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THE MISSING PROFITS OF NATIONS

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ABSTRACT

By exploiting new macroeconomic data known as foreign affiliates statistics, we show that foreign firms are an order of magnitude more profitable than local firms in tax havens, but less profitable than local firms in other countries. Leveraging this differential profitability, we estimate that close to 40% of multinational profits are shifted to tax havens globally each year. The non-haven European Union countries appear to be the main losers from this shifting. 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. This policy failure can explain the persistence of profit shifting to tax havens despite the sizable costs involved for high-tax countries. We provide a new international database of GDP, trade balances, and factor shares corrected for profit shifting, showing that the rise of the global corporate capital share is significantly underestimated.

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A Appendix and Data is available at http://gabriel-zucman.eu/missingprofits/

1 Introduction

Perhaps the most striking development in tax policy throughout the world over the last few decades has been the decline in corporate income tax rates. Between 1985 and 2018, the global average statutory corporate tax rate has fallen by more than half, from 49% to 24%. In 2018, most spectacularly, the United States cut its rate from 35% to 21%. One often cited reason for this decline is that globalization makes countries compete for capital. By cutting their tax rates, countries can attract more machines, plants, and equipment, which makes workers more productive and boosts their wage (see Keen and Konrad, 2013, for a survey of the large literature on tax competition).

Our paper asks a simple question: globally, how much profits move across borders today because of differences in corporate income tax rates? Imagine that all countries agreed tomorrow to adopt the same tax rate. By how much would the profits booked in the United States, the European Union, and developing countries increase—and by how much would they fall in low-tax places like Ireland? And would a lot of tangible capital move back to today's high tax-countries, or would firms merely change the location of paper profits without many tangible assets moving across borders?

These questions matter for core issues in macroeconomics and public finance. First they matter for understanding the redistributive impacts of globalization—that is, which countries (and social groups) have gained most from it, and which have gained less or lost. Second, they are of interest to policymakers, who would like to know how much capital their country could realistically attract by cutting its rate, the extent to which such a policy could contribute to boosting wages, and how much revenue they lose today because of profit shifting to tax havens. Third, they matter for public finance economists, who would like to better understand why profit shifting—if its revenue costs for many governments really are high—nonetheless persists. Last, they matter for the measurement of world economic activity. How does tax optimization by multinationals affect the measured GDP, trade balances, and labor and capital shares of the various countries in which they operate?

To make progress in addressing these questions, we make two contributions. The first—and most important one—is to produce a new global database of where profits are booked by multinational companies today. Until recently, it was not possible to have such a global map, because firms usually do not publicly disclose the countries in which their profits are booked, and national accounts data did not make it possible to study multinational corporations separately from other firms. But in recent years, the statistical institutes of most of the world's developed

countries—including the major tax havens—have started releasing new macroeconomic data known as foreign affiliates statistics. Following new international guidelines, these statistics record the amount of profits made by affiliates of foreign multinational companies and the wages these affiliates pay. They make it possible to break down the national account aggregates of the main tax haven and non-haven countries by firm ownership—foreign-owned firms vs. local firms. We use these data to quantify the international mobility of profits. Although a large literature studies profit shifting by U.S. multinationals (e.g., Clausing, 2016), and a number of recent papers attempt to estimate the total amount of profits shifted globally (Crivelli, de Mooij and Keen, 2015; UNCTAD, 2015), to our knowledge it is the first time that profits gains and losses for each country are estimated based on directly observable data covering the activities of all multinationals in tax havens.[1] Our goal is to update this database annually, so as to be able to monitor the changing distributional implications of financial globalization and to study the effects of ongoing corporate tax policy reforms throughout the world.

We stress at the outset that we are well aware of the deficiencies of existing foreign affiliates statistics and national account data. The complex structures used by multinationals to organize their global activity raise considerable challenges for statistical authorities. But these macro data are at present the most comprehensive that exist to study the activities of multinational corporations globally. In addition, we feel that the best way for scholars to contribute to future data improvement is to use the existing statistics in a systematic manner, so as to better identify their limits and how these limits could be overcome. Our article, therefore, can also be viewed as an attempt to assess the internal consistency of the foreign affiliates statistics of all the world's countries, and to pinpoint the areas in which progress needs to be made.

Using our new database, we document a new and striking fact. Foreign firms are systematically more profitable than local firms in some countries (namely, tax havens) but not in others. For local firms, the ratio of pre-tax profits to wages is typically around 30%–40% in both high-tax countries and tax havens. But 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). By contrast, in non-haven countries, foreign firms are systematically *less* profitable than local firms. Global macro data thus show a large redistribution of profits within divisions of multinational companies, away

[1] Cobham and Janský (2018) estimate country-level tax revenue losses due international corporate tax avoidance, but these estimates are based on indirect inferences from the cross-country relationship between the corporate tax revenue collected by each country and the statutory tax rates of other countries, not direct statistics on the profits booked by multinationals in tax havens (the foreign affiliates statistics used in this paper). See Section 2.

from high-tax countries and towards low-tax places.

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

Exploiting these facts and new bilateral balance of payments data recently published by tax havens, we develop a methodology to estimate how much profits are shifted into each haven and how much each country loses in profits from such shifting. Our computations are relative to a benchmark in which all countries would have the same tax rate keeping everything else (in particular the definition of the corporate tax base and world profits) fixed. Globally, we find that close to 40% of multinational profits—defined as profits made by multinational companies outside of the country where their parent is located—are shifted to tax havens in 2015. The governments of the (non-haven) European Union countries appear to be the prime losers of this shifting. 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. The shareholders of U.S. multinationals thus appear to be the main winners from global profit shifting. Moreover, we find that the governments of tax havens derive sizable benefits from this phenomenon: by taxing the large amount of paper profits they attract at very low rates (less than 5%), they 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.

Overall, financial globalization with unequal tax rates has sizable redistributive impacts. But these impacts are different than in the textbook model of tax competition that influences much of the discussion about tax policy (such as the decision by the United States to reduce its rate in 2017; e.g., Council of Economic Advisors, 2017). Instead of affecting wages, it redistributes tax bases across nations, for the the benefit of very low-tax places and shareholders of multina-

tionals. Although these results are not completely unexpected, we feel that quantifying these redistributions transparently on the basis of readily available statistics is important to monitor globalization and help design policies that may contribute to making it more sustainable politically and economically. A number of proposals for fundamental reforms that would make profit shifting harder have recently been formulated, for instance the adoption of a destination-based corporate cash flow tax (Auerbach, 2010) or the use of a formulary apportionment system (e.g., Avi-Yonah and Clausing, 2007). Our estimates could be used to quantify how much each country could gain in taxable profits from such reforms.

Our second contribution is to explain why, despite the sizable revenue costs involved, governments in high-tax countries have so far failed to protect their tax base from the tax avoidance opportunities created by globalization. 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 have incentives 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 (due to a lack of cooperation by tax havens).

We analyze data on tax disputes between tax authorities. Consistent with the theory, our analysis shows 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 result suggests that some of the current policy efforts aimed at reducing tax avoidance by multinationals might in fact, and quite counter-intuitively, 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 may devote to chasing the profits shifted to Bermuda—potentially increasing shifting to low-tax locales. And indeed, our results show that countries without functioning dispute resolution mechanisms are more likely to focus their efforts on tax havens today. A more effective way for high-tax countries to curb profit shifting might be to impose economic sanctions to the jurisdictions that

enable it (Zucman, 2015) or to change how corporate profits are taxed.

Last, our findings show that headline economic indicators, including GDP, trade balances, and corporate labor and capital shares, are significantly distorted. The flip side of the profits shifted to tax havens is that output, net exports and profits recorded in non-haven countries are too low. We provide a new database of corrected macro statistics for all OECD countries and the largest emerging economies. Adding back the profits shifted out of high-tax countries increases the corporate capital share significantly. By our estimates, the rise in the European corporate capital share since the early 1990s is twice as large as recorded in the national account data used, e.g., by Karabarbounis and Neiman (2014). This finding has implications for current debates about the changing nature of technology and inequality.

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 profits shifted to each tax haven in Section 4, before analyzing the implications of this phenomenon for non-haven countries in Section 5. Section 6 analyzes the incentives that tax authorities face and studies their enforcement efforts. We present our corrected estimates of GDP, trade balances, and factor shares in Section 7, and provide concrete proposals to improve economic statistics and the monitoring of global activity in the conclusion (Section 8). There are numerous intricacies in the ways multinationals structure their global activities and in the international statistics used in this paper. 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

We start by relating our work to previous attempts to estimate profit shifting. The main difference between our work and previous studies is the following. Most of the literature uses an indirect method to estimate profit shifting, extrapolating from the correlation between tax rates and reported pre-tax profits (at the firm or country level). By contrast, we base our analysis on the directly observable amount of profits booked by multinationals in tax havens globally—using data that were not available until recently. This difference has important implications, as we explain in this Section. We refer the reader to Appendix Section D for a detailed comparison of our results with earlier estimates.

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

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:

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

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 erasion and profit shifting (see Johansson et al., 2017).[4]

One limitation of this procedure is that little micro-data exists about the profits booked by multinationals in low-tax countries. Orbis provides accurate information about the global consolidated profits of most of the world's multinationals (see, e.g., Cobham and Loretz, 2014). Multinational companies, however, are generally not required to publish their profits country by country or subsidiary by subsidiary. Orbis relies on administrative information in public business registries (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 countries 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

[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. 2017), and (4) the simple corporate tax rate (e.g., Lohse and Riedel, 2013). On a priori ground, it is unclear which of these measures is preferable. Heckemeyer and Overesch (2013) give an overview of 26 studies using this approach; see also Wier (2018).

[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.

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.

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. It is only in the special case where the semi-elasticity of profit shifting with respect to tax rate differentials is constant that the estimated β is unbiased.[8] But there is evidence in the literature that the shifting elasticity is highly nonlinear, with far more responsiveness at lower tax rates than at higher ones.[9] Further, one may imagine that 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

[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.

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

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

income shifting among major multinational corporations." Second, estimating equation 1 with financial accounts micro-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 low-tax countries.[10]

The main contribution of our paper is to bring in direct evidence on the amount of profits that multinationals book in tax havens by drawing on two key data sources that had not been used in the literature so far. First, and most importantly, we exploit new foreign affiliates statistics published by the world's largest economic and financial centers. Such data have been compiled in the United States as far back as 1950. But in most European countries—including key countries such as Ireland, Luxembourg, and the Netherlands—the publication of these statistics started only around 2010. These data allow us to directly observe the amount of profits booked by foreign firms in the world's prominent tax havens. Second, we collect and exploit the national account data of the smaller tax havens (including places like Bermuda, the Cayman Islands, the British Virgin Islands, etc.) in a systematic manner. These countries do not currently publish foreign affiliate statistics, but because most (sometimes all) of the activity in these offshore financial centers takes place in affiliates of foreign multinationals, their national account aggregates provide useful information for our purposes.

The 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 set of information to compile their foreign affiliates and national account 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 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.

[10]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.

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 macro literature uses U.S. statistics, hence focuses on U.S. multinationals only (Clausing, 2009, 2016; Gravelle, 2009; Zucman, 2014; Guvenen et al., 2018). In this paper, by contrast, we take a global perspective: we estimate profit shifting by all the world's multinationals and the implications of this phenomenon for each OECD country, the main emerging economies, and tax havens. Our results are thus relevant for policy-makers across the world and make it possible to put the United States in an international perspective (e.g., to show that U.S. multinationals shift significantly more profits than other multinationals in 2015).

Two recent studies, UNCTAD (2015) and Crivelli, de Mooij and Keen (2015), use global macro data to study profit shifting and are the most closely related to our work.[11] Our paper, however, uses completely different data and methodologies. UNCTAD (2015) and Crivelli, de Mooij and Keen (2015) do not base their estimates on the tax haven data (foreign affiliates statistics and bilateral balances of payments) that are central to our estimation procedure.[12] The new data we use in this paper allow us to push knowledge forward in a number of directions. First and most importantly, the foreign affiliates statistics allow us to directly observe the profits booked by multinationals in tax havens and to compute factor shares in foreign vs. local firms across the world. This enables us to have a simple and transparent estimate of profit shifting (based on the abnormally high capital share reported by foreign firms in tax havens) that can be easily tracked by policy makers on a year-to-year basis.[13] Second, while UNCTAD (2015) and Crivelli, de Mooij and Keen (2015) focus on the global tax revenue losses caused by international corporate tax avoidance (and study broad groups of countries such as advanced vs. developing economies), our data and methodology allow us to estimate the profits losses for OECD countries

[11] These studies are replicated and tested for robustness in Janský and Palanský (2017) and Cobham and Janský (2018).

[12] Instead, they rely on the balance of payments and FDI statistics of non-haven countries (UNCTAD, 2015) or corporate income tax revenue data (Crivelli, de Mooij and Keen, 2015). A number of papers in international finance (e.g., Lane and Milesi-Ferretti, 2018) use tax havens' international investment positions, but this literature attempts to characterize patterns in international investment, not to estimate the size of profit shifting as we do here.

[13] Crivelli, de Mooij and Keen (2015) infer the tax revenue losses due to international corporate tax avoidance for developing vs. advanced economies from the correlation between corporate tax revenue collected and the statutory tax rates of other countries estimated in a panel model—not direct statistics on the profits booked by multinationals in tax havens. We view the two approaches as complementary.

and the main emerging economies individually.[14] In addition to quantifying profit losses we also quantify the profits gains for each tax haven in a globally consistent way (i.e., such that profits gains and losses add up globally). This enables us to estimate the benefits that tax havens derive by taxing multinationals at very low rates, and to study how profit shifting redistributes tax revenues across nations. Third, the new bilateral balance of payments data we use enable us to provide a granular map of profit shifting, e.g., to quantify the amount of profits shifted by French firms in Luxembourg, German corporations in the Netherlands, etc.—which was not possible with earlier approaches. Such granular data make it possible to calibrate quantitative models of international tax competition and multinational production with profit shifting (e.g., Wang, 2018).

2.3 Literature on Tax Competition

Our paper is also related to the large theoretical literature on international tax competition. While a large body of work focuses on competition for tangible capital, a number of studies consider profit shifting, its interaction with competition for tangible capital, the incentives of tax havens, and the costs involved for non-haven countries.[15] Our contribution here is to highlight the incentives of tax authorities, to show that these authorities do not combat shifting to tax havens as much as one might have imagined, 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.

3 Conceptual Framework and Methodology

There are three main steps in our empirical analysis. We first show that there are large, systematic differences in the profitability of local vs. foreign firms: in low-tax countries, foreign firms are much more profitable than local firms, while in high-tax countries they are less profitable. Second we show that these differences mainly reflect profit shifting (not higher capital intensities in low-tax places). Third we apportion the shifted profits to the countries where they would have been booked absent international differences in taxes (or to the countries where

[14] Using the methodology in Crivelli, de Mooij and Keen (2015), Cobham and Janský (2018) estimate country-level tax revenue losses due to international corporate tax avoidance. As in Crivelli, de Mooij and Keen (2015), these estimates are based on extrapolations from the estimated cross-country correlation between corporate income tax revenue and foreign countries' tax rates. A systematic reconciliation of the findings from these two different methodologies is a fruitful avenue for future research.

[15] See Slemrod and Wilson (2009); Hong and Smart (2010); Johannesen (2010); the application of the Kanbur and Keen (1993) model of commodity tax competition to profit shifting in Keen and Konrad (2013).

tax-avoiding multinationals are headquartered). We discuss each step in turn.

3.1 Macroeconomic Profitability Ratios

We base our analysis of profitability 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. We are interested in how this statistic varies across countries, and how it varies within countries but across foreign-owned (π_f) vs. local (π_l) firms.

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, operating surplus, 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 operating surplus to wages is $\alpha/(1-\alpha)$. Corporations pay p percent of their operating surplus rK in net interest. We define (pre-tax) corporate profits as $(1-p) \cdot rK$. Our ratio of interest π measures how much profits are generated by resident firms per dollar of wage paid: $\pi = (1-p) \cdot \alpha/(1-\alpha)$.[16] We subtract net interest paid from corporations' operating surplus because interest payments are typically deductible from the corporate tax base while interest received (e.g., by banks) is typically taxable. At the country level, net interest paid by corporations is generally small (interest paid by non-financial corporations is 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.

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

[16] 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.

discussion). Local firms are all firms that are not foreign. By definition, $\pi = s \cdot \pi_f + (1-s) \cdot \pi_l$, where s is the share of wages paid by foreign firms.

We compute 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.[17] 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 our database by showing its global totals. In 2015, global gross value-added (i.e., global GDP) reached \$75 trillion and global net value-added (i.e., after capital depreciation) about \$63 trillion. About 54% of global net value-added was produced by corporations; the rest was produced by governments, households, and non-corporate businesses. Within corporations, the capital share of net value-added was about 1/3 and the labor share about 2/3. Out of the \$11.5 trillion in net-of-depreciation corporate profits, close to 15% (\$1.7 trillion) were made in 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 United States (where its headquarter is located). It is what we call "multinational profits." That is, multinational profits include all the profits made by multinational companies outside of the country where their parent is located. Out of these multinational profits, we estimate that more than \$600 billion, i.e., 36%, were shifted to tax havens. Another way to present this result is that about

[17]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.

5% of global corporate profits (multinational plus local) are shifted to tax havens ($600 out of $11.5 trillion). But to analyze how the international location of profits would change if all countries had the same tax rate—our purpose in this paper—multinational profits are a more relevant focus point, because local profits would be virtually unaffected by such a change.[18]

3.2 Decomposing Tax Havens Profits: Tangible Capital vs. Shifting

Conceptually, a high recorded profits-to-wage ratio in tax havens can be due to two things: either paper profits are being shifted offshore, or there's a lot capital used in production and the elasticity of substitution between capital and labor is high. We are interested in quantifying the relative contributions of paper profits vs. tangible capital to the profits recorded by multinationals in their tax haven affiliates.

There are three forms of profit shifting (see Heckemeyer and Overesch, 2013, for a survey), and each affects the recorded profit-to-wage ratio π. First, multinational groups can manipulate intra-group exports and import prices: subsidiaries in high-tax countries can try to export goods and services at low prices to related firms in low-tax countries, and import from them at high prices.[19] Such transfer price manipulations increase the recorded π_f (hence π) in tax havens. Second, multinationals can shift profits using intra-group interest payments: affiliates in high-tax countries can try to borrow money (potentially at relatively high interest rates) from affiliates in low-tax countries, which again increase π_f in tax havens.[20] Last, multinationals can locate intangibles—such as proprietary trademarks, patents, logos, algorithms, or financial portfolios—in tax haven affiliates. These affiliates then receive royalties (or interest or payments from final customers) which boost π_f.[21] We treat movements of intangible as profit shifting, because they have the same distributional implications as transfer price manipulations and intra-group borrowing. Since patents, algorithms, etc., can be used in many locations simultaneously,

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

[19]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).

[20]See, e.g., Huizinga, Laeven, and Nicodeme (2008). Relatedly, 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.

[21]See Faulkender et al. (2017) for evidence suggestive of profit shifting by U.S. multinationals through the strategic location of intangibles in low-tax countries.

movements of intangibles have no particular reason to affect workers' productivity (keeping everything else—including the global stock of intangibles—fixed); like transfer pricing and intra-group borrowing, they can be analyzed as relocating tax bases across countries without affecting wages. By contrast, if the elasticity of substitution between labor and tangible capital is finite, movements of tangible capital affect wages.[22]

To identify which part of the high profits reported by foreign firms in tax havens reflect profit shifting, it is convenient to start by considering the simple case where all countries—havens and non-havens—have the same aggregate Cobb-Douglas production function $Y = K^{\alpha}(AL)^{1-\alpha}$. 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 $\pi_f < \pi_l = 33\%$). With Cobb-Douglas production, the stock of tangible capital does not affect π, because any increase in the capital stock is perfectly offset by a corresponding fall in the marginal product of capital.

In the more general case where countries have a constant elasticity of substitution (CES) production function, the effect of the capital stock on the profits-to-wage ratio is ambiguous. Namely, 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 high capital intensity have low π, as the marginal product of capital becomes very low. To identify the contribution of capital intensity to the high reported profits-to-wage ratios of tax havens, we decompose the measured π_f of these countries into three components:

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

where r_f is the measured return to capital used by foreign firms, including any abnormal return (above the marginal product of capital) due to tax-induced profit shifting. We then make assumptions about the value of the elasticity of substitution σ in foreign firms to infer what fraction of the high π_f of tax havens can be attributed to high capital intensities. A large micro literature finds $\sigma < 1$, while a nascent macro literature finds $\sigma > 1$ (Karabarbounis and

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

Neiman, 2014; Piketty and Zucman, 2014).

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

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

3.3 How we Allocate the Shifted Profits

We allocate the shifted profits to the countries where they would be taxed if all countries had the same tax rate as follows. First, we collect all the available balances of payments for all countries, havens and non-havens. We then allocate the shifted profits proportionally to the bilateral service exports and bilateral intra-group interest receipts recorded in the balances of payments of tax havens. Among services, we focus on the specific types of services which have been found in the literature to be most conducive of shifting: exports of the rights to use intellectual property (patents and trademarks), headquarter services (administration, management and advertising), information and communication technology services, and financial services (Hebous and Johannesen, 2016).[23]

[23]We disregard goods exports, which are typically less conducive of profit shifting because reference prices are usually observable by tax authorities. See Appendix Section D, where we discuss the evidence in the literature

Our innovation here is to exploit bilateral balance of payments data made available recently. While balance of payments statistics traditionally only reported transactions with all non-residents as a total, following the adoption of the 6^{th} edition of the IMF (2009) Balance of Payments Manual, most countries have started publishing *bilateral* balances of payments, which in particular include bilateral service trade by type of service, and bilateral foreign direct investment income (including bilateral intra-group interest payments and receipts).[24]

We focus on the bilateral data reported by tax havens because they are more comprehensive than those recorded by counterpart countries. As shown in Appendix B, the service exports recorded by the 6 E.U. tax havens (Ireland, Luxembourg, Netherlands, Belgium, Malta, Cyprus) to the 22 non-haven E.U. countries exceed the recorded imports by more than 30% (and more than 50% for Luxembourg). One likely explanation for this gap is that importers' data miss (at least some of) the services that are exported by tax-haven corporations directly to foreign customers, such as digital music subscriptions, ride-sharing services, and various Internet services (server space, voice over IP, etc.).[25] 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 (except at the time of the initial transfer of the intellectual property).

Our procedure to allocate the shifted profits is consistent with how profit shifting is perceived by policy-makers globally. Many countries have anti-avoidance policies known as controlled-foreign corporations provisions, whereby specific cross-border transactions thought to be conducive of profit shifting (such as certain royalty payments, interest, or services) are presumed to be motivated by tax avoidance and taxed in the source country.[26] Our procedure is also

on the magnitude of profit shifting through the mispricing of intra-group goods trade vs. other channels.

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

[25]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.

[26]Similarly, in 2017, the United States introduced a "base-erosion anti-avoidance tax" (BEAT) that presumes

consistent with Clausing (2009), who estimates how much of the profits booked offshore by U.S. multinationals are shifted out of the United States by apportioning the offshore profits of U.S. firms proportionally to the amount of affiliate intra-firm transactions that occur with the United States. Our paper generalizes this approach in three ways: (i) we apportion the profits shifted offshore by all (not only U.S.) multinationals; (ii) we use balance of payments data which capture all cross-border transactions (not only transactions within divisions of multinationals); (iii) we focus on the types of transaction identified in the literature as being particularly conducive of shifting.

Our approach differs from Guvenen et al. (2018), who apportion the worldwide profits of U.S. multinationals proportionally to labor compensation and sales to unaffiliated parties in each country. Their allocation approximates how the profits of U.S. firms would be split if all countries used a formulary apportionment system (with labor and sales as apportionment factors), a system different than the one currently used by governments worldwide. By contrast, our allocation approximates how the profits of all (U.S. and non-U.S.) multinationals would be split if the international tax system remained the same but all countries had the same tax rate. We view these two benchmarks as relevant. In both cases, there are uncertainties involved and the counterfactual profit allocations should be seen as approximate. One advantage of our approach is that it does not require us to make assumptions on how the move to a formulary apportionment system would affect firm behavior (compared to the current international tax system of arm's length pricing). Because many of the transactions we consider are intra-group (not to final customers), our allocation of the shifted profits is not equivalent to a sales-based apportionment of these profits.[27]

We also provide an alternative allocation, in which we distribute the profits shifted offshore to the countries where the ultimate parents of the offshore affiliates are incorporated. To do so, we draw on the bilateral direct investment statistics on an ultimate ownership basis compiled by Damgaard and Elkjaer (2017), who exploit the data recently made available by OECD countries following the implementation of the 6^{th} edition of the IMF (2009) Balance of Payments Manual (see Appendix Section C.2 for a detailed discussion). This allocation makes it possible to estimate what fraction of the globally shifted profits ultimately accrue to the shareholders of U.S. multinationals, European multinationals, etc.

that services transactions by multinational firms with related parties are motivated by tax avoidance.

[27] 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.

4 The Level and Rise of Global Profit Shifting

4.1 Profitability in Tax Havens vs. Non-Haven Countries

We start the analysis by displaying in Figure 3 how the profit-to-wage ratio π varies across countries. Among the main non-haven countries (displayed in Figure 3), π average 36% in 2015. That is, for any dollar of wage paid, corporations made 36 cents in pre-tax profits. This corresponds to a capital share of net corporate value-added of 26%, and net interest paid of -3% of net operating surplus. The profits-to-wage ratio π 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.[28] By contrast, tax havens are abnormally profitable. In Singapore and Hong Kong, the macroeconomic profit-to-wage ratio exceeds 100%; in Ireland, Puerto Rico, and Luxembourg, it exceeds 200% (corresponding to a net capital share of net corporate value-added of about two-thirds).

The 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, in the world balance of payments, more direct investment equity income is received than paid.[29] 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 the gap 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 haven 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

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

[29] 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.

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 tax havens. We discuss alternative corrections in Appendix A.

Figure 4 shows our key empirical result. Foreign firms in tax havens are an order of magnitude more profitable than local firms, while foreign firms in other countries are *less* profitable than local firms. That is, there is a clear trace in global macro data of movements of profits within divisions of multinational groups, away from high-tax affiliates and towards low-tax affiliates.

There are three other main take-aways from Figure 4. First, the reported profitability of foreign firms in tax havens is truly exceptional, with π_f ratios of 800% (which corresponds to a capital share of corporate value-added of close to 90%) in Ireland and as high as 1,625% in Puerto Rico.[30] Second, the high overall profits-to-wage ratio π of tax havens is entirely driven by the high profitability of their foreign firms π_f. Local firms in tax havens do not seem to be more profitable than the local firms of other countries, which could in principle be the case if low-tax countries also had pro-capital and anti-labor institutions (such as bans on unions or no minimum wage) or if the reported profitability of local haven firms was inflated by inward profit shifting. This suggests that the π_l ratios of tax havens are a useful benchmark to estimate what fraction of the huge π_f of tax havens can be attributed to profit shifting. Third, although tax havens generally receive positive net intra-group interest from the rest of the world, their high π_f are mostly driven by the high reported capital shares in foreign firms, not by net intra-group

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

interest. The main exception is Luxembourg, where net intra-group interest receipts are sizable (see Appendix Table A.5).

The profitability of haven firms has surged since the 1980s. As shown in the top panel of Figure 5, 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 5, 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 coupled with a high elasticity of substitution between capital and labor. We study this question by focusing on the majority-owned affiliates of U.S. multinationals in tax havens, for which the data is particularly good. Crucially, the outward FATS of the United States include information on the stock of tangible 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 6, 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 6

decomposes the profit-to-wage ratio of the affiliates of U.S. multinationals following equation 2 above. In 2015, haven affiliates have higher capital intensities than non-haven affiliates, but the difference is not massive. By contrast their rate of return on tangible capital is close to four times higher. They also receive slightly more interest payments—but by far the main driver of their profitability is their high recorded returns on tangible capital.

More broadly, the bottom panel of Figure 6 shows that globalization, so far, has not made the relative capital intensity of affiliates in low- vs. high-tax places change much. What has changed is their relative rates of return. Up to the late 1970s, affiliates in tax havens had roughly the same recorded rate of return to tangible capital r, same capital intensity, and same net interest payments than other affiliates. Since the 1980s, their relative r has increased by a factor of about 4. By contrast, the relative capital intensity of these two groups of affiliates has remained close to 1. Capital moves across borders, but it does not seem to move significantly more towards low-tax places.

Two remarks are in order here. First, even when capital intensities are not particularly high, foreign firms can account for a large share of employment and bring important economic benefits to their host countries. This is the case in some of the tax havens that attract large paper profits. One potential explanation is that it may be easier for multinationals to shift profits into the countries where they also have sizable real activity.[31] Our analysis does not reveal how much each tax haven gains from international capital mobility vs. movements of paper profits. Such an analysis would require an explicit model of firm location decisions (factoring in tax and non-tax reasons), which we leave to future research. Second, the relative capital intensity of tax haven affiliate seems to be on a rising trend since the early 2000s. So far, this increase is mild compared to the large rise in the rate of return of low-tax affiliates, but it could accelerate in the future. For instance, firms may start moving more tangible assets to low-tax places if policy-makers reduce profit shifting opportunities but tax rates remain different across countries. That is, while for tax havens capital mobility and artificial shifting may be complement, for non-haven countries they may be substitutes. What the data suggest is that, so far, profit shifting seems to have swamped tax-driven capital mobility. But our analysis does not allow us to say what would have happened in a counter-factual world without profit shifting, nor to predict what will

[31] According to our estimates, foreign firms pay 24% of all wages in Ireland (Appendix Table A.4), while they account for as much as 78% of all profits (Appendix Table A.7). Note that there are many countries where foreign firms account for an even larger fraction of the total wage bill and yet there was little profit shifting in 2015. This includes most Eastern European countries, where foreign firms account for around 40% of both wages and profits. These countries had corporate rates close to 20% in 2015. Looking forward, one may imagine that these countries could emerge as profit shifting destinations if their rate is cut (which Hungary has already done in 2016, from 19% to 9%).

happen in the future.

Conceptually, the high rates of return of haven affiliates can be seen as the product of two effects. First, multinationals book intangibles in low-tax affiliates. These intangibles are not included in our measure of corporations' capital stocks, for lack of data about their market value—which in many cases is impossible to assess, given that many of these intangibles are firm-specific and never exchanged on markets between unrelated parties. Second, for a given stock of total capital (tangible plus intangible), haven affiliates can report high profits because of intra-group transfer price manipulations. With the macro data at our disposal, we cannot separate the role of intangibles vs. intra-group transfer prices in explaining the high rates of returns recorded by haven affiliates. This distinction is not relevant for our purposes, however, since both of these techniques have similar redistributive implications.

4.3 Estimates of Profits Shifted to Tax Havens

To form our benchmark estimate of the amount of profits shifted to tax havens, we set π_f equal to π_l in each tax haven. That is, we assume that absent profit shifting, foreign firms in Ireland would be as profitable as local Irish firms, foreign firms in Luxembourg as profitable as local Luxembourg firms, etc. We present our estimate of the amount of profits shifted into each tax haven in the bottom panel of Table 2. In total, more than $600 billion in profits were shifted to tax havens in 2015, close to 40% of multinational profits. By our estimates, Ireland is the number one shifting destination, accounting for more than $100 billion alone. Singapore, the Netherlands, Caribbean tax havens, and Switzerland come next. Due to the complex structures used by multinationals, allocating the shifted profits to specific jurisdictions involves a margin of error (for instance, the frontier between Ireland and Bermuda is not always clear). This uncertainty, however, does not affect our estimate of the global amount of profits shifted offshore.

One potential concern with comparing profitability in foreign vs. local firms is that foreign firms in tax havens may be in other sectors than local firms, and profits-to-wage ratios may vary across sectors. To address this issue, we use the fact that in some countries, foreign affiliates statistics are available by sector of economic activity. Appendix Figure L.1 focuses on the case of U.S. multinationals, using the outward foreign affiliates statistics of the United States. We find that the haven affiliates of U.S. multinationals are an order of magnitude more profitable than non-haven affiliates in the same sector. In non-haven countries, U.S. affiliates are typically less profitable than local firms operating in the same sector; while in tax havens they are an

order of magnitude more profitable than local firms operating in the same sector—consistent with the pattern depicted in Figure 4. Therefore controlling for sectoral differences in local vs. foreign firms does not quantitatively affect our findings.

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

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

A last concern is that by using the local firms of tax havens as benchmark, we may actually under-estimate the size of global profit shifting, since firms headquartered in tax havens may shift foreign profits inward, inflating π_l.[32] This phenomenon could explain the relatively high profits-to-wage ratio of Irish local firms reported in Figure 4, and suggests that our estimates of global profit shifting should probably be viewed as conservative.[33] We have run robustness tests where we make the profitability of local haven firms vary and assess the impact on our results, and found only second-order effects, however. The reason is that the bulk of our estimated

[32]Another small source of uncertainty in our estimated π_l owes to the treatment of offshore mutual funds (i.e., mutual funds with mostly foreign investors and foreign investments). Throughout this article, we exclude these mutual funds (which among OECD countries are only significant in Luxembourg, Ireland, and to a much lesser extent the Netherlands) from our π ratios, because they would otherwise distort the local profitability of tax havens: by convention mutual funds have an apparently high profitability as defined in our paper (i.e., after net interest payments), but for purely accounting reasons (all income paid by mutual funds to their shareholders is recorded as dividends in the national accounts, even for mutual funds that only invest in bonds; as a result bond funds are large receivers of net interest). Estimating the net interest received by mutual funds involves a margin of error, but this uncertainty is very small compared to the large π_f of tax havens; see Appendix Section A.3 for a discussion.

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

$600bn in shifted profits comes from small tax havens where π_f is an order of magnitude higher than π_l (hence where the exact level of π_l does not matter much); only a small fraction comes from larger tax havens (such as Netherlands and Belgium) where π_f is only slightly higher than π_l (hence where the exact level of π_l matters more); see Table 2. If we assumed that local firms in tax havens are in reality as profitable as local firms are on average in the OECD ($\pi_l = 41\%$), then our estimate of global profit shifting would rise by about 3%.[34]

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

5 The Redistributive Implications of Profit Shifting

5.1 Allocating the Shifted Profits Across Countries

Which countries lose profits compared to a benchmark of perfect international tax coordination? The pink bar in the top panel of Figure 7 allocates the roughly $600bn in excess profits in tax havens across source countries, proportionally to the bilateral intra-group interest received by tax havens and their bilateral exports of services conducive of profit shifting (such as rights to use intellectual property). As described in Appendix C, we find that the amount of intra-group interest received and 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

[34] See Appendix Table A.7.

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

We also allocate the profits shifted to tax havens to the countries where the ultimate owners of the tax haven subsidiaries are located (blue bar in the top panel of Figure 7). Multinationals from all countries shift profits, but we find that U.S. multinationals are the main "shifters": about half of all the shifted profits ultimately accrue to U.S. parents, while about 30% accrue to E.U. parents. 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). Industry composition effects may also play some role, but because profit-shifting seems to happen in all sectors, they are unlikely to be the key reason why U.S. multinationals shift more.

In the bottom panel of Figure 7 and in Table 2, we estimate the losses of corporate income tax revenues implied by our estimate of where the shifted profits come from. We consider the following thought experiment: "How much more corporate income tax revenues would Germany collect if all countries had the same tax rate as Germany?," keeping the level and location of the world capital stock constant. This is an informative thought experiment in light of our result that what has moved to low-tax places over the past decades is mostly paper profits, not tangible capital.[35] By our estimate, profit shifting by multinationals reduces the corporate tax revenue of the European Union by around 20%. For the world as a whole, the tax revenue loss is around 10%. The revenue losses vary significantly across countries. One of the reasons is that the share of corporate profits that come from multinational corporations varies, as some economies are more open than others. In Japan and some of the largest developing countries (e.g., China), a high share of profits originate from local firms; this limits the amount of shifted profits. Moreover, the size of the revenue losses is correlated with the corporate income tax

[35]Note that if Ireland had the same tax rate as Germany, there would probably be less activity and profits made in Ireland. However, this is not relevant for our purposes here, because the profits made in Ireland are typically not taxable in Germany (even if they are made by German multinationals). More broadly, almost all countries have territorial tax systems that exempt foreign profits from taxation. What matters—and what our computations capture—is that if all countries had the same tax rate as Germany, there would not be any incentives for multinationals to shift profits out of Germany, and hence more corporate income tax would be collected in Germany.

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

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

How do tax havens manage to collect so much tax revenue? As shown by the bottom panel of Figure 8, most of their revenue derive from taxes collected on foreign firms. With source taxation (and no international coordination or sanction against tax havens), tax havens can generate sizable revenue by taxing the huge foreign profits they attract at low but positive rates. Strikingly, the havens that collect the largest revenue are those that impose the lowest tax rate on foreign profits: the revenue-maximizing tax rate appears to be very low, less than 5%. The low revenue-maximizing rate of tax havens can explain the rise of the supply of tax avoidance schemes documented in the literature—such a favorable tax rulings granted to specific multinationals—and in turn the rise of profit shifting since the 1980s.[36]

Figure 9 considers the case of Ireland, the country that by our estimates attracts the largest amount of shifted profits (more than $100 billion in 2015). As shown in the top panel of this Figure, until the 1990s Ireland used to collect relatively little corporate income tax revenue, about 1.5%–2% of national income—significantly less than the United States. Then, as profit shifting surged (Figure 5), so did tax collection: since the mid-1990s, Ireland has collected significantly more corporate tax revenue (as a fraction of national income) than the United States—about twice as much in 2015. Tax collection is strongly negatively correlated with the statutory corporate tax rate (bottom panel of Figure 9): when the tax rate was high (around 50% until the late 1980s), tax collection was low; since the rate was cut to 12.5% in the 1990s,

[36] 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.

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.

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 revenues across countries, profit shifting thus redistributes income to the benefit of the shareholders of multinational companies. According to our estimates, about half of the benefits accrue to the shareholders of U.S. multinationals (some of which are Americans and some of which aren't). To have a sense of the magnitude of the redistribution involved, note that U.S. firms have seen their foreign effective corporate tax rate fall from about from 32% in 2000 to about 16%-17% in 2016, and that, according to the estimates of Wright and Zucman (2018), about half of this decline can be attributed to profit shifting (and the other half to the decline in statutory tax rates in the countries where U.S. multinationals have production activities). Because equity ownership is concentrated (see e.g., Saez and Zucman, 2016, for evidence on equity wealth concentration in the United States), shareholders tend to be wealthy, hence profit shifting tends, everything else equal, to increase inequality. A full quantitative analysis of these redistributive effects across income and wealth groups would require making more assumptions, however—a task we leave to future research.

6 The Incentives of Tax Authorities

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 protected 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 transactions. All aspects of multinational activity are examined: transfer mispricing of goods and services; debt shifting; abuses of double-tax

treaties, etc. 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.[37] If an agreement is reached, this procedure results in a relocation of taxable income across countries.[38]

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 re-located to France is worth the same to France whether it comes from Germany or from Bermuda (that is, the French tax authority doesn't internalize the externality of reducing the corporate tax base in the partner country). 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.[39] 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.

The correction of transactions between France and Germany crowds out the correction of 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.

[37] 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. Simply 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).

[38] If no agreement is reached, then taxable income increases in one country without any offsetting decrease elsewhere. Within the European Union, an agreement is almost guaranteed: 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.

[39] 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.

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 reshuffle tax payments across high-tax places. From a global perspective, such corrections are welfare decreasing, since they consume resources without changing global tax payments.

We first start by analyzing the universe of transfer price corrections initiated by the Danish tax authority—data internal to the Danish administration to which we were granted access in the context of this research. As reported in Appendix Figures J.2 and J.2, the vast majority of transfer price corrections (about 75%) initiated by the Danish tax authorities involve other high-tax countries. This fraction is even larger (about 80%) when cases are dollar-weighted. 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. Because most transfer price corrections initiated by Denmark are followed by successful mutual agreement procedures, these corrections ultimately *lower* the taxes paid by the targeted multinationals. This result is at odds with the popular perception that the enforcement activities of tax authorities increase the taxes paid by multinationals.

Do these findings apply to other countries? 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 10, 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 being sometimes targeted. Ireland (which according to our estimates is the number one shifting destination in 2015) is never named among the top 3 targets. Tax authorities also say they look at "low-tax jurisdictions" in the EY survey, but with the exception of Switzerland and Netherlands prominent tax havens are almost never named by tax authorities as being involved in actual disputes. Although tax authorities might intend to go after tax havens, the fact is that actual transfer price corrections seem to mostly involve non-havens.

Quite strikingly, if we re-do the figure in the top panel of Figure 10 but restricting the EY sample to the countries that have working mutual agreement procedures in place, then tax havens feature even more rarely as being targeted (Appendix Figure M.1). In that sample, the Cayman Islands, Singapore, Hong Kong and the BVI are never named among the top 3 tar-

gets, and the Netherlands and Switzerland move further down the ranking. Mutual agreement procedures that facilitate dispute settlements between high-tax countries appear to crowd-out enforcement on tax havens. As shown by the bottom panel of Figure 10, 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 exceptional.[40]

There are at least two ways to interpret these results. One is that tax authorities are not really interested in fully enforcing taxes on multinationals. With territorial tax systems, lax enforcement can encourage domestic investment by lowering effective marginal tax rates on multinationals. The tax authorities of high-tax countries might perceive that profit shifting and capital mobility are strongly substitutable—with less shifting there would be more outflows of tangible capital, with potentially adverse effects on wages and employment—and rationally choose to limit enforcement for that reason. Another possible interpretation is that tax authorities really are interested in increasing effective tax rates on multinationals when these rates are below those mandated by the tax law, but that they fail to do so because enforcement on non-havens crowds out enforcement on tax havens—a rational outcome in today's international tax system. With the data at our disposal, it is hard to precisely quantify which explanation is likely to matter more, and we view both as complementary.

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 change the enforcement patterns 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.

[40] 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. The evidence discussed above for Denmark does not suffer from this limitation, as it encompasses all transfer price corrections initiated by the tax authority, not only those for which firms then ask for a mutual agreement procedure.

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 countries where shifted profits are booked (i.e., tax havens), GDP, corporate profits, the capital share of corporate value-added, and trade balances are over-estimated. In non-haven countries, by contrast, these indicators are under-estimated. In this section, we present macroeconomic statistics corrected for the effect of profit shifting for all OECD countries, all tax havens, and the main emerging economies. All our estimates are available online in Appendix Tables C.5 and C.5b; in this section we focus on discussing the methodology and main results.[41]

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.[42] 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 5) the higher level

[41] 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.

[42] 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).

of the capital share implies a higher rise in the capital share over the last few decades. By our estimates, the rise in the European corporate capital share since the early 1990s is twice as large as recorded in the national account data used, e.g., by Karabarbounis and Neiman (2014).

Profit shifting also has significant effect on trade balances. For instance, after accounting for profit shifting, Japan, the U.K., France, and Greece turn out to have trade surpluses in 2015, in contrast to the published data that record trade deficits. According to our estimates, the true trade deficit of the United States was 2.1% of GDP in 2015, instead of 2.8% in the official statistics—that is, a quarter of the recorded trade deficit of the United States is an illusion of multinational corporate tax avoidance.[43]

8 Conclusion

What have we learned from this paper? In our view the main finding is that one can obtain a clear picture of global profit shifting by exploiting the foreign affiliates statistics recently made available by many countries. These data show that the capital share of corporate value-added is extremely high in the foreign firms of tax havens, while it is low in the foreign firms of other countries compared to the capital share of local firms. By exploiting this pattern of differential profitability as well as new bilateral balance of payments data recently made available by tax havens, our paper estimates how much each tax haven, each OECD country, and the main emerging economies gain or lose in profits compared to a benchmark of global tax coordination. We find that the redistributive effects of financial globalization with unequal rates are large: by our estimates, close to 40% of multinational profits are shifted to tax havens in 2015. Non-haven European Union countries appear to be the largest losers from this phenomenon, while very-low tax countries (and the shareholders of multinational firms) appear to be the main beneficiaries. Quite counter-intuitively, the fiscal authorities of high-tax countries seem to focus most of their limited enforcement resources not on tax havens, but on other high-tax countries—a rational move for them given the incentives they face, and one that can help explain why profit shifting to tax havens persists despite its sizable cost for many countries.

Our findings have implications for policy. First, they suggest that cutting corporate tax rates, as the United States has done at the end of 2017, is less likely to generate quick positive effects on wages than textbook economic models suggest. For wages to rise, factors of production that complement labor need to increase, which can happen fast if tangible capital flows from abroad, less so if it is mostly paper profits that move across borders. Second, profit shifting

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

raises challenges in a number of policy areas. It reduces the effective rates paid by multinationals corporations compared to what local firms pays, which could adversely affect competition. It reduces the taxes paid by the wealthy—as ownership of these firms is concentrated—which might call for offsetting changes in individual income taxation, or changes in the way multinational companies are taxed. Moreover, while the OECD and the European Union are currently trying to facilitate dispute resolution between countries, we point out that this may come with the adverse effect of crowding out corrections involving tax havens, hence ultimately result in more profit shifting—the opposite outcome of the stated goal of these policy initiatives.

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.

Our analysis has focused on how financial globalization with unequal rates has redistributed tax bases across countries. In future research, it would be good to introduce the inequality dimension in the analysis, i.e., to quantify how much the various income and wealth groups in each country have gained or lost from this phenomenon. It would also be good to include non-tax driven capital flows. We have found that overall, capital intensities do not seem to be markedly higher in low-tax places, but this does not imply that capital is not mobile internationally. Including in the analysis the non-tax determinants of firm location along with the redistributive consequences across income groups would make it possible to offer a full-fledged macro-distributional analysis of financial globalization. This raises major conceptual and empirical challenges for future research.

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

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

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

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

	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**		

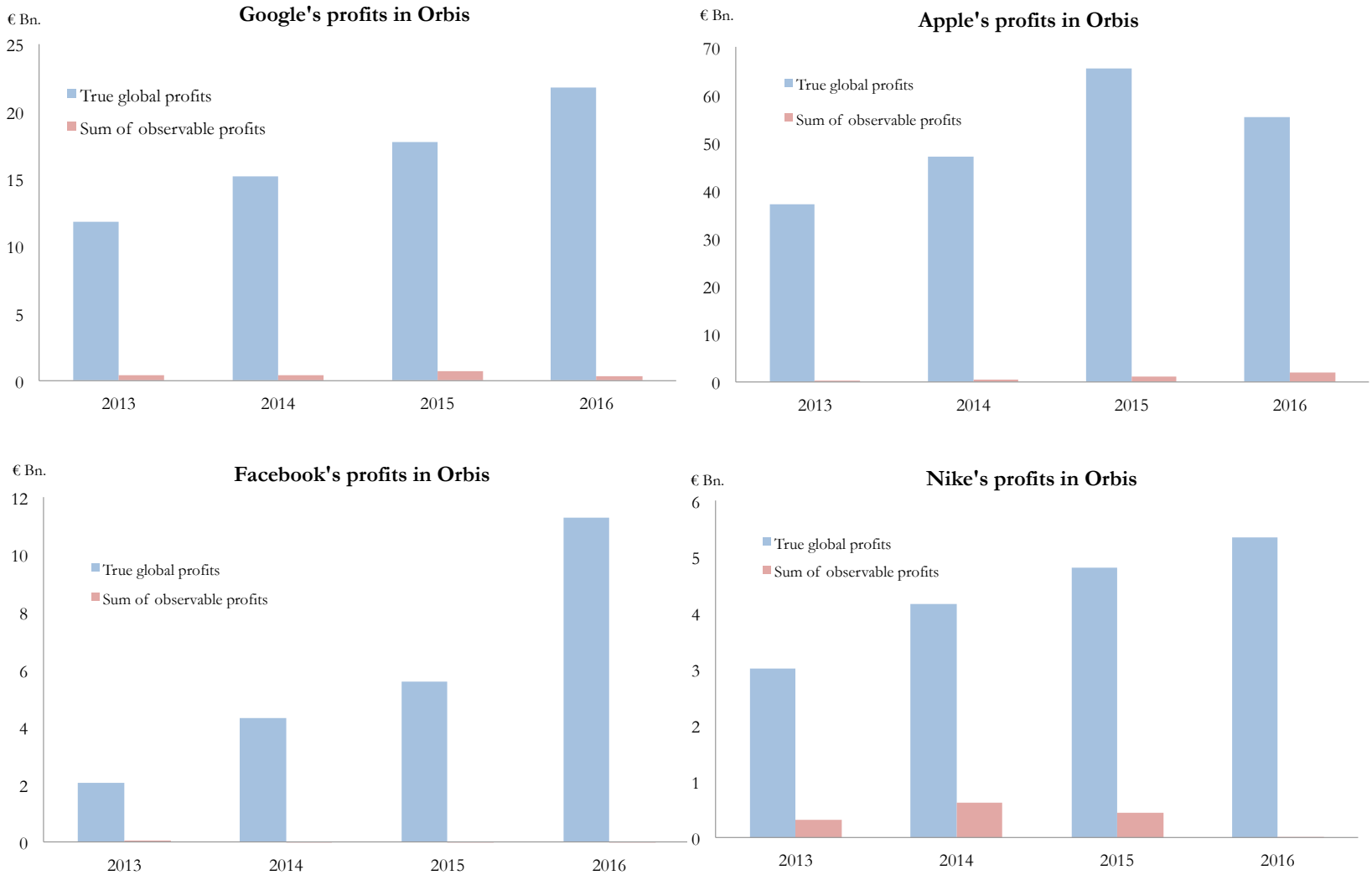
Notes: amounts are in current billion US$. All data are for 2015. Source: Appendix Tables A.6., A.7, C.4d, and C.4.

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

	Corrected capital share	*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%*

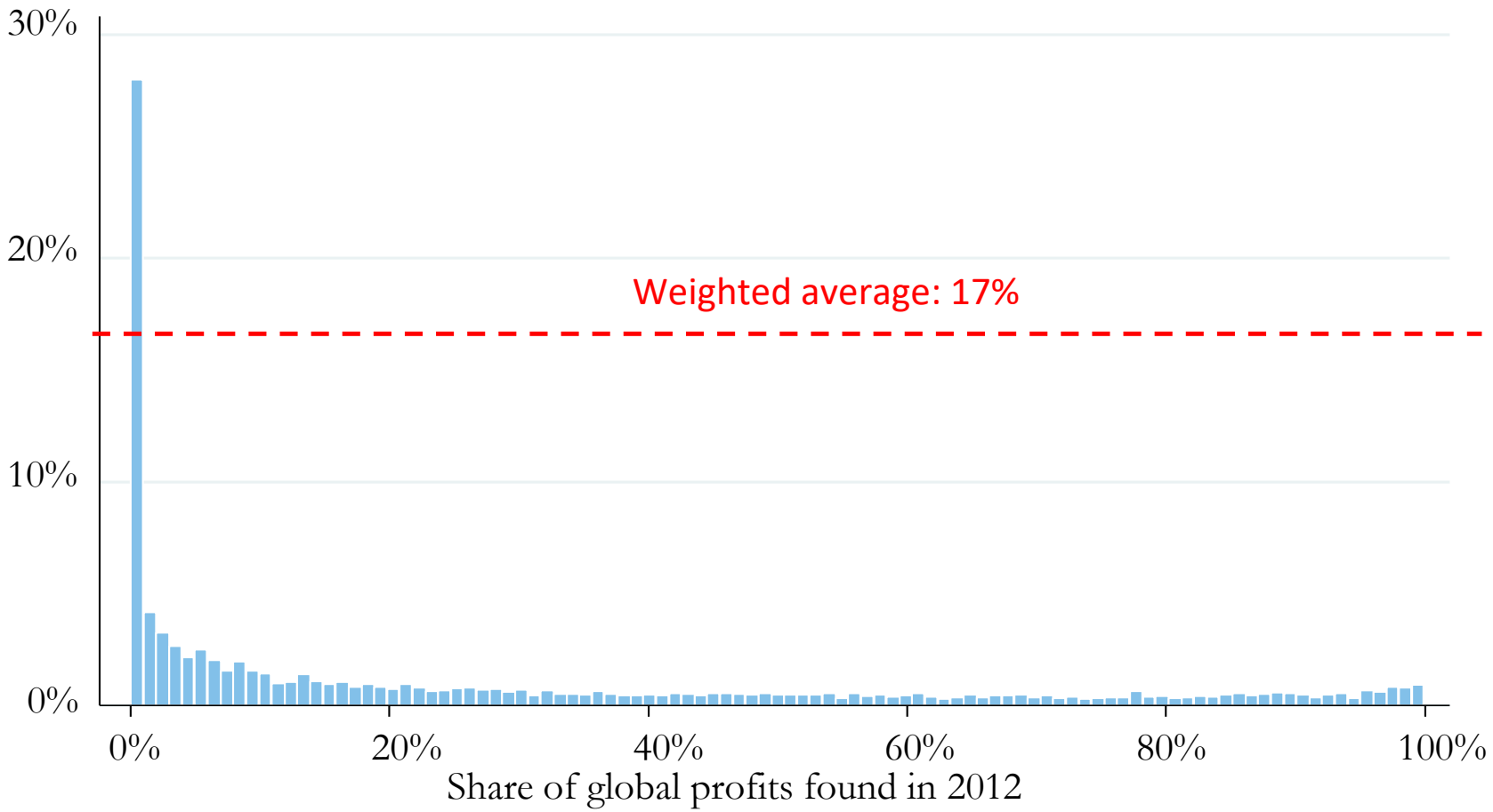
Source: Appendix Tables C.5 and C.5b.

Figure 1: The Missing Profits of Apple, Google, Facebook, and Nike



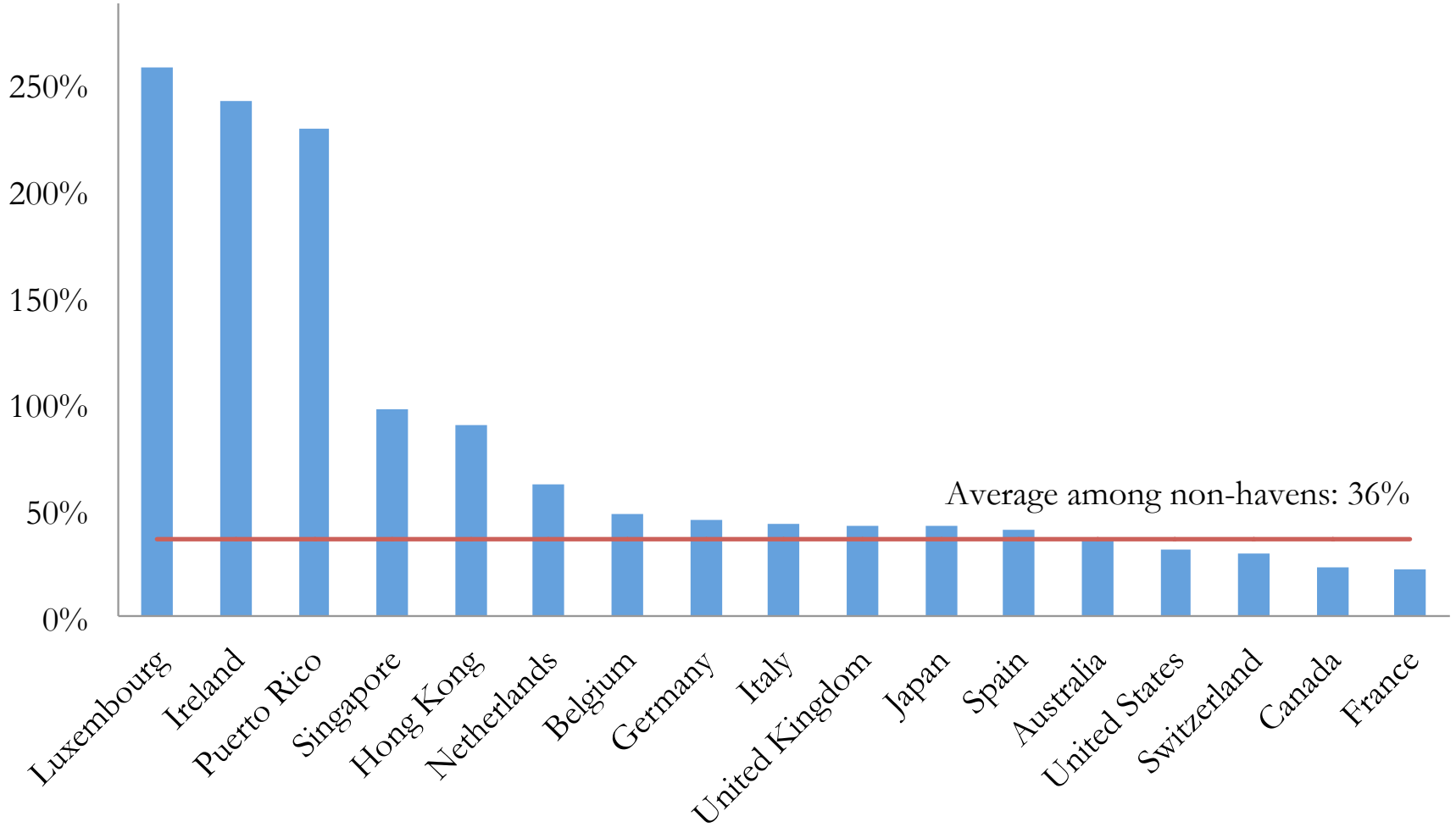
Notes: This graph shows the difference between Apple's, Facebook's, Alphabet's, and Nike's global consolidated profits, and the sum of the profits made by Apple's, Facebook's, Alphabet's, and Nike's subsidiaries, as recorded in Orbis. The difference is due to the fact that the subsidiaries where these 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



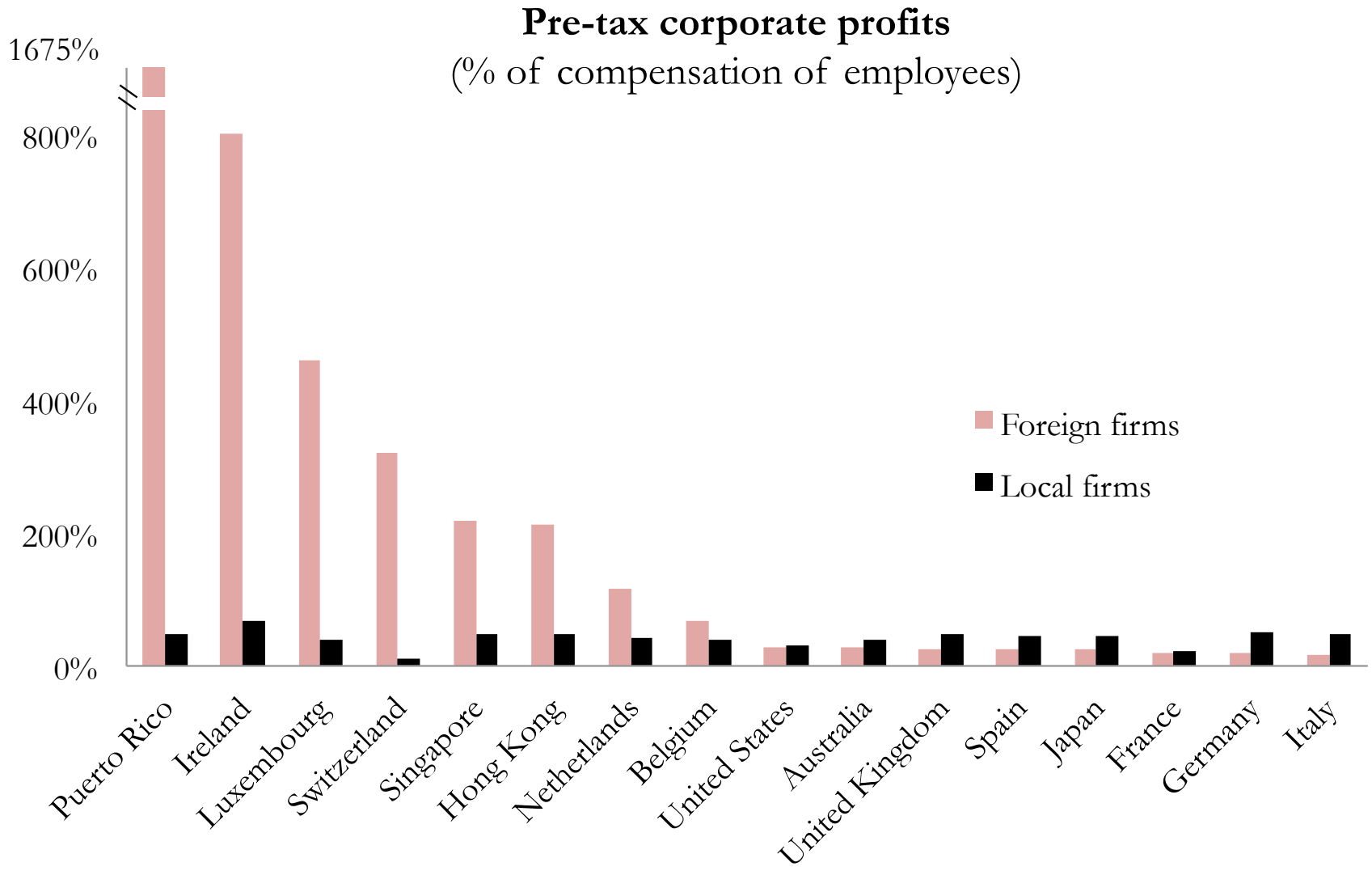
Notes: This graph shows the density of the following ratio. For each multinational firm in Orbis, we compute the sum of the unconsolidated pre-tax profits of all subsidiaries (code U1), and we divide this sum by the consolidated global profits of the firm (code C1). Whenever the ratio is less than 1,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



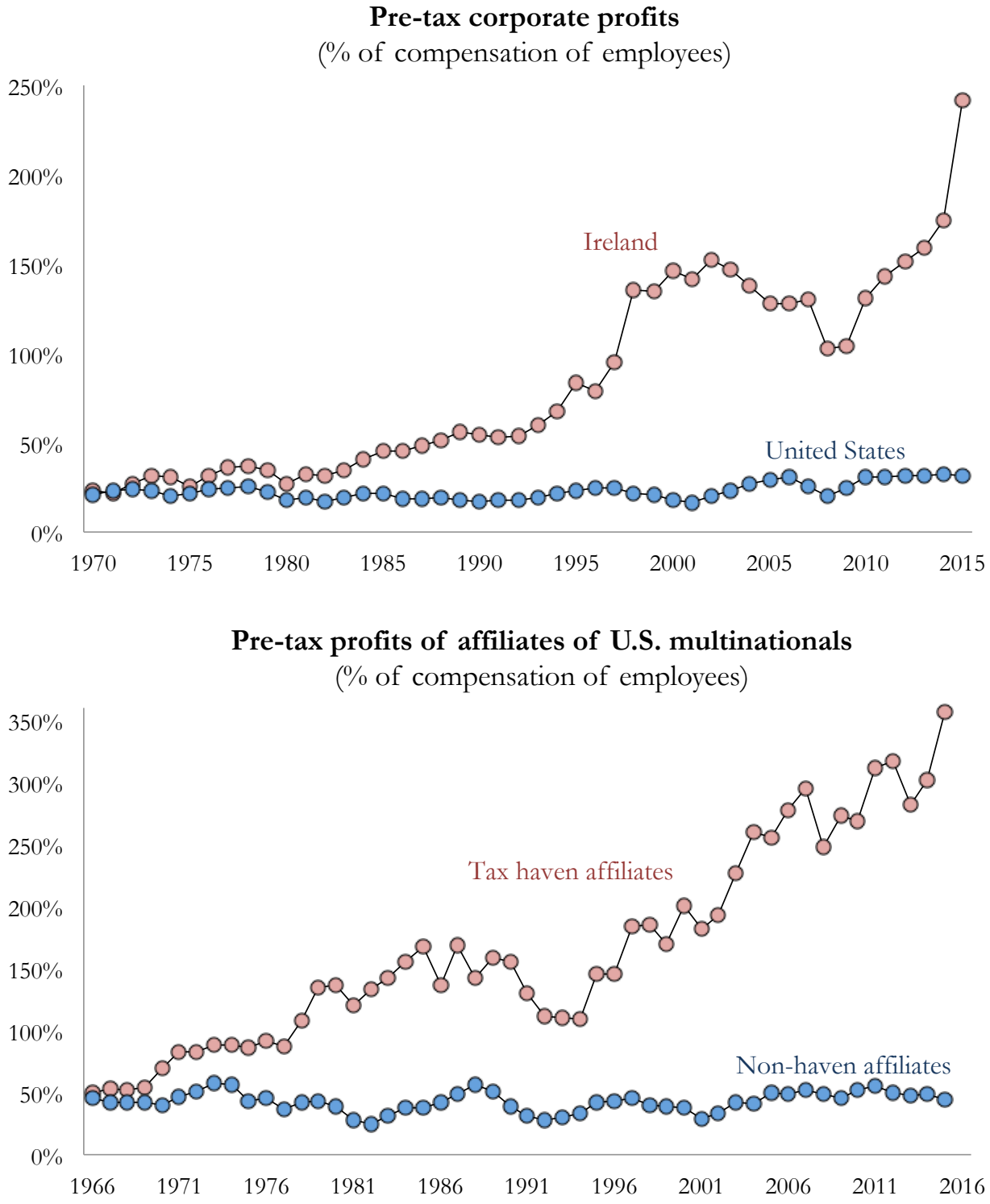
Notes: the bar shows the ratio of pre-tax corporate profits (net of interest and depreciation) to compensation of employees in 2015, as recorded in national accounts data. Source: Appendix Table A.7.

Figure 4: Profitability in Foreign vs. Local Firms



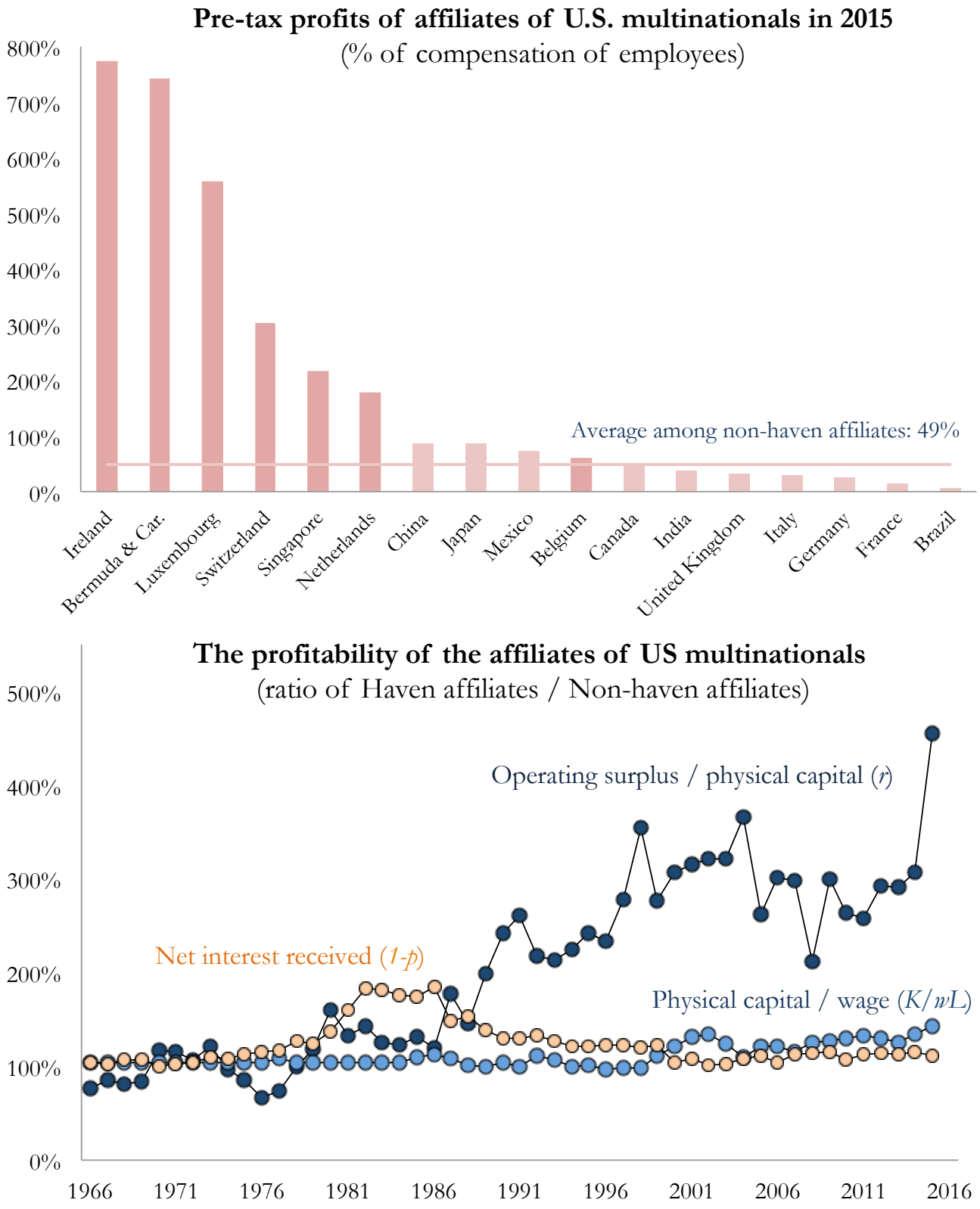
Notes: data are for 2015. Source: Appendix Table A.7.

Figure 5: The Rise of Profit Shifting



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

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

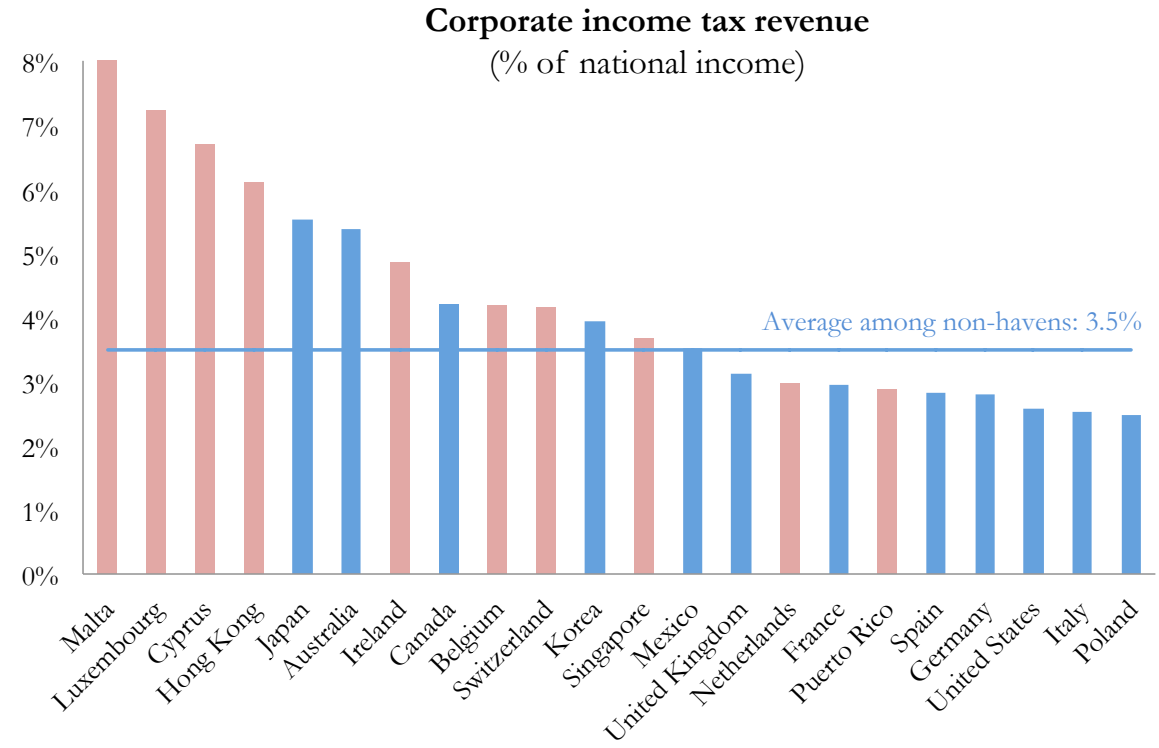


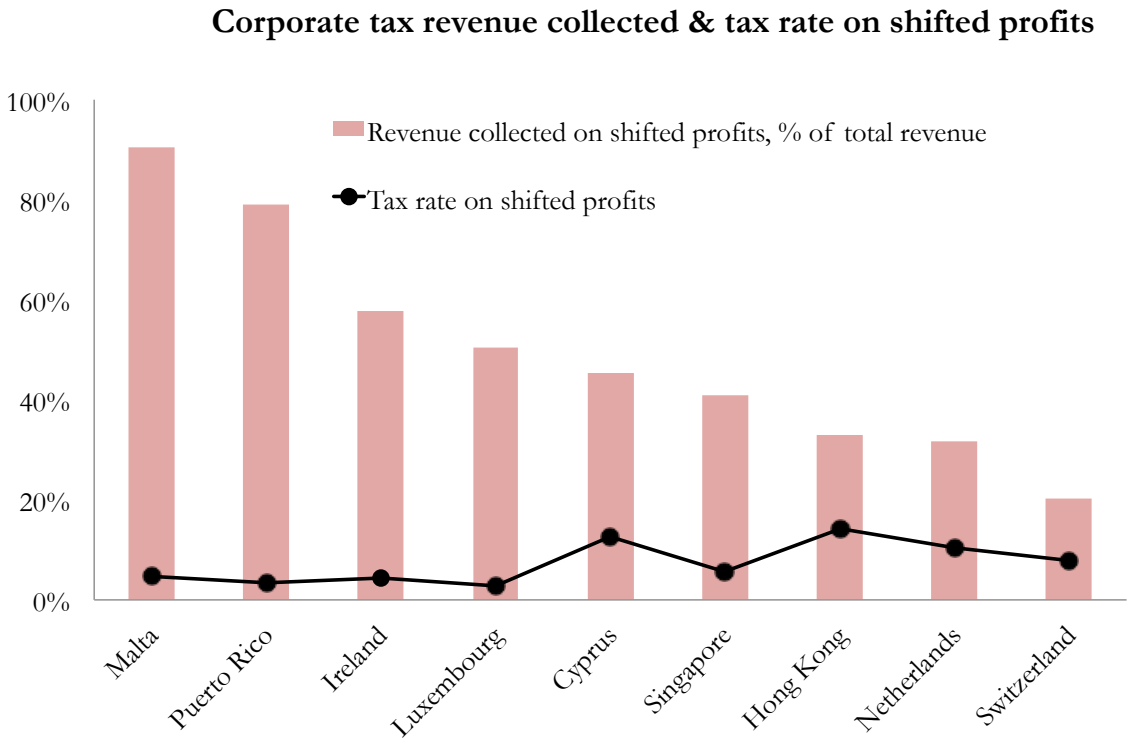
Notes: see notes to Figure 5. Source: BEA survey of the activities of U.S. multinationals abroad, Tables II.B 1-2 (column "Plant, property, and equipment (net)" and II.F.1.

Figure 7: Allocating the Shifted Profits

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

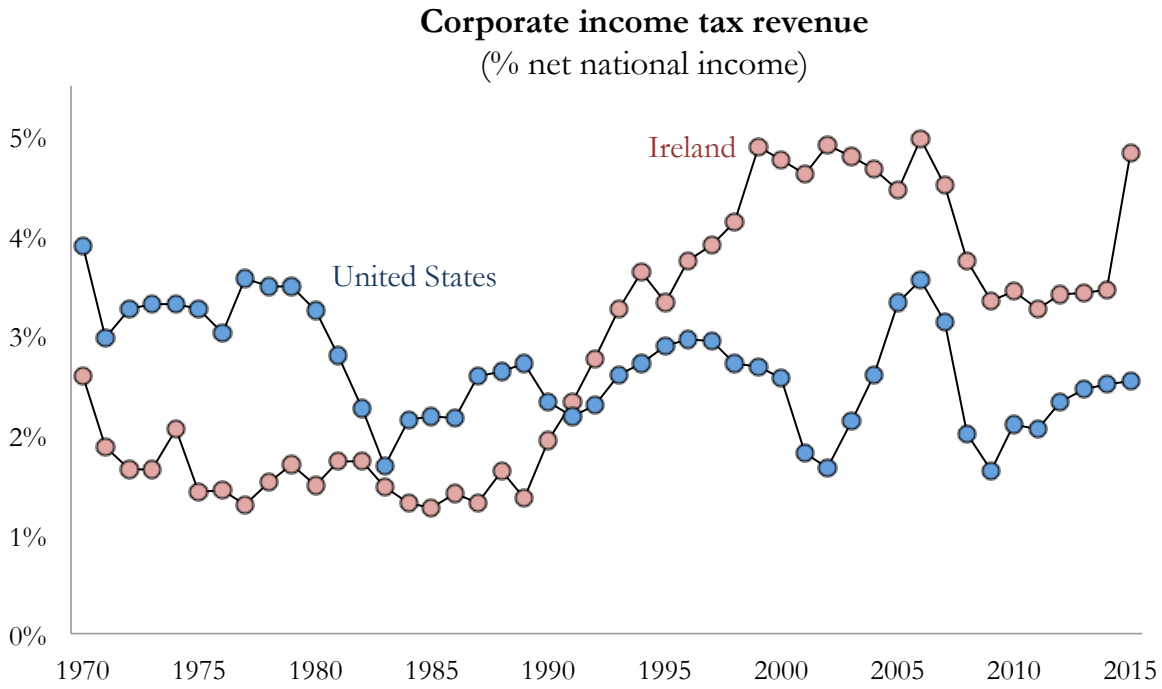
Figure 8: Corporate Tax Revenue in Tax Havens

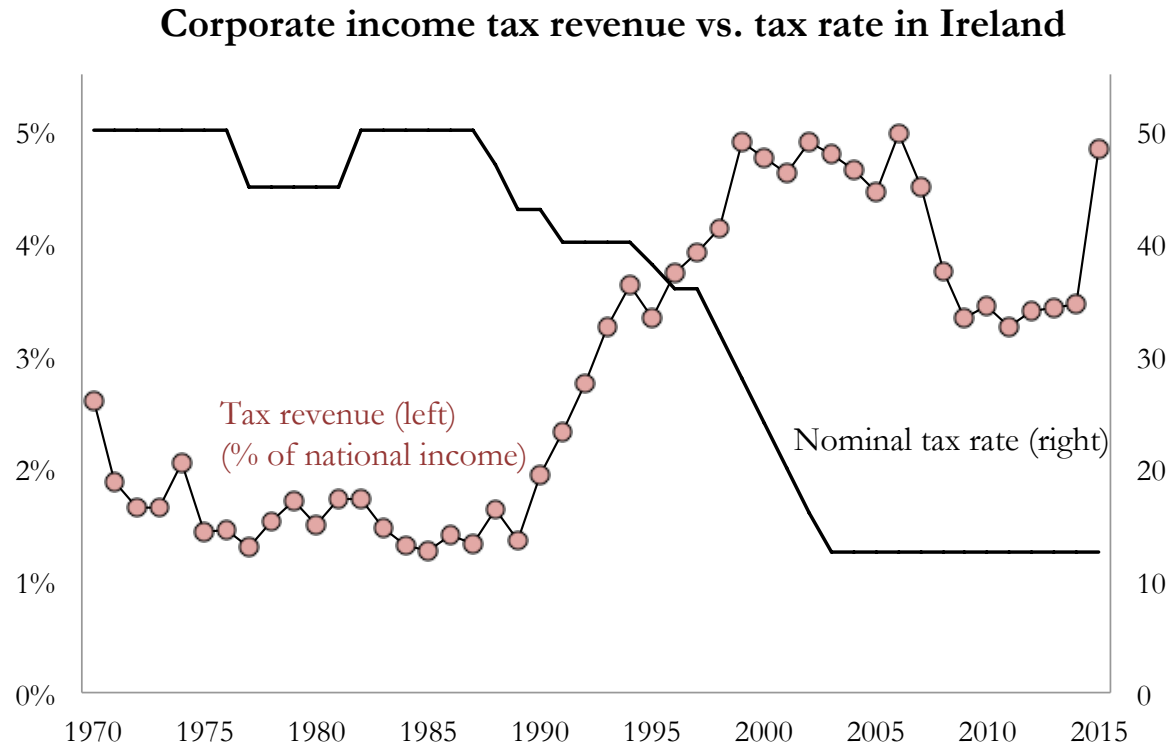




Notes: data are for 2015. Source: Appendix Tables A.3., A.6., A.7, and A.11.

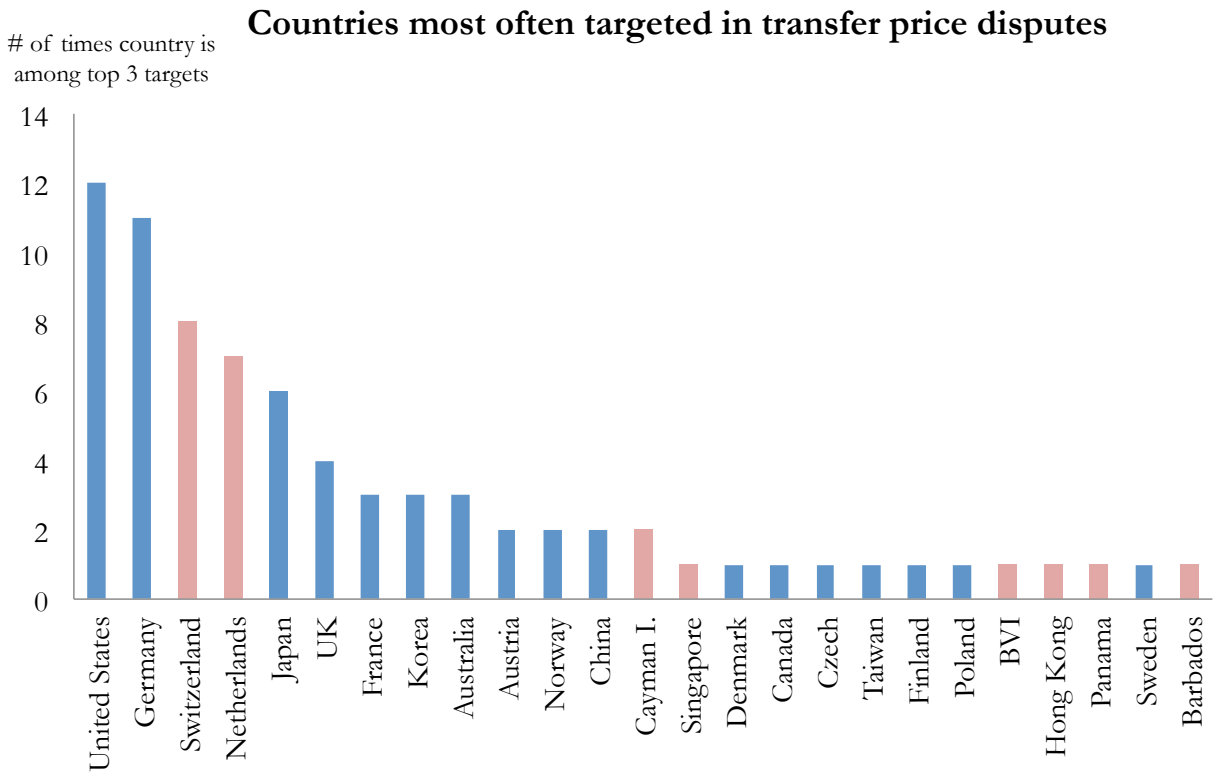
Figure 9: The Redistribution of Corporate Income Tax Revenue

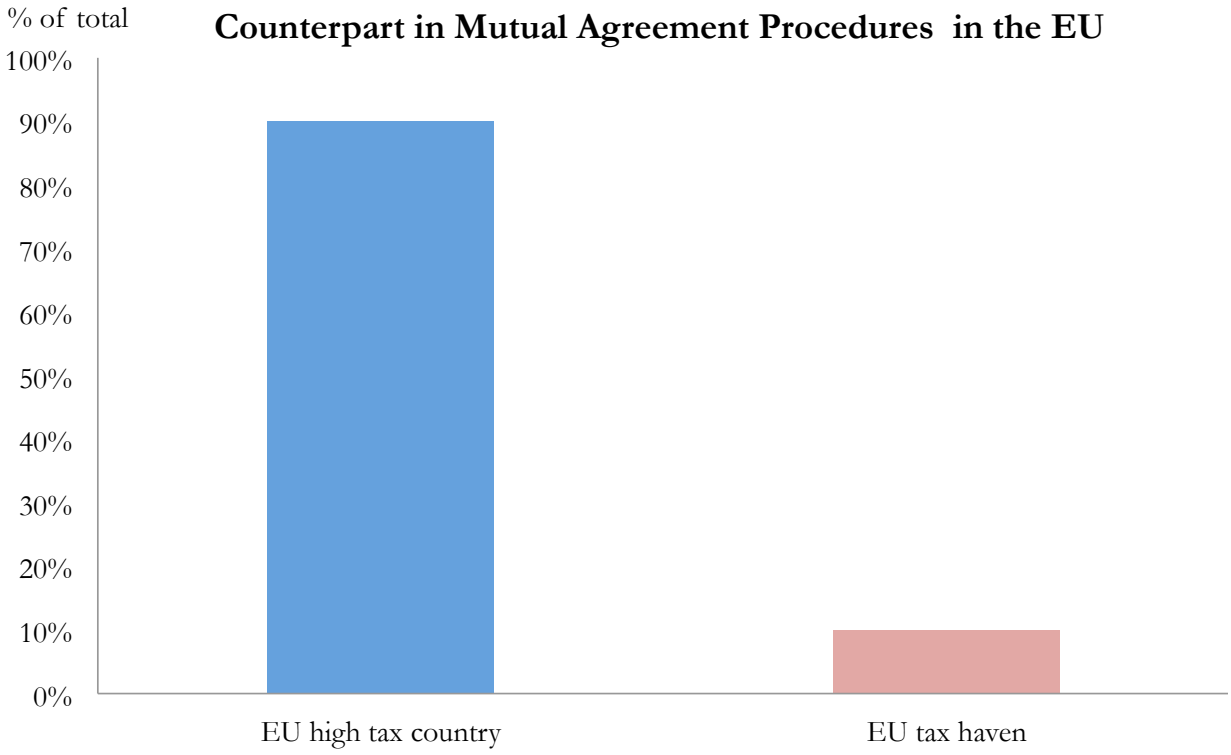




Source: national accounts of Ireland and the United States; see text.

Figure 10: How Tax Authorities Enforce Taxes on Multinationals





Notes and source: see text.