How Digitalization and Globalization have Remapped the Global FDI Network

Thomas Elkjaer and Jannick Damgaard

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How Digitalization and Globalization have Remapped the Global FDI Network

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those of the authors.
ABSTRACT

Digitalization and globalization affect multinational enterprises’ location and investment decisions. Digitalization is often associated with heavy reliance on intangible assets and enables the widespread use of special purpose entities (SPEs) in low-tax economies, thereby masking the patterns of real economic integration between countries. To address the decoupling in foreign direct investment (FDI), a unique global FDI network is estimated: SPEs are removed and FDI positions are broken down by the ultimate investing economy, making the network less sensitive to financial engineering. Total inward FDI is reduced by one-third in the new network, and financial centers become significantly less dominant.

Keywords: FDI, multinational enterprises, special purpose entities, financial globalization, digitalization, network, macroeconomic statistics
1. INTRODUCTION

Foreign direct investment (FDI) is a key link in global economic interconnectedness and is widely used to analyze globalization, attractiveness of an economy, long-term relationships between economies, technology transfer, and real economic activity generated by foreign companies. Digitalization of the economy can be seen as the use of internet-based digital technologies for R&D, production, and delivery of goods and services. Since digitalization is globalizing economies and makes economic relationships borderless, traditional macroeconomic statistics that aim to measure the footprint of the national economy are being challenged. For instance, digitalization allows multinational enterprises (MNEs) to place patents in and sell digital services from offshore financial centers. These centers dominate global FDI: the Netherlands and Luxembourg are the world’s largest recipients of FDI, and are also ranked in the global top three for outward FDI along with the United States (US). Five of the top 10 FDI receiving economies appear on various lists of low-tax economies.

This paper looks at FDI as a proxy for MNE presence and illustrates how digitalization, globalization, and taxation have remapped the global FDI network. FDI is often understood as long-term strategic investments, where location decisions are driven by market or resource access. However, in today’s digital economy, where intangibles are very important, these location decisions are often driven by other considerations, notably taxation. These new drivers lead to a decoupling between FDI and real economic activity.

FDI includes all cross-border investments between enterprises in an FDI relationship, where a company owns at least 10 percent of the equity in another company directly or through a chain of subsidiaries. The 10 percent ownership share is the threshold set to capture long-term strategic and stable investments in macroeconomic statistics. However, this standard measure of FDI is geographically decoupled in three main ways. First, bilateral asymmetries between inward and corresponding outward FDI positions exist for most economy pairs in the published data. For instance, in the IMF’s Coordinated Direct Investment Survey (CDIS) for end-2015, one economy’s FDI is at least twice as high as the counterpart economy’s mirror estimate for 44 percent of the economy pairs and at least 10 times higher for 10 percent of the pairs (Annex I). Second, some smaller economies are very important for global FDI, suggesting a decoupling between FDI and real economic activity. How can small economies be so dominant in global FDI? Essentially, FDI is a measure of purely financial investments that may or may not be a good proxy for “brick and mortar” investments. Some economies host many foreign-owned special purpose entities (SPEs), which typically focus on group financing or holding activities (e.g., financial assets, intellectual property rights, or other intangibles) and do not necessarily reflect stable investment motives. While SPEs have no or very limited real economic activity in the economy they are domiciled in, they can significantly inflate FDI. Digitalization has enabled MNEs’ widespread use of SPEs since these empty shells can easily be set up in foreign countries with the assistance of non-resident tax lawyers through digital channels.

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1 This paper relies heavily on Damgaard and Elkjaer (2017).
Third, as MNEs often carry out FDI through complex ownership chains, the immediate counterpart economy may not be the economy of the ultimate owner who carries the risks and benefits, or the investments’ end destination. Financial centers that typically host SPEs are much less important as ultimate FDI economies, reflecting the transitory nature of investments flowing through these centers. FDI has traditionally been broken down by the immediate counterpart economy, which provides a good measure for direct exposures, but lacks information about the ultimate investing economy (UIE). To close this data gap, OECD countries are now encouraged to also break down inward FDI by the UIE.

This paper remaps FDI positions for 116 economies into a new global FDI network, where SPEs are removed and FDI positions are broken down by the UIE. The new unique FDI network provides a clearer picture of real economic integration and ultimate financial linkages than current available data and thus offers new insights into globalization. In the new global FDI network, global FDI is reduced by one-third, financial centers are much less dominating, and traditional industrialized economies become more important.

The paper is organized as follows. The roles of digitalization and SPEs in FDI are discussed in Sections 2 and 3, respectively. Section 4 compares FDI broken down by the immediate counterpart economy and the UIE, while Section 5 estimates and analyzes the new global FDI network. Section 6 summarizes the key conclusions.

2. THE ROLE OF DIGITALIZATION

Digitalization is transformative, and is a strong driver of globalization. Digitalization — the use of digital technologies, such as the internet and smart phones, in everyday life — has made the access and process of information more reliable, timely, and accurate. It is a global phenomenon: Worldwide internet users have tripled since 2005, and with 3.2 billion users in developing countries at the end of 2015, more now have access to digital technology than to secondary school or clean water (World Bank, 2016). On the business side, the emergence of digital business is also a global force. Businesses use internet-based digital technologies for R&D, production, and delivery of goods and services. According to the IMF (2018a), the digital sector — i.e., producers of ICT goods and services, online platforms, and platform-enabled services — still accounts for less than 10 percent of value added, income, and employment in most economies. However, digitalization has penetrated many activities, and almost all activities could be included in a broader definition of the digital economy.

Digitalization is also transforming global finance. Digital fundraiser platforms, such as Kickstarter, create new financial market platforms and allow for more direct financing, including cross-border, without traditional intermediation. Moreover, blockchain with its decentralized distributed digital ledger can challenge traditional financing by making cross-border financing quicker, cheaper, and more secure. These digital drivers of global finance are starting to challenge the monopoly of traditional intermediaries, including banks, to provide international finance (McKinsey, 2017).

Since digitalization is globalizing economies and makes economic relationships borderless, traditional macroeconomic statistics that aim to measure the footprint of the national economy based on physical presence are being challenged. Much analytical work has already been done on the challenges that
global value chains present when allocating income to different economies along the production chain (e.g., Timmer, Azeez Erumban, Los, Stehrer, and Vries, 2014). However, digitalization also makes it difficult to geographically connect investments and separate real financial integration and diversification from financial engineering in macroeconomic statistics.

In particular, since digitalization is often associated with heavy reliance on intangible assets, enabling little or no physical presence, it can be difficult to make precise valuations of investments in the national economies. Intangibles used by digital companies include, for example, algorithms to process data and to generate value through personalized advertising. From a funding point of view, valuation uncertainties may also make it challenging for companies that rely heavily on intangibles to raise funds through initial public offerings (IPOs) because it is difficult for outsiders to make reliable appraisals. For instance, in the US Generally Accepted Accounting Principles (GAAP), own R&D expenses are deducted from profits and are generally not capitalized (do not build assets and thereby own equity), whereas intangibles bought via acquisitions can be added as assets.

FDI equity mainly consists of unlisted equity, for which no market prices exist and therefore fair valuations are estimated. Damgaard and Elkjær (2014) show that choice of valuation method can have a significant impact on FDI data (Figure 1). Using Danish micro level company data, they also find that unlisted FDI equity liabilities vary from 22 to 156 percent of GDP when applying different estimation techniques, but just one fair valuation method, price to earnings. While the most common FDI valuation method, own funds at book value, promotes cross-economy comparability, it does not necessarily lead to current market-value approximations if companies value their assets and liabilities at outdated historical costs.

The use of intangibles and valuation challenges are not limited to tech companies. IMF (2018b) finds that some other sectors, such as pharmaceuticals, also use intangibles intensively, and tech companies are just slightly more dependent on intangibles than the average US Fortune 500 company. In addition, digitalization is not only associated with large companies in advanced economies. Small companies can become “micro-multinationals” by using digital platforms, like Amazon or Alibaba, to connect to customers and suppliers worldwide. Also, going forward, the developing world is expected to play a large role globally. By 2025, emerging economies are expected to host almost 230 companies in the Global Fortune 500, up from 85 in 2010 (McKinsey, 2016).

Doidge, Kahle, Karolyi, and Stulz (2018) find that publicly listed companies in the US are becoming older and larger while profits are more concentrated. According to Crouzet and Eberly (2018), this rising concentration can primarily be attributed to increased market shares of the most productive firms in the consumer sector, partly due to scalability of intangibles, and to market power (measured by markups) in the healthcare sector. Even if these issues related to digitalization and globalization are not new, at least digitalization seems to reinforce existing challenges because sheer scale is putting so much pressure on current international statistical methodological arrangements as to require fundamental changes to better measure activities. These measurement uncertainties can lead to important misunderstandings and affect policy recommendations, thus pointing to the need for further international harmonization and exchange of data.
3. THE ROLE OF SPEs

The decoupling between FDI and real economic activity is growing as corporate structures and financing mechanisms become more digitalized and global. Even though FDI measures financial investments, it is traditionally used as a proxy for real economic activity generated by foreign-owned companies and long-term relations between economies. However, with increasingly complex and flexible MNE structures and widespread use of SPEs, FDI may be a less useful indicator for real activity, long-term relations between economies, or even for stable external financing.

SPEs break the direct link between the receiving economy and the ultimate owner, and “inflate” FDI because they have large gross foreign positions but very small net foreign positions, reflecting their role as pure financial intermediaries rather than final investment targets. Consequently, SPEs make it difficult to separate real financial integration and diversification from financial engineering. While there is no uniform international definition of SPEs, statistical manuals provide similar criteria for identifying an SPE. These include: formally registered legal entity that is subject to national law, ultimate owners are not residents of the territory of incorporation, few or no employees, little or no production in the host economy, little or no physical presence, most assets and liabilities are vis-à-vis
non-residents, and the core business of the enterprise consists of group financing or holding activities (OECD, 2008).

FDI financing through SPEs is often only transitory. For instance, Blanchard and Acalin (2016) find a high positive correlation between quarterly FDI inflows and outflows in several economies, suggesting that FDI inflows are often just passing through an economy on the way to their final destination. Moreover, Lane and Milesi-Ferretti (2017) find that FDI positions, unlike positions in portfolio investment and other investment, have continued to expand in the aftermath of the financial crisis. This increase primarily stems from FDI positions vis-à-vis financial centers and can be attributed to the growing complexity of the corporate structures of large MNEs.

Tax, regulatory, and confidentiality benefits – utilized through SPEs that are typically set up in offshore financial centers – drive much of the expansion in FDI. These benefits are potentially large, for instance for the US the annual tax revenue loss from offshore tax exploitations is estimated to be around USD 100 billion (U.S. Senate Permanent Subcommittee on Investigations, 2008). Therefore, both SPE funding and location are likely less stable than for other types of FDI because even small legislative changes – domestically or abroad – can significantly shift investment patterns and lead to capital outflows. Table 1 provides an overview of the 50 economies, mostly Caribbean and European, appearing on various low-tax economy lists.

<table>
<thead>
<tr>
<th>Table 1. List of Low-Tax Economies</th>
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<tbody>
<tr>
<td>Asia:</td>
</tr>
<tr>
<td>Hong Kong SAR, Macao SAR, Maldives, Singapore</td>
</tr>
<tr>
<td>Caribbean:</td>
</tr>
<tr>
<td>Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, British Virgin Islands, Cayman Islands, Dominica, Grenada, Montserrat, Netherlands Antilles, St. Kitts and Nevis, St. Lucia, St. Vincent and Grenadines, Turks and Caicos Islands, U.S. Virgin Islands</td>
</tr>
<tr>
<td>Central America:</td>
</tr>
<tr>
<td>Belize, Costa Rica, Panama</td>
</tr>
<tr>
<td>Eastern Africa:</td>
</tr>
<tr>
<td>Mauritius, Seychelles</td>
</tr>
<tr>
<td>Europe:</td>
</tr>
<tr>
<td>Andorra, Cyprus, Gibraltar, Guernsey, Ireland, Isle of Man, Jersey, Latvia, Liechtenstein, Luxembourg, Malta, Monaco, San Marino, Switzerland</td>
</tr>
<tr>
<td>Northern America:</td>
</tr>
<tr>
<td>Bermuda</td>
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<tr>
<td>Middle East:</td>
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<tr>
<td>Bahrain, Jordan, Lebanon</td>
</tr>
<tr>
<td>Oceania:</td>
</tr>
<tr>
<td>Cook Islands, Marshall Islands, Nauru, Niue, Samoa, Vanuatu</td>
</tr>
<tr>
<td>Western Africa:</td>
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<tr>
<td>Liberia</td>
</tr>
</tbody>
</table>

Note: Includes economies that appeared in at least one of the following lists: (1) OECD’s list of committed jurisdictions and uncooperative tax havens (no jurisdictions have been included in this list since 2009), (2) the tax haven list by Dharmapala and Hines (2006), and (3) the IRS list of offshore haven or financial privacy jurisdictions. Economies in bold report to the CDIS.
FDI has become more responsive to taxation over time (OECD, 2007). MNEs can optimize taxes through SPEs or regular operating units, and tax optimization often involves shifting profits to a low-tax jurisdiction through debt allocation, transfer pricing, or corporate inversions. For example, MNEs may allocate most of their debt to a high-tax economy to take advantage of high interest deductions while shifting profits to low-tax jurisdictions.

Moreover, MNEs can use distorted transfer pricing to shift profits to low-tax jurisdictions through sales of goods and services between affiliates. Such practices can substantially affect FDI through profits and retained earnings. In principle, the transfer pricing should be at arm's-length prices, but it can be very difficult for tax authorities to determine if a fair price has been used for transfers of intellectual property rights and intangibles. For the US, intra-group trade in goods accounts for 48 percent of total imports and 30 percent of exports, and 22 and 26 percent of services imports and exports, respectively (Lanz and Miroudot, 2011). In a string of high-profile cases, the European Commission has ruled that the tax authorities in Ireland, Luxembourg, and the Netherlands have allowed Apple, Fiat, and Starbucks to use transfer prices that do not reflect underlying economic prices. This practice was found to violate EU state aid rules, and the three countries have been instructed to collect significant additional taxes from the companies involved, but the countries disagreed with the rulings and subsequently appealed them.

Finally, international corporate structures can be used to shift profits away from high-tax jurisdictions. Recently, some US-based MNEs have been involved in corporate inversions, where the parent company’s headquarter is moved abroad to a low-tax jurisdiction through a merger with a foreign company, effectively changing the domicile of the parent company but not providing new actual FDI funding. While such MNE corporate structures may not technically meet the SPE criteria, they still function to some extent as near-SPE structures and can contribute to the geographical decoupling in FDI, see for instance Lane and Milesi-Ferretti (2017) for an analysis of FDI in Ireland. This practice has also had a significant impact on Irish GDP data (OECD, 2016). Near-SPEs may become more common with the implementation of the principles of the G-20/OECD Base Erosion and Profit Shifting (BEPS) Project because MNEs will need to have more presence in low-tax jurisdictions to be able to claim permanent establishment and have taxable presence in such jurisdictions.

Globally, the largest recipients of FDI in absolute terms include major economies like the US, China (Mainland), United Kingdom, Germany, and France, but also smaller economies such as the Netherlands, Luxembourg, Hong Kong SAR, Singapore, Ireland, and Switzerland (Figure 2). All economies in the latter group host financial centers, and a large share of the high FDI in these economies can most likely be attributed to SPE presence.

The top recipient economies change somewhat when looking at FDI intensity, measured as inward FDI-to-GDP. Luxembourg is now the largest recipients by a wide margin, followed by Mauritius, Malta, and Cyprus, which are all included in the list of low-tax economies (Table 1). The Netherlands, Hong Kong SAR, Ireland, Singapore, and Switzerland remain near the top whereas the major economies are no longer present. More economies appearing on the list of low-tax economies are likely to be top recipients of FDI in relative terms, but only economies that report to the CDIS are
included in Figure 2, and many offshore financial centers, e.g., British Virgin Islands and Cayman Islands, do not report to the CDIS.

SPEs have no or very limited real economic activity in the economy they are domiciled in, but can have significant FDI, essentially “inflating” the FDI numbers. Most OECD countries report FDI data including and excluding SPEs separately to the OECD while the CDIS does not currently include such a breakdown. Economies that host SPEs tend to have high FDI-to-GDP ratios. For Luxembourg, the inward FDI position excluding SPEs is 393 percent of GDP, compared to 5,658 percent when SPEs are included (Annex II). The large non-SPE FDI in Luxembourg largely reflects investments in the financial sector. For the Netherlands, the corresponding numbers are 97 percent and 525 percent.

4. FDI BY ULTIMATE INVESTING ECONOMY

FDI by the UIE, i.e., the economy of the ultimate controlling parent, provides important insights into the underlying interconnectedness between economies, including real economic interdependencies and ultimate financial benefits and risks incurred by the ultimate investors.

There is a strong push for more comprehensive data on cross-border exposures and “ultimate risk,” including in the report *The Financial Crisis and Information Gaps* by the IMF and Financial Stability

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**Figure 2. Top 20 Inward FDI Economies**

- Right-hand axis: Top 20 inward FDI economies in percentage of GDP
- Left-hand axis: Top 20 inward FDI economies in USD billions

Source: IMF (CDIS and World Economic Outlook Database).

Note: End-2015 inward FDI positions published with the initial release of the 2015 CDIS in December 2016 and GDP for 2015 from the October 2016 World Economic Outlook Database. In the few cases where data for 2015 are not available, latest available data are used. Economies with an asterisk are in both top 20 lists.
Board (2009) that led to the G-20 Data Gaps Initiative. Also, the OECD (2008), in the BMD4 (para. 355), strongly encourages economies to provide supplementary data on inward FDI positions on a UIE basis using the following method (BMD4, para. 610–611): “[The ultimate investor] is identified by proceeding up the immediate direct investor’s ownership chain through the controlling links (ownership of more than 50 percent of the voting power) until an enterprise is reached that is not controlled by another enterprise. If there is no enterprise that controls the immediate direct investor, then the direct investor is effectively the ultimate investor in the direct investment enterprise. The country in which the ultimate investor is resident is the ultimate investing country (UIC) for the investment in the direct investment enterprise.” [UIE is referred to as ultimate investing country, UIC, in BMD4.]

By January 2017, 12 OECD countries – Austria, Czech Republic, Estonia, Finland, France, Germany, Hungary, Iceland, Italy, Poland, Switzerland, and the US – had reported inward FDI positions by the UIE for the annual update of the OECD’s BMD4 Partner Country Database, and more countries are expected to follow. Economies with significant SPE presence, e.g., Luxembourg and the Netherlands, tend to be much more dominant when inward FDI positions are measured by the immediate investing economy than by the UIE (Figure 3). This pattern suggests that investments from financial centers are often pass-through investments, which originate from other economies.

**Figure 3. Inward FDI Positions by Immediate and Ultimate Investing Economy**

Source: OECD (BMD4 Partner Country Database).

Note: Top 20 total inward FDI positions by immediate investing economy and the corresponding inward positions by the UIE based on aggregate data from the 12 OECD countries that report FDI on an UIE basis. Excludes resident SPEs and positions, where either the immediate or ultimate investing economy is confidential. End-2015; in a few cases end-2014.
Economies like the US and Germany with no or few resident SPEs, however, are more dominant when inward FDI positions are measured by the UIE rather than the immediate investing economy. This result suggests that these economies are home to the parent companies of MNEs that invest through chains of subsidiaries and holding companies abroad. Ireland is also more dominant when inward FDI positions are measured by the UIE rather than the immediate investing economy even though the country is known to host many SPEs and is included in the list of low-tax economies. The Irish pattern can be attributed to US FDI data and may in part be explained by the corporate inversions in recent years, where several US parent companies have moved their domiciles to Ireland for tax reasons, in particular to avoid the US’ global taxation principle that was in place until the end of 2017. As a result, many entities in the US will have Ireland as the UIE through complex MNE holding structures.

The ultimate investor may be from the same economy as the direct investment enterprise, which effectively “inflates” FDI since the ultimate funding source is the domestic economy. Tax planning may motivate such round-tripping. In Italy, round-tripping exceeds 10 percent of inward FDI, and the average for the reporting OECD countries is 5 percent (Figure 4).

5. GLOBAL FDI NETWORKS

To provide a better measure for real economic integration and long-term financial linkages, a new global FDI network is estimated. The new network shows the ultimate source of control/influence and is less sensitive to the volatile group financing, SPE relocation decisions, and holding activities of MNEs. The new FDI estimates are constructed in the following three steps (the method is described in details in Annex III): (1) based on OECD data covering 21 economies, the SPEs are removed by using the clear tendency that economies with high total inward FDI-to-GDP ratios are more likely to host SPEs than economies with low ratios, (2) by combining the coverage of 116 economies in the CDIS with OECD data covering 12 economies on geographical distribution of the ultimate investors versus immediate investors, each economy’s inward FDI is redistributed to the ultimate investor, and
finally (3) the data are adjusted for round-tripping, i.e., when the ultimate funding source is the domestic economy.

The new FDI estimates make it possible to compare global FDI networks based on different FDI measures. The US, Netherlands, and Luxembourg dominate the FDI network based on the CDIS, reflecting the difficulties in untangling traditional FDI economies (the US) from transitory FDI economies (the Netherlands and Luxembourg) (Figure 5). The network also reveals a very high degree of connectedness where most economies have FDI links vis-à-vis each other. Guerin (2006) finds a negative effect of distance on FDI flows, but CDIS data show that the reporting economies typically receive inward FDI from 60–90 different economies. Put differently, FDI is not only regionally clustered, but investments are also spread out between many economies with direct FDI links.

![Figure 5. Network of FDI Positions Based on the CDIS](image)

Source: Own calculations based on the IMF’s CDIS.
Note: Top 40 economies according to the size of bilateral FDI positions. Reported inward FDI positions including SPEs and by the immediate counterpart economy.

Investment gateways or hubs can also be identified in the network. For instance, the strong link between China (Mainland) and Hong Kong SAR likely reflects that many foreign investors use Hong Kong as a third jurisdiction or gateway for investments in China because of various tax agreements. Hong Kong also reports large sums of inward FDI from British Virgin Islands,
suggesting that some MNEs invest in China through complex SPE ownership chains passing through the British Virgin Islands and then Hong Kong before entering China.

Some offshore financial centers – British Virgin Islands, Bermuda, Cayman Islands, Gibraltar, and Jersey – are included in the global top 40 even though they do not report to the CDIS. Thus, they are only part of the network because they are counterparts to the inward FDI of reporting economies. These five economies would have been even more important in the network if they reported to the CDIS.

In the new FDI network, i.e., with SPEs removed and broken down by the UIE, the US still dominates (Figure 6), while the role of the Netherlands and Luxembourg is much smaller compared to the CDIS network (Figure 5). The substantial presence of SPEs has been removed for the Netherlands and Luxembourg, and other economies’ inward FDI from these two countries has been adjusted significantly downwards when moving from the immediate counterpart economy to the UIE. However, compared to the size of their economies, FDI remains substantial for the Netherlands and Luxembourg.

Figure 6. Network of FDI Positions Based on New Global FDI Estimates

Source: Own calculations based on the IMF’s CDIS and the OECD’s BMD4 Partner Country Database. Note: Top 40 economies according to the size of bilateral FDI positions. Reported/estimated inward FDI positions with SPEs removed and by the UIE. Circular links back to own economy reflect round-tripping.
The new global FDI network also show how much SPEs inflate global FDI; total inward FDI positions are now 34 percent lower compared to the CDIS. SPEs would probably account for an even larger share of worldwide FDI if data for all economies were available, suggesting that the 34 percent is the lower limit of SPEs’ share of global FDI. The reason is that most major economies report to the CDIS and are therefore included in the new network whereas most economies appearing on the list of low-tax economies that typically domicile SPEs are not.

While Hong Kong SAR’s inward FDI is significantly lower when SPEs are removed, there are still strong FDI links between Hong Kong and China (Mainland). In fact, China’s inward FDI from Hong Kong remains almost unchanged compared to the CDIS because the reporting OECD countries do not have higher levels of inward FDI from Hong Kong according to immediate counterpart principle compared to the UIE principle. Therefore, no UIE adjustment is made for inward FDI from Hong Kong. If China had reported FDI based on the UIE, it is likely that the ultimate link between China and Hong Kong would be significantly weaker.

Some economies appearing on the list of low-tax economies (Cyprus, Gibraltar, Jersey, and Mauritius) and Hungary, which is hosting many SPEs, are no longer in the top 40 in the new network. They have been replaced by more traditional FDI economies, namely the Czech Republic, Finland, Israel, Saudi Arabia, and the United Arab Emirates. Moreover, the new network takes round-tripping into account, reflected in the circular links back to own economy.

In Damgaard, Elkjaer, and Johannessen (2018), the coverage is extended to all 246 economies compared to 116 in the CDIS. Based on this extension, it is found that no less than USD 12 trillion of global FDI is pass-through investment. Further, the new calculations demonstrate that financial engineering is truly a worldwide phenomenon that cuts across emerging market and advanced economies. In emerging market economies such as India, China, and Brazil, as well as in advanced economies such as the United Kingdom and the US, more than 50 percent of outward FDI goes through a foreign entity with no economic substance (Figure 7). These findings on magnitude are in line with Tetsløv, Wier, and Zucman (2018) who estimate that close to 40 percent of multinational profits (USD 600 billion) are shifted to low-tax economies each year. This shifting also distorts macroeconomic statistics, including overestimation of GDP, corporate profits, and trade balances in these low-tax economies and underestimation in other economies. Further, since intangibles are much more scalable than tangible assets, companies will look to sell as much as possible, often through access to a global platform with global distribution abilities (Haskel and Westlake, 2017). This effect means that companies’ locational considerations become less relevant in their FDI decisions.

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2 The extension is using mirror data from reporting economies and grossing-up.
6. CONCLUSION

FDI – besides providing financing – is a key driver of economic interconnectedness, job creation, and technological transfers and is therefore important to understand both financial and real economic links between economies. However, digitalization, globalization, and taxation blur bilateral linkages: who is really investing in whom? This paper’s main contribution is to estimate adjusted global FDI data as a proxy for MNE presence. These data are the first to explicitly account for SPEs and ultimate ownership in a consistent and comparable way across more than 100 economies using OECD and IMF data. The new global FDI network offers several insights and stylized facts that provide a different picture of long-term relations between economies and final investment patterns than traditional FDI data. First, when SPEs are removed, total inward FDI positions are reduced by one-third compared to the CDIS. Second, “traditional” major economies become more dominant in the adjusted global FDI network. Third, financial centers become less important, but still have high inward FDI-to-GDP ratios when SPEs are removed. This stylized fact suggests that some entities located in financial centers also take an active management role and are not just passive holding companies, or alternatively how difficult it is to fully identify SPEs. Fourth, round-tripping, where an economy is ultimately providing FDI to itself, averages 5 percent of FDI.

This paper illustrates how a more globalized, digitalized, and interconnected world economy poses new challenges to traditional macroeconomic statistics that are based on the concept of national economic territory. Globalization and digitalization that impact MNEs’ geographical location and investing decisions also distort macroeconomic statistics by shifting GDP, corporate profits, and trade.
balances to low-tax economies. To describe a globalized world, where national borders are less relevant, economic statistics also need to adapt: information on the “national economy” needs to be supplemented with information on global interconnectedness. Looking ahead, financial statistics could be supplemented with ultimate counterpart economy information for a comprehensive picture of ultimate cross-economy financial linkages and risks. Such data will cast transparency on global financial holdings and assist policy makers to make informed decisions about international taxation and other policy initiatives.
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ANNEX I: BILATERAL ASYMMETRIES IN OFFICIAL FDI DATA

Bilateral asymmetries in official FDI data are significant. Since 2010, the IMF’s CDIS has published bilateral FDI positions for 116 economies broken down by the immediate counterpart economy, but asymmetric recordings are present for all economies. For 44 percent of the 1,805 published bilateral economy pairs for end-2015, one economy’s FDI is at least twice of its counterpart economy’s recording and at least 10 times higher for almost 10 percent of the pairs (Figure A1). In absolute terms, the average discrepancy is also large, USD 5.9 billion. Interestingly, the average inward and outward FDI positions are close (USD 12.3 billion and USD 13.0 billion, respectively), indicating no systematic overstatement of inward FDI compared to outward FDI, or vice versa. The bilateral asymmetries can stem from differences in applying the macroeconomic statistical methodology and from compilation practices. Damgaard and Elkjaer (2017) provide an in-depth discussion of the asymmetries and their root causes.

Figure A1. Asymmetries in FDI between Economy Pairs

Source: Own calculations based on the IMF’s CDIS data.

Note: Inward FDI position reported by an economy compared to outward FDI position reported by the counterpart economy. For each economy pair, the asymmetry is shown as the difference between the highest and lowest position in percent of the lowest position. Only includes pairs, where both economies provided a non-confidential number exceeding USD 1 million. Total FDI, equity, and debt instruments cover 1,805, 1,403, and 906 pairs, respectively, reflecting data availability at the release of the 2015 CDIS in December 2016. FDI equity accounts for approximately 80 percent of total FDI and FDI debt instruments for 20 percent.
## ANNEX II: SPE BREAKDOWN

### Table II.1. Inward FDI Positions Broken Down by SPEs and Non-SPEs

<table>
<thead>
<tr>
<th>Country</th>
<th>FDI (percent of GDP)</th>
<th>FDI country rank</th>
<th>Change in rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total SPEs Non-SPEs</td>
<td>Total Non-SPEs</td>
<td></td>
</tr>
<tr>
<td>Luxembourg</td>
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Source: IMF (World Economic Outlook Database) and OECD (BMD4 Partner Country and Main Aggregates Databases).

Note: Includes all countries as reported as of end-2015 to the OECD for publication by January 2017. Some OECD countries may have reported zero when no information about SPEs was available.
ANNEX III: CONSTRUCTING NEW GLOBAL FDI ESTIMATES

To constructs new global FDI estimates the details of the OECD data is combined with the broad coverage of the CDIS. In the new estimates, SPEs are excluded, and FDI is broken down by the UIE, which provides a better measure for real economic integration and long-term financial linkages because it shows the ultimate source of control/influence and is less sensitive to the volatile group financing, SPE relocation decisions, and holding activities of MNEs.

The new estimates are based on inward FDI positions for two reasons. First, inward FDI data are generally of better quality than outward FDI data because it is easier to identify and obtain information about resident rather than non-resident direct investment enterprises via business registers, particularly for unlisted companies. Second, information about ultimate ownership is currently only available for inward FDI. Since the new global FDI estimates are based on inward FDI, estimates for “ultimate outward FDI” are generated as the mirror data from the new FDI network.

For OECD countries that report data excluding SPEs and broken down by the UIE, these data are included directly in the new estimates. For the remaining economies, the CDIS data are first adjusted for SPEs and then the geographical breakdown is transformed from the immediate counterpart to the UIE. To remove the SPEs, the starting point is the clear tendency that economies with high total inward FDI-to-GDP ratios are more likely to host SPEs than economies with low ratios (Annex I). Except for Luxembourg, no OECD country has reported an inward FDI position for non-SPEs that exceeds 114 percent of GDP. This finding suggests that there is a structural limit to an economy’s capacity to attract or absorb non-SPE FDI, e.g., due to skilled labor constraints, infrastructure, and regulatory market entry barriers. To adjust for these structural limits, a model based on data for the SPE-reporting OECD countries is used to estimate SPE adjustment factors. For a given economy, the same SPE adjustment factor is then applied to all its counterpart economies, equivalent to assuming that investors from each counterpart economy use SPEs proportional to their total FDI in the economy. The model results show that the non-SPE share of total inward FDI positions decreases when the FDI intensity (measured as the total inward FDI position as a share of GDP) increases (Figure A2). While the two main outliers, Luxembourg and the Netherlands, to some extent drive this relationship, it still holds if these two outliers are excluded. Luxembourg and the Netherlands are included in the SPE adjustment model because they contain important information on non-SPE inward FDI-to-total inward FDI ratios for economies with high FDI intensity.

The model is specified as a univariate regression with the non-SPE inward FDI-to-total inward FDI ratio as the dependent variable and the FDI intensity as the explanatory variable. A log-log transformation is made to achieve linearity. Only economies with FDI intensity above 30 percent are included in the estimation since none of the reporting OECD countries with ratios below this threshold host SPEs. The model generates SPE adjustment factors, i.e., non-SPE inward FDI-to-total inward FDI ratios, below 1 for economies with FDI intensity higher than 46 percent and adjustment factors above 1 for economies with FDI intensity lower than 46 percent. For economies with FDI intensity below 46 percent, no SPE adjustments are made, reflecting that these economies host few or no SPEs. For economies with FDI intensity above 46 percent, SPE adjustments are made to adjust down total inward FDI, reflecting that these economies host many SPEs.
Alternatively, a multivariate model for the structural level of non-SPE FDI in an economy could be estimated based on economy-specific characteristics, including size, openness, taxation rules, and financial sophistication. However, this approach would entail a risk of overfitting due to the limited number of reporting economies. An advantage of the simple model is that it can easily and uniformly be used to estimate the non-SPE share of total FDI for all economies that do not report the SPE breakdown.

Next, the geographical breakdown is transformed from the immediate counterpart to the UIE basis. The geographical UIE adjustment factors, \( a_i \), which are based on the UIE to immediate counterpart relationships for the 12 UIE-reporting OECD countries (Figure 3), are constructed in the following manner:

\[
a_i = \frac{\sum_{c \neq i} FDI(UIE)_{ic}}{\sum_{c} FDI(UIE)_{ic}} \text{ for } i \neq c,
\]

where \( c \) denotes the counterpart economy, \( i \) the OECD reporting country, \( n \) the number of reporting economies, \( FDI(UIE) \) the inward FDI position according to the UIE breakdown, and \( FDI(UIE) \) the inward position according to the immediate investing economy breakdown. For instance, the 12 OECD reporting countries have an aggregate inward FDI position of USD 326 billion from the Netherlands on the UIE basis and USD 906 billion on the immediate counterpart basis, so the adjustment factor for positions vis-à-vis the Netherlands, \( a_{NL} \), is 0.36. To avoid extreme adjustments, for instance due to limited data availability for some counterpart economies, the adjustment factors

![Figure A2. SPE Adjustment Model](image-url)
are capped between 0.33 and 3. For economies appearing on the list of low-tax economies, which are likely to have significant SPE presence, the adjustment factors are capped between 0.2 and 1 so FDI from these economies can never be higher under the UIE breakdown than under the immediate counterpart economy breakdown.

Then, the round-tripping adjustment factor, $b$, is calculated as the simple average for reporting economies:

$$b = \frac{1}{n} \sum_{i=1}^{n} \frac{FDI(UIE),i}{FDI(total),i} \quad \text{for} \quad i = c.$$

For each economy, the adjustment factor, $b$, is applied to total non-SPE inward FDI, effectively allocating 5 percent of the inward FDI back to its own economy. Finally, the total adjustments are constrained so that on an economy level, adjusted FDI cannot exceed reported total inward FDI for the economy.

The new global FDI estimates fit relatively well when the estimated FDI is contrasted with the reported FDI from the OECD countries that report detailed breakdowns. As a model verification, the SPE adjustment factors are applied to the CDIS data for the SPE-reporting OECD countries, and the UIE adjustment factors are applied to reported non-SPE data for the UIE-reporting OECD countries. The discrepancies for the SPE estimations are generally small (Figure A3), mainly because only a few OECD countries have a large SPE presence, meaning that the adjustments are modest in most cases. As an illustration, the SPE adjustment model generates an adjustment factor of 0.8 for an economy with an inward FDI-to-GDP ratio of 70 percent, effectively adjusting down inward FDI by 20 percent, and only seven OECD countries have ratios above that threshold. The UIE estimations are more uncertain because large adjustments are made for all reporting economies, and investment patterns can vary greatly across economies. For instance, Haberly and Wójcik (2015) show that FDI patterns are influenced by historical and political relationships between economies. The joint model test, where the UIE estimations are based on estimated SPE data, shows the highest discrepancies. Interestingly, the discrepancies between estimated and reported inward FDI are smaller than the bilateral discrepancies in the reported data (Annex 1). Nevertheless, model FDI estimates based on data from a subset of economies, the reporting OECD countries, will inevitably be uncertain because investment patterns may vary across economies, regions, and economic development levels, and therefore any single data point should not be over-interpreted. When more countries start reporting the SPE and UIE breakdowns, the estimation method can be further fine-tuned to make FDI estimates more robust.
Figure A3. Discrepancies between Reported and Estimated Inward FDI Positions

Percent

Increasing discrepancies

Legend (percentiles):

- 90th
- 75th
- 25th
- 10th

Source: Own calculations based on data from the IMF (CDIS) and the OECD (BMD4 Database).

Note: Reported inward FDI positions broken down by counterpart economy compared to estimated inward FDI positions, where the discrepancy is shown as the difference between the highest and lowest position in percent of the lowest position. Only discrepancies for non-confidential estimates exceeding USD 1 million are shown. SPE, UIE, and joint (SPE + UIE) cover 1229, 514, and 481 comparisons, respectively, which reflects data availability.