The Missing Profits of Nations

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Abstract

By combining new macroeconomic statistics on the activities of multinational companies with the national accounts of tax havens and the world's other countries, we estimate that close to 40% of multinational profits are shifted to low-tax countries each year. Profit shifting is highest among U.S. multinationals; the tax revenue losses are largest for the European Union and developing countries. We show theoretically and empirically that in the current international tax system, tax authorities of high-tax countries do not have incentives to combat profit shifting to tax havens. They instead focus their enforcement effort on relocating profits booked in other high-tax places—in effect stealing revenue from each other. This policy failure can explain the persistence of profit shifting to low-tax countries despite the sizable costs involved for high-tax countries. We provide a new cross-country database of GDP, corporate profits, trade balances, and factor shares corrected for profit shifting, showing that the global rise of the corporate capital share is significantly under-estimated.

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%.

Why are corporate tax rates falling? The standard explanation is that globalization makes countries compete harder for productive capital, pushing corporate tax rates down. By cutting their rates and providing public services and infrastructure more efficiently, countries can attract more machines, plants, and equipment, which makes workers more productive and boosts their wage. Global economic integration has made capital location more sensitive to differences in taxes and led to a more perfect competition between nations. This theory provides a consistent explanation for the global decline in tax rates observed over the last twenty years and offers nuanced normative insights (see Keen and Konrad, 2013, for a survey of the large literature on tax competition).

Our paper asks a simple question: is this view of globalization and of the striking tax policy changes of the last years well founded empirically? Our simple answer is "no." Machines don't move to low-tax places; paper profits do. By our estimates, close to 40% of multinational profits are artificially shifted to tax havens in 2015. This tax avoidance and the failure to curb it are the main reason why corporate tax rates are falling globally—not tax competition for productive capital. The decline in corporate tax rate is the result of policies in high-tax countries—not a necessary by-product of globalization. The redistributive consequences of this process are major, and different than in the textbook model of tax competition. Instead of increasing capital stocks in low-tax countries, boosting wages along the way, profit shifting merely reduces the taxes paid by multinationals, which mostly benefits their shareholders, who tend to be wealthy.

It is apparent to many observers that the textbook model of tax competition doesn't capture the behavior of today's largest multinational companies well. These firms don't seem to move much tangible capital to low-tax places—they don't even have much tangible capital to start with. Instead, they avoid taxes by shifting accounting profits. In 2016 for instance, Google Alphabet made $19.2 billion in revenue in Bermuda, a small island in the Atlantic where it barely employs any worker nor owns any tangible assets, and where the corporate tax rate is zero percent.[1] Contrary to the central postulate of the tax competition model, Bermuda does

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[1]https://www.bloomberg.com/news/articles/2018-01-02/google-s-dutch-sandwich-shielded-16-billion-euros-from-tax.

not have much to gain from attracting paper profits that don't improve wages for the population and that it taxes at 0%. Despite this, the standard view of tax competition between nations continues to permeate much of the discussion about tax policy. The most likely reason is that we do not currently have comprehensive estimates of how much profits multinationals shift to low-tax places. Nor do we have good explanations for why this form of tax avoidance, if its costs for governments in high-tax countries really is substantial, persists. Our paper bridges this gap by making two contributions, one empirical and one theoretical.

Our first—and most important—contribution is to produce new estimates of the size of global profit shifting using the macroeconomic data of tax havens. To our knowledge, it is the first time that tax haven macro data are used to estimate the amount of profits shifted to low-tax places. An advantage of this approach is that it enables us to compute the amount of profits shifted offshore in a direct and transparent way. Until recently, the data published by tax havens were too limited to conduct this exercise meaningfully. But in recent years, following data improvement efforts coordinated by, e.g., the OECD and the IMF, the statistical institutes of most of the world's developed countries—including the major tax havens—have started releasing new international investment data known as foreign affiliates statistics. These statistics record the amount of wages paid by affiliates of foreign multinational companies and the profits these affiliates make. We draw on these statistics to create a new global database recording the profits reported in each country by local vs. foreign corporations. This database enables us to have the first comprehensive map of where profits are booked globally.

We stress at the outset that we are well aware of the deficiencies of existing international investment data. The complex structures used by multinationals to organize their global activity and minimize their tax bills raise considerable challenges for statistical authorities. But these macro data are at present the most comprehensive that exist to study profit shifting—a phenomenon that has become so important that we cannot wait for perfect data to study it, and which has indeed been analyzed in the past by many authors using less comprehensive data than we now have. In addition, we feel that the best way for scholars to contribute to future data improvement is to use the existing international investment 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 macro data of all the world's countries, and to pinpoint the areas in which progress needs to be made.

In the first step of our empirical work, we construct and analyze a simple macro statistic: the ratio of pre-tax corporate profits to wages. Thanks to the new foreign affiliates statistics

exploited in this paper, we can compute this ratio for foreign vs. local firms separately. Our investigation reveals spectacular findings. In non-haven countries, foreign firms are systematically less profitable than local firms. In tax havens, by contrast, they are systematically more profitable—and hugely so. While for local firms the ratio of taxable profits to wages is typically around 30%–40%, for foreign firms in tax havens the ratio is an order of magnitude higher—as much as 800% in Ireland. This corresponds to a capital share of corporate value-added of 80%–90% (vs. around 25% in local firms). To understand these high profits, we provide decompositions into real effects (more productive capital used by foreign firms in tax havens) and shifting effects (above-normal returns to capital and receipts of interest). The results show that the high profits-to-wage ratios of tax havens are essentially explained by shifting effects. Overall, 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.

In the second step of our empirical work, we use new bilateral balance of payments statistics to trace the profits booked in tax havens to the countries where they have been made in the first place—and would have been taxed in a world without profit shifting. This allows us to provide the first comprehensive view of the cost of profit shifting for governments worldwide. We find that governments of the European Union and developing countries are the prime losers of this shifting. By our estimate, tax avoidance by multinationals reduces E.U. corporate tax revenue by around 20%. When we look at where the firms that shift profits are headquartered, we find that U.S. multinationals shift comparatively more profits than multinationals from other countries.

Our second contribution is to explain why, despite the high revenue costs involved, high-tax countries in Europe, developing countries, and the rest of the world have been unable to protect their tax base. Our innovation is to focus on the incentives faced by tax authorities, which had not been studied until now. We show theoretically that the fiscal authorities of high-tax countries do not have incentives to combat shifting to tax havens, but instead to focus their enforcement effort on relocating profits booked by multinationals in other high-tax countries. Chasing the profits booked in other high-tax places is feasible (the information exists), cheap (there is little push-back from multinationals, since it does not affect much their global tax bill), and fast (a framework exists to settle disputes between high-tax countries quickly). This type of enforcement crowds out enforcement on tax havens, which is hard (little data exists), costly (as multinationals spend large resources to defend their shifting to low-tax locales), and lengthy

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(due to a lack of cooperation between haven and non-haven countries).

We provide the first analysis of data on tax disputes between tax authorities. Our analysis shows, consistent with the theory, that the vast majority of high-tax countries enforcement effort are directed at other high-tax countries. In effect, non-haven countries steal revenue from each other while letting tax havens flourish.

This policy failure is reinforced by the incentives of tax havens. Although some of them like Bermuda have 0% corporate tax rates, most, like Ireland and Luxembourg, have low but positive rates. By lightly taxing the large amount of profits they attract, they have been able to 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. 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. The incentives of tax havens, however, are not enough to explain the persistence of this shifting—to understand it, one has to understand why high-tax countries' fiscal authorities have so far failed to curb it.

Our findings have implications for policy. First, they suggest that cutting corporate tax rates, as the United States did at the end of 2017, is less likely to generate quick positive effects on wages than textbook economic models suggest. For wages to rise, productive capital needs to increase, which can happen fast if capital flows from abroad, much less so if paper profits—not productive capital—is what moves across countries. Second, profit shifting raises new challenges for tax policy. It reduces the effective rates paid by multinationals corporations compared to what local firms pays. Whatever one's view about the efficiency cost of capital taxes, this seems difficult to justify—especially if part of the profits of multinationals derive form rents, which standard models suggest should be taxed. Profit shifting reduces the taxes paid by the wealthy—as ownership of these firms is highly concentrated—which might call for offsetting changes in individual income taxation, or changes in the way multinational companies are taxed (such as the adoption of a formula apportionment system making profit shifting harder).

Our results also suggest that some of the current policy efforts aimed at reducing tax avoidance by multinational corporations may in fact exacerbate it. The OECD has launched an initiative to curb base erosion and profit shifting. Action 14 of this plan calls for more effective dispute resolution mechanisms (OECD, 2015). But the easier it is for, say, the French tax authority to relocate profits booked in Germany, the less resources it will devote to chasing the profits shifted to Bermuda—increasing shifting to low-tax locales and reducing corporate tax

revenue globally. A more effective way for high-tax countries to curb profit shifting might be to impose economic sanctions (such as trade tariffs) to the jurisdictions that enable it. Our work provides transparent, easy to compute metrics for policy makers to track how much profits tax havens attract, how much they gain in tax revenue and other countries lose. These statistics, which we will update regularly online, could be used to monitor the impact of the policies implemented to reduce tax avoidance.

Last, our findings show that headline economic indicators, including GDP, corporate profits, trade balances, and corporate labor and capital shares, are significantly distorted. The flip side of the high profits recorded in 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 important implications for current debates about the changing nature of technology and inequality. We provide concrete proposals to improve economic statistics and the monitoring of global economic activity.

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 estimate of the amount of profit shifted to tax havens globally in Section 4, before decomposing this total by country (which countries lose more? which multinationals shift more?) in Section 5. Section 6 analyzes the incentives that tax authorities face and why high-tax countries have failed so far to curb profit shifting. We present our corrected estimates of GDP, corporate profits, trade balances, and factor shares in Section 7, and conclude in Section 8. There are numerous intricacies in the financial activities of tax havens and the international statistics. The most important ones are discussed in the article; others are detailed in a comprehensive Online Appendix that enable 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 too.[2]

2 Related Literature

Profit shifting by multinationals has attracted considerable attention among economists, policy makers, and the public. Yet despite the interest for these questions, we do not have a compre-

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[2]The Appendix and dataset are available online at `http://gabriel-zucman.eu/missingprofits`.

hensive view of how much profits are shifted globally. On the one hand, a large micro literature studies this question using financial accounts micro data, but these data do not capture well the subsidiaries of multinational companies in low-tax places—and therefore largely miss the profits shifted to these havens. On the other hand, a nascent macro literature studies profit shifting using macro data which are more comprehensive, but this literature has so far mostly focused on data published by the United States—hence on shifting by U.S. multinationals. Our paper pushes the literature forward by systematically exploiting a new source of data: the macroeconomic statistics of tax havens. We start by relating our work to previous attempts to estimate profit shifting. We highlight the main differences between our work and previous studies, and refer the reader to Appendix Section D for a detailed comparison of our results with earlier estimates.

2.1 Microeconometric Estimates of Profit Shifting

A large body of work studies profit shifting using corporate financial and balance-sheet micro-data, collected in the Orbis database of Bureau van Dijk.[3] Profit shifting is estimated by running regressions of the following form:

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

where π_{ic} denotes the pre-tax profits booked by company i in country c, τ_c the tax rate in country c, τ_p the tax rate in the company's parent's country, and $Firm_i$ and $Country_c$ firms 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 β. The OECD (2015) uses this methodology for its official estimate of the size of base erosion and profit shifting (see Johansson et al., 2016).[4]

One limitation of this procedure is that little 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

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[3]See Kalemli-Özcan et al. (2015) for a presentation of these data.

[4]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. 2016), 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).

or subsidiary by subsidiary. Orbis relies on administrative information in public business registries (collected by Chambers of Commerce throughout the world) to record how much profits multinationals make 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. 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. But in many of the world's countries, including prominent corporate tax havens, public registries are much more limited: they either do not exist (e.g., Bermuda), or when they do no income information is available (e.g., United States, Ireland, Switzerland).[5] As a result, much of the profits booked by multinationals in these countries are not visible in Orbis. For instance, as shown by Figure 1, Orbis correctly reports that the worldwide consolidated profits of Apple were 55.3 billion euros in 2016. But if one adds up all the profits recorded in Orbis by all of Apple's subsidiaries throughout the world, 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—which are known to be used by Apple[6]—are visible. Similarly large discrepancies are observed for Google Alphabet, Facebook, and Nike.

And these firms are far from isolated cases. In Figure 2, we compare the true consolidated global profits of each multinational in Orbis to the sum of its subsidiary-by-subsidiary profits. In 2012, only 17% of the global profits of multinationals could be traced in Orbis—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.[7]

The limited reporting of data in tax havens, already noted in the literature (e.g., Dowd et al., 2017), has two implications. First, it means that estimating equation 1 above with publicly available financial accounts data is likely to deliver estimates of β that are downwards biased.

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[5]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 available in these registries.

[6]See for instance the detailed U.S. Senate (2014) investigation on Apple's corporate tax structure; see also the analysis of leaked documents from the "Paradise Papers" at https://www.nytimes.com/2017/11/06/world/apple-taxes-jersey.html.

[7]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., Desai et al., 2003, Clausing, 2009) 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, however, can only be used to study shifting by U.S. multinationals, while we are interested in shifting by all multinationals.

Multinational companies usually 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, then the estimated β in Orbis is zero, while in actual facts it is positive and possibly large. This bias could explain the puzzling disconnect noted by Dharmapala (2014) between the relatively small estimated profit shifting elasticities from recent research and the "anecdotal evidence suggesting extensive income shifting among major multinational corporations." Second, estimating equation 1 with publicly available financial accounts data can lead to biased inferences about the location of shifted profits. For instance, 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 zero-tax countries.[8]

The main contribution of our paper is to bring in direct evidence on the amount of profits shifted offshore by analyzing the macro data published by tax havens. These data had not been systematically used so far, probably because a number of important havens did not report sufficient data and the statistics were hard to interpret. We leverage recent improvements: first, and most importantly, a number of major tax havens now public foreign affiliates statistics which provide direct information on the amount of profits made by foreign corporations. Second, following the implementation of the 6th edition of the IMF Balance of Payments Manual (IMF, 2009), most tax havens now publish balance of payments statistics that capture royalty and other service payments more accurately than in the past. Third, all tax havens from the European Union now report harmonized, bilateral balance of payments statistics to the E.U. statistical institute, Eurostat. These data allow us to directly estimate what fraction of global corporate profits are shifted to places where taxes are low, and out of where the profits are being shifted.

The tax havens macro data we use in this paper 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

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[8]Inferring the amount of profits shifted globally from financial accounts micro data (using variants of equation 1 above) faces other limitations which have been noted in the literature. Most of the work in this area focuses on estimating the marginal effects of tax differentials on reported pre-tax profits. This raises a number of issues. First, as already noted, it is unclear which tax differential matters to capture the incentives to shift profits. Second, it is unclear that marginal tax differentials matter much in explaining the behavior of multinational companies. The most prominent cases of profit shifting involve corner solutions where highly valuable intangible assets are shifted once and for all, independently of any change in tax laws. Third, the standard approach (as summarized by equation 1 above) under-estimates profit shifting if all firms shift profits, with the ones that have a parent in a low-tax country simply shifting more. Last, this approach misses modern forms of profit shifting, where a firm is incorporated in a tax haven (say Luxembourg), and from there directly sells services (such as digital subscriptions to music or movie databases) to foreign clients without any subsidiary abroad.

set of information to compile their cross-border investment, national accounts, and balance of payments statistics—most importantly corporate income tax returns, censuses of the activities of domestic and foreign corporations, and (private) income statements and balance sheets. As a result, the macro flow of profits recorded in these macro data is much larger than the one in Orbis. However, the macro data of tax havens are still imperfect and need to be corrected, as we discuss below.

2.2 Macro Estimates of Profit Shifting

A nascent literature takes a macro perspective to study multinationals' profit shifting. The OECD (2015) itself, while it used Orbis for its official BEPS estimate, also suggested that global macro data be used to estimate profit shifting. Most of this literature uses U.S. statistics, hence focuses on U.S. multinationals or foreign multinationals operating in the United States only (Clausing, 2009, 2016; Zucman, 2014; Guvenen et al., 2018). In this paper, by contrast, we take a global perspective and estimate profit shifting by all the world's multinationals.

Two recent studies, UNCTAD (2015) and Crivelli et al. (2015), use global macro data to study profit shifting and are the most closely related to our work. These studies, however, do not base their estimates on the macro data of tax havens, but on the data reported by the United States, European countries, and other non-haven countries.[9] The tax haven macro data we use in this paper allow us to overcome three limitations of these data. First, with macro data from non-haven countries only, one cannot directly see how much tax multinationals avoid by shifting profits, because one does not observe the taxes paid abroad by these firms. Second, one cannot directly infer which countries lose revenue—that is, out of which countries profits are being shifted. For instance, Zucman (2014, 2015) reports that more than half of the foreign direct investment income of the United States comes from tax havens. This statistic reflects the fact that U.S. multinationals make sizable profits in their subsidiaries in Ireland, Bermuda, Luxembourg, and similar havens. However it does not reveal whether these profits have been made in the United States, in Europe, or in developing countries.[10] The tax havens data allow

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[9]A number of papers in international finance (e.g., Lane and Milesi-Ferretti, 2018) also use tax haven macro data. This literature attempts to characterize patterns in international investment, not to estimate the size of profit shifting as we do here.

[10]Clausing (2009) estimates how much of the profits shifted 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. Our paper generalizes this approach by using balance of payments data (which capture all transactions, not only transactions within divisions of U.S. multinationals) and focusing on the types of cross-border transaction that are particularly conducive of profit shifting; see Section 3 below.

us to address this issue, because they show which countries pay interest, royalties, and service payments to tax havens—i.e., out of where profits are being shifted. Third, as we show below, the tax haven data better cover the service flows between havens and non-havens, which allows us to obtain a better estimate of the amount of profits shifted out of high-tax places than would be obtained using data of high-tax countries only. For instance, the services exported by Luxembourg to the non-haven E.U. countries are more than twice larger when seen from Luxembourg than from the non-haven E.U. countries.

2.3   Literature on Tax Competition

Our paper is also related to the large literature on international tax competition. While a large body of work focuses on competition for productive investment, a number of studies consider profit shifting, its interaction with competition for productive capital, the incentives of tax havens, and the costs involved for non-haven countries.[11] We make several contributions to this literature. First, and most importantly, our paper is the first to highlight the incentives of tax authorities, to show that these authorities do not combat shifting to tax havens but instead try to relocate profits booked in other high-tax countries, and to explain why. This insight can explain why tax avoidance by multinationals persists despite its revenue costs for high-tax countries. Second, we are the first to quantify the benefits that tax havens derive by supplying tax avoidance services to foreign multinationals. This computation could not be done in a comprehensive manner previously due to the lack of macro estimates of the profits shifted to these havens.

3   Conceptual Framework and Methodology

There are two main steps in our empirical analysis: first we estimate the amount of profits shifted to tax havens; second we apportion these profits to the countries where they have been made in the first place (or to the countries where tax-avoiding multinationals are headquartered). We discuss each step in turn.

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[11]See Desai et al. (2006); 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).

3.1 Macroeconomic Profitability Ratios

We base our estimate of the amount of profits shifted to tax havens on macro data on corporate profits that we collected for all the world's countries including tax havens. Our key statistic of interest is the ratio π of pre-tax corporate profits to wages. A high π is indicative of inward profit shifting, while a low π is indicative of outward profit shifting. We are interested in how this statistic varies across countries, and how it varies within countries but across firms depending on whether firms are foreign or not.

We define π 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, corporate profits, accrues to the owners of capital: $Y = F(K, AL) = rK + wL$. The capital share of corporate output is $\alpha = rK/Y$ and the ratio of corporate profits to wages is $\alpha/(1 - \alpha)$. Corporations pay p percent of their profits rK in net interest. We define corporate profits as $(1 - p) \cdot rK$. Our ratio of interest π measures how much taxable profits are generated by resident firms per dollar of wage paid: $\pi = (1 - p) \cdot \alpha/(1 - \alpha)$.[12] We subtract net interest paid from corporations' profits 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 typically offset by interest received by financial corporations), so π 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 depreciation from profits, because depreciation is deductible from taxable profits. Thus Y, α, r, and π are all net of capital depreciation.

There are three forms of profit shifting, and each affects the recorded profit-to-wage ratio π. First, multinational groups manipulate intra-group exports and import prices: subsidiaries in high-tax countries export goods and services at low prices to related firms in low-tax countries, and import from them at high prices.[13] Such transfer price manipulations reduces π in high-tax countries and increases it in tax havens. Second, multinationals shift profits using intra-group interest payments: affiliates in high-tax countries borrow money (potentially at relatively high

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[12]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.

[13]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).

interest rates) from affiliates in low-tax countries, which again reduces π in high-tax countries and increases it in tax havens.[14] Last, multinationals locate intangibles—such as proprietary trademarks, logos, and algorithms—in tax haven affiliates. These affiliates then receive royalties which boost π and reduces taxable profits in non-havens countries.

In addition to the profits-to-wage ratio at the country level (π), we are also interested in the profits-to-wage ratio for foreign corporations (π_f) and local firms (π_l) within each country. Following internationally-agreed guidelines, foreign firms include all firms where foreign investors own more than 50% of shares with voting rights. However this condition is sufficient but not necessary: there are some other ways firms can be foreign-controlled (see Eurostat, 2012, for a detailed discussion). Local firms are all firms that are not foreign. A positive $\pi_f - \pi_l$ gap is indicative of inward profit shifting into foreign firms, while a negative $\pi_f - \pi_l$ gap is indicative of outward profit shifting by foreign firms.

We compute π in tax havens and non-haven countries using harmonized national accounts data that follow the 2008 System of National Accounts (United Nations, 2009). We include in our list of tax havens all the countries considered as havens by Hines and Rice (1993), as well as Belgium and the Netherlands.[15] The basic data source to compute π is the OECD's detailed national accounts by sector (Table 14A). This source covers the most prominent corporate tax havens: Ireland, Luxembourg, Netherlands, Belgium, and Switzerland. For the other tax havens (such as Singapore, Hong Kong, and Puerto Rico) we have gathered all the national account data from each country's own statistical authorities. When no national accounts were available (which is the case for a number of Caribbean tax havens, most importantly Bermuda and the Cayman Islands), we imputed data based on counterpart countries' statistics, as described in details in the Online Appendix Section A. We compute profitability for foreign vs. local firms within each country using harmonized foreign affiliates (FATS) statistics. These data are disseminated by Eurostat and the OECD. When no FATS data are available, we impute π_f and π_l by using balance of payments data and counterpart country statistics (see Online Appendix Section A).

Table 1 presents summary statistics for global output and profits. In 2015, global gross

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[14]For instance, Desai, Foley, and Hines (2016) show that U.S.-owned affiliates in low-tax countries use trade credit to lend, whereas those in high-tax countries use trade credit to borrow.

[15]The Netherlands was not considered as a tax haven by Hines and Rice (1993) 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.

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 affiliates of 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 US (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., close to 40%, were shifted to tax havens.

3.2 Decomposition of Tax Havens Profits: Real Capital vs. Shifting

Conceptually, a high profits-to-wage ratio in tax havens can be due to two things: either there's a lot capital used in production (and the marginal return to capital is not too low), or profits are being artificially shifted offshore. We are interested in identifying which fraction of the high profits booked by multinationals in their tax haven affiliates are due to real capital vs. paper profits moving to where taxes are low.

To do this, 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 $Y = K^\alpha (AL)^{1-\alpha}$. If net interest paid ($p$) is zero and $\alpha = 25\%$, then all countries have a true $\pi = 33\%$ and any deviation of the recorded π from this value reflects profit shifting. Specifically, countries with recorded π above 33% attract paper profits from abroad (they have $\pi_f > \pi_l = 33\%$), while countries with recorded π below 33% shift profits abroad (they have $\pi_f < \pi_l = 33\%$).

In the more general case where countries have a constant elasticity of substitution (CES) production function, π varies with the capital stock depending on the value of the capital-labor elasticity of substitution σ. If $\sigma > 1$, then countries with a high capital intensity K/AL have high profit-to-wage ratios π. Conversely, if $\sigma < 1$, then countries with a low capital intensity have low π. To identify the contribution of capital intensity to profits-to-wage ratios, we decompose π into three components:

$$\pi = \frac{K}{wL} \cdot r \cdot (1 - p) \tag{2}$$

Where r is the measured return to productive capital, 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 σ to infer what fraction of the variation in π can be attributed to differences in 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). As we shall see, our estimate of the amount of profits shifted to tax haven affiliates will not depend on the assumed σ, because it turns out that foreign corporations in tax havens have similar capital intensity than those in high-tax countries. As a result, whatever assumption one makes about σ, differences in capital intensity cannot explain more than a small fraction of the high π_f of tax havens—almost all of it is due to artificial profit shifting.

3.3 How we Apportion the Shifted Profits

To apportion the shifted profits to the countries where they have been made in the first place, we track the cross-border flows of tax havens as recorded in their balance of payments.

Profit shifting affects the balance of payments of tax havens in two polar ways. First, it inflates their trade surplus (because of intra-group transfer price manipulations) and the net interest they receive (because of intra-group loans). Second, the profits accruing to the foreign owners of affiliates where profits are shifted show up as high direct investment equity income paid (dividends plus reinvested earnings). By following the bilateral trade and interest flows of tax havens, one can identify the countries out of which profits are shifted. By following their bilateral direct investment equity income payments, one can identify the countries where the multinationals that shift profits are headquartered. We do so using the bilateral balances of payments of tax havens that follow the 6th edition of the IMF (2009) Balance of Payments Manual.[16]

More precisely, to identify the countries out of which profits are shifted, we follow the destination of tax havens' service exports and intra-group interest payments.[17] We disregard goods exports, which are typically less conducive of profit shifting because reference prices are easily

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[16]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 flow data are available (as is the case for a number of non-E.U. tax havens), we impute data using counterpart country statistics, see Online Data Appendix Section B.

[17]This procedure is consistent with the way that profit shifting is perceived by U.S. policy makers: in December 2017, the United States introduced a "base-erosion anti-avoidance tax" (BEAT) tax that presumes that services transactions by multinational firms with related parties are motivated by tax avoidance. An alternative approach would involve trying to figure where production has "truly" taken place. 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.

observable by tax authorities.[18] Among services, we focus on exports of rights to use intellectual property (patents and trademarks), headquarter services (administration, management and advertising), information and communication technology services, and financial services, which have been found in the literature to be most conducive of shifting (Hebous and Johannesen, 2016). One advantage of using the service exports data reported by tax havens is that they are more comprehensive than service imports data 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.).[19] 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). Using tax haven data is critical to 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.

4 The Level and Rise of Global Profit Shifting

4.1 Above Normal Profitability in Tax Havens

We start the analysis by displaying in Figure 3 how the profit-to-wage ratio π varies across countries. Among non-haven countries, π average 36% in 2015. That is, for any dollar of wage paid, corporations made 36 cents in taxable profits. This ratio 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.[20] By contrast, tax havens are abnormally profitable. In Singapore

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[18]See Appendix Section D, where we discuss the evidence in the literature on the magnitude of profit shifting through the mis-pricing of intra-firm goods trade vs. other channels.

[19]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.

[20]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

and Hong Kong, the macroeconomic profit-to-wage ratio exceeds 100%; in Ireland, Puerto Rico, and Luxembourg, it exceeds 200%.

The true profitability ratios of tax havens are higher than recorded in their national accounts, because the official statistics miss some of the profits made by affiliates of multinational companies. We know this because parents of multinational companies receive more profits from their affiliates in tax havens (in the form of dividends and reinvested earnings) than what these affiliates report paying to their parents. At the global level, more direct investment equity income is received than paid.[21] This gap reaches about $200 billion in 2015. In Appendix B, we decompose it in a comprehensive way by leveraging the bilateral direct investment income data of all the world's countries. We find that the bulk of it comes from missing payments by affiliates located in Ireland, Luxembourg, Netherlands, and Caribbean tax havens. In Figure 3 we correct for this problem by adding the missing profits paid by tax havens affiliates to U.S. and E.U. parents. That is, we add the discrepancy between direct investment equity income received by the United States and non-haven E.U. countries from Ireland, the Netherlands, Luxembourg, etc., and the income that these havens record paying to the United States and European Union countries. Most of the discrepancy comes from missing payments to the United States. The United States has the world's most sophisticated system for recording the activities of its multinationals abroad, based on exhaustive census-like surveys conducted every five years since 1950, and quasi-exhaustive, detailed surveys conducted annually since 1982 (see Appendix Section A.1). Therefore the U.S. data are likely to be more accurate than those reported by tax havens, which are likely in particular to miss some of the profits made by special purpose entities (due to a lack of comprehensive enough corporate registries, non-response to surveys, or other data issues; see, e.g., Angulo and Hierro, 2017; Damgaard and Elkjaer, 2017; and our discussion and supplementary results in Appendix A). By construction, our correction ensures that at the global level, parents receive as much profits from their subsidiaries as what subsidiaries pay to their parents (i.e., global net direct investment income adds up to zero). Note that it is possible that some parents themselves under-estimate the income that accrues to them in their offshore subsidiaries—in which case we would under-estimate the amount of profits booked in

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rates, low or no minimum wages).

[21]By contrast, for portfolio and other investment income—i.e., cross-border capital income other than payments within divisions of multinational companies—the opposite gap exists in the data: more income is paid than received. As shown in Zucman (2013), this can be explained by the fact that dividends and interest earned by households on their offshore bank accounts are duly recorded by the paying country but not by the payee. For instance if a French household has a bank account in Switzerland and owns U.S. equities on her Swiss account, the dividends paid by the U.S. are duly recorded in the U.S. balance of payments, but neither Switzerland nor France records any dividend receipt. Alstadsæter et al. (2018) provide estimates of offshore household wealth by country.

tax havens. We discuss alternative corrections in Appendix A.

The high profitability of tax havens is driven by foreign corporations. It does not owe to structurally higher capital shares in places where taxes are low (which could in principle be the case if low-tax countries also have pro-capital and anti-labor institutions, such as bans on unions, no or low minimum wages, etc.). In fact, as shown by Figures 4 and 5, the local firms of tax havens are generally as profitable as the local firms of non-haven countries. Foreign corporations, on the other hand, have extremely high profitability ratios in tax havens, e.g., 800% in Ireland. This corresponds to a capital share of corporate value-added of 80%-90% (vs. around 25%–30% in local firms). By contrast, and strikingly, in almost all non-haven countries foreign firms are *less* profitable than local firms. Thus, there is a clear trace in global macro data of shifting from high- to low-tax affiliates, in such a way that profitability is systematically over-stated in tax havens and under-stated elsewhere.

The profitability of haven firms has surged since the 1980s. As shown in the top panel of Figure 6, in Ireland—the tax haven for which the longest and highest quality time series exist—π 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. 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). By contrast, in non-haven countries π never dramatically varies. It has tended to increase since the 1980s, 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.

In the bottom panel of Figure 6, 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, a similar pattern emerges. In the early 1970s, the haven and non-haven affiliates of U.S. multinationals were as profitable, with a π ratio around 50%. Since then, profitability for haven affiliates has sharply increased: for them π exceeds 350% today, while it has stayed constant for non-haven affiliates.

4.2 Decomposing The High Profits of Haven Affiliates

Why are the tax haven affiliates of foreign multinationals so profitable? The available data suggest that their high profits essentially stem from high rates of returns on assets—not high capital intensities. We show this by focusing on the majority-owned affiliates of U.S. multina-

tionals in tax havens, for which the data is particularly good. Crucially, the outward FATS of the United States include information on the stock of capital used by foreign affiliates of U.S. multinationals, in contrast to the outward FATS of other countries and the inward FATS of tax havens, which currently don't.

We compare the haven affiliates of U.S. multinationals to their non-haven affiliates. As shown by the top Panel of Figure 7, the haven affiliates of U.S. multinationals are on average five times more profitable than their non-haven affiliates. Consistent with the patterns shown above for all multinationals, affiliates in Ireland, Luxembourg, Bermuda and the Caribbean are particularly profitable, with profits-to-wage ratios above 500%. The bottom panel of Figure 7 decomposes the profit-to-wage ratio of the affiliates of U.S. multinationals following equation 2 above. In 2015, haven affiliates have slightly higher capital intensities than non-haven affiliates, but barely so. By contrast their rate of return on tangible capital is more than three times higher. They also receive slightly more interest payments—but by far the main driver of their profitability is their high returns on tangible capital. Consistent with the existing evidence in the literature (e.g., Heckemeyer and Overesch 2013), shifting through debt does not appear to play a major role.

More broadly, the bottom panel of Figure 7 shows that globalization, so far, has not made capital move to low-tax places, in the sense that the relative capital intensity of low vs. high-tax places has remained close to 1 since the 1960s. There is evidence of an increase in the relative capital intensity of tax haven affiliate starting in the late 1990s. But this increase is small compared to the large rise in the rate of return recorded in low-tax affiliates (i.e., profit shifting). Of course, we do not know what would have happened in a counter-factual world without profit shifting. In such a world, firms might have moved more physical capital to low-tax places—i.e., there may be substitution between real capital mobility and artificial shifting (Hong and Smart, 2010). What the data suggest is that, so far, profit shifting seems to have swamped real capital mobility.

Conceptually, the high rates of return of haven affiliates can be seen as the product of two effects. First, multinationals book intangible assets such as patents, logos, algorithms, etc., 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 case 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 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. However, this distinction is not relevant for our purposes: both of these techniques effectively shift profits out of high-tax places without any tangible assets moving across borders.

Another indication that the high π_f of tax havens is due to artificial shifting, not tangible capital moving to low-tax places, is that haven affiliates are systematically more profitable within sector, including in service industries that barely use tangible capital at all. We illustrate this in the Appendix with the case of U.S. affiliates. The haven affiliates of U.S. multinationals are an order of magnitude more profitable than non-haven affiliates in the same sector. Profit shifting is not limited to just a few sectors of the economy, such as information and communication technology (where intangible capital plays a large role): it is an across-the-board phenomenon.

To form our benchmark estimate of the amount of profits shifted to tax havens, we set π_f equal to π_l within each tax haven. That is, we assume that absent profit shifting, foreign corporations would be as profitable as local firms. We have conducted extensive robustness checks, presented in Appendix Section A, and found only second-order effects on our results.[22] We present our estimate of the amount of profits shifted in 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, which is 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 multinational companies, 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.

5 Decompositions of the Shifted Profits

5.1 Sales vs. Residence Allocation

The top panel of Figure 8 presents our estimate of where the shifted profits come from. The pink bar 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 risky services (i.e., services conducive of profit shifting, such as exports of intellectual

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[22]For instance, we let π_f and π_l differ for non-shifting reasons by computing capital intensity in the foreign vs. local sector, and considering that both sectors have the same CES production but with an elasticity of substitutions between capital and labor σ different than one. Because in practice foreign corporations in tax havens are not particularly capital intensive, the impact on our results is negligible.

property). As described in Appendix C, we find that the amount of intra-group interest received and risky services exported by tax havens (above and beyond what could be expected given the size of their economies) totals about $600bn. That is, it matches our independent estimate of the amount of profits shifted in tax havens (based on setting $\pi_f = \pi_l$ 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. 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.

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 8). 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 6th edition of the IMF (2009) Balance of Payments Manual (see Appendix Section C.2 for a detailed discussion). 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. As explained in Wright and Zucman (2018), 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 (what is known as check-the-box regulations).

In the bottom panel of Figure 8, we compute the losses of corporate income tax revenue implied by our estimate of where the shifted profits come from. That is, we assume that intra-group interest payments to tax havens and imports of risky services from tax havens reduce the tax base in non-haven countries, and we compute how much revenue would be collected absent these flows, everything else equal. By our estimate, corporate tax avoidance 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 top two panels of Table 2 provide country-by-country estimates of the amount of shifted profits and of the tax revenue loss involved for governments worldwide. The revenue loss varies significantly among 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 tends to limit 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.

5.2   The Tax Revenue Gains of Tax Havens

Profit shifting redistributes the tax base and tax revenue across countries. Using our new 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 9, 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 9, most of their revenue derive from taxes collected on foreign firms. With source taxation (and no international coordination or sanction against tax havens), tax havens can generate sizable revenue by taxing the foreign profits they attract at 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.[23]

Figure 10 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 6), 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

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[23]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.

statutory corporate tax rate (bottom panel of Figure 10): 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. However, although tax havens do collect revenue, profit shifting significantly reduces corporate income tax payments globally: for each $1 paid in tax to a haven, close to 5$ are avoided in high-tax countries. More than redistributing tax bases across countries, profit shifting redistributes income to the benefit of the shareholders of multinational companies. Because equity ownership is concentrated, these shareholders tend to be wealthy, hence profit shifting tends, everything else equal, to increase inequality. This stands in contrast with tax competition for real capital which has ambiguous effects on inequality, as it can increase wages.

6 The Incentives of Tax Authorities

Why is a high fraction of multinationals' profits shifted to tax havens? The incentives of tax havens can explain the rise of shifting since the 1980s, but they are not enough to explain why, despite the high revenue costs involved, this profit has persisted since then. Why haven't non-haven countries been able to defend their tax base? To understand why profit shifting has persisted so far, one has to understand how tax authorities throughout the world—in particular in Europe, the region where revenue losses are the highest—attempt to enforce taxes on multinational companies and the incentives they face.

6.1 Transfer Price Correction and Mutual Agreement Procedures

To ensure profits are taxed where they have been made (i.e., the prevailing internationally-agreed rules), tax authorities in high-tax countries routinely audit large companies. They check that intra-group transactions are conducted at arm's length (i.e., as if the subsidiaries of a given multinational group were independent entities). When they find it is not the case, they can attempt to ask multinationals to correct their transfer prices, which results in a relocation of taxable income across countries.

In the current international tax system, tax authorities have incentives to relocate profits booked in other high-tax countries—not profits shifted to havens. Take the case of France. €1 relocated to France is worth the same to France whether it comes from Germany or from Bermuda. But it is easier for the French tax authority to relocate €1 booked in Germany, for three reasons. First, it is feasible, because information exists on the profits booked in Germany (from Orbis),

while no or little information typically exists on the profits booked in Bermuda.[24] Second, it is more likely to succeed, because firms are unlikely to spend much resources opposing this transfer price correction: for them, whether profits are booked in France or Germany makes little difference to their global tax bill, since the tax rates in France and Germany are similar. Third, if there is a dispute between France and Germany, it is likely to be settled relatively quickly through the dispute resolution agreements in force among OECD countries and E.U. countries.[25] The correction of transfer prices involving transactions between France and Germany crowds out the correction of transfer prices involving transactions between France and low-tax countries. Such corrections are harder to make (less data exist on the profits booked in tax havens), more costly (as firms spend legal resources to defend their transfer pricing optimization), and take more time (due to a lack of cooperation with some tax havens). In Section E.2 of the Online Appendix, we formalize this argument and make precise the conditions under which it is optimal for high-tax countries to focus their enforcement resources on relocating profits booked in other high-tax countries.

6.2   Patterns in International Tax Enforcement

This theory is supported by the available data. Our analysis of the enforcement activities of tax authorities globally shows that most transfer price corrections are between high-tax countries. These corrections typically do not increase the taxes paid by multinationals, but merely re-shuffle tax payments across high-tax places.

In 2014, the audit firm EY conducted a transfer price authority survey in which they asked 26 major economies which countries were the main focus of their transfer price correction efforts. As shown by the top panel of Figure 11, throughout the world, countries most often targeted in transfer price disputes are high-tax countries. The United States comes first, followed by Germany, and Japan. Among tax havens, only Switzerland and the Netherlands show up as

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[24]In recent years, governments have sought to get access to more information by asking multinational firms to report country-by-country breakdowns of their profits. We discuss below how more information affects enforcement.

[25]OECD countries have created dispute settlement mechanisms making it easy for a tax authority in country A to relocate profits that it considers have been mistakenly booked in country B. In the European Union, a strict system—known as the Arbitrage Convention—is in place to ensure that disputes among two E.U. countries are settled within two years. If the tax authorities do not come to terms in that time frame, an external panel is brought in to settle the case. The procedure works as follows. After a tax authority has decided on a transfer price correction nationally, the firm may ask the tax authority to enter into a Mutual Agreement Procedure with the countries suspected of having excessive taxable income. The tax authority that increased its own tax base will then approach the country that it perceives as the one having to reduce its tax base. Bluntly put, the tax authority conducting the transfer price correction will ask a foreign government to pay for this. For an economic analysis of mutual agreement procedures, see Becker and Davies (2014).

being sometimes targeted. Ireland (which according to our estimates is the number one shifting destination in 2015) is never among the top 3 targets.

Furthermore, as shown by the bottom panel of Figure 11, in the European Union 90 percent of all mutual agreement procedures are between two high-tax countries. Cases involving tax havens (Ireland, Luxembourg, Netherlands, Belgium, Cyprus, Malta) are rare. One caveat here is that firms might not care to initiate a mutual agreement procedure with a tax haven if they are not paying any tax in that haven. We would thus like to see the composition of the transfer price correction initiated by the tax authority (and not only the distribution of mutual agreement procedure cases). Such data is not available at the EU level, but we have been granted granted access to such statistics in Denmark. As reported in the Appendix, the vast majority of transfer price corrections initiated by the Danish tax authorities involve other high tax countries. As Denmark has a moderate corporate tax rate (22% in 2015), this finding implies that the majority of transfer price corrections initiated by Denmark involve countries with higher rates—hence, if successful, ultimately *lower* the taxes paid by the targeted firms.

Could more information lead tax authorities to focus more of their resources on curbing shifting to low-tax places? Our analysis suggests that more information is in itself not enough to address the enforcement problem uncovered in this paper. Even if the tax authorities had access to perfect information on the amount of profits booked by each firm in each country, multinational companies would still have incentives to fight tax authorities (e.g., by spending substantial legal resources) when these authorities attempt to relocate profits booked in low-tax places. Internalizing this, tax authorities would still have incentives to try to chase the profits booked in high-tax places instead (see Appendix E.2 for a formal discussion). Better information is necessary to address the enforcement issues discussed in this paper, but not sufficient. The enforcement problem is inherent to the way governments currently tax multinational companies (i.e., inherent to the use of transfer prices to allocate taxable income across countries). It would, however, disappear if governments taxed the consolidated profits of multinationals and used an apportionment formula to allocate profits across countries (similar to the way U.S. States tax U.S. profits). In such a system, intra-group exports, imports, and interest payments are irrelevant, hence profit shifting as it currently exists is not possible.

7   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 coun-

tries 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.[26]

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.[27] 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). Because there was almost no profit shifting before the 1980s (see, e.g., Figure 6) 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

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[26]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.

[27]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).

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.[28]

8 Conclusion

What have we learned from this paper? In our view the main finding is that there is nothing natural in the decline of corporate income tax rates. Profit shifting, more than tax competition for productive capital, is the key driver of this decline. It is not a necessary by-product of globalization and technological change, but the result of policies—in particular tax enforcement issues—in high-tax countries. Globalization does not imply that corporate income tax rates are bound to fall.

Tax avoidance by multinationals is quantitatively significant: by our estimates, close to 40% of multinational profits are shifted to tax havens in 2015. This shifting rose and persists because it increases tax revenue (not wages) in tax havens, and because the incentives of high-tax countries' fiscal authorities, quite counter-intuitively, prevent them from curbing it.

We stress that our estimates of the amount of profits shifted by multinationals globally is conservative. Our investigation has uncovered important 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 already does). A number of Caribbean tax havens do not currently publish comprehensive enough national account (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.

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[28]See Sandholtz (2018) for an estimation based on U.S. bilateral trade data.

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

	Trillions 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)

|	Reported pre-tax profits	Of which: Local firms	Of which: Foreign firms	Shifted profits	Effective corporate tax rate	Corp. tax revenue loss/gain (% collected)
OECD countries						
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%
Main developing countries						
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%
Tax havens						
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**		

Source: Appendix Tables A.6., A.7, C.4d, and C.4.

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

|	Corrected capital share	Difference with published data	Corrected trade balance	Difference with published data
OECD countries				
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%
Main developing countries				
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.

# Figure 1: The Missing Profits of Apple, Google, Facebook, and Nike
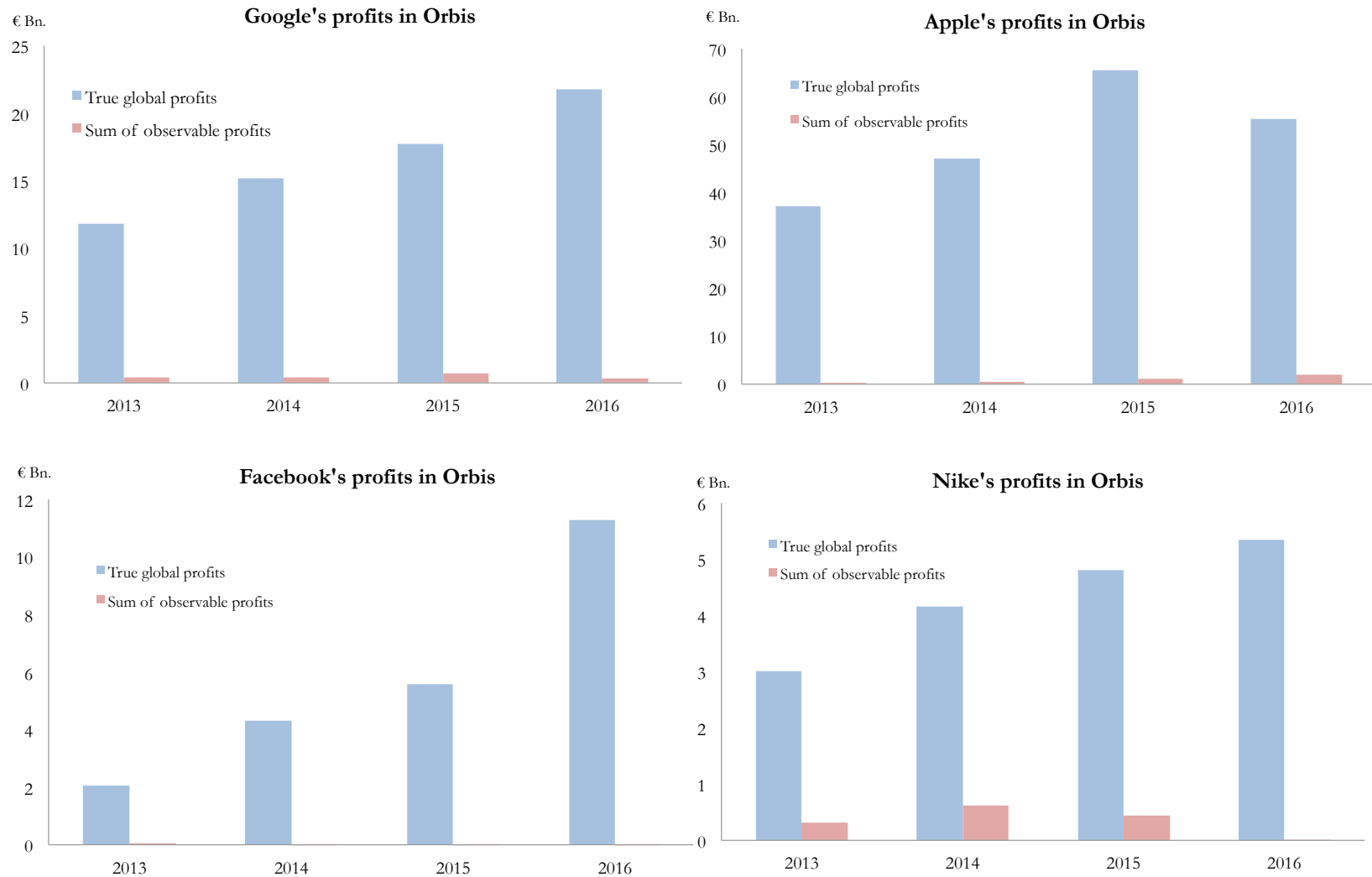
Notes: This graph shows the difference between Apple's, Facebook's, Alphabet's, and Nike's global consolidated profits, and the sum of the profits made by Apple's, Facebook's, Alphabet's, and Nike's subsidiaries, as recorded in Orbis. The difference is due to the fact that the subsidiaries where these firms make the bulk of their profits are not visible in Orbis. Source: authors' computations using Orbis data.

# Figure 2: The Missing Profits in Orbis
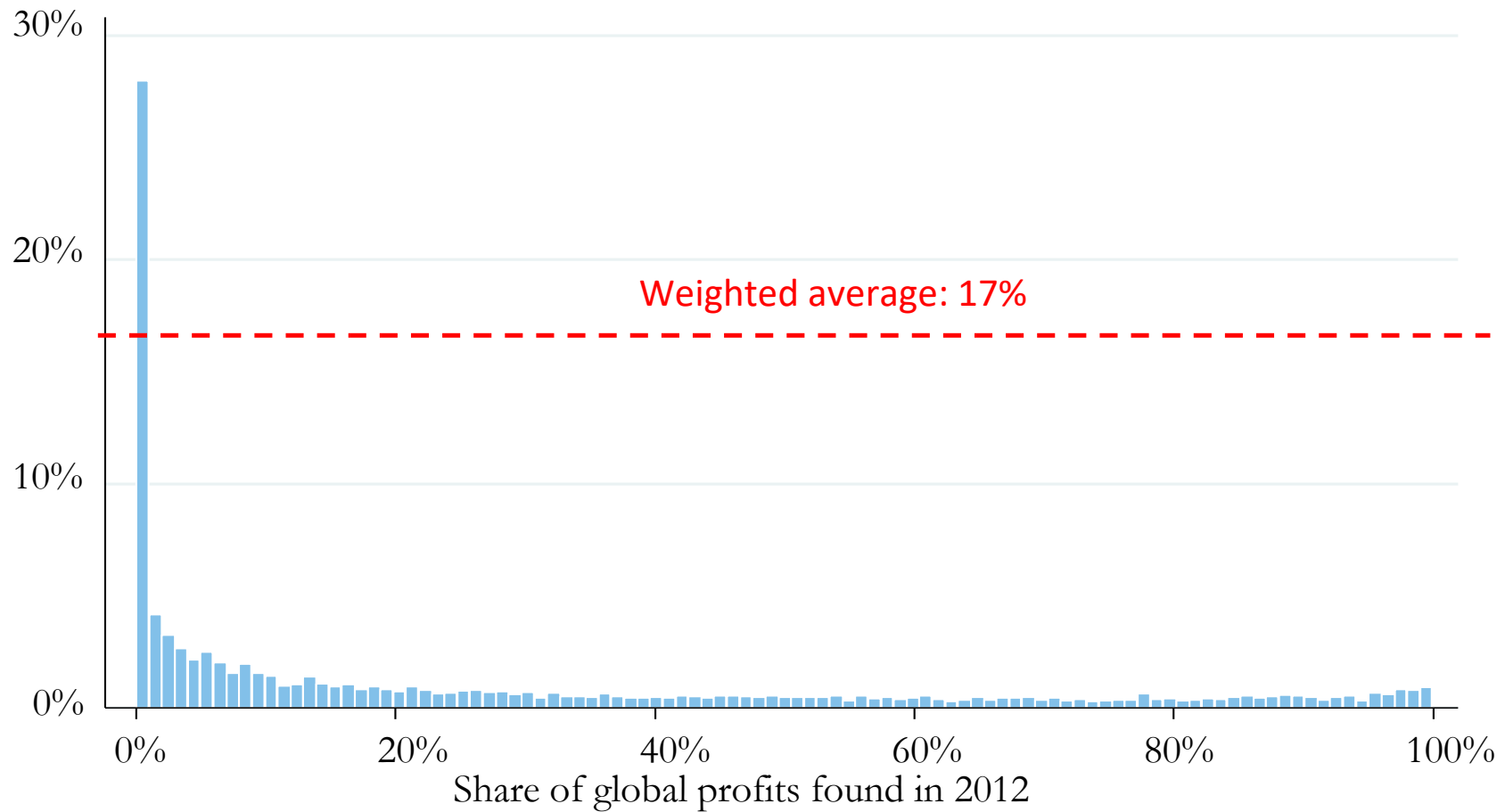
Notes: This graph shows the density of the following ratio. For each multinational firm in Orbis, we compute the sum of the unconsolidated pre-tax profits of all subsidiaries (code U1), and we divide this sum by the consolidated global profits of the firm (code C1). Whenever the ratio is less than 1, 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)
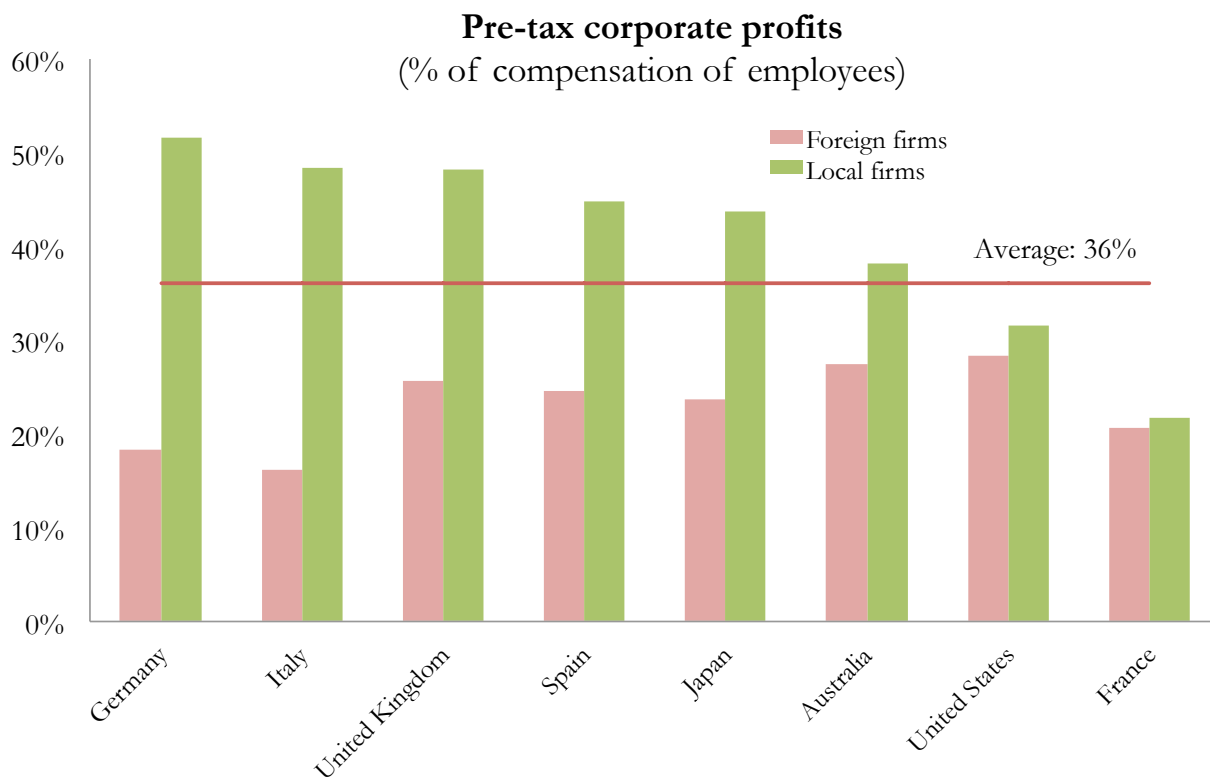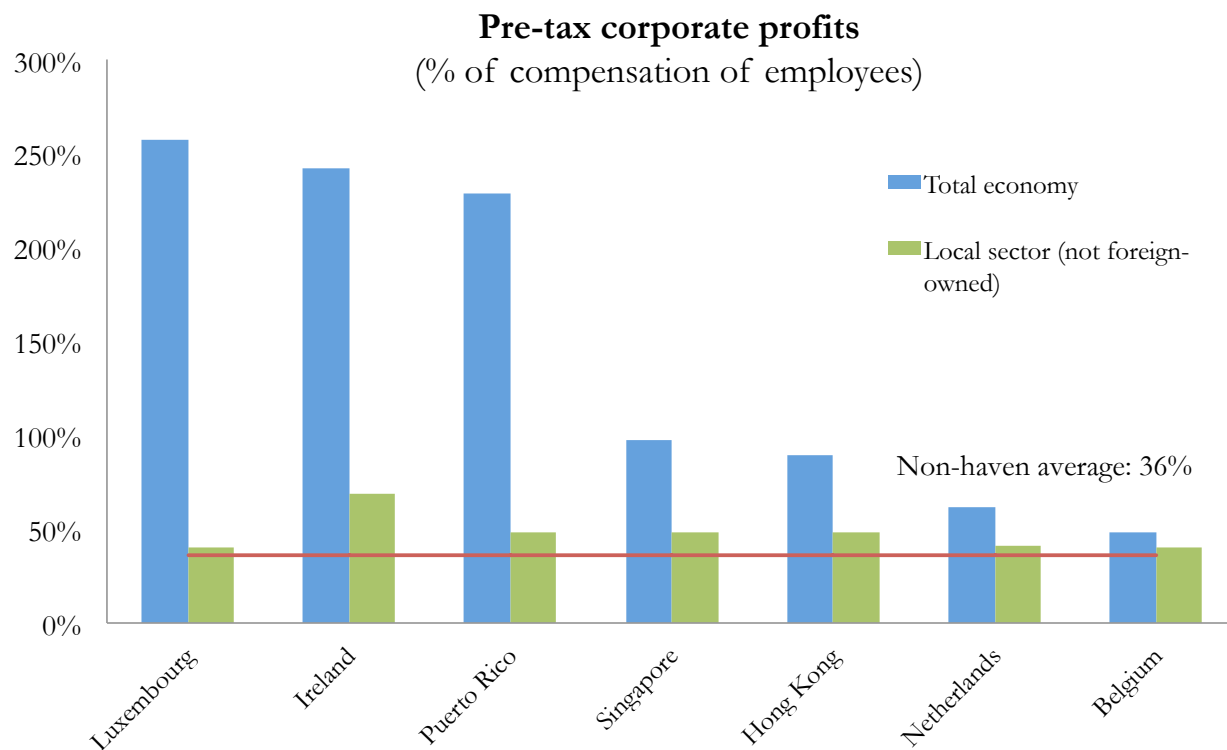

Average among non-havens: 36%
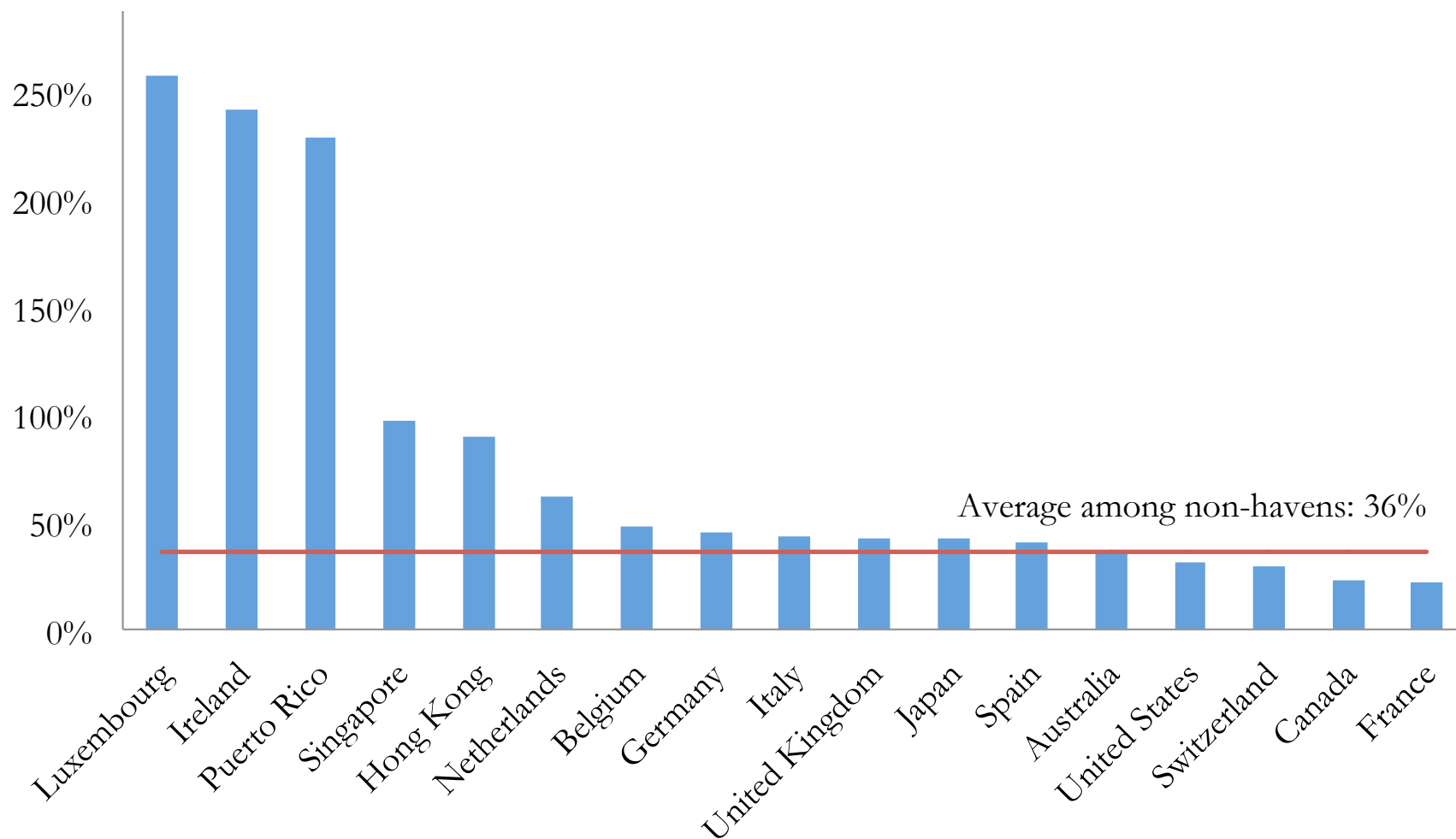
Notes: the bar shows the ratio of pre-tax corporate profits (net of interest and depreciation) to compensation of employees in 2015, as recorded in national accounts data. Source: Appendix Table A.7.

**Figure 4: Profitability in Foreign vs. Local Firms**

Pre-tax corporate profits

(% of compensation of employees)

■ Foreign firms
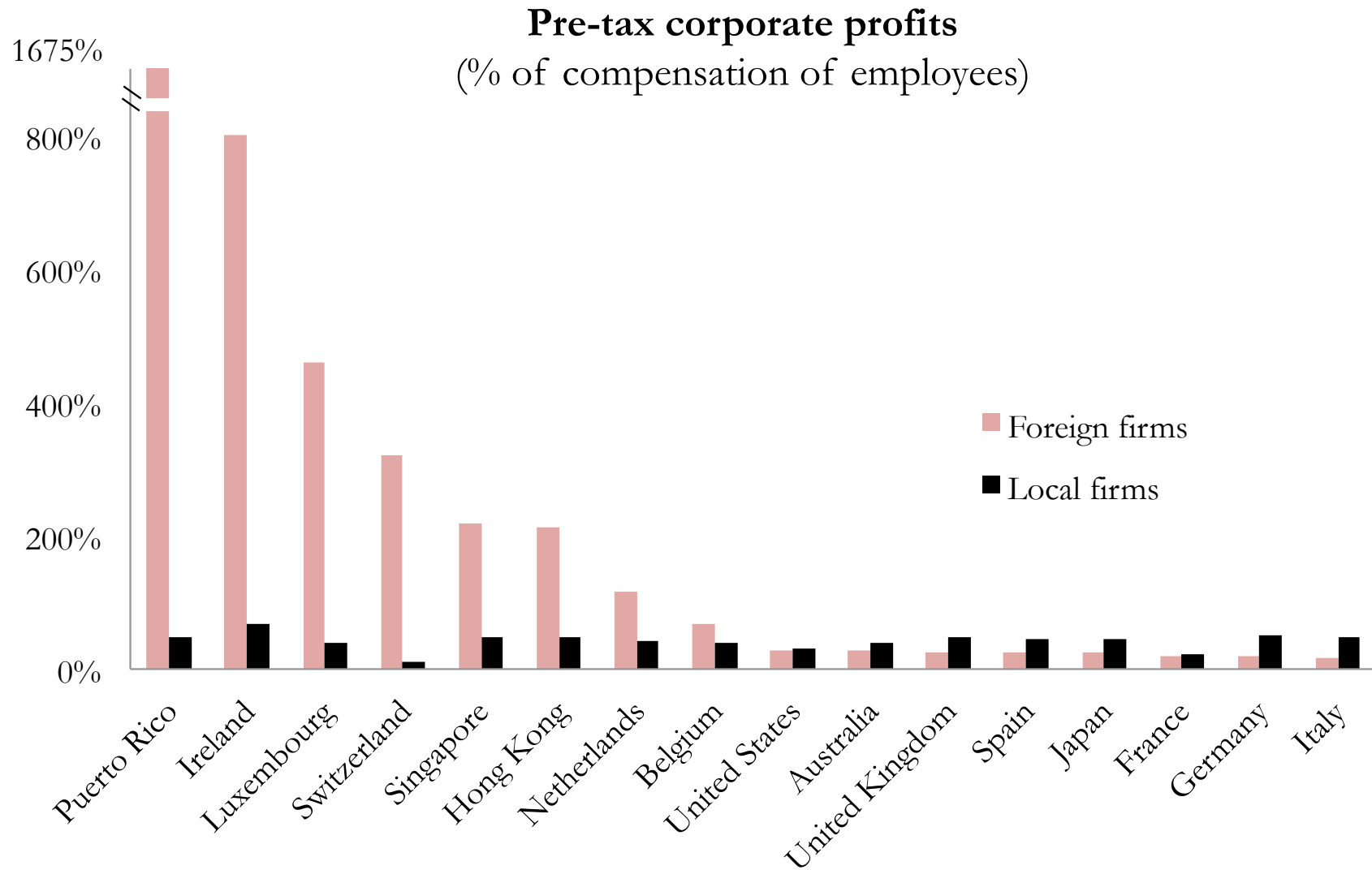
■ Local firms

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

Figure 5: Profitability in Foreign vs. Local Firms

Pre-tax corporate profits
(% of compensation of employees)

- Total economy (blue)
- Local sector (not foreign-owned) (green)

Non-haven average: 36%

Countries: Luxembourg, Ireland, Puerto Rico, Singapore, Hong Kong, Netherlands, Belgium

Pre-tax corporate profits
(% of compensation of employees)

- Foreign firms (pink)
- Local firms (green)

Average: 36%

Countries: Germany, Italy, United Kingdom, Spain, Japan, Australia, United States, France

Notes: the blue bar shows the ratio of pre-tax corporate profits (net of interest and depreciation) to compensation of employees in 2015. The green bar shows the same ratio but for local firms only—defined as firms that are less than 50% owned by foreigners—and the pink bar for foreign firms only. Source: Appendix Table A.7.

Figure 6: The Rise of Profit Shifting

Pre-tax corporate profits
(% of compensation of employees)

Pre-tax profits of affiliates of U.S. multinationals
(% of compensation of employees)
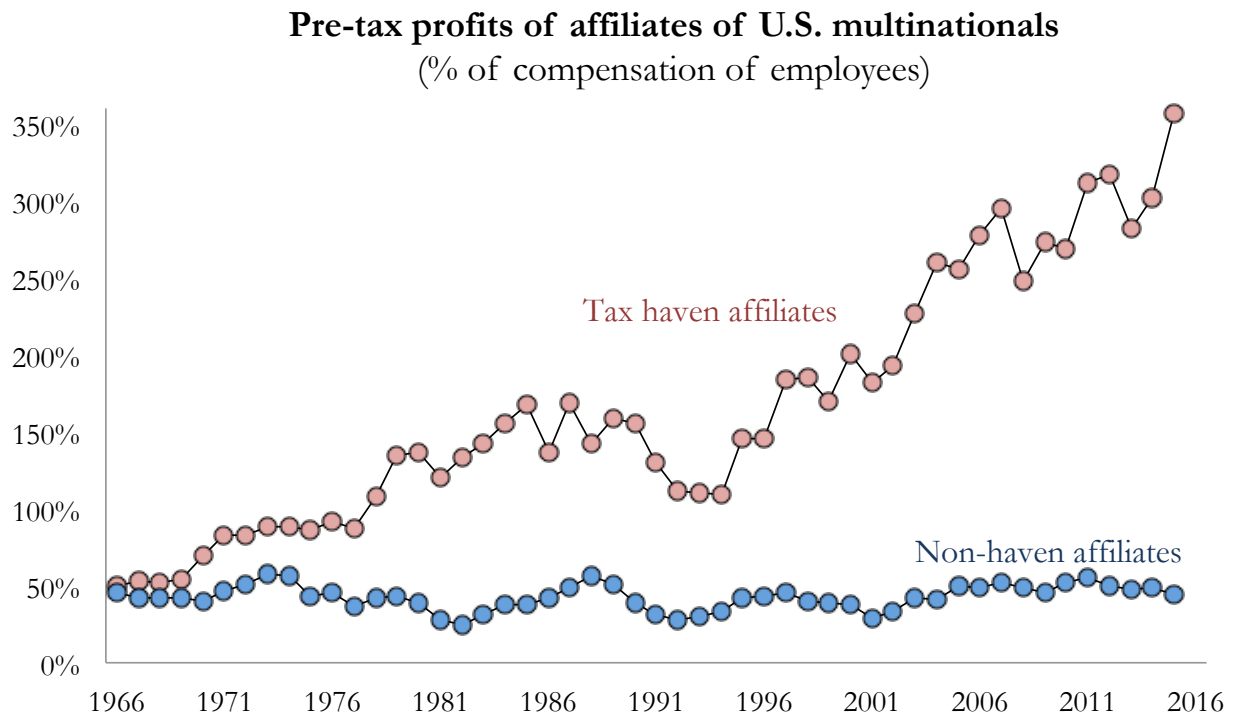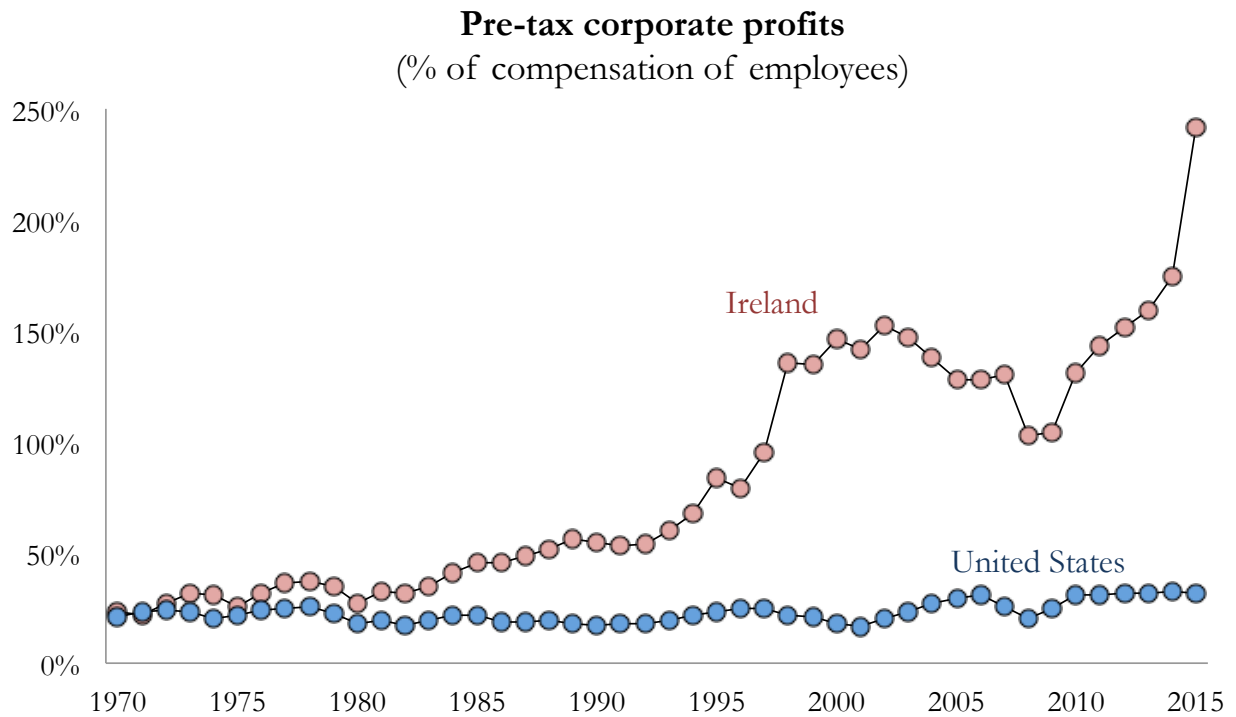
Notes and source: see text.

Figure 7: The Profits of US Firms: Havens vs. Non-Haven Affiliates

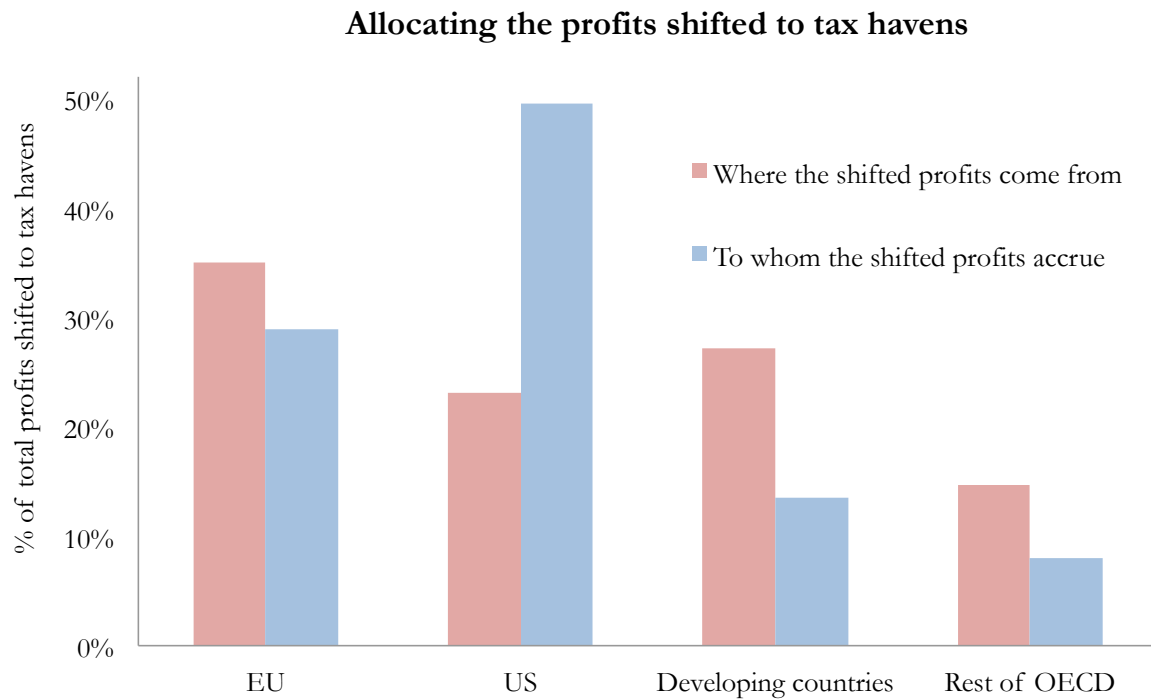**Taxable profits of affiliates of U.S. multinationals in 2015**
(% of compensation of employees)

Average among non-haven affiliates: 49%

Ireland, Bermuda & Car., Luxembourg, Switzerland, Singapore, Netherlands, China, Japan, Mexico, Belgium, Canada, India, United Kingdom, Italy, Germany, France, Brazil

The profitability of the affiliates of US multinationals
(ratio of Haven affiliates / Non-haven affiliates)

Operating surplus / physical capital (*r*)

Net interest received (*1-p*)

Physical capital / wage (*K/wL*)

Figure 8: Allocating the Shifted Profits

Allocating the profits shifted to tax havens

Tax revenue lost due to profit shifting
(% of corporate tax revenue collected)
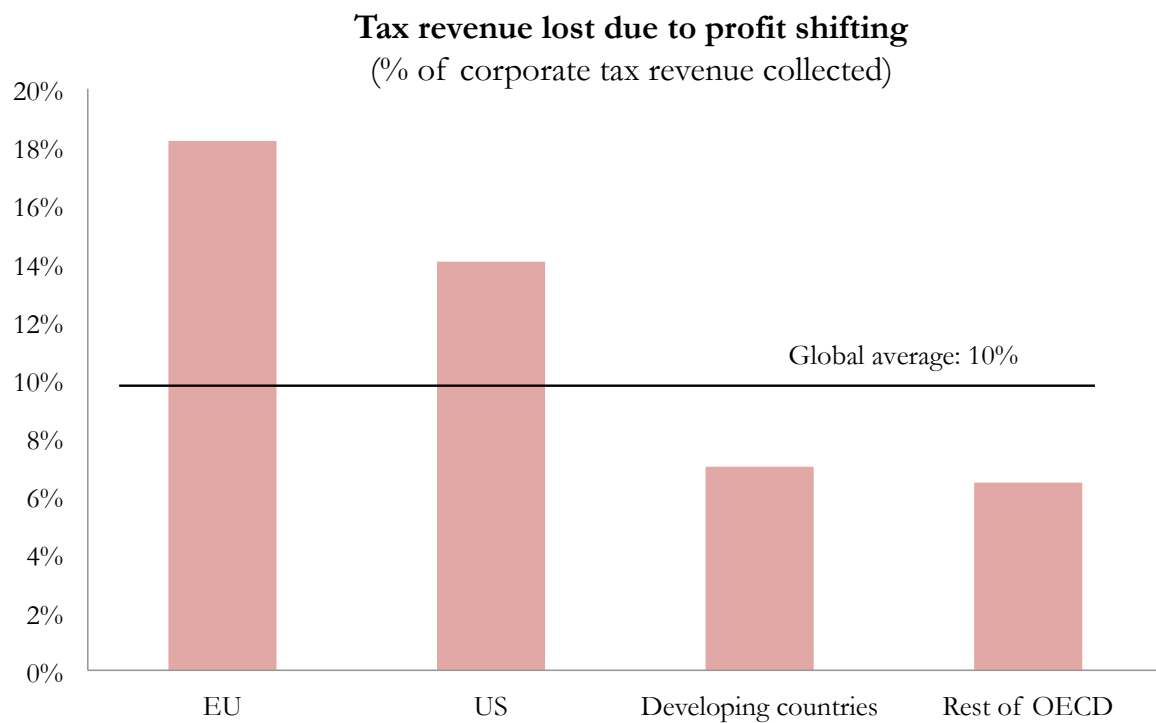

Note: In the benchmark scenario, offshore profits are allocated proportionally to the sum of high-risk services imported from and FDI interest paid tax havens. In the "residence" scenario, offshore profits are allocated based each country's share of global FDI income credits. Estimates are for 2015.
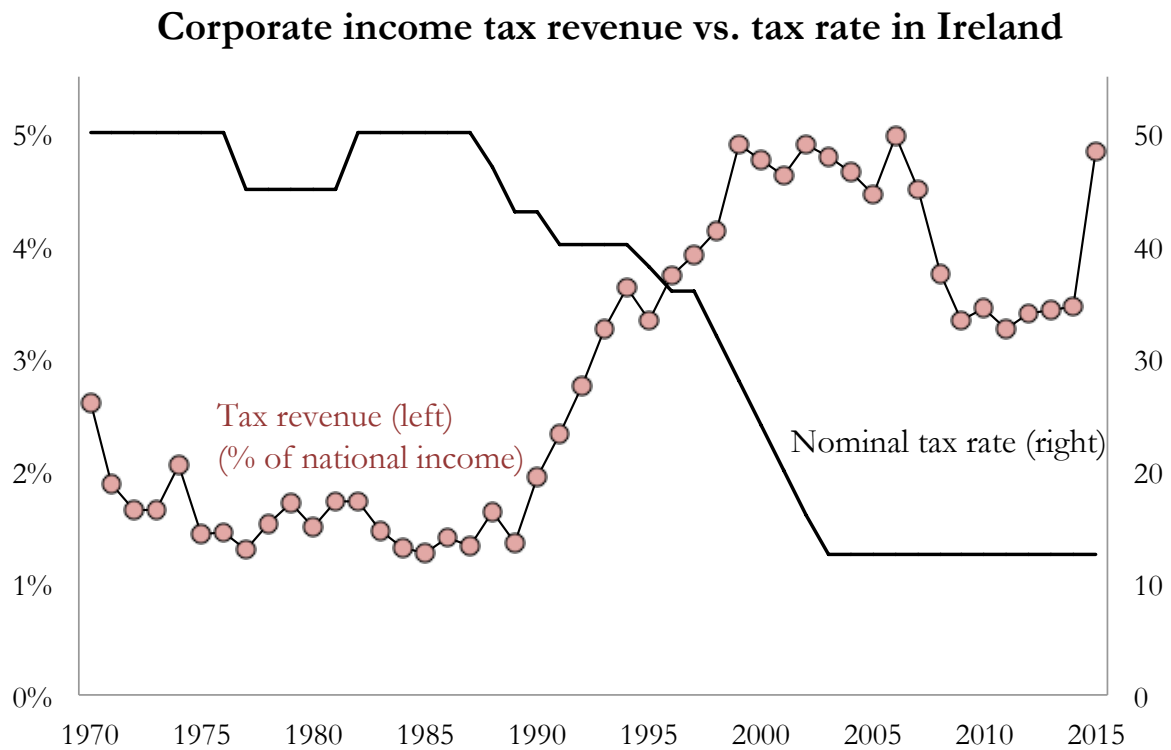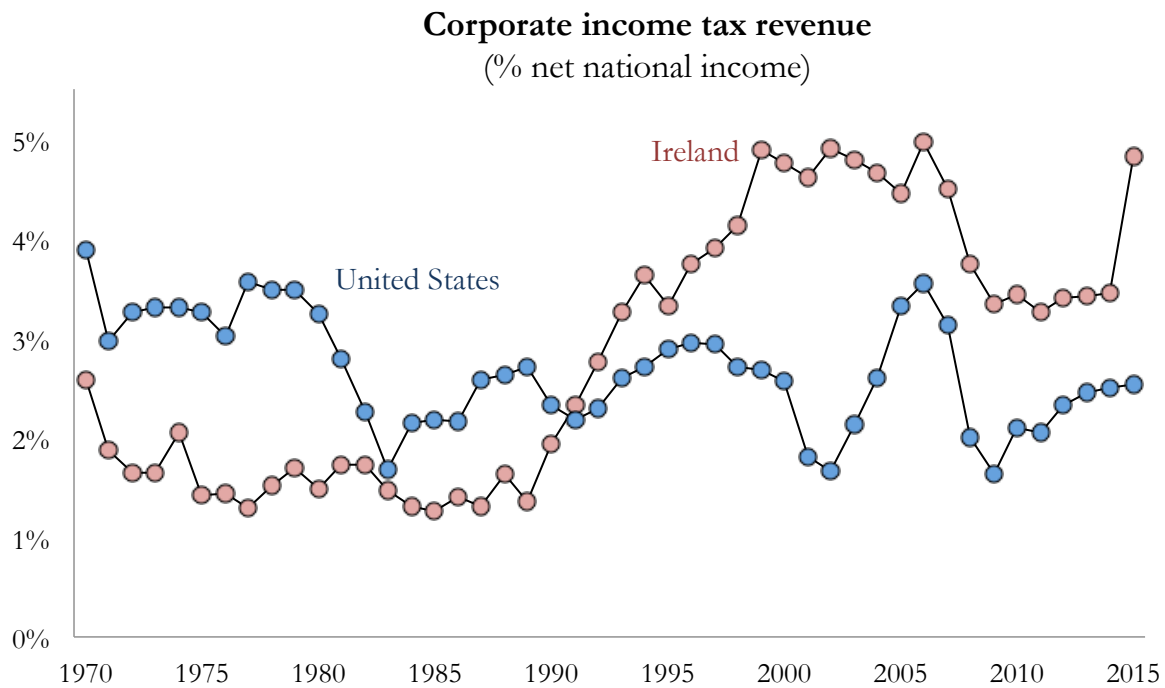
Figure 9: Corporate Tax Revenue in Tax Havens

Corporate income tax revenue
(% of national income)
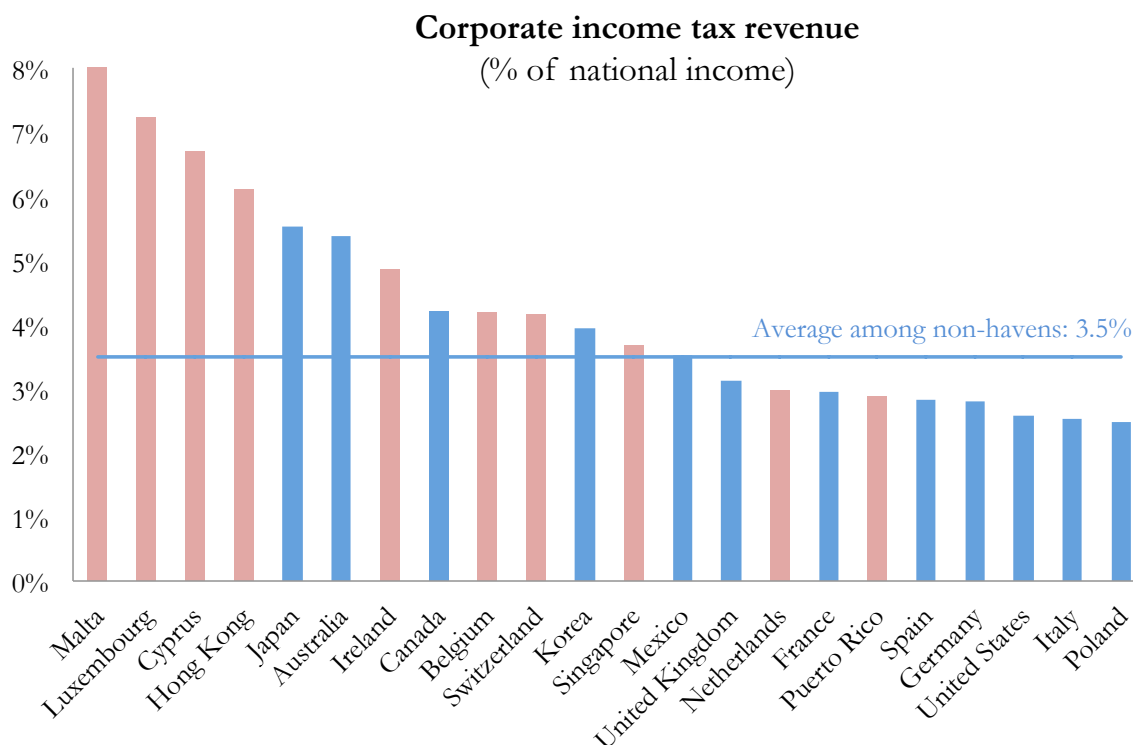
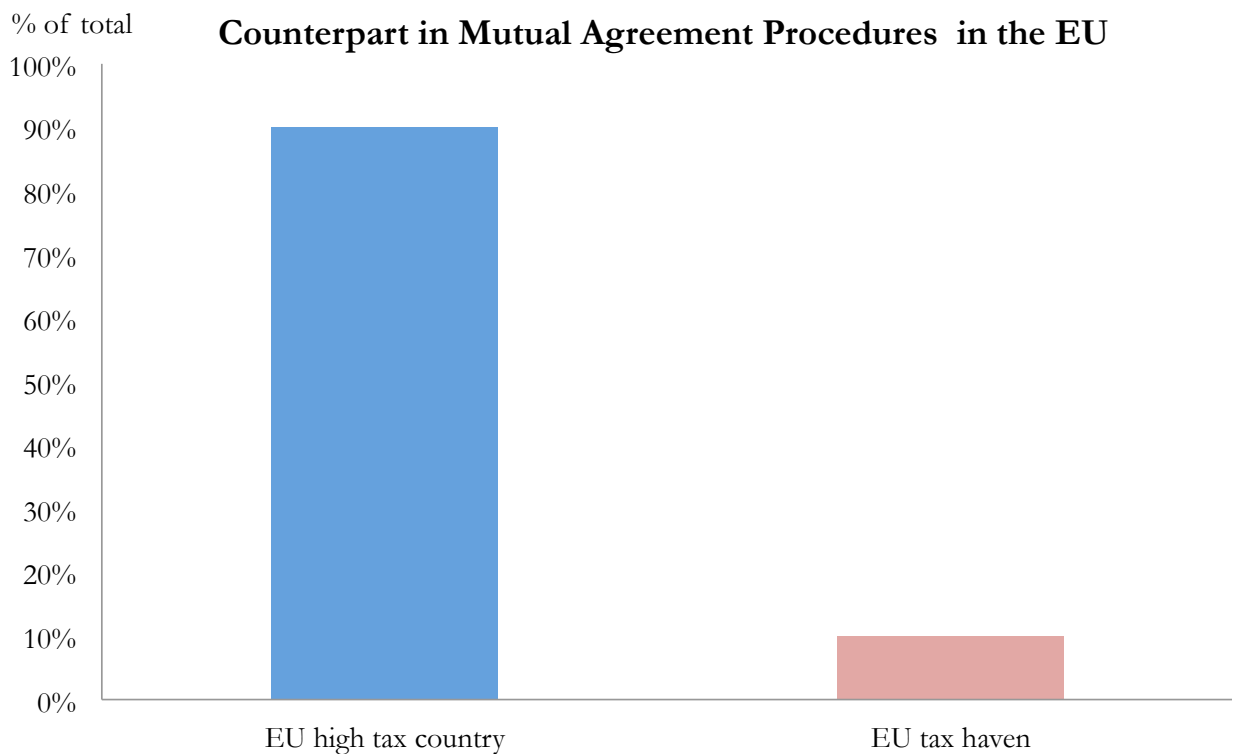**Corporate tax revenue collected & tax rate on shifted profits**
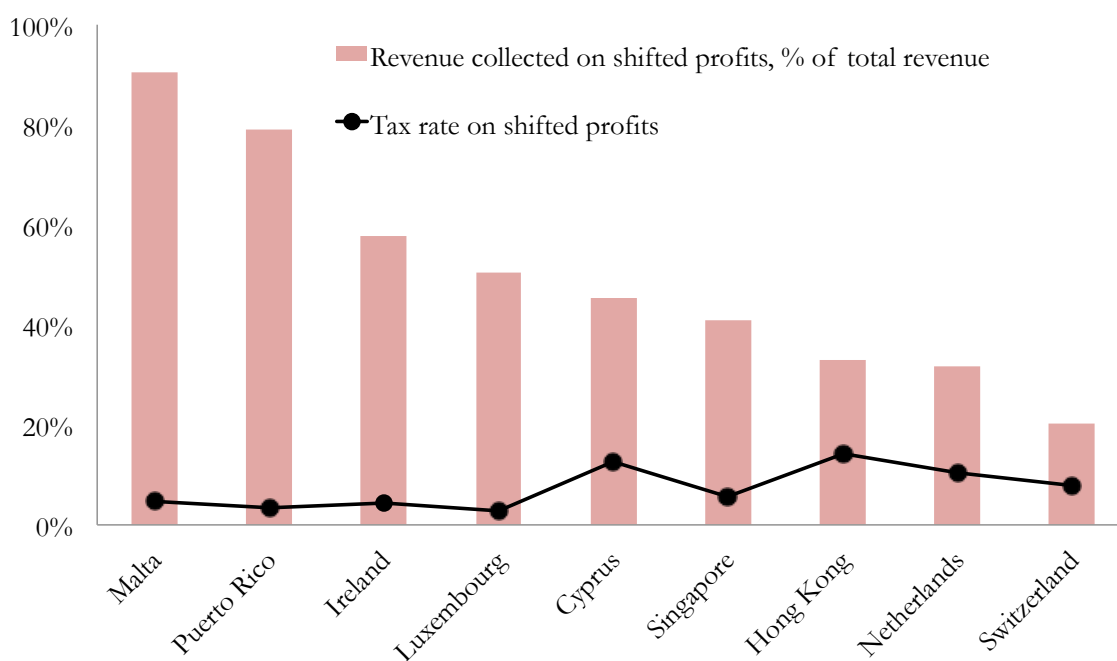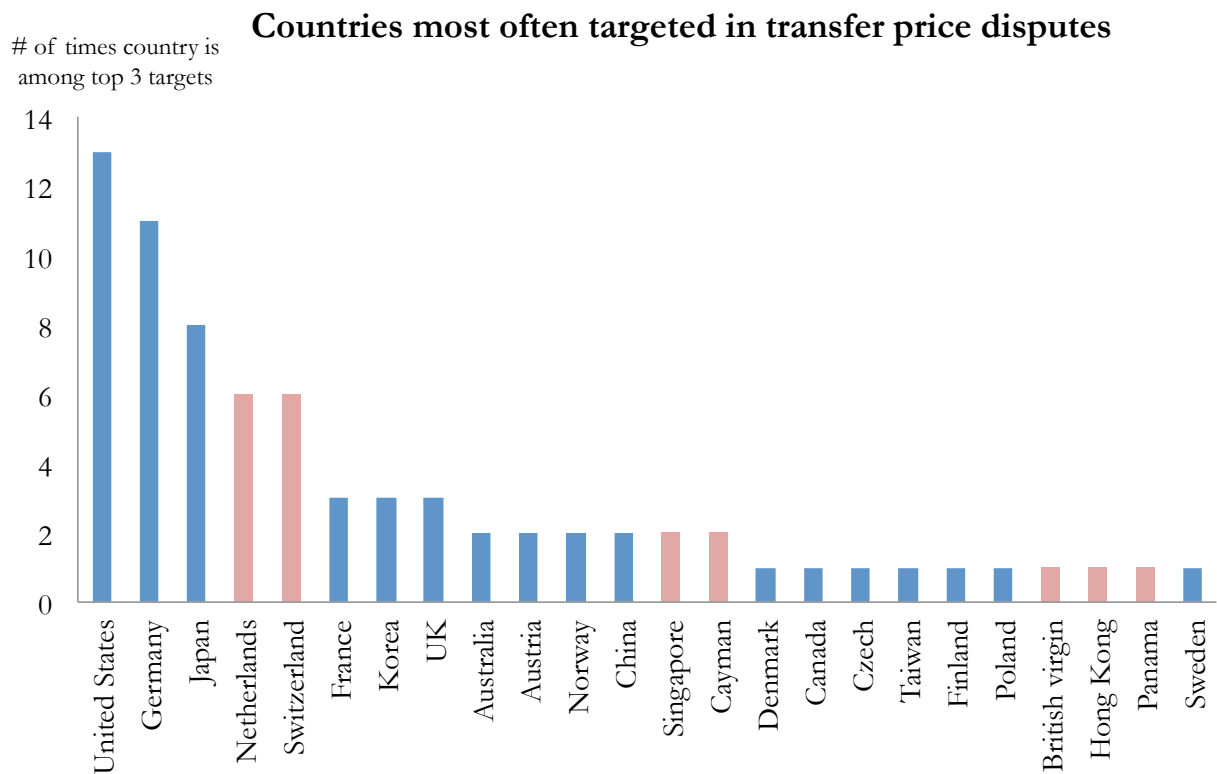

Notes: data are for 2015. Source: Appendix Tables A.3., A.6., A.7, and A.11.

Figure 10: The Redistribution of Corporate Income Tax Revenue

Corporate income tax revenue
(% net national income)

Ireland

United States

Corporate income tax revenue vs. tax rate in Ireland

Tax revenue (left)
(% of national income)

Nominal tax rate (right)

Notes and source: see text.

Figure 11: How Tax Authorities Enforce Taxes on Multinationals

Countries most often targeted in transfer price disputes

# of times country is among top 3 targets

Counterpart in Mutual Agreement Procedures in the EU

% of total

Notes and source: see text.

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