INTERNATIONAL MONETARY FUND

Measuring Multinational Production with Foreign Direct Investment Statistics:

Recent Trends, Challenges, and Developments

Bruno Casella, Maria Borga, and Konstantin M. Wacker

WP/23/113

2023
JUN

WORKING PAPER

 WP/23/113

IMF Working Paper

Statistics Department

Measuring Multinational Production with Foreign Direct Investment Statistics: Recent Trends, Challenges, and Developments

Prepared by Bruno Casella, Maria Borga, and Konstantin M. Wacker

Authorized for distribution by Carlos Sánchez-Muñoz

June 2023

Abstract

In a complex global production landscape, the quest for measures of economic activity by multinational enterprises (MNEs) has become more pressing. Foreign Direct Investment (FDI) statistics, which capture financing aspects of MNEs, have often been used as a proxy for multinational production given their wide availability and cross-country comparability, but concerns that multinational production occurs in different countries than where financial positions are recorded call this practice into question. This paper revisits the main objections to the use of FDI as a proxy for multinational production, explores counterarguments, and provides guidance on the use of FDI statistics to measure multinational production.

JEL Classification Numbers: F20, F23, C82

Keywords: FDI; multinational production; multinational enterprises; foreign affiliates

Author's E-Mail Address: bruno.casella@unctad.org; mborga@imf.org; k.m.wacker@rug.nl

Maria Borga is Deputy Division Chief in the Balance of Payments Division, IMF; Bruno Casella is Senior Economist at the Division of Investment and Enterprise, UNCTAD; Konstantin M. Wacker is an assistant professor at the University of Groningen, Netherlands. The authors are grateful to Richard Bolwijn (UNCTAD), Carlos Sánchez-Muñoz (IMF), Jannick Damgaard (IMF), and Thomas Elkjaer (IMF) for helpful comments. Substantial statistical and research inputs were provided by Gregory Auclaire (UNCTAD).

WORKING PAPERS

Measuring Multinational Production with Foreign Direct Investment Statistics

Recent Trends, Challenges, and Developments

Prepared by Bruno Casella, Maria Borga, and Konstantin M. Wacker[1]

[1] Maria Borga is Deputy Division Chief in the Balance of Payments Division, IMF; Bruno Casella is Senior Economist at the Division of Investment and Enterprise, UNCTAD; Konstantin M. Wacker is an assistant professor at the University of Groningen, Netherlands. The corresponding author is Konstantin Wacker: k.m.wacker@rug.nl.The authors are grateful to Richard Bolwijn (UNCTAD), Carlos Sanchez Munoz (IMF), Jannick Damgaard (IMF), and Thomas Elkjaer (IMF) for helpful comments. Substantial statistical and research inputs were provided by Gregory Auclaire (UNCTAD).

Contents

FIGURES

TABLES

Glossary

BEPS	Base Erosion and Profit Shifting
BoP	Balance of Payments
CDIS	Coordinated Direct Investment Survey
FA	Foreign Affiliate
FATS	Foreign Affiliate Statistics
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
IIP	International Investment Position
MNE	Multinational Enterprise
OECD	Organization for Economic Cooperation and Development
OFC	Offshore Financial Center
SPE	Special Purpose Entity
UNCTAD	United Nations Conference on Trade and Development
UIE	Ultimate Investing Economy
US BEA	United States Bureau of Economic Analysis

Executive Summary

Given the importance of multinational enterprises (MNEs) in the world economy, it is important for policymakers, researchers and analysts to properly measure their economic activity. It is common to use foreign direct investment (FDI) statistics for this purpose because they are widely available and comparable across countries. Since FDI statistics capture the financing aspects of MNEs, recent research has questioned this use of FDI statistics due to concerns that the production of MNEs happens in different economies than where they record financial positions.

The most prominent critique of the use of FDI statistics has been that MNEs can channel their investments through an enterprise resident in one economy to an enterprise in another economy. The channelling of FDI through multiple jurisdictions, also called conduit FDI, happens for a variety of reasons, including access to sophisticated tax and financial services, to protect parent companies against claims on their affiliates, and to protect their investments against political risk. This practice inflates FDI statistics and obscures the ultimate investors and destinations of FDI. While conduit FDI can occur in any economy, it is most associated with offshore financial centers (OFCs) in which the OFC acts as intermediate jurisdiction between the investors' economy of origin and the final destination of FDI. It has been estimated that between 30 and 40 percent of total FDI stock is routed through OFCs.

This paper highlights the progress that researchers and the international statistical community have made in addressing these concerns. The international statistical community has developed guidelines and initiated collection of data on Special Purpose Entities (SPEs), which are entities that are often involved in channelling FDI through OFCs. Identifying transactions and positions of SPEs separately from other direct investment enterprises enables the identification of pure conduit activities. If FDI data to and from SPEs are not available, it is possible to rely on alternative analytical methods to estimate the role of SPEs in aggregate FDI statistics, which we discuss in this paper. These methods build on the statistical correlation between gross domestic product and FDI stock to estimate the size of conduit FDI. The statistical community has also developed guidance on the recording of FDI positions by the ultimate investing economy (UIE) to look through the conduit economies and reveal the ultimate origin of FDI in an economy. Where such statistics are not yet available, researchers have developed analytical methods to address the gap between direct and ultimate bilateral statistics generated by channelling FDI through OFCs. Finally, it is important to remember that when the bilateral link involves non-OFC economies, standard bilateral FDI statistics already identify ultimate investors relatively well.

Researchers who regard FDI statistics as a proxy for multinational production should consider the following practical steps: (1) Explore the metadata to understand the coverage of FDI statistics (e.g., whether it includes SPEs or not and whether SPEs are reported separately); (2) Take into account the institutional setting of the economies being studied to understand if factors that can distort the relationship between FDI positions and multinational production are present; (3) Adjust for FDI to and from SPEs by using published data combined with one of the available analytical methods; (4) In the analysis of bilateral FDI statistics, identify ultimate investors using published data combined with one of the available analytical methods discussed; and (5) Compare and complement FDI data with other relevant data sources, including project-based data, firm-level data, survey-level data, and trade and value added trade data when available. With care taken in their use, IIP-based FDI statistics remain an important and instrumental data source to study and understand multinational production.

Introduction

Foreign direct investment (FDI) is a key category of international investment. According to the most recent vintage of the dataset of Lane and Milesi-Ferretti (2021), FDI stocks accounted for some 30 percent of global cross-border liabilities in 2015, and FDI accounted for over half of foreign financing in more than a third of countries, most of them developing. Together with statistics on portfolio investment and other cross-border investment (such as cross-border bank loans), FDI positions reflect financial exposure and international financial integration across countries.

What distinguishes FDI from other international investment is the idea that the FDI investor seeks a lasting interest in and a significant degree of influence over an enterprise in another economy.[1] This definition has historically motivated the use of FDI data from the Balance of Payments as a proxy for multinational enterprises' production, activities and presence in the host economy because the foreign enterprises receiving FDI (direct investment enterprises) are largely foreign subsidiaries, branches, and associates of multinational groups. In this paper, we refer to "multinational production" as a concept that quantifies the real activity of MNE's affiliates, such as output or sales, in line with the seminal academic literature (e.g., Ramondo et al., 2015; Alviarez, 2019; Arkolakis et al., 2018; Miroudot and Rigo, 2021).

However, there have long been concerns about the adequacy of FDI statistics to measure patterns of multinational production that have increased in recent years (e.g., Lipsey, 2007; Beugelsdijk et al., 2010; Leino and Ali-Yrkkö, 2014; Blanchard and Acalin, 2016; Sauvant, 2017; Linsi and Mugge, 2019). As discussed further below, these papers have highlighted that the production activities of MNEs may not occur in the locations where they record their financial positions, raising questions when FDI statistics can adequately be used. Those empirical contributions were mostly based on comparing FDI statistics to data on the activities of MNEs that statistical agencies in a few countries, including the United States, Sweden, and Japan, had collected in recognition of the need for a data collection specifically designed to measure multinational production. In 2007, Eurostat began its first data collection of Foreign Affiliate Statistics (FATS). [2] However, there has not been much progress in expanding the coverage of these data as only a few additional countries have introduced such data collections since then.[3]

Lipsey (2007) found differences between outward FDI data for the United States and statistics on the activities of U.S. MNEs abroad, including their employment, value added and property, plant and equipment; the differences were especially significant in industry distributions. He attributed those differences to the tax avoidance strategies of U.S. MNEs and to the increasing importance of intangible assets in production.[4]

[1] Ownership of 10 percent of the voting power of an enterprise by a non-resident investor is taken as evidence of a direct investment relationship.

[2] FATS are foreign affiliate statistics based on exhaustive or quasi-exhaustive census-type surveys of multinational enterprises. Inward FATS describe the operating activities of enterprises that are controlled by MNEs that are resident in another country or economy. They include variables such as employment, turnover, and value added and are typically compiled by developed economies. The indicator inward foreign affiliate turnover employed in Figure 3 (y-axis) is an example of FATS. The OECD collects statistics on the Activities of Multinational Enterprises (AMNE) from its members; AMNE statistics cover FATS as well as statistics on the activities of MNE parent companies.

[3] In 2008, the OECD's *Benchmark Definition of Foreign Direct Investment, fourth edition* attempted to better align FDI statistics with multinational production by, for example, recommending the separate identification of FDI to and from resident Special Purpose Entities and the classification of FDI positions by the Ultimate Investing Country.

[4] For an approach to derive intangible asset income from global production networks, see Chen et al. (2021).

Using a similar analytical approach of comparing FDI and foreign affiliates statistics, Beugelsdijk et al. (2010) found a systematic over-estimation of foreign affiliates' (FAs) operations in specific jurisdictions classified as offshore financial centers (OFCs).[5] Conversely, they also find an underestimation of foreign affiliate operations (e.g., sales or value added) by FDI statistics in countries with more advanced financial systems that is attributed to non-FDI financing (i.e., financing from unaffiliated parties).

Leino and Ali-Yrkkö (2014) studied FDI as a measure of real investment (gross fixed capital formation) in Finnish foreign-owned companies. Their results suggest that the recorded annual inflows of FDI do not constitute an accurate measure of annual real investments in foreign-owned companies. They attributed these results to non-FDI financing, the impact of cross-border mergers and acquisitions (M&As), and the presence of conduit investment in which FDI is channelled through one economy on its way to another economy (also called pass-through capital or capital-in-transit).

Blanchard and Acalin (2016) asserted a prominent role for conduit investment in FDI statistics based on the evidence of a high correlation between quarterly inward and outward FDI flows at the country level. Sauvant (2017) observed that the value of total assets for United States foreign affiliates in 2012 largely exceeded US outward FDI: up to two-thirds of foreign affiliate assets are not financed by FDI.

As part of a broader critique of the accuracy and reliability of international economic statistics, Linsi and Mugge (2019) have re-ignited the debate, exposing the main failings of FDI statistics, both in terms of measurement accuracy and in terms of a concept-measurement gap (i.e., systematic differences between what data actually measure and what they are expected to measure).

In this context, Damgaard et al. (2019) made three important contributions. First, it offered an exhaustive account of the main statistical challenges related to FDI, namely the role of pass-through capital through special purpose entities (SPEs), resulting in FDI statistics by immediate partner economy that do not reflect the real economic ties between economies. Second, it introduced a way to estimate the SPE component in FDI statistics for countries that do not report such information; this proposal adds to the other available options for the estimation of conduit FDI (e.g., World Investment Report, 2015; Bolwijn et al., 2018). Lastly, and most importantly, it provided an analytical procedure to estimate the distribution of ultimate investors to better reflect the locations of the investors who have made investments into substantive businesses in that host economy.

On the last point, approximately at the same time as Damgaard et al. (2019), an UNCTAD study by Casella (2019) proposed a way to derive bilateral FDI stocks by ultimate investors based on Markov chain results, relying on a completely different analytical approach. Damgaard et al. (2019) and Casella (2019) both have the merit of addressing one of the most critical challenges of FDI statistics—the gap between immediate and ultimate investors—marking a significant step towards a "re-conciliation" between FDI and measures of international MNE activity. The issue of ultimate investors in FDI statistics will be extensively discussed in

[5] There is no strict definition of offshore financial centers (OFCs), although there is general agreement on their features. IMF (2020) proposes an operational definition that "an OFC is a center where the bulk of financial sector activity is offshore on both sides of the balance sheet, (that is the counterparties of the majority of financial institutions liabilities and assets are non-residents), where the transactions are initiated elsewhere, and where the majority of the institutions involved are controlled by non-residents. Thus, OFCs are usually referred to as: Jurisdictions that have relatively large numbers of financial institutions engaged primarily in business with non-residents; Financial systems with external assets and liabilities out of proportion to domestic financial intermediation designed to finance domestic economies; and more popularly, centers which provide some or all of the following services: low or zero taxation; moderate or light financial regulation; banking secrecy and anonymity." In the corporate context, financial services offered by OFCs can generate a large amount of inward and outward FDI. Hence, these jurisdictions have also been recently referred to as investment hubs.

section II of this paper, including a description and comparison of the Damgaard et al. (2019) and UNCTAD Markov Chain methodologies.

The purpose of this paper is to revisit the most recent critiques of the use of FDI data as a proxy for multinational production and to outline possible counterarguments, mitigating factors, and recent advancements in the compilation of international FDI statistics. We consider such a balanced approach important due to an increasingly dominant narrative around "phantom FDI" that has lacked nuance in media coverage.[6] Researchers often revert to FDI statistics due to their broad geographic and time coverage compared to other data on multinational production, especially for developing countries (see for example Demir and Duan, 2018; and Harms and Meon, 2018).[7] It is, hence, useful to re-assess what FDI data can (and cannot) provide. We focus on FDI stocks (also called positions), as opposed to FDI flows, since stocks reflect the scale of multinational presence in an economy.

Our paper is organized as follows: Sections I through III elaborate on the three main critiques directed at FDI statistics as a proxy for multinational production (as summarized in Figure 1). They start from the most contentious issue of "phantom FDI" and its impacts on aggregate and on bilateral FDI statistics (Section I and II, respectively). Section III broadens the perspective and questions the fundamental assumption of the productive nature of FDI financing, including the problem of local financing of MNEs' foreign affiliate operations. Section IV takes stock of the main initiatives taking place at the level of the international statistical community to address the issues presented in Sections I to III. A concluding Section V then follows, with a practical proposal for (re-)conciliation between FDI statistics and multinational production.

[6] The paper by Damgaard et al. (2019) greatly increased public awareness of these issues: see "Phantom investment calls for an exorcism" (Financial Times, September 2019); "Phantom FDI records huge growth" (fDi Intelligence, December 2019) for examples of media coverage.

[7] Specifically, for developing countries, alternative survey-based statistics, such as Foreign Affiliate statistics (FATS), are not available apart from exceptional cases (e.g., Thailand, Malaysia, Zambia, India; selected years). Firm-level data (e.g., from ORBIS) also has severe problems of coverage and availability of financial and operational information, especially for foreign affiliates in Africa and Latin America (see for example the discussion in Cobham and Loretz, 2014 and Tørsløv et al., 2018). Tørsløv et al. (2018) show that only 17 percent of MNEs' consolidated profits as reported by ORBIS are reflected at the subsidiary level. Project-level data on announced greenfield projects and cross-border M&As may be a more feasible option. For example, Amighini et al. (2017) employ greenfield data to analyze the relationship between FDI and capital formation in developing countries. However, these data also have structural weaknesses that significantly limit their application. Data on FDI greenfield projects and cross-border M&As are from different sources and have different scopes, and therefore cannot be compared and/or combined. This makes their use challenging when the objective is to provide a comprehensive picture of multinational production. Data on greenfield projects in particular refer to announced rather than actually implemented projects; values are often estimated based on benchmarks; and coverage in developing countries can be very poor.

Figure 1. Main Critiques of the Use of FDI Data to Measure Multinational Production and Recent Developments and Findings

1. *Real and phantom FDI*	**Recent developments and findings**
Phantom FDI through OFCs are driven by financial/tax motives, weakening the relationship between FDI and international production	• Phantom FDI through OFCs can be excluded from FDI data and analysis either directly (for those countries that separately release cross-border statistics of special purpose entities) or indirectly, via estimation techniques
2. *Direct and ultimate investors*	
OFCs act as middlemen between investors' country of origin and final destination, making ultimate-investor countries invisible in bilateral FDI statistics	• Standard FDI reporting is being expanded to include statistics based on ultimate investors; alternatively, analytical techniques have been developed to estimate bilateral FDI by location of the ultimate investor
3. *Source and use of funds*	
FDI is a specific source of funds and does not necessarily reflect the scale of multinationals' productive assets (use of funds); it does not capture local sources of financing of multinational operations	• More systematic, not anecdotal, analysis of the relationship between FDI statistics and indicators of MNEs foreign operations indicates a strong link, with significant divergence confined to OFC jurisdictions

I. How to Unmask "Phantom FDI"?

Critique 1: "Phantom FDI" through offshore financial centers is driven by financial and tax motives, weakening the relationship between FDI and multinational production.

Most recent criticism of the use of FDI statistics to measure multinational production has focused on the outsized role of offshore financial centers (OFCs), also known as investment hubs. OFCs mainly act as intermediate jurisdictions between the investors' economy of origin and the final destination of FDI, generating "conduit" or "pass-through" FDI (Damgaard et al, 2019; Borga and Caliandro, 2018; Casella, 2019). They may also lead to the "parking" of FDI in certain tax-avoiding assets (see Tørsløv, Wier, and Zucman, 2018) or may be used to raise financing[8] (see Coppola et al., 2021; Blanchard and Acalin, 2016; Biswas et al., 2022).

The presence of OFCs inflates FDI statistics and, in the most common case of conduit structures, it obscures the ultimate investors of real FDI. "Phantom FDI" is an expression introduced by Damgaard et al. (2019) that became quite popular in the media to label these OFC-related investments, where "phantom" indicates (a part of) investment that plays no clear productive role in the host economies. Bolwijn et al. (2018) estimated that

[8] This is the case for example of the Variable Interest Entities used by Chinese firms described by Coppola et al. (2021), where portfolio financing raised in offshore jurisdictions is channeled back to China in the form of FDI.

between 30 and 40 percent of total FDI stock is routed through investment hubs (see also Table 1).[9] This share increased significantly since the beginning of the 2000s[10] but has gradually declined since 2017, likely in response to the tax changes in the 2017 U.S. Tax Cuts and Jobs Act and implemented under the OECD/G20 Base Erosion and Profit Shifting Initiative.

Lewellen and Robinson (2013) explored reasons for the complicated ownership structure of U.S. MNEs and found that, in addition to tax planning, MNEs also use OFCs to protect parent companies against claims on their affiliates, to protect their investments against political risks, and to take advantage of investor protection regimes offered by some countries.

Figure 2 illustrates how phantom FDI generates significant double-counting in FDI statistics and hides the ultimate-investor country. The figure displays a simplified but common situation with three jurisdictions: an investor economy (A), a conduit economy (B) and an economy of final destination (C). Conduit investment through B is made by means of a SPE located in B. SPEs are corporate structures purposely conceived to shield and channel capital financing, with no or extremely limited real business activity.[11] The role of the SPE in B is, thus, to channel FDI received from A to the final destination C to finance real productive capacity in C. It is assumed that economy B not only receives conduit investment but also some real investment. This is the case for some of the largest OFCs, including, for example, the Netherlands and Switzerland.[12]

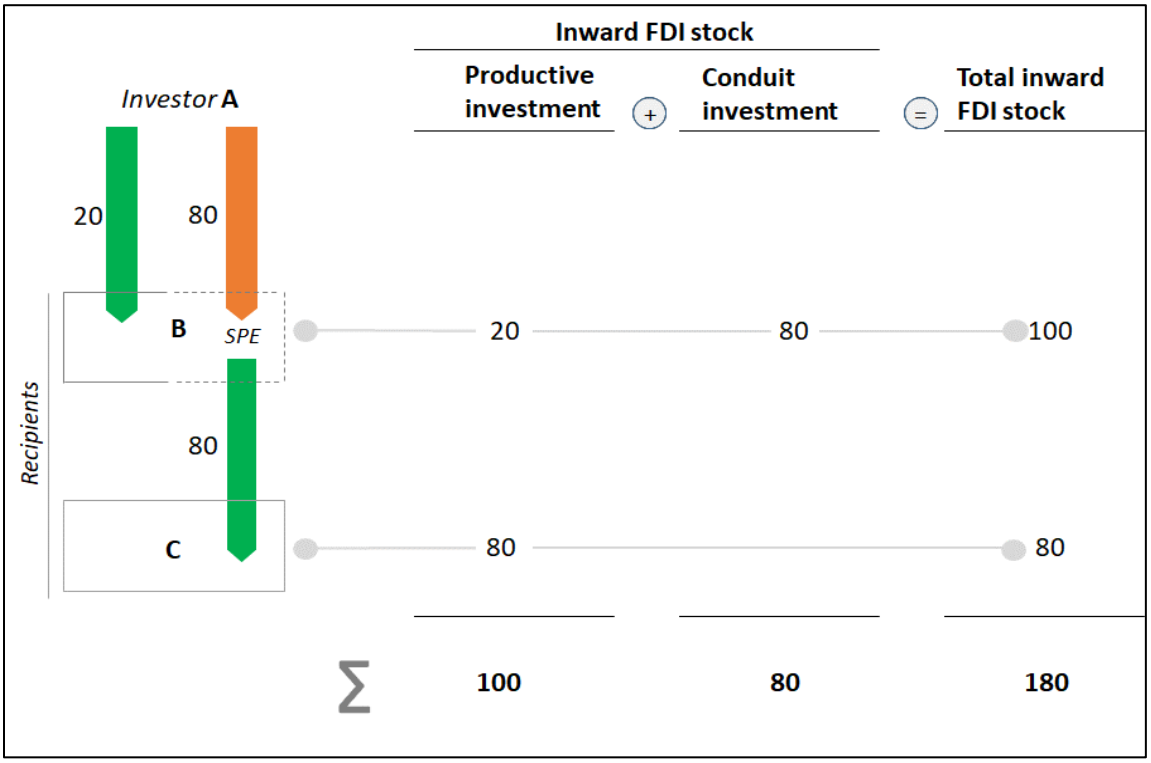
[9] This order of magnitude is also confirmed by other studies using alternative methodologies, such as Haberly and Wojcik (2015), Damgaard et al (2019) and Turban et al. (2020).

[10] Using FDI flows to better capture historical trends, UNCTAD (2015) estimates that the share of conduit FDI has increased from 20 percent to almost 30 percent in just ten years, between the beginning and the end of the first decade of the 2000s (Figure V.12).

[11] According to the definition from the IMF-led Task Force on Special Purpose Entities “An SPE resident in an economy, is a formally registered and/or incorporated legal entity recognized as an institutional unit, with no or little employment up to maximum of five employees, no or little physical presence, and no or little physical production in the host economy. SPEs are directly or indirectly controlled by nonresidents. SPEs are established to obtain specific advantages provided by the host jurisdiction with an objective to (i) grant its owner(s) access to capital markets or sophisticated financial services; and/or (ii) isolate owner(s) from financial risks; and/or (iii) reduce regulatory and tax burden; and/or (iv) safeguard confidentiality of their transactions and owner(s). SPEs transact almost entirely with nonresidents and a large part of their financial balance sheet typically consists of cross-border claims and liabilities.”

[12] UNCTAD (2015) and the related papers Bolwijn et al. (2018) and Casella (2019) make a distinction within the group of investment hubs between SPE-countries and other OFCs. The definition of SPE-country applies to countries with substantial real economic activity that also act as financial centers for MNEs owing to a favorable tax and investment regime, typically granted through the option to operate by means of SPEs. Other OFCs are instead small economies that have relatively large numbers of financial institutions engaged primarily in business with non-residents and whose external assets and liabilities are out of proportion to the size of their domestic economies. According to UNCTAD estimates, around two thirds of conduit FDI is channeled through SPE-countries, the remaining third through other OFCs (UNCTAD, 2015; Figure V.10).

Figure 2. An Illustrative Scheme of Conduit FDI



Conduit FDI through OFCs does not add value to international production in the traditional "brick and mortar" sense and generates substantial double-counting in FDI statistics. In Figure 2, investment from economy A to economy B in orange and from economy B to economy C in green are double-counted. In particular, while investment from B to C adds to the productive capacity of country C, investment from A to B does not do the same for B. For FDI to serve as a good proxy for multinational production, this investment from A to B (equal to 80 in the figure) should be removed from the inward stock in B and, accordingly, from aggregate regional and global figures.

While figure 2 focuses on a specific investment triangulation for illustrative purposes, any economy can simultaneously be the investor (A), the recipient (C) and (to some extent) also the conduit (B), although specific regulatory and institutional factors make certain jurisdictions more attractive to serve as conduits.[13]

If the goal is to use FDI to analyze trends and patterns of multinational production at the *aggregate* (national, regional, or global) level, the analytical challenge consists of identifying and excluding FDI channeled through OFCs from FDI stock data and analysis. Fortunately, this is possible to a large extent.

[13] Such factors include providing access to capital markets or sophisticated financial services, reducing regulatory and tax burdens, isolating the ultimate owner from financial risk, and ensuring confidentiality of ownership and transactions (IMF, 2018).

A first approach is to rely on Balance of Payments (BoP) reported data on investment to and from SPEs.[14] While not all conduit investments involve SPEs (Borga and Caliandro, 2019), most do.[15] Conversely, almost all investments to and from SPEs are conduit. For simplicity, in this study, we will also indicate phantom or conduit investment simply as SPE or SPE-investment.

International organizations have long acknowledged the distinctive nature of SPEs but adopted different approaches to their reporting. The IMF in its Coordinated Direct Investment Survey (CDIS) includes SPEs in the reporting of bilateral stocks.[16] UNCTAD directly removes SPEs from aggregate stock (and flow) figures whenever reported by the countries to get a more realistic picture of the status and dynamics of multinational production.[17] The OECD and Eurostat provide separate statistics for SPEs, leaving the analyst the option to include SPEs or analyze them separately.[18]

For those countries that do not report SPEs, it is possible to rely on alternative analytical methods to estimate their size. These methods include UNCTAD's *implied investment method* (Bolwijn et al., 2018; Casella, 2019) and IMF's method to estimate *real (and phantom) FDI* (Damgaard et al, 2019).[19] Both methodologies build on the statistical correlation between gross domestic product (GDP) and FDI stock or, in other words, a relationship between the size of an economy and its (inward and outward) foreign investment. This straightforward relationship is broken for jurisdictions with a large share of conduit FDI.

More specifically, UNCTAD's approach relies on a direct linear relationship between inward (or outward) log FDI stock and log GDP. Countries displaying disproportionate amounts of FDI relative to their size are identified as outliers, and the oversized component is then attributed to conduit structures. The approach of Damgaard et al. (2019)—henceforth "DEJ"— makes a more direct extrapolation from reported information on SPEs. It estimates the relationship between the share of non-SPE to total FDI and the ratio between total FDI and GDP

[14] This paper focuses on adjustments to the macroeconomic statistics because these are available to data users. There are methods that FDI compilers can use to adjust the micro-level data for conduit FDI, but these are outside of the scope of this paper.

[15] The amount of conduit investments through non-SPEs may be increasing as a result of growth in so-called "near-SPEs" in response to the OECD/G20 Base Erosion and Profit Shifting (BEPS) initiative to address tax avoidance strategies that exploit tax gaps and mismatches to artificially shift profits to low- or no-tax locations with no or little economic activity. "Near-SPEs" serve the same functions as SPEs but their economic presence (e.g., employment) is too substantial to meet the definition of an SPE. Examples of economies likely to have a significant presence of near-SPEs are Switzerland and Ireland (see also discussion in Damgaard et al, 2019, page 21). However, there is no common definition of near-SPEs that can be used to collect data. It should also be noted that conduit investments through SPEs are those that would not be associated with production in the host economy while other entities that may be involved in conduit FDI would also be invovled in production..

[16] From 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."

[17] Reported SPEs are the main reason of the discrepancies between IMF and UNCTAD statistics on FDI positions. For 2016, the amount of reported inward FDI stock into SPEs is some 7 trillion US$ out of 31 trillion US$ of total inward FDI stock reported by IMF-CDIS.

[18] The IMF launched its first data collection on cross-border transactions and positions of resident SPEs in 2021. Twenty-six economies, including several OFCs, participated in the first data collection, and the IMF is offering technical assistance to assist more economies to report in the future. The database can be accessed here: Balance of Payments and International Investment Position - BOP/IIP Home - IMF Data.

[19] More recently, in the context of the Economic Impact Assessment (EIA) of the OECD/G20-BEPS initiative, the OECD has also proposed a methodology to measure conduit investment based on extrapolation of conduit probabilities from Balance of Payments statistics on ultimate investors (Turban et al., 2020).

("FDI intensity") based on economies reporting non-zero SPEs (both variables are log transformed). Then, it extrapolates to other economies, assigning to each economy a share of "real" FDI and a share of phantom FDI, consistent with the capacity of the economy to absorb real FDI, as established within the group of reporting economies. Both approaches share the same logic: there is a level of genuine FDI the economy can absorb and any amount exceeding that level is not "real" (i.e., it is phantom).[20]

Table 1 compares the results of the UNCTAD and the DEJ methodologies—between each other and relative to reported SPEs—at the global level and for the main countries hosting SPEs. Table 1.a shows that the aggregate results across the methodologies point to a consensus estimate on the overall size of SPEs. At the global level, the UNCTAD and DEJ methodologies agree on an estimated share of SPEs between 36 and 37 percent of total FDI.[21] Restricting the comparison to economies reporting SPEs enables cross-validation of the estimates against the actual size of the SPEs; at 46 percent and 44 percent of the corresponding FDI stock respectively, both the UNCTAD and DEJ approaches closely proxy the size of reported SPEs (43 percent).

For the economies hosting the largest amount of SPE investment, discrepancies between the UNCTAD and DEJ approaches at the economy-level are small (Table 1.b). Considering only the subset of the five economies reporting the largest amount of investment into SPEs (Netherlands, Luxembourg, Hong Kong SAR, Switzerland, and the United Kingdom), the aggregate share of SPEs estimated by DEJ (69 percent) approximates the actual (reported) share (70 percent) more closely than UNCTAD (77 percent). This is not surprising as DEJ's methodology implies by construction a close correspondence between estimated values and reported values for the subset of economies reporting SPEs (i.e., it provides an "in-sample prediction"). On the other side, DEJ's extrapolation from SPE-reporting economies to the entire "out-of-sample" universe of recipient economies assumes a similar relationship between economies reporting SPEs and non-reporters, which may not be the case. In particular, there may be non-negligible differences between estimated and reported SPEs for smaller economies hosting SPEs because larger economies dominate the reporting. When the analytical focus is at the individual economy level, comparative analysis between different approaches and economy-specific calibration are recommended to identify the most realistic estimate given the specific circumstances of that economy.

[20] While the intuition behind the UNCTAD and DEJ approaches is the same, the two methods have some distinctive features. The IMF approach is more direct because it empirically captures the link between the amount of investment in SPEs and the size of investment relative to GDP. UNCTAD instead relies on a more general empirical relationship between total investment and GDP of the host economy and derives the investment in SPEs by difference. The IMF approach, however, applies a relationship based on a small sample of developed and emerging economies to all countries in the world—the estimation by Damgaard et al. (2019) relies on 16 countries reporting non-zero SPEs in 2017. A limited sample size also makes the analysis prone to the effects of extreme observations, such as the inclusion of very large financial centers like the Netherlands and Luxembourg in the sample.

[21] The estimate of SPEs resulting from our replication of the IMF methodology is fully in line with the results reported in Figure 6 of Damgaard et al. (2019) for 2016, despite the fact that the authors use reported SPEs when available (with values, however, very close to the estimated ones). The estimate by the OECD (Turban et al., 2020) of pass-through investment in 2016 of 32 percent is substantially lower but still shows a relevant role of conduit FDI. One possible explanation is that OECD extrapolation of pass-through shares based on the set of (developed) economies reporting ultimate investors' statistics may underestimate the conduit size of jurisdictions that act as gateways to emerging market and developing economies, such as Hong Kong SAR and Singapore for Asian countries and Mauritius for African and Southeast Asian economies.

Table 1. The Size of SPEs: Comparison Between Estimated and Reported and Between UNCTAD and DEJ Estimates, 2016

a. Global estimates of SPEs

		UNCTAD		DEJ		OFFICIAL STATISTICS	
	Total FDI stock, Billion $	Estimated SPEs, Billion $	Share SPEs, Per Cent	Estimated SPEs, Billion $	Share SPEs, Per Cent	Reported SPEs, Billion $	Share SPEs, Per Cent
Global	34,183	12,332	36%	12,543	37%		
Countries reporting SPEs	20,453	9,382	46%	8,917	44%	8,819	43%

b. Estimates of SPEs by Country, Top 10 Recipient Countries by Size of Inward FDI Stock into SPEs (as Estimated Using the UNCTAD Methodology)

		UNCTAD		DEJ		OFFICIAL STATISTICS	
Countries	Total FDI stock, Billion $	Estimated SPEs, Billion $	Share SPEs, Per Cent	Estimated SPEs, Billion $	Share SPEs, Per Cent	Reported SPEs, Billion $	Share SPEs, Per Cent
Luxembourg	3,775	3,626	96%	3,480	92%	3,505	93%
Netherlands	4,185	3,588	86%	3,044	73%	3,269	78%
Hong Kong, China	1,419	1,048	74%	989	70%	1,097	77%
British Virgin Islands	796	778	98%	779	98%		
Switzerland	1,280	727	57%	689	54%	249	19%
Singapore	1,001	647	65%	654	65%		
Ireland	841	487	58%	523	62%		
Cayman Islands	441	404	92%	415	94%		
United Kingdom	1,476	297	20%	217	15%	415	28%
Mauritius	283	218	77%	247	87%		
Total top 10	11,722	8,194	70%	7,557	64%		
Countries reporting SPEs	12,134	9,286	77%	8,417	69%	8,536	70%

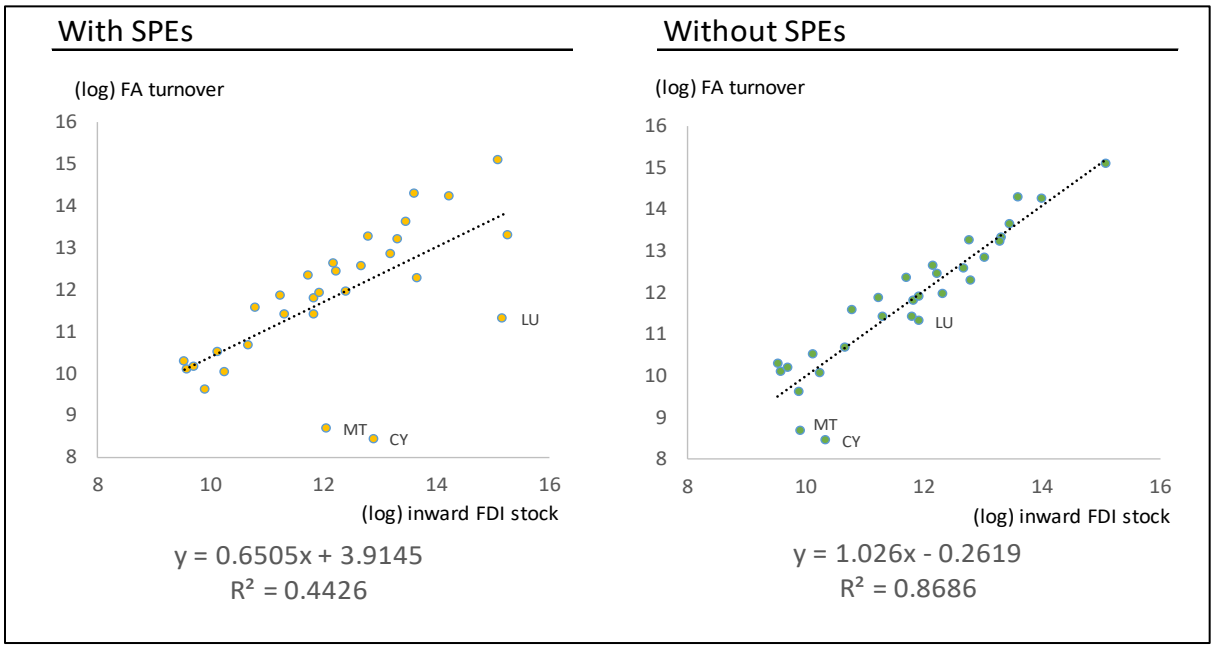
Note: Based on 2016 inward FDI stock data from OECD direct investment statistics for OECD countries; for non-OECD countries the primary source was IMF Coordinated Direct Investment Survey (CDIS) and UNCTAD FDI Database for countries not covered by IMF CDIS. Extraction was done in December 2021. For both UNCTAD and DEJ approaches, SPEs are estimated—including for countries already reporting SPEs—to allow cross-validation of the results of the analytical methodology with the reported data. The replication of the results for the DEJ approach was done by applying the coefficients reported in Table 2 column 1 of Damgaard et al. (2019). Notice that the Netherlands has significantly revised 2016 data for SPEs after 2019. For the Netherlands, due to significant (backward) revision of 2016 SPE data, UNCTAD estimates (columns 2 and 3) and the benchmark (columns 6 and 7) are still based on 2019 reporting for consistency and comparability with DEJ.

Equipped with complementary statistics on SPEs for a selection of countries and a toolkit of analytical solutions for estimation, analysts that wish to separate investment through SPEs from other FDI in a sample can choose either a fully estimated approach (Turban et al., 2020) or a hybrid approach (Bolwijn et al., 2018; Damgaard et al., 2019), combining data and estimation. The first option prioritizes comparability between SPE figures, extending estimation to all economies (including those reporting SPEs); the second option prioritizes empirics, using SPE data when they are available and confining estimation only to economies not reporting data on SPEs.

While investment through SPEs is not the only reason behind the departure of FDI statistics from indicators of multinational production (see Section III), it is the most relevant. Figure 3 illustrates the relationship between inward FDI stock and inward sales of foreign affiliates—defined as the turnover of foreign affiliates of

multinational enterprises in the reporting economy[22]—for those OECD countries for which the relevant FATS statistics are available. Notably, the removal of FDI stock into SPEs from total inward FDI stock leads to an increase of the correlation coefficient (R^2) between inward FDI stock and foreign affiliates' turnover from 0.44 to 0.87. Also note that there is a near-unity elasticity between foreign affiliates' turnover and FDI stock without SPEs. Accordingly, an x percent increase in the FDI stock is associated with an equivalent x percent increase in sales.

Figure 3. Relationship Between FDI Inward Stock and Inward Sales of Foreign Affiliates, OECD Countries, 2016, US$ millions



Note: Sample is based on 26 OECD countries reporting inward FDI stock (x-axis) and inward statistics on foreign affiliates' turnover for 2016 (extraction: December 2021). FDI statistics are from OECD direct investment statistics. Foreign affiliate statistics are from the OECD AMNE Database. The SPE component is estimated applying UNCTAD's implied investment method to economies in the sample (for economies also in the list of Table 1.b, estimated shares of SPEs are as reported in column 3).

In conclusion, if the objective is to reconcile FDI data with indicators of multinational production at the global, regional and even national level, available methods provide reliable and ready-to-use estimates of FDI to and from SPEs. FDI to OFCs and tax minimization of MNEs deserve serious attention but citing "phantom FDI" to dismiss the idea of using BoP-based FDI statistics as a measure for multinational production altogether is equivalent to "throwing out the baby with the bathwater". The water may be blurry, but it contains relevant and often unique information on cross-border activities of MNEs.

[22] "Turnover" of foreign affiliates is one of the most used indicators of multinational production among those included in FATS. It is usually preferred to other indicators such as "assets", "employees", or "value added" due to higher coverage. Based on the data reported by the OECD AMNE database, it is almost perfectly correlated with "production value" across reporting countries.

II. Bilateral FDI Statistics: How Much of a Puzzle?

Critique 2: Offshore financial centers act as middlemen between investors' country of origin and final destination, making ultimate investor countries invisible in bilateral FDI statistics.

The separate treatment of SPEs reduces but does not eliminate the problem of "phantom FDI". It helps when the analytical scope involves the analysis of global or regional FDI statistics or the analysis of an economy's *aggregate* FDI positions. However, in bilateral settings, where all economies are tightly interconnected, the simple removal of phantom FDI on one side of the investment link (inward or outward) is insufficient. In the example of Figure 2, after removing conduit investment from the inward FDI stock of economy B and from the totals, we are still left with the problem of how to attribute the real origin of productive investment to economy C. Standard bilateral FDI statistics would record a direct investment from B to C equal to 80, but, in reality, the investment originally comes from economy A, the ultimate investor.

Usually, bilateral FDI statistics show immediate direct investors and recipients.[23] However, for around 40 percent of foreign affiliates, the economy of the immediate direct investor does not coincide with the economy of the ultimate investor (UNCTAD, 2016; Alabrese and Casella, 2019). This leads to a distribution of bilateral FDI by immediate investing economies that is significantly different from the distribution by ultimate investing countries (UIEs) and from the distribution of (inward) bilateral foreign affiliate statistics (FATS)—also allocated according to the UIE.

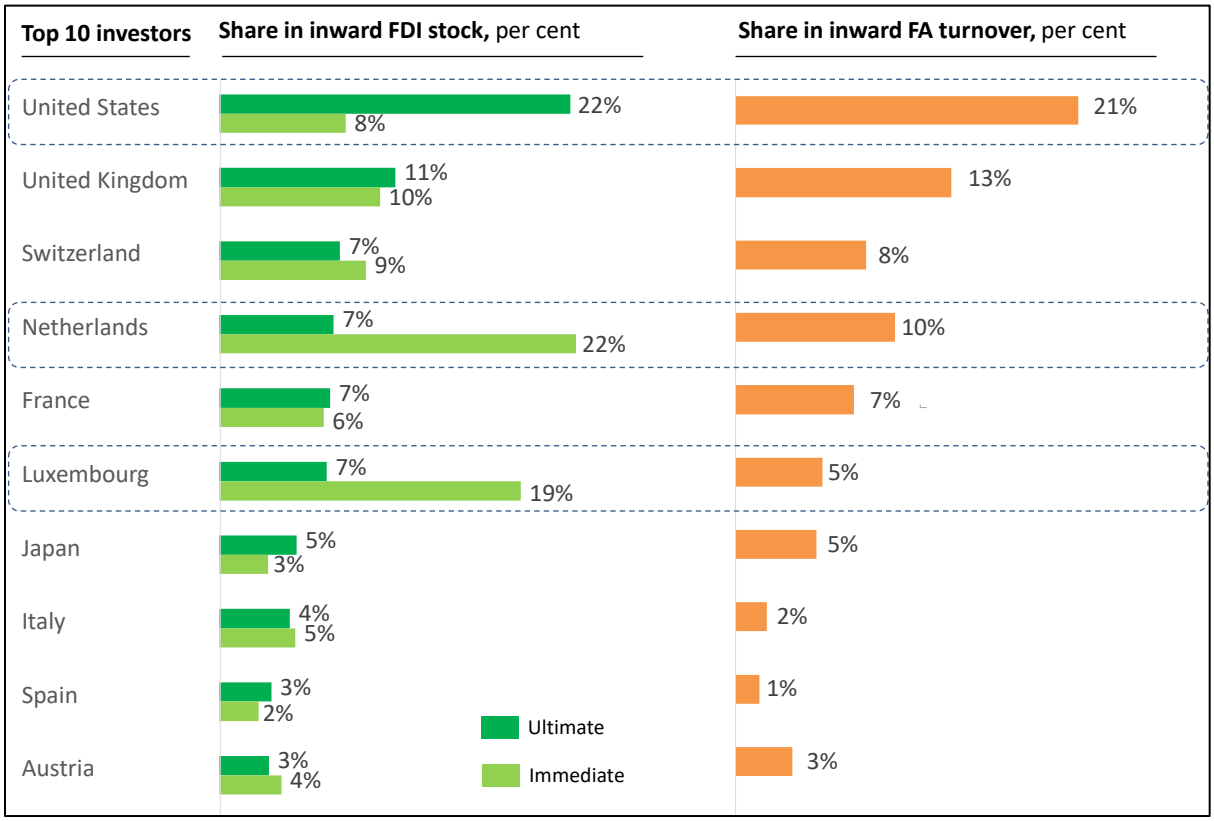
In bilateral distributions of FDI stocks, there tend to be a few jurisdictions whose weight does not reflect their "real" level of ownership and control of global production, but rather their role in conduit FDI. Conversely, some large economies are underweighted in FDI statistics as they are "shielded behind" conduit jurisdictions. For example, in 2016, the combined weight of two major conduit jurisdictions, the Netherlands and Luxembourg, as immediate direct investors to Germany was 41 percent, compared to 8 percent for the United States. However, according to FATS statistics, the United States account for around 21 percent of sales of foreign affiliates in Germany, whereas Netherlands and Luxembourg combined accounted for 15 percent (Figure 4, dotted lines). The distribution of bilateral FDI by ultimate investors (available for Germany and for a limited set of other developed economies) is very similar to the distribution of FATS statistics (United States at 22 percent versus Luxembourg and the Netherlands together at 14 percent).

Challenges in the economic application and interpretation of bilateral FDI data imply that it is important that economies intensify their efforts to supplement the standard FDI reporting by immediate direct investor with statistics based on UIEs. However, the pace at which developing countries are disseminating statistics by UIE has lagged behind developed countries.[24] Against this backdrop, international organizations are stepping up efforts to analytically determine distributions of ultimate investors (Casella, 2019; IMF Damgaard et al, 2019).

[23] Such bilateral FDI statistics include UNCTAD, OECD, Eurostat, and CDIS; OECD FDI Statistics database includes inward FDI positions by both immediate and ultimate investing economy for 18 members.

[24] As of December 2021, 18 countries report complementary inward FDI stock by UIE for reference year 2016. As part of the update of *BPM6,* the IMF and OECD conducted a survey of FDI compilers that found that 34 economies are able to classify their inward FDI positions by UIE, raising expectations that these statistics will become available for more countries in the future. In addition, Eurostat will begin a voluntary data collection of inward FDI positions by UIE from its Member States in the future.

Figure 4. Germany's Inward FDI Stock and FATS Turnover by Partner (Investor) Country, Share in Total, Top Ten Largest Ultimate Investors in Germany, 2016



Note: Underlying data are from the OECD Direct Investment Statistics (extraction: December 2021), immediate direct investors and ultimate investors (left-hand side). Bilateral statistics on the turnover of foreign affiliates operating in Germany from OECD AMNE database (right-hand side). The ranking of top largest ultimate investors excludes Germany itself (i.e., round-tripping, see footnote 36).

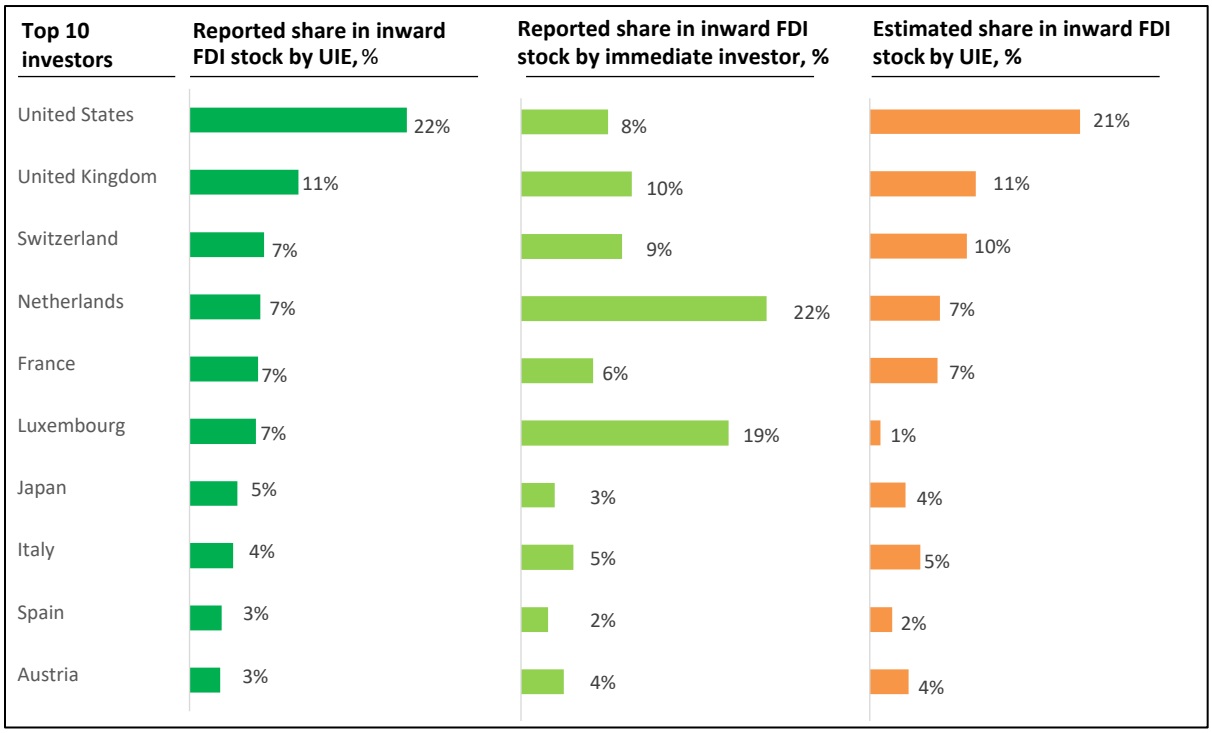
UNCTAD's probabilistic approach (Casella, 2019) assigns a transition rule to link recipient countries to ultimate investors based on the information provided by bilateral FDI statistics and estimates of conduit FDI (based on the implied investment method). Absorbing Markov chains make it possible to derive the distribution of ultimate investors for any recipient economy for which (inward) bilateral FDI stocks are available (more than 100 countries, corresponding to over 95 percent of the global FDI stock according to the CDIS). The OECD Economic Impact Assessment (Turban et al., 2020) employs a slightly modified version of the probabilistic method, where conduit FDI is estimated by extrapolation from the set of economies reporting ultimate investors rather than by the implied investment method.

The DEJ approach instead employs firm-level data to derive a *factor* to convert the distribution of immediate direct investors into a distribution of ultimate investors (Damgaard et al., 2019). Roughly speaking, the factor—

defined at the economy-pair (investor-recipient) level—is meant to capture how much a given counterpart is likely to behave as an ultimate investor relative to its size as an immediate direct investor.[25]

For illustration, Figure 5 shows the results of UNCTAD's methodology for one recipient economy (Germany) that reports statistics by ultimate investor. The distribution of ultimate investors to Germany estimated by the UNCTAD approach (column 3) proxies the reported distribution of ultimate investors (column 1) much better than does the distribution of bilateral FDI (column 2). The application of the probabilistic Markov chain approach re-establishes a realistic ranking between investors, not only aligned with reported data on ultimate investors but also consistent with the economic size of the economies involved.

Figure 5. Comparison Between Germany Reported Positions by Ultimate Investing Economy (UIE), Reported Positions by Immediate Direct Investor and Estimated Positions by UIE, Share in Total, Top Ten Largest UIEs in Germany, 2016



Note: Estimates of the distribution of ultimate investors (orange) from UNCTAD FDI database, based on Casella (2019). Underlying data are from the OECD direct investment statistics (extraction: December 2021), immediate direct investors and ultimate investors (green). The ranking of the largest ultimate investors excludes Germany itself (i.e., round-tripping, see footnote 36).

[25] Furthermore, for (non-FDI) security positions, Coppola et al. (2021) have estimated "reallocation matrices" based on an algorithm that matches subsidiaries to ultimate investors in mutual and exchange traded fund data. These matrices can be used to convert bilateral investment position data from a residency to a nationality (ultimate investor) basis. Future research may consider the application of similar techniques to FDI positions.

The relationship between the estimated positions for other economies with available statistics by ultimate counterparts is as strong as for Germany. Both Casella (2019) and Turban (2020) compare the distance (in "L1-norm") between the predicted and the actual distribution of ultimate investors for each economy reporting bilateral positions by UIE. Their computed distances are positive but substantially smaller than distances between the reported distribution of ultimate investors and that of immediate direct investors, confirming that the estimates approximate patterns of ultimate investors more closely than standard FDI statistics.[26]

These analytical methods address the main disparities between standard FDI statistics by immediate investor and distributions of ultimate investors due to the outsized role of OFCs in international investment. In a nutshell, as exemplified by the results in Figure 5, UNCTAD's probabilistic approach provides a systematic way to address the gap between direct and ultimate bilateral statistics generated by channeling FDI through OFCs. A prominent case in the figure concerns investment from the United States to European countries via Luxembourg and the Netherlands.[27] When the bilateral link involves non-OFC economies, standard bilateral FDI statistics instead identify ultimate investors relatively well.

Figure 6 compares the two sets of bilateral statistics—by immediate investors from OECD data and the UNCTAD ultimate investor data—for economies where data are fully available. Both data sets exhibit a high correlation coefficient of 83 percent, with considerable deviations only for bilateral links involving large OFCs on the one side and the United States on the other side.[28]

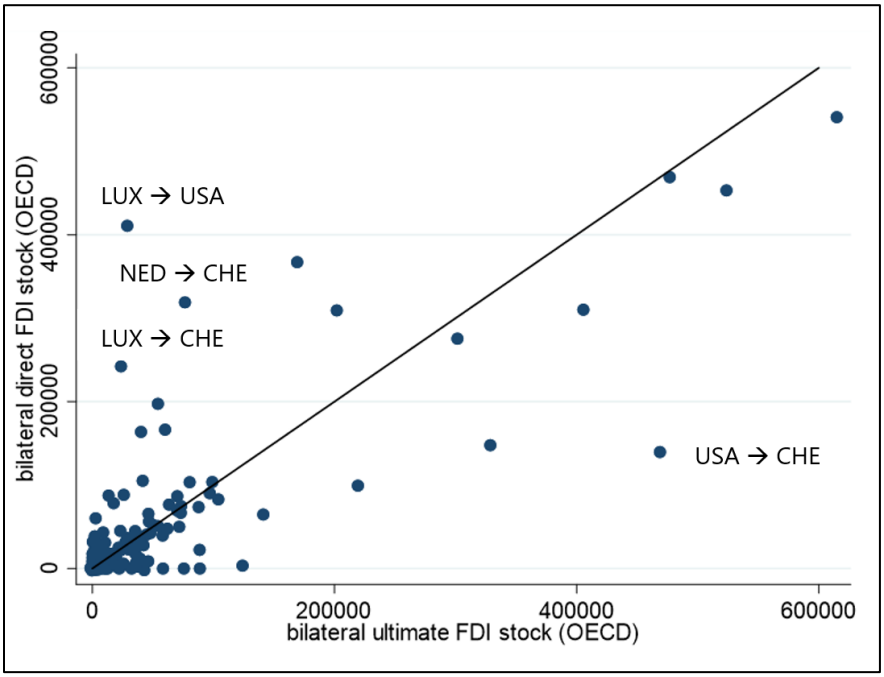
Finally, the differences in FDI stocks for some bilateral observations when measured according to the immediate and the ultimate investor principle raise the question of whether analysis of FDI determinants using standard FDI statistics have been misleading. Wacker (2020) addresses this question by estimating the parameters of a gravity model for FDI data on immediate and ultimate ownership in 2017, taken from OECD, IMF's CDIS, and UNCTAD. His results suggest rather modest differences. Qualitatively, estimates from all data sets are consistent with theory. Quantitatively, they reveal some differences, particularly when comparing the IMF's CDIS to the UNCTAD's ultimate ownership estimates, but he concludes that "it is hard to argue that results from using ultimate investor statistics differ from traditional direct investor statistics to a degree that completely turns around our economic understanding of the key drivers for bilateral FDI positions."

[26] Both Casella (2019) and Turban et al (2020) find considerable improvements using estimated ultimate investors rather than reported immediate investors. Casella (2019) finds that in eight out of twelve economies examined, the decline in distance from the actual distribution is over 40 percent; Turban et al. (2020) report a median decrease of 34 percent over 14 economies.

[27] See Casella, 2019 (page 133, figure 5) for results similar to Figure 5 for selected recipient countries other than Germany.

[28] The high correlation is not driven by particular observations: when limiting the sample to those (approximately 95% of) observations that are smaller than 10,000, the correlation coefficient is still 81%. When additionally deleting 0 observations (which account for up to 2/3 of bilateral data), the correlation coefficient is still 80%.

Figure 6. Relationship Between Immediate and Ultimate FDI Stocks in Bilateral Data



Note: Comparison of immediate vs. ultimate ownership in bilateral FDI observations in the OECD data from 2017 (*BMD4*). Observations on the upper left of the 45-degree line exhibit higher immediate bilateral FDI stocks than their ultimate ownership relation would suggest. Source: Wacker (2020).

Table 2 reproduces his results for the OECD data set, which contains actual FDI data for immediate and ultimate investors.[29] Three results are worth noting. First, when comparing columns (1) and (2) one does not observe qualitative differences in FDI determinants between the data for immediate and ultimate ownership—the literature about FDI determinants, which so far mostly relied on immediate ownership, need not be re-written. Second, for the parameters where we observe statistically different estimates (investor GDP and distance), those differences are in line with expectations. The coefficient for investor GDP doubles for ultimate vs. immediate investors, while the coefficient for distance halves. This reflects that many OFCs that appear as immediate investors are in comparatively small economies and serve as regional investment hubs, rather than global ones.[30] This illustrates the usefulness of ongoing efforts to improve statistical coverage of ultimate vs. direct ownership. And third, the parameter estimate for the recipient economies' GDP is near unity in either case, consistent with the prediction of the horizontal gravity model that Kleinert and Toubal (2010) derive for foreign affiliates' sales. This confirms the view that by and large, FDI statistics are a decent proxy to measure multinational production.

[29] We omit the sum of GDPs as an explanatory variable to facilitate direct comparison of the investing and recipient countries' GDPs. In the presence of the sum of GDPs, those individual GDP parameters cannot meaningfully be compared across data sets, as the sum of GDPs may absorb part of an individual GDP effect.

[30] The halving coefficient for distance suggests that FDI is less sensitive to distance when measured on the ultimate investor principle. This suggests that transport costs (for vertical, resource-seeking FDI) or setup costs (for market-seeking horizontal FDI) are less important, or less correlated with geographical distance, for ultimate FDI than for immediate FDI (which comprises FDI channeled through OFCs).

Table 2. Gravity Estimation for Immediate and Ultimate FDI Determinants

	(1)	(2)	(3)
VARIABLES	OECD immediate	OECD ultimate	p-value for equality
ln(GDP investor)	0.384***	0.668***	0.009***
	(0.100)	(0.109)	
ln(GDP recipient)	1.047***	0.900***	0.408
	(0.159)	(0.178)	
ln(distance)	-0.624***	-0.334***	0.030**
	(0.126)	(0.134)	
Relative skill endowment	2.709***	2.462***	0.659
	(0.613)	(0.560)	
Constant	-25.739***	-31.740***	0.231
	(5.187)	(5.008)	
Observations	1,324	1,324	
R-squared	0.169	0.192	

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Source: Re-estimation of Wacker (2020) using a PPML estimator and data from OECD, dropping the sum of GDPs. GDP is measured using the rgdpna series from PWT9.0, (population-weighted) distance is taken from the CEPII gravity data set and relative skill endowment captures skill intensity of the source country relative to the host, where "skilled" reflects completed secondary and tertiary education, see Schneider and Wacker (2022) for details.

In conclusion, standard bilateral FDI statistics provide an important map of financial relationships between economies, exposing where financial claims and liabilities are created and where they are held. However, when the focus is on multinational production, the ultimate investor view reveals the relevant underlying patterns: where the investment decision was taken and who bears the risks and reaps the benefits of the investment. Recent developments in FDI statistics, such as reporting stocks by ultimate investors, and statistical methods make it increasingly possible to attribute bilateral FDI data to ultimate investors. Where this is not possible, current evidence does not suggest that immediate FDI data paint a systematically distorted picture of ultimate FDI motives in the global economy. Moreover, researchers using bilateral FDI data with the aim of studying multinational production can either exclude country pairs that are most susceptible to distortion by tax optimization and round-tipping, or control for them (e.g., with specific pair fixed effects).

III. Beyond Phantom FDI: Source of Funds vs Use of Funds

Critique 3: FDI is a specific source of funds and does not capture local and non-affiliated sources of financing of multinational operations

Beyond the recent emphasis on phantom FDI, some critics argue that foreign direct investment as measured by International Investment Position (IIP) data represent a source of finance and not a use of funds. There is no guarantee that the funds are employed in productive investment to generate sales, employment, and value added. Even if the financing is used for such productive investment, it may not reflect all of the inputs used to generate that production. Consequently, there is a divergence between what FDI data show and the "real" economic trends in multinational production. The divergence between the source and use of funds is at the origin of two seemingly opposed—but indeed related—critiques of FDI data.

The first critique states that FDI follows peculiar taxation and investor considerations and does not necessarily lead to a commensurate investment in productive assets. This is in essence the issue discussed in the previous two sections. The first critique, hence, states that FDI *overestimates* multinationals' assets in the host country, particularly in OFCs.

The second critique raises concerns that FDI underestimates the productive assets commanded by MNEs because they use other financing instruments (such as local financing in the host economy). For example, Lehmann et al. (2004) found that financing by U.S. parent companies (that is, FDI stocks in the host economies) represents no more than a third of total balance sheets of foreign affiliates and that the disparity between FDI stock and assets commanded by the affiliates is larger for high-income economies. Similarly, Leino and Ali-Yrkkö (2014) estimate that other means of finance than FDI account for about half of all financing of foreign-owned affiliates in Finland. The second critique, hence, states that FDI *underestimates* multinationals' assets in the host economy. The case of the Variable Interest Entity structures used by Chinese firms to access foreign capital—described in detail by Coppola et al. (2021)—is also an example of foreign financing through portfolio investment rather than FDI. In this case, however, FDI statistics do not underestimate the overall financing; instead, a part of what is recorded as FDI is rather disguised foreign portfolio investment.

These papers shed light on the financing behavior of MNEs. To what extent they create concerns about the use of FDI as a measure of multinational production depends on the context. In most applications, researchers and policy analysts are concerned about (semi-)elasticities, such as the response of multinational production to host economies' income or the response of productivity to the presence of multinational production facilities. Such elasticities are not affected by the use of FDI vs. operational data (e.g., sales) if the ratio of FDI to overall capital is constant in a basic Cobb-Douglas multinational production function (with no factor bias of technology).[31]

To see to what extent this reasoning about the multinational production process applies to the real world, we relate FDI stock data to operational data of U.S. MNEs abroad. If there is no difference between FDI data and operational data for elasticities in empirical settings, those data should themselves reveal a unitary elasticity.

[31] More formally, one can consider that the output Y of a multinational's foreign affiliate is produced with a standard Cobb-Douglas production function, where foreign affiliate capital assets K are again a Cobb-Douglas product of FDI and local leveraging C:

$$Y = AL^{\alpha}[FDI^{\gamma}C^{(1-\gamma)}]^{(1-\alpha)}.$$

The US Bureau of Economic Analysis (BEA) provides data on FDI stock (at a historical cost basis) and on operational data such as assets, sales, and employees of US' multinationals' affiliates abroad for about 100 countries. Relating sales of those affiliates to the US outward FDI position in the respective economy for 2018 (the last year available) shows a strong positive correlation and suggests an elasticity close to 1 (0.94, with a robust standard error of 0.04), with an R squared of 86 percent (panel A of figure 7). In line with the reasoning that FDI should be a particularly good proxy for capital stock in a multinational production function (see Wacker, 2016), the correlation of the FDI stock with foreign affiliates' total assets is even stronger, with an estimated elasticity of 0.95 (robust standard error 0.03) and an R squared of 91% (panel B of figure 7).[32] Those results suggest that a considerable amount of variation in multinationals' operations across economies can be explained with FDI stocks, and the implied elasticities are in line with a simple multinational production function.

It is also instructive to look at significant deviations from the predictions implied by such a relationship. In the lower panel of Figure 7, we plot host economies with residuals ≥2.[33] This applies to 11 observations when using the affiliate sales data as a dependent variable (panel C). Out of those 11 economies, 6 appear on the IMF's list of OFCs (Antigua and Barbuda, Singapore, Luxembourg, Malta, St. Lucia, and Anguilla), and the UK Pacific Islands may not come as a surprise either. A similar result is obtained for the residuals of affiliate assets (panel D), although there are fewer sizeable deviations.

Further analysis by Fukui and Lakatos (2012) confirmed a positive and significant relationship between FDI and foreign affiliate sales with high explanatory power. The authors concluded that FDI statistics can be considered an appropriate measure of the aggregate business activity of foreign affiliates while, at the same time, they warn against potential biases that may arise in cross-country and cross-industry analysis.[34] Similar analysis and results were presented by Ramondo and Rodríguez-Clare (2013), where FDI data were employed to impute missing (bilateral) data of foreign affiliates sales, in an effort to build a comprehensive database of multinational production. Moreover, our reasoning is also consistent with findings in Beugelsdijk et al. (2010). They show that in economies with more advanced financial systems, FDI stocks tend to underestimate foreign affiliates' operations (sales, value added), which they indirectly attributed to the effect of non-affiliated financing: better financial systems lead to larger use of local financing and, consequently, comparatively higher operations (relative to the level of FDI).[35]

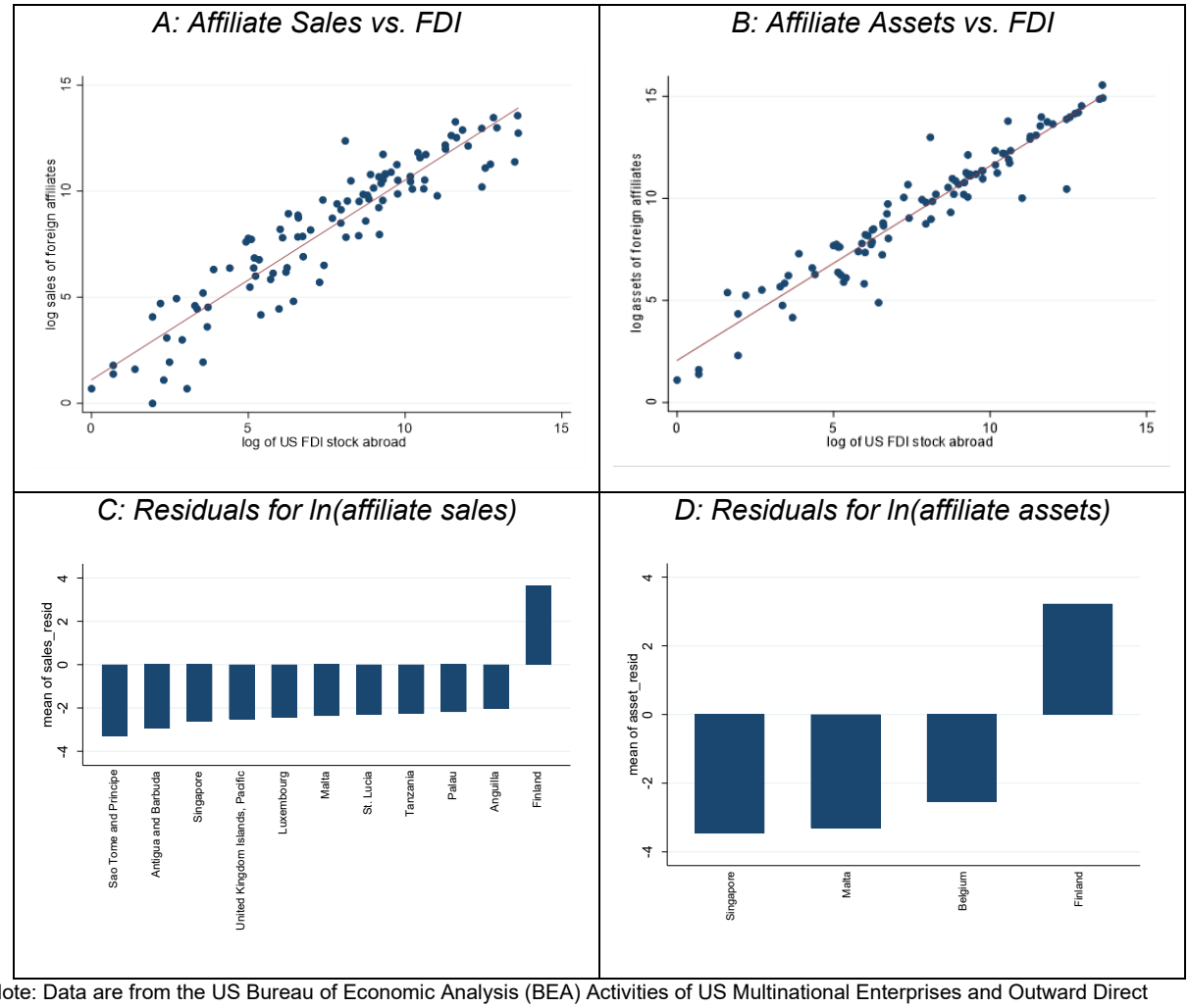
[32] While a correlation with the stock of physical and intangible capital (i.e., excluding financial assets) would be more meaningful, comprehensive data are lacking to make such a comparison. Despite the inclusion of financial assets, panel B of Figure 7 suggests a strong correlation between the source and use of funds.

[33] Given that data are in logs, this implies that actual data deviates by more than 200% from values predicted by the model.

[34] As suggested by the authors, bias across countries may be due to different levels of financial development, while across industries it could be related to differences in capital intensity.

[35] Financial development may impact the potential productive uses of (foreign) capital, hence the elasticity of substitution for (foreign) capital and the elasticity between multinationals' output and FDI. Moreover there can be other factors at play: it could be that countries with advanced financial systems tend to attract FDI in more service-oriented and/or less capital-intensive industries and this (rather than, or eventually in combination with, non-affiliated financing) explains high values of operational indicators. Again, the lack of a direct indicator of non-affiliated financing limits the possibility to rigorously measure its scale and assess its impact on the link between FDI and international production.

Figure 7. Relationship Between FDI Stock and Operational Data



Note: Data are from the US Bureau of Economic Analysis (BEA) Activities of US Multinational Enterprises and Outward Direct Investment Positions by Country databases for 2018. The lower panel depicts the largest deviations from the regression line that is depicted in red in the corresponding upper panel.

In conclusion, while FDI stocks are not appropriate for measuring the value of the overall assets that MNEs command in the host economy, the relationship between FDI stocks, assets, and key operational data of MNEs exhibits an elasticity near unity such that FDI stocks are appropriate for measuring multinational production in most empirical settings.

IV. Improving FDI Data: Recent Progress and Developments

The problems of FDI statistics have long been known by FDI statisticians who have taken steps to improve the analytical usefulness of FDI statistics. Since several of these improvements seem not to have reached a wider applied research audience, this section describes some of these innovations that have been adopted by several economies and reviews proposals that are currently under consideration as part of the update of the IMF's *Balance of Payments and International Investment Position Manual, sixth edition (BPM6)*.[36]

Several economies already disseminate FDI statistics that separately identify FDI to and from SPEs resident in their economies as a result of data requests by the OECD and Eurostat. In 2021, the IMF launched a data collection on the cross-border transactions and positions of resident SPEs that will increase the number of economies for which these data are available. In addition, the IMF will collect not only FDI statistics for SPEs but also portfolio investment and selected trade in services transactions, including financial services, payments for the use of intellectual property, and merchanting. This additional information will shed light on the types of activities that SPEs are carrying out in different economies.

Several economies already disseminate inward FDI positions by the ultimate investing economy. It is proposed that the update of *BPM6* include a recommendation that countries publish supplemental annual data of inward FDI statistics by ultimate investing economy as well as of outward FDI statistics looking through any directly held SPEs to the first operating unit; such a recommendation will also likely be included in the update of *BD4*. The latter will provide information on the geographic distribution of economies' outward investment that more closely aligns with data on the operations of their MNEs abroad. The recommendation also proposes that economies utilize the information on the ultimate investing economy to identify the amount of round-tripping[37] and funds passing through the economy. This information will provide much better measures of the genuine FDI into an economy as well as the amount that remains in the economy.

There are also recommendations under consideration that would enable economies to break down FDI flows by the purpose, or type, of FDI. There are four main types of operations that qualify as FDI: (1) the purchase or sale of existing equity in the form of M&As; (2) greenfield investments, that is, FDI that brings new and additional resources and assets and leads to gross fixed capital formation; (3) extensions of capacity, that is, additional new investments that expand the productive capacity of existing affiliates; and (4) financial restructuring (OECD, 2008). There is much interest in greenfield investment because it is perceived as having the greatest impact on the host economy although extensions of capacity likely have similar impacts. Under this presentation, economies could break out FDI transactions for M&As, for greenfield investment, extensions of capacity, and for financial restructuring; the presentation could also separately identify corporate inversions in economies where they are important. A corporate inversion is usually an agreement between corporations in two economies in which one corporation ("the inverter") merges with a corporation in another economy ("the new parent company") that is headquartered in a lower-tax economy. These transactions can often result in

[36] More information on the update of *BPM6* can be found at: https://www.imf.org/en/Data/Statistics/BPM.

[37] Round-tripping refers to the channeling abroad by domestic investors of local funds that subsequently return to the local economy in the form of direct investment.

large FDI transactions but little or no change in the underlying operations of the MNE. Separately identifying them can improve the measurement of FDI to and from economies with significant numbers of inversions.[38]

Another issue that hampers the analytical use of FDI statistics are large, bilateral asymmetries. While there are many causes of bilateral asymmetries (e.g., Angulo and Hierro, 2017; Biswas et al., 2022), one of the key reasons are differences in the valuation of FDI positions (Damgaard and Elkjaer, 2014).[39] While the international standards call for valuing FDI equity at market value, this is difficult due to the very high share of equity accounted for by unlisted enterprises in FDI statistics. In this case, different methods must be used to estimate the market value of unlisted equity. Currently, *BPM6* recommends six possible methods for this estimation. To help reduce asymmetries arising from the use of different methods to value unlisted equity, the updated manual will recommend fewer methods and will provide more detailed implementation guidance to assist compilers in implementing the methods consistently across economies. To enhance comparability across economies, the IMF's CDIS calls for economies to report their FDI positions valued using one specific method (i.e., Own Funds at Book Value). Compilers are also taking steps to address asymmetries through bilateral reconciliation exercises (see, for example, Howell et al, 2019) and, within Europe, the exchange of microdata through the FDI Network. While there is no one valuation of FDI positions that would best serve as a proxy for production, more consistent valuations across countries would enhance the usability of the statistics.

One of the broader goals of the update is to better capture the activities of MNEs. As part of this effort, there is a proposal to develop a framework that helps to reconcile FDI statistics with statistics on the operations of MNEs. While this effort is still under development, it does offer the possibility to better understand the relationship between FDI and the operations of MNEs. Finally, there are several proposals being considered that would improve the measurement of FDI, such as clarifying the coverage of investment funds in FDI and the treatment of distributions from retained earnings in affiliates.

In conclusion, statistical compilers are well-aware of the main critiques concerning FDI data and continuously improve FDI data to address them.

V. Conclusion and Guidelines for Applied Research

In this paper, we have revisited most recent critiques to the use of IIP-based FDI statistics as a measure for multinational production. We have shown that the most severe problems for that use of FDI data are confined to specific economies that act as offshore financial centers for MNEs and, perhaps more importantly, that statistical agencies and researchers have developed data and techniques to address those issues. Researchers who (have to) use IIP-based FDI statistics (e.g., due to limited data alternatives) should hence consider the following practical steps:

[38] The Central Statistics Office of Ireland, a popular destination for the new headquarters of inverted companies, publishes such data here.

[39] For example, in analytical applications it is recommended to avoid mixing the inward side and the outward side. Keeping only one side prevents some of the inconsistencies that arise from mismatches due to countries' different valuations. In this respect, inward data are generally preferred to outward due to their higher reliability and comparability with other domestic indicators. Similarly, in cross-country analysis of FDI stock, it is often necessary to resort to book values to avoid data heterogeneity across the sample, as many countries do not report FDI at market values.

1. Explore the standardized reporting as well as the metadata to understand the coverage and valuation of FDI statistics (e.g., whether it includes SPEs or not, whether SPEs are reported separately, and the method for valuing unlisted equity in FDI positions). All of the databases mentioned in footnote 23 include metadata information, and many economies publish such information on their websites.
2. Take into account the institutional setting of the economies being studied to understand if factors that can distort the relationship between FDI positions and multinational production are present. For example, if the economy offers access to capital markets or sophisticated financial services, reduced regulatory and/or tax burdens, isolates the ultimate owner from financial risk, or ensures confidentiality, it may host SPEs (see Section II). In addition, if the host economy has advanced financial markets, the affiliate can access external financing, which could lead to an understatement of multinational production as discussed in Section III.
3. Analysts should accordingly be careful with FDI data on the industry level. For example, conduit FDI and FDI as a source of funds are more likely to be present in financial service activities. An industry-level analysis of the appropriateness of FDI as a proxy for multinational production is beyond the scope of our paper, but Lipsey (2007) has already highlighted that the cross-country distribution of FDI provides a much more accurate representation than the distribution across industries.
4. In the analysis of aggregate FDI statistics, adjust for SPEs using published data combined with one of the available analytical methods as described in Section II of this paper.
5. Similarly, in the analysis of bilateral FDI statistics, adjust for ultimate investors using published data combined with one of the available analytical methods discussed in Section II. If this is not possible, FDI statistics by immediate partner country can be used for some analyses, especially if country pairs that are most liable to tax optimization and round-tipping are either excluded or controlled for (e.g., with specific pair fixed effects).
6. Compare and complement FDI data with other relevant data sources, including project-based data, firm-level data, survey-level data, and trade and value-added trade data when available.[40]

With care taken in their use, IIP-based FDI statistics remain an important and instrumental data source to study and understand multinational production.

In our view, FDI statistics also capture financial considerations that play a key role in how multinational production networks are structured (see also Davies and Markusen, 2021). Exclusive focus on “real” activities, hence, poses the risk of not capturing this important aspect that is crucial to understanding the differences between multinational enterprises and their domestic counterparts. FDI statistics that separately identify resident SPEs and ultimate vs. immediate ownership provide researchers consistent data to study the interconnection of ‘real’ and ‘financial’ motives. FDI statistics could even better reflect some important aspects of production, such as intangible capital, that are difficult to measure. It also allows them, for example, to separate income from value added in the context of multinational production, which is essential to understanding the welfare effects of globalization (e.g., Bohn et al. 2021; Wang et al., 2021).

[40] For example: project-based data from fDi Markets for announced greenfield projects and from Thomson Reuter for cross-border M&As; firm-level data from ORBIS; survey-level data from Eurostat or US BEA Foreign Affiliates Statistics; and trade in value added data from UNCTAD-EORA GVC database or OECD TiVA database.

References

Alabrese, E., and B. Casella (2020), “The Blurring of Corporate Investor Nationality and Complex Ownership Structures,” *Transnational Corporations*, Vol. 27 (April), pp. 115–137.

Alviarez, V. (2019), “Multinational Production and Comparative Advantage,” *Journal of International Economics*, Vol. 119 (July), pp. 1–54.

Amighini, A., M. McMillan, and M. Sanfilippo (2017), “FDI and Capital Formation in Developing Economies: New Evidence from Industry-level Data,” *NBER Working Paper No. 23049,* The National Bureau of Economic Research, Cambridge, MA.

Angulo, E and A. Hierro (2017), “Asymmetries in the Coordinated Direct Investment Survey: What Lies Behind?”, IMF Working Paper 17/261, November 2017, International Monetary Fund, Washington, DC.

Arkolakis, C., N. Ramondo, A. Rodríguez-Clare, and S. Yeaple (2018), “Innovation and Production in the Global Economy,” *American Economic Review*, Vol. 108 (8), pp. 2128–73.

Beugelsdijk, S., J.F. Hennart, A. Slangen and R. Smeets (2010), " Why and How FDI Stocks Are a Biased Measure of MNE Affiliate Activity," *Journal of International Business Studies,* Vol. 41(9), pp. 1444–59.

Biswas, A.K., J. von Hagen, and S. Sarkar (2022), “FDI Mismatch, Trade Mis-reporting, and Hidden Capital Movements: The USA - China Case,” *Journal of International Money and Finance*, Vol. 120, Article 102534.

Blanchard, O. and J. Acalin (2016), "What Does Measured FDI Actually Measure?", *Policy Brief 16–17*, Peterson Institute for International Economics, Washington, DC.

Bohn, T., S. Brakman, and E. Dietzenbacher (2021), “From Exports to Value Added to Income: Accounting for Bilateral Income Transfers,” *Journal of International Economics,* Vol. 131, Article 103496.

Bolwijn, R., Casella, B., and Rigo, D. (2018), “An FDI-driven Approach to Measuring the Scale and Economic Impact of BEPS,” *Transnational Corporations,* Vol. 25(2), pp. 107–143.

Borga, M. and Caliandro, C. (2018), “Eliminating the Pass-through: Towards FDI Statistics that Better Capture the Financial and Economic Linkages between Countries,” in *The Challenges of Globalization in the Measurement of National Accounts*, ed. Nadim Ahmad, Brent Moulton, Peter van de Ven, and J. David Richardson (Chicago, Illinois: University of Chicago Press).

Casella, B. (2019), “Looking through Conduit FDI in Search of Ultimate Investors – A Probabilistic Approach,” *Transnational Corporations,* Vol. 26(1), pp.109–146.

Chen, W., B. Los, and M. P. Timmer (2021), “Factor Incomes in Global Value Chains: The Role of Intangibles,” in *Measuring and Accounting for Innovation in the Twenty-First Century,* ed. By Carol Corrado, Jonathan Haskel, Javier Miranda, and Daniel Sichel (Studies in Income and Wealth, 78, Chicago, Illinois: University of Chicago Press).

Cobham, A. and Loretz, S. (2014), “International Distribution of the Corporate Tax Base: Impact of Different Apportionment Factors under Unitary Taxation,” *ICTD Working Paper,* International Centre for Tax and Development, Brighton, United Kingdom.

Coppola, A., M. Maggiori, B. Neiman, and J. Schreger (2021), “Redrawing the Map of Global Capital Flows: The Role of Cross-Border Financing and Tax Havens,” *Quarterly Journal of Economics,* Vol. 136(3), pp. 1499–1556.

Damgaard, J., Elkjaer T and N. Johannessen (2019), "What is Real and What is Not Real in the Global FDI Network", *IMF Working Papers*, WP/19/274, International Monetary Fund, Washington, DC.

Damgaard, J., and T. Elkjaer (2014), "Foreign Direct Investment and External Wealth of Nations: How Important is Valuation?", *Review of Income and Wealth*, Vol. 60(2), pp. 245–260.

Davies, R. B. and J. R. Markusen (2021), “What Do Multinationals Do? The Structure of Multinational Firms’ International Activities,” *The World Economy*, Vol. 44(12), pp. 3444–81.

Demir F. and Y. Duan (2018), "Bilateral FDI Flows, Productivity Growth, and Convergence: The North vs. The South," *World Development*, Vol. 101(C), pp. 235–249.

Fukui, T. and C. Lakatos (2012), "A Global Database of Foreign Affiliate Sales," *GTAP Research Memoranda 4009*, Center for Global Trade Analysis, Department of Agricultural Economics, Purdue University.

Gravelle, J.G. (2013), "Tax Havens: International Tax Avoidance and Evasion," Congressional Research Service, Washington, DC, www.fas.org/sgp/crs/misc/R40623.pdf.

Haberly, D. and Wojcik, D. (2015), “Regional Blocks and Imperial Legacies: Mapping the Global Offshore FDI Network,” *Economic Geography*, Vol. 91(3), pp. 251–280.

Harms, P. and P.G. Meon (2018), " Good and Useless FDI: The Growth Effects of Greenfield Investment and Mergers and Acquisitions," *Review of International Economics*, Vol. 26(1), pp. 34–59.

Howell, K., J. Hanson, R. Obrzut, and O. Nowak (2019), “Current Account Asymmetries in U.S.-EU Statistics,” BEA Working Paper, WP2019-6, Washington, DC.

International Monetary Fund (2018), “Final Report of the Task Force on Special Purpose Entities,” IMF Balance of Payments Committee Paper 18/03, Washington, DC.

International Monetary Fund (2020), “Offshore Financial Centers: A Background Document,” Washington, DC.

Kleinert, J. and F. Toubal (2010), “Gravity for FDI.” *Review of International Economics*, Vol. 18(1), pp. 1–13.

Lane, P.R. and G.M. Milesi-Ferretti (2018), “The External Wealth of Nations Revisited: International Financial Integration in the Aftermath of the Global Financial Crisis.” *IMF Economic Review*, Vol. 66, pp. 189–222.

Lehmann, A., S. Sayek, and H. G. Kang (2004), “Multinational Affiliates and Local Financial Markets,” *IMF Working Paper* 04/107, International Monetary Fund, Washington, DC.

Leino, T. and J. Ali-Yrkkö (2014). "How Well Does Foreign Direct Investment Measure Real Investment by Foreign-Owned Companies? – Firm-Level Analysis," *Bank of Finland Research Discussion Paper No. 12/2014,* Helsinki, Finland.

Lewellen, K. and L. Robinsons (2013), “Internal Ownership Structures of U.S. Multinational Firms,” available at SSRN: https://ssrn.com/abstract=2273553 or http://dx.doi.org/10.2139/ssrn.2273553.

Linsi, L. and Mügge, D. (2019), “Globalization and the Growing Defects of International Economic Statistics.” *Review of International Political Economy*, Vol. 26(3), pp. 361–383.

Lipsey, R.E. (2007), "Defining and Measuring the Location of FDI Output," *NBER Working Paper No. 12996,* The National Bureau of Economic Research, Cambridge, MA.

Miroudot, S. and D. Rigo (2021), “Multinational Production and Investment Provisions in Preferential Trade Agreements.” *Journal of Economic Geography*, Vol. 22(6), pp. 1275–1308.

OECD (1998), "Harmful Tax Competition: An Emerging Global Issue," Paris, France: www.oecd.org/tax/transparency/44430243.pdf.

OECD (2000). "Towards Global Tax Co-operation: Report to the 2000 Ministerial Council Meeting and Recommendations by the Committee on Fiscal Affairs," Paris, France.

OECD (2008), *Benchmark Definition of Foreign Direct Investment, fourth edition,* Paris, France.

Ramondo, N. and A. Rodríguez-Clare (2013), “Trade, Multinational Production, and the Gains from Openness”. *Journal of Political Economy,* Vol. 121(2), pp. 273–322.

Ramondo, N., A. Rodríguez-Clare, and F. Tintelnot (2015), “Multinational Production: Data and Stylized Facts,” *American Economic Review*, Vol. 105(5), pp. 530–36.

Sauvant, K. (2017), "Beware of FDI Statistics!", *Columbia FDI Perspectives*, No. 215: Available at SSRN: https://ssrn.com/abstract=3089794.

Schneider, S.T. and K.M. Wacker (2022), “Explaining the Global Landscape of Foreign Direct Investment: Knowledge Capital, Gravity, and the Role of Culture and Institutions,” *The World Economy*, Vol. 45(10), pp. 3080-3108.

Tax Justice Network (2007), "Identifying Tax Havens and Offshore Finance Centers," Briefing paper, Chesham, Buckinghamshire, United Kingdom, www.taxjustice.net/cms/upload/pdf/Identifying_Tax_Havens_Jul_07.pdf.

Tørsløv, T.R., L.S. Wier, and G. Zucman (2018), “The Missing Profits of Nations,” NBER Working Paper 24701, National Bureau of Economic Research, Cambridge, MA.

Turban, S., S. Sorbe, V. Millot, and A. Johansson (2020), “A Set of Matrices to Map the Location of Profit and Economic Activity of Multinational Enterprises.” *Documents de travail de l'OCDE sur la fiscalité*, n° 52, Éditions OCDE, Paris, https://doi.org/10.1787/4ec98acc-en.

UNCTAD (2015), *World Investment Report 2015: Reforming International Investment Governance.* New York and Geneva: United Nations.

UNCTAD (2016), *World Investment Report 2016*. *Investor Nationality: Policy Challenges.* New York and Geneva: United Nations.

U.S. Government Accountability Office (2008), "Large U.S. Corporations and Federal Contractors with Subsidiaries in Jurisdictions Listed as Tax Havens or Financial Privacy Jurisdictions," Report to Congressional Requesters GAO-09-157, Washington, DC: www.gao.gov/new.items/d09157.pdf.

Wacker, K.M. (2016), "(When) Should We Use Foreign Direct Investment Data to Measure the Activities of Multinational Corporations? Theory and Evidence," *Review of International Economics*, Vol. 24(5), pp. 980–999.

Wacker, K.M. (2020), “Differences in Measuring FDI: Do They Matter for Our Economic Conclusions?” *IFC Bulletin* No. 52 (Proceedings of the IFC Conference on external statistics, co-organised with the Bank of Portugal and the European Central Bank, Lisbon, Portugal, 17–18 February 2020).

Wang, Z., S.-J. Wei, X. Yu, and K. Zhu (2021), “Tracing Value Added in the Presence of Foreign Direct Investment,” NBER Working Paper 29335 National Bureau of Economic Research, Cambridge, MA.

PUBLICATIONS