Methodology for profit shifting series reported on the Atlas of the Offshore World

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ATLAS OF THE
OFFSHORE WORLD

Global Profit Shifting, 1975-2022

Data update user guide

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July 2025

Abstract: This user guide outlines the steps to follow in order to perform the data update and replication of estimates of profit shifting from multinational companies following the methodology from *The missing profits of nations* (Tørsløv, Wier and Zucman, 2023). The guide details the most recent changes in methodology according to improvements in data availability of international statistical organizations. It covers an overview of the input data, an explanation of the relevant do-files and relates them to the main methodology, and verification steps to facilitate the update to the most recent year of analysis. The guide also offers a brief overview of the methodology.

For a comprehensive overview of the analysis discussed below, users are invited to view the original paper of Tørsløv et al. (2023) published in the *Review of Economic Studies*, as well as the original replication guide which delves into the methodology in greater detail than this document.

Contents

1 Summary

This user guide provides an overview of the steps necessary to perform the yearly update of profit shifting estimates. The guide starts with a section that highlights the most recent methodological updates that depart from the original methodology. It is followed by a summary of the methodology used, which is broadly separated in three steps. The first concerns the estimation of profits shifted to tax haven countries. The second reallocates the total profits estimated in the first step back to source countries. The third step addresses the imputation method used to obtain profit and revenue losses of source countries for which data availability is limited. The section on the methodology is kept short as more information on the methodology is available in the original paper as well in the replication guide provided by the authors.

The subsequent section runs through the preparation steps. This includes all elements to update in the relevant do-files in order to run the code for a new year of estimates. It also includes a list of the raw data tables that need to be downloaded manually, as well as several potential issues that may arise while running the update on Stata and how to deal with them.

The key section of the user guide relates the methodology and data to the Stata code. The Stata code is central because it includes all the estimation steps performed to obtain estimates of global profit shifting for a given year. This section includes helpful steps to follow in order to perform the data update, including for instance which data sources to pay attention to when conducting the update, what imputations are made when data is missing, and how the key variables used in the analysis are constructed, among others. This section also includes information about some of the assumptions made in order to obtain estimates of profit shifting, and as such elaborates on the limitations of the methodology and points to improve.

Note finally that this document also serves as a the methodological guide for the update of the profit shifting estimates documented in Wier and Zucman (2022), which expands the analysis of profit shifting series to the period 1975-2022.

2 Baseline methodology

This methodology section is a summary of the methodology used to estimate global profit shifting. To find the full methodology as elaborated by the authors, please see the original paper from Tørsløv et al. (2023) and their replication guide.

2.1 The methodology in a nutshell

The methodology used to estimate global profit shifting grounds on one key statistical anomaly: foreign-owned companies located in tax haven countries are an order of magnitude more profitable than domestic companies in those same countries. At the same time, foreign-owned companies located in high-tax countries tend to be less profitable than domestic companies in those countries. The imbalance in firm profitability in both tax havens and non-tax havens is the central point of the analysis. As such, the argument goes, all profits that exceed the amount of what should be expected in that country, i.e. all profits of foreign firms beyond the profitability level of domestic firms, are considered as artificially shifted profits. Taking the sum of all artificially shifted profits in each tax haven country constitutes the estimate for global profit shifting in a given year.

The second step of the analysis consists of reallocating profits back to source countries. The approach used in the second part is to look at balance of payments data and isolate payments that academic literature finds to be conducive of tax avoidance strategies.

The final step in the methodology concerns imputed values for countries for which data availability is limited. The estimate of reallocated profits to these countries centers on a reallocation formula which reallocates the residual amount of profits shifted, i.e., the amount of profits sourced from the "rest of the world". This formula uses the tax revenue loss as a share of corporate tax revenue collected for the rest of the world, and imputes "in reverse" the amount of profits shifted to a given country based on its corporate tax revenue.

2.2 Step 1: Estimating profits shifted to tax haven countries

As elaborated above, the methodology used to estimate profits shifted to tax haven countries focuses on comparing profitability of local and foreign corporate sectors in a given country. Such comparisons are done using **profit-to-wage ratios**. The profit-to-wage ratio of a given sector is the ratio between total profits earned and total wage costs in that sector. The method prescribes, for each country where data is available, to calculate two

sets of profit-to-wage ratios: one for the local corporate sector, and one for the foreign corporate sector. In the second step, the total amount of profits in the foreign sector is readjusted by calculating profits *should firms in the foreign sector be as profitable as domestic firms*. This means that for each tax haven country, profits are computed by multiplying the profit-to-wage ratio of the local sector by the wage costs of the foreign sector. The final step is to take the difference between total profits in the foreign sector and the readjusted profits. The difference is the estimate for artificially shifted profits to a given tax haven country.

Estimating profit-to-wage ratios requires data for four distinct variables. (i) Total profits earned and (ii) total wage costs in the corporate sector for domestic firms, and (iii) total profits earned and (iv) total wage costs in the corporate sector for foreign-owned firms. The choices of data sources and imputations made for countries for which data is missing are elaborated in the Stata code section.

Computing domestic profits.   Domestic profits are computed using national accounts data. The starting point is the decomposition of GDP by sector, i.e., disaggregating GDP (at factor cost, i.e. net of taxes on production) into value-added in the corporate sector, value-added in the government sector, and value-added in the rest of the economy (including among others households, non-incorporated businesses, and non-profit organisations). This step enables to identify the total value-added in the corporate sector of a given country.

The next step is to disaggregate value-added in the corporate sector (taken at factor cost, i.e. net of indirect taxes) into compensation for employees paid, net operating surplus, and depreciation. Net operating surplus equals gross operating surplus minus capital depreciation. Net interest is equal to the interest paid by corporations minus the interest received by corporations. This information is sufficient to compute domestic corporate profits, which are equal to net operating surplus minus net interest. This definition of corporate profits is conceptually in line with the definition of the tax base in corporate tax systems, which typically allow for interest payments to be deducted from the tax base.

Computing domestic compensation to employees.   Domestic compensation to employees is computed through the same steps as for the computation of domestic profits, i.e., by disaggregating national accounts data. First by isolating value-added in the corporate sector from other contributing sectors to GDP, and second by isolating compensation for employees paid from the other components of value-added in the corporate sector.

Computing profits of foreign-controlled firms. Foreign-controlled profits and employee compensation are computed using foreign affiliates statistics (FATS) data. FATS are a new source of data (existing since 2010) which inform on macroeconomic data about the activity of foreign-controlled firms (i.e., firms where more than 50% of shares with voting rights are owned by foreign investors). Of interest to this exercise, these data include the wages and profits of foreign-owned firms. Two types of FATS exist. Inward FATS record the wages and profits of the foreign sector of a given country. For instance, Eurostat compiles FATS for all EU countries. As such, inward FATS in Belgium provide information about profits and wages of firms residing in Belgium but owned by non-Belgian nationals. Outward FATS for a country like the US, compiled by the US Bureau of Economic Analysis, provide information about the profits and wages of affiliates belonging to US MNEs.

Adding up local and foreign profits recorded in FATS often does not match entirely with total corporate profits recorded in national accounts. This is because some countries rely on surveys rather than census to collect FATS data and because FATS data cover only non-financial corporations (except for the US). As such, FATS data exclude profits from holding companies and special purpose entities. For this reason, foreign profits are computed by taking the ratio of foreign profits as a share of total profits in a given country (available in inward FATS data) and applying this ratio to the total profits recorded in national accounts. For countries where inward FATS data is not available, as is the case for many developing countries and non-OECD tax havens, foreign profits are computed using foreign direct investment statistics compiled by the OECD and the IMF.

Computing employee compensation of foreign-controlled firms. Employee compensation in the foreign sector is also computed using FATS data. Due to the incompleteness of FATS data discussed above (i.e., that FATS do not cover the full amount of foreign sector activity as recorded in national accounts), foreign employee compensation is derived by computing the fraction of foreign employee compensation as a share of total employee compensation in a given country (available in inward FATS) and applying that ratio to total employee compensation observed in national accounts. When inward FATS data is missing, foreign employee compensation is obtained by assuming that non-US affiliates in a given country have the same profitability as US affiliates in that same country. Information about US affiliate profitability is available in the outward FATS of the US collected by the Bureau of Economic Analysis. As such, the method implies taking the profits-to-wage ratio of US affiliates and applying to the total value of foreign profits computed using FDI statistics (as discussed above in the case of missing inward FATS data).

2.3 Step 2: Reallocating profits shifted back to source countries

The second part of the analysis is devoted to reallocating the profits shifted to tax havens back to the source countries where these profits were earned. This enables to track the losses in recorded profits and corresponding tax revenue losses for these countries. The corresponding tax revenue losses are estimated at a later stage in the analysis by combining corporate tax rates and tax revenues data together with the computed profits losses. The methodology relies on information about "high-risk" payments. High-risk payments are defined as payments that academic literature considers to be typically conducive of profit shifting strategies [1]. These include internal FDI interest payments, exports of the right to use intellectual property (trademarks and patents), headquarter services (management, advertising, and administration), information and communication technology services, and financial and insurance services.

There are two main steps in the reallocation of profits to source countries. The first step requires to identify the total amount of bilateral high-risk payments between each tax haven and non-tax haven country in the database. As such, we can obtain the amount of profits shifted away from each high-tax country. The second step involves matching the estimated amount of profits shifted away from non-tax haven countries with the estimated amount of profits shifted to tax havens countries (estimated in part 1). This is done by taking the ratio of profits shifted away from non-tax haven countries as a share of all profits shifted estimated in part 2. And by multiplying this ratio, for each non-tax haven country, by the estimated profit shifting estimate of part 1. The two methods used to estimate profit shifting provide estimates that are of the same order of magnitude.

High-risk payments to EU tax havens. High-risk payments are separated into FDI interest paid and service payments (including royalties, insurance, ICT, financial, and "other"). High-risk payments to EU tax havens are computed using Eurostat tables "bop its6 det" and "bop fdi6 inc" which detail service trade and FDI interest flows at the bilateral level for all European countries. This data enables to obtain total high-risk payments exported to EU tax havens, which include Belgium, Cyprus, Ireland, Luxembourg, Malta, and the Netherlands.

High-risk payments to Switzerland, Singapore, Puerto Rico and Hong Kong. For Switzerland, Singapore, and Hong-Kong, high-risk payments are estimated using IMF data. For Puerto Rico, high-risk exports are estimated by taking the total exports reported by the Puerto Rico statistical agency and multiplying this total by the fraction of average

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[1]As documented in Hebous and Johannesen (2021).

high-risk exports as a share of total exports found in EU tax havens (73%). Due to a gap between reported Swiss exports to the EU and US and imports from Switzerland reported by the EU and US, several additional adjustments are conducted for the estimate of Swiss high-risk payments (see the section below "do-file table C1").

High-risk payments to remaining tax havens. For the remaining tax havens, the estimation of high-risk payments relies on the allocation of total excessive profits to those tax havens as estimated in part 1. The reallocation to EU countries and the US is based on recorded high-risk imports by the EU and US. The reallocation to remaining countries is based on FDI imports which serves as a proxy for MNE activity in those countries.

2.4   Step 3: Imputed profit losses for remaining source countries

The last part goes beyond the original methodology developed by the authors of the paper and concerns the extension of the country-coverage in the frame of the preparation of the results for the Atlas of the Offshore World - a global database mapping trends in tax avoidance worldwide. In part 3, profit and tax revenue losses from global profit shifting are imputed for remaining non-tax haven countries which were initially left out of the analysis due to data limitations. The imputation consists of reallocating the residual profits shifted which were allocated to "the rest of the world" back to source countries. This is done in three steps elaborated below.

Estimating tax losses as a share of corporate tax revenue collected. The starting point is the estimate of tax losses as a share of corporate tax revenue collected. This is a statistic that is calculated for each country of the initial database. For non-tax haven countries, it is calculated first multiplying profit lost by the country-specific statutory corporate tax rate (derived from the Tax Foundation Corporate Tax Rates Around the World). This product provides with total tax losses of all non-tax haven countries. The tax loss is then divided by the country-specific corporate tax revenue collected (derived from the UN Government Revenue Dataset), which yields the tax loss as a share of tax revenue collected. For the "rest of the world", this statistic is obtained by multiplying the residual profits shifted by the average corporate tax rate worldwide, and then dividing by the corporate tax revenues of the rest of the world.

Imputing profit losses in reverse. The reverse imputation of profit losses consists of imputing profit losses for the new set of countries starting from the tax loss as a share of tax revenue collected for the rest of the world. This imputation is conducted in reverse because the original method derives the tax loss based on profits shifted away, whereas

here the tax loss is used to estimate profits shifted. For each of the remaining countries, the tax loss as share of tax revenue collected for the rest of the world is multiplied by the country-specific corporate tax revenue (derived from UN GRD as well as from the work of Bachas et al. (2022) who map a global dataset of effective tax rates). This provides the tax loss from profit shifting for each remaining country. To obtain the profit losses, the tax loss is divided by statutory corporate tax rates (which take a value between $[0;1]$).

Calibrating profit losses to the estimate for the rest of the world. The final step consists of calibrating the total imputed profits shifted to the estimate of profits shifted away from the rest of the world obtained in the reallocation exercise of part 2. This is done in two steps. Starting from imputed profit losses estimated in reverse, we take the ratio of each country's profit loss as a share of total profit losses (the total of remaining countries). These ratios - or weights - are then multiplied by the estimate of total profit losses for the rest of the world. This way, the final country estimate of profit losses is imputed grounding on country-specific corporate tax rates and revenue, while being consisted with the residual shifted profits estimated in the previous steps of the analysis.

3 Data update checklist

3.1 Preparation steps

Before undertaking the data update, consult the following steps. A step-by-step overview of the Stata code is outlined in section 4.

- Update the global GDP growth rate for the latest year of analysis in "world growth rates.xlsx" in the raw data folder. World growth rates are found in WBdata for the country "world". Subsequently update the value for the most recent year in the master do file.

- Update exchange rates to the most recent year in the master do file.

- Make sure years of analysis are up to date in UN corp tax data.do (which applies the country local separately as it includes the year 2015 - because it is used in the preparation of data for the Atlas).

- Make sure years of analysis are up to date in step 5 at the very bottom of the do file "prepare data for tooltip.do".

Raw data files to be downloaded manually.

- Latest version of IMF BOP data "BOP_11-17-2023 07-23-06-02_timeSeries". To be added in the raw data folder. And ammend the code according to the new file name in the do file "IMFs BOP data.do".

- Latest verion of UN GRD data (UN corp tax data). To be added in the raw data folder. And ammend the code according to the new file name in the do file "UN corp tax data.do". Current version only goes until 2021. For 2022, use of OECD global tax revenue series.

- Latest version of OECD SNA table 14. As of 2025, no longer available by sdmxuse. Download instead from OECD data explorer, economy, national accounts. Current version: 2016-2023.

- Latest verison of OECD BOP data. Not available from sdmxuse. Download instead from OCED data explorer, table "FDI by counterpart area and by economic activity, BMD4". Current version 2016-2023.

- Latest version of Eurostat employee costs data. Download from Eurostat website, database: "Foreign controlled EU enterprises by detailed breakdown of countries of control (from 2021 onwards)", economic indicator: "Employee benefits expense - million euro".

- Update China BOP data to most recent year. Current version 1950-2022.

3.2   Potential error messages in Stata

- In the do file "Eurostat services bulk download.do", it sometimes occurs that the Stata code fails to perform the bulk download. This is often due to connection issues, so if it occurs, try again once your connection is fully restored. If the problem persists, you can also skip this do file, as the previous version of Eurostat service data is already uploaded into the working files folder under the name "bop_its6_det". The remaining steps of the do file will then perform the data update using the previous version of the Eurostat services bulk download.

- In the do file "WBdata.do" and in "highriskexports.do" which both perform a bulk download of WB data, it sometimes occurs that the Stata code fails to perform the bulk download. This is often due to connection issues, so if it occurs, try again once your connection is fully restored. If the problem persists, consider removing lines 11-15 in dofile "highriskexports.do" and consider skipping the do file "WBdata.do", in both cases that would imply continuing the analysis with the most recent bulk downloads from World Bank data.

- In the do file "Eurostat FDI income bulk download.do" it sometimes occurs that the Stata code fails to perform the bulk download. This is often due to connection issues, so if it occurs, try again once your connection is fully restored. If the problem persists, you can also skip this do file, as the previous version of Eurostat FDI income data is already uploaded into the working files folder under the name "bop_its6_inc". The remaining steps of the do file will then perform the data update using the previous version of the Eurostat FDI income bulk download.

- If Stata states the error message "cannot be modified or erased; likely cause is read-only directory or file": This issue is only linked to the use of dropbox which does not allow to remove the "read-only" option of dropbox folders. You can launch the code again several times until eventually the error message will vanish.

4   The Stata code

In what follows, every do file used in the analysis is briefly described. This is in order to facilitate data update of profit shifting estimates for any internal or external user.

4.1   Stata project profit shifting

Stata-project-profit-shifting.stpr.   The structure of the Stata do files is based on one central Stata "stpr" file. Such files enable to save multiple do files within separate folders which can be directly accessed from the stpr file. The first step to conduct the estimate of global profit shifting is to open this file. When opening this do file, on the left side of the screen will appear all the folders where the remaining do files are saved. Input and output from the analysis is structured into different folders. The folder "code" stores all do files. The folder "figures" stores figures. The folder "output" stores the final results of the analysis. The folder "raw-data" stores raw data used as input for the analysis. The folder "work-data" stores working files, prepared in the analysis that are subsequently used in the analysis.

0a-master.do.   This do file is used to run the full analysis. If all other do files are activated in the remaining do files of the analysis, then running the master do will proceed with the full analysis from downloading raw data all the way to preparing graphs and results. The master do includes several macros necessary to the remainder of the analysis, such as working directories as well as year-specific exchange rates and growth rates. Importantly, the master do enables the user to select the years for which the analysis is conducted (lines 62-64). The default option includes all years from 2016 until the most recent update. Note that analysis for the year 2015 is kept separately as this is the year for which the initial analysis was conducted by the authors. The estimates for the year 2015 are merged to the remaining results in the section 4.5 below (preparing data for the Atlas of the Offshore World).

0b-install-packages.do.   This do file should be run to download all Stata packages necessary to conduct the analysis. By default this do file is not activated.

4.2   Download raw data

0c-download-raw-data.do.   This do file is the master do file to be run for downloading data from statistical agencies. It bulk downloads data and proceeds with data cleaning steps in order to prepare the data in a working format for the remainder of the analysis.

IMFs BOP data.do. This do file imports the latest bulk download of IMF balance of payments data which is stored in the folder "raw-data". The bulk download needs to be done manually from the IMF website. It requires creating an account and then entering the webpage IMF Balance of Payments and International Investment Position Statistics (BOP/IIP). Then on the right corner, selecting the years of analysis (i.e. from 01 January 2016 until latest available update). Balance of payments is a statistical statement that summarizes transactions between residents and non-residents during a period. BOP data is structured into different accounts (goods and services account, primary income account, etc.). The international investment position is a statistical statement that shows at a point in time the value of financial assets of residents in an economy that are claims on non-residents, and the liabilities of residents of an economy to non-residents. The nature of the exercise to compute profit shifting implies a focus on flows rather than assets, which explains why we use only BOP rather than IIP data. The do file proceeds with data cleaning and outputs two working files. A first which stores total DI debit and credit values by countries worldwide, and a second which stores total interest values by countries worldwide.

WBdata.do. This do file bulk downloads World Bank growth data straight from the statistical agency. The data includes GDP and depreciation values for countries worldwide from 2012 until the latest year available.

UN corp tax data.do. This do file imports the corporate tax revenue data from the UNU WIDER Government Revenue Database. The bulk download needs to be done manually from the UNU WIDER GRD web page. The data is freely accessible upon filling in a form, and can be downloaded straight into Stata format. It is stored in the "raw-data" folder. The do file imports and cleans this data and stores year-specific subfiles in the work folder.

GDPgrowthrates.do. This do file imports the GDP values from the World Bank data downloaded in WBdata.do. It then imputes missing GDP values by taking the value for 2015 and multiplying it by the year-specific global GDP growth rate, relative to 2015 (this is the case for Anguilla, Bonaire, Guernsey, Gibraltar, Jersey, and British Virgin Islands). Global GDP growth rates are computed for each year of analysis in "world growth rates.xlsx" in the raw data folder.

highriskexports.do. This do file bulk downloads World Bank BOP data straight from the statistical agency. The data includes high-risk imports and exports for a selected few

countries. It is used in the reallocation of profits back to source countries (see section High-risk payments to Switzerland, Singapore, Puerto Rico and Hong Kong above).

FDI equity income operating units.do. This do file is used to download FDI income data from the OECD. It imports the data straight from the OECD online database. FDI data is structured by type of income (e.g. including equity income, interest income, FDI income). The do file prepares FDI income of operating units for OECD countries. Imputations are made when data is missing. The final value of FDI income of operating units is taken net of FDI income in the holdings sector (treated as conduit income) and net of FDI interest income of residential operating units.

OECD BOP disc.do. Computes discrepancies in FDI using OECD BOP data. For all countries for which data is available, discrepancies are computed by taking the difference between outward income reported by country A to counterpart B and inward income reported by counterpart B from country A (referred to as mirror data). Discrepancy data is used to obtain the finding from Table B10 that there is a global direct income surplus which goes unreported in BOP statistics.

OECD table 14a.do. Imports SNA table 4 and SNA table 14a data from OECD. Table 4 data is used to obtain corporate tax revenue data for OECD countries. Table 14a is used to obtain domestic corporate profits (the numerator in the domestic profit-to-wage ratios - cf. methodology part 1) as well as domestic wage costs (the denominator).

Eurostat services bulk download.do. Bulk download Eurostat service data. With data cleaning steps to account for the removal of UK in EU data from 2020 onwards.

non EU - debit.do. This do file handles service debit data (including imputations) from non-EU countries, that is, EU countries importing services from non-EU countries. A debit is recorded when goods or services flow into an economy (so this is similar to an import). These data become useful in part 2 of the methodology when assessing imports of risky service payments.

non EU - credit.do. This do file handles service credit data (including imputations) from non-EU countries, that is, EU countries exporting services to non-EU countries. A credit is recorded when goods or services flow out of an economy (so this is similar to an export). These data become useful in part 2 of the methodology when assessing exports of risky service payments.

Internal EU - credit.do.   This do file handles service credit data (including imputations) from EU countries, that is, EU countries exporting services to EU countries. A credit is recorded when goods or services flow out of an economy (so this is similar to an export). These data become useful in part 2 of the methodology when assessing exports of risky service payments.

Eurostat FDI income bulk download.do.   Bulk download of Eurostat FDI income data directly from Eurostat website.

Generating basic.do.   Performs data cleaning of the Eurostat FDI income data including data adjustment for the EU-total values after 2019, and prepares a working file called "basic".

Ireland mirror data.do. For countries other than Ireland, Eurostat data is used to compute the "credited" amount of interest income accruing to havens, instead of "net flows" where incoming interest is deducted from outcoming. However, Ireland only reports "net flows" and as a result Eurostat simply replaces FDI income credit with "net income" for Ireland specifically. To correct this, this do file uses mirror flows for Ireland, that is, it computes credited interest for Ireland by taking the reported debited income flows to other countries from Ireland.

Div & Int EU (DO & DI) CRE.do. This do file handles FDI income credit data where both parties are EU countries. That is, FDI income exported from one EU country to another. Data for Ireland is merged from the Ireland mirror data.

Div & Int EU (DO & DI) DEB.do. This do file handles FDI income debit data where both parties are EU countries. That is, FDI income imported from one EU country to another. Data for Ireland is merged from the Ireland mirror data.

Div & Int Non EU (DO & DI) CRE.do. This do file handles FDI income credit data where the exporter is an EU country and the partner economy is a non-EU country. That is, FDI income exported from one EU country to a non-EU country. Data for Ireland is merged from the Ireland mirror data.

Div & Int Non EU (DO & DI) DEB.do. This do file handles FDI income debit data where the importer is an EU country and the partner economy is a non-EU country. That is, FDI income imported to one EU country from a non-EU country. Data for Ireland is

merged from the Ireland mirror data.

FDI income disc within EU.do. This do file computes discrepancies in reported FDI income among EU countries using Eurostat data. That is, it takes the difference between outward flows from the reporting economy (DO) and inward flows in the partner economy (DI), and the other way around.

FDI income mirroring EU vs non-EU.do. Using Eurostat data, this do file computes FDI income received by non-EU countries based on the import flows reported by EU countries.

FDI income mirroring_nonEU.do. Structures the data from the do file above and saves in separate working files.

US outward FATS.do. Uses US Bureau of Economic Analysis (BEA) data to compute foreign affiliates statistics (FATS) of US multinational companies. The data concerns outward FATS, meaning it compiles information about the activity of US MNEs outside of the United States. Data for US MNE activity for Bermuda and Hong-Kong is added manually based on CbCR data.

4.3   Computing profit shifting estimates

Table B10.do. Table B10 addresses the global gap in reported FDI income. In the do file, steps 1-4 concern the inward DI gap. This starts with compiling OECD BOP data on inward FDI flows as reported by the receiving country. Missing values are completed using IMF data (except for Hong Kong and Singapore for which data is retrieved from national statistical offices). Then OECD BOP data is used to compile outward FDI for partner countries, i.e. those that report the same FDI flow as the previous step but from a sender perspective (outward FDI). Steps 5 and 6 address country-specific anomalies. Step 5 corrects a specific gap in reported DI income between the US and Japan and three EU tax havens (the Netherlands, Luxembourg, and Ireland). This is further discussed in Table B11 below. Step 6 corrects FDI data about British Virgin Islands, Curacao, St. Kitts and Nevis and the Turks and Caicos, all of which report zero or missing values in FDI income in the OECD and IMF BOP statistics. Instead, for those countries DI income is estimated using CDIS stock data and multiplying the stock by average rates of return on inward and outward FDI in tax havens. Steps 7-11 concern the outward DI gap following the same method as for the inward DI gap. Before the last step, we calculate the global residual DI gap in three steps. First we take the difference between

global outward DI income and global inward DI income, which constitutes our global DI discrepancy. To this value we add back inward DI income of the holding sector and inward DI interest income which was deducted from equity income of operating units (see "FDI equity income operating units.do". Second, we add outward DI income gaps between country reports and partner country reports, and deduct inward DI income gaps, which in effect results in removing the net DI income gap between country reports and partner country reports. Third, we obtain the final residual to be reallocated by deducting the equity income surplus estimated in step 6. Finally, step 12 reallocates the total residual DI gap to non-EU tax havens, proportionally to the reported gap of each non-EU tax haven, such that after running table B10.do, the residual DI gap is zero.

Table B11.do. Table B11 focuses on a gap in reported FDI income between on one hand the Netherlands, Luxembourg, and Ireland, and on the receiving end, the United States and Japan. The focus is on these countries because the magnitude of the gap deserves special attention and must be corrected for - in 2015, the US reported receiving USD 122 billion more in FDI income from the EU than what the EU had reported paying to the US, the majority of which is paid by these three EU countries. Table B11 thus computes the DI income discrepancy between those countries by using both OECD and Eurostat BOP data. The approach used in conservative in that the smallest discrepancy between OECD and Eurostat data is then kept as the final estimate reported in table B11.

Table U1.do. This do file is the central piece of the estimation. It essentially performs the different steps outlined in part 1 of the methodology (section 2.2.). That is, it computes profit-to-wage ratios in foreign and local sectors of each country in the analysis, and then uses this information to estimate artificially shifted profits. In what follows we briefly describe what each step of "do file table U1" does. Note that the order of steps follows that of the do file, the order is not meant to be logical when considering the methodology steps of the analysis, rather the order gives priority first to variables which are themselves subsequently necessary for the computation of other variables.

- **Step 1: GDP**. Imports GDP values from the OECD and other sources (see download GDP data above). And restricts the analysis to the sample of countries for which there is sufficient data in all data sources of relevance to compute profit shifting estimates.

- **Step 2: Structure**. Builds up several additional variables which structure the data in a handy way for subsequent analysis, including a tax haven country dummy, a country categorical variable, and country name.

- **Step 3: Compensation of employees**. Imports the employee compensation from OECD table 14a (after data cleaning steps in "OECD table 14a.do"). When there is no data, compensation of employees is imputed as 35% of GDP for OECD countries (the OECD country average) and 30% of GDP for non-OECD non-haven and non-OECD tax haven countries (the non-OECD average). Data for Puerto Rico is imported from the raw data file "Wright_Zucman.xlsx" which stores information for Puerto Rico based on previous analysis.

- **Step 4: Profit/compensation ratio for US affiliates**. The outward profit-to-wage ratio for affiliates of US MNEs (i.e. the ratio for the foreign sector when considering only the activity of US MNEs) is directly imported from the working file using US FATS data from BEA (see US outward FATS.do). The BEA data does not include country-specific information for multiple tax havens. Missing values are imputed using regional profit/compensation ratios. Regions used in the analysis include "Other western hemisphere countries", "Caribbean UK islands", "remaining Non-OECD tax havens", "remaining OECD countries". Data for Puerto Rico is imported from the raw data file "Wright_Zucman.xlsx". Profit-to-wage ratios are treated separately in this analysis because of the prevalence of US MNEs in the world and the high quality data available via BEA. These P/W ratios are subsequently used in the end stage of the analysis to replace missing values for other countries.

- **Step 5: Profits of operating units**. Profits of operating units is the core variable used to build the foreign profits in a given country. The variable relies on up-to-date OECD data on FDI equity income paid by operating units - see "FDI equity income operating units.do" for complete details. The OECD data is used to upload data for OECD countries. For non-OECD tax havens, we assume net operating profits to be equal to 15% of GDP. For major developing countries in the dataset and remaining missing values, we import inward DI income as reported in table B10 (using OECD BOP data). Data for Puerto Rico is imported from the raw data file "Wright_Zucman.xlsx".

- **Step 6: Import profits of SPEs**. Here we compute the difference between inward and outward FDI income for special purpose entities (SPEs) using data from OECD FDI statistics. Note that for now SPE profits are set to zero which cancels out step 6. This is because equity income of operating units is now taken net of income in the holdings sector - which substitutes the need to remove SPE profits from equity income.

- **Step 7: Unrecorded net-of-tax foreign profits**. Here we correct the measure of foreign profits for tax haven countries by completing the gap in FDI income reported

in table B10. For non-OECD tax havens, unrecorded foreign profits are computed as the net missing income, i.e. the gap in outward DI income net of the gap in inward DI income, plus the value of residual DI income gap allocated to that country. For British Virgin Islands, Curacao, St. Kitts and Nevis and the Turks and Caicos, unrecorded foreign profits are computed as the sum of net missing income, residual DI income, as well as the DI income estimate using stock data (see Table B10 for more details). For Luxembourg, Ireland, and the Netherlands, unrecorded foreign profits are estimated using the discrepancy in FDI income between these countries and Japan and the United States (see table B11).

- **Step 8: Recorded corporate profits in national accounts.** This step computes total corporate profits (foreign + local). When data is available, we use National accounts data from table 14a. Missing values are imputed as a share of GDP according to country-group averages. Recorded corporate profits are imputed as 15% of GDP for OECD countries, as 20% of GDP for major developing countries, and as 20% of GDP for the rest of the world. The variable is left blank for non-OECD tax havens.

- **Step 9a: Corporate tax paid (part 1)**. Corporate taxes paid are computed in two steps because for a subset of countries, this variable is computed based on data from a different variable that itself is only computed at a later stage. When data is available, corporate tax paid is imported from the UNU WIDER GRD database. For missing values we impute corporate taxes paid as 18% of corporate profits recorded in the national accounts (the global average effective tax rate in 2015-2020).

- **Step 10: Corporate tax paid on foreign profits**. For non-OECD tax havens and for Switzerland, this variable is computed as 5% of the sum of equity income from operating units grossed up by an assumed effective tax rate of 5% (step 5) and unrecorded foreign profits (step 7). For remaining countries it is computed as the sum of the product of equity income from operating units and the corporate effective tax rate (total corporate tax paid over total corporate profits) taken as a share of 1 minus the corporate ETR, and 5% of unrecorded foreign profits grossed up by an assumed effective tax rate of 5%. For Puerto Rico, the foreign corporate tax paid is taken from the raw data file "Wright_Zucman.xlsx".

- **Step 11: Pre-tax foreign profits**. Pre-tax foreign profits, i.e., the variable capturing corporate profits in the foreign sector, is computed as the sum of equity income from operating units (setp 5), SPE profits (step 6 - though this step is cancelled for now), unrecorded foreign profits (step 7), and foreign corporate tax paid (step 10).

- **Step 12: Profits of offshore mutual funds**. Profits from offshore mutual funds are used to correct the estimate of unrecorded profits in the foreign sector. Profits from this sector are accounted for in Ireland, Luxembourg, and the Netherlands. Data for financial sector profits is imported from OECD table 14a. For Ireland, 75% of portfolio investment income in the financial sector is assumed to reflect profit of offshore funds. For Luxembourg and Netherlands, 35% of portfolio investment income in the financial sector is assumed to reflect profit of offshore funds.

- **Step 13: Profit correction**. The variable profit correction is used to correct total pre-tax corporate profits (computed subsequently). It is equal to unrecorded net-of-tax foreign profits grossed up by an assumed effective tax rate of 5%, minus profits of offshore mutual funds.

- **Step 14a: Pre-tax profits of local firms (part 1)**. Local profits are computed in two steps as for a subset of countries, they can only be computed after having created an additional variable which itself is only computed at a later stage. For non-OECD tax havens, pre-tax local profits are assumed to be equal to 10% of GDP.

- **Step 15a: Pre-tax corporate profits (part 1)**. Computed in two steps for the reasons explained above. This step corrects the value for total pre-tax corporate profits obtained in step 8. Pre-tax corporate profits are computed as the sum of pre-tax profits from step 8 and the profit correction variable from step 13. This way, total corporate profits are corrected for unrecorded profits and profits from offshore mutual funds.

- **Step 14b: Pre-tax profits of local firms (part 2)**. For OECD countries, OECD tax havens, major developing countries, and the rest of the world, local profits are simply taken as the difference between pre-tax total profits (step 15a) pre-tax foreign profits (step 11).

- **Step 15b: Pre-tax corporate profits (part 2)**. For non-OECD tax havens, total profits are taken as the sum of pre-tax local profits (steps 14a and 14b) and pre-tax foreign profits (step 11).

- **Step 9b: Corporate tax paid (part 2)**. For non-OECD tax havens, we impute corporate taxes paid as 5% of corporate profits.

- **Step 16a: Compensation of employees: foreign corp (part 1)**. In this step we compute foreign wage costs relying on Eurostat FATS employee compensation data. Using Eurostat FATS data, we compute a country-specific foreign wage ratio by taking the country-specific wage costs in all countries except in its own economy

as a share of total wage costs. We then multiply the foreign ratio by total wage costs as reported in national accounts (step 3) and derive the total foreign employee compensation, now in line with national accounts. For countries with missing data in Eurostat, we take the global profit-to-wage ratio for US MNEs reported in BEA's FATS data for the US. We then take the country-specific value for pre-tax foreign profits (step 11) and divide it by this ratio to obtain the country's foreign corporate wage estimate. Finally, for the US we use the total compensation for employees outside the US reported in US outward FATS.

- **Step 17a: Compensation of employees: local corp (part 1)**. We compute the local compensation of employees as the difference between total compensation for employees and foreign compensation of employees. For countries with missing data we take the world local profit-to-wage ratio as world local profits over world local employee compensation. Then, we estimate local employee compensation as the country-specific pre-tax local profits divided by the world local profit-to-wage ratio.

- **Step 16b: Compensation of employees: foreign corp (part 2)**. For remaining countries with missing data, we compute the foreign employee compensation as the difference between the total employee compensation and the local employee compensation. Puerto Rico-specific data is imported from the raw data file "Wright_Zucman.xlsx".

- **Step 17b: Compensation of employees: local corp (part 2)**. We can now compute for Puerto Rico as the difference between total employee compensation and foreign employee compensation.

- **Step 18: Effective corporate tax rate**. The ETR is computed as the ratio between total corporate tax paid and total corporate profits.

- **Step 19: Profit-to-wage ratios**. Three profit to wage ratios are computed, one for all corporate sectors, one for the local corporate sector and one for the foreign corporate sector. The p/w ratio for all is the ratio of total profits over total wages. The local p/w is the ratio of pre-tax local profits over local corporate wages. For non-OECD tax havens it is replaced by the world local p/w ratio (computed in step 17a). The foreign p/w is the ratio of foreign profits over foreign wages.

- **Step 20: Shifted profits**. Finally, the computation of shifted profits is conducted for tax haven countries only. For those countries, we take the difference between the foreign p/w ratio and the local p/w ratio, and multiply this difference by the

foreign corporate employee compensation. This provides an estimate of shifted profits defined as the difference between observed foreign profits and the hypothetical foreign profits *should foreign-owned firms be as profitable as local foreign.* Which is in line with the methodological concept of shifted profits.

4.4 Computing reallocated profits estimates

Table C1.do. The reallocation of profits back to source countries concerns only non-haven countries. Estimates are computed for all OECD non-havens, and a dozen major developing countries and other developing countries. For the remaining countries, the values are imputed using estimates for the "rest of the world" (see part 3 of the methodology section above). Table C1 compiles cross-country high-risk transactions between non-tax havens and tax havens. This includes service payments and interest payments - both of which are found to be conducive of profit shifting behavior. This exercise is done separately for European tax havens, Switzerland, and other tax havens, owing to different availability of data sources. In essence this do file computes the total bilateral service and interest payments between the non-havens of interest and the tax havens.

Table C2.do. In a second step, table C2 computes "excessive high-risk payments". That is, this do file deducts from the estimates of C1 an amount of reasonable service and interest FDI in and out of tax havens, according to the size of their economy. Put differently, the do file differentiates between total high risk payments and those type of payments that reflect real economic activity in tax haven countries. This way, table C2 allows to isolate payments purely conducive of profit shifting behavior.

Table C3.do. Table C3 reallocates FDI stocks to ultimate owners. This step is not included in this current version of the computation.

Table C4a - C4d.do. In table C4a we adjust the bilateral excess high-risk payments obtained from table C2 to the total amount of profits shifted computed in table U1. The adjustment is done proportionally such that countries with higher high-risk transactions are allocated a higher share of profit shifting relative to countries with a lower estimate of high-risk transactions. This method enables to have a coherent result where total profits shifted to tax havens match total profits shifted away from source countries. Tables C4b-d consist of obtaining additional information about source country losses, including total tax losses due to profit shifting, and total tax revenue losses as a share of the corporate income tax they have collected. This provides insights to the extent of the damage that profit shifting does to the countries losing in the game for profits.

4.5 Preparing data for the Atlas of the Offshore World

prepare data for atlas.do. This do file compiles results by year and country-group, separating between tax haven countries and non-tax haven countries. This dichotomy enables to derive different indicators for each group. In practice, in the Atlas this translates into showing tax and profit losses for non-tax haven countries and tax and profit gains for tax haven countries. Indicators are obtained using country-specific data on corporate tax rate and corporate tax revenue collected which is collected in previous steps above. For non-tax haven countries, indicators include (i) profit losses, (ii) tax revenue losses, and (iii) tax revenue lost as a share of corporate tax revenue collected. For tax haven countries, indicators shown are (i) profit gains, (ii) tax revenue gains, and (iii) tax revenue gained as a share of corporate tax revenue collected. Results for non-tax havens are further separated by counterpart area, including the world, European tax havens, and non-European tax havens, thereby shedding light on the destination of profits lost for a given country.

analysis for ROW countries.do. In this do file, we proceed with the imputation of estimates of profits and tax losses for non-tax haven countries with missing data. The imputation consists of reallocating the profits shifted away from the "rest of the world" back to different source countries where possible. This exercise is further elaborated in part 3 of the methodology.

prepare data for tooltip.do. This do file compiles additional information about the bilateral gains and losses between countries. Bilateral profit shifting, e.g. the amount of profits shifted away from Nigeria to Switzerland, are estimated in tables C1-C4 of the analysis. This information is recycled to provide detailed information about the counterpart of non-tax haven countries, which in addition to European and non-European tax havens, now includes a series of specific European tax havens.

5 Annual methodological update

Recent developments in the methodology. This section highlights the methodological developments for the most recent data update that depart from the baseline methodology. Changes originate from improvements in data availability of international statistical organizations. The following are changes from the original methodology used in Tørsløv et al. (2023).

- Inward DI income in the holding sector and inward DI interest income is removed from DI inward equity income from operating units. Removing income in the holding sector and interest income is a step that replaces the removal of SPE income from equity income (in the previous methodology). See "FDI equity income operating units.do" and "step 6" in "table U1.do" for more details.

- Because we subtract inward DI income of the holding sector and inward DI interest income from DI equity income (in the step above), this inward income that was subtracted is then added back to the total inward income in the reallocation of missing income of table B10. As such, in table B10, we add to the global DI income discrepancy the inward income that was previously removed such that this income which is deducted is redistributed back to remaining tax havens and as such global DI inward income remains equal to global DI outward income.

- Improvement in OECD FDI statistics for inward income reported by Ireland from the USA. This implies lower discrepancy in FDI income between both countries, which substantially lowers values for Ireland in table B11.

- In table C2, which computes "excessive high risk payments" (elaborated in table C2.do below), the value for rest of the world is computed as the residual service payments from non-haven countries to the country category "Extra-EU, not allocated" (see lines 1023-1030 in table C2.do).

- In table C2, which takes the difference between high-risk payments and plausible payments to compute excessive high-risk payments (elaborated in table C2.do below), negative values are equated to zero (lines 1232 &1500).

- In table C2, bilateral service payments between Ireland and Iceland, Nigeria, Malaysia, and Chile, are set to zero, due to inconsistently high bilateral service trade values (lines 1392, 1393, and 1410).

- Profit and tax revenue losses from global profit shifting are imputed for remaining non-tax haven countries which were initially left out of the analysis due to data

limitations. The imputation consists of reallocating the residual profits shifted which were allocated to "the rest of the world" back to source countries. This is done in three steps elaborated in step 3 of the baseline methodology below.

- Venezuela is currently removed from the analysis due to missing corporate tax revenue data values since 2017. To add Venezuela, add "VEN" in lines 101, 103 of Table C2.do, and remove line 1261 from Table C1.do.

- Corporate tax revenue statistics for the country Zimbabwe were revised downwards for the year 2020, 2021, and 2022, following the identification of a typo in the decimal used for the total value of corporate tax revenue for that country. This change leads to a downward revision of the estimate of profits shifted away from Zimbabwe, as well as the tax revenue lost from profit shifting in those years.

The case of OECD FDI statistics for Ireland. One noteworthy improvement in data availability from statistical agencies is the evolution of FDI inflows from the US to Ireland reported in the OECD FDI statistics[2]. In 2015, according to the available data, Ireland reported \$412 million inward direct investment from the US. The reported amount sharply increases in 2021 to \$88,194 million and reaches \$98,036 million by 2023, as can be seen in Figure 5. This suggests that Ireland was substantially under-reporting FDI inflows from the US until 2021. A direct result of the improvement in bilateral FDI data in the computation of global profit shifting is that the global FDI income gap (total FDI outward minus total FDI inward) shrinks.

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[2]OECD Data explorer, table "FDI flows by counterpart area, BMD4", found in: https://data-explorer.oecd.org

6 Results
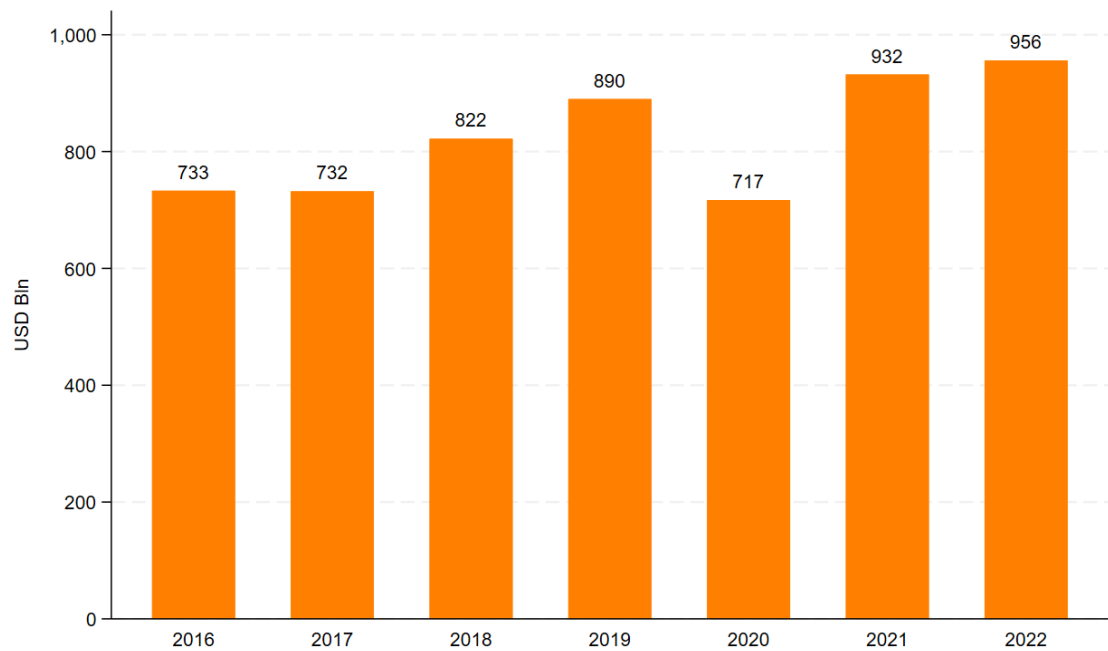
Figure 1: Global profit shifting gains

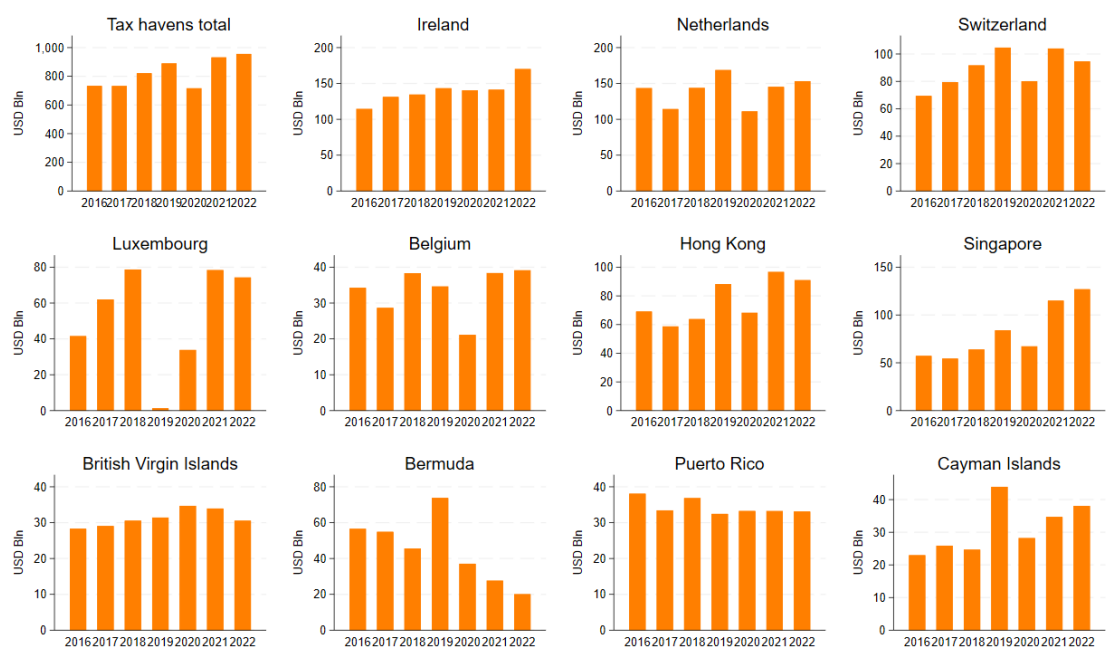Figure 2: Profit shifting gains - 12 major tax havens

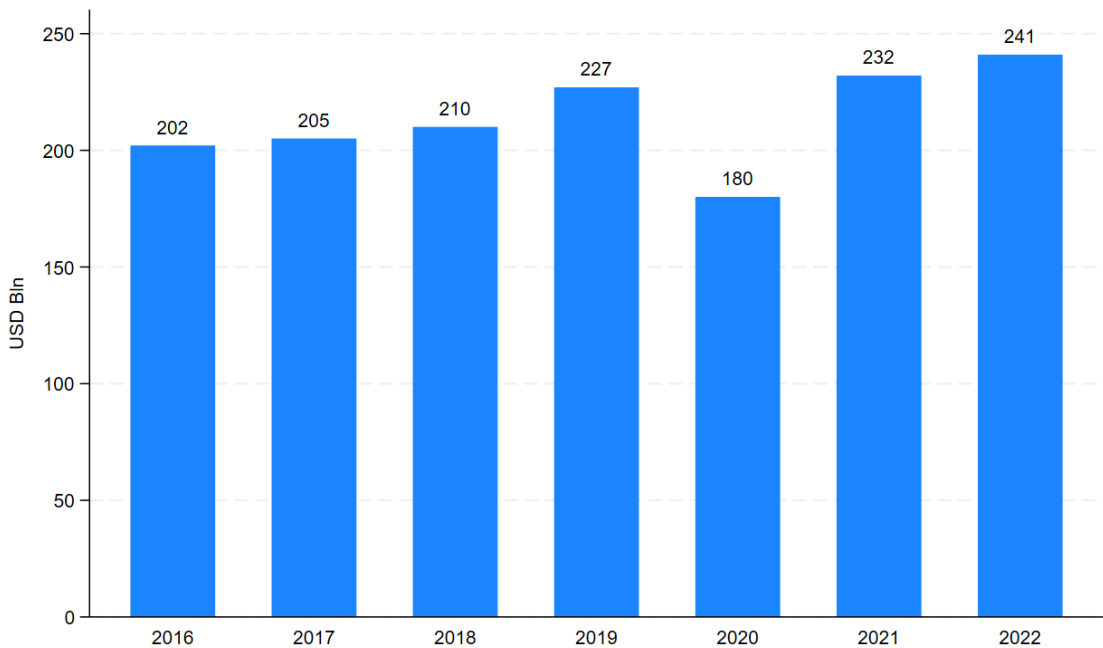Figure 3: Global corporate tax revenue losses

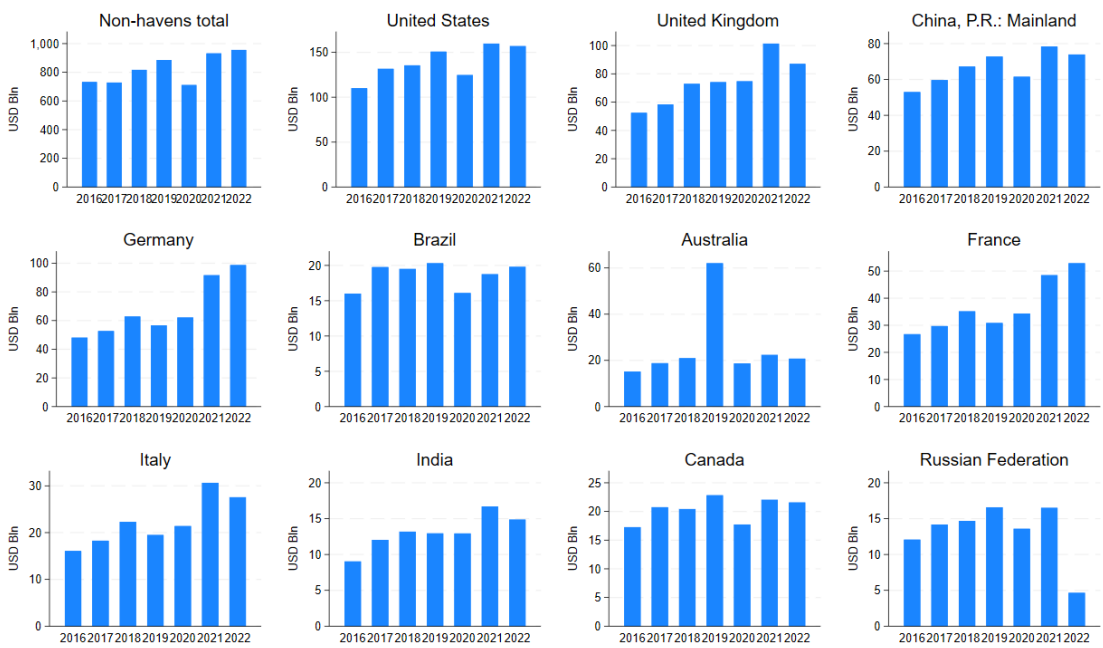
Figure 4: Profit shifting losses: 12 major economies

Figure 5: The change in FDI inflows from the US to Ireland, 2015-2023
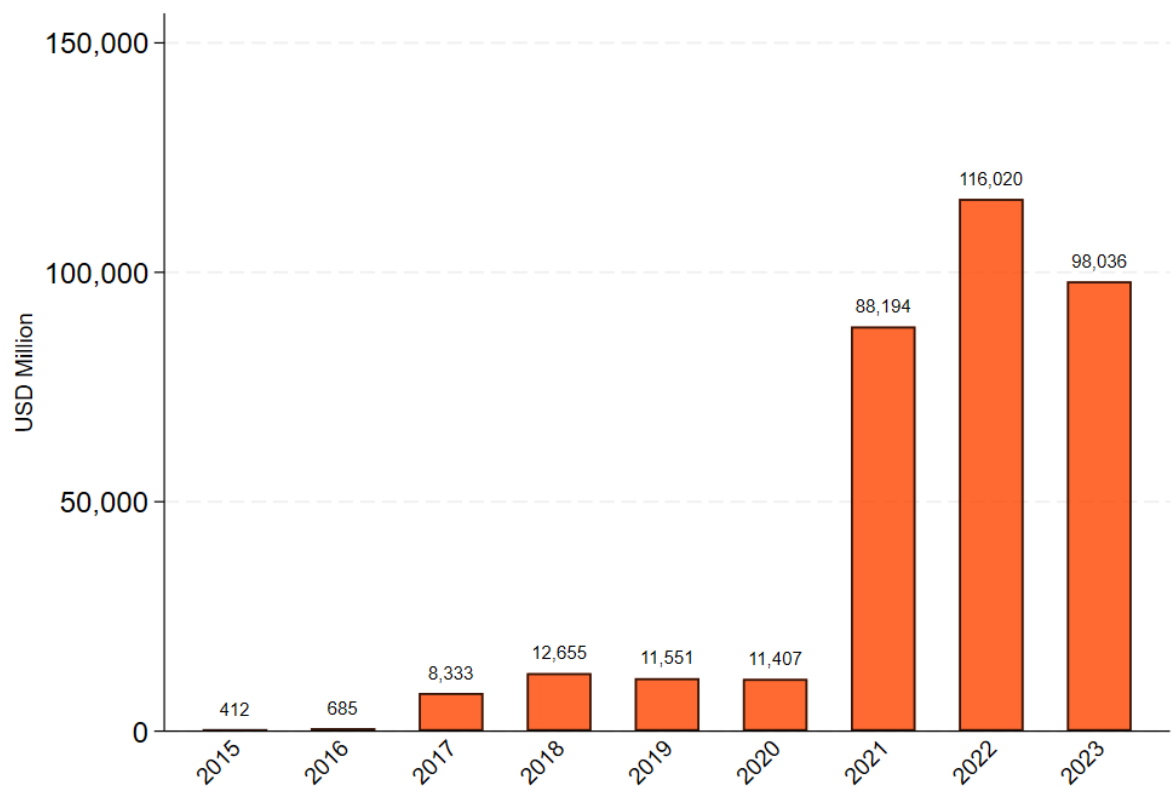

Figure 5 shows the change in foreign direct investment (FDI) inflows from the US to Ireland and reported by Irish authorities over the period 2015–2023.

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