An FDI-driven approach to measuring the scale and economic impact of BEPS

Bolwijn, Richard and Casella, Bruno and Rigo, Davide

UNCTAD, UNCTAD, Graduate Institute of Development Studies

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An FDI-driven approach to measuring the scale and economic impact of BEPS[†]

Richard Bolwijn, Bruno Casella and Davide Rigo[*]

This paper explores the link between foreign direct investment (FDI) and the BEPS (base erosion and profit shifting) practices of multinationals (MNEs). It puts the spotlight on the outsize role of offshore investment hubs as major players in global corporate investment, a role that is largely due to MNEs' tax planning, although other factors contribute. The paper shows that tax avoidance practices enabled by FDI through offshore hubs are responsible for significant leakage of development financing resources. In policy terms, these findings call for enhanced cooperation and synergies between international tax and investment policymaking.

Keywords: multinational enterprise, BEPS, revenue losses, developing countries, offshore investment

1. Introduction: an investment perspective on international taxation

MNEs build their corporate structures through cross-border investment. They construct those corporate structures in the most tax-efficient manner possible, within the constraints of their business and operational needs. The size and direction of FDI flows are thus often influenced by MNE tax considerations, because the structure and modality of the underlying investments enable tax avoidance opportunities on subsequent investment income. In tackling tax avoidance, most notably in the BEPS approach, the attention of policymakers focuses naturally on tax rules, company law and transparency principles – i.e. on accounting for income. The fundamental role of investment as the enabler of tax avoidance warrants a complementary perspective.

[†] This paper draws on the technical background paper accompanying the *World Investment Report 2015*, chapter V, "International Tax and Investment Policy Coherence", prepared under the guidance of James X. Zhan. The authors benefited from comments provided by David Bradbury, Krit Carlier, Steve Clark, Alex Cobham, Lorrain Eden, Martin Hearson, Jan Loeprick, Ruud de Mooij and Thomas Neubig. The authors are responsible for all the remaining errors.

[*] Richard Bolwijn and Bruno Casella are at the United Nations Conference on Trade and Development. Davide Rigo is at the Graduate Institute of International and Development Studies, Geneva. The corresponding author is Bruno Casella (bruno.casella@unctad.org). The views expressed in this article are solely those of the authors and do not necessarily represent the views of the United Nations.

This paper aims to provide a new perspective on corporate international taxation and MNE tax avoidance schemes. It integrates the mainstream approach of the BEPS project with an investment-based approach emphasizing the relevance of corporate structures set up by channelling FDI through offshore investment hubs and offshore financial centres (OFCs), notably tax havens and jurisdictions offering so-called special purpose entities (SPEs), as these are the enablers of many BEPS schemes. In essence, corporate structures built through FDI can be considered "the engine" and profit shifting "the fuel" of MNE tax avoidance schemes.

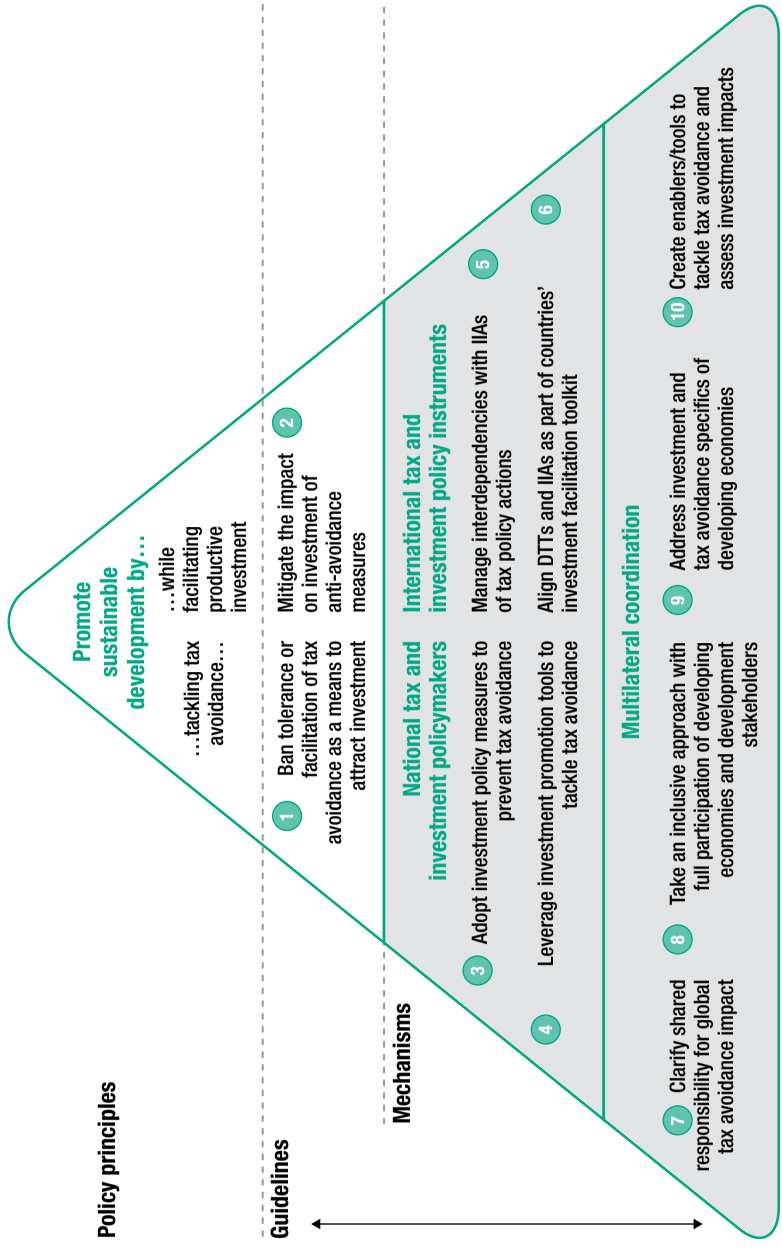
In order to analyse the scope, dimensions and effects of tax-efficient corporate structures ("fuel-efficient engines"), this paper looks at FDI flowing through OFCs or conduit jurisdictions (transit FDI). It is important to emphasize from the outset that the notion of transit FDI does not equate to non-productive FDI. FDI designed as part of tax planning strategies of MNEs may or may not have a real economic impact on the countries involved. For example, an investment by a North American firm in Asia to start a new production plant may be channelled through Europe for tax reasons (potentially penalizing tax revenues in both home and host countries) but still carry the productive-asset-creating effects of a greenfield investment. By contrast, transit FDI tends to have very little real economic impact in countries that act as investment hubs in MNE tax planning schemes.

It should be also noted that the conduit countries discussed in this paper are not alone in offering certain tax benefits to foreign investors; a degree of tax competition has led many other countries to adopt similar policies. No policy implications are implied by the scope of the perimeter for offshore investment hubs used in this paper. In fact, the analysis will show that any action on tax avoidance practices needs to address policies across all jurisdictions – in base (home) countries, conduit (transit) countries and source (host) countries alike.

The policy implications of this study are significant. In particular, the interdependence between the international tax and investment dimensions calls for an integrated policy approach. UNCTAD's *World Investment Report 2015* (*WIR15*) established 10 guidelines for coherent international tax and investment policies (figure 1), addressing the most pressing issues at the intersection between the international tax and investment domains: removing aggressive tax planning opportunities as investment promotion levers (*guideline 1*); considering the potential impact on investment of anti-avoidance measures (*2*); leveraging national investment policies to prevent and combat tax avoidance (*3, 4*); managing the interaction between international investment and tax agreements (*5, 6*); taking a partnership approach in recognition of shared responsibilities between investor host, home and conduit countries (*7*); strengthening the role of both investment and fiscal revenues in sustainable development as well as the capabilities of developing countries to address tax avoidance issues (*8, 9*); and enhancing transparency of investment and ownership information, as a tool to

monitor tax avoidance practices (*10*). For a detailed discussion of UNCTAD policy guidelines, refer to *WIR15* (chapter V, section D).

Figure 1. Guidelines for coherent international tax and investment policies



Source: UNCTAD.

The rest of this paper focuses instead on the analytic background of *WIR15*. It integrates material both from chapter V of *WIR15* and its annex (annex II), the latter being the main source. Our objective is to provide a comprehensive and self-contained account of UNCTAD's analysis of the scale and economic impact of BEPS, one of the two analytic pillars of UNCTAD research in the broad area of investment and international taxation (the other pillar is the "contribution analysis" presented in Bolwijn et al., 2018).

This paper consists of two building blocks. The first part (section 2) presents a methodology for analysing investment through OFC jurisdictions. The key outcome is the *Offshore Investment Matrix*, an analytical tool to map and quantify corporate investment patterns through such jurisdictions. The second building block, in section 3, uses the results from the matrix to estimate the profit shifting and tax revenue losses generated by investment through OFCs. We empirically show that countries with greater exposure to OFCs tend to underreport profits from foreign investment, and we interpret this effect as an indicator of profit-shifting practices enabled by FDI through OFCs. The relationship between FDI through OFCs and profit shifting is then used to estimate potential tax revenue losses for host countries exposed to investment from OFCs. The estimation of revenue losses primarily focuses on developing countries, but the methodology can be easily applied to developed countries as well (box 1).

From a methodological perspective, the approach presented in this paper is characterized by the central role of FDI statistics from the balance of payments (BoP), either stock data from capital accounts or their income counterparts (FDI income) from current accounts. In this context, FDI statistics provide information on the international presence and operations of MNEs, a key input to any empirical study on corporate tax avoidance and a very difficult one to find. Despite some known limitations (Lipsey, 2007; Beugelsdijk et al., 2010; Leino and Ali-Yrkko, 2014), FDI statistics benefit from greater coverage and country cross-comparability than other sources of information on MNEs' activity, such as firm-level or survey data (see, for example, the discussion in Casella, 2018). Recently, Cobham and Loretz (2014) and Tørsløv et al. (2018) also discussed the limitations of firm-level data from ORBIS Bureau Van Dijk for the analysis of BEPS, primarily stemming from the lack of reported financials at the subsidiary level. Interestingly, Tørsløv et al. (2018) show that only 17% of MNEs' consolidated profits as reported by ORBIS are reflected at the subsidiary level. Acknowledging some key limitations of firm-level data, this study was the first to fully leverage FDI statistics for the analysis of BEPS. Later studies have followed the same (Janský and Palanský, 2018) or similar approaches (Tørsløv et al., 2018). Yet, we believe that there remains substantial unexploited information on BEPS embedded in FDI statistics. Section 4 discusses some new ideas to further push the frontier in this research area.

2. Mapping corporate investment patterns through OFCs

2.1. The Offshore Investment Matrix

The objective of this first analysis is to estimate the share of international corporate investment stock routed through OFCs and conduits, either tax havens or other entities (in particular SPEs) operating in jurisdictions providing favourable legal and financial treatment for foreign investors. The key objective is to quantify to what extent tax and other financial (non-business) factors affect global corporate investment patterns.

The idea to use investment data for the analysis of offshore financial patterns is not new; there are studies alluding to this approach both by international organizations and in the academic literature. In its report on BEPS (OECD, 2013; page 17), the Organization for Economic Cooperation and Development (OECD) acknowledges FDI statistics as one of the potential sources of data on profit-shifting practices by MNEs (together with data on corporate income tax revenues), stating that "an analysis of the available data on FDIs may give useful indications in relation to the magnitude of BEPS", and provides some anecdotal supporting evidence from data reported on FDI through tax havens. Two studies by non-governmental organizations (NGOs) (Christian Aid, 2013; ActionAid, 2013) notice the "unusual" FDI patterns related to some locations. Haberly and Wojcik (2014) resort to the notion of "offshore FDI" in a study aimed at investigating the determinants of FDI routed through tax havens. The International Monetary Fund (IMF) (2014), after identifying a number of countries with disproportionately high FDI stock, acknowledges that (page 15) "Such lists ... confirm the impression that taxation plays a key role in shaping the structure of international capital flows: jurisdictions known for attractive tax regimes and extensive treaty networks commonly feature prominently as 'conduits' through which investments pass".

However, this is the first paper that provides an analytical framework for a systematic and comprehensive investigation of FDI offshore patterns at a global scale. The key analytical tool to achieve this goal is the *Offshore Investment Matrix*, which provides a comprehensive mapping of FDI through OFCs and offshore investment hubs (figure 2). More specifically, the matrix classifies investor and recipient countries in a bilateral FDI setting according to three classifications: tax havens, SPEs or non-OFCs. The first two represent the offshore or conduit component of global corporate investment stock, while the third represents the standard FDI stock. Analytical and methodological issues related to the definition and quantification of the three components are discussed in detail in the next section.

The Offshore Investment Matrix provides two main ways to analyse corporate investment through offshore hubs.

One-sided analysis (figures 2.a and 2.b) shows the extent to which investment to and from standard jurisdictions is routed through hubs as direct partners. More specifically, inward one-sided analysis (figure 2.a) provides the size and share of investment stock into non-OFCs originating from either tax havens or SPEs; outward one-sided analysis (figure 2.b) provides the size and share of investment stock from non-OFCs invested into tax havens or SPEs.

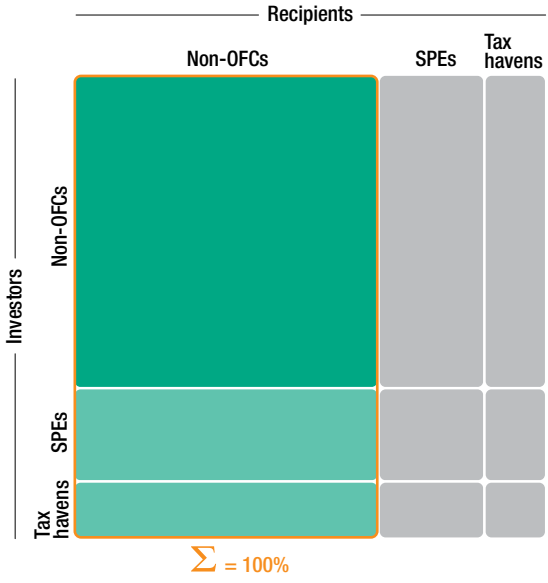
Two-sided analysis (figure 2.c) takes a more comprehensive view, looking at all corporate investment links involving offshore investment hubs, either as investors or as recipients. It also maps investment between tax havens and SPEs, often a substantial component of tax-driven investment schemes (such as the "Double Irish–Dutch Sandwich"; see *WIR15*, chapter V, section B.2).

Clearly, the outcome of the Offshore Investment Matrix critically depends on the perimeter of the OFC component (tax havens and SPEs) in global investment stock: concretely, which jurisdictions are included in the perimeter of OFCs? And, for each jurisdiction of interest, which share of FDI should be qualified as "offshore"? Two options are presented here.

- A baseline conservative approach with a restricted perimeter of offshore investment hubs, including tax havens and self-declared SPE countries (section 2.2).
- An extended approach that widens the OFC perimeter beyond self-declared SPE countries (section 2.3).

Figure 2. The Offshore Investment Matrix

a. One-sided inward



b. One-sided outward

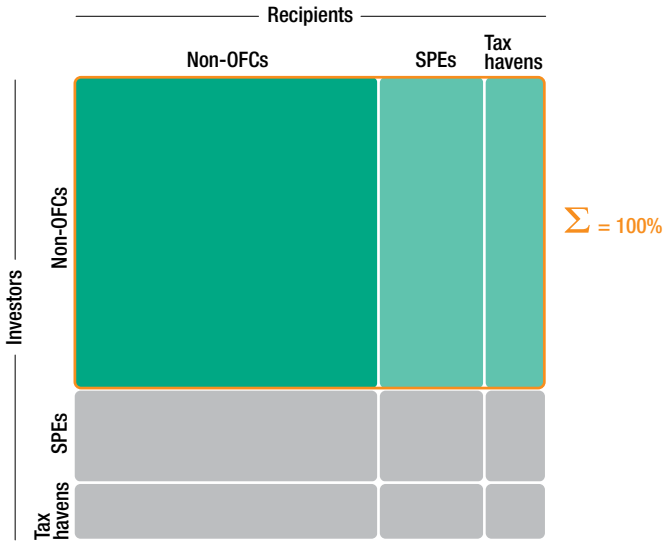
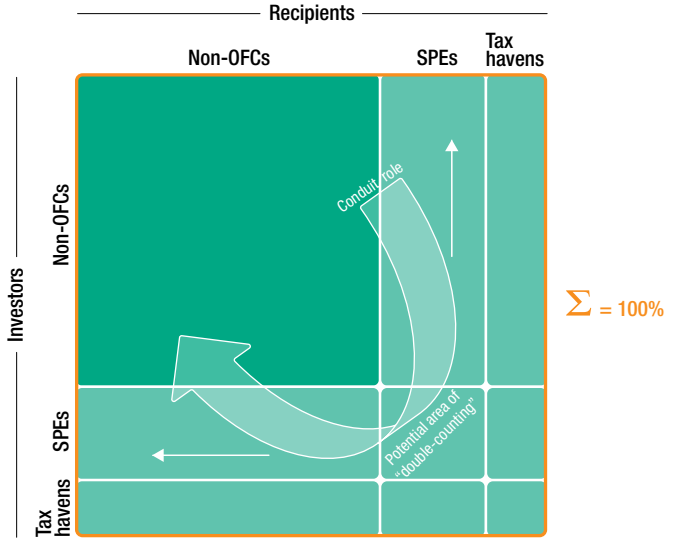


Figure 2. The Offshore Investment Matrix (concluded)

c. Two-sided



Source: UNCTAD.

2.2. Analytical approach based on a conservative OFC perimeter

The data inputs for the Offshore Investment Matrix are bilateral FDI inward stock from the IMF's Coordinated Direct Investment Survey (IMF CDIS). The reference edition of the survey is IMF CDIS 2012, released on the IMF website in December 2013.[1] To achieve the greatest possible coverage, IMF CDIS 2012 was supplemented by IMF CDIS 2011 for 16 countries for which data are available for 2011 but not for 2012.[2] The resulting sample consists of 104 reporting countries. Its representativeness

[1] IMF website, http://data.imf.org/?sk=40313609-F037-48C1-84B1-E1F1CE54D6D5. Figures are those reported at the time of the analysis and do not necessarily correspond to currently reported data. The latest download of the data from the IMF CDIS was in April 2014.

[2] Data based on the 2011 survey for the following reporting economies: Albania, Barbados, Benin, Georgia, Ghana, Guatemala, Guinea-Bissau, Honduras, Morocco, Rwanda, Samoa, the Slovak Republic, the United Republic of Tanzania, Togo, Uruguay, and West Bank and Gaza. Integration of 2012 data with (the few) 2011 data made it possible to expand the coverage of the sample without affecting overall consistency or accuracy, as stock data are only marginally sensitive to yearly changes.

can be estimated at more than 90% of total inward FDI stock.[3] The CDIS includes also direct investments from and to SPEs,[4] unlike UNCTAD FDI statistics, which do not report inward stocks to SPEs for Austria, Hungary, Luxembourg and the Netherlands. Thus, the total value of investment stock reported by the IMF CDIS is higher than reported by UNCTAD FDI statistics.[5] Our approach requires the SPE component to be fully accounted for in the scope of the analysis; this is the reason why we rely on IMF CDIS data rather than UNCTAD's FDI statistics.[6]

The key analytical issue is to map bilateral investment stocks from the IMF CDIS into the Offshore Investment Matrix; i.e. to allocate any given unit of corporate investment stock between two jurisdictions to an investor–recipient pairing properly classified according to the matrix categories of non-OFCs, SPEs and tax havens (figure 3.a). This requires a preliminary classification of OFC jurisdictions.

- Group 1: Tax havens. A list of 38 small jurisdictions originally defined by the OECD.[7] It includes small countries whose economy is entirely, or almost entirely, dedicated to the provision of offshore financial services.
- Group 2: SPE countries. The qualification SPE countries applies to countries with substantial real economic activity (unlike tax havens) that also act as financial centres or investment hubs for MNEs owing to a favourable tax and investment regime, typically granted through the option to operate by means of SPEs. Unlike tax havens, such as the British Virgin Islands or Cayman Islands,

[3] The ratio between the total bilateral inward stocks reported by the sample and 2012 global inward stocks is 93%. The calculation requires the comparison of two sources of data: the CDIS data for the sampled bilateral inward investment stocks and the UNCTAD data for the total inward FDI stock. As CDIS data include SPEs for all countries whereas official UNCTAD data do not include SPEs for Austria, Hungary, Luxembourg and the Netherlands, the total inward FDI stock reported by UNCTAD statistics was adjusted upward to account for the SPE component (retrievable from the statistics of the four countries' central banks).

[4] From the IMF CDIS Guide: "SPEs are residents of the economies in which they are incorporated or organised and, therefore, they may be direct investors or direct investment enterprises. Even if they are shell companies or pass-through entities without any other productive economic activity of their own, they qualify as direct investors or as direct investment enterprises by virtue of being resident in one economy and being owned by, or owning, an enterprise in a different economy. Thus, positions between direct investors and direct investment enterprises that are SPEs are to be treated in the same way as those with investors and enterprises that are not SPEs".

[5] Total inward investment stock reported by the CDIS for the sampled countries amounts to $26 trillion, against some $20 trillion reported by official UNCTAD statistics for the same group of countries.

[6] In general, with the notable exception of countries reporting SPEs, the stock data of the IMF and UNCTAD are close, with UNCTAD covering a larger number of developing countries.

[7] Anguilla, Antigua and Barbuda, Aruba, the Bahamas, Bahrain, Belize, Bermuda, British Virgin Islands, Cayman Islands, the Cook Islands, Cyprus, Dominica, Gibraltar, Grenada, Guernsey, Isle of Man, Jersey, Liberia, Liechtenstein, Malta, the Marshall Islands, Mauritius, Monaco, Montserrat, Nauru, Netherlands Antilles, Niue, Panama, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Seychelles, Turks and Caicos Islands, United States Virgin Islands and Vanuatu. The list has also been referred to by a number of other studies comparing OFC perimeters, including Tax Justice Network (2007), U.S. Government Accountability Office (2008) and Gravelle (2013).

the scoping of SPE countries and the assessment of their offshore component are more controversial. In order to minimize arbitrary classification, our baseline approach is conservative and limits the scope of this group to self-declared SPE countries, a limited set of jurisdictions that (at the time of the analysis) explicitly report the share of inward and outward investment into and from their SPEs. The group includes Austria, Hungary, Luxembourg and the Netherlands. The number of jurisdictions publishing SPE investment data is increasing rapidly as more countries are aligning to the OECD BD4 and IMF BPM6 reporting standards. However, the countries used here have a long record of publishing SPE data and account for the bulk of global SPE stock (especially the Netherlands and Luxembourg).

If the investor or recipient from the bilateral data is a country in the scope of the SPE countries (Austria, Hungary, Luxembourg and the Netherlands), only a given share of the stock is allocated to an investor or recipient classified as SPEs, while the remaining part is allocated to an investor or recipient classified as non-OFCs. This seems reasonable as SPE countries are sizable economies with significant real economic activity, and therefore the treatment of their entire investment as offshore or conduit investment (as in other studies)[8] would lead to an overstatement in the estimation of the offshore component. The shares of the SPE component depend on the country and the investment direction (inward or outward) and are derived immediately using the share of investment stock to and from SPEs in total inward and outward investment stock as reported by national central banks. When non-SPE countries (tax havens and non-OFCs) are involved, the procedure is more straightforward as 100% of the FDI stock is allocated to the corresponding category in the matrix (figure 3.b).

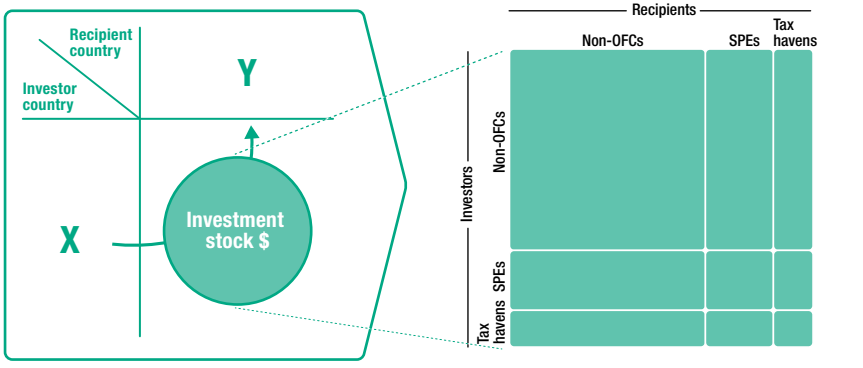
[8] See, for example, ActionAid (2013) and Christian Aid (2013).

Figure 3. The analytical approach

a. The problem: mapping bilateral investment stock into the Offshore Investment Matrix

Data input: bilateral investment stock
(IMF-CDIS matrix)

Output: Offshore Investment Matrix



b. The rules for allocation

Bilateral investment stock		Offshore Investment Matrix		
Investor	Recipient	Percentage of investment stock	Investor	Recipient
SPE-country	Other country	β % (1-β) %	SPE Non-OFC	Non-OFC Non-OFC
Tax Haven	Other country	100%	Tax Haven	Non-OFC
Other country	Other country	100%	Non-OFC	Non-OFC
Other country	SPE-country	α % (1-α) %	Non-OFC Non-OFC	SPE Non-OFC
Other country	Tax Haven	100%	Non-OFC	Tax Haven
SPE-country	SPE-country	α % (1-α) %	SPE Non-OFC	SPE Non-OFC
Tax Haven	SPE-country	α % (1-α) %	Tax Haven Tax Haven	SPE Non-OFC
SPE-country	Tax Haven	β % (1-β) %	SPE Non-OFC	Tax Haven Tax Haven
Tax Haven	Tax Haven	100%	Tax Haven	Tax Haven

The SPE-shares (α, β)

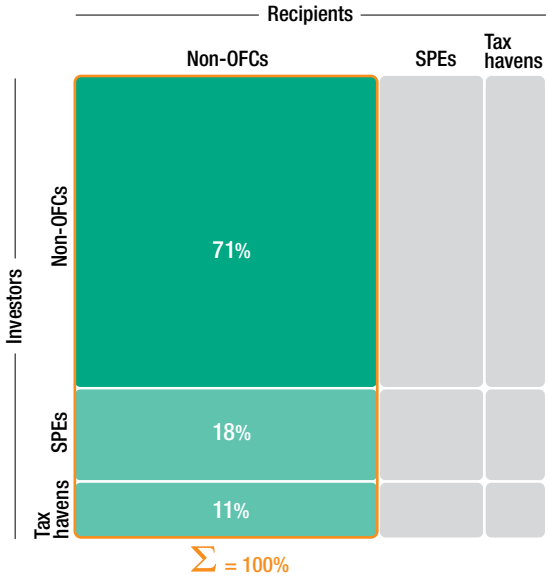
SPE-countries	SPE share in inward stock (α%)	SPE share in outward stock (β%)
Austria	40%	36%
Hungary	58%	81%
Luxembourg	96%	95%
Netherlands	83%	78%

Source: UNCTAD.
Note: For each SPE country, α and β represent the share of the OFC component over the total inward investment stock and the total outward investment stock, respectively. Shares are derived from central bank statistics, based on 2012 figures updated as of April 2014.

Figure 4 shows the resulting outcome of the Offshore Investment Matrix. The results highlight the pervasive role of offshore investment hubs in the international investment structures of MNEs. In 2012, out of an estimated $21 trillion of international corporate investment stock in non-OFC recipient countries (the green area in figure 4.a), around 30%, or some $6.5 trillion, was channelled through offshore hubs (the light green area). A mirror analysis (the light green area in figure 4.b) reveals that a similar share (31%) of the total amount of cross-border corporate investment stock is invested into intermediary entities based in hubs. The contribution of SPEs to investments from/to conduit locations is far more relevant than the contribution of tax havens; the largest offshore investment players are SPE jurisdictions. In some cases, these entities may undertake some economic activity on behalf of related companies in higher-tax jurisdictions, such as management services, asset administration or financial services (*base companies*). However, often they are equivalent to letterbox companies, legal constructions conceived for tax optimization purposes (*conduit companies*) and potentially to benefit from other advantages associated with intermediate legal entities. From a different (two-sided) perspective, the outcome of the Offshore Investment Matrix shows that about half of global FDI stock has at least an offshore side, on either the investor or the recipient end (the light green area in figure 4.c). The share of stock *between* hubs (light green area, bottom-right quadrant) is also relevant, at 5% of global investment stock. This confirms that offshore investment hubs tend to be highly interconnected within complex, multilayered tax avoidance schemes.

Figure 4. Outcome of the Offshore Investment Matrix
(based on a conservative OFC perimeter)

a. One-sided inward



b. One-sided outward

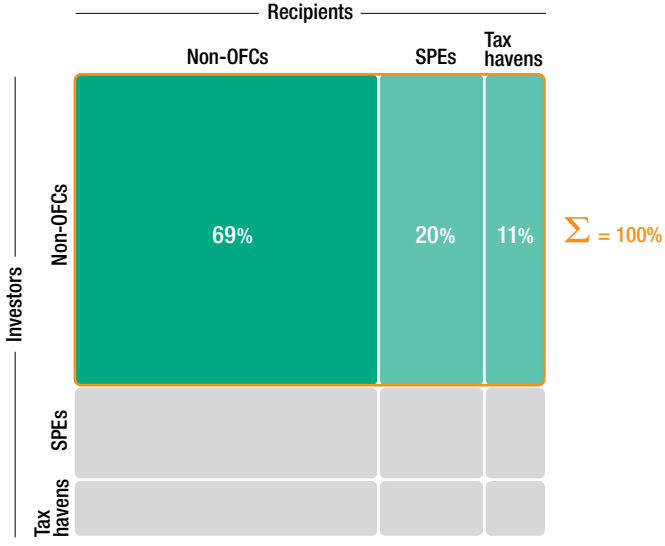
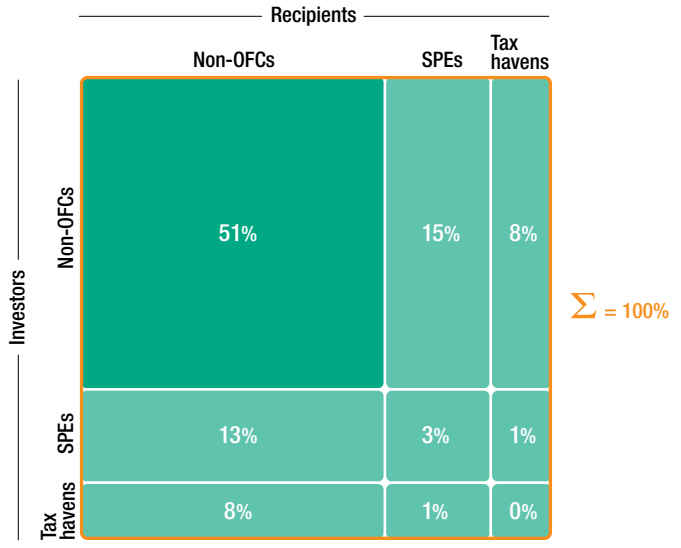


Figure 4. Outcome of the Offshore Investment Matrix
(based on a conservative OFC perimeter) (concluded)

c. Two-sided



Source: IMF Coordinated Direct Investment Survey 2012 and 2011; national statistics; UNCTAD estimates.

2.3. Extending the perimeter of the offshore component: the Implied Investment Method

There are important investment hubs that are not on the list of 38 tax havens because they are large economies; at the same time, they do not report their SPE component and therefore they do not appear in the group of self-declared SPE countries. These jurisdictions are excluded by our (conservative) OFC perimeter. The "implied investment method" presented in this section removes this limitation and makes it possible to extend the scoping of OFCs beyond tax havens and self-declared SPEs. To this end, it provides an empirical, FDI-driven way to identify large investment hubs and the size of their offshore components.

The general idea is that the level of investment stock in countries with relevant offshore activity is outsized compared with the size of the economy because a part

of that stock is routed through SPEs as transit investment and driven by financial rather than real operational considerations.

a. Identification of major offshore investment hubs

The goal is to identify countries acting as global offshore investment hubs with exceptionally large inward and outward investment (transit investment). This method is not designed to collect a comprehensive list of jurisdictions offering favourable offshore services to MNEs (many countries do so to some extent); instead, it focuses on those that have been particularly successful in becoming major global investment hubs. This identification can be established on the basis of two conditions:

i. They host a relevant amount of FDI stock (including SPEs); and

ii. The amount of inward FDI stock is disproportionately high compared with the size of the economy, as measured by GDP.

The first dimension ensures the relevance of the group from an FDI perspective; the second signals the presence of significant offshore financial activity (beyond real investment operations). Clearly, the actual perimeter of this set depends on how the two conditions are translated into selection criteria. A large number of countries have a certain degree of offshore activity; adopting a more or less restrictive perimeter is a methodological and analytical decision.

Notice that the four countries in the group of self-declared SPE countries also rank high according to conditions (i) and (ii). In particular, the Netherlands and Luxembourg rank first and third globally in terms of inward FDI stock and (respectively) third and first in terms of the ratio of inward FDI stock to GDP.

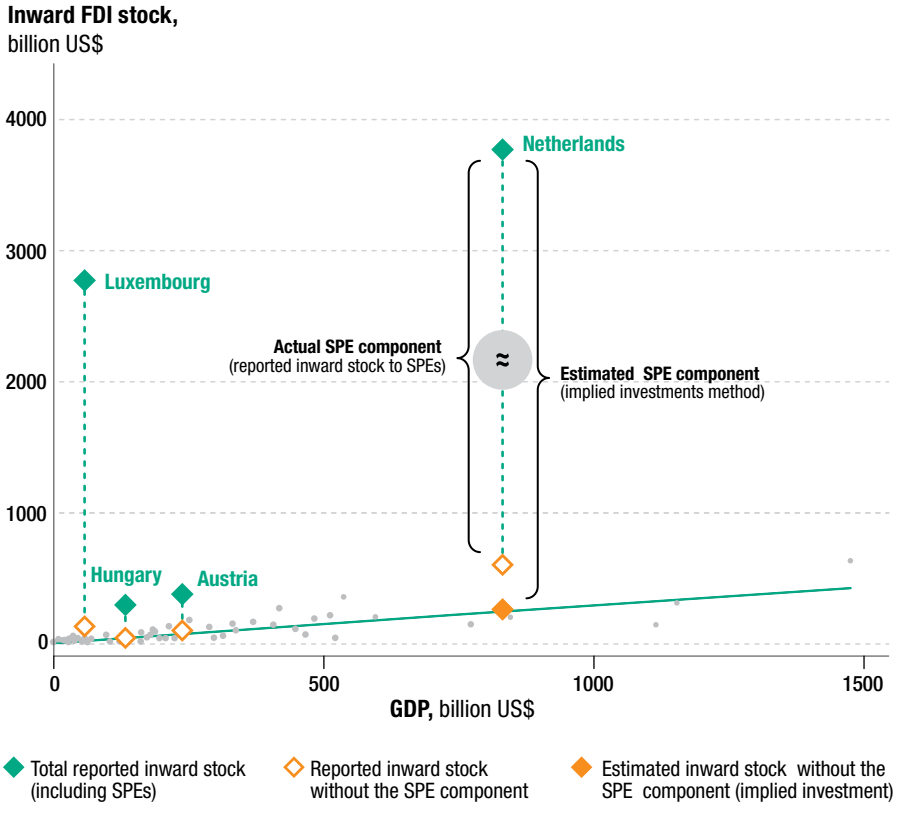
b. Sizing of the offshore component

The idea is to first estimate an expected amount of international corporate investment stock as implied by the size of the economy (measured by GDP), and then, by difference, the SPE component, i.e. the residual investment not explained by real economic drivers.

Figure 5 illustrates the procedure for the inward side (i.e. estimation of the share of SPEs in the inward corporate stock) and compares the SPE estimate against actual data for the four countries for which SPE information is available from official statistics. As desired, the estimated outsized portion of the investment stock that is not explained by the size of the economy is largely captured by the reported SPE component. An identical procedure can be applied to the outward side (estimation of the share of SPEs in the outward corporate stock) with similar results.

Figure 5. Illustration of the methodology to estimate the SPE component, 2012 data, inward case

Comparison between the SPE estimates from the Implied Investment Method and the reported SPE data



Source: UNCTAD FDI database; United Nations data; national statistics; UNCTAD analysis.
Note: The implied investment stock is estimated through linear regression of corporate investment inward stock on GDP (R-squared at 0.75) for a sample of countries for which complete 2012 information on GDP and corporate inward stock is available.

c. Simulation of the Offshore Investment Matrix

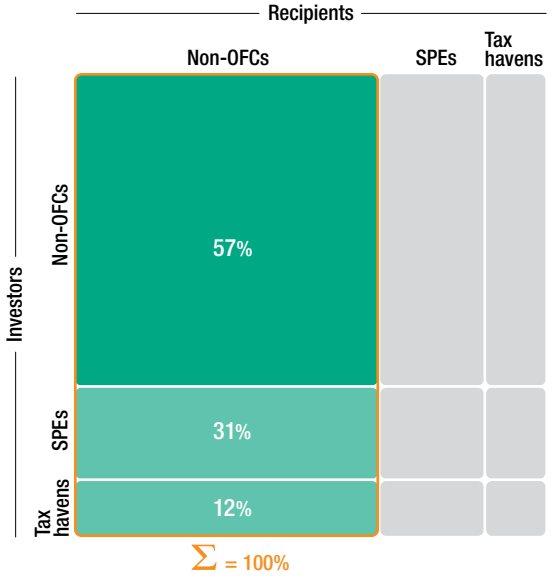
Figure 6 shows the simulated outcome of the Offshore Investment Matrix when based on an extended perimeter that includes tax havens and a number of other major investment hubs selected through the Implied Investment Method. In particular, we have selected investment hubs according to conditions (i) and (ii) above in the following way: (i) they rank globally in the first quartile in terms of inward FDI stock; (ii) they have a ratio of inward stock to GDP higher than 1.[9] Notice that jurisdictions in the group of self-declared SPEs also meet the investment-driven conditions (i) and (ii) (with a partial exception for Austria),[10] and thus qualify as investment hubs also according to the Implied Investment Method. The resulting group of investment hubs include, in addition to 38 tax havens (footnote 7) and four self-declared SPEs, five other economies (Belgium, Ireland, Hong Kong (China), Singapore and Switzerland, based on these criteria). These economies feature prominently as MNE regional headquarters location. Other economies could also be considered, depending on how parameters are set. As expected, while the tax haven component of the Offshore Investment Matrix remains unchanged, the SPE component significantly increases relative to the conservative perimeter (compare figure 4 and figure 6). In the one-sided view, the offshore component grows from 30% to almost 45%; whereas in the two-sided view the portion of stock "touched by" offshore entities rises to 65% (from about 50% in the conservative approach). In other words, two thirds of global FDI stock is either located in, or has been routed through, investment hubs.

[9] Corresponding to the top 15th quartile of the global ranking in terms of ratio of FDI inward stock to GDP.

[10] Austria does not meet condition (ii). Although its investment over GDP ratio is relatively high (in the first quartile, at 0.66), it does not exceed 1, as per the defined criteria.

Figure 6. Simulation of the Offshore Investment Matrix based on the Implied Investment Method (extended perimeter)

a. One-sided inward



b. One-sided outward

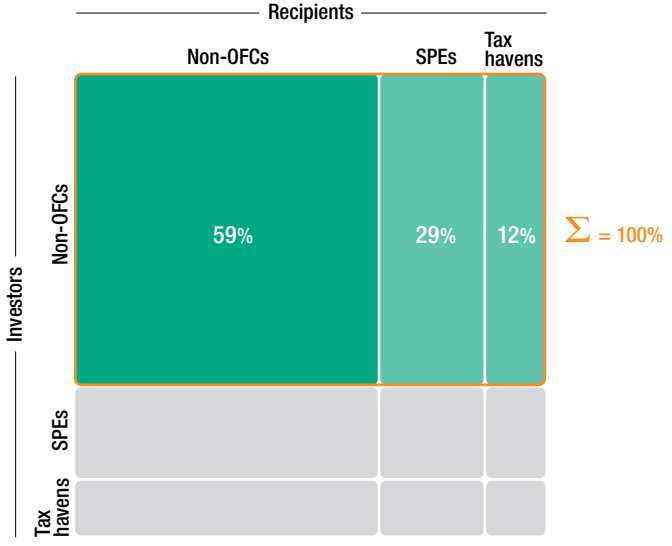
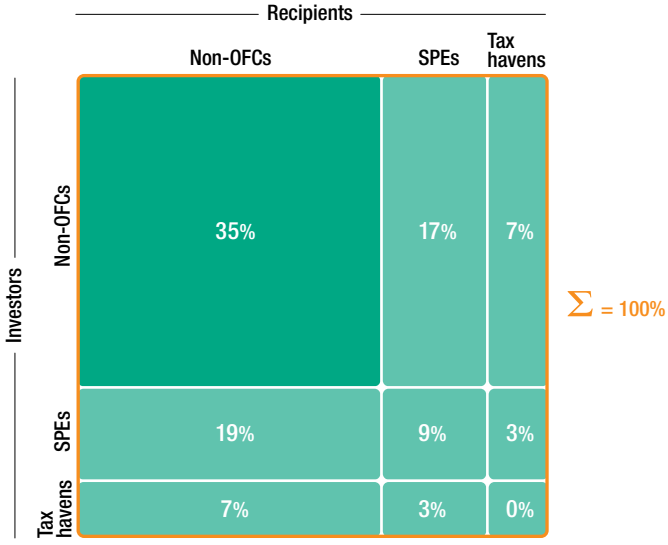


Figure 6. Simulation of the Offshore Investment Matrix based on the Implied Investment Method (extended perimeter) (concluded)

c. Two-sided



Source: IMF Coordinated Direct Investment Survey 2012 and 2011; national statistics; UNCTAD estimates.

3. An FDI-driven estimation of profit shifting and tax revenue losses related to BEPS for developing economies

3.1. Tax revenue losses for developing economies

The process of formulating the Sustainable Development Goals and the related Financing for Development discussion have raised both the political profile and public awareness of the role of taxation as a source of development financing and focused attention on the detrimental impact of tax avoidance schemes on developing economies.

Tax is a major component of the development financing pool. Concord (2013) estimates the total amount of domestic sources of development financing at some 60% of the aggregate GDP of developing economies against 5% for external sources, with taxation – at 15 to 30% of GDP – representing a significant share of domestic sources. The OECD calculated in 2010 that at the aggregate global level

up to half of annual additional resources needed to achieve the (first six) Millennium Development Goals (MDGs) could be recovered just by improving tax revenue collection in developing economies (Atisophon et al., 2011). The situation will be similar for the SDGs.

The concerns of development organizations and NGOs related to BEPS practices in developing countries centre on two issues: (i) developing economies are less equipped than developed economies to counter corporate tax avoidance, so therefore their exposure may be greater; and (ii) the impact in terms of resource losses for developing economies is significant, especially against the background of the scarcity of available local resources and the development financing gap.

The FDI-based analytical toolkit presented in this section provides a methodology to estimate the tax revenue losses for developing economies related to MNEs' tax avoidance schemes. The distinctive feature and to some extent also the limitation of the approach is to focus specifically on the role and the impact of FDI from offshore hubs into developing economies. It is important to point out that a direct investment link to an offshore hub is not a prerequisite for profit shifting. However, such links enable some important forms of profit shifting, and they are usually part of the tax planning strategy of MNEs (see the more extensive discussion in *WIR15*, chapter V and its annex II).

The quantification of profit shifting and related revenue losses is a challenging exercise. First, tax avoidance options can be numerous. MNEs employ highly sophisticated and creative combinations of individual tax avoidance levers. Second, by the nature of the phenomenon, the available data and information are limited. In particular the profits shifted to offshore locations are difficult to track as they typically do not appear in any official reporting: not, obviously, in the financial reporting of the foreign affiliates where the value is generated and not in that of the foreign affiliates where it is shifted, owing to often lax reporting requirements.

Empirical literature on corporate profit shifting relates broadly to two main research streams.

One, older and more established, investigates the phenomenon of profit shifting by MNEs per se. It addresses such questions as, Do MNEs shift profits for tax purposes? What are the main profit-shifting strategies? The major contribution of these studies has been to provide solid empirical evidence of the occurrence of profit shifting, mainly by showing how tax rate differentials across jurisdictions affect the distribution of pre-tax profit within multinational groups. Examples of this literature include Hines Jr. and Rice (1994), Huizinga and Laeven (2008), Dharmapala and Riedel (2013) and, more recently, Johannesen et al. (2017). An exhaustive literature review in this area appears in Dharmapala (2014).

This study instead belongs to the second main research stream, which attempts

to estimate the effects of profit shifting on the economic environment and on the development prospects of countries. Key questions here are, for example, what is the total amount of profit shifting taking place at the global level due to MNEs' tax avoidance? And, more importantly, what does this imply in terms of lost tax revenues for governments, at the global level or for groups of countries (e.g. developing countries)? In this context, analytical efforts focus on sizing the phenomenon or, using a terminology that has become quite common in this area, on identifying the "big number", i.e. an order of magnitude that realistically represents the value at stake. This is an exceptionally challenging exercise, both for empirical reasons (the availability of key information on MNEs' international activities is poor) and methodological ones (e.g. the lack of any realistic counterfactuals).[11] Yet, analytical efforts to estimate revenues losses have seen a remarkable acceleration in the last three years.

Until 2015, attempts to estimate tax revenue losses on a global scale have been confined to some pioneering efforts, with limited analytical ground (for example, Oxfam, 2000, and ChristianAid 2008 and 2009; for a review, see also Fuest and Riedel, 2009 and 2010). Since then, a new generation of empirical studies on global profit shifting and revenue losses has been thriving (UNCTAD, 2015b; Crivelli et al., 2016; OECD, 2015; Clausing, 2016; Cobham and Janský, 2017; Cobham and Janský, 2018a; Janský and Palanský, 2018; Tørsløv et al., 2018), significantly pushing the exploration of available data and techniques. Not only have these studies expanded the range of analytic options, but they have also contributed to create some consensus on the orders of magnitude involved.

Interestingly, the initial impetus to this generation of estimates came from three independent but almost simultaneous studies by international organizations at the forefront of the research and policy debate on MNEs' international taxation: UNCTAD (2015a; 2015b), the IMF's Crivelli et al. (2015; 2016) and OECD (2015).[12] These studies, by means of completely different analytical strategies, have proposed alternative, yet somehow comparable, estimates of tax revenue

[11] Namely, what the tax base would be in the absence of profit shifting.

[12] The UNCTAD analysis was published as a working paper for review and feedback in March 2015 (UNCTAD, 2015a) and then in final form in June 2015 as part of the *World Investment Report 2015* (UNCTAD, 2015b). IMF's work from Crivelli et al. first appeared as an IMF Working Paper in May 2015 (Crivelli et al., 2015), before publication in a refereed journal in 2016 (Crivelli et al., 2016). Finally, the OECD analysis was published in October 2015 as part of the BEPS Action 11 Report (OECD, 2015).

losses.[13] It is generally acknowledged that these results, while necessarily relying on some strong assumptions and thus being far from perfect, have marked a methodological step-change and have contributed critically to stimulating further research developments.

Subsequent research work has further added to the credibility of this research avenue by validating some of the original approaches. Cobham and Janský (2018a) have tested for robustness and refined IMF methodology, including country-level estimates; Janský and Polanský (2018) have done a similar exercise for the UNCTAD approach. Research momentum has led to other relevant contributions, notably Clausing (2016), Cobham and Janský (2017), and Tørsløv et al. (2018), developing alternative yet related approaches to the estimation of revenue losses. The availability of several techniques and estimates has heated up the academic and policy debate on the big numbers and motivated a number of critical reviews of the different methodologies (OECD, 2015 and Bradbury et al., 2018;[14] Cobham and Janský, 2018b). We refer to these excellent overviews for detailed descriptions and comparisons of the methodologies.

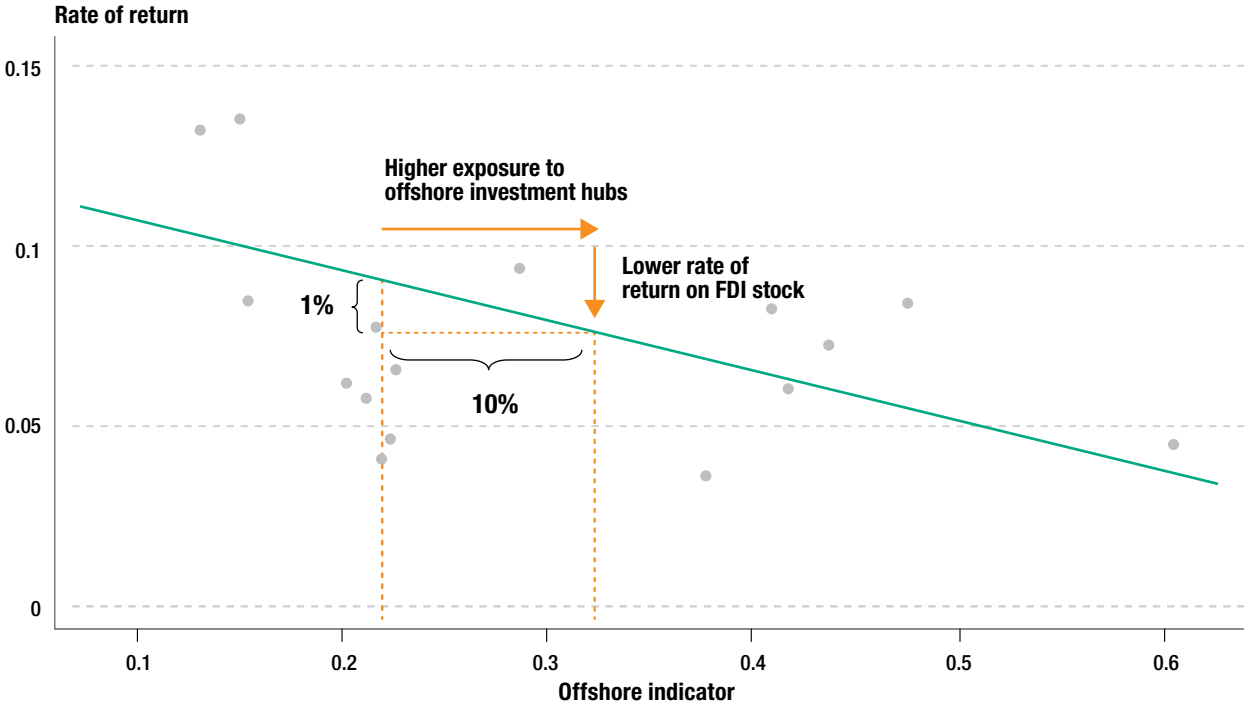
3.2. UNCTAD approach: relationship between offshore FDI and investment profitability

The UNCTAD methodology for the estimation of profit shifting and tax revenue losses builds on the assumption of a negative relationship at country level between the share of inward investment stock from offshore hubs (hereafter "offshore indicator") and the rate of return on the total inward FDI stock (hereafter "rate of return"). The rationale underlying this assumption is that the income generated by foreign direct investments from offshore investment hubs is subject to a greater extent to profit-shifting practices with the effect of "artificially" deflating the rate of return. Figure 7 illustrates the argument.

[13] The UNCTAD analysis employs statistics on FDI from countries' BoP as the main data source (full methodological details are provided in the rest of this paper). Estimates of revenue losses at about $100 billion for developing countries and $200 billion globally target specifically BEPS practices enabled by FDI through OFCs (to be regarded as a lower bound). The IMF approach in Crivelli et al. (2016) also uses macroeconomic variables, but not from the BoP. Their main source is country data on (corporate income) tax revenues and statutory tax rates. The sizing of the BEPS impact is based on the response of countries' tax bases to the average tax rate of countries classified as tax havens. Short-term revenue effects are estimated at $120 billion globally, and long-term effects at $600 billion ($200 billion for non-OECD countries). Unlike the UNCTAD and IMF approaches (which relied on macroeconomic statistics), the OECD approach leverages firm-level data from ORBIS. The analysis provides a range for estimates of tax revenue losses between $100 billion and $240 billion globally, as a combined effect of profit shifting due to tax rate differentials on the one side and mismatches between tax system and preferential treatment on the other.

[14] Published in this volume.

Figure 7. Illustration of the relationship between the share of inward investment from offshore investment hubs and rate of return on inward investment



Source: UNCTAD analysis based on data from the IMF Balance of Payments Database and IMF Coordinated Direct Investment Survey.
Note: Scatterplot representing the relationship between offshore hub exposure (*offshore indicator*) and rate of return on investment stock (*rate of return*) for developing countries. "Conservative" case with beta coefficient at –10%. The fitted line is merely illustrative and does not reflect the econometric modelling behind the estimation of the beta coefficient (the econometrics rely on a larger sample of data points, including four years, and accounts for regional fixed effects and time fixed effects; for details, see section 3.3).

Formally, the target relationship is analyzed through econometric modeling of country-level data, with the rate of return as the dependent variable and the offshore indicator as the explanatory variable (see details in next section). The offshore indicator is derived as a straightforward application at the country level of the Offshore Investment Matrix illustrated in the previous section.

Once a significant relationship is established between the offshore indicator and the rate of return, then the tax revenue losses can be calculated through appropriate assumptions on the profitability gap (how much FDI income is missing due to investments from offshore hubs) and on the average corporate tax rate.

It is important to stress that the estimated profit shifting and tax revenue losses are mostly confined to those associated with tax avoidance schemes that require a direct investment relationship. Financing schemes (e.g. archetype 2 in *WIR15*; page 196) are an important example but other schemes also rely on FDI links to offshore hubs, including for example the well-known Double Irish-Dutch Sandwich (archetype 1 in *WIR15*; page 194). Hence, financing schemes do not account for the entirety of the estimated revenue loss.

3.3. Regression analysis

The relationship between the offshore indicator and the rate of return is subject to econometric estimation. The reference model is a standard linear regression model (ordinary least squares, OLS) with time and region[15] fixed effects:

$$y_{i,t} = \alpha + \beta x_{i,t} + \delta_t + \theta_k + \varepsilon_{i,t}$$

where x denotes the offshore indicator and *y* the rate of return; each data point (*x, y*) is recorded for a number of countries (indexed by *i* from 1 to *N = 72*), across four years (indexed by *t*) from 2009 to 2012; δ (indexed by *t*) represent the time fixed effect and θ (indexed by *k* from 1 to 7) represents the regional fixed effects.[16]

[15] The following United Nations regional classifications are used: Africa, Asia, Europe, Latin America and the Caribbean, North America, Oceania, and South-East Europe and the Commonwealth of Independent States.

[16] More formally, denoting by $I_{\{A\}}$ the indicator function that equals 1 if the event A realizes and 0 otherwise, the two variables δ and θ representing the fixed-effect components can be defined in the regression equation as follows:

$\delta = \sum_{s=2009}^{2012} \delta_s I_{\{t=s\}}$;

$\theta = \sum_{k=1}^{7} \theta_k I_{\{i \in k\}}$ where the event $\{i \in k\}$ realizes if country i belongs to region k.

For each country, the offshore indicator is calculated through a straightforward application of the methodology of the Offshore Investment Matrix (one-sided inward analysis). To capture the full impact of exposure to offshore hubs on investment profitability, and to ensure greater statistical validity of the relationship between offshore investment links and rates of return on investment, the econometrics are based on the extended perimeter, including tax havens, countries reporting SPEs and other important investment hubs (selected and analytically treated as explained in section 2.3). Thus, the perimeter and resulting Offshore Investment Matrix are the same as the simulation in figure 6.

The size of the sample is subject to data availability on bilateral FDI inward stock (needed to calculate the offshore indicator) and the FDI income (to calculate the rate of return). Consistently with the approach employed throughout the study, the reference source of bilateral FDI stock is the IMF CDIS database, recording bilateral investment stocks for a sample of about 100 recipient countries from 2009 to 2012. The data on the FDI income, including the further split between equity and debt components, is retrieved from balance-of-payments data as reported by the IMF BoP (current account, primary income on direct investment, debit side). Finally, the data on the FDI inward stock employed (at the denominator) in the calculation of the rate of return on FDI are from the UNCTAD FDI database.[17]

Since the goal of the analysis is to quantify the losses related to investment from offshore hubs, the sample includes only non-OFCs, i.e. jurisdictions that do not qualify as tax havens or SPE jurisdictions. Exploratory univariate data analysis led to the identification of nine outliers[18] displaying extreme values of one variable (either the offshore indicator or the rate of return), consistently across the four years.[19] The selection of the outliers is still robust with respect to a (bivariate) test heuristic based on the 95% confidence ellipses. The resulting sample consists of an unbalanced panel of 72 countries, including 27 developed economies, 34 developing economies and 11 transition economies, covering the years from 2009 to 2012 (53 countries report information for all four years).

[17] All figures are those reported at the time of the analysis and do not necessarily correspond to currently reported data. The latest download of the data from IMF CDIS for the calculation of the offshore indicator was in April 2014; the latest download of the data from the IMF BoP database (FDI income) and the UNCTAD FDI database (inward FDI stock) for the calculation of the rate of return was in November 2014.

[18] The countries not considered in the econometric analysis include Azerbaijan, Botswana, China, Iceland, Kazakhstan, Macao (China), Nigeria and the Russian Federation. Bhutan was also excluded for very anomalous values of rate of return.

[19] A closer look at the outliers highlights the specificity of the selected countries. Outliers with a high value of the offshore indicator are characterized by special investment relations with particular offshore hubs, often in their region. In many cases these relations entail FDI round-tripping, with an impact on the source country potentially very different from the general (trans-shipping) case. The second group of outliers, characterized by an unusually high rate of return, includes countries with an investment profile heavily biased toward natural resources.

The response of the rate of return on FDI to the offshore indicator is analyzed using three formulations of the dependent variable.

Model 1. A standard formulation of the rate of return on FDI as the ratio of total FDI income (income on equity and interests on debt) over FDI inward stock.

Model 2 and model 3. Two more granular formulations addressing separately the effects on the equity component and on the debt component of the FDI income. In this version, the dependent variables become, respectively, the ratio of the equity income to total FDI stock (hereafter Rate of Return_equity; model 2) and the ratio of debt income (interest payments) to total FDI stock (hereafter Rate of Return_debt; model 3).[20]

Performing separate analysis for the equity and the debt component has some advantages. Primarily, profit-shifting practices target the equity component of the FDI income (the foreign income) while the debt component (the interest rates paid to the foreign investors) represents a cost for the foreign affiliates, not subject to corporate income taxation (though withholding taxes may apply). In addition, some BEPS practices do not only affect the (declared) profitability of FDI but also their structure, favoring debt over equity financing (debt financing schemes). The change in the financing mix is actually one lever used by MNEs in BEPS schemes. The isolation of the equity component from the debt component makes it possible to better capture the impact on profits of this effect.[21] As a consequence, the responsiveness of the equity component to exposure to offshore investment hubs is expected to be higher (more negative) than the one of the aggregate rate of return. Conversely, the debt component is expected to be positively related to exposure to offshore hubs.

All regressions account for time and regional fixed effects, and they include a dummy variable accounting for prominent shares of natural resources in exports.[22] Table 1 reports the results of the regression analysis.

- Model 1: Results support the assumption of a negative relationship between the offshore indicator and the rate of return, with a significant beta-coefficient. Comparison of the estimated coefficients suggests that developing countries (β = –11.5%) are relatively more vulnerable to profit shifting than developed countries (β = –5.4%).

[20] Notice here that the two ratios Rate of Return_equity and Rate of Return_debt are not strictly rates of return as they both have as denominator the total FDI stock rather than (respectively) the equity component and the debt component of the FDI stock. They should rather be interpreted as the equity component and the debt component of the FDI income rate of return.

[21] In the general case where the dependent variable is the aggregate rate of return, low levels of the equity component are partially compensated by higher levels of the debt component.

[22] Countries with a share of resource-based exports in total exports higher than 90% in 2012.

- Model 2: The same picture is seen when focusing only on the equity component of the rate of return (Rate of Return_Equity). The negative relationship turns out to be stronger, both in terms of the slope of the regression line (for developing economies: from –11.5% to –15.8%) and in terms of statistical significance of the OLS estimates. Also the R-squared increases (for developing economies from 22% to 24%). The improvement of the regression when focusing specifically on the equity income is consistent with the realization of BEPS practices. Finally, comparison of the results between developed and developing economies confirms the higher responsiveness of the rate of return for developing economies.[23]
- Model 3: As expected, for the debt component the relationship is reverted: the higher the exposure to offshore investment hubs, the higher the debt component of the rate of return (Rate of Return_Debt). In this case the relationship is also statistically significant. This evidence, together with evidence on the equity component from model 2, supports the assumption that exposure to offshore hubs enables profit-shifting practices based on debt financing, among others.

Focusing on the impact of profit shifting on developing economies (shaded columns in table 1), the result of the regression analysis can be legitimately interpreted as follows: a 10% share of inward investment stock originating from offshore investment hubs is associated with a 1-1.5 percentage point lower reported (taxable) rate of return However, interpretation of this statement in a strictly causal way (i.e. an additional 10% exposure to offshore investment hubs generates a 1-1.5 percentage point decrease in the rate of return) requires caution. As the relationship holds across countries, it is not possible to exclude that the compositional effects of specific countries may drive the results. Certainly controlling for regional fixed effects makes it possible to capture a significant part of fixed country characteristics that may influence offshore investment patterns and the rate of return on foreign investment.[24] This consideration is empirically supported by the increase of R-squared (from 4% to 24%) determined by the inclusion of regional fixed effects.[25] In addition to regional fixed effects, the inclusion of a number of

[23] For both model 1 (*Rate of Return*) and model 2 (*Rate of Return_Equity*) the interaction term between the offshore indicator and a dummy variable that equals 1 for developing economies and 0 for developed economies is not significant, suggesting that the difference in the response to the offshore indicator between developed and developing countries is not statistically significant. However, for both models the interaction term between the offshore indicator and GDP per capita holds at the 5% level, confirming that poorer countries are more vulnerable to profit shifting than richer countries.

[24] It can be argued that a country fixed-effect model would better address countries' fixed characteristics that potentially affect the relationship. However, within-country variability of the explanatory variable (specified in terms of stocks, highly stable over time) over a time horizon of four years (from 2009 to 2012, the time horizon covered by IMF CDIS at the time of this analysis) is very limited to observe meaningful effects on the dependent variable at the level of the individual country.

[25] Notice the OLS estimation of the bivariate regression (i.e. the offshore indicator on the rate of return, without fixed effects and additional control variables) returns significant (at 1%) beta-coefficients, similar in magnitude to those reported in table 1.

Table 1. OLS regression of the offshore indicator on the rate of return, key statistics

	(1) Dependent variable: FDI income rate of return *(Rate of Return)*			(2) Dependent variable: equity component of FDI income rate of return *(Rate of Return_Equity)*			(3) Dependent variable: debt component of FDI income rate of return *(Rate of Return_Debt)*		
	All (1)	**Developing** (2)	**Developed** (3)	**All** (4)	**Developing** (5)	**Developed** (6)	**All** (7)	**Developing** (8)	**Developed** (9)
Offshore indicator	-0.097***	-0.115**	-0.054*	-0.126***	-0.158**	-0.084*	0.019***	0.016**	0.033*
	(0.093)	(0.0492)	(0.0317)	(0.0299)	(0.0504)	(0.0319)	(0.0048)	(0.0073)	(0.0102)
Obs.	265	122	103	258	117	101	208	82	94
R^2	0.272	0.220	0.115	0.314	0.243	0.150	0.371	0.126	0.304
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses *** P<0.01, ** P<0.05, * P<0.1.

Source: IMF Coordinated Direct Investment Survey 2012 and 2011; IMF BoP data; UNCTAD data; UNCTAD estimates.

Note: Estimates in the table are obtained through a regression procedure with robust standard errors employing the Huber-White sandwich estimator. In addition, to account for potential within-country correlation between the residuals (induced by the quadrennial country observations), an OLS procedure with (robust) clustered standard errors at the country level was performed. The latter procedure yields OLS estimates that are significant at the 5% level for all models. Finally, the results continue to hold at the 5% level for lagged one and two years offshore indicators.

control variables (described in section 3.4) provides further backing to the strength of the relationship.

Thus, even though it is very challenging to irrefutably prove a direct causal relationship between exposure to offshore hubs and reduced profitability of FDI, this analysis provides sound empirical underpinning for the widespread evidence that MNEs leverage direct investment links to financial centres to enable profit-shifting practices that ultimately result in artificially lower FDI income. More importantly, the quantification of the responsiveness of the rate of return to exposure to offshore investment hubs allows simulating the potential impact of these practices on tax revenues.

3.4. Further robustness tests

This section illustrates the results of a number of tests aimed at strengthening the robustness of the econometric exercise. For ease of exposition, the outcomes are described for model 2 (rate of return on equity as dependent variable – columns 4 to 6 in table 1). Similarly, positive results are observed also for models (1) and (3).

The robustness tests address three critical areas.

a. Selection of the outliers

The selection of the outliers described in the previous section, although explained by economic considerations and supported by evidence from descriptive statistics, is prone to some degree of discretionality. In order to ensure that the selection of the outliers does not affect the main findings, two robust regression analyses are performed: the iteratively reweighted regression (IRR) and the quantile regression (QR).[26] The two procedures were applied to the complete sample of developed and developing countries including the outliers (column 4 in table 1). Both the IRR and the QR return negative and statistically significant beta-coefficients (at the 1% level). The magnitude of the coefficient estimated with the IRR decreases from the baseline value of –0.126 (column 4 in table 1) to –0.086, while the estimate obtained with the QR remains substantially the same as the baseline.

b. Control variables

Since the offshore indicator could be correlated with omitted variables that may also affect the rate of return on FDI, some economic and institutional variables were

[26] The goal of the two methods is to mitigate the effect of the extreme or deviant observations by assigning them a lower weight compared with "well-behaved" observations. Both methods are in practice standardized procedures to deal with outliers.

added to the baseline specification. Selected controls were tailored to the group of developing economies, as they are the main focus of the analysis. Specific control variables include (i) corporate income tax rates;[27] (ii) a variable measuring the level of development;[28] (iii) a proxy variable for financial development;[29] (iv) a proxy variable for the quality of institutions;[30] (v) a variable for levels of corruption.[31] With the exception of the level of corruption, all the other controls significantly explain the variation in the rate of return for developing economies. After including all (significant) controls in the regression, the beta-coefficient for the offshore indicator still holds significant (at 5%), with a magnitude decreasing from –0.158 (table 2, column 5) to –0.085 and the R-squared rising from 24% to 38%, as expected.

c. Robustness to the definition of country groups

Finally, different definitions of developing or lower-income economies were adopted to make sure that the main findings are not affected by the United Nations scoping of the group of developing economies. Two definitions of lower-income countries were used: the sample of countries with GDP per capita lower than the median value (129 observations); and the sample of low-income and lower-middle-income countries based on the World Bank classification (106 observations). For both samples, the regression returns a negative and significant (at 1%) beta-coefficient for the offshore indicator with a magnitude of –0.146 and –0.113, respectively.

3.5. Simulation of the tax revenue loss for developing economies

Given a negative relationship between the share of inward investment from offshore investment hubs and the rate of return on inward investment, the problem of estimating the tax revenue loss for developing economies boils down to (i) finding the "missing profits" due to current levels of investment from offshore hubs (estimation of the profit shifting); and (ii) translating the profit shifting into tax revenue losses.

i. It is reasonable to use the results of the regression analysis to simulate the profitability gap (i.e. the decrease in the profitability) associated with the actual exposure of developing economies to offshore investment hubs. Given an average

[27] Statutory corporate tax rate from USAID, 2012. Notice that potential endogeneity follows from the fact that higher corporate income tax rates in the host country may increase the incentive to shift profits and thus the use of offshore hubs, resulting in a higher offshore indicator; at the same time it may depress the FDI income, reported net of tax, resulting in a lower rate of return.

[28] GDP per capita from UNCTAD, 2009–2012.

[29] The domestic credit to private sector as a fraction of GDP from the World Bank, 2009–2012.

[30] The regulatory quality index from the World Bank's worldwide governance indicators, 2009–2012.

[31] The corruption index from the World Bank's worldwide governance indicators, 2009–2012.

exposure of developing economies at 46% of total inward stock,[32] the estimated β at –11.5% (table 1, model 1, shaded) and –15.8% (table 1, model 2, shaded) imply a profitability gap of 5.3 percentage points and 7.2 percentage points, respectively. Applying these profitability gaps to the actual reported FDI stock for developing countries leads to an estimate of the (after-tax) profit shifting of between $330 billion and $450 billion. Table 2 summarizes the steps of the simulation.

Table 2. Simulation of the profit shifting for developing economies

	Estimated profitability gap		Reported FDI stock Billions of dollars, 2012		Simulated profit shifting *after* tax Billions of dollars		Simulated profit shifting *pre* tax Billions of dollars
Model 1 ***Rate of Return***	5.3 pp	x	5000	=	265	/(1-20%)=	331
Model 2 ***Rate of Return_Equity***	7.2 pp		5000		360		450

Source: UNCTAD.

ii. The calculation of the tax revenue loss given the profit shifting is technically straightforward but conceptually challenging. It requires the application of a given corporate tax rate to the shifted portion of the (pre-tax) profits. The key question is which tax rate, in particular whether to resort to a metric of effective tax rate or of statutory tax rate. In this context, the effective tax rate seems to be more realistic, as the revenue impact of profit shifting should be assessed against what MNEs actually pay rather than what they are supposed to pay if discounts and incentives did not apply. By contrast, resorting to the statutory tax rate may have the methodological advantage of keeping the issues of tax avoidance and tax incentives clearly separated, as they are different in nature and they imply different policy considerations. In this case the estimated revenue loss would be the result of tax avoidance alone, in an ideal world where tax incentives do not lower the income tax rate faced by MNEs. For completeness, table 3 reports the simulated tax revenue losses with both the effective tax rate (at 20%) and the statutory tax rate (at 27%).[33]

[32] This share differs from the share reported in the *WIR15*, chapter V (reporting average exposure of developing economies to offshore investment hubs at 30%), because it is based on a larger perimeter (see discussion in section 2.3).

[33] Weighted (by the FDI income) average of the statutory corporate income tax rates for a sample of developing countries for which complete information is available. Data on corporate income tax rates from United States Agency for International Development: http://egateg.usaid.gov/collecting-taxes.

Table 3 shows the results of the simulation of the revenue losses under the four main formulations. The simulation clearly points to tax revenue losses approximately on the order of $100 billion. Among the four options, the shaded one focusing specifically on the equity component of the FDI income and applying an effective tax rate seems to the best description of the real dynamics. The corresponding value of revenue losses at $90 billion is also well centred within the range of results covered by the sensitivity analysis.

Table 3. Simulation of the revenue losses for developing economies
(preferential option shaded)

	Effective tax rate (20%)	Statutory tax rate (27%)
Model 1 ***Rate of Return***	$66 billion	$89 billion
Model 2 ***Rate of Return_Equity***	$90 billion	$122 billion

Source: UNCTAD.

Box 1. The simulation of the revenue losses for developed economies

The negative relationship between the offshore indicator and the rate of return holds significant also for developed economies (table 1, columns 3 and 6); this suggests that also developed economies are affected by profit shifting and tax revenue losses related to direct FDI exposure to offshore investment hubs. However, the application of the simulation procedure to the group of developed economies gives values of profit shifting and tax revenue losses proportionally smaller than for developing economies (given the relative sizes of the economies).

Several factors contribute to mitigating the impact of the exposure to offshore investment hubs for developed economies.

First and foremost, developed economies display a lower beta-coefficient, indicating lower responsiveness of profits to investments from offshore hubs; in fact, in the case of developed economies, an additional 10% share of exposure to offshore investment hubs corresponds to a decrease in the rate of return of "only" 0.5 to 1.0 percentage point (columns 3 and 6 in table 1).

In addition, when applying the beta-coefficient to (a) the average exposure share of the group to calculate the profitability gap (table 2, column 1); and then to (b) the total FDI stock to calculate the profit shifting (table 2, column 2), the following elements further reduce the base for the calculation:

…/

Box 1. The simulation of the revenue losses for developed economies (concluded)

(a) The average exposure to offshore investment hubs (using the extended perimeter for offshore investment hubs) for developed economies (at 35%) is lower than for developing economies (46%). For the reference model 2, this translates in a profitability gap of 3 percentage points against 7 percentage points for developing economies (column 1 in table 2).

(b) The removal of some large developed-economy offshore investment hubs from the perimeter of the calculation reduces significantly the baseline of FDI stock used for the calculation of the profit shifting (from about $14 trillion to $11 trillion, according to UNCTAD statistics).

In this context, despite the larger size of the economies, the simulation of tax revenue losses resulting from direct offshore investment links for developed countries yields an estimate similar to that of developing countries, on the order of $100 billion. In particular, for the reference option (model 2, with average effective tax rate; see table 3), assuming an average effective tax rate at 25% – higher than for developing economies – the simulation procedure returns an estimate of revenue losses at $110 billion, against $90 billion for developing economies.

Source: UNCTAD.

4. Conclusions and directions of future research

The analysis presented in this paper claims two main analytical achievements. First, it introduces a methodology to quantify FDI investment through OFCs (the Offshore Investment Matrix). The results of the analysis indicate a major role of FDI through OFCs in the global FDI network, from a (conservative) 30% of total bilateral FDI up to almost 50%, depending on the OFC perimeter. This analysis is of major interest on its own, as it measures the link between investment and taxation, but also as an input to the second main objective: the calculation of the economic impact of FDI-enabled tax avoidance. In this context, econometric analysis of the relationship between offshore FDI and investment profitability confirms that investment through OFCs is responsible for some degree of profit shifting ("FDI-enabled"), resulting in estimated revenue losses at about $100 billion annually for developing countries (and $200 billion globally).

Both analytical results are susceptible to improvements.

The analysis of the Offshore Investment Matrix is descriptive; hence, potential developments are relatively straightforward. These include a more updated and refined scoping of the OFC component, also taking into account new self-declared

SPE countries.[34] In the extended setting of section 2.3, the Implied Investment Method is at this stage of development an effective heuristic to identify and size the offshore component; its treatment can be refined and grounded on more solid statistical analysis. In this respect, a larger number of countries reporting SPEs provide a more robust benchmark for testing and validating the method against "real" counterfactuals. Finally, as the parameters driving the perimeter of the OFC component are quite arbitrary, it would be interesting to perform a full-fledged comparative study to analyse the results' sensitivity to different assumptions. In the same spirit, it would also be interesting to compare the results of the Implied Investment Method with alternative approaches to the sizing of FDI through OFCs, for example, from the recent IMF's Damgaard and Elkjaer (2017).

The second set of results, related to the estimation of the tax revenue losses, require some bolder inference steps, and thus are more prone to criticism and margins for improvement. The major objection addressed to the UNCTAD method is that it exposes the BEPS effects of investment through OFCs without fully clarifying the causes, i.e. it does not clarify the nature and the boundaries of the profit-shifting practices enabled by offshore FDI.[35] Importantly, in the debate on big numbers, this limitation makes it difficult to assess how far is our final estimation of revenue losses – a lower bound by definition – from the "true" number. As a first step to address this concern, a systematic review of some of the most common BEPS schemes with a specific focus on the role of FDI and its implications on FDI patterns or data would be insightful. This could lead to an FDI-driven taxonomy of BEPS schemes, as opposed to available income-driven categorization. (Currently the efforts to understand the mechanics of MNEs' tax planning schemes have mainly revolved around the income dimension rather than the FDI dimension.) We expect such a review to support our approach by showing that the vast majority of known BEPS schemes do use FDI links to OFCs. More analytically, one could think of splitting the explicative variable (the offshore indicator) into its equity (equity exposure) and debt component (debt exposure) and analyse separately their effects on the rate of return, and potentially also the correlation between the two components. This analysis would provide an indication of the relevance of thin capitalization (mainly related to debt exposure) in driving the relationship of interest. Finally, there is a whole set of relevant bilateral FDI data on OECD countries that have not been yet exploited for the analysis of BEPS schemes. These include, for example,

[34] As of 2016, from OECD reporting, there are 29 countries reporting FDI stock to and from SPEs (though 13 of them claim a negligible presence), compared with only four jurisdictions in 2010.

[35] As put by Tax Justice Network: "Their [UNCTAD] estimates (..) seem rigorous, but it is not clear that what they estimate is actually profit shifting. (..) we are not disputing that an additional 10% share of inward investment stock originating from offshore investment hubs is associate with a decrease in the rate of return of 1–1.5 percentage point and the role of offshore hubs does seem to be distinct, but we do not see what the likely channels of profit shifting associated with the lower returns might be…."

bilateral information on SPE investment, FDI income, ultimate investors and FDI components. Such detailed views cannot be directly employed in the estimation of revenue losses on a global scale due to their limited coverage, but we believe they can significantly contribute to a better understanding of how FDI-enabled profit shifting takes place.

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