Online Appendix (for online publication)

Section A details the analysis of U.S. multinational data, including measurement of profits; patterns in excess profitability by sectors; regression tables; and decompositions of excess profitability into capital intensity, excess return, and interest components. Section B provides supplementary results on the tax revenue gains of tax havens. Section C compares our findings to the literature and provides reconciliations with other studies.

A U.S. Multinationals Appendix

We collected all the publicly available tabulations of the U.S. outward foreign affiliates statistics, which are published by the Bureau of Economic Analysis based on surveys of the foreign operations of U.S. multinationals. The BEA conducts an annual survey since 1982. Tabulations are available at: https://www.bea.gov/international/di1usdop. Earlier surveys were conducted in 1966, 1970, and 1977 and digitized by Wright and Zucman (2018).

A.1 Variable Definitions

In all our analyses of U.S. multinational data, we use "profit-type return" as our measure of profit. Profit-type return is only reported by BEA since 1994. Before 1994, following Wright and Zucman (2018), we compute profit-type return as net income, minus equity income received, minus income from capital gains, plus foreign income taxes paid.

Before 1994, profit cannot be computed at the industry × country level in the publicly available tabulations of the BEA survey, but only at the country level. Starting in 1994, profit-type return is available at the industry × country. We consider 8 industries in our analysis: Mining, Utilities, Manufacturing, Wholesale Trade, Information, Finance and Insurance, Professional, Scientific, and Technical Services, and Other Industries. When data for Manufacturing subindustries (Food Manufacturing; Chemicals Manufacturing; Primary and Fabricated Metals Manufacturing; Machinery Manufacturing; Computers and Electronic Products Manufacturing; Electrical Equipment, Appliances, and Components Manufacturing; Transportation Equipment Manufacturing) are available we also use those. Profit-type return is not available in 1995 and linearly interpolated.

Tax havens are defined as: Ireland, Luxembourg, Netherlands, Switzerland, Bermuda, Caribbean tax havens ("Other Western Hemisphere" in the BEA data), and Singapore. Non-havens include all other countries. This list of havens is the same as the one used in Wright and Zucman (2018). Note that our list of tax havens is narrower than the list of havens used in the rest of the paper. This is due to a number of reasons. First, many small tax havens cannot be isolated in the BEA data as they are lumped with other countries. For instance, Andorra, Cyprus, Guernsey, Gibraltar, Isle of Man, Jersey, Liechtenstein, Malta, and Monaco are lumped with other European countries and territories in an "Other Europe" aggregate. Second, when small havens can be isolated (e.g., Barbados), public BEA tabulations by country × industry often do not disclose values for confidentiality reasons. Last, the BEA survey does not cover

Puerto Rico. The 7 havens we consider in our analysis of the BEA data account for 75% of global profit shifting in 2015 in our benchmark estimates ($460 billion out of $616 billion).

The BEA data are based on exhaustive surveys of US firms with outward investments (in benchmark years) and quasi-exhaustive surveys of large US firms with outward investments (in non-benchmark years). Note that the surveys capture all outward investments by firms operating in the US, including those with a foreign ultimate parent. This means that a company like Toyota, that has a regional headquarter in the United States, will be included. In 2019, the Bureau of Economic Analysis added a breakdown to its outward foreign affiliates statistics for 2017 focusing on the activities of U.S.-headquartered multinationals.[48] This breakdown excludes the activities of U.S. parents that are ultimately owned by a foreign company and the activities of foreign affiliates of those parents. Using this breakdown we can see that US-headquartered multinationals account for 94% of the value added of all US multinationals (including those that are ultimately owned by a foreign company.). Thus the BEA data can be seen as representative of the activities of US-headquartered multinationals.

A.2 Profitability Regressions

Using these data, we project the reported profitability of haven vs. non-haven affiliates of US multinationals on observables, including sectors, capital stocks, characteristics of host countries, etc. Specifically and and as explained in Section 3.3 of the paper, we study the determinants of the profitability of the affiliates of US multinationals by estimating specifications of the following model:

$$\pi_{cti} = \alpha_t + \beta_{1t} t \cdot ln(K_{cti}) + \beta_{2t} t \cdot ln(RD_{cti}) + \gamma_t t \cdot X_{ct} + \delta_t t \cdot Haven + \epsilon_{cti} \tag{5}$$

where π_{cti} denotes the profits-to-wage ratio, K_{cti} the net plant, property and equipment, and RD_{cti} the research and development expenditures of affiliates in country or territory c, in year t, and industry i; X_{ct} denotes time-varying country controls (GDP in US$ using purchasing power parity exchange rates, and population); $Haven$ is a dummy for being in our list of tax havens; and α_t are year fixed effects. The coefficient of interest, δ_t, captures the excess profitability of subsidiaries in tax havens relative to subsidiaries in non-havens in year t. All regressions are weighted by compensation of employees.

Table A shows the regression coefficient δ_t with robust standard errors clustered at the country level. The first column shows the raw series with no controls. In the baseline specification (reported in column 2), which is at the country level, we control for tangible capital inputs, GDP of host country, and population of host country, using yearly interactions for each term. We then move to the country × industry level. In column 3, starting from our baseline specification with controls we additionally control for industry × year fixed effects to ensure that unobserved and time-varying industry effects are not driving our results. In col. 4, we additionally control for R&D expenditures to ensure that different research intensity in haven vs. non-haven subsidiaries is not driving our results.

[48] "Part III—U.S.-Headquartered MNEs" tables available at https://www.bea.gov/worldwide-activities-us-multinational-enterprises-revised-2017-statistics.

Figure A: Explaining the excess profitability of haven affiliates

	Dependent variable: profits-to-wage ratio			
	[1]	[2]	[3]	[4]
	No controls	**Baseline controls**	**Baseline controls + year x industry FE**	**Baseline controls + year x industry FE + R&D controls**
1983b.Year#c.haven	0.547	0.216		
	(0.412)	(0.473)		
1984.Year#c.haven	0.563	0.347		
	(0.406)	(0.520)		
1985.Year#c.haven	0.594*	0.407		
	(0.328)	(0.452)		
1986.Year#c.haven	0.534***	0.509**		
	(0.185)	(0.226)		
1987.Year#c.haven	0.867***	0.946***		
	(0.315)	(0.340)		
1988.Year#c.haven	0.709***	0.776***		
	(0.243)	(0.236)		
1989.Year#c.haven	1.303***	1.314***		
	(0.317)	(0.387)		
1990.Year#c.haven	0.777***	0.691**		
	(0.276)	(0.272)		
1991.Year#c.haven	0.687***	0.651**		
	(0.232)	(0.254)		
1992.Year#c.haven	0.560**	0.507**		
	(0.263)	(0.243)		
1993.Year#c.haven	0.530*	0.595**		
	(0.277)	(0.270)		
1994.Year#c.haven	0.668**	0.617**	0.652**	
	(0.297)	(0.253)	(0.268)	
1995.Year#c.haven	0.793**	0.779**	0.774**	
	(0.362)	(0.318)	(0.301)	
1996.Year#c.haven	0.929**	0.866**	0.860**	
	(0.434)	(0.383)	(0.360)	
1997.Year#c.haven	1.300**	1.206**	0.984**	
	(0.622)	(0.590)	(0.433)	
1998.Year#c.haven	1.418*	1.295*	0.989*	
	(0.715)	(0.694)	(0.533)	
1999.Year#c.haven	1.273**	1.126*	1.084*	1.298*
	(0.611)	(0.574)	(0.573)	(0.678)
2000.Year#c.haven	1.160	0.970	1.069	
	(0.817)	(0.722)	(0.742)	

2001.Year#c.haven	1.109	0.902	0.871	
	(0.793)	(0.730)	(0.719)	
2002.Year#c.haven	1.547*	1.270	1.365	
	(0.889)	(0.850)	(1.091)	
2003.Year#c.haven	1.786*	1.564	1.490	
	(1.047)	(0.990)	(1.104)	
2004.Year#c.haven	2.111*	1.852*	1.576	1.790
	(1.144)	(1.059)	(0.993)	(1.148)
2005.Year#c.haven	1.975*	1.750*	1.554*	
	(1.117)	(1.029)	(0.915)	
2006.Year#c.haven	2.204	1.861	1.560	
	(1.389)	(1.266)	(0.993)	
2007.Year#c.haven	2.402	1.928	1.663*	
	(1.490)	(1.368)	(0.945)	
2008.Year#c.haven	1.863	1.357	1.193	
	(1.340)	(1.136)	(0.835)	
2009.Year#c.haven	2.208*	1.862*	1.606*	1.802*
	(1.213)	(1.093)	(0.952)	(1.048)
2010.Year#c.haven	2.091	1.692	1.333	
	(1.336)	(1.148)	(1.033)	
2011.Year#c.haven	2.466*	2.055*	1.867	
	(1.332)	(1.167)	(1.152)	
2012.Year#c.haven	2.583*	2.176*	1.904*	
	(1.315)	(1.141)	(1.073)	
2013.Year#c.haven	2.267*	1.867	1.566	
	(1.302)	(1.232)	(1.150)	
2014.Year#c.haven	2.480**	2.165**	1.807*	2.108**
	(1.023)	(0.974)	(0.913)	(1.037)
2015.Year#c.haven	2.999***	2.824**	2.296**	
	(1.105)	(1.060)	(0.969)	
2016.Year#c.haven	3.075***	3.051***	2.651***	
	(0.941)	(0.879)	(0.833)	
2017.Year#c.haven	3.414***	3.275***	2.879***	
	(0.987)	(0.907)	(0.900)	
2018.Year#c.haven	3.498***	3.335***	2.846**	
	(1.291)	(1.250)	(1.231)	
Observations	1,942	1,884	13,661	2,556
R-squared	0.261	0.405	0.268	0.318

Notes: Robust standard errors clustered at the country level. *** p<0.01, ** p<0.05, * p<0.1.

As the variable of interest, *Haven*, varies at the country level, we conservatively cluster standard errors at the country level. In our benchmark year (2015) or the closest BEA benchmark survey year (2014), haven profitability is statistically different from non-haven profitability in all specifications, although this is not the case earlier in time as standard errors can be quite large. We stress two caveats when interpreting these standard errors. First, the main reason why the standard errors can be sizable is that the regressions are run on the publicly available tabulations of the BEA survey by country × industry, not on the underlying firm-level micro data. The BEA survey of the foreign operations of US multinationals covers the universe of US multinationals (in benchmark years) and almost all large US multinationals (in non-benchmark years); there is thus virtually no sampling noise. Running the same regression on the underlying micro-data (which are available to sworn researchers in Census/BEA facilities) would deliver the same point estimates as those reported in Table A, but with dramatically lower standard errors. We leave this task to future research. Second, and magnifying this, due to country aggregation in the BEA tabulations, the *Haven* dummy is equal to 1 for only 7 countries/regions (see above). With clustering at the country level, statistical testing is done on only 7 observations. Using the underlying micro-data (where small havens are not grouped) would again address this issue.

To supplement these profitability regressions, Figure B provides simple descriptive evidence that the excess profitability of haven affiliates indeed holds within sector. Focusing on the year 2015 (our benchmark year), we compute the profits-to-wage ratio of haven affiliates vs. non-haven affiliates within sectors. Consistent with the regression results described above, the results show that haven affiliates are an order of magnitude more profitable than non-haven affiliates within sector. This provides transparent evidence that the overall excess profitability of haven affiliates is not driven by differences in sectoral composition between havens and non-havens.

A.3 Decomposition of Excess Profitability

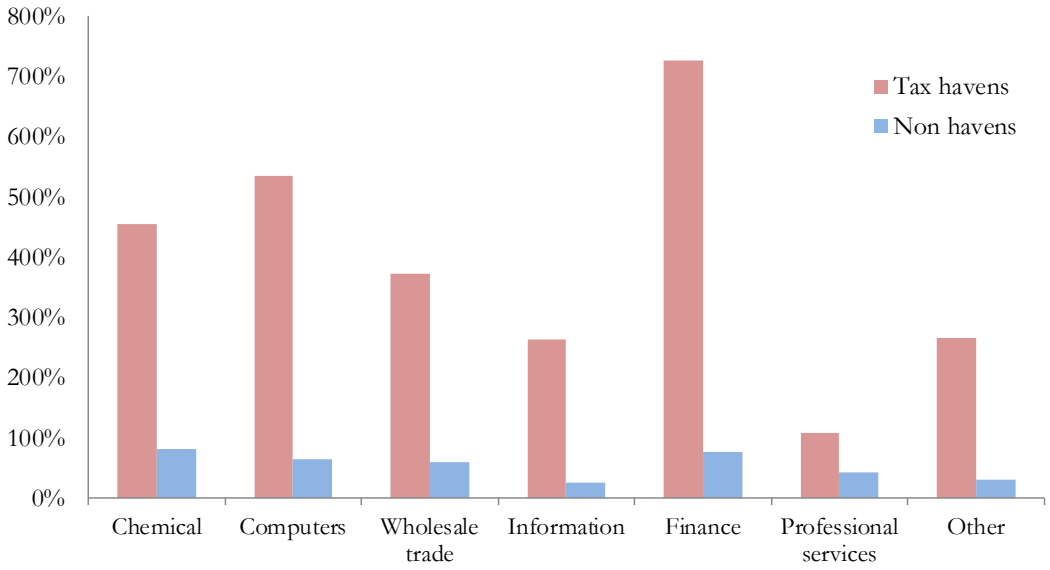
To non-parametrically identify the contribution of capital intensity to the high reported profits-to-wage ratios of the haven affiliates of US multinational companies, we decompose the measured π of haven and non-affiliates as follows:

$$\pi = \left(\frac{K}{wL}\right) \cdot r \cdot (1-p) \tag{6}$$

where K is tangible capital (net plant, property and equipment), wL is compensation of employees paid, r is the measured return to capital including any abnormal return (above the marginal product of capital) due to profit shifting, and p is net interest payments relative to operating surplus.

Figure C shows the ratio of capital to wages (K/wL), rate of return (r), and interest received ($1-p$) for the haven affiliates of US multinationals relative to their non-haven affiliates. The figure shows that the haven affiliates of U.S. multinationals have higher capital intensities than non-haven affiliates, but only slightly so. For a given amount of wages paid, haven affiliates use a 1.4 times larger stock of tangible capital than non-haven affiliates in 2015. Haven affiliates also receive slightly more interest in 2015 (1.1 time more than non-haven affiliates, relative

Figure B: Pre-tax profits of affiliates of US multinationals (% of compensation of employees)



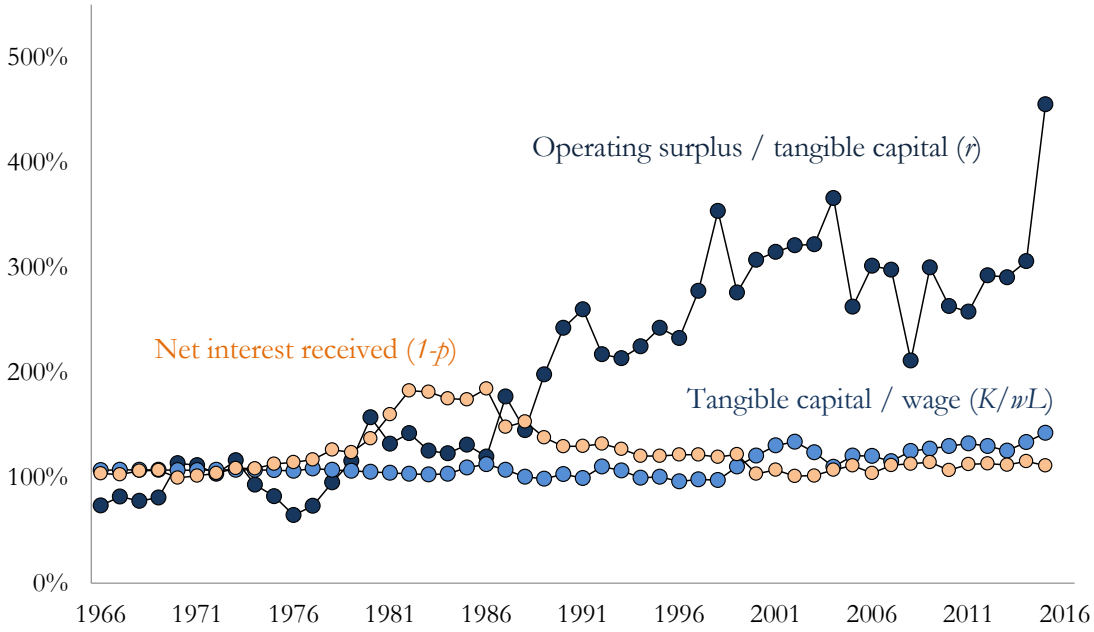
Notes: This figure shows the ratio of pre-tax profits to compensation of employees for the majority-owned affiliates of US multinational enterprises in tax havens vs. non-haven countries by sector in 2015. See variable definition and list of tax havens in Section A.1.

to operating surplus), but the difference is not large. By contrast, haven affiliates have much higher recorded rates of return on capital than non-haven affiliates today. In 2015, the recorded rate of return to capital r is close to five times higher in haven affiliates than in non-haven affiliates. The bulk of the sevenfold difference in profits-to-wage ratios between havens and non-haven affiliates is thus due to higher recorded returns to capital in haven affiliates—not high intra-group interest receipts or high capital intensities.

The high rates of return of haven affiliates can be seen as the product of two effects. First, multinationals can 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. 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 in this paper, since both of these techniques have similar redistributive implications: for a given global amount of profits, both redistribute profits across countries without affecting wages.

One potential concern with this interpretation is that some of the intangibles booked in tax havens may not have been shifted there but produced locally, by workers employed in R&D. To shed light on this question, we use the fact that foreign affiliates statistics include data on R&D personnel. The US outward FATS show that out of the 308,100 employees of the majority-owned foreign affiliates of US multinationals engaged in R&D in 2014, only 8% were

Figure C: Decomposing the excess profitability of US multinationals' haven affiliates



This graph shows K/wL, r, and $1-p$ of haven affiliates divided by K/wL, r, and $1-p$ of non-haven affiliates. 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 (profit-type return, net interest, compensation of employees).

employed in tax havens; 92% were employed in non-haven affiliates (primarily in Germany, the U.K., Canada, etc.).[49] By and large, the intangibles booked in low-tax countries have been produced in high-tax countries. The regressions shown in Section A.2 confirm that local R&D expenditures cannot explain the abnormally high profitability of haven affiliates.

Figure C also show how the contribution of rates of return to capital vs. capital stocks vs. interest payments has changed over time, back to 1966. The main driver of the rise in the profits-to-wage ratio of the haven affiliates of US multinationals since the mid-1960s has been the rise in their rate of return. Up to the late 1970s, affiliates in tax havens had roughly the same recorded rate of return to tangible capital, same capital intensity, and same net interest receipts than other affiliates. Since the 1980s, their relative rate of return has increased by a factor of about 5. By contrast, the relative capital intensity of these two groups of affiliates has remained close to 1, with only a mild rising trend. These da suggest that so far, profit shifting seems to have swamped tax-driven movements of tangible capital.

[49] See BEA, "Activities of US Multinationals Abroad," Table II-I.1. These tabulations are only made available during benchmark-year surveys (the latest of which was in 2014).

B Revenue Gains of Tax Havens

This appendix presents supplementary results on 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 generate by taxing these profits.

To motivate this analysis, the top panel of Figure D shows that tax havens, although they have low tax rates, generate more tax revenue than non-haven countries, relative to the size of their economy. 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 in 2015), corporate tax revenue amount to less than 3% of national income.

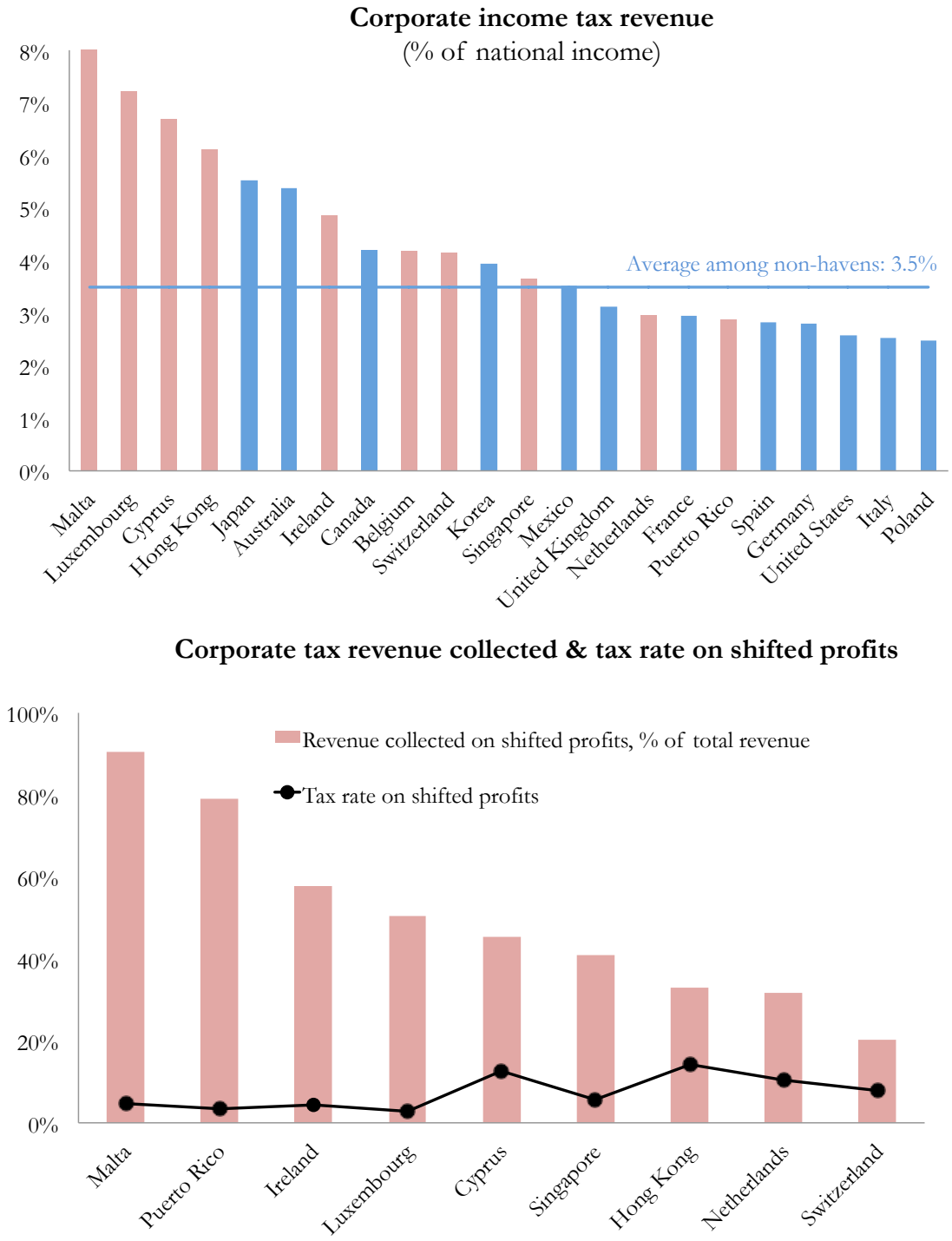
The bottom panel of Figure D reports the fraction of havens' corporate tax revenues that derive from the taxation of foreign profits. Most of their revenue derive from taxes collected on foreign firms. With source taxation and no international coordination, tax havens can generate sizable revenue by taxing the huge foreign profits they attract at low but positive rates. The havens that collect the largest amount of revenue appear to be those that impose the lowest tax rate on foreign profits. 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.

Figure E 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 rose, 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 E): when the tax rate was high (around 50% until the late 1980s), tax collection was low; since the rate was cut to 12.5% in the 1990s, tax collection has been high. Whenever they choose non-zero rates—even rates effectively quite close to zero—tax havens derive clear benefits from attracting paper profits.

It is worth noting that gains in tax revenue are not the only way tax havens benefit from tax competition. As we have seen a number of tax havens (including Ireland) have high capital intensities, i.e., they also attract capital-intensive industries (which can boost wages). Even when capital intensities are not higher, foreign firms can account for a large share of employment in tax havens and bring important economic benefits.[50] Our analysis does not allow us to quantify the complete gains that tax havens derive from international capital mobility. Such an analysis would require an explicit model of how movements of tangible capital affect the host economies, which we leave to future research.

[50] One potential explanation is that it may be easier for multinationals to shift profits into the countries where they also have sizable real activity. 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, however, that there are countries where foreign firms account for an even larger fraction of the total wage bill and yet there was little profit shifting in 2015. This includes most Eastern European countries, where foreign firms account for around 40% of both wages and profits. These countries had corporate tax rates close to 20% in 2015.

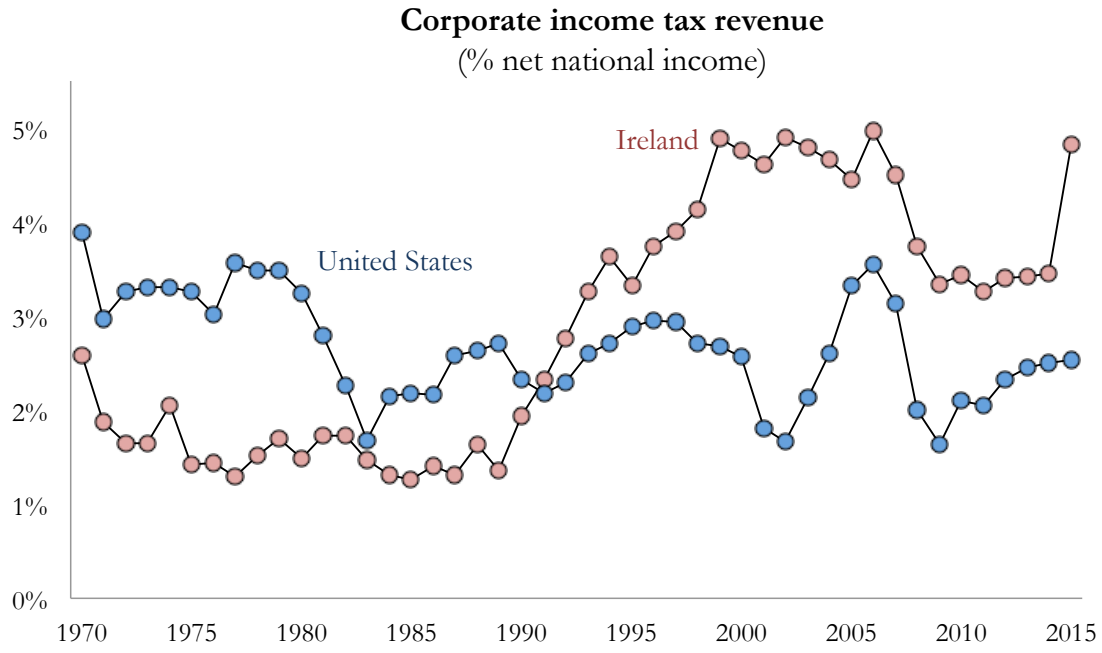
Figure D: Corporate Tax Revenue in Tax Havens

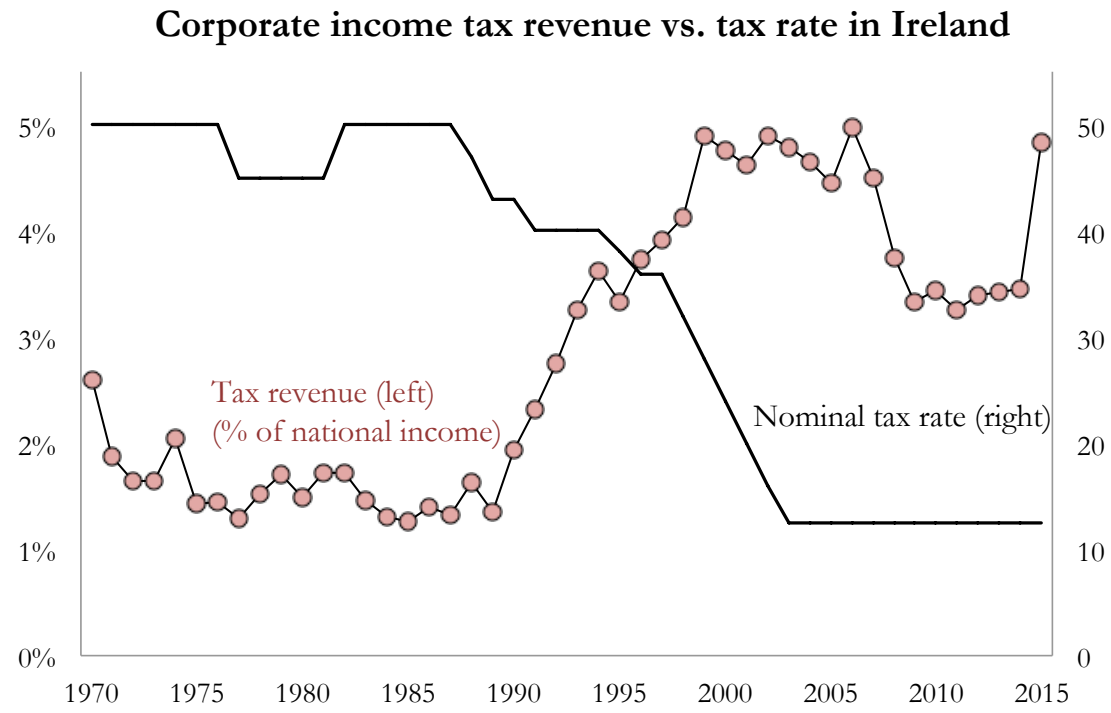


Notes: data are for 2015. Source: Replication Guide Tables A.3., A.6., A.7, and A.11.

C Comparisons With Previous Estimates

Figure E: The Redistribution of Corporate Income Tax Revenue





Source: national accounts of Ireland and the United States.

C.1 Studies Based on Financial Accounting Micro Data

A number of articles exploit micro-data from Bureau Van Dijk, namely Orbis and Amadeus (See Heckemeyer and Overesch 2013 for and overview), that collects public accounts on firms

and subsidiaries throughout the world. The most cited papers are Huizinga and Laeven (2008), Dharmapala and Riedel (2013) and the OECD BEPS estimate by Johansson et al. (2017). The methodology in these papers is conceptually similar as they all relate profitability (or changes in profitability) to a profit shifting incentive (or changes in profit shifting incentive) and from this extrapolate the total amount of profits shifted.

As we discuss in Section 2 of the paper, one concern when using Orbis data is coverage. Another concern related to micro-studies is how to measure the profit shifting incentive of each subsidiary. In the literature profit shifting is estimated by running regressions of the following form:

$$log(\pi_{ic}) = \alpha + \beta(\tau_p - \tau_c) + \delta Firm_i + \gamma Country_c + \epsilon_{ic} \tag{7}$$

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.

However, it is unclear which tax differential matters to capture the incentives to shift profits. There is no clear way of doing so and a variety of methods are hence applied: the unweighted tax differential to all subsidiaries, the differential to the parent firm, the weighted tax differential or the differential to the minimum tax rate. Moreover, 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 the equation above) may 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 may miss 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.

C.2 Studies Based on Macro Data

UNCTAD (2015) Most closely related work to our own as they use macro-statistics on FDI income to estimate profit shifting. The method applied is first to estimate the impact of tax haven exposure (measured as the share of FDI inward stock that is owned by tax havens) on profitability (measured as overall return on the FDI inward stock). They find a significant negative relationship -implying that higher tax haven exposure implies lower FDI inward return. From this they extrapolate the amount of profits shifted.

Crivelli et al., 2016 Estimate is based on the elasticity of corporate tax revenue with respect to changes in the average tax rate of tax havens. Since the average tax rate of tax havens does not differ across non-haven countries, the profit shifting effect is indistinguishable from a general time effect; and for each haven country it is readily seen to be a linear combination of its own tax rate and the average rate across all havens, the latter equivalent to that same time effect. To address this, they take the same approach as Devereux et al. (2008) and restrict the form

of time effects by assuming a common linear time trend. The authors use an autoregressive estimation model to allow for accumulating time effects- which implies that short-run estimates are scaled up by a factor 4 to allow for dynamic long-run effects. The long run estimated tax loss by Crivelli et al. is very substantial - $600 Bn. - implying that profits shifted to tax havens would be at least in the ball-park of $1800 Bn., which is more than the total profits of foreign owned corporations. Cobham and Jansky (2018) replicate Crivelli et al. (2016) and give a country by country split.

Clausing, 2016 Clausing (2016) uses U.S. data on multinationals to estimate the semi-elasticity of taxable income with respect to the corporate tax rate. She interprets this elasticity as the result of profit shifting and infers the amount of income shifted by U.S. firms to 17 low-tax countries to be in a range of $77bn to $111bn. She extrapolates these findings to the rest of the world by using Forbes 2000 companies as a proxy for global multinational profits and by assuming the same share of profits being booked in low-tax countries as observed for U.S. firms.

C.3 Studies of Transfer Mispricing

Hebous and Johannesen (2017) This study finds clear evidence of transfer mis-pricing of services within German multinationals, especially for intellectual property (patents and trademarks), headquarter services (administration, management and advertising) and sea transport (shipping). In these service categories, trade with affiliates in tax havens is heavily skewed towards imports and the internal service providers in tax havens earn significant excess profits, consistent with the macro flows we discuss in our paper. However, in contrast to our work, Hebous and Johannesen (2017) conclude that "government revenue associated with mispricing of affiliate service trade is relatively modest.". Two reasons can explain the relatively modest revenue loss estimated. First, Hebous and Johannesen (2017) look at service imported from directly-owned subsidiaries or direct parents in tax havens. According to this definition only 30% of service imports come from affiliates in tax havens and this is what they base their estimate on. Several potential limitations are can be noted: 1) direct linkage is not needed to profit shift. Profit shifting can occur directly through business to consumer sales (no internal service payment needed) as we see with Spotify, Uber, Google etc. 2) We know imports of services from tax havens are systematically underestimated.

Transfer mispricing of goods A number of studies deliver convincing evidence of transfer mispricing of goods by comparing internal/external unit prices at the product-level and testing for systematic deviations. Notably, Cristeau and Nguyen (2014), Liu et al. (2017), Davies et al. (2016) and Bernard et al. (2006) all find that related exports to low-tax countries are systematically under priced (hence leading to income being shifted to lower taxed affiliates). Common to all of these studies, is that the magnitude of profits being shifted is extremely small (less than 2 percent of CIT revenue lost). This is in support with what we find table C2.

C.4 Comparison With Previous Literature

Table D1a compares our global estimate of tax revenue losses to existing estimates. We find that our estimate is close to the official OECD BEPS estimate (Johansson et al.,2017) and to the UNCTAD (2015) estimate. Our estimate is smaller than Clausing (2016) and much smaller than the long run estimate of Crivelli et al. (2016).

Clausing (2016) gives a country breakdown of her estimate and Cobham and Jansky (2017) replicate Crivelli et al. (2016) to provide a country breakdown. We compare their estimates at the country level to ours in table D1b.

Table D2 summarizes the estimated tax revenue losses caused by transfer mispricing of goods. In all studies the estimated loss is below 2 percent of tax revenue.

C.5 Reconciliation with Blouin and Robinson (2019)

In "Double Counting Accounting: How Much Profit of Multinational Enterprises Is Really in Tax Havens?" Blouin and Robinson (2019, December) discuss the double counting issues in some of the BEA data on the activities of US multinational enterprises.

More precisely, as was already pointed out in the literature (e.g., Clausing, 2016), "net income" as reported in the BEA Activities of US multinational enterprises Income Statement tables (D1–D13) double-counts the income of US affiliates going through chains of holding companies.

In their original draft paper, Blouin and Robinson also discussed our work. Blouin and Robinson have since their original draft paper (December, 2019) removed the section of their paper commenting on our work (May, 2020). As some readers may still have read the original version, we still find it relevant to comment on any misunderstandings their original paper may have led to.

In our paper, we do not use "net income". To measure the foreign profits of US multinationals, we use "profit-type return" as reported in the BEA Activities of US multinational enterprises Value Added tables (F1–F9).[51] Wright and Zucman (2018) similarly use "profit-type-return" for their analysis of the long-run evolution of profit shifting by US multinationals.

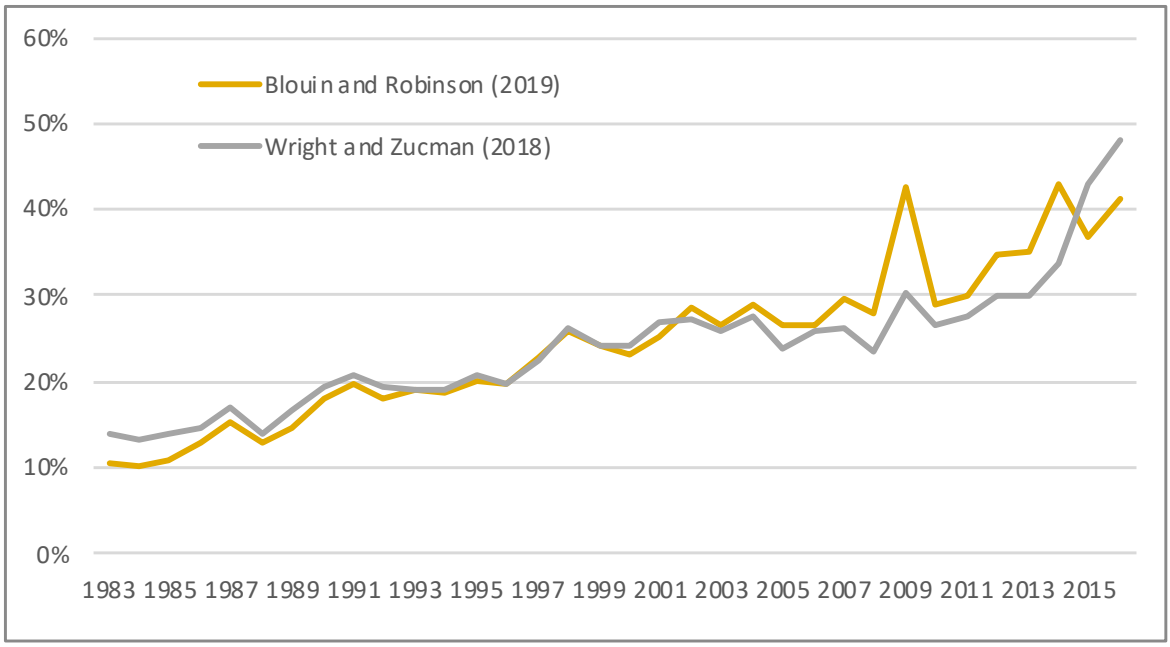
Importantly, "profit-type return" in the BEA Value Added tables does not double-count profits, because in contrast to "net income" it does not count as profit equity income received. Consider for instance the case a US parent that owns a German affiliate through a Bermuda holding company. Assume the German affiliate makes $100 in profit and pays $100 in dividends to the Bermuda holding. In the Income Statement Table D1 (not used in this paper), $100 in "net income" is assigned to Germany and $100 in "net income" is also assigned to Bermuda: foreign income is counted twice. But in the Value-Added Table F1 (used in this paper), $100 in profit is assigned to Germany and $0 profit is assigned to Bermuda. Indeed, to the extent that it has no other activity than to act as a paper intermediary between the US and Germany, the

[51] These tables are those that report our statistics of interest as defined in Section 2 of our paper: the (net-of-depreciation) value-added Y, employee compensation wL, (net-of-depreciation) operating surplus rK, net interest paid $p \cdot rK$, and (net-of-depreciation) pre-tax profits $(1-p) \cdot rK$ of the majority-owned affiliates of US multinationals abroad (called "profit-type return" by the BEA).

Bermuda affiliate has zero economic value added: for this affiliate, $wL = 0$, $(1-p) \cdot rK = 0$, $Y = 0$.[52]

Blouin and Robinson (2019) proceed to correct the BEA "net income" data (from the BEA Table D1) in a way that essentially mirrors the BEA "profit-type" return data (from the BEA Table F1). As a result, Blouin and Robinson's (2019) estimate of the share of foreign profits booked by US multinationals in tax havens (their Figure 3) is essentially the same as our estimate computed directly from the BEA Table F1 (and previously reported in Wright and Zucman, 2018), as shown by the figure below.

Figure F: Share of foreign profits booked in tax havens



Notes: This figure compares the share of foreign profits made by US multinationals in tax havens according to Blouin and Robinson (2019, Figure 3, right panel) and as measured in the BEA Activities of US multinational enterprises, Value-Added Tables, Table II.F.1., "profit-type return" (used in this paper and in Wright and Zucman, 2018). Source: grey line is taken straight from Wright and Zucman (2018, Appendix Table A.3 col. 12); orange line is from Blouin and Robinson (2019, Figure 3, right panel).

Wright and Zucman (2018) provide a detailed discussion and reconciliation of the recording of foreign income in the US international economic accounts. The results can be summarized as follows (see Wright and Zucman, 2018, Appendix Table A0):

- "Net income" in the BEA Activities of US multinational enterprises statistics, Table II.D.1, double-counts foreign income.

[52] In 2015, the total amount of pre-tax profits $(1-p) \cdot rK$ recorded by the BEA for the majority-owned affiliates of US multinationals operating in Bermuda was only $7.1 billion (Table F1), much less than the "net income" of these affiliates ($72.1 billion, Table D1).

- "Profit-type return" in the BEA Activities of US multinational enterprises statistics, Table II.F.1, does not double-count foreign income.
- Direct investment income in the BEA balance of payments does not double-count foreign income.
- In direct investment statistics, transactions are assigned to the country with which the reporting country has an immediate link. As a result, in the above example, $100 in income is assigned to Bermuda and $0 to Germany in the US balance of payments. For this reason, a disproportionate share of foreign income tends to be allocated to countries where holding companies are located (as noted by, e.g., Zucman 2014, p. 129).
- In "profit-type return" statistics, equity income received from affiliates is excluded from income. As a result, in the above example, $0 in income is assigned to Bermuda and $100 to Germany. Foreign income is not mis-allocated.

To summarize: only "net income" (not used in this paper) double-counts foreign income. Neither direct investment statistics nor value-added statistics (used in this paper) double-count foreign income. Direct investment statistics and value-added statistics differ in the way they allocate foreign income across countries. Direct investment statistics, by construction, assign income to the country with which the United States has a direct link (which in practice often times means a tax haven), in contrast to value-added statistics.

The best estimate of the share of the foreign profits booked by US multinationals in tax havens is 54% in 2016. In 2016, according to the BEA Value Added tables, 48% of the pre-tax profit of majority-owned affiliates of US multinationals were made in tax havens. But these statistics exclude Puerto Rico, which is not treated as a foreign country in the BEA data on the activities of US multinational enterprises. According to tabulations of IRS forms 8975 (country-by-country reports), U.S. multinationals made $38.9 billion in pre-tax income in Puerto Rico in 2016. Adding this amount of income to the amount of haven "profit-type return" in the BEA table II.F.1, 54% of the pre-tax profit of the majority-owned affiliates of U.S. multinationals were made in tax havens in 2016. The preferred estimate of Blouin and Robinson (2019), "adjusted pre-tax income," excludes Puerto Rico and is too low by about 12 points (42% in 2016). We refer to Clausing (2019) for a more detailed discussion of Blouin and Robinson (2019).

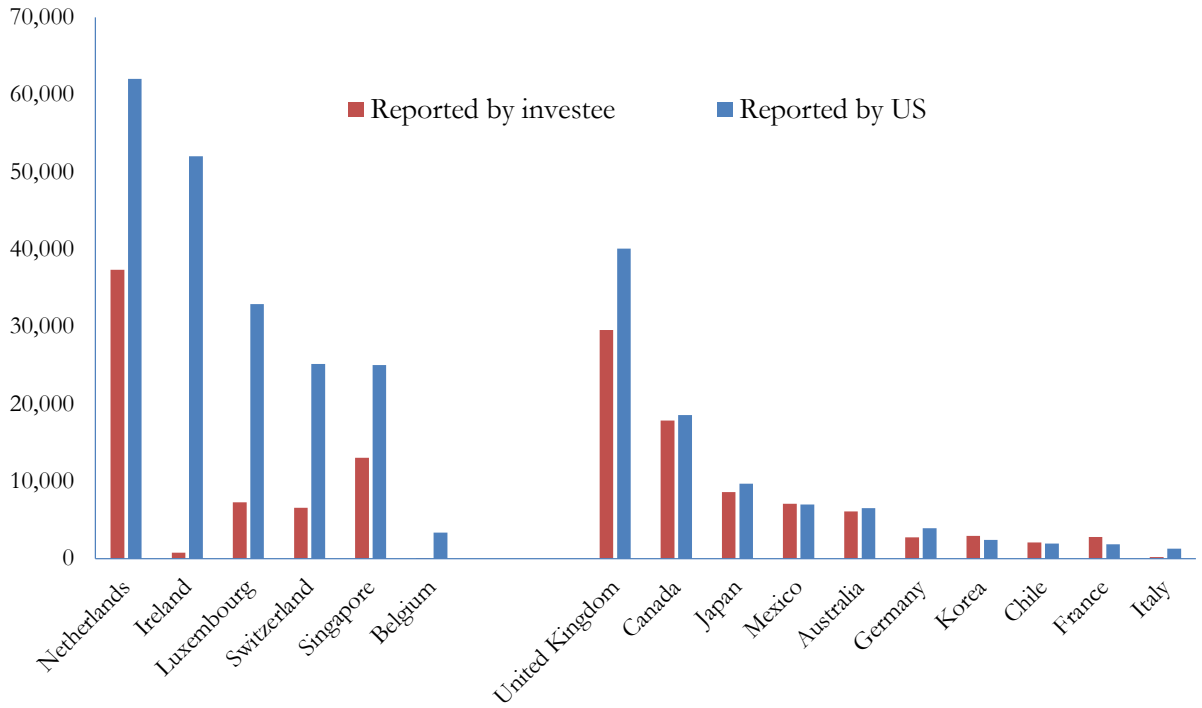
Another argument in Blouin and Robinson (2019) is that the US international accounts are not comparable to the international accounts of other countries. This argument, however, is incorrect. In compiling its direct investment and value-added statistics, BEA follows international statistical standards.

For direct investment, the international standard is defined by the OECD (2008) in its "benchmark definition of direct investment." Paragraph 218 states that: "When a direct investment ownership chain exists, direct investment earnings should reflect income from direct and indirect enterprises. All earnings from an ownership chain are geographically allocated to the enterprises directly owned." The United States follows this principle. In the above example where a German affiliate is held through a Bermuda holding, all income in US direct investment statistics is assigned to the enterprise directly owned by the US parent, i.e., to Bermuda.

For value-added statistics, the international standard is defined by Eurostat (2012) in its "Foreign affiliates statistics recommendations manual." Paragraph 1.3.4 states that "Income and expenditure classified as financial in company accounts according to the 4th Accounting Directive (78/660) is excluded from value added." This means that intra-company dividends are not counted as part of value-added or profit. The BEA follows this principle. In the above example where a German affiliate pays $100 in dividend to a Bermuda holding company, no profit is recorded in Bermuda in the BEA Value Added tables.

To further investigate the hypothesis that US statistical practices deviate from those of other countries, we have conducted a systematic comparison of global bilateral direct investment income data involving the US. Namely, we have compared direct investment income received by the US, as recorded in the US balance of payments, to direct investment paid to the US, as recorded in the balance of payments of the countries that publish bilateral direct investment income statistics. The results are summarized in Figure G below.

Figure G: Outward FDI income earned by the United States vs. reported by investee ($ billions)



Notes: This figure compares direct investment income received by the US, as recorded in the US balance of payments, to direct investment paid to the US, as recorded in the balance of payments of the partner countries that publish bilateral direct investment income statistics, in 2015.

The figure shows that for non-haven countries, US data generally match the partner countries' data (right panel). For instance, Canada reports $17.9 billion in DI income paid to the US

in 2015, while the US records $18.5 billion in DI income received from Canada. Japan reports $8.6 billion in DI income paid to the US in 2015, while the US records $9.7 billion in DI income received from Japan. Australia reports $6.1 billion in DI income paid to the US in 2015, while the US records $6.5 billion in DI income received from Australia. For most countries, direct investment received by the US (as reported in US data) matches direct investment paid to the US (as reported in partner country data).

The only quantitatively notable discrepancies involve tax havens (left panel), with, as noted in section 4.2 of our paper, the three largest gaps involving Ireland, Luxembourg, and the Netherlands. Ireland reports $0.8 billion in DI income paid to the US in 2015, while the US records $52 billion in DI income received from Ireland. Luxembourg reports $7.3 billion in DI income paid to the US in 2015, while the US records $33 billion in DI income received from Luxembourg. The Netherlands reports $37 billion in DI income paid to the US in 2015, while the US records $62 billion in DI income received from the Netherlands. Significant gaps are also present for Switzerland, Singapore, and Belgium.

As we discuss in section 4.2. of our paper, a likely explanation for this pattern is data issues in the statistics of these tax havens. In particular, these havens may miss some of the profits booked in special purpose entities due to a lack of comprehensive enough corporate registries, non-response to surveys, or other data issues (Angulo and Hierro, 2017; Damgaard and Elkjaer, 2017).

The important point is the following. If:

1. The US correctly estimates its total direct investment income receipts from the rest of the world, and,

2. The US correctly estimates its direct investment income receipts from non-haven countries overall (which is plausible since the US data match the data of partner countries),

Then: it must be the case that the US correctly estimates its direct investment receipts from tax havens overall. The US cannot record too much income receipts from tax havens overall. It is thus reasonable to upgrade the haven data so that they match the US data, as we do in our benchmark scenario. As we discuss in section 4.2. of the paper and section A.3.3 above, it is possible that some of the bilateral discrepancies between the US and the European haven data owe to inconsistent definitions of residency. For instance, affiliates that the US may consider as incorporated in Ireland may be considered by Ireland as incorporated in Bermuda. In that case, our benchmark estimate of the amount of profits globally shifted would be unaffected, but the location of the shifted profit would be affected (with, in the above example, more profit shifted to Bermuda and less profit shifted to Ireland compared to our benchmark estimate). More research is needed to reconcile the bilateral data of the US and the main European havens. In the conclusion we discuss several concrete steps to make progress on this issue.