pi_f$  weighted by the share  $s$  of wages paid to workers employed by foreign firms and  $\pi_l$  weighted by  $1 - s$ . A key result emerges: the high overall profits-to-wage ratios  $\pi$  of tax havens are entirely driven by the high profitability of foreign firms (high  $\pi_f$ ). Foreign firms in tax havens are an order of magnitude more profitable than local firms in tax havens.

There are three other main take-aways from Figure 5. First, the reported profitability of foreign firms in tax havens is truly exceptional, with  $\pi_f$  ratios of 800% (which corresponds to a capital share of corporate value-added  $\alpha$  of close to 90%) in Ireland and as high as 1,625% in Puerto Rico (corresponding to a capital share of more than 94%, i.e., a corporate labor share of less than 6%).<sup>47</sup>

Second, while foreign firms are an order of magnitude more profitable than local firms in tax havens, the opposite is true in high-tax countries: in these countries foreign firms are *less* profitable than local firms. For instance, in the United Kingdom the profits-to-wage ratio is 26% for foreign firms ( $\pi_f$ ) vs. 48% for local firms ( $\pi_l$ ); in Japan  $\pi_f$  equals 24% while  $\pi_l$  reaches 44%, etc.<sup>48</sup> There are several possible reasons for the low profitability of foreign firms in high-tax countries (relative to local firms in these countries). For instance foreign firms may be younger, or they could operate in less profitable industries. The fact that  $\pi_f < \pi_l$  in high-tax countries while  $\pi_f \gg \pi_l$  in tax havens (Figure 5) suggests that profit shifting is also an important part of the reason why foreign firms appear unprofitable in high-tax places. That is, there is a clear trace in global macro data of movements of profits within divisions of multinational groups, away from high-tax affiliates and towards low-tax affiliates. Precisely quantifying the relative importance of profit shifting (vs. firm age and other factors) in the low  $\pi_f$  observed in high-tax countries is a task we leave to future research.

Third, local firms in tax havens are generally as profitable as local firms in non-haven countries. The high overall profits-to-wage ratio  $\pi$  of tax havens is entirely driven by the high

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<sup>47</sup>Puerto Rico is a U.S. possession, but is treated as a foreign country for purposes of U.S. taxation and in some (but not all) U.S. macroeconomic statistics. In this paper we treat it as a foreign country. Almost all the profits shifted to Puerto Rico accrue to U.S. multinationals. See Suárez Serrato (2018) for an analysis of the evolution of profit shifting by U.S. multinationals to Puerto Rico.

<sup>48</sup>The lower profitability of foreign firms in the United Kingdom compare to local firms (by a factor of about 2) is consistent with Bilicka (2019) who finds that foreign multinational subsidiaries in the UK underreport their taxable profits by about 50 percent relative to domestic standalone.

profitability of their foreign firms  $\pi_f$ . Local firms in tax havens do not seem to be abnormally profitable, which could in principle be the case if low-tax countries also had pro-capital and anti-labor institutions (such as bans on unions or no minimum wage) or if the reported profitability of local haven firms was inflated by inward profit shifting. This suggests that the  $\pi_l$  ratios of tax havens are a useful benchmark to estimate what fraction of the large  $\pi_f$  of tax havens can be attributed to profit shifting.

#### 4.4 Decomposing The High Profits of Haven Affiliates

Why are foreign firms in tax havens so profitable? In particular, what is the relative contribution of high capital intensities vs. profit shifting to the high recorded  $\pi_f$  of tax havens? We study these questions by focusing on the majority-owned affiliates of U.S. multinationals in tax havens, because the outward FATS of the United States include information on the stock of capital used by foreign affiliates of U.S. firms, in contrast to the outward FATS of other countries and the inward FATS of tax havens. We quantify the contribution of capital stocks to the high profitability recorded by haven affiliates by comparing the profitability, capital intensity, and rates of return to capital of the haven and non-haven affiliates of U.S. multinationals (Figure 6). A number of notable results emerge.

First, as shown in the top panel of Figure 6, the haven affiliates of U.S. multinationals have much higher profits-to-wage ratios than non-haven affiliates. Among non-haven affiliates, the profits-to-wage ratio averages 49% in 2015, while it averages 250% among haven affiliates. That is, the profits-to-wage ratio is 5 times larger in haven affiliates than in non-haven affiliates. Consistent with the patterns found above for all (U.S. and non U.S.) multinationals, U.S. affiliates in Ireland, Luxembourg, Bermuda, and the Caribbean are particularly profitable, with profits-to-wage ratios above 500%.

Second, haven affiliates have much higher recorded rates of return on capital than non-haven affiliates. This is shown in the bottom panel of Figure 6, which decomposes the profit-to-wage ratio of the affiliates of U.S. multinationals following equation 2 above. In 2015, the recorded rate of return to capital  $r_f$  is close to 4 times higher in haven affiliates than in non-haven affiliates. That is, almost all of the fivefold difference in profits-to-wage ratios between havens and non-haven affiliates is due to higher recorded returns to capital in haven affiliates.

Third, haven affiliates have higher capital intensities than non-haven affiliates, but only slightly so. For a given amount of wages paid, haven affiliates use a 1.4 times larger stock of tangible capital than non-haven affiliates in 2015. Haven affiliates also receive slightly more

interest in 2015 (1.1 time more than non-haven affiliates, relative to operating surplus), but the difference is not large (again consistent with the patterns seen in the aggregate statistics of tax havens). The high profits-to-wage ratios of the haven affiliates of U.S. multinationals primarily stem from high rates of returns on capital—not high intra-group interest receipts or high capital intensities coupled with a high elasticity of substitution between capital and labor.

Fourth, if we now analyze the evolution of the relative capital intensities, interest receipts, and rates of returns on tangible capital of haven vs. non-haven affiliates since the 1960s, we can see that the main change has been the rise in the rate of return of haven affiliates. Up to the late 1970s, affiliates in tax havens had roughly the same recorded rate of return to tangible capital, same capital intensity, and same net interest receipts than other affiliates. Since the 1980s, their relative rate of return has increased by a factor of about 4. By contrast, the relative capital intensity of these two groups of affiliates has remained close to 1, with only a mild rising trend. Some capital has moved towards low-tax places. But what the data suggest is that, so far, profit shifting seems to have swamped tax-driven movements of tangible capital.<sup>49</sup>

The high rates of return of haven affiliates observed in recent years can be seen as the product of two effects. First, multinationals book intangibles in low-tax affiliates. These intangibles are not included in our measure of corporations' capital stocks, for lack of data about their market value—which in many cases is impossible to assess, given that many of these intangibles are firm-specific and never exchanged on markets between unrelated parties. Second, for a given stock of total capital (tangible plus intangible), haven affiliates can report high profits because of intra-group transfer price manipulations. With the macro data at our disposal, we cannot separate the role of intangibles vs. intra-group transfer prices in explaining the high rates of returns recorded by haven affiliates. This distinction is not relevant for our purposes, however, since both of these techniques have similar redistributive implications: for a given global amount of profits, both techniques redistribute profits (hence tax bases) across countries without affecting wages.

## 4.5 Estimates of Profits Shifted to Tax Havens

To form our benchmark estimate of the amount of profits shifted to tax havens, we set  $\pi_f$  equal to  $\pi_l$  in each tax haven. That is, we assume that absent profit shifting, foreign firms in Ireland would be as profitable as local Irish firms, foreign firms in Luxembourg as profitable as local Luxembourg firms, etc. We present our estimate of the amount of profits shifted into

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<sup>49</sup>This conclusion is consistent with the firm-level analysis of Grubert and Slemrod (1998) in the context of US investments in Puerto Rico.

each tax haven in the bottom panel of Table 2. In total, more than \$600 billion in profits were shifted to tax havens in 2015, close to 40% of multinational profits. By our estimates, Ireland is the number one shifting destination, accounting for more than \$100 billion alone. Singapore, the Netherlands, Caribbean tax havens, and Switzerland come next. Due to the complex structures used by multinationals and to the data limitations discussed in Section 3.2, allocating the shifted profits to specific jurisdictions involves a margin of error (for instance, the frontier between Ireland and Bermuda is not always clear). This uncertainty, however, does not affect our estimate of the global amount of profits shifted offshore.

One potential concern with comparing profitability in foreign vs. local firms is that foreign firms in tax havens may be in other sectors than local firms, and profits-to-wage ratios may vary across sectors. To address this issue, we use the fact that in some countries, foreign affiliates statistics are available by sector of economic activity. Appendix Figure L.1 focuses on the case of U.S. multinationals, using the outward foreign affiliates statistics of the United States. We find that the haven affiliates of U.S. multinationals are an order of magnitude more profitable than non-haven affiliates in the same sector. In non-haven countries, U.S. affiliates are typically less profitable than local firms operating in the same sector; while in tax havens they are an order of magnitude more profitable than local firms operating in the same sector—consistent with the pattern depicted in Figure 5. Controlling for sectoral differences in local vs. foreign firms does not quantitatively affect our findings.

Another take-away from Appendix Figure L.1 is that profit shifting is not limited to just a few sectors of the economy, such as information and communication technology. Profit shifting appears to be an across-the-board phenomenon, observable even in industries where intangibles play a relatively minor role in the production process (such as manufacturing). There are several potential explanations for this finding. Firms across all industries may shift profits by using intra-group trade and borrowing. It could also be that multinationals in all sectors can create firm-specific intangibles (such as logos), book these in low-tax places, and charge royalties to high-tax subsidiaries for the right to use these intangibles.

Another potential concern with our estimation procedure is that local firms in tax havens may be smaller than foreign firms, and smaller firms may have lower profits-to-wage ratios, leading us to over-estimate global profit shifting. Currently available foreign affiliates statistics do not enable us to control for firm size. We note, however, that being a local firm does not imply being small. There are many large multinationals headquartered in tax havens (for instance, after “inverting” from the United States). In our data, such firms are treated as local firms in

tax havens, as they are not owned by foreign parents.

A last concern is that by using the local firms of tax havens as benchmark, we may actually under-estimate the extent of global profit shifting, since firms headquartered in tax havens may shift foreign profits inward, inflating  $\pi_l$ . This phenomenon could explain the relatively high profits-to-wage ratio of Irish local firms reported in Figure 5, and suggests that our estimates of global profit shifting should probably be viewed as conservative.<sup>50</sup> We have run robustness tests where we make the profitability of local haven firms vary and assess the impact on our results, and found only second-order effects, however. The reason is that the bulk of our estimated \$600bn in shifted profits comes from small tax havens where  $\pi_f$  is an order of magnitude higher than  $\pi_l$  (hence where the exact level of  $\pi_l$  does not matter much). Only a small fraction of our estimated \$600 billion comes from larger tax havens (such as Netherlands and Belgium) where  $\pi_f$  is only slightly higher than  $\pi_l$  (hence where the exact level of  $\pi_l$  matters more); see Table 2. If we assumed that local firms in tax havens are in reality as profitable as local firms are on average in the OECD ( $\pi_l = 41\%$ ), then our estimate of global profit shifting would rise by about 3%.<sup>51</sup>

To conclude, comparing foreign and local firms in tax havens is not perfect. But this estimation procedure has the advantage that it can be implemented transparently using readily available macro data which are much more comprehensive than the data used so far to study global profit shifting. We view our database of local vs. foreign profits across the world as living series that we will update annually, making it possible for researchers and policy-makers to track the effects of ongoing corporate tax policy changes on a year-to-year basis. Another advantage is that our results are robust to changes in key assumptions. In particular, because profits-to-wage ratios vary so dramatically while capital intensities don't, even assuming elasticities of substitution between capital and labor way larger than 1 has only small effects on our estimates of the amount of profits shifted to tax havens. Looking forward, our estimation procedure could be refined by drawing on more detailed foreign affiliates statistics (e.g., tabulated by firm size) and global micro-data on the operations of foreign firms.

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<sup>50</sup>Ideally we would like to be able to compare the foreign firms of tax havens to local firms of comparable size and without foreign affiliates. Existing foreign affiliates statistics, however, do not currently make it possible to decompose local firms into firms with affiliates abroad vs. firms with only domestic operations.

<sup>51</sup>See Appendix Table A.7.

## 5 The Redistributive Implications of Profit Shifting

### 5.1 Allocating the Shifted Profits Across Countries

Which countries lose profits compared to a benchmark of perfect international tax coordination? The pink bar in the top panel of Figure 7 allocates the roughly \$600bn in excess profits in tax havens across source countries, proportionally to the bilateral intra-group interest received by tax havens and their bilateral exports of services conducive of profit shifting (such as rights to use intellectual property). As described in Appendix C, we find that the amount of intra-group interest received and services exported by tax havens (above and beyond what could be expected given the size of their economies) totals about \$600bn.<sup>52</sup> That is, it matches our estimate of the amount of profits shifted in tax havens based on setting  $\pi_f = \pi_t$  in tax havens. This consistency of findings obtained using completely different data and methodologies lends support to the view that \$600bn is indeed the correct order of magnitude for the amount of profits shifted to tax havens globally in 2015.

In our benchmark allocation, we find that about 35% of the shifted profits come from E.U. (non-haven) countries, close to 30% from developing countries, and about 25% from the United States.<sup>53</sup> If all countries had the same effective tax rate, profits in non-E.U. tax havens would be 20% higher than they currently are; profits in the US would be 15% higher, and profits in developing countries close to 10% higher (bottom panel of Figure 7).

We also allocate the profits shifted to tax havens to the countries where the ultimate owners of the tax haven subsidiaries are located (blue bar in the top panel of Figure 7). Multinationals from all countries shift profits, but we find that U.S. multinationals are the main “shifters”: about half of all the shifted profits ultimately accrue to U.S. parents, while about 30% accrue to E.U. parents. The higher shifting intensity of U.S. multinationals can be explained by the specific provisions contained in the U.S. tax code before 2018 and by U.S. policies adopted in the mid-1990s that facilitated shifting from foreign high-tax countries to tax havens (check-the-box regulations), see Wright and Zucman (2018). Industry composition effects may also play some role, but because profit-shifting seems to happen in all sectors, they are unlikely to be the key reason why U.S. multinationals shift more.

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<sup>52</sup>As noted in Section 3.4, we only include the specific types of services which have been found in the literature to be most conducive of profit shifting: exports of the rights to use intellectual property (patents and trademarks), headquarter services (administration, management and advertising), information and communication technology services, and financial services (Hebous and Johannesen, 2016).

<sup>53</sup>About 80% of the profits shifted out of the European Union are shifted to the E.U. tax havens, primarily Ireland, Luxembourg, and the Netherlands (see Appendix Figure C.1), while the profits shifted out of the United States are primarily shifted to the non-E.U. havens.

## 5.2 The Tax Revenue Gains of Tax Havens

Using our estimates of the amount of profits shifted into each haven, we compute how much tax revenue tax havens have been able to generate by taxing these profits. Although some havens like Bermuda have 0% corporate tax rates, most others, like Ireland, Singapore, and Luxembourg, have low but positive rates. A striking fact, depicted on the top panel of Figure 8, is that tax havens, although they have low statutory tax rates (and even lower effective rates) generate much more revenue than non-haven countries. Malta collects about 8% of its national income in corporate tax revenue, Luxembourg 7%, and Ireland more than 5%. By contrast, in the United States, Germany, and Italy (three of the countries with the highest statutory tax rates), corporate tax revenue amount to less than 3% of national income.

How do tax havens manage to collect so much tax revenue? As shown by the bottom panel of Figure 8, most of their revenue derive from taxes collected on foreign firms. With source taxation and no international coordination, tax havens can generate sizable revenue by taxing the huge foreign profits they attract at low but positive rates. Strikingly, the havens that collect the largest revenue are those that impose the lowest tax rate on foreign profits: the revenue-maximizing tax rate appears to be very low, less than 5%. The low revenue-maximizing rate of tax havens can explain the rise of the supply of tax avoidance schemes documented in the literature—such a favorable tax rulings granted to specific multinationals—and in turn the rise of profit shifting since the 1980s.<sup>54</sup>

Figure 9 considers the case of Ireland, the country that by our estimates attracts the largest amount of shifted profits (more than \$100 billion in 2015). As shown in the top panel of this Figure, until the 1990s Ireland used to collect relatively little corporate income tax revenue, about 1.5%–2% of national income—significantly less than the United States. Then, as profit shifting surged (Figure 4), so did tax collection: since the mid-1990s, Ireland has collected significantly more corporate tax revenue (as a fraction of national income) than the United States—about twice as much in 2015. Tax collection is strongly negatively correlated with the statutory corporate tax rate (bottom panel of Figure 9): when the tax rate was high (around 50% until the late 1980s), tax collection was low; since the rate was cut to 12.5% in the 1990s, tax collection has been high. Whenever they choose non-zero rates—even rates effectively quite close to zero—tax havens derive clear benefits from attracting paper profits.

Two remarks are in order here. First, gains in tax revenue are not the only way tax havens

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<sup>54</sup>See for instance the case between the E.U. Commission and Apple in Ireland. The E.U. Commission contends that the Irish tax authorities have allowed Apple to pay particularly low rates, of as little as 0.001%, over years.

benefit from tax competition. As we've seen capital intensities are slightly higher in tax havens, i.e., tax havens also attract capital-intensive industries (which can boost wages). Even when capital intensities are not higher, foreign firms can account for a large share of employment in tax havens and bring important economic benefits. This is the case in some of the tax havens that we estimate attract large paper profits. That is, these countries, such as Ireland, not only attract paper profits but also real activity (even if it's not particularly capital intensive). One potential explanation is that it may be easier for multinationals to shift profits into the countries where they also have sizable real activity.<sup>55</sup> Our analysis does not allow us to quantify the complete gains that tax havens derive from capital mobility. Such an analysis would require an explicit model of how movements of tangible capital affect the host economies, which we leave to future research.

Second, although tax havens do collect revenue from paper profits, profit shifting significantly reduces corporate income tax payments globally, because it reduces corporate tax payments in high-tax countries. Table 2 presents our estimates of the losses of corporate income tax revenues in high-tax countries. These estimates are obtained by applying the statutory income tax rate to the amount of profits shifted outward. We find that globally, for each \$1 paid in tax to a haven, close to 5\$ are avoided in high-tax countries. Profit shifting by multinationals reduces the corporate tax revenue of the European Union by around 20%. For the world as a whole, the tax revenue loss is around 10%. The revenue losses vary significantly across countries. One of the reasons is that the share of corporate profits that come from multinational corporations varies, as some economies are more open than others. In Japan and some of the largest developing countries (e.g., China), a high share of profits originate from local firms; this limits the amount of shifted profits. Moreover, the size of the revenue losses is correlated with the corporate income tax rate. Within the European Union, higher tax countries (such as France and Italy) experience higher losses than lower tax countries (such as Eastern European countries). This correlation is consistent with the notion that higher corporate tax rates give more incentives to shift.

A number of limitations are worth stressing. Countries attempt to tax profits that are shifted outward through controlled foreign corporations rules. This means that a dollar of lost profit does not necessarily translate into  $\tau$  cents lost in tax revenue, if  $\tau$  is the statutory corporate tax

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<sup>55</sup>According to our estimates, foreign firms pay 24% of all wages in Ireland (Appendix Table A.4), while they account for as much as 78% of all profits (Appendix Table A.7). Note that there are many countries where foreign firms account for an even larger fraction of the total wage bill and yet there was little profit shifting in 2015. This includes most Eastern European countries, where foreign firms account for around 40% of both wages and profits. These countries had corporate tax rates close to 20% in 2015.

rate. Moreover, it is possible that with better enforcement there would be more real responses to taxation, such as more mobility of tangible capital to low-tax places. Our tax revenue loss computations keep everything else constant, as done in the literature on the size of tax evasion.

## 6 Macro Statistics Corrected for Profit Shifting

The flip side of the high profits recorded in tax havens is that profits recorded in non-haven countries are too low. In both cases, core macroeconomic statistics are distorted. In the countries where shifted profits are booked (i.e., tax havens), GDP, corporate profits, the capital share of corporate value-added, and trade balances are over-estimated. In non-haven countries, by contrast, these indicators are under-estimated. In this section, we present macroeconomic statistics corrected for the effect of profit shifting for all OECD countries, all tax havens, and the main emerging economies. All our estimates are available online in Appendix Tables C.5 and C.5b; in this section we focus on discussing the methodology and main results.<sup>56</sup>

Not all forms of profit shifting affect the data in the same way. The manipulation of intra-group transfer prices and the offshoring of intangibles affect GDP, corporate operating surplus, factor shares, and trade balance. But profit shifting through the use of intra-group interest payments does not. According to our estimates, about 1/7 of the profits globally shifted to tax havens are shifted via interest payments (intra-group interest received by tax havens are about 1/7 the size of the exports of services most conducive of profit shifting recorded by tax havens). Our corrected macroeconomic statistics take this fact into account.

Table 3 presents our estimates of capital shares and trade balances corrected for profit shifting. A number of results are worth noting. First, accounting for profit shifting significantly increases the capital share of corporate value-added in non-haven countries.<sup>57</sup> Consistent with our earlier results that showed that European countries are particularly affected, we find that the capital share is under-estimated by about 2% to 2.5% points in the main E.U. countries (Germany, United Kingdom, France, Italy), which is more than in the United States (1.1 point).

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<sup>56</sup>Bruner, Rassier, and Ruhl (2018) present US macroeconomic statistics corrected for profit shifting and discuss how the effect of profit shifting cascades through the economic accounts; see also Avdjiev et al. (2018). Compared to these studies, our contribution is to offer a set of correction for all countries (not only the United States), and in such a way that global accounts balance (i.e., that the global direct investment income balance adds up to zero). Our results for the United States are broadly consistent with the results of Bruner, Rassier, and Ruhl (2018) who find that accounting for profit shifting increases U.S. GDP by 1.5 percent.

<sup>57</sup>Note that it does not necessarily increase the capital share of national income, as the profits of the offshore subsidiaries that belong to domestic shareholders enter national income in the form of direct investment income received from the rest of the world. We focus here on correcting domestic corporate value-added, corporate operating surplus, and corporate factor shares (which are the factor shares used in most of the literature on the decline of the labor share, e.g., Karabarbounis and Neiman, 2014).

Because there was almost no profit shifting before the 1980s (see, e.g., Figure 4) the higher level of the capital share implies a higher rise in the capital share over the last few decades. By our estimates, the rise in the European corporate capital share since the early 1990s is twice as large as recorded in the national account data used, e.g., by Karabarbounis and Neiman (2014).

Profit shifting also has significant effect on trade balances. For instance, after accounting for profit shifting, Japan, the U.K., France, and Greece turn out to have trade surpluses in 2015, in contrast to the published data that record trade deficits. According to our estimates, the true trade deficit of the United States was 2.1% of GDP in 2015, instead of 2.8% in the official statistics—that is, a quarter of the recorded trade deficit of the United States is an illusion of multinational corporate tax avoidance.<sup>58</sup>

## 7 Conclusion

What have we learned from this paper? In our view the main finding is that one can obtain a clear picture of global profit shifting by exploiting the foreign affiliates statistics recently made available by many countries. These data show that the capital share of corporate value-added is extremely high in the foreign firms of tax havens, while it is low in the foreign firms of other countries compared to the capital share of local firms. By exploiting this pattern of differential profitability as well as new bilateral balance of payments data recently made available by tax havens, our paper estimates how much each tax haven, each OECD country, and the main emerging economies gain or lose in profits compared to a benchmark of global tax coordination. We find that the redistributive effects of tax competition are large: by our estimates, close to 40% of multinational profits are shifted to tax havens in 2015. Non-haven European Union countries appear to be the largest losers from this phenomenon, while very-low tax countries (and the shareholders of multinational firms) appear to be the main beneficiaries.

Our findings have implications for policy. First, they suggest that cutting corporate tax rates, as the United States has done at the end of 2017, is less likely to generate quick positive effects on wages than textbook economic models suggest. For wages to rise, factors of production that complement labor need to increase, which can happen fast if tangible capital flows from abroad, less so if it is mostly paper profits that move across borders. Second, profit shifting raises challenges in a number of policy areas. It reduces the effective rates paid by multinationals corporations compared to what local firms pays, which could adversely affect competition. It reduces the taxes paid by the wealthy—as ownership of these firms is concentrated—which might

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<sup>58</sup>See Sandholtz (2018) for an estimation based on U.S. bilateral trade data.

call for offsetting changes in individual income taxation, or changes in the way multinational companies are taxed.

We stress that our estimates of the amount of profits shifted by multinationals globally is conservative. Our investigation has uncovered statistical gaps that limit our ability to monitor global economic activity and constrain tax enforcement. Statistical improvements are necessary. To solve the asymmetries in bilateral foreign affiliates and direct investment statistics (in particular between the United States and European tax havens), national statistical authorities need to be authorized to exchange micro-data. The foreign affiliates statistics that we exploited in this paper need to be compiled by more countries and expanded to include more information, such as interest payments, corporate income taxes paid, and capital stocks (as the United States, for example, already does). A number of Caribbean tax havens do not currently publish comprehensive enough national accounts (for instance, they set profits to zero in the offshore sector). Last and maybe most importantly, many countries—including the United States and a number of tax havens—could improve their public corporate registries so that all firms are included and profit information is made publicly available at the subsidiary level. Altogether, these improvements would significantly improve our ability to study globalization and its distributional effects.

Our analysis has focused on how tax competition redistributes tax bases across countries. In future research, it would be good to introduce the inequality dimension in the analysis, i.e., to quantify how much the various income and wealth groups in each country have gained or lost from tax competition. According to our estimates, about half of the globally shifted profits accrue to the shareholders of U.S. multinationals (a majority of which, but not all, are Americans). Because equity ownership is concentrated (see e.g., Saez and Zucman, 2016, for evidence on equity wealth concentration in the United States), profit shifting tends, everything else equal, to reduce the effective tax rate of the wealthy, which may contribute to increasing inequality. A quantitative analysis of these redistributive effects across income and wealth groups would make it possible to make progress towards a full-fledged macro-distributional analysis of globalization. This raises major conceptual and empirical challenges for future research.

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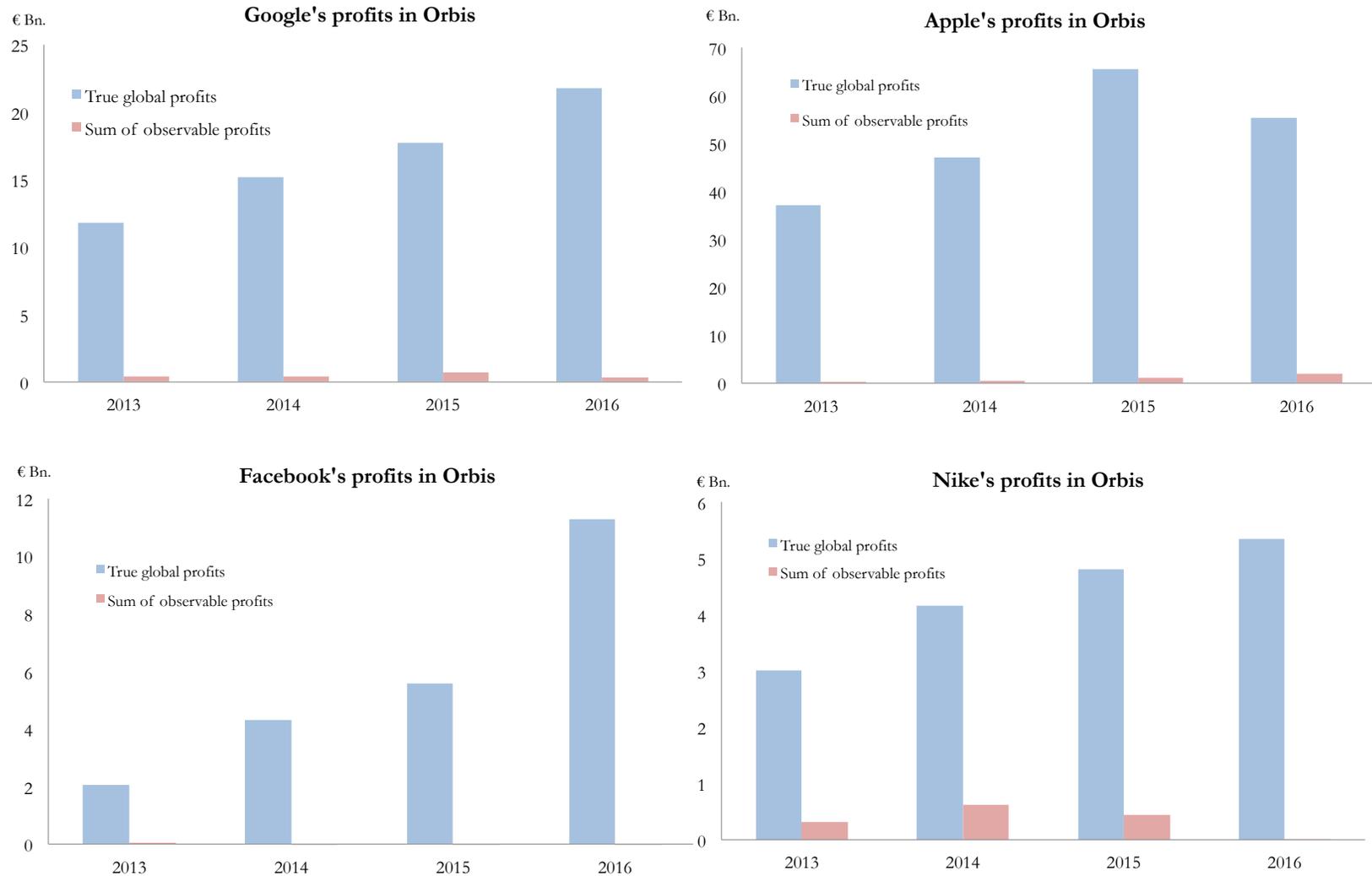
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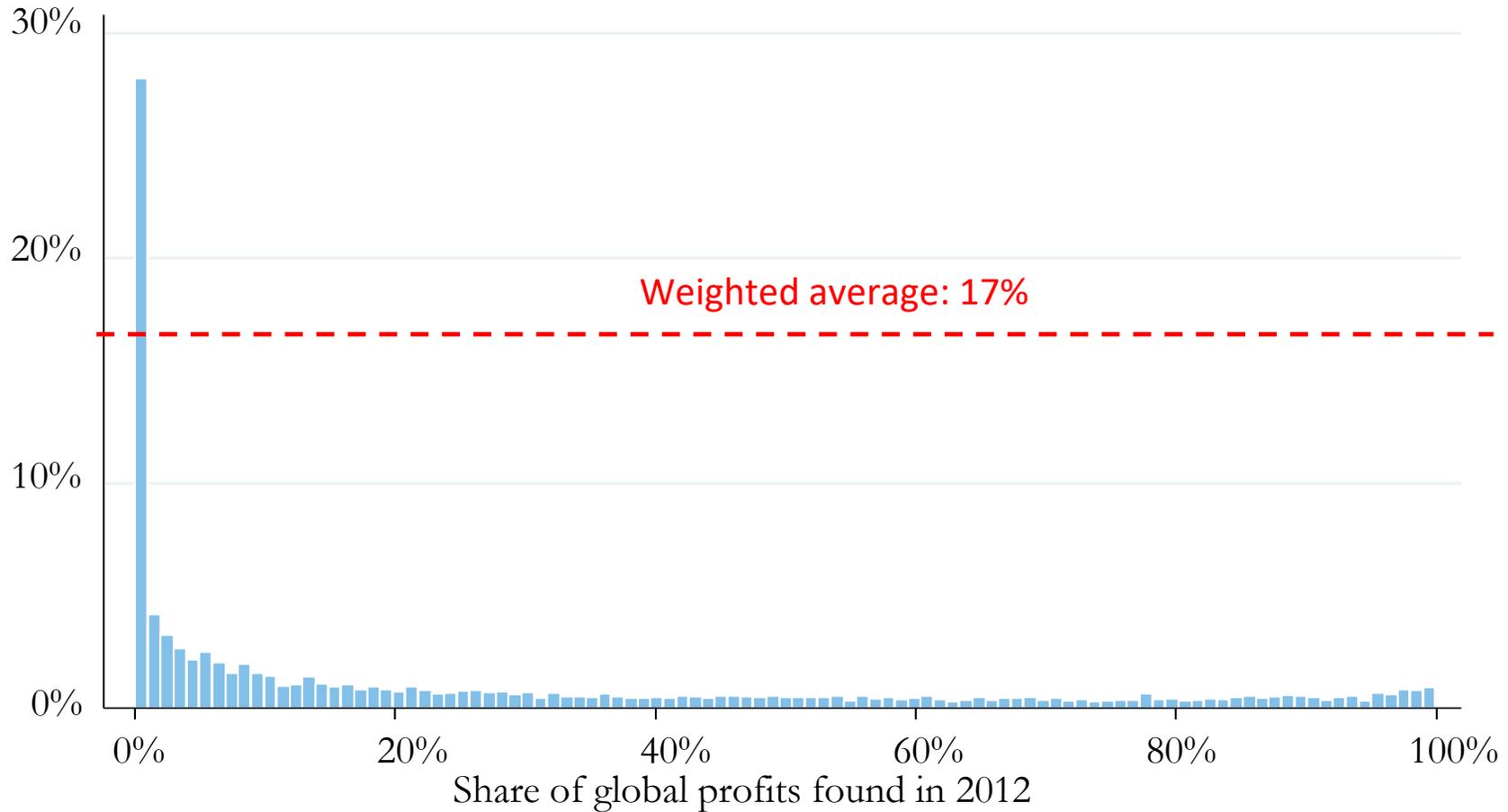
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**Figure 1: Consolidated Global Profits vs. Observable Profits Across Subsidiaries**



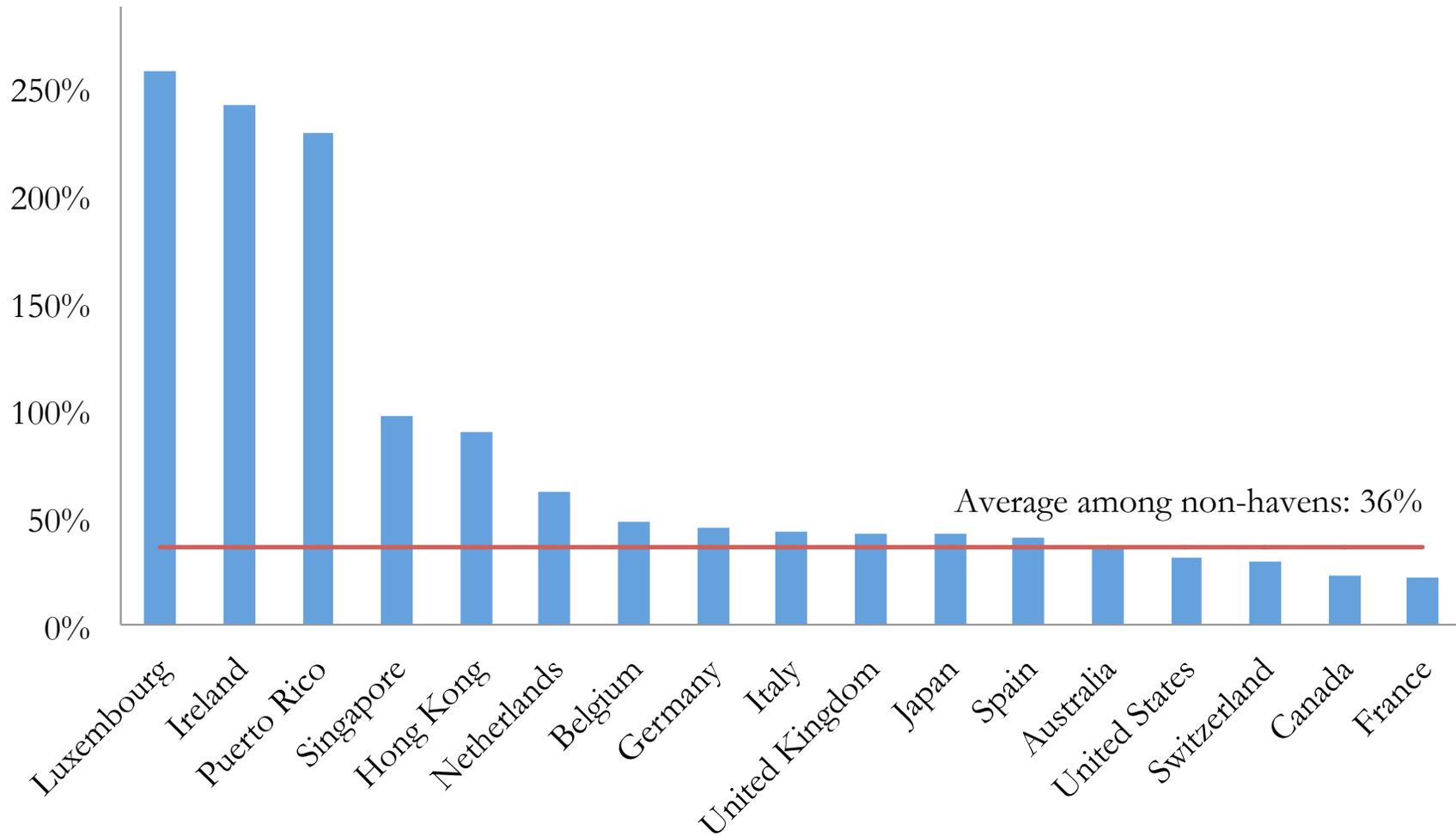
Notes: This graph shows the difference between Apple's, Facebook's, Alphabet's, and Nike's global consolidated profits, and the sum of the profits made by Apple's, Facebook's, Alphabet's, and Nike's subsidiaries, as recorded in Orbis. The difference is due to the fact that the subsidiaries where these firms make the bulk of their profits are not visible in Orbis. Source: authors' computations using Orbis data.

**Figure 2: Fraction of Global Profits That Can be Observed in Orbis**



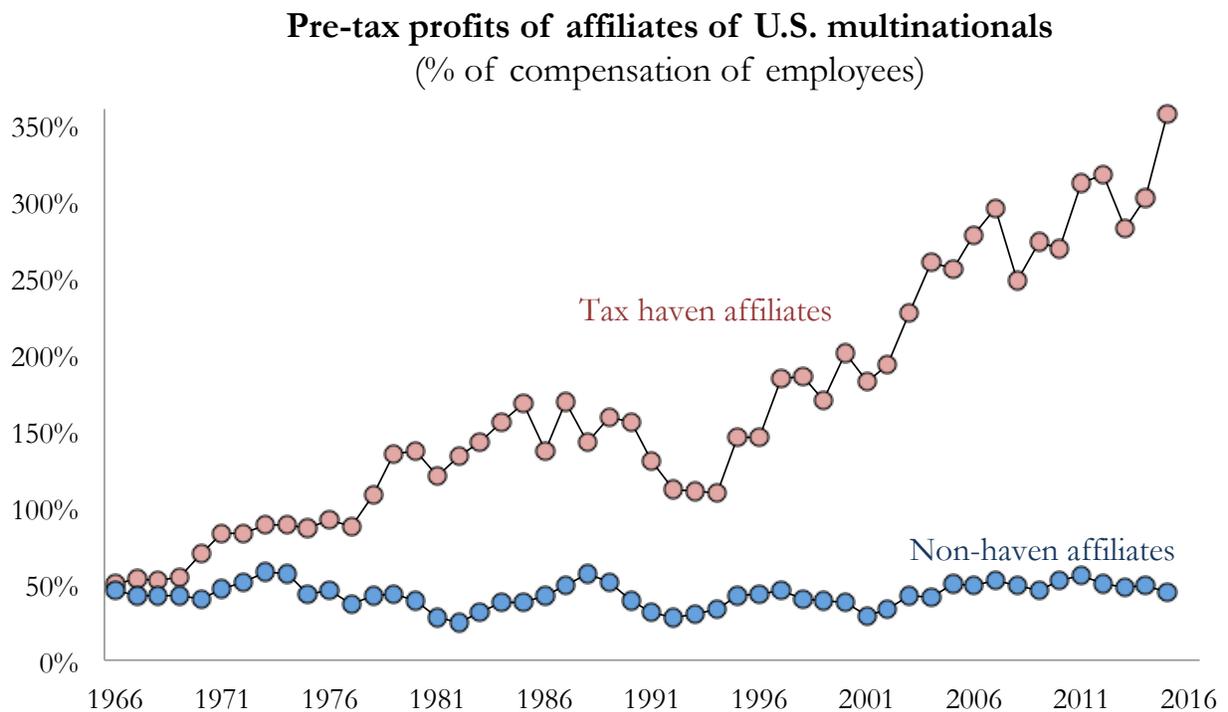
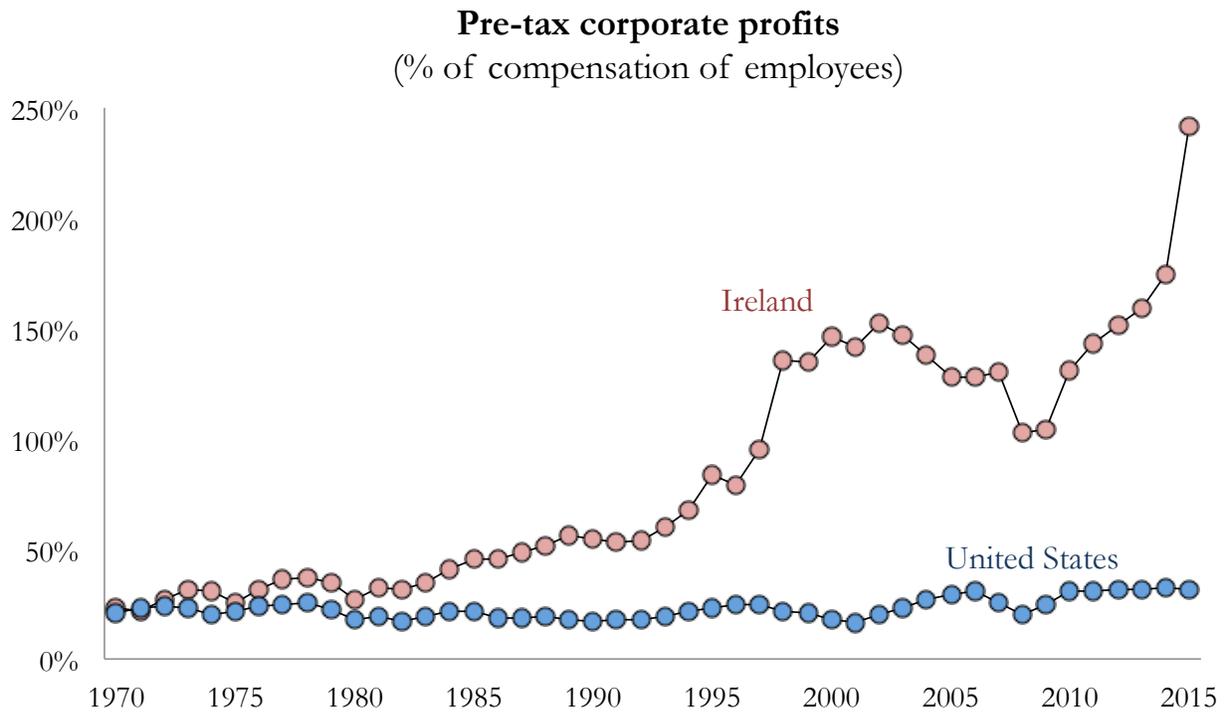
Notes: This graph shows the density of the following ratio. For each multinational firm in Orbis, we compute the sum of the unconsolidated pre-tax profits of all subsidiaries (code U1), and we divide this sum by the consolidated global profits of the firm (code C1). Whenever the ratio is less than 1, this means that only part of the global profits of the firm are visible at the subsidiary level in Orbis. In 28% of the cases, no profits are visible at the subsidiary level. The weighted average of 17% is weighed by profit. Source: authors' computations using Orbis data.

**Figure 3: Pre-tax Corporate Profits (% Compensation of Employees)**



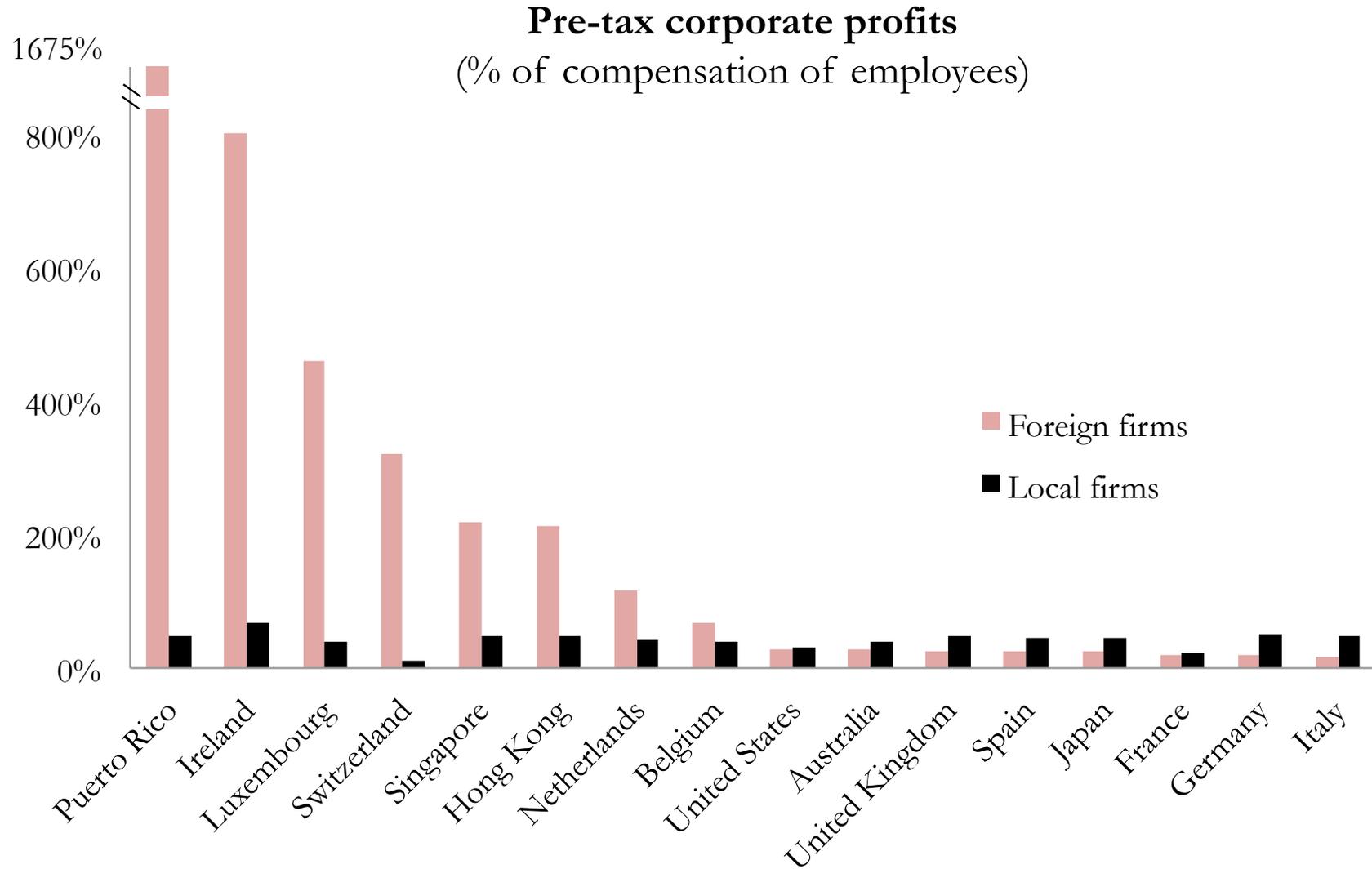
Notes: the bar shows the ratio of pre-tax corporate profits (net of interest and depreciation) to compensation of employees in 2015, as recorded in national accounts data. Source: Appendix Table A.7.

**Figure 4: The Rise of Profit Shifting**



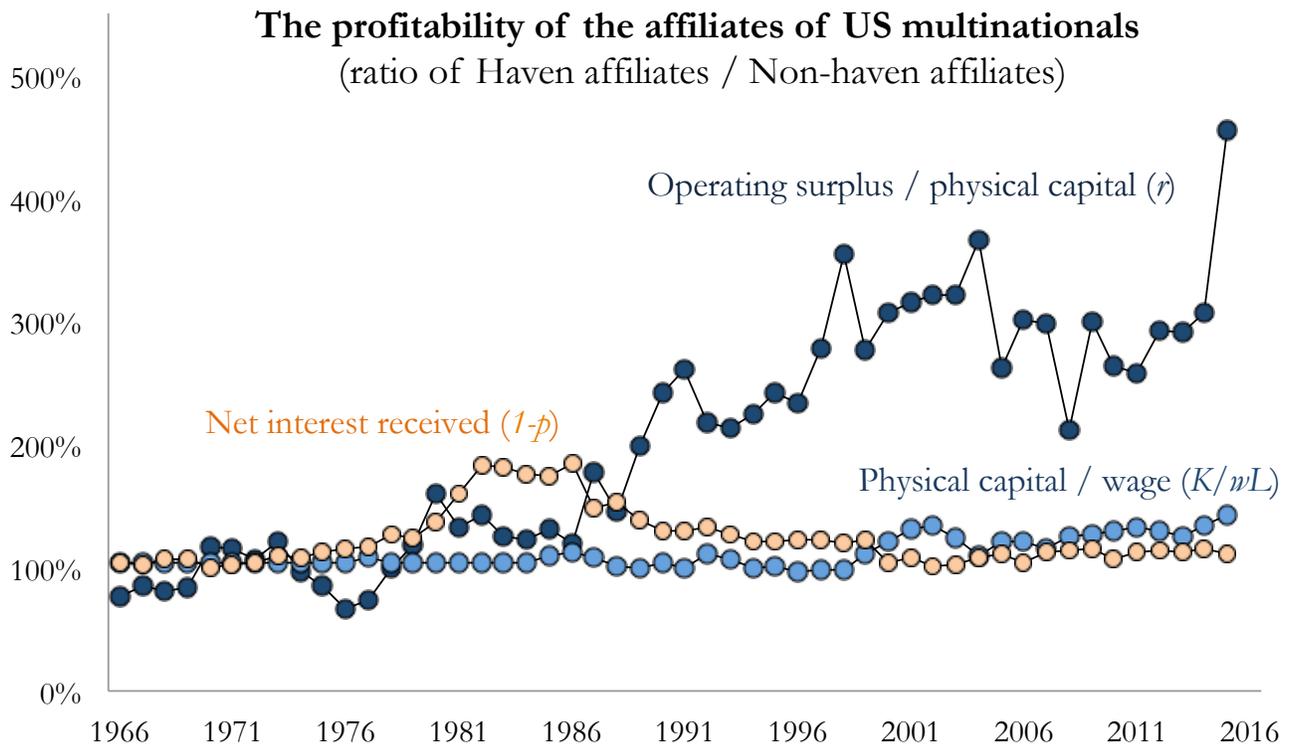
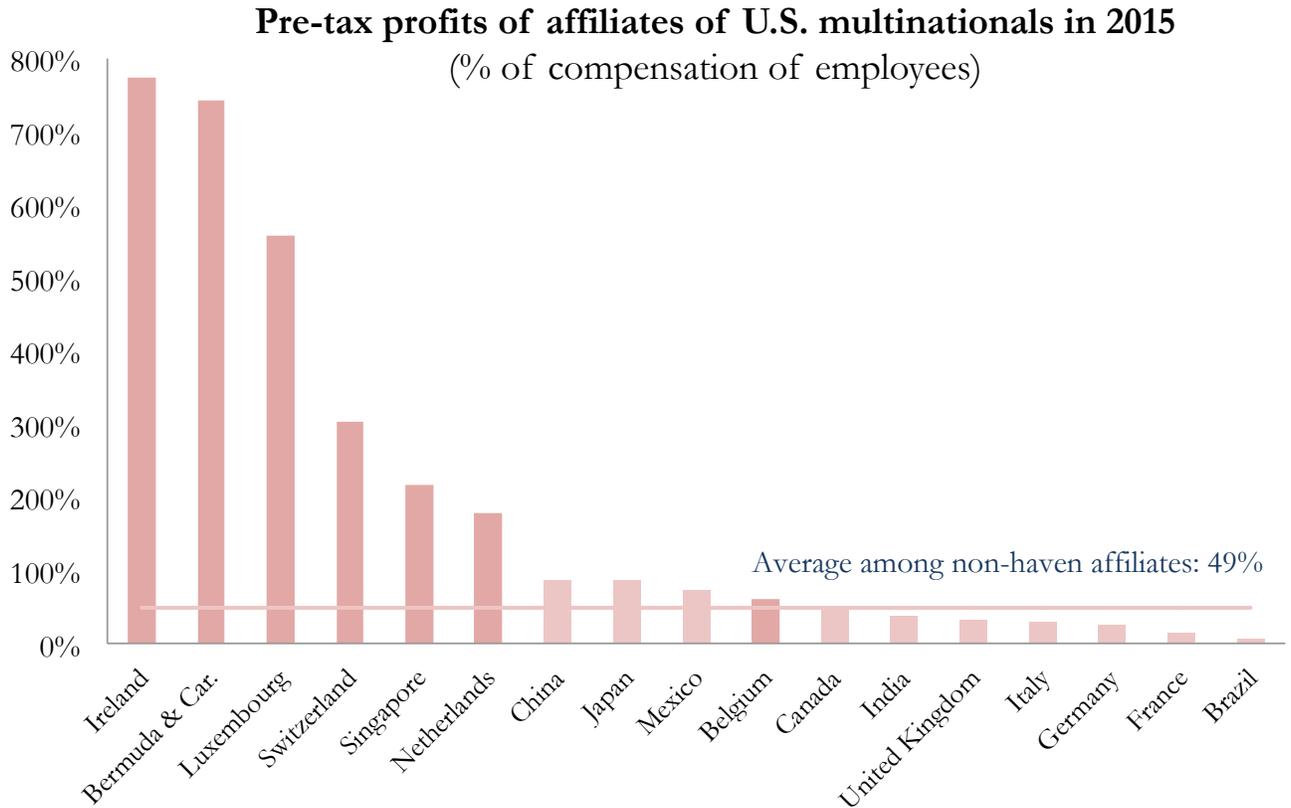
Notes: in the bottom panel, tax havens include: Ireland, Luxembourg, Netherlands, Switzerland, Bermuda and Caribbean tax havens (“Other Western Hemisphere” in the BEA data), and Singapore. Non-havens include all other countries. Sources: For top panel, national accounts of Ireland and the United States and authors’ computations; for bottom panel: BEA survey of the activities of U.S. multinationals abroad, Tables II.F.1 and II.F.2, column “profit-type return” and “compensation of employees” .

Figure 5: Profitability in Foreign vs. Local Firms



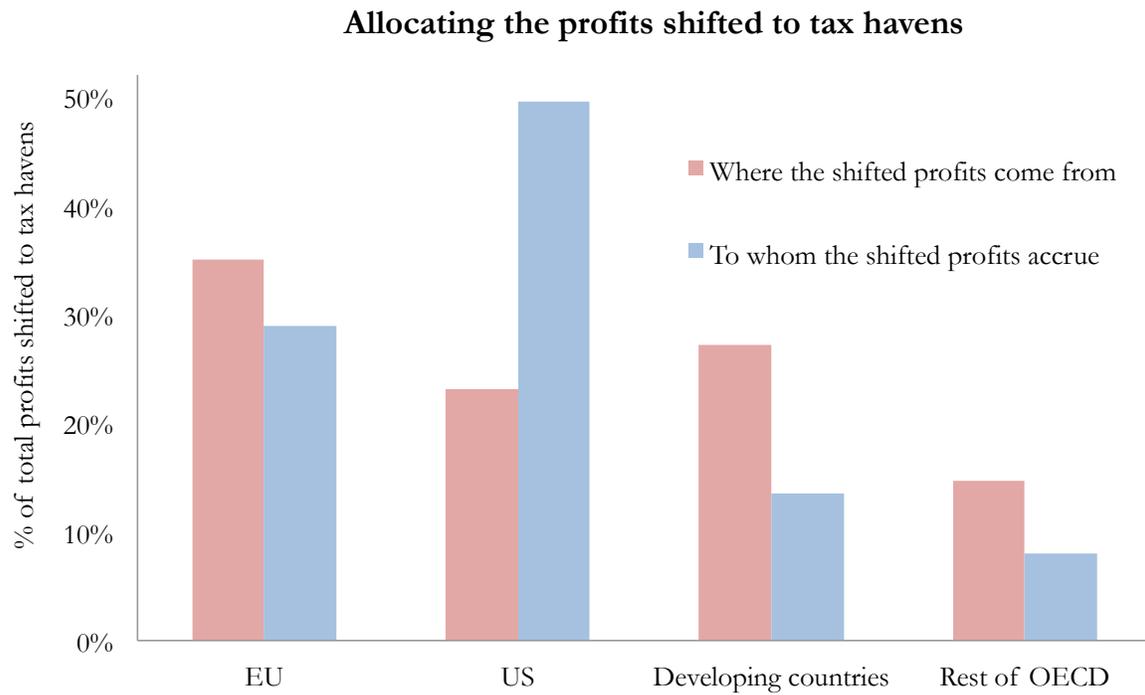
Notes: data are for 2015. Source: Appendix Table A.7.

**Figure 6: The Profits of US Firms: Havens vs. Non-Haven Affiliates**



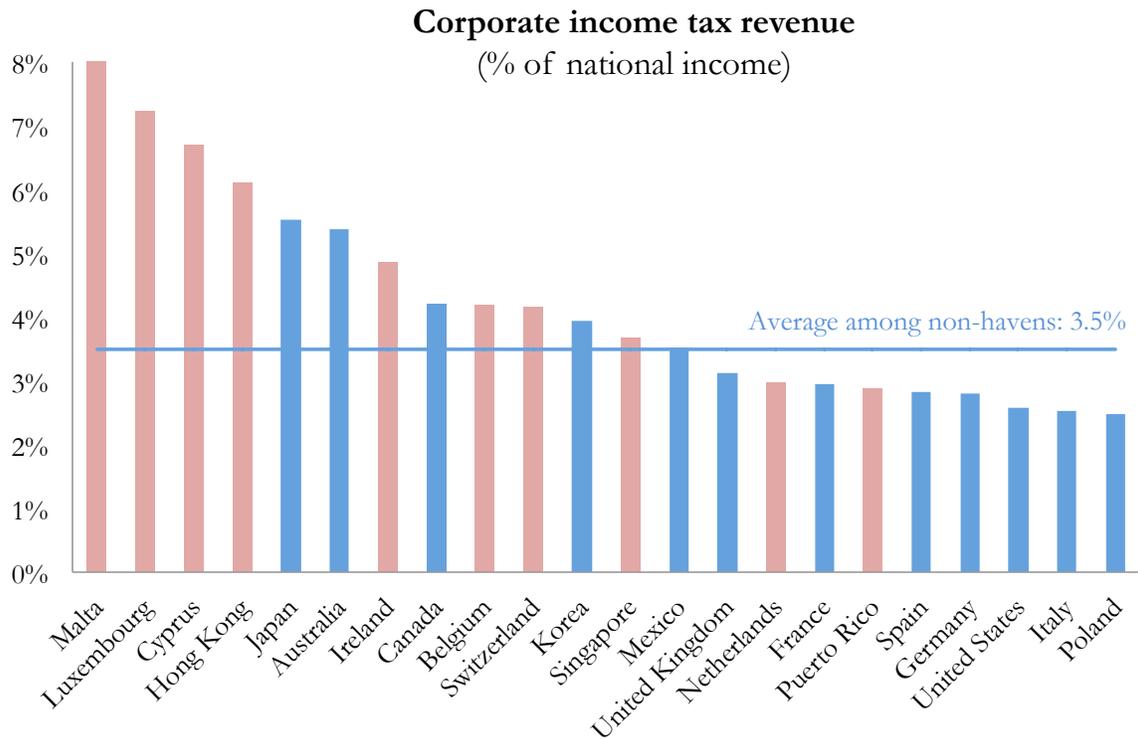
Notes: see notes to Figure 4. Source: BEA survey of the activities of U.S. multinationals abroad, Tables II.B 1-2 (column "Plant, property, and equipment (net)" and II.F.1.

**Figure 7: Allocating the Shifted Profits**

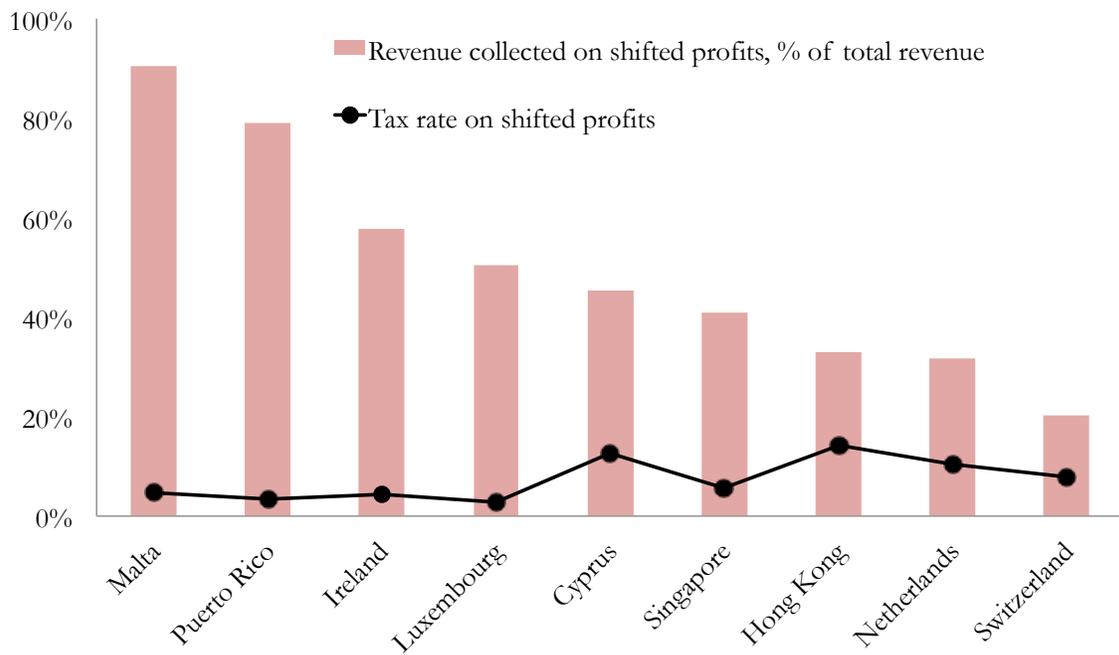


Note: Estimates are for 2015. Source: Appendix Tables C.4b, C.4c, and C.4d.

**Figure 8: Corporate Tax Revenue in Tax Havens**

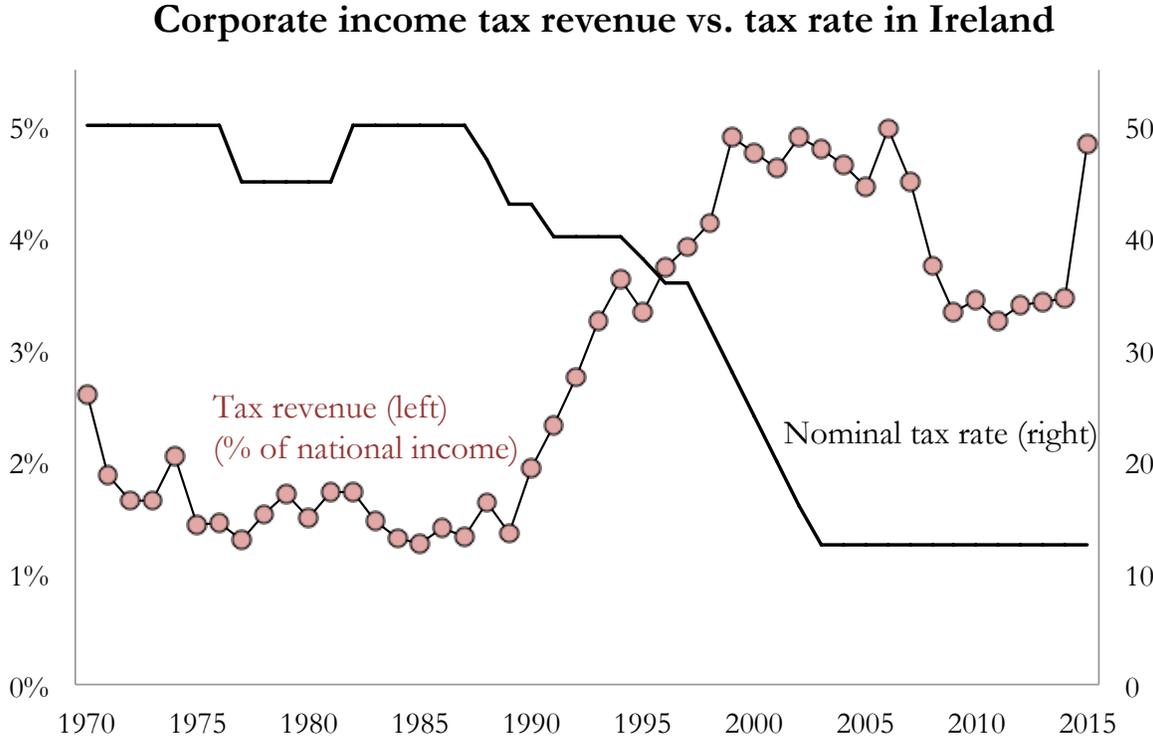


**Corporate tax revenue collected & tax rate on shifted profits**



Notes: data are for 2015. Source: Appendix Tables A.3., A.6., A.7, and A.11.

**Figure 9: The Redistribution of Corporate Income Tax Revenue**



Source: national accounts of Ireland and the United States; see text.

**Table 1: Global Output, Corporate Output, and Corporate Taxes Paid (2015)**

	Billions of current US\$	% of net corporate profits
Global gross output (GDP)	75,038	
Depreciation	11,940	
Net output	63,098	
Net corporate output	34,083	296%
Net corporate profits	11,515	100%
Net profits of foreign-controlled corp.	1,703	15%
Of which: shifted to tax havens	616	5%
Net profits of local corporations	9,812	85%
Corporate income taxes paid	2,154	19%

Notes: Profits of foreign corporations include all the profits made by companies more than 50% owned by a foreign country; profits of local corporations equal all corporate profits minus the profits of foreign corporations. Source: Appendix Tables C.5 and A.3.

**Table 2: Shifted Profits: Country-by-Country Estimates (2015)**

	<b>Reported pre-tax profits</b>	<i>Of which: Local firms</i>	<i>Of which: Foreign firms</i>	<b>Shifted profits</b>	Effective corporate tax rate	Corp. tax revenue loss/gain (% collected)
<b>OECD countries</b>						
Australia	179	151	28	12	30%	7%
Austria	48	37	11	4	18%	11%
Canada	143	96	47	17	35%	9%
Chile	68	58	10	5	15%	11%
Czech Republic	34	16	17	2	20%	5%
Denmark	52	47	5	3	15%	8%
Estonia	4	3	1	0	12%	10%
Finland	25	21	4	3	20%	11%
France	188	156	32	32	27%	21%
Germany	553	510	43	55	11%	28%
Greece	23	21	1	1	19%	7%
Hungary	21	11	10	2	11%	21%
Iceland	2	2	0	0	19%	22%
Israel	54	48	6	1	17%	2%
Italy	212	199	13	23	18%	19%
Japan	634	602	32	28	26%	6%
Korea	248	246	3	4	18%	2%
Latvia	4	3	1	0	10%	7%
Mexico	325	302	23	12	12%	10%
New Zealand	44	37	6	1	18%	5%
Norway	76	69	7	5	22%	8%
Poland	88	68	19	4	10%	8%
Portugal	27	22	5	3	23%	9%
Slovakia	12	6	5	1	25%	5%
Slovenia	3	2	1	0	18%	6%
Spain	159	138	21	14	18%	14%
Sweden	63	39	24	9	23%	13%
Turkey	213	209	4	5	6%	8%
United Kingdom	425	353	72	61	17%	18%
United States	1,889	1,737	153	142	21%	14%
<b>Main developing countries</b>						
Brazil	274	245	30	13	20%	8%
China	2,069	1,906	162	55	20%	3%
Colombia	59	52	7	1	29%	2%
Costa Rica	13	12	1	1	12%	19%
India	376	368	8	9	10%	8%
Russia	290	253	37	11	14%	5%
South Africa	76	68	9	4	25%	6%
<b>Tax havens</b>						
Belgium	80	48	32	-13	19%	16%
Ireland	174	58	116	-106	4%	58%
Luxembourg	91	40	51	-47	3%	50%
Malta	14	1	13	-12	5%	90%
Netherlands	195	106	89	-57	10%	32%
Caribbean	102	4	98	-97	2%	100%
Bermuda	25	1	25	-24	0%	
Singapore	120	30	90	-70	8%	41%
Puerto Rico	53	10	43	-42	3%	79%
Hong Kong	95	45	50	-39	18%	33%
Switzerland	95	35	60	-58	21%	20%
Other				-51		

Notes: amounts are in current billion US\$. All data are for 2015. Source: Appendix Tables A.6., A.7, C.4d, and C.4.

**Table 3: Macro Statistics Corrected for Profit Shifting (2015)**

	Corrected capital share	<i>Difference with published data</i>	Corrected trade balance	<i>Difference with published data</i>
<b>OECD countries</b>				
Australia	26%	+1.1%	-1.4%	+0.8%
Austria	29%	+1.3%	4.1%	+0.8%
Canada	24%	+1.4%	-1.4%	+0.9%
Chile	51%	+1.5%	1.8%	+1.8%
Czech Republic	39%	+1.0%	6.5%	+0.7%
Denmark	31%	+1.2%	8.2%	+0.8%
Estonia	35%	+1.1%	5.0%	+0.9%
Finland	28%	+1.6%	0.9%	+1.0%
France	19%	+2.1%	0.4%	+1.1%
Germany	31%	+1.8%	9.2%	+1.2%
Greece	43%	+1.1%	0.3%	+0.5%
Hungary	39%	+2.3%	10.4%	+1.5%
Iceland	33%	+3.4%	9.5%	+2.0%
Israel	37%	+0.2%	3.2%	+0.2%
Italy	30%	+1.9%	3.9%	+1.0%
Japan	28%	+0.8%	0.0%	+0.5%
Korea	37%	+0.4%	8.0%	+0.2%
Latvia	31%	+0.9%	-0.5%	+0.6%
Mexico	71%	+0.6%	-1.2%	+0.9%
New Zealand	44%	+0.7%	1.4%	+0.7%
Norway	41%	+1.2%	6.5%	+1.0%
Poland	45%	+0.9%	3.7%	+0.6%
Portugal	33%	+1.8%	2.8%	+1.1%
Slovakia	35%	+1.1%	3.4%	+0.6%
Slovenia	18%	+0.9%	9.1%	+0.4%
Spain	29%	+1.6%	3.4%	+1.0%
Sweden	31%	+2.2%	6.3%	+1.4%
Turkey	55%	+0.4%	-2.3%	+0.5%
United Kingdom	31%	+2.5%	0.2%	+1.8%
United States	27%	+1.1%	-2.1%	+0.7%
<b>Main developing countries</b>				
Brazil	26%	+1.0%	-0.3%	+0.5%
China	44%	+0.5%	3.7%	+0.4%
Colombia	54%	+0.5%	-5.9%	+0.4%
Costa Rica	45%	+1.9%	1.6%	+1.7%
India	56%	+0.5%	-2.6%	+0.4%
Russia	40%	+0.8%	8.9%	+0.7%
South Africa	39%	+1.4%	0.0%	+1.0%

Source: Appendix Tables C.5 and C.5b.