UPDATED DRAFT FOR PILOT TESTING

METHODOLOGICAL GUIDELINES TO MEASURE TAX AND COMMERCIAL ILLICIT FINANCIAL FLOWS

Methods for pilot testing

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Note

These methodological guidelines provide a selection of methods for the pilot testing of the measurement of tax and commercial IFFs in member states participating in the United Nations Development Account projects in the African, and Asian and Pacific regions, and Task Force member countries.

The purpose of pilot testing will be to test the feasibility, validity and robustness of the suggested methods. The guidelines are intended for statistical and other national authorities with a mandate to collect and access relevant information and apply the suggested methods, to the maximum extent possible, to enable more reliable and comparable results across countries.

The aim is to roll out country pilots beginning in the second quarter of 2021. These methodological guidelines will be a living document open to adjustment and refinement during and after the pilot testing phases, taking on board the experiences gained by United Nations member states on the choice of methods, their application and related practical guidelines.

The guidelines, once refined after the pilot phase, are planned to be added to the *Statistical Framework for the Measurement of IFFs*, together with guidelines and materials on the measurement of IFFs from illegal markets, corruption and exploitation-type activities, being developed by UNODC.

Contents

List of acronyms

AMNE	Activity of Multinational Enterprises
ADIMA	Analytical Database on Individual Multinationals and Affiliates
BEPS	Base erosion and profit shifting
BIS	Bank of International Settlements
BoP	Balance of Payments
BPM6	Balance of Payments and International Investment Position Manual, 6th edition
CbCR	Country-by-country reporting
CIF	Cost, insurance and freight
CPIS	Coordinated Portfolio Investment Survey
CRS	Common reporting standard
CSO	Civil society organisation
DOTS	Direction of Trade Statistics
EBIT	Earnings Before Interest and Tax
EC	European Commission
EWN	External Wealth of Nations Mark II database
EX	Exports
FATF	Financial Action Task Force
FATS	Foreign affiliates statistics
FDI	Foreign direct investment
FIU	Financial intelligence unit
FOB	Free on board or freight on board
GDP	Gross domestic product
GFI	Global Financial Integrity
HS	The Harmonized Commodity Description and Coding System
IAEG-SDGs	Inter-agency and Expert Group on Sustainable Development Goals Indicators
ICCS	International Classification of Crime for Statistical
IFC	International Financial Centre
IFFs	Illicit financial flows
IGOs	Income Generation Operations

IIP	International investment positions
ILO	International Labour Organization
IM	Imports
IMF	International Monetary Fund
IMOs	Income Management Operations
IMTS	International merchandise trade statistics
IQR	Inter-quartile range
IT	Information technology
ITIC	International Transport and Insurance Costs of Merchandise Trade
ITRS	International transactions reporting system
LCU	Large cases unit
LP	Lower-bound price
ML	Machine learning
MNE	Multinational Enterprise Group
MoU	Memorandum of Understanding
MPCs	Mediterranean partner countries
MTIC	Missing Trader Intra-Community
NGO	Non-governmental organisation
NOE	Non-observed economy
NSO	National statistical office
NSS	National statistical system
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary least squares
PCM	Partner country method
PFM	Price filter method
PPP	Purchasing power parity
PS	Propensity score matching
ROC	Receiver operating characteristics
R&D	Research and development
SARS	South Africa Revenue Service

SBS	Structural business statistics
SBR	Statistical business registers
SDG	Sustainable Development Goal
SNA	System of National Accounts
SNB	Swiss National Bank
STS	Short-term statistics
SUV	Standard unit value
TJN	Tax Justice Network
UNCTAD	United Nations Conference for Trade and Development
UNECA	United Nations Economic Commission for Africa
UNECLAC	United Nations Economic Commission for Latin America and the Caribbean
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCWA	United Nations Economic and Social Commission for Western Asia
UNODC	United Nations Office on Drugs and Crime
UNSD	United Nations Statistics Division
UP	Upper-bound price
VAT	Value-added tax
WCO	World Customs Organization

Introduction

Every year organized crime and trade in illegal goods (such as drug trafficking or trafficking in firearms) and illegal or illicit commercial and tax practices generate billions of dollars in illicit financial flows (IFFs). IFFs stemming from illegal activities such as crime and corruption erode the functioning of criminal justice systems, reduce state revenues, erode the tax base, and weaken state institutions. Other IFFs originating in the legal economy also divert resources for development, erode the tax base, hamper structural transformation and sustainable economic growth.[1]

IFFs are also important for official statistics since they influence gross domestic product (GDP) and other key statistics and can give rise to mismeasurement or wrong interpretation of economic development. Measuring IFFs has risen to the forefront of both policy and statistical agendas in the context of the 2030 Agenda for Sustainable Development. Its indicator framework proposes a Sustainable Development Goal (SDG) indicator 16.4.1 to measure the "*total value of inward and outward illicit financial flows (in current United States dollars)*".

Statisticians have successfully developed and applied methods and concepts to measure hidden economic activities, referred to as with different terms, such as the shadow economy, illegal economy, grey economy, non-observed economy etc. In July 2017, the United Nations General Assembly assigned the custodianship of SDG indicator 16.4.1 to the United Nations Conference on Trade and Development (UNCTAD) and the United Nations Office on Drugs and Crime (UNODC) and tasked them with the development of methods and concepts to measure IFFs. These flows often relate to the hidden economy. In 2017-2018, the custodian agencies held expert consultations on the scope and measurement of IFFs, and in January 2019, they established an UNCTAD/UNODC Task Force[2] on the statistical measurement of illicit financial flows with the participation of several national authorities and international organisations.

In October 2019, the Inter-agency and Expert Group on Sustainable Development Goals Indicators (IAEG-SDGs) approved a methodological proposal by the custodian agencies and reclassified the indicator from Tier III to Tier II. This means that the indicator is conceptually clear and aligned with internationally established standards, although data are not yet produced by countries. Accordingly, the statistical definition of IFFs is "*financial flows that are illicit in origin, transfer or use, that reflect an exchange of value and that cross country borders*". In October 2020, UNCTAD and UNODC published a *Conceptual Framework for the Statistical Measurement of Illicit Financial Flows*, developed based on wide expert consultations and in coordination with the UNCTAD/UNODC Task Force.

The purpose of these methodological guidelines is to provide a selection of methods for the pilot testing of the measurement of tax and commercial IFFs in interested United Nations member states. The purpose of pilot testing is to test the feasibility, validity and robustness of the suggested methods. The guidelines are intended for statistical and other national authorities with a mandate to collect and

[1] Large portions of text, specifically in Part I of the guidelines are taken directly from or make explicit and/or implicit reference to the Conceptual Framework for the Statistical Measurement of Illicit Financial Flows, a document by UNCTAD and UNODC (2020).

[2] The Task Force is composed of statistical experts from Brazil, Finland, Ireland, Italy, Peru, South Africa and the United Kingdom of Great Britain and Northern Ireland representing National Statistical Offices, Central Banks, Customs or Tax authorities. Experts from Eurostat, the International Monetary Fund (IMF), the Organisation for Economic Co-operation and Development (OECD), the United Nations Economic Commission for Africa (UNECA) and the United Nations Statistics Division (UNSD) are also represented in the Task Force, in addition to UNCTAD and UNODC.

access relevant information and apply the suggested methods on microdata, to the extent possible, to enable more reliable and comparable results across countries.

The role of official statistics and National Statistical Offices (NSOs) is crucial for the measurement of IFFs, as part of the SDG indicator framework. The General Assembly resolution (A/RES/71/313) *"stresses that official statistics and data from national statistical systems constitute the basis needed for the global indicator framework, recommends that national statistical systems explore ways to integrate new data sources into their systems to satisfy new data needs of the 2030 Agenda for Sustainable Development, as appropriate, and also stresses the role of National Statistical Offices as the coordinator of the national statistical system."*

This is particularly relevant for IFFs that cannot be fully monitored or captured by a single data source. Data needed for the estimation on IFFs are scattered across datasets held by NSOs, tax and revenue authorities, Customs, police, ministries, etc., gathered in government tasks as they touch upon different aspects of this multifaceted phenomenon. Measurement of the many types of IFFs in one indicator can only be done in close collaboration within the national statistical system (NSS) and with administrative data providers, in coordination by the NSO. The compilation of SDG indicator 16.4.1 is a technical, statistical activity that must be carried out independently in line with the Fundamental Principles of Official Statistics.

The guidelines start by introducing the statistical concepts related to tax and commercial IFFs (Part I), while Part II proposes a selection of methods for the pilot testing of the measurement of IFFs. The guidelines assess the strengths and weaknesses of each method and provide country case studies to illustrate the application of the suggested methods. Part III provides practical recommendations, concrete steps and tools for the authorities involved in providing and/or compiling data on tax and commercial IFFs, and Part IV lists additional resources and tools, including a glossary of terms on IFF.

The guidelines, once refined after pilot testing, will be part of a Statistical Framework for the Measurement of IFFs, together with the guidelines on the measurement of IFFs from illegal markets, corruption and exploitation-type activities, being developed by UNODC.

I. What are tax and commercial illicit financial flows?

This section refers to the UNCTAD and UNODC (2020) Conceptual Framework for the Statistical Measurement of Illicit Financial Flows. It identifies four main categories of activities that may generate IFFs, namely:

1. Illicit commercial and tax activities;
2. Illegal markets;
3. Corruption; and
4. Exploitation-type activities and financing of crime and terrorism.

UNODC leads the work to develop guidelines on the measurement of the last three categories, while these guidelines focus on the first category, tax and commercial IFFs.

Since an agreed methodology does not yet exist, the research estimates produced so far vary but indicate potentially large volumes of IFFs, for instance more than US$1 trillion leaking annually from developing economies according to Global Financial Integrity (GFI) (2019) and Africa losing annually over US$50 billion (United Nations Economic Commission for Africa (UNECA), 2015). Many studies at country levels, including by the World Customs Organization (WCO) also suggest the existence of notable IFFs, including from tax and commercial activities (e.g., Alstadsæter et al., 2017; Carbonnier and Mehrotra, 2020; WCO, 2018).

The first chapter of Part I covers the conceptual framework delineating tax and commercial IFFs and providing insight into statistical concepts. Chapter 2 discusses activities and types of tax and commercial IFFs and considers their overlaps and interlinkages. Tax and commercial IFFs are placed into the context of existing statistical frameworks in Chapter 3. Chapter 4 focuses on key data sources and related statistical challenges.

1. Conceptual framework for tax and commercial illicit financial flows

The statistical definition of IFFs is "*financial flows that are illicit in origin, transfer or use, that reflect an exchange of value and that cross country borders*". This includes the category of tax and commercial IFFs that can be generated from illegal commercial activities and tax evasion, and from legal economic activities through aggressive tax avoidance. All IFFs share the following features:

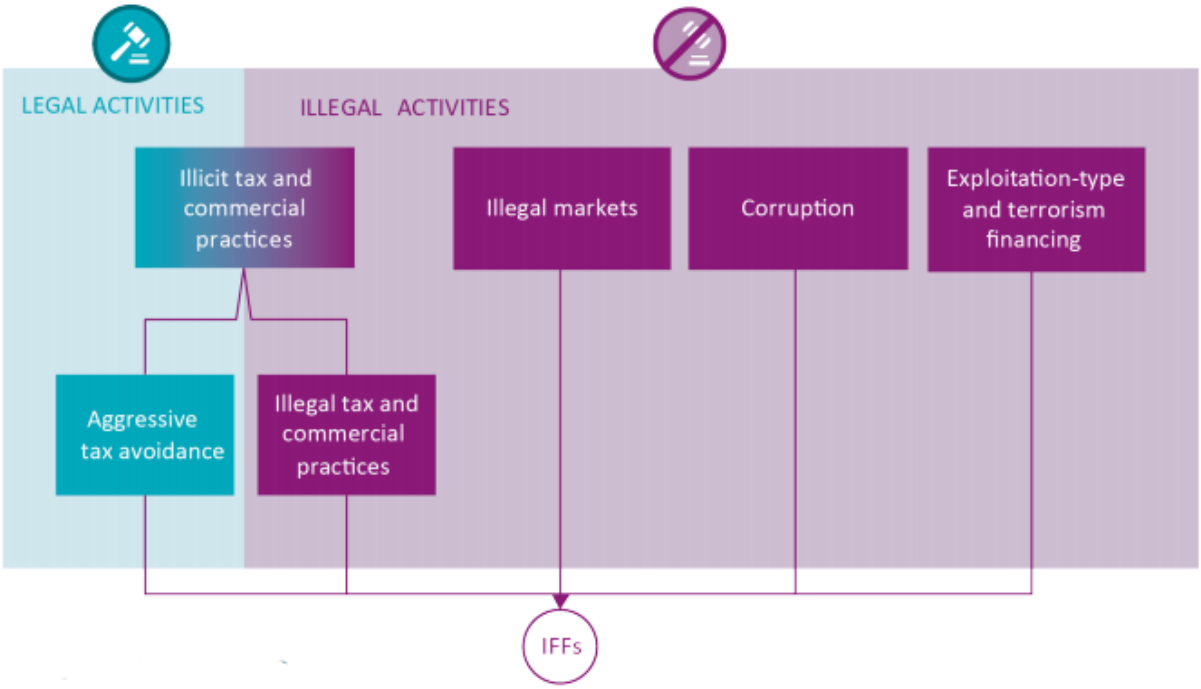
- They are **illicit in origin, transfer, or use**. A flow of value is considered illicit if it is illicitly generated (e.g., originates from criminal activities or tax evasion), illicitly transferred (e.g., violating currency controls) or illicitly used (e.g., for financing terrorism). The flow can be licitly generated, transferred or used, but it must be illicit in at least one of these aspects. Some flows that are not illegal may fall within the definition of IFFs for statistical purposes; for example, cross-border tax avoidance, which erodes the tax base of a country where that income was generated.
- **Exchange of value**, comprising more than purely financial transfers. Exchange of value includes exchange of goods and services, and financial and non-financial assets. For instance, illicit cross-border bartering, meaning the illicit exchange of goods and services for other goods and services (a common practice in illegal markets), is considered as an illicit financial flow.
- IFFs measure **a flow of value** over a given time as opposed to a stock measure, which would be the accumulation of value.

- **Flows that cross a border**. This includes assets that cross borders and assets where the ownership changes from a resident of a country to a non-resident, even if the assets remain in the same jurisdiction.

As outlined in Figure 1, tax and commercial IFFs (left-most category) can be divided into two components[3]:

- **IFFs from illegal commercial and tax practices**. These include illegal practices such as tariff, duty and revenue offences, tax evasion, competition offences and market manipulation amongst others. Most of these activities are non-observed, hidden or part of the "shadow economy", the underground economy or the informal economy that may generate IFFs.
- **IFFs from aggressive tax avoidance**. Illicit flows can also be generated from legal economic activities through aggressive tax avoidance. This can take place through the manipulation of transfer pricing, strategic location of debt and intellectual property, tax treaty shopping and the use of hybrid instruments and entities. These flows need to be carefully considered, as they generally arise from legal business transactions and only the illicit part of the cross-border flows belongs within the scope of IFFs.

Figure 1. Categories of activities that may generate illicit financial flows



Source: UNCTAD and UNODC (2020).

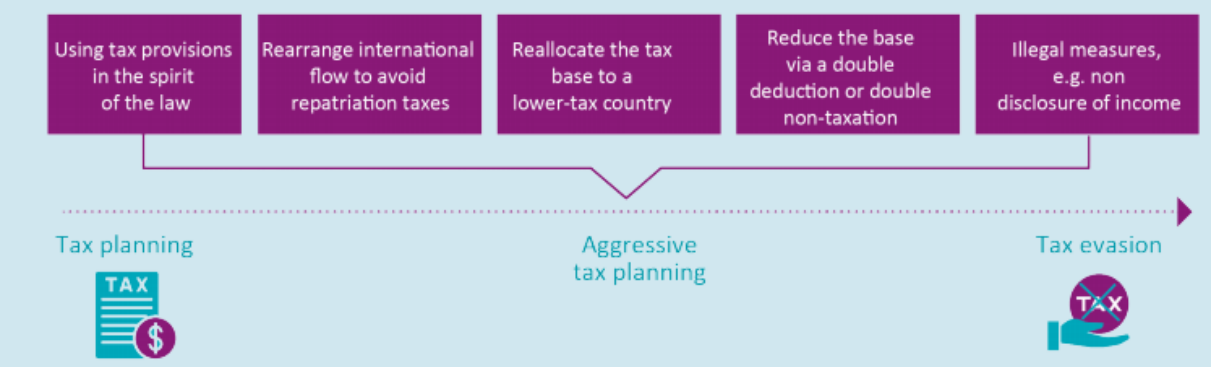
Tax and commercial IFFs may originate in the illegal economy, such as criminal activities or corruption, while they can also originate in legal economic activities but become illicit when the financial flows are managed or transferred illicitly; for instance, to evade taxes or exchange controls or when they are used to finance illegal activities. Tax and commercial IFFs can include practices by legal entities, as well as arrangements by individuals.

It is challenging to specify what kinds of activities should be considered **illicit or licit**. This issue is particularly challenging in the area of tax avoidance. It is noteworthy that SDG target 16.4 refers to

[3] For more detail, see UNCTAD and UNODC (2020).

"illicit" rather than "illegal" financial flows. Tax avoidance, including by multinational enterprise group (MNE), although usually legal, can drain resources and be considered illicit in the context of IFFs. Aggressive tax avoidance is included in the scope of SDG indicator 16.4.1 as an IFF, while noting that activities generating such IFFs are generally legal. Noting that the boundary between legal and illegal practices may be unclear, European Commission (EC) (2017) describes a continuum of activities from legal tax planning to tax evasion which is illegal (see Figure 2). Aggressive tax planning is described as *"taking advantage of the technicalities of a tax system or of mismatches between two or more tax systems for the purpose of reducing tax liability"*.

Figure 2. Boundaries of aggressive tax planning



Source: European Commission (2017).

The actors **whose actions** may generate IFFs and need to be measured include (1) **individuals** (citizens), and (2) **entities**, comprising domestic firms and MNEs as well as trusts and foundations. Several studies focus on MNEs only, due to their opportunities to participate in, but also because of their sheer size or scale of conducted IFFs. Please note that distinction between whether actors come from developed or developing countries is not relevant as both developing and developed countries are affected by tax and commercial IFFs[4].

As defined on the SDG indicator framework, SDG indicator 16.4.1 measures the total value of inward (inflows) and outward (outflows) IFFs. In addition, to curb IFFs, it is important to measure the direction i.e., **inflows and outflows** of IFFs separately. IFF inflows enter the recipient country, and outflows leave the country, draining its resources.

2. Activities generating tax and commercial illicit financial flows

Given the complexity of differing national laws and practices, and with the measurement of IFFs being a statistical exercise rather than an audit or judicial one, it is not possible to define the scope of activities for measurement in terms of their legality. The indicator is, therefore, constructed based on a typology of behaviours, events and activities that may generate IFFs. For illegal activities, we apply the International Classification of Crime for Statistical (ICCS) (UNODC, 2015) as a basis for delineating activities that may generate IFFs. The ICCS details and defines activities, many of which may generate

[4] As IFFs are closely linked to development questions within the 2030 Agenda, significant amount of empirical research on tax and commercial IFFs has focused on developing or less developed, low-income countries (e.g., Carbonnier and Mehrotra, 2018; Ahene-Codjoe et. al., 2020; Nolintha et al., 2020; WCO, 2018; GFI, 2019). This interest is most prominent in trade misinvoicing methods to estimate IFFs which focus on commodity trade. According to Khan et. al. (2019) countries at early stages of industrialisation are 'structurally vulnerable' to trade-related IFFs.

IFFs, such as exploitation-type activities and terrorism, trafficking, and corruption, as well as many activities related to tax and commercial malpractices.

The activities are broken down into two **categories**, namely IFFs from illegal commercial and tax practices and from aggressive tax avoidance. For the purposes of pilot testing, Table 1 provides an indicative list of tax and commercial **activities** that may generate IFFs and identifies types of flows.

Identifying the main types of flows[5] that carry IFFs helps to set up a measurement framework and identify relevant data sources. Knowing the types of flows can help to identify traces of IFFs in the official economy. Carbonnier and Mehrotra (2018) note that data on IFFs arising from legal activities are usually recorded systematically by the administrative service.

Table 1. Activities that may generate tax and commercial illicit financial flows and types of flows

Categories	Activities	Flows
A. *IFFs from illegal commercial and tax activities*	**A1** Acts against public revenue provisions [08041] **A2** Acts against commercial or financial regulations [08042] **A3** Market manipulations or insider trading [08045] **A4** Acts of commercial fraud [07019] **A5** Other illegal commercial and tax acts [08049+]	**F1** Transfer of wealth to evade taxes, i.e., flows related to undeclared offshore wealth o Outright undeclared (concealed e.g., in secrecy jurisdictions) o Undeclared via instruments (Phantom corporations or shell companies, tax havens) **F2** Misinvoicing o Under/over pricing o Multiple invoicing o Over/under reporting of quantities o Misclassification of tariff categories
B. *IFFs from aggressive tax avoidance*	**B1** Acts departing from the arm's length principle **B2** Acts related to strategic location of debt, assets, risks, or other corporate activities **B3** Other acts of aggressive tax avoidance	**F3** Transfer mispricing **F4** Debt shifting o Intracompany loans o Interest payments **F5** Assets and intellectual property shifting o Strategic location of intellectual property o Strategic location of other assets o Cost-sharing agreements o Royalty payments

Source: Authors' deliberations.
Note: Activities in category A are based on level-3 categories of the ICCS (with corresponding codes in brackets).

The table focuses on transfers rather than sources or uses of IFFs that are of interest when describing the value chain related to the generation and management of IFFs. A more exhaustive listing of activities will be provided once a classification is developed for IFFs from aggressive tax avoidance. Money laundering, for instance, is classified under acts involving the proceeds of crime, and is, therefore, covered in methods for the measurement of IFFs from crime. Similarly, IFFs from illegal markets where illegal goods and services are traded, fall under IFFs from crime. They can also make use of legal trading and banking systems.

[5] Referred to in some texts as channels or means. Further work in setting up a classification in this field will address the issue of terminology.

The ICCS describes the actions and behaviours relating to each category and provides examples of the types of activities concerned. The following may generate IFFs related to tax and commercial activities:

- **A1** Acts against public revenue provisions (08041): Acts against Customs, taxation and other public revenue provisions. Included are tax evasion and corporate offences, such as tariff, taxation, duty and revenue offences and failure to register for value added taxation or Customs, or failure to remit, if these lead to cross-border flows of illicit finance. Example: IFFs from misinvoicing by entities or flows related to undeclared assets by individuals fall under this category.
- **A2** Acts against commercial or financial regulations (08042): Acts against commercial, industrial or financial regulations, including competition and fraudulent insolvency; import/export offences; acts against trade regulations, restrictions or embargoes; evasion of capital controls or exchange regulations; investment or stock/shares offences (not amounting to fraud). Example: A denial of an export license application could turn a legal exporter into an illegal exporter due to fears of financial loss and, thus, generate an IFF.
- **A3** Market manipulations[6] or insider trading[7] (08045): Unlawful market manipulation or insider trading, including trading financial products based on inside information (insider dealing); improper disclosure of market-relevant information; misuse of market-relevant information; and price fixing in so far as they generate commercial or tax IFFs and lead to flows of wealth to offshore locations (F1) or mispricing (F2) flows. Example: Market manipulation and insider trading may be linked to mispricing.
- **A4** Acts of commercial fraud (07019): insofar as these are not part of A1-A3, included are use of false weights for measure; false accounting; hiding or destroying money; and unlicensed/unregistered practice in a trade or profession in so far as they generate commercial or tax IFFs and lead to flows of wealth to offshore locations (F1) or mispricing (F2) flows. Example: False accounting could aim at hiding undeclared offshore wealth or evade taxes. Excluded: tax fraud is covered under A1 (08041).
- **A5** Other illegal commercial and tax acts: in line with ICCS includes other acts against public administration and regulatory provisions (08049) and any illegal commercial activities and tax evasion not listed above.

At this stage, the guidelines suggest the pilot testing of two main flows related to the above acts. First, the transfer of wealth out of a country by individuals to evade taxes leading to concealed or undeclared offshore wealth (F1) e.g., in secrecy jurisdictions or tax havens.[8] Such flows might also be concealed using instruments, like shell companies, where borderline between categories A and B is blurred. Second, trade misinvoicing flows (F2) comprising mispricing, wrong reporting of imported or exported quantities, or misclassifying tariff categories of traded goods or services[9]. Trade mispricing may involve over or under pricing that wrongly states the true price in import or export documentation.

[6] Market manipulation is defined as entering into a transaction, placing an order to trade or any other behaviour which gives a false or misleading signal as to the supply of, demand for, or price of, a financial instrument or a related spot commodity contract; or secures the price of one or several financial instruments or a related spot commodity contract at an abnormal or artificial level (UNODC, 2015).

[7] Insider trading is defined as possessing inside information and using that information by acquiring or disposing of, for its own account or for the account of a third party, directly or indirectly, financial instruments to which that information relates (UNODC, 2015). It is used synonymously with insider dealing as in European Union (2014)

[8] According to Tax Research (2019), secrecy jurisdictions intentionally create regulation for the primary benefit and use of non-residents and create a deliberate, legally backed veil of secrecy.

[9] Relationship between the real and financial economy needs to be carefully considered, as they do not necessarily flow in opposite directions: IFF inflows do not automatically mean outflows (export) of goods or services. Rather, exports of goods can create either inflows or outflows of IFFs. Underpriced export of goods from country A to country B represents IFF outflows for country A (and IFF inflows for country B); when the same export is overpriced, IFF inflows into country A are being generated (and IFFs outflows for country B).

The identification of activities and flows related to IFFs from aggressive tax avoidance for the purposes of pilot testing is indicative and based on previous work, for instance on informal economy (IMF, 2019), non-observed economy (OECD, 2002), corporate tax avoidance (Beer et al., 2018), aggressive tax planning (European Commission, 2017), and base erosion and profit shifting (BEPS) (OECD, 2013 and 2015). Base erosion refers to lowering the tax base of a company, thus reducing its taxes paid, whereas profit shifting refers to shifting profits away from the jurisdictions where the activities creating those profits take place (OECD, 2013). According to OECD (2013) activities considered as aggressive tax avoidance can include interest payments, strategic location of intangible assets, abuse of tax treaties, artificial avoidance of permanent establishment and transfer pricing manipulation.

Similar to ICCS, we define initial activities for category B, IFFs related to aggressive tax avoidance, presented in Table 1, as:

- **B1** Acts departing from the arm's length principle: Under the current international tax architecture, transactions between related parties should be conducted on an arm's length prices basis. According to OECD (2017), transactions should be valued as if they had been carried out between unrelated parties, each acting in their own best interest. Where firms engage in transfer mispricing among the units of an MNE (with differing corporate tax rates), they depart from the arm's length principle with a view to shifting profits to avoid taxes.
- **B2** Acts related to strategic location of debt, assets, risks, or other corporate activities: These can include strategic location of debt as noted by OECD (2013) to inappropriately reduce the earnings base of the issuer. To this end, interest costs are deducted from generated turnover reducing tax base (European Commission, 2017). This group also includes the shifting of intellectual property to locations (MNE units) with higher income tax rates, thereby reducing their tax base via royalty payments. Direct investment relationship through equity or debt leverages FDI links to profit shifting (UNCTAD, 2015).
- **B3** Other acts of aggressive tax avoidance. This category includes any other acts with the purpose of aggressive tax avoidance that are not described or classified in categories B1-B2.

The above acts of aggressive tax avoidance can lead to several types of flows, including transfer mispricing (F3) which may involve stretching or violating the arm's length principle; flows related to debt shifting (F4) through intracompany loans and related interest payments which can manifest as excessive borrowing in high-tax countries and lending to low-tax countries; flows resulting from the strategic location of intangible assets, such as intellectual property (F5) to low-tax countries to reduce taxes on associated income and capital gains and shifting profits e.g., through royalty payments or cost-sharing agreements[10].

Different types of strategies or settings can further support shifting profits and generating above-mentioned flows of IFFs (see Beer et al., 2018), such as tax treaty shopping[11] or transfers via hybrid

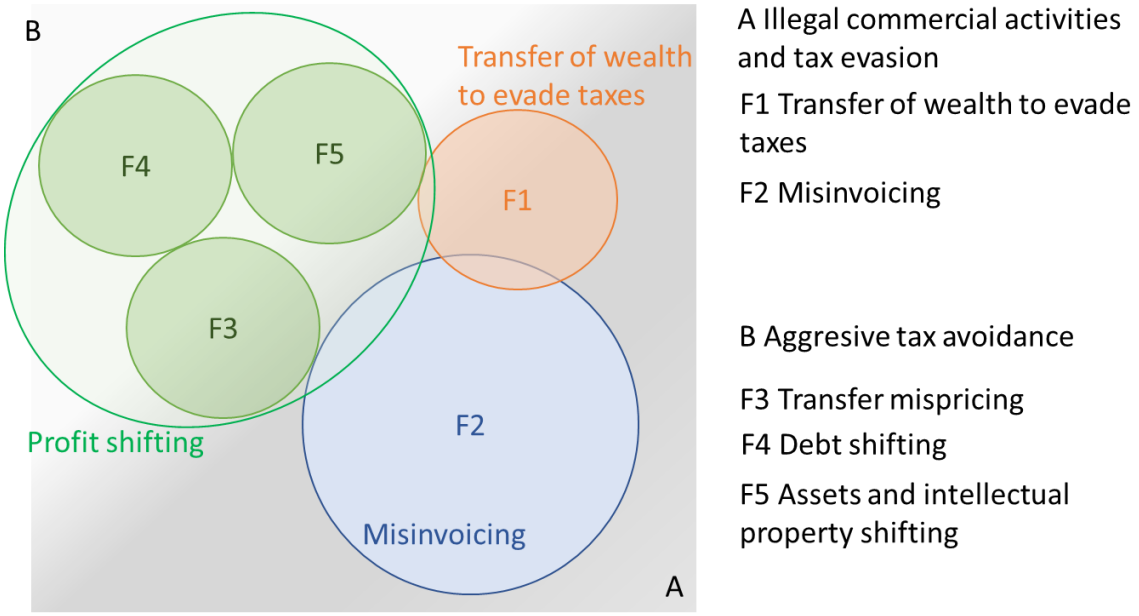
[10] A cost-sharing agreement is a contract between related parties specifying how they will share the costs of developing intangible assets, and how they will arrange the rights to exploit the intangible assets once developed (Dyreng and Markle, 2015).

[11] With tax treaty shopping, entities, including MNEs, have access to a broader range of (potentially mismatching) tax systems and pairs of bilateral tax treaties, creating scope for 'treaty abuse', as noted by OECD (2015). Tax treaty shopping involves the improper use of a double taxation agreements (DTAs), whereby a (legal) person acts through an entity created in another state with the main or sole purpose of obtaining treaty benefits which would not be available directly to such a person (HM Revenue and Customs of the United Kingdom, 2016)

instruments and entities (e.g., phantom corporations[12], shell companies[13], special purpose entities (SPEs) [14], corporate inversions[15]).

Three main types of flows can be identified from the above. First, the transfer of undeclared wealth to offshore locations by individuals (F1); second, trade misinvoicing by entities (F2); and third, aggressive tax avoidance or profit shifting by MNEs (F3-F5) (see Figure 3).

Figure 3. Main types of tax and commercial illicit financial flows



Source: Authors' deliberations

It may be useful to attempt in-depth measurement of different types of profit shifting flows (F3-F5), for feasibility, however, these guidelines propose an aggregated estimate of profit shifting (see Part II). Box 1 illustrates the transfer of profit shifting flows from the exporter to the final consumer through corporate entities.

Box 1. Exposure to profit shifting opportunities in export transactions

A case study of profit shifting in Brazil by Amaral and Barcarolo (2020) presents how profit shifting flows move via export transactions in triangular operations with offshore intermediary entities, located in tax havens or privileged tax regime jurisdictions.

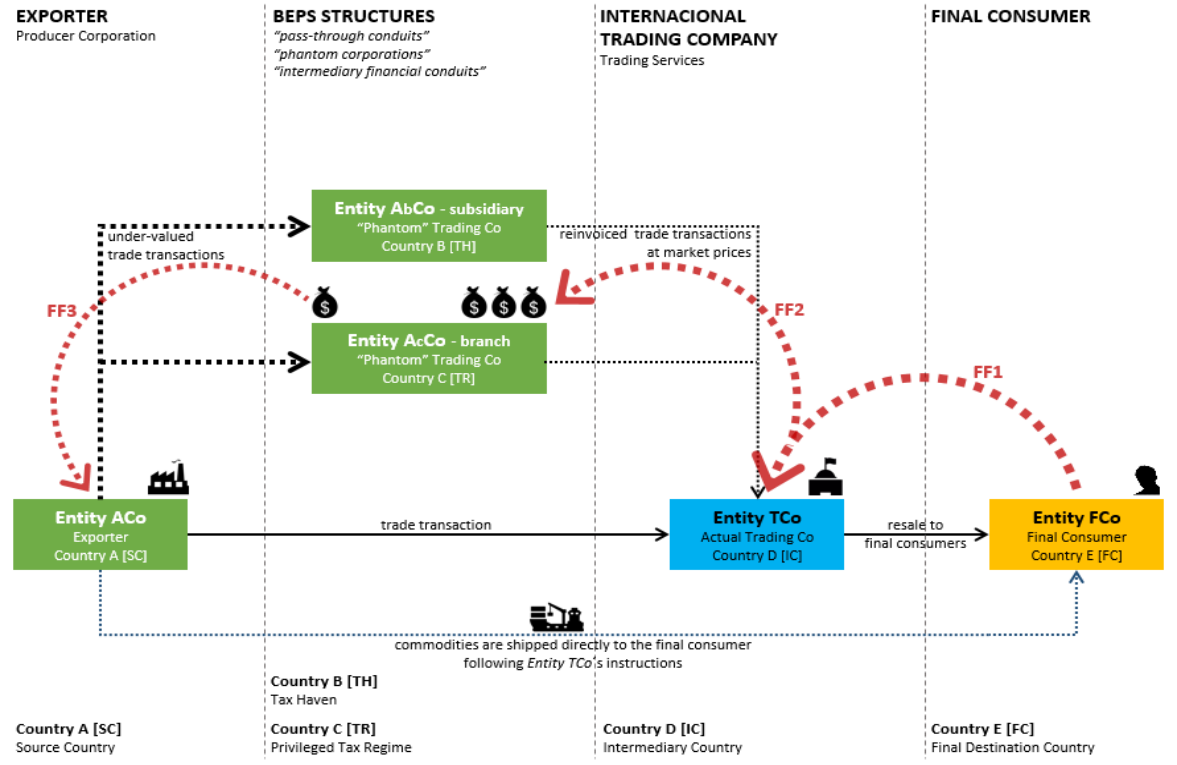
[12] There is no commonly agreed definition of phantom firms. ONE (2013) defines them as "*secretive companies or trusts used by international criminals and corrupt businesses to hide money, rip off governments and siphon off cash that could be used to pay for health care, education or vital infrastructure investment.*"

[13] EPRS (2018) states that shell companies in a country "have no (or few) employees and/or no (or little) production and/or no (or little) physical presence«. The study however, notes that a clear definition does not exist; rather, it is research-driven, and identifies three types of shell companies, SPE being one of the types of shell companies.

[14] IMF (2018) defines SPE as "*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*."

[15] Corporate inversions can take the form of a merger with a foreign entity, which then results in the former domestic parent becoming a subsidiary of the new foreign parent (even though the shareholders of the original domestic company may retain more than 50 per cent of the shares in the new corporation) (Beer et al., 2018).

Infographic on profit shifting opportunities in export transactions



Source: Amaral and Barcarolo (2020)

The payments or financial flows (FF) enabled by the BEPS structures could be disentangled as follows:

- FF1 (Country E [FC] to Country D [IC]): payments from final consumers (e.g.: Entity FCo) to actual international trading companies (e.g.: Entity TCo) at market prices. Low-tax or non-transparent jurisdictions not involved.
- FF2 (Country D [IC] to Country B [TH] or Country C [TR]): payments from actual international trading companies (e.g.: Entity TCo) to phantom trading companies (Entities AbCo and AcCo) at market prices. Low-tax or non-transparent jurisdictions involved.
- FF3 (Country B [TH] or Country C [TR] to Country A [SC]): payments from phantom trading companies (Entities AbCo and AcCo) to the Entity ACo (Exporter) at undervalued prices. Low-tax or non-transparent jurisdictions involved.
- The FF2 is artificially created through the insertion of phantom trading companies (Entities AbCo and AcCo), empty corporate shells with no real economic activity located in low-tax and non-transparent jurisdictions, leading to profit shifting and tax revenue loss where the real economic activity is undertaken, and the income is generated (Country A [SC]).

Where:
[SC]: Source Country, wherein the income is generated.
[TH]: Tax Haven, wherein the trading company (intermediary financial conduit) is located.
[TR]: Privileged Tax Regime, wherein the trading company (intermediary financial conduit) is located.
[IC]: Intermediary Country, wherein the actual international trading companies are located.
[FC]: Final Destination Country, wherein the final consumers are located.

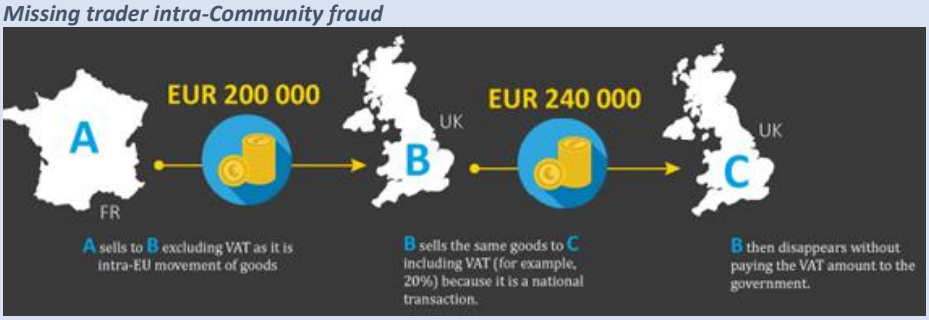
Tax gap estimates can be useful for benchmarking and improving the estimates of IFFs from tax evasion and aggressive tax avoidance. IFF estimates aim at capturing all cross-border flows that relate to tax gap. However, tax gap estimates, for instance of value added tax (VAT), do not usually explicitly consider the part that crosses country borders. It would be useful to apply tax expert's knowledge to assessing the size of tax gap flows that cross country borders.

Box 2. Value added tax fraud

A study by the European Commission (2018b) estimated the VAT gap to be €147 billion in 2016. The reasons for this tax gap include lack of compliance, ranging from negligence, omissions, non-deliberate errors, differences in interpretation, lack of knowledge and insolvencies to deliberate actions such as tax fraud, tax evasion and tax avoidance.

A specific type of VAT fraud is the so-called missing trader Intra-Community (MTIC), sometimes referred to as VAT carousel fraud. Trading across borders is tax free within the European Union (EU). In MTIC fraud the first company in the chain charges VAT to the customer but does not pay it to the government, becoming the missing trader.

Missing trader intra-Community fraud



Source: Europol, 2019

The part of VAT gap that crosses borders belongs to the scope of IFFs. The United Kingdom (ONS, 2020) produces monthly estimates of MTIC fraud trade.

MTIC fraud trade in the United Kingdom, millions of British Pounds

Source: ONS (2020)

A case study in Finland estimates that the amount of MTIC fraud can be up to €35 million per year (Ristola and Mäki, 2018). The estimate is based on a combination of cases identified in tax surveillance and audit, and the profiling of companies with similar characteristics in the economy.

Frunza (2016) used a macroeconomic model finding that MTIC fraud accounts for almost €94 billion in 2014 across 28 EU member states representing 0.67 per cent of EU's GDP. Many Tax authorities globally carry out regular tax gap studies, for instance the Australian Taxation Office (2021) and the United States Internal Revenue Service (2016), and IMF has estimated the tax gap jointly with the authorities of many countries, for instance in South Africa (IMF, 2015).

3. Links to statistical frameworks

Integrating the measurement of IFFs in existing statistical frameworks is important for consistency, exhaustiveness, and the overall quality of estimates. Using existing statistical concepts and definitions also enables reusing data of statistical authorities, thus reducing compilation costs and burden to respondents. It can also enrich the analytical power of IFF estimates if they can be linked with other statistical data to assess their impacts, e.g., the economic or social consequences. Aligning with current

statistical practice helps countries absorb the measurement of IFFs and promotes international comparability. Two frameworks are of particular importance: the System of National Accounts (SNA) and the Balance of Payments (BoP).

The 2008 SNA (United Nations et. al., 2008) defines a transaction as "*an economic flow that is an interaction between institutional units by mutual agreement*". In the SNA, each transaction that satisfies the principle of "mutual agreement" between parties is to be included within the production boundary, i.e., as a productive activity, whether it is legal or not. The European Commission (2018a) emphasizes that all economic phenomena irrespective of whether they are legal or illegal should be included in macroeconomic statistics. While only productive activities generate value added, non-productive activities can also transfer value from one actor to another.

The indicator on IFFs should measure all IFFs whether they are considered productive activities or not, and even in cases where there is no mutual agreement, for instance in the case of embezzlement or theft. According to the European Commission (2018a), there is no mutual agreement between the tax evader and the tax administration. Tax evasion is outside of the SNA production boundary. However, transactions taking place between the evader and its counterpart (e.g., through misinvoicing, undeclaring of assets through tax havens) are mutually agreed and may originate in legal economic activities. To link IFFs with the SNA and the BoP, it is important to know which activities are already covered in the accounts and which ones are not. Some flows, like the exploitation type[16], that fall outside of the SNA production boundary, could still be accounted for in the national accounts and BoP statistics as 'other flows'[17].

Many illicit activities are intertwined, such as bribery related to trade mispricing. Separate accounting of income generation and income management can help to avoid some of the potential overlaps and to be consistent with the SNA, BoP and other statistical frameworks (UNCTAD and UNODC, 2020)[18]:

- **Illicit income generation** includes the set of cross-border transactions that are either performed in the context of the production of illicit goods and services or generate illicit income for an actor during a non-productive illicit activity; and
- **Illicit income management** refers to cross-border transactions that use illicit income to invest in financial and non-financial assets or to consume goods and services.

Income generation can be represented by three main aggregates: gross output, intermediate expenditure (or intermediate costs) and value added (which also represents the net income for the actors).

- **(Illicit) gross income/(illicit) gross output** refers to the value of the illicit goods or services produced in a given period. The value is determined as quantity-times-price (where the price is, for example, the retail price in the domestic market, or the export price if goods are exported).
- **(Illicit) intermediate expenditure** refers to the value of (licit and illicit) inputs acquired to produce illicit goods and services over a given period. The value of inputs is determined as quantity-per-price (where the price is, for example, the domestic price if the goods are bought from a resident, or the import price if the goods are bought from a non-resident).

[16] Exploitation-type activities are illegal activities that entail a forced and/or involuntary transfer of economic resources between two actors. They fall outside the scope of the SNA, since there is no mutual agreement between parties (UNCTAD and UNODC, 2020).
[17] European Commission (2018a) defines other flows as "*genuine economic phenomena and capture changes in assets and liabilities between opening and closing positions that are not due to transactions*", which is in line with 2008 SNA definition of other flows.
[18] Further methodological work will provide its comprehensive linkage to and integration with standards such as SNA and BoP.

- **(Illicit) value added/(illicit) net income** is the economic result of the productive process. It is determined as gross output-minus-intermediate expenditure. It also represents the net income (income after accounting for costs) earned by all actors carrying out the illicit activity.

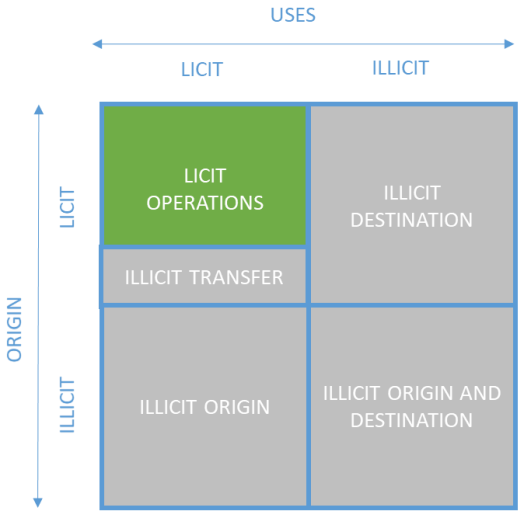
3.1 Income generation/income management framework for tax and commercial illicit financial flows

This section divides illicit tax and commercial practices into the income generation and income management framework for measuring IFFs, which is also helpful for linking with international statistical standards (i.e., SNA and BoP).

IFFs are generated by cross-border transactions carried out by individuals and/or corporations (i.e., economic agents) in which the exchanged resources (i.e., commodities, goods, services, financial and non-financial assets) are illicit in origin and/or use or when, though licit in their origin and use, the modality of the transfer is illicit.

The origin/use matrix in Figure 4 conceptualises the generation of IFFs. Excluding the green part of the upper-left corner, other types of transactions generate IFFs as they involve resources that are illicit in origin and/or destination or that, though licit, are exchanged in an illicit way. This scheme can be used as a first step to interpret transactions and classify them into the scope of IFFs identification and measurement.

Figure 4. Origin/use framework and the generation of IFFs



Source: Author's deliberations

Transactions may involve different kind of resources and rationales: goods and services may be acquired in order to either carry out production processes (i.e., intermediate consumption) or to be consumed (i.e., final consumption) or invested (i.e., investments), where investments may in turn involve either financial or non-financial assets.

Transactions may be classified by economic agent, object, function etc. Clustering transactions by function allows for grasping the rationale for the economic operations generating IFFs and presenting them coherently within the origin/destination scheme.

The operations that economic agents (e.g., individuals, corporations, public administrations) carry out contribute, on one hand, to determining the amount of income they have at their disposal and, on the

other hand, determining how this disposable income is spent in either final consumption or investments (savings).

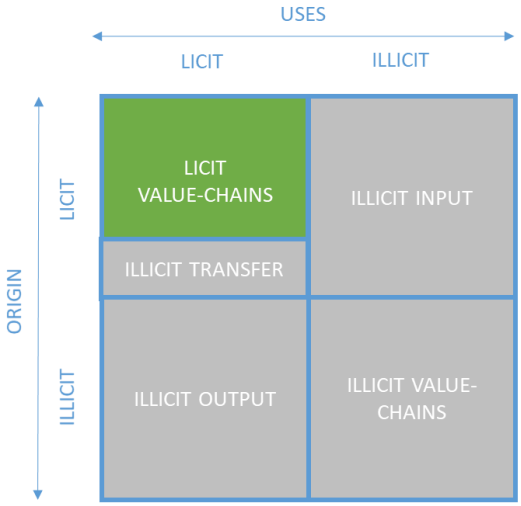
Taking this perspective, transactions can be classified into income generation operations (IGOs) and income management operations (IMOs) according to the finality (i.e., determination of disposable income or definition of the use of the disposable income) of the transaction.

In particular:

- IGOs include all transactions (and transfers) that generate the income of individuals or corporations (e.g., intermediate consumption, production, salaries, interests and dividends);
- IMOs include all transactions involving the use of the disposable income (e.g., consumption of goods and services, acquisition and disposal of financial and non-financial assets).

Matching the definition of IGOs and IMOs with the origin/destination framework shown in Figure 4, two different matrices can be derived to interpret the type of transactions that may generate IFFs. Figure 5 shows IGOs in the origin/use framework.

Figure 5. Origin/use framework and income generation operations (IGOs)



Source: Author's deliberations

Five types of IGOs may emerge:

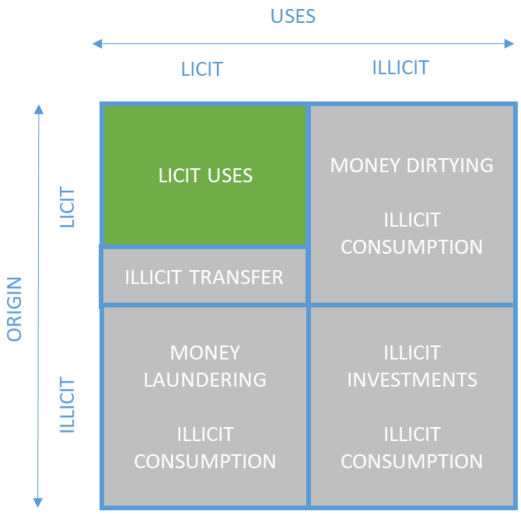
- *Licit value chains*, when both the activity that produces the output and the one that uses the good/service as input are licit;
- *Illicit transfers*, when, though both activities are licit, the exchange is carried out in an illicit way;
- *Illicit value chains*, when both activities are illicit;
- *Illicit output*, when the activity that produces the output is illicit whereas the one that uses the good/service as input is licit;
- *Illicit input*, when the activity that produces the output is licit whereas the one that uses the good/service as input is illicit;

Figure 3 shows in turn IMOs in the origin/use framework and here five types of operation may emerge:

- *Licit uses*, when both the origin of the income (the productive and distributive actions) and its use (the goods/services consumed and the assets acquired) are licit;

- *Illicit transfers*, when, though both the origin of the income and the use are licit, the transaction is carried out in an illicit way;
- *Illicit investments/illicit consumption*, when both the origin of the income and its use are illicit;
- *Money dirtying/illicit consumption*, when the origin of income is licit whereas the use is illicit;
- *Money laundering/illicit consumption*, when the origin of income is illicit whereas the use is licit;

Figure 6. Origin/use framework and income management operations (IMOs)



Source: Author's deliberations

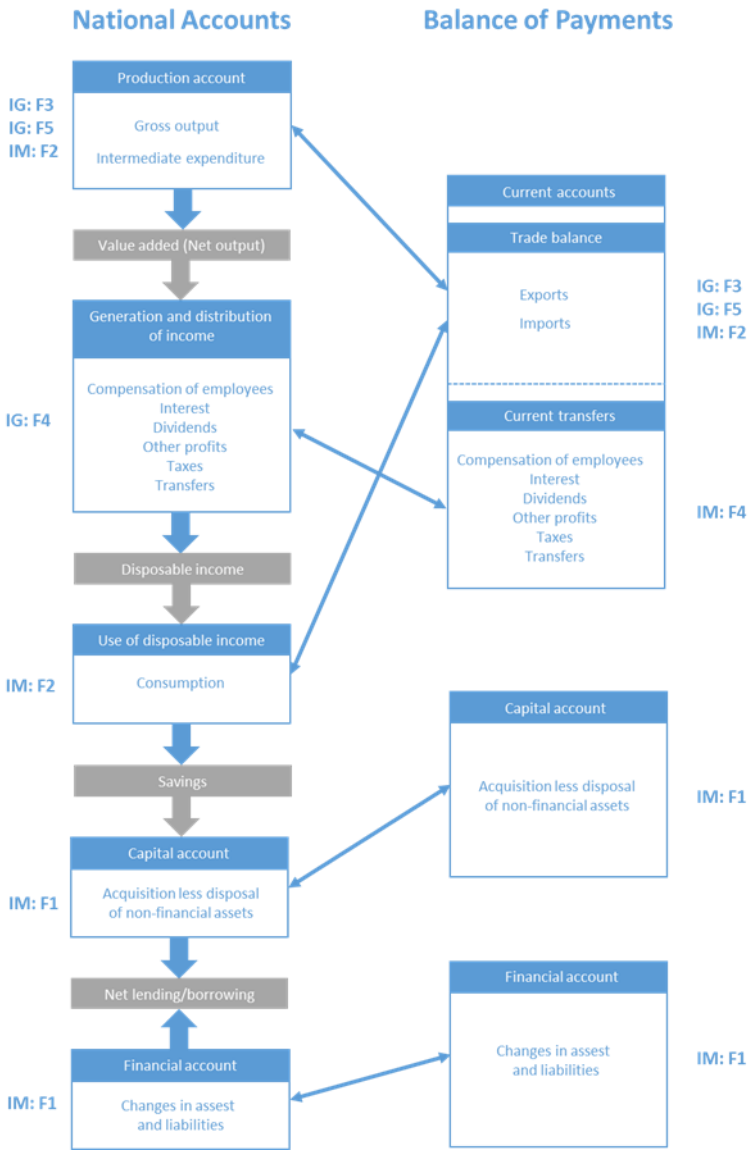
Each type of (licit or illicit) practices that generates IFFs can be classified and interpreted. They generate flows that may be included in the taxonomy according to the characteristics of the given practices and the nature of the transaction in terms of object (i.e., licit/illicit goods/services/assets) and function (i.e., production, distribution, consumption, investments).

3.2 Income generation and income management in the sequence of national accounts and balance of payments

This IGO/IMO matching between SNA/BoP and the statistical framework for measuring IFFs allows tracking down how and where IFFs are (or should be) included in the SNA and the BoP. Furthermore, this also permits defining how the different practices generating IFFs are (or should be) conceptually positioned in the sequence of accounts.

As Figure 7 shows, the SNA takes the form of a sequence of accounts representing the way in which value added is generated, distributed and used by resident agents (also considering the interaction with non-resident ones) in order to modify the net position of an agent (or a country) with respect to the rest of the world. IGO or IMO, as well as related flows (as defined in Table 1) are clearly marked in the figure.

Figure 7. Sequence of accounts and main items in the national accounts and balance of payments



Source: Author's deliberations

In particular, *production account* represents the generation of value added as the result of the production of an output starting from a set of inputs. The *generation and distribution of income account* shows in turn how the value added is distributed among the factors of production as compensation of employees and different kinds of profits (e.g., interests, dividends, withdrawals, mixed income) in order to generate the primary income of agents. A second level of distribution of income relates to taxation and current transfers, which contribute to modify the allocation of income among agents defining their disposable income. This amount of resources can be consumed or saved, and the choice between the two uses is represented in the *use of income account*. Savings contribute to fund the net acquisition of non-financial assets (acquisition less disposal), represented in the *capital account*. In this context, if savings are higher than the amount of resources needed to the net acquisition of non-financial assets then a positive financial position emerge (net lending). Conversely, if savings are lower than the given amount, then a negative financial position emerges (net borrowing). A positive or negative position of agents involves a change in the stock of their assets and liabilities

registered in the *financial account*: the net change (assets less liabilities) has to be equal in amount and coherent in sign with respect to the net position resulting from the capital account.

This sequence of accounts can be compiled for each resident agent (normally by institutional sector, which includes residents by typology), also taking into account their interaction with non-residents. In this respect, the BoP is a complement of SNA, considering the relationships between residents and non-residents along the whole sequence of accounts. Indeed, as Figure 4 shows, BoP takes the form of an analogous sequence of accounts with respect to SNA, representing the way in which residents in the given country interacts with the rest of the world.

Current account of BoP includes all the operations that are connected with production, generation and distribution of income, and the use of disposable income. In particular, *trade balance* (exports net imports) includes the operations connected with production account (e.g., export of output and import of intermediate inputs), and the use of disposable income (e.g., imported consumption). *Current transfers* include cross-border (inward and outward) flows linked to the generation and distribution of income (e.g., compensation of non-resident workforce, remittances, payments of dividends or interests to non-residents). *Capital account* of BoP registers cross-border flows connected with the acquisition and disposal of non-financial assets, contributing to define the final position of a country as net borrower or net lender. Finally, *financial account* of BoP registers financial operations aimed at balancing the real position of the given country with respect to the rest of the world.

In this framework, cross-border movements of resources (current, capital or financial) have to be registered in order to define the relative position of a given country with respect to the rest of the world. Current and capital account of BoP define the way in which cross-border flows contribute to generate the final position of the country (as net lender or net borrower). Financial account of BoP stresses the way in which a negative position (net borrowing) is financed by selling (financial) assets abroad or, symmetrically, a positive position (net lending) finances the acquisition of foreign (financial) assets.

SNA and BoP compose therefore a combined framework permitting to register any flow of resources in both a domestic and a cross-border perspective. In particular, SNA contains the information included in BoP and represents the general framework from a country perspective. The structure of this combined framework also permits to define the final position of each resident agent (or country, as the whole set of residents), taking into account their interaction with non-resident agents (or foreign country, as the set of non-residents residing other countries).

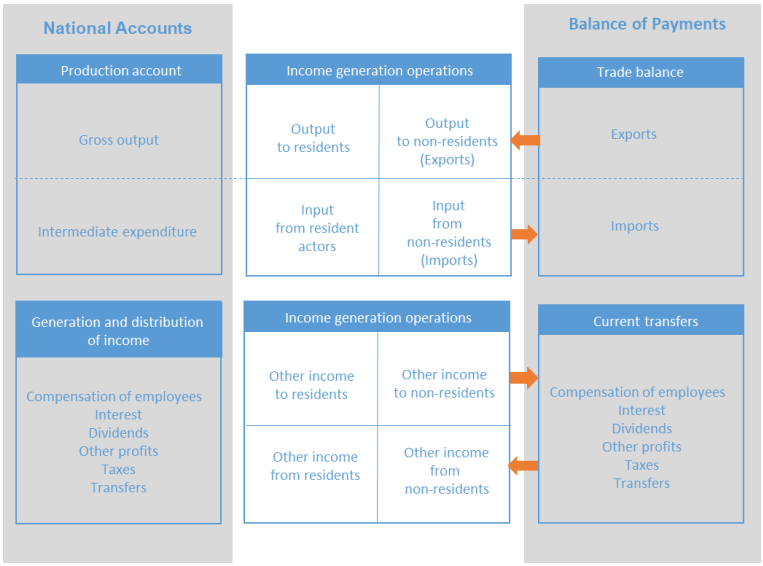
Looking first at income generation in SNA and BoP, IGOs refer to transactions related to productive and distributive operations. In particular, IGOs include transactions related to production processes (e.g., selling out goods and services, acquisition of productive inputs) and to the formation and distribution of income (e.g., pay/receive interest and dividends or other form of profits, compensation of employees, other transfers including those with Public Administration).

Taking into account the sequence of accounts presented in the preceding paragraph, therefore, IGOs can be split into two sub-categories: productive and distributive operations. In this context, Figure 8 shows where different sub-categories of IGOs are included in SNA and BoP.

Transactions related to production processes are included in the *production account* in SNA (i.e., gross output, intermediate consumption) and, where involving an exchange with non-resident agents in the *trade balance* of BoP (i.e., imports, exports). Concerning IFFs (orange arrows in Figure 8), only cross-border operations are considered and the direction of flows (inward or outward) is the opposite with

respect to the one of the good/service traded (i.e., imports generate outward IFFs, exports generate inward IFFs).[19]

Figure 8. IGOs and the sequence of accounts of the national accounts and balance of payments



Source: Author's deliberations

Transaction referred to distributive actions are instead included in the *generation and distribution of income account* in the SNA (according to the type and direction of flow, e.g., dividends, interests) and, where involving an exchange with non-resident agents in the *current transfers* in the BoP (according to the type and direction of flow, e.g., dividends, interests). Also in this case, only cross-border operations fall into the scope of IFFs (signalled by orange arrows in Figure 8) and the direction of flows (inward or outward) follows the one of the related transfer (e.g. payment of interest generates outward IFFs, receiving dividends generates inward IFFs).

As for income management within the SNA and the BoP, IMOs refer to transactions related to the use of disposable income. They include transactions related to consumption (i.e., acquisition of goods and services) and investments (i.e., acquisition and disposal of financial and non-financial assets).

IMOs can be split into two sub-categories, in this case according to the nature of the object of the operation (i.e., goods/services and non-financial assets or financial assets). Figure 9 shows where different sub-categories of IMOs are included in the SNA and the BoP.

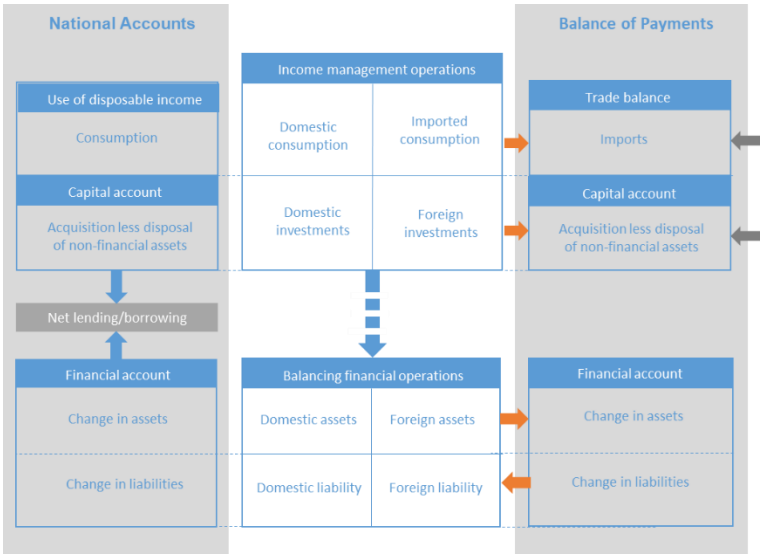
Transactions related to goods/services and non-financial assets fall in the *use of disposable income account* (i.e., consumption of goods and services) or into the *capital account* (i.e., acquisition or disposal of non-financial assets) in the SNA. If the exchange involves non-resident agents, the transaction should also be registered in the *trade balance* (i.e., consumption of goods and services) or in the *capital accounts* (acquisition of non-financial assets) in the BoP.

In the case of IFFs, where only cross-border operations are under analysis, the use of income (as consumption or investments) generate outward IFFs (orange arrows in the upper part of Figure 6). Inward IFFs (grey arrows in the upper part of Figure 9) are instead generated when non-resident agents

[19] The opposite direction of goods/services and financial flows is to be intended as a general rule that may be reversed in case of peculiar type of fraud such as misinvoicing in international trade (see below). Indeed, exports under-invoicing generates outward IFFs (even though exports generally involve inward financial flows), while imports over-invoicing generates inward IFFs (even though imports generally involve outward financial flows).

use their illicit income in order to buy goods/services produced in the given country or when they acquire non-financial assets (which are disinvested by the given country).

Figure 9. IGOs and the sequence of accounts of the national accounts and balance of payments



Source: Author's deliberations

Transactions related to financial assets fall into the *financial account* in both the SNA and the BoP (as changes in assets and liabilities). Operations on financial assets and liabilities are the financial counterpart of the whole set of real operations carried out by residents (also with non-residents), and have also the role of balancing their final position in terms of net borrowing/lending. Cross-border operations on financial assets generate IFFs according to the direction of the transaction (i.e., inward IFFs when liabilities (assets) increase (decrease), outward IFFs when liabilities (assets) decrease (increase)).[20]

3.3 How to interpret different tax and commercial IFFs in IGO/IMO framework

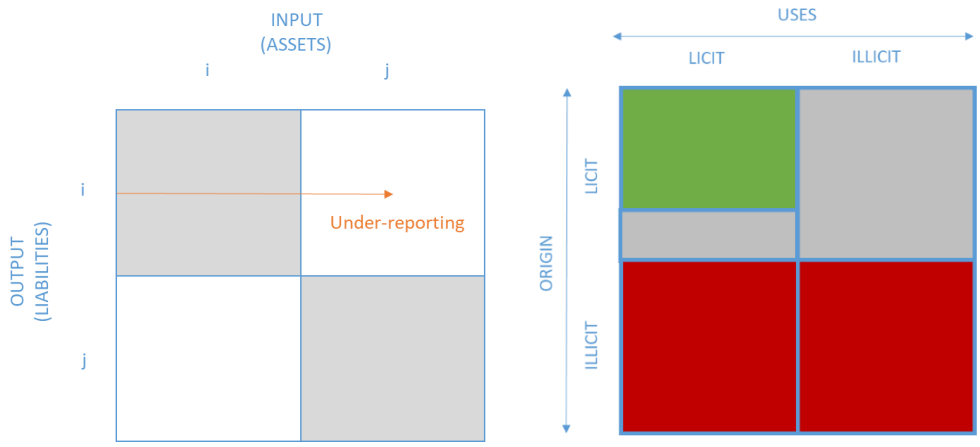
This section describes how different illicit tax and commercial practices generating IFFs (as defined in Table 1) can be classified and interpreted in the IGO/IMO framework and where the relative flows can be (or already are) registered in SNA and BoP. Five flows are analysed under the following headings.

Undeclared offshore wealth (F1)

Undeclared offshore wealth refers to misreporting of non-financial and/or financial assets with the aim of under-reporting the wealth which is held by resident of higher taxation countries (country i) in countries with lower taxation or less transparent financial systems (country j). The left part of Figure 10 provides an input/output representation of undeclared offshore wealth.

[20] Exogeneous changes in the value of assets and liabilities (e.g., capital gains, change in the value of bonds) are not taken into account in this treatment.

Figure 10. Undeclared offshore wealth



Source: Author's deliberations

The under-reporting of financial and/or non-financial assets refers to transactions in which those resources have been acquired by residents in country i as a way to use their income, and the related flow falls therefore in IMOs. Referring to the taxonomy in Figure 6, under-reporting of offshore wealth may fall in different categories according to the nature of both the income and the investment.

Undeclared assets could be in principle both licit and illicit, while the income that finances their acquisition is illicit by definition (otherwise there was no incentive to under-report). Consequently, undeclared offshore wealth can be included in the two lower portions of the classification matrix of IMOs (see the right part of Figure 10): money laundering (when the undeclared asset is licit) or criminal investments (when the undeclared asset is illicit). In terms of direction of flows, undeclared offshore wealth generates inward IFFs for country j (the country that sells the asset) and outward IFFs for country i (the country that acquires the asset).

Transactions behind undeclared wealth are linked to the acquisition and disposal of financial and/or non-financial assets. Therefore, from a SNA perspective they should be registered in *capital account* or *financial account* according to whether non-financial or financial assets are involved, and the same hold for BoP.

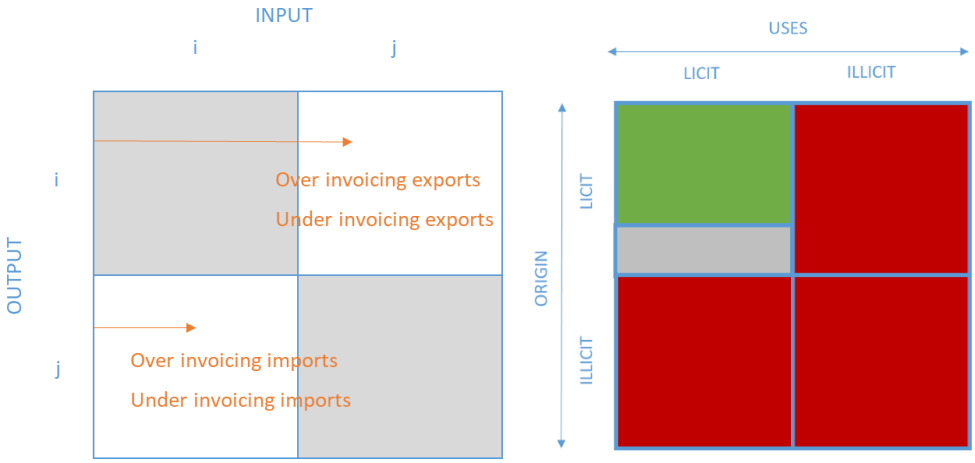
Trade misinvoicing (F2)

Trade misinvoicing occurs when licit transactions between trading partners are mis-reported to fiscal and control authorities in order to shift money among countries (or evade custom duties). In particular, taking countries i and j, four scenarios can be distinguished based on the characteristics of the possible asymmetries in mirror invoicing:

- $IMP_i > EXP_j$ (import over-invoicing)
- $EXP_i < IMP_j$ (export under-invoicing)
- $IMP_i < EXP_j$ (import under-invoicing)
- $EXP_i > IMP_j$ (export over-invoicing)

From the perspective of country i, over-invoicing imports and under-invoicing exports may generate IFFs aimed at retaining or moving resources abroad (outward IFFs). Under-invoicing imports and over-invoicing exports can be connected with custom fraud (on duties or export credits respectively) involve inward IFFs for country i. The left part of Figure 11 provides an input/output representation of trade misinvoicing.

Figure 11. Trade misinvoicing



Source: Author's deliberations

Though relating to imports and exports of goods and services, trade misinvoicing cannot be included in productive operations. Indeed, the misevaluation does not involve the value of the good/service (as in the case of transfer pricing or assets shifting) but only the registration. The practice, therefore, would not be connected with the shifting of costs and revenues but it would seem more related to the possibility of shifting money to be used from one country to another, thus falling in the class of IMOs. The case of custom fraud is an exception to this conceptualization: in this case, trade misinvoicing can be considered as part of productive operations and would fall in the class of IGOs.

Trade misinvoicing may generate different types of IMOs according to whether the origin and destination of income are licit or illicit (right part of Figure 11). Indeed, an income of licit origin can be shifted abroad to be used in illicit ways (i.e., money dirtying, the upper right portion of the matrix), while an income of illicit origin can be shifted abroad to be used in both licit (i.e., money laundering, the lower left portion of the matrix) or illicit (i.e., criminal investments, le lower right portion of the matrix) ways.

Flows connected with trade misinvoicing should be registered as imports/exports in the *production account* of SNA (and in the *use of income account* in the balance of current cross-country operation item) and in the *trade balance* of BoP.

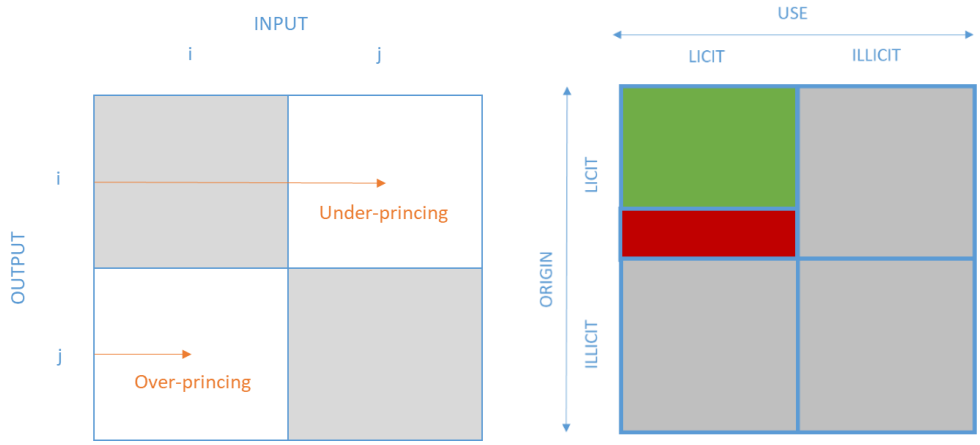
Transfer mispricing and assets shifting (F3 and F5)

Transfer mispricing and assets shifting are finalised to shift profits among different units of a MNE group by under/over pricing productive inputs (e.g., components) or assets (e.g., intellectual property products) with the aim of distributing intra-group costs and revenues so as to let the bulk of profits emerge in the country with lower taxation.

The left part of Figure 12 provides an input/output representation of both transfer mispricing and assets shifting. Let i be a country characterised by a higher taxation level than country j. Transfer pricing/assets shifting takes the form of either an overpricing of the input (output) acquired (sold) by the business unit resident in country i (country j) or an underpricing of the input (output) acquired (sold) by the business unit resident in country j (country i).

Both practices relate to production processes and should therefore be included in IGOs. In particular, referring to the taxonomy in Figure 5, transfer pricing/assets shifting refer to licit output used as input in licit production processes while the transaction is carried out in an illicit way (the red portion of the upper-left portion of the classification matrix show in the right part of Figure 12). In this context, IFFs generated by transfer pricing and assets shifting are normally inward (outward) for the country that receive the over (under) payment.

Figure 12. Transfer mispricing and assets shifting



Source: Author's deliberations

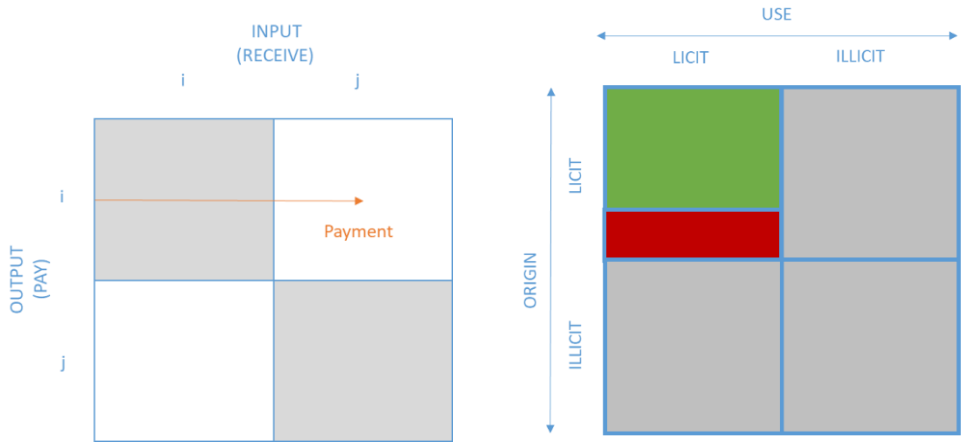
Transactions connected with transfer pricing and assets shifting should be included in the *production account* of SNA (as output or intermediate costs according to the direction of the transaction) and in the *trade balance* of BoP (as import or export of goods/services according to the direction of the transaction).

Debt shifting (F4)

Debt shifting relates to intra-group borrowing/lending of financial resources that allows multinational groups for distributing negative financial position in countries characterised by higher taxation levels. The payment of interest reduces the tax base for determining the taxation of income. Indeed, the flow of interests represents a cost for the business unit in country i (the country with higher taxation level) and a revenue for the business units in country j. The left part of Figure 8 provides an input/output representation of debt shifting.

The flow of interests (the repayment of the debt) involved in debt shifting concurs to determine the income of agents and should therefore be included in IGOs. In particular, referring to the taxonomy of IGOs in Figure 5, debt shifting refers to a licit payment of interest by the borrower (output) which is licitly received by the lender (input) while the transaction is carried out in an illicit way. The practice is therefore included in the red portion of the upper-left portion of the matrix in the right part of Figure 13. In this context, IFFs generated by debt shifting are normally inward (outward) for the country that receive (pays) the flow of interest.

Figure 13. Debt shifting



Source: Author's deliberations

Transactions connected with debt shifting (the flow of interests) should be included in the *generation and distribution of income account* of SNA (as paid or received interests according to the direction of the transaction) and in the *current transfer* of BoP (as paid or received interests according to the direction of the transaction).

Based on the definitions provided in the preceding paragraphs, illicit tax and commercial activities can be qualified and taxonomised so as to obtain a comprehensive interpretative framework.

In this respect, Table 2 shows, for each tax and commercial IFFs, the type of flow involved, the function of the operation, how they can be classified into income generation/income management classification and how they are included in SNA and BoP.

Table 2. Characteristics of tax and commercial IFFs

Flow	Type	Object of the flow	Function of the operation	IG/IM taxonomy	SNA		BoP	
					Account	Item	Account	Item
Transfer mispricing	F3	Goods/Services	Production	IGOs	Production account	Output, Intermdiate costs	Trade balance	Imports, Exports
Assets shifting	F5	Goods/Services	Production	IGOs	Production account	Output, Intermdiate costs	Trade balance	Imports, Exports
Debt shifting	F4	Interests	Distribution of income	IGOs	Generation and distribution of income account	Pay/Receive interests	Current transfer	Pay/Receive interests
Undeclared offshore wealth (Non financial assets)	F1	Financial assets	Use of income	IMOs	Financial account	Acquisition less disposal of financial assets	Financial account	Acquisition less disposal of financial assets
Undeclared offshore wealth (Financial assets)	F1	Non-financial assets	Use of income	IMOs	Capital account	Acquisition less disposal of non financial assets	Capital account	Acquisition less disposal of non financial assets
Trade mis-invoicing (general)	F2	Goods/Services	Use of income	IMOs	Production account, Use of income account	Output, Intermediate costs, balance of current cross-country operations	Trade balance	Imports, Exports
Trade mis-invoicing (evasion of custom duties)	F2	Goods/Services	Production	IGOs	Production account	Output, Intermdiate costs	Trade balance	Imports, Exports

3.4 Other aspects of linking to statistical frameworks

The measurement of IFFs also follows the concept of **residence**, as defined in the Balance of Payments and International Investment Position Manual, 6th edition (BPM6)[21]: "*The residence of each institutional unit is the economic territory with which it has the strongest connection, expressed as its center of predominant economic interest*" (IMF, 2009).

Valuation is done in line with the 2008 SNA and BPM6, i.e., goods and services (and other categories, such as assets and labour) are valued at market prices when exchanged. The concept of market prices is important when trying to estimate IFFs by identifying abnormal prices. Market prices are the actual price agreed upon by the transactors. In the case of non-market transactions, valuation is made according to costs incurred or by reference to market prices for analogous goods or services.

The **change of ownership principle** requires that imports and exports related to processing without a change of ownership are excluded from trade statistics, even if they cross country borders. This principle may be challenging for countries to follow and can contribute to trade asymmetry – one of the many issues to be considered when estimating IFFs based on trade data. All financial flows crossing borders, on the other hand, are included when estimating IFFs irrespective of ownership change.

The activities that generate IFFs need to be analysed carefully and placed in a framework so that statisticians can identify the various components that need to be accounted for. This calls for a discrete, exhaustive, and mutually exclusive **statistical classification** aligned with existing statistical frameworks and principles. IFFs are, therefore, compiled based on the classification and definitions provided by the ICCS (UNODC, 2015) for illegal activities, and an extension will be built using a similar logic for the aggressive tax avoidance part, not covered by the ICCS.

Early work on the non-observed economy sets the basis for improving the exhaustiveness of national accounts and balance of payments statistics to cover activities and flows generated therein (e.g., OECD, 2002; Eurostat, 2005; and European Commission, 2018a). As these concepts are methodologically and conceptually more advanced, observing the relationship between IFFs and non-observed economy may support the measurement of IFFs, and ensure their alignment with existing statistical frameworks. One such attempt is presented in Box 3.

Box 3. Linking concepts related to illicit financial flows

Many concepts partially overlap with the scope of IFFs. The figure links four related concepts to IFFs, namely the non-observed economy[22], Eurostat's tabular approach to fight non-exhaustiveness of the national accounts, informal sector[23] and shadow economy[24]. Non-observed economy and Eurostat's tabular approach to non-exhaustiveness are taken as the basis to which the other concepts are linked. Informal sector plays an important role in many developing economies, yet ILO (2015), by definition, excludes illicit activities from the informal economy. Shadow economy (and closely related concepts, such as underground economy) lacks a clear statistical definition. Only IFFs delineate their scope by a focus on cross border flows. The figure considers the four main types of IFFs, not only IFFs from commercial and tax practices.

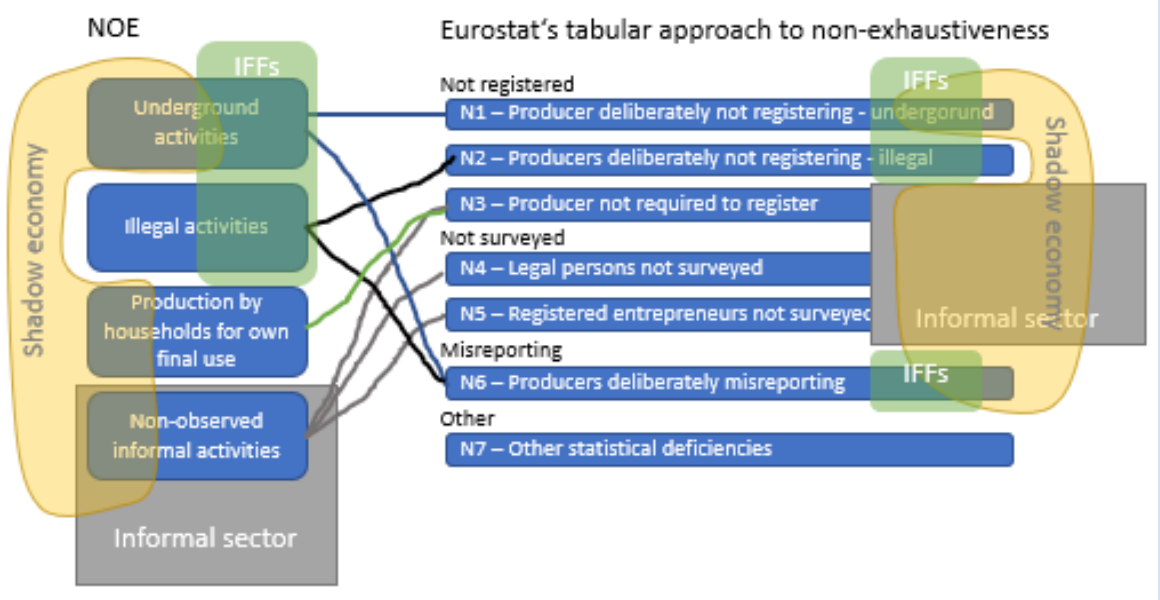
[21] When referring to either of the statistical frameworks, their most recent versions are meant, i.e., 2008 SNA and BPM6, respectively.

[22] "*The groups of activities most likely to be non-observed are those that are underground, illegal, informal sector, or undertaken by households for their own final use. Activities may also be missed because of deficiencies in the basic statistical data collection programme.*" (OECD, 2002)

[23] IMF (2019) uses the following working definition of informal economy: "*[T]he informal economy comprises (i) the production of goods and market services of households; and (ii) the activities of corporations (illegal; underground) that may not be covered in the regular data collection framework for compiling macroeconomic statistics. This scope of the informal economy considers not only the domestic activities, but also the cross-border transactions of resident units […]".*

[24] According to Medina and Schneider (2018) the shadow economy includes all economic activities which are hidden from official authorities for monetary, regulatory, and institutional reasons.

Links of illicit financial flows to related concepts



Source: Authors' deliberations.

In 2021, UNCTAD and UNODC, together with the Task Force, will continue the work to link the IFF concepts and definitions with the national accounts and balance of payments statistics to support their interoperability. This would be particularly useful for understanding the flows within global value chains, and interaction with data and statistics on special purpose entities, factoryless goods producers, governance (e.g., Praia city group), and others.

4. Key data sources and challenges

There are some traces of IFFs in official economies residing across a variety of datasets. The challenge is to identify, access and pool these data for IFF estimation. The selection of data sets depends also on what IFF flows need to be estimated. National authorities are best placed to estimate IFFs using datasets they already have or can access. The IFF estimate could be compiled by the NSO, or in parts based on data available in the Customs, the Central Bank, Tax Authority etc. The following list provides examples of data sources and statistics that could be available in a country, but there are large country differences.

Tax data are reported by individuals, corporations and other entities covering a range of activities subject to taxes, including corporate tax, income tax and social security contributions, tax rates on consumption, and other, specific taxes, such as environmental taxes. While the data are collected for other than statistical purposes, Tax or Revenue offices often have a statistical unit. Tax data provide the basis for measuring the amount of taxes paid, taxable income, effective tax rates and tax gap, which are useful for IFF estimation.

Tax audits and criminal investigations are also valuable data sources for IFFs estimation. Leakage data may also provide relevant new information. Tax authorities may also have access to third-party data, for example banks' transactions and credit card transactions data etc. Tax authorities can also exchange information with other countries.

International trade in goods statistics measure the value and quantity of goods traded between countries broken down by types of goods and by partner countries. These statistics are compiled by a specialised statistical unit of the Customs or Revenue offices, sometimes by the NSO based on microdata on individual cross-border goods flows. Trade in goods statistics provide a key source to measure tax and commercial IFFs.

International trade in services statistics measure trade in services broken down by service categories and partner countries. The statistics are compiled from a country's balance of payments which capture transactions that take place between an economy's residents and non-residents. A wide range of source data can be used, such as enterprise surveys, administrative data, the international transactions reporting system, data from international organizations, information obtained from partner countries, household surveys, credit card and mobile phone data. These statistics are compiled often by the NSO or the statistical unit of the Central Bank. Services are an increasingly important carrier of IFFs, but these statistics are typically based on a sample and are conceptually challenging to measure.

Customs data pertain to detailed Customs record of imports and export to and from a country. They cover variables such as trading partners, flows, price, value, quantity, product, date, mode of transport, and similar. Data sources contain individual transactions as reported in Customs declarations and reviewed by the Customs authorities. These data are compiled by statistical units within the Customs or similar agencies. The data are used to compile trade in goods statistics, and could be a key source for IFF statistics calculation, e.g., to estimate IFFs from mispricing.

Financial transactions data include records of financial transactions domestically and flows crossing borders, financial assets and liabilities and related categories, data on currencies and exchange and interest rates. Banks' transactions data would be valuable for the analysis of IFFs, especially those related to money laundering under IFFs from crime, but also to identify deviations between real and financial transactions for tax and commercial IFFs. In many countries, Central Banks have access to banking transactions data also for analytical and statistical purposes. Financial Intelligence Centres (FICs) typically receive information from banks on transactions that are suspicious to be able to analyse and follow-up. Banking statistics can also be of interest, including on debt and derivatives, liquidity indicators etc.

Financial statistics are compiled by financial institutions, including FICs, foreign exchange banks and Central Banks using the above and additional data sources. These authorities can also have access to transaction-level data. The aggregated statistics can be compared with other sources and analysed in mirror exercises to inform the estimation of tax and commercial IFFs.

Price statistics measure changes in the prices of goods and services from the perspectives of consumers or producers or focus on import and export prices or provide international market prices. Price statistics are based on the use of multiple microdata sources and collect prices based on transactions in the markets. Price statistics can be a useful source of information for identifying reference prices (and thus detecting abnormal prices) to determine IFFs channelled via mispricing. NSOs have access to very detailed data, while publicly available price information may be too aggregated for IFF estimation. Moreover, product heterogeneity can cause large variations in prices and if improperly used, fail at identifying IFFs.

Structural business statistics, compiled by NSOs, describe the performance of businesses based on firm's financial and balance sheet information by economic activity. They include information on

turnover, value added, profitability, number of employees and wages and salaries etc. at the unit level. These data are useful in determining characteristics of and identifying tax-avoiding behaviours among companies, thus supporting the measurement of IFFs. Availability of business identifiers can greatly improve the possibility to integrate these data with other data sources.

Statistical business registers, maintained by NSOs, play a central role in the production of business statistics as they provide a sampling frame for all business statistics and key classification information on businesses. Business registers include important data for IFF estimation, such as data on the locations of units, type of economic activity, business identifiers, enterprise group structures, ownership and affiliates, as well as key statistics such as employment and turnover.

Short-term statistics, compiled by NSOs, describe the most recent developments of the business sector on quarterly or monthly frequency by economic activity, including monthly observations on production, turnover, prices, number of persons employed, wages and salaries etc., all relevant for IFF measurement. Some countries compile business statistics annually only.

National accounts aim at providing a consistent set of macroeconomic indicators for the analyses of the structure of economies and development over time. They can include:

- Quarterly national accounts: GDP and its main components (gross value added, final consumption, gross fixed capital formation, exports and imports of goods and services, income accounts, etc.) and employment.
- Quarterly sector accounts: production, generation, use and distribution of income, as well as financial and non-financial accumulation. Data is divided into sectors (households and non-profit institutions serving households, non-financial corporations, financial corporations, government, rest of the world).
- Government finance statistics: government economic activities: revenue, expenditure, deficit/surplus, financing, other economic flows and balance sheets

National accounts are compiled most often by the NSO or the Central Bank, and they provide the contextual framework for the measurement of IFFs.

Balance of payments (BoP) statistics summarise all economic transactions of an economy with the rest of the world; provide harmonised information on international transactions which are part of the current account (goods, services, income, current transfers) and of the capital and financial account, including foreign assets and liabilities. Balance of payments statistics are compiled from a variety of sources, such as international trade in goods and services statistics, international passenger surveys, foreign direct investment surveys, financial data and inquiries etc. The statistical unit of the Central Bank, or sometimes other agencies, compile these statistics. BoP statistics are used e.g., to identify asymmetries that might be due to IFFs and include information on financial flows related to goods and services, interests, royalties. Analysis of the underlying microdata can provide a basis for developing more accurate IFF estimates.

Foreign affiliates statistics (FATS) are compiled by some countries, such as EU and OECD countries, and provide information that can be used to assess the impact of foreign-controlled enterprises. Inward FATS describe the activity of foreign affiliates resident in the compiling country, and in particular measure the impact of foreign control on employment, wages, and productivity. Outward FATS describe the activity of foreign affiliates abroad controlled by the compiling country, and in particular measure the turnover, activity, number of persons employed, and number of foreign affiliates controlled by the compiling country. A range of data sources are used, from registers, surveys,

or administrative sources. FATS are compiled typically by the NSO or the statistical unit of the Central Bank. FATS is a highly useful source for estimating IFFs due to the information on MNEs and their affiliates but is not compiled by many countries yet.

Some NSOs have organised the work related to the MNE data and respondent relations to a **large cases unit (LCU)** (see UNECE, 2020). LCU is a team of experts dealing with all statistical aspects of MNEs in countries where they are significant. LCU may prove essential in ensuring high-quality national statistics, in particular correctness of MNE data and coherence of their treatment across statistics. LCUs can provide valuable expertise on MNEs and carry out mappings of MNE global structures and role of units which can benefit the measurement of IFFs.

New data sources and big data will, potentially, play an important role in the measurement of IFFs in the future. These guidelines seek to find the common denominator across countries, hence new data sources are, for the time being, left aside until more experience is gained. However, NSOs and other statistical authorities are encouraged to experiment on the use of new data sources, as IFFs are difficult to capture, and data held by private data holders have the potential to reveal significant structures and characteristics of IFFs and contribute to the compilation of more reliable estimates.

Commercial global data sources can be used to estimate some types of IFFs and to complement national data, but these include also proprietary databases (e.g., External Wealth of Nations Mark II database, Orbis database by Bureau van Dijk, Taxes Explorer by IBFD, databases from Bloomberg or Thomson Reuters). Statistical quality and compatibility should be checked as global data are not usually as representative of national conditions as data collected by national statistical authorities.

Global Groups Register (GGR), is being developed by the United Nations Statistics Division (UNSD), building on the existing content and processes of the EuroGroups Register. GGR would significantly help in mapping the structures and links among enterprises in different countries and how control is exercised throughout the global value chain. UNSD is developing a GGR from publicly available information and exploring possibilities to create an automated mechanism to update the GGR directly with NSOs. In this context, UNECE (2020) recommends the development of a central repository of key data on MNEs for use by NSOs which would be useful for measuring certain IFFs too.

United Nations International Trade Statistics Database (United Nations Comtrade) is a comprehensive and detailed depository of international trade data. It provides statistics on international trade in goods and services, disaggregated by partners (countries), classifications and commodities, and trade flows, with monthly and annual frequencies. Values and quantities of trade flows are available for longer time series. Data are as reported by countries, i.e., data are not being estimated by the United Nations to populate the database. Hence, missing data are present, specifically in more recent months, limiting its applicability in these periods. United Nations Comtrade provides a valuable data source to measure tax and commercial IFFs through misinvoicing.

IMF Direction of Trade Statistics (DOTS) also provides international trade data. Specifically, value of merchandise exports and imports are reported, disaggregated according to country's primary trading partners. IMF DOTS applies their estimates to supplement reported data when these are not available or current. Primarily IMF member countries are covered, with annual, and when available also quarterly and monthly series. Limitations of the data source are in the absence of detailed commodity-level international trade. Nevertheless, data source is useful with initial and exploratory analysis of trade misinvoicing to measure IFFs.

Global Transport Costs Dataset for International Trade by UNCTAD, the World Bank, and Equitable Maritime Consulting is a new dataset that provides mode-specific transport costs based on the Comtrade Plus data. It covers all commodities and countries that report bilateral trade data to Comtrade. Based on cost, insurance and freight (CIF), free on board (FOB) and quantity data, the dataset displays the related transport costs (including insurance costs). The dataset offers better data on the CIF-FOB ratio (see Part II, Chapter 3) for enhanced estimates of trade misinvoicing.

OECD International Transport and Insurance Costs of Merchandise Trade (ITIC) database combines the cross-country sample of official national statistics on explicit CIF-FOB margins with estimates from an econometric gravity model, and uses a novel approach to pool product codes across the Harmonized Commodity Description and Coding System (HS) vintages. The database provides potential new insights on how distance, natural barriers such as mountain ranges, and inadequate infrastructure, shape regional (and global) value chains.

OECD Country-by-Country Reporting (CbCR) data provide global information on MNEs' activities, with data on MNE employees, related and unrelated party revenues, profits and taxes paid. Data are geographically disaggregated by jurisdiction of tax residence. National governments will have access to the granular (and not anonymised) CbCR data which can be very useful for assessing certain IFFs. MNEs with consolidated revenues above €750 million are required to file their CbCR one year after the closing date of their fiscal year according to a common reporting template. As the threshold is high, many countries will not have any MNE units in the dataset. However, the CbCR data provide a complete coverage of large MNEs headquartered in jurisdictions where CbCR filing is mandatory, less so for countries where this reporting is voluntary. In the first group, over 70 per cent of the total worldwide corporate profits of firms above the CbCR threshold was covered.

OECD Analytical Database on Individual Multinationals and Affiliates (ADIMA) is a four-component database offering comprehensive view of each of the included 500 MNE and its subsidiaries. The database covers (i) a physical register listing MNEs and their subsidiaries; (ii) digital register with a list of MNE websites; (iii) harmonised indicators, such as number of affiliates, number of jurisdictions declared in annual reporting, number of jurisdictions with a physical presence, or the Herfindahl–Hirschman Index (HHI) provided at global level of MNE for headquarters and affiliates and by jurisdictions; and (iv) events which may correspond to large company restructurings and, so, providing early warnings of potential significant changes to estimates of trade, GDP and foreign direct investment (FDI). UNECE (2020) recommends developing an "ADIMA extension for statistics" to include confidential data for exchange between national statistical authorities only.

OECD Activity of Multinational Enterprises (AMNE) database presents detailed data on the activities of foreign affiliates in OECD countries (inward and outward activity of MNEs). It provides data on foreign affiliates' production, employment, value added, research and development, labour compensation and exports in host countries. The database contains 17 variables broken down by country of origin (inward investment) or location (outward investment) and by economic activity. AMNE is based on data reported to OECD and Eurostat in the framework of annual surveys on the activities of foreign-controlled enterprises and foreign affiliates abroad controlled by residents of the compiling country.

The locational banking statistics from the Bank of International Settlements (BIS) provide detailed statistics on debt and derivatives, liquidity indicators etc. by location of reporting bank, by residence

and sector of counterparty and by nationality of the reporting bank. BIS statistics are compiled in cooperation with Central Banks and other national authorities to inform analysis of financial stability, international monetary spillovers and global liquidity. The limitations relate to coverage, confidentiality restrictions and difficulty to distinguish between individuals and entities. BIS has increased details it publishes about banks' balance sheet linkages with non-bank counterparties which has alleviated this deficiency (Luna and Hardy, 2019). These data are a useful source for estimating IFFs, specifically the flows related to undeclared offshore wealth.

Key data sources for measuring tax and commercial IFFs are inevitably a combination of various national and international sources depending on the type of IFFs to be measured. Compilation and use of such a variety of sources, however, opens up a range of **statistical considerations and** these **challenges** need to be addressed properly. They are considered in Chapter 6 of Part III.

II. Suggested methods to measure tax and commercial illicit financial flows

The Conceptual Framework for the Statistical Measurement of Illicit Financial Flows (UNCTAD and UNODC, 2020) underlines the importance of having a common framework to measure IFFs in a consistent, comprehensive, and comparable way. The UNCTAD/UNODC Task Force on the statistical measurement of illicit financial flows has reviewed several methodologies for estimating IFFs, including:

1. **Trade misinvoicing** methods estimate IFFs from illegal commercial and tax activities, category A and flow F2 on trade misinvoicing, as identified in Table 1. The models look at discrepancies in reported values and true values of traded goods (and services). Most often these models are based on mirror statistics comparing imports (exports) of a country against exports (imports) of its trading partners to identify asymmetries. Examples include WCO (2018), UNECA (2015), United Nations Economic Commission for Latin America and the Caribbean (UNECLAC) (2016), United Nations Economic and Social Commission for Western Asia (UNESCWA) (2018), Kravchenko (2018), Schuster and Davis (2020) etc. The weakness of this approach is in the difficulty of distinguishing IFFs from other reasons for trade asymmetries. Another approach aims to identify abnormal practices by comparing trade in goods transactions to comparative reference prices for the goods. It required detailed price information and a high capacity to analyse large datasets. Examples include among others Hanni and Podestá (2019), Nolintha et al. (2020), Carbonnier and Mehrotra (2020), Amaral and Barcarolo (2020).
2. **Tax gap models** do not measure directly IFFs, but tax gap is likely to include IFFs, i.e., many types of financial flows related to tax evasion and aggressive tax avoidance that cross country borders. These methods estimate the difference between actual tax collected and the potential tax collection, the latter resulting from complete compliance with tax regulations in a country. These methods relate closely to the concept of shadow economy (productive economic activities concealed from authorities for tax, regulatory or similar reasons) and estimate the size of the shadow economy and derive from it the missing tax base and the resulting tax gap. For examples of tax gap estimation, see e.g., Frunza (2016), Ristola and Mäki (2018).
3. **Capital account models** may be applied to estimate several types of flows, especially profit shifting (F3-F5) under category B on aggressive tax avoidance (Table 1). The models assess anomalies in the capital account, resulting from hiding financial flows. The two most common methods are the World Bank residual model which subtracts the total of funds used by a country from the total of funds entering that country (World Bank, 1985; Kar et al., 2010) and the Hot Money Narrow method which assesses the net errors and omissions (Kar and Freitas, 2012).
4. **Offshore wealth models** estimate the amount of tax revenue loss and/or the amount of undeclared financial wealth of households (F1), under category A on illegal commercial and tax activities (of Table 1), held abroad, typically in lower-tax jurisdictions. These methods estimate the stock of undeclared wealth, while for IFFs the stocks would need to be transferred to flows. These studies have been carried out for instance by Henry (2012), Zucman (2013), Alstadsæter et al. (2017).
5. **Corporate tax avoidance** methods estimate profit shifting (F3-F5) under category B on aggressive tax avoidance (Table 1). The link between FDI and profit shifting by MNEs has been

studied by UNCTAD (2015) and Janský and Palanský (2019) using the so-called FDI-based analytical toolkit to assess the exposure to abnormal levels of FDI and estimating resulting tax revenue losses. Empirical analysis of a link between FDI and tax havens has also been studied by Haberly and Wójcik (2015). OECD (2020b) uses the FDI-to-GDP ratio in identifying profit-shifting movements (destinations), parsing that information further into modelling tax revenue loss. Models further investigate reasons for differences in taxable income or profits, accounting for labour and capital inputs and using observed parameters to measure the amount of profits shifted as a response to tax incentives (e.g., differences in effective tax rates) to shift profits. Other approaches have compared the 'actual' and 'normal' tax paid by MNEs where normal tax is estimated by examining the tax paid by domestic enterprises in the same sector. The many research reports include for instance Crivelli et al. (2015), Cobham and Janský (2018), Clausing (2016), Sallusti (2021), Tørsløv et al. (2020), Wier and Reynolds (2018).

6. **Risk-based models** assess the risk, indications or likelihood of IFFs in a country or in an economic activity, by looking at e.g., the Financial Secrecy Index (Tax Justice Network (TJN), 2020a) or a set of indicators (European Commission, 2017). They provide indications of risk to guide policy attention and measures. These indicators can address several types of IFFs.
7. **Integrated IFF methods** combine several methods into one to improve the accuracy of the estimation. Improved accuracy is reflected in the significantly higher resources required to produce values. The use of several different methods to measure the same or partially overlapping IFFs, as possible, is very useful for improving the quality of estimates. Kar and Freitas (2012) provide an example which combines the trade misinvoicing method with capital account models. Due to their integrated nature, these methods could address several types of IFFs.
8. **Artificial intelligence** techniques' applications to IFF estimation are becoming more common. These models could address several types of IFFs. Machine learning (ML) has been applied in practice mainly to detect fraud, support anti-money laundering activities by analysis of transactions, but also trade misinvoicing (e.g., Wohl and Kennedy, 2018; Lépissier, 2020). The application of ML seems to replace the rules-based systems, however without reliable training data available, to date supervised ML appears of only limited relevance to IFFs. Unsupervised ML, on the other hand, is a powerful analytical tool to support the analysis of IFFs based on tracks they leave in connection with observed activities. Further work is needed to examine appropriate application of ML in the field of IFFs.

The above methods address different types of IFFs, as highlighted, but their results are not necessarily mutually exclusive. These guidelines prioritise statistical methods based on microdata, using so-called bottom-up or direct measurement of IFFs (see UNCTAD and UNODC, 2020) which is important for the quality of estimates. Selected methods should also be consistent with existing statistical frameworks, such as the SNA or BoP. While bottom-up methods are strongly preferred, all statistical systems around the world do not have the data or the statistical capacity to apply the most sophisticated methods. Some simpler top-down methods are suggested for pilot testing in such cases.

Rather than proposing one method for all, the guidelines suggest a suite of methodologies that can be selected considering the national data environment to measure the most prominent types of IFF. On one hand, integrated approaches using several methods could yield the most comprehensive results but require considerable resources. Top-down methods might seem like the quick fix to compile a global measure of IFFs and populate indicator 16.4.1, but such an approach would deprive UN member states of the possibility to compile country-specific estimates from their national statistical data. Rough global estimates would be of limited value in guiding policy response due to lack of accuracy and detail.

These guidelines are intended at national statistical authorities who have the best possibility to estimate IFFs from detailed microdata. National statistical authorities, including NSOs, statistical units of the Customs and Tax authorities etc., have large datasets and access to detailed microdata, collected for other statistics or administrative purposes. Statistical authorities are mandated to collect or acquire data from other state authorities and private companies for statistical purposes. They apply internationally agreed definitions, concepts and methodologies designed to improve the consistency and international comparability of statistics across countries.

In the guidelines, the selection of suggested methods is based on an assessment of methodological soundness, quality of data sources and results (see Part IV, Chapter 3, Section D). The intention is to move away from top-down estimates of IFFs towards measurement based on microdata in line with the *Fundamental Principles of Official Statistics*. Therefore, the guidelines are targeted at national statistical authorities who have such data or access to it. The suite of methods and practical guidelines for IFF measurement will be refined and updated based on the results of pilot testing after 2021.

The selection of methods for pilot testing builds on a desk review of methodologies and previous work of UNCTAD, UNODC, the UNCTAD/UNODC Task Force and other experts. In 2019, Kathy Nicolau prepared a wider review of methodologies to measure IFFs for UNCTAD and UNECA. The results of that exercise show that artificial intelligence models performed best followed by some integrated methods, international tax avoidance and transaction-based trade misinvoicing methods.

The proposed methods are aligned with activities that may generate IFFs (see Table 1), and different methods will be needed for the measurement of different types of flows. For the three main types of tax and commercial IFFs (see Figure 3), a pair of methods is suggested for pilot testing:

a) Trade misinvoicing by entities (flow F2, Table 1)
   #1 – Partner Country Method (PCM) +
   #2 – Price Filter Method (PFM) +

b) Aggressive tax avoidance or profit shifting by MNEs (flows F3-F5, Table 1)
   #3 – Global distribution of MNEs' profits and corporate taxes
   #4 – MNE vs comparable non-MNE profit shifting

c) Transfer of wealth to evade taxes by individuals (flow F1, Table 1)
   #5 – Flows of undeclared offshore assets indicator
   #6 – Flows of offshore financial wealth by country

The different flows related to profit shifting are suggested for measurement as one aggregate in the pilot testing. It may be useful to study profit shifting (flows F3-F5, Table 1) separately if detailed enough source data are available. An assessment of profit shifting by flow could be conducted for example as an in-depth study for a selected (base) year. The more detailed estimates can help validate the overall estimate of profit shifting. It is important to note that, even though separately measured, the results are not mutually exclusive. Further methodological work is undertaken to identify and reduce the risk of double counting and to develop methods for aggregating the measures into a combined measure of IFFs for SDG indicator 16.4.1.

1. Trade misinvoicing by entities

Trade misinvoicing has been identified as one of the main type of flows of IFFs in empirical research (see e.g., WCO, 2018). The guidelines propose to apply and enhance two well-known approaches, the Partner Country Method (PCM) and the Price Filter Method (PFM). Studies have shown (e.g., WCO, 2018) that there is a wide difference in the magnitude of under-invoicing and over-invoicing amounts estimated by PFM and PCM. Somewhat expectedly, PCM yields higher values than PFM, as PCM has a high probability of taking other factors into account when producing estimates (e.g., statistical errors and differences in the recording of bilateral trade), whereas on the other hand, PFM may report estimates on the lower bound of IFFs due to various factors depending on price-filter determination, and because the method focuses on mispricing only. WCO (2018) cites several researchers in noting that cross-referencing the two methods could be an effective tool to assess the risk of trade transactions which were likely to contain instances of trade misinvoicing.

1.1. Partner Country Method (PCM) +

Concept and assumptions

The PCM is a top-down method comparing import (or export) values reported by one country with the corresponding export (or import) values reported by its partner country. The concept of PCM is based on a trade gap, defined as discrepancy in the values of a trade transaction, independently reported by both trading partners. The main assumption behind PCM is that partner's trade statistics are sufficiently accurate and comparable to treat differences in mirror statistics as misinvoicing, hence directly applicable to measuring tax and commercial IFFs as IFFs. This assumption is critical and highly unlikely, raising serious doubts about the reliability of this method.

Many factors contribute to trade asymmetry. Therefore, all measures must be taken to correct for other reasons before attributing a portion of asymmetry to IFFs or trade misinvoicing. According to UNSD (2019), three main and well-known reasons for asymmetries in bilateral merchandise trade are:

i. Application of different criteria of partner attribution in import and export statistics,
ii. Use of CIF-type values in import statistics and FOB-type values in export statistics,
iii. Application of different trade systems (General versus Special Trade System).

Reported exports of one country may not coincide with the reported imports of its partner country also due to (see UNSD, 2019):

- shipping time-lags across different accounting periods (quarters or years);
- goods entering Customs warehousing for several months;
- goods passing through third countries;
- lack of information or misspecification of re-exports and re-imports;
- improper declaration of product classification at the customs border, either entry or exit;
- differences in scope and coverage e.g., merchanting and trade value thresholds;
- statistical measurement differences and errors;
- variations in data compilation methods, and confidentiality among other reasons.

Overcoming limitations

Even the major drawbacks of PCM do not render it redundant. According to WCO (2018), any implementation of the PCM approach requires additional assumptions to be made and inferential

techniques to be chosen. Most PCM applications use globally accessible data on bilateral trade flows from IMF DOTS or United Nations Comtrade databases (such as WCO, 2018 and GFI, 2019). National statistical authorities, in particular Customs, have more detailed data. We propose the PCM method to be used but enhanced with national data and bilateral data exchange to improve the quality of estimates. PCM methodology (hence, PCM +) can be enhanced with the following:

1. ***Compare national data with trading partners*** as it can significantly improve the accuracy of PCM estimates. Carry out mirror exercises to exchange and compare trade statistics data focusing on important trade partner countries with the largest trade flows and the largest observed asymmetries (see Case study 1).
2. ***Use granular national data****, including most detailed levels of the product classification by partner country, and available microdata,* to reduce uncertainty about the source of bilateral trade asymmetries. Apply PCM on the national data held by statistical authorities, in particular Customs, to improve the accuracy of PCM estimates. Focus corrections on trading flows or products with largest asymmetries and known prominent types of IFFs.
3. ***Resolve CIF-FOB differences****.* Exports are usually reported as FOB and imports as CIF. UNSD (2019) encourages countries to compile FOB values of imported goods as supplementary information. When these are not available, CIF/FOB ratios are needed to correct for the asymmetry caused by valuation differences. It is better to apply country and region-specific ratios rather than common ratios for all countries[25]. In some instances, commodity-specific CIF/FOB ratios are needed[26]. Precious metals are a good example where transportation and insurance costs constitute a lower share of the value of goods (see Case study 2).
4. ***Analyse remaining bilateral asymmetries*** after CIF-FOB differences have been accounted for. UNSD (2019) provides a step-by-step guide and tabular template to support the analysis of bilateral asymmetries, and this is applied to the following guidance on applying PCM.
5. ***Apply the reliability weighting procedure****.* In cases where gaps in mirror trade statistics are substantial, doubt may arise as to whether this is due to misinvoicing or other factors. A weighting procedure to address the issue (WCO, 2018) assigns a higher weight to trade gap the closer the associated matched volume reports are, i.e., the smaller the gap.
6. ***Validate results with qualitative methods.*** Mehrotra et. al. (2020) suggest complementing the above steps with qualitative research, interviews and consultations with Customs and trade experts to enhance the reliability of PCM results.

Case study 1. Comparing bilateral trade statistics between national authorities

In 2016, Canada and China decided to conduct a joint study on the differences or asymmetries between their trade statistics. The objective was to explain and quantify the differences in the statistical data and to carry out an in-depth analysis of the origins of these differences. The exercise was carried out by the Chinese Ministry of Commerce and the General Administration of Customs, and the Global Affairs Canada and Statistics Canada. Over two years, the authorities exchanged and compared bilateral trade in goods and services data for reference years 2014 to 2016.

Indirect trade may result in increased value of goods, and even though the share of indirect trade has been declining in recent years in eastbound trade, it still accounted for over 90 per cent of the total asymmetry for goods. Shipments through Hong Kong and the United States had the greatest impact on the differences. Asymmetries also arise from differences in statistical methods and conceptual definitions in the processing of data, such as shipment time lag and China's re-exports, among others. In goods shipped from China to Canada directly, it seems possible that the same shipment of goods has a

[25] GFI (2019) uses a 6 per cent fixed ratio, down from 10 per cent used in previous studies. WCO's (2018) study of 2016 import data for the United States of America revealed that the average CIF is 2.2 per cent with Europe, 4.81 per cent with South America and 2.8 per cent with all other partner countries. The United States International Trade Commission (2013) apply different CIF/FOB ratios for east and westbound transport between China and Hong Kong, and the United States of America.

[26] Carbonnier and Mehrotra (2020) apply a 2 per cent ratio for trade of gold. Gaulier et al. (2008) provide insight into CIF/FOB ratios differences across activity sectors, noting that transport costs are higher for mining and quarrying than for manufacturing and that fresh goods and other commodities (agricultural, fishing) appear to have 2 percentage points higher transport costs than those of manufacturing.

lower declared export value in China than the declared import value in Canada. In westbound trade, there is a lack of data on transshipments, shipment time lags and other sources of asymmetry.

The comparison of China's and Canada's bilateral trade in services statistics revealed that most of the asymmetries resided with travel and transport services while discrepancies for all other services remained relatively small and comparable. The following table provides a useful summary of issues that may be causing asymmetry in trade statistics.

Comparison of statistical concepts and definitions in China's and Canada's merchandise trade statistics

Issue	China	Canada
Trade structure	Total trade structure	Total trade structure
Valuation methods	Exports: FOB Imports: CIF	Exports: FOB Imports: FOB
Partner countries	China applies the country of origin and country of destination principle to determine its trading partners. China Customs also records the countries where the shipment initiates as well as where it ends. Exports: Country of final destination/country of shipment ends Imports: Country of origin/country of shipment initiates	Canada applies the country of origin and country of destination principle to determine its trading partners. Exports: Country of final destination Imports: Country of origin/country of export
Frequency of data publication	Each month, China publishes its previous month's preliminary trade data on the 8th or 13th, and releases its official data on the 23rd.	For each reference month, Canada publishes official trade data about 35 days after the close of the calendar month.
Frequency of data adjustments or revisions	China adjusts the previous monthly data for the current year and publishes the adjusted results on the 23rd of each month. The final revisions to the previous year's data are published in October of each year.	Current year data are revised each month. Previous year data are revised in January and February, and on a quarterly basis. The previous two years of data are revised annually in February.
Commodity codes and descriptions	Goods are classified based on the Harmonized System classification. The first six digits of the HS codes are consistent with the Harmonized System, and the seventh and eighth digits are added according to the needs of China's tariff, statistics and trade management.	Goods are classified based on the Harmonized System classification. The first six digits of the HS codes are consistent with the Harmonized System, and the seventh and eighth digits for exports and imports and the ninth and tenth digits for imports are added for tariff and statistical purposes.
Special classifications	China classifies special traded goods, low-value simple customs clearance goods and unclassified goods into Chapter 98.	Canada classifies special trade, such as confidential trade and low value shipments, into chapters 98 and 99.
Re-export statistics	Re-export data are not included in China's customs statistics.	Re-exports are included in total exports and reported separately from domestic exports.
Special economic zones	Due to the preferential policies of trade and the need of customs supervision, China has a number of special regulatory areas, including: special economic zones, economic and technological development zones, high-tech development zones, bonded zones, bonded warehouses (including outbound supervision warehouses), export processing zones, bonded logistics zones, bonded port areas, bonded logistics centers (type A, type B), etc. When goods under these special zones are traded with foreign countries, these transactions are included in the customs statistics.	Goods stored in bonded warehouses are included in the customs statistics.
Freight and insurance costs	Freight and insurance premiums for imported goods are based on actual fees paid.	Freight and insurance premiums for imported goods are based on actual fees paid.

Source: Statistics Canada (2018)

Source data

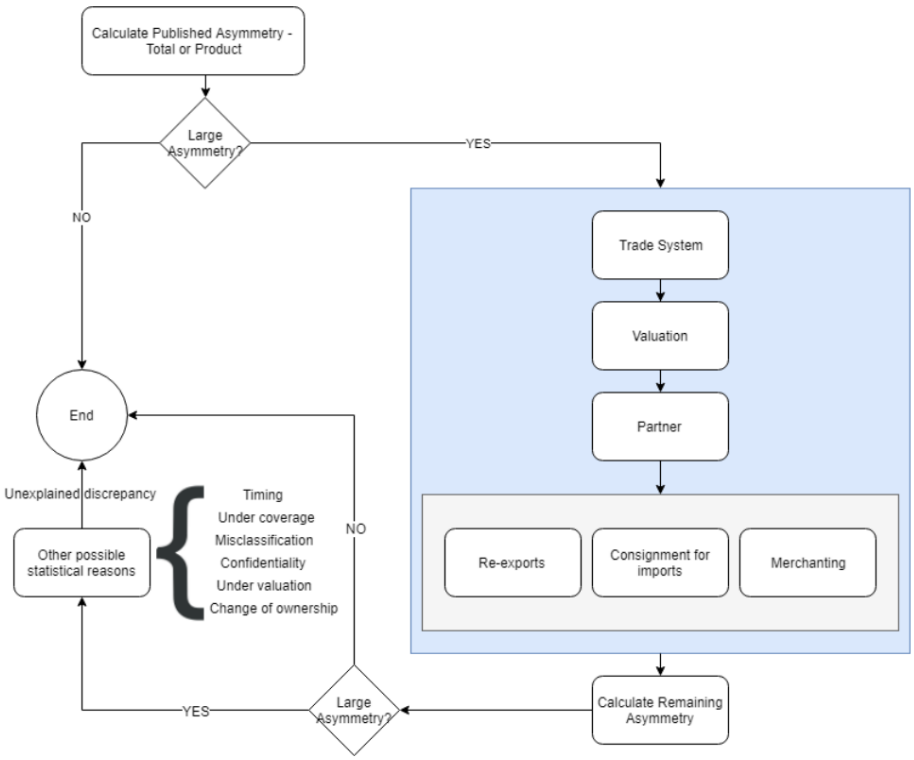
PCM requires bilateral trade statistics between reporting country and its trading partners, ideally by partner and not aggregated to the rest-of-the-world category. Source data include trade data collected nationally by the Customs or other relevant national authority. Data are preferably at the most granular level of product classification (at least 6-digit HS level with data on price, quantity, total value, CIF or FOB valuation, trading partner, country of origin or destination and type of flow, e.g., import/export or re-import/re-export). International data sources such as United Nations Comtrade or the IMF DOTS can be used in addition. The UNCTAD Global Transport Costs database for International Trade can be useful for resolving CIF-FOB discrepancy and the OECD's ITIC database a source of CIF-FOB margins (see also Case study 2).

Calculation

Once source data are gathered and prepared, PCM is implemented in the following phases:

The analysis starts from a review of bilateral asymmetries, as outlined in UNSD (2019) – see Figure 14. It will be useful to start by assessing published asymmetries starting with total exports and imports and then moving to selected commodity groups looking at the main trading partners. As an alternative, observe discrepancy at HS chapters, and go deeper when significant discrepancy is detected. In observing the bilateral asymmetries, also consider the difference of HS editions.

Figure 14. Flow chart for analysing and reducing bilateral asymmetries



Source: UNSD (2019)

1. Adjusting for trade system differences

The first step examines the sources of differences for large asymmetries. First, check differences of **trade systems** used in reporting and partner countries based on information provided by United

Nations Comtrade[27] and adjust. Difference of trade systems may lead to trade asymmetries not attributable to IFFs. Box 4 illustrates how to deal with the differences caused by different trade systems.

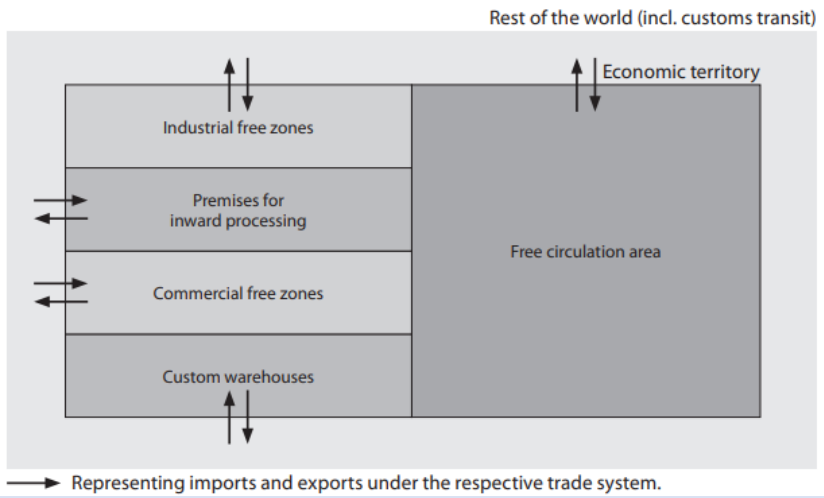
Box 4. General and special trade systems

Analysing trade systems requires first the definition of the statistical territory of a country, which is "*the territory with respect to which trade data are being compiled*" (UNSD, 2011). Several territorial elements of statistical territory exist:

(a) Islands;
(b) Territorial waters;
(c) Continental shelf;
(d) Offshore and outer space installations and apparatus;
(e) Commercial free zones;
(f) Industrial free zones;
(g) Customs warehouses;
(h) Premises for inward processing;
(i) Territorial enclaves of the compiling country in other countries; and
(j) Territorial exclaves, that is, enclaves of other countries in the compiling country.

Some countries use the **general trade system** (where statistical and economic territories coincide), some others use the **special trade system** (when statistical territory comprises only some parts of the economic territory, hence not all flows are considered).

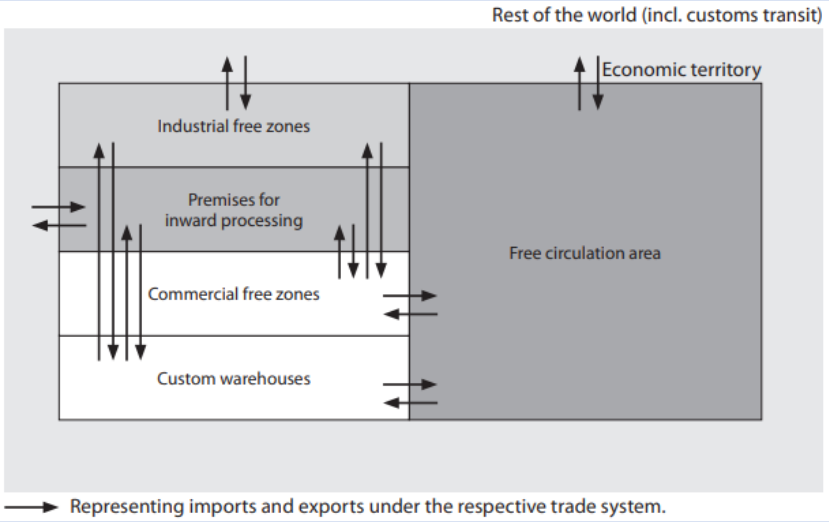
General trade system - territorial elements and potential imports and exports



Source: UNSD (2011)

[27] See https://comtrade.un.org/survey/Reports/byQuestion, Section 15: "Trade System".

Special trade system - territorial elements and potential imports and exports



Source: UNSD (2011)

When special trade system is used, lack of coverage may negatively impact usefulness of trade data and particularly in the application of PCM. Adjustment for the differences in trade system applied by trade partners is required, and they are processed by detailed bilateral comparison and using breakdowns, e.g., in the above figures, to eliminate elements of economic territory not present in both trading partners, therefore ensuring comparing like to like. UNSD (2011) encourages countries using special trade system to develop plans to introduce the general trade system. As this may be resource intensive, it is also recommended that those countries estimate the following statistics (unless such trade is insignificant):

(a) When the strict definition is used, statistics on goods imported into and exported from premises for Customs warehousing, premises for inward processing, industrial free zones or commercial free zones;

(b) When the relaxed definition is used, statistics on goods imported into and exported from premises for Customs warehousing or commercial free zones (ibid).

2. Valuation - converting import data to FOB

The second step is to review the difference in valuation of imports and exports. It should be checked which valuation is used by the trade partner countries of interest. And where imports use CIF valuation, these should be adjusted to FOB to match with exports. Otherwise, this discrepancy may lead to trade asymmetries not attributable to IFFs.

First, annual import data need to be converted to FOB valuation, if not already available[28]. Multiple ways of estimating the FOB values from CIF exist, apart from using fixed ratios. UNSD (2019) lists a few options, such as: extracting data from International Merchandise Trade Statistics (IMTS); collecting data on freight and insurance premiums from importers; analysing trade flows, freights, and insurance rates. Readers may consult the IMTS Compilers Manual, Chapter 14 on Valuation (UNSD, 2013) or Supplement to the Compiler's Manual (UNSD, 2008). If FOB import values cannot be obtained directly, CIF/FOB ratio approach is applied:

$$IM_{FOB,c,r,p,t} = \frac{IM_{CIF,c,r,p,t}}{CFr_{c,r,p,t}} \qquad \textit{Equation (1)}$$

where:

IM … import value

[28] United Nations Comtrade provides information on data availability. See https://comtrade.un.org/survey/Reports/byQuestion, Section 12: "Valuation".

CFr … CIF/FOB ratio
FOB … FOB valuation
CIF … CIF valuation
c … commodity
r … reporter (country)
p … partner (country)
t … year.

During this phase, **CIF/FOB ratios** are constructed at as detailed level(s) as possible with respect to commodities, reporting and partner countries (or regions), and years. Studying existent data on trade flows, freight and insurance premiums, distance between trading partners and similar provides basis for ratio calculation. Basic ratio can be calculated as:

$$CFr_{c,r,p,t} = \frac{IM_{CIF,c,r,p,t}}{EX_{FOB,c,r,p,t}} = \frac{p_{CIF,c,r,p,t} * q_{IM,c,r,p,t}}{p_{FOB,c,r,p,t} * q_{EX,c,r,p,t}} \qquad \textit{Equation (2)}$$

where:
EX … export value
p_{CIF} … CIF price declared by importer
p_{FOB} … FOB price declared by exporter
q_{IM} … declared quantity by importer
q_{EX} … declared quantity by exporter.

Further considerations on data and methodology of estimating CIF/FOB ratios can be found in e.g., Gauiler et al. (2008) or Hummels and Lugovskyy (2003), and Case study 2 showcases the estimation of CIF for commodity-specific research (Schuster and Davis, 2020).

Case study 2. Cost, insurance, freight by commodity

Schuster and Davis (2020) use the mirror trade gap method to estimate IFFs in Africa. They note that detection of IFFs with the mirror trade gap method has evolved from using total trade flows to reviewing commodity specific trade flows. This has given rise to the need for a better approximation of CIF due to heterogeneity between commodity groups.

The authors use the OECD ITIC database to match (56 354 out of 88 285) extra-African trade observations and (37 855 out of 48 513) intra-African trade observations for 17 selected commodity groups and 41 African countries from 2000 to 2018. The mean cost lies at 6.4 per cent of export value for extra-African trade and at 7 per cent for intra-African trade. The mean hides large commodity specific heterogeneities for extra-continental trade, for instance:

a) For high value commodities (gold, platinum and diamonds), CIF is around 2.5 per cent of export value;
b) Copper, aluminium and petroleum are close to the 6 per cent of CIF, as also recommended by IMF;
c) Manganese and iron are closer to 10 per cent, the amount of adjustment widely used in literature;
d) Standard deviations are very large.

The conclusion is that a more in-depth application of PCM by analysing commodity-based transactions, requires more precise estimates of CIF. Adding 10 per cent to the export value to account for the difference in valuation might be a good proxy when using total exports, but hides significant heterogeneity across commodity groups.

3. Partner country attribution

Goods are either shipped directly from one country to another or through third countries. Asymmetries can arise when the country of export may not know the final country of destination at the time of

export. Similarly, importing country may not be able to identify the country of origin. This may lead to trade asymmetries not attributable to IFFs and should be corrected.

According to UNSD (2019), for imports, two categories of partner countries can be distinguished: **country of origin** and **country of consignment** (also called the country of exports). For exports, **country of final (known) destination** is important along with the identification of **re-export** flows. Identification of country of consignment is crucial for observing trade asymmetries.

There are three important considerations for partner country attribution: **consignments for imports**, **re-exports** and **merchanting**. In merchanting, a unit purchases goods from abroad and then sells them to another country without the goods entering the purchaser's economy. Goods under merchanting are recommended to be excluded from trade statistics (UNSD, 2013), but countries may end up measuring the related flows differently thus leading to asymmetry.

Instead of direct shipment of goods to the destination country, they can be re-exported further or shipped via a consignment country[29]. This country is often mistakenly recorded as the destination or origin of the flow which causes trade asymmetry. Partner country attribution needs to be done for each trade partner country, and related flows studied carefully to make sure proper attributions are used (see Case study 3).

Case study 3. Country of consignment in mobile phone trade between Canada and China

UNSD (2019) highlights the importance of proper partner country attribution. It refers to the trade of mobile phones between Canada and China with two possible ways:

- The phone could be exported directly from China to Canada. Here, it is reported in China as an export to Canada and in Canada as an import from China.
- The phone could also arrive in Canada via the United States of America. This trade could be reported as: in China, as export to the United States of America. In the United States of America, an import from China and an export to Canada. And in Canada, an import from the United States. However, such recording leads to imprecisions and it should be reported as an import from China to Canada with the United States of America as a country of consignment.

This is best shown directly in the bilateral trade of mobile phones, revealing reported and adjusted values of Canadian imports and Chinese exports.

Bilateral inbound trade of mobile phones

Inbound Trade	CAN imports	CHN exports
Official data	3 329	1 362
Published asymmetry		1 967
Adjustment: *CAN imports of CHN goods from countries of export (consignment) other than CHN	1 280	
Adjusted official data	2 049	1 362
Remaining asymmetry		687

Source: UNSD (2019)

[29] A country of consignment is the country from which goods were dispatched to the importing country (or to which goods were dispatched from the exporting country), without any commercial transactions or other operations (UNSD, 2013).

4. Review remaining asymmetry

Trade asymmetries can arise from time lags in shipments or seasonal trade cycles, e.g., high trade at the end of the year. Generally, goods are recorded at the time of entering or leaving the economic territory of a country (UNSD, 2013). This may lead to some flows, or their parts, to be assigned to different years (or months) by each trading partner. Differences are often due to country-specific reasons and need to be addressed in a case-specific way. As UNSD (2019) point out, the method of estimating time lags depends on dominant mode of transport and can be obtained from transport documents (e.g., bill of lading for sea transport) or from transport operators. Required adjustments are netted, i.e., consolidated from reporter's import or export perspective, and in the end subtracted to obtain adjusted value of imports, or exports.

There are also other sources of discrepancies, such as those listed at the start of this chapter, for instance coverage issues, misclassification, under valuation, difficulties in recording trade by change of ownership and measurement errors. Correcting for these asymmetries requires close collaboration of national authorities, such as the NSOs and Customs, within and across countries (Case study 4).

Case study 4. Multilateral study on bilateral trade asymmetries

Bilateral or multilateral studies on asymmetries in trade statistics are very useful before the analysis of IFFs based on trade asymmetry. Examples across the globe have led to considerable corrections to trade statistics which improves the analysis of remaining asymmetries (e.g., Case study 1).

A programme called MEDSTAT II aimed to harmonise statistical methods between the EU and its Mediterranean partner countries in line with international statistical standards in order to improve the comparability of trade data between these countries. The programme included eight bilateral mirror studies on data from 2006 to 2009. One of these was a study with the Central Agency for Mobilisation and Statistics of Egypt (CAPMAS), which revealed substantial under-coverage of trade since statistics did not receive all Customs declarations. In addition, the strict definition of 'special trade system' was applied and the product nomenclature was based on the 1992 version of the HS classification. Egyptian free zones and bunkers were considered as separate countries and imports from them into the area of free circulation were recorded without product distinctions (European Commission, 2009).

A detailed analysis of asymmetries between the EU and the Mediterranean partner countries helped address many trade asymmetries by country and flow. The study found that Egypt exhibited significant asymmetries in trade with the EU in both directions.

Overview of asymmetries between the EU and Mediterranean partner countries (MPCs)

	Mirror discrepancy							
	Northbound				Southbound			
	MPC exports to EU-25 (1000 euro)	EU-25 imports from MPC (1000 euro)	Northbound mirror discrepancy		EU-25 exports to MPC (1000 euro)	MPC imports from EU-25 (1000 euro)	Southbound mirror discrepancy	
			Value (1000 euro)	%			Value (1000 euro)	%
JORDAN	124 115	375 076	250 961	202.2	2 315 469	2 028 265	- 287 205	-12.4
EGYPT	2 217 471	4 191 972	1 974 500	89.0	7 398 116	3 059 961	-4 338 154	-58.6
ALGERIA	13 932 458	15 251 581	1 319 122	9.5	9 451 495	8 062 116	-1 389 379	-14.7
SYRIA	3 493 711	3 455 586	- 38 125	-1.1	2 902 799	1 698 860	-1 203 938	-41.5
MOROCCO	7 349 554	7 159 447	- 190 106	-2.6	10 387 890	9 882 012	- 505 877	-4.9
LEBANON	146 651	240 367	93 715	63.9	3 224 947	3 022 096	- 202 850	-6.3
ISRAEL	11 671 813	11 351 149	- 320 664	-2.8	14 286 886	13 645 370	- 641 516	-4.5
TUNISIA	8 782 949	8 975 115	192 165	2.2	9 503 610	9 052 109	- 451 500	-4.8

Note: Mirror discrepancy in value = Imports - Exports ; Mirror discrepancy in % = (Imports-Exports)/Exports

Source: European Commission (2009)

The study identified the following main reasons for discrepancies in trade statistics:

a. Confidentiality concerning the partner country in some EU countries (in particular for HS27);
b. Repairs of aircraft (HS88, HS84 and HS90);
c. Differences in the trade systems (impact on processing);
d. Difficulties with measuring trade involving Free Zones;
e. Non-use of registers to measure trade in vessels and aircraft (HS88 and HS89);
f. Difficulties with measuring trade in diamonds (HS71);
g. Registration of the country of origin for used cars in accordance with international recommendations; and
h. Possible under-declaration of values.

Finally, all the identified corrections should be implemented leaving the remaining part of trade asymmetries. The UNSD template (2019a) is useful for addressing these to come to a value of remaining asymmetry. A procedure for adapting imports of a reporting country and exports of a partner country is presented in Table 3.

Table 3. Adjusting imports of reporting and exports of partner country to calculate the remaining asymmetry

		R IMPORTS	P EXPORTS
ORIGINAL DATA	Official data	$\mathrm{IM}_{\mathrm{CIF},c,r,p,t}$	$\mathrm{EX}_{\mathrm{FOB},c,r,p,t}$
ADJUSTMENT	CIF-FOB	$\mathrm{A}_{\mathrm{CIF-FOB},c,r,p,t}$	
	ADJUSTED DATA*	$\mathrm{IM}_{\mathrm{FOB},c,r,p,t}$	
ADJUSTMENT	Trade system	$\mathrm{A}_{\mathrm{TS},c,r,p,t}$	
	Indirect trade	$\mathrm{A}_{\mathrm{IT},c,r,p,t}$	
	Re-exports		$\mathrm{B}_{\mathrm{Re-Ex},c,r,p,t}$
	Merchanting	$\mathrm{A}_{\mathrm{M},c,r,p,t}$	$\mathrm{B}_{\mathrm{M},c,r,p,t}$
	Timing (time lags)	$\mathrm{A}_{\mathrm{T},c,r,p,t}$	
ADJUSTED DATA		$\mathrm{IM}^{\mathrm{Adj}}_{\mathrm{FOB},c,r,p,t} = \mathrm{IM}_{\mathrm{FOB},c,r,p,t} - \mathrm{A}_{\mathrm{TS},c,r,p,t} - \mathrm{A}_{\mathrm{IT},c,r,p,t} - \mathrm{A}_{\mathrm{M},c,r,p,t} - \mathrm{A}_{\mathrm{T},c,r,p,t}$	$\mathrm{EX}^{\mathrm{Adj}}_{\mathrm{FOB},c,r,p,t} = \mathrm{EX}_{\mathrm{FOB},c,r,p,t} - \mathrm{B}_{\mathrm{Re-Ex},c,r,p,t} - \mathrm{B}_{\mathrm{M},c,r,p,t}$
REMAINING ASYMMETRY		$\mathrm{InboundRA} = \mathrm{IM}^{\mathrm{Adj}}_{\mathrm{FOB},c,r,p,t} - \mathrm{EX}^{\mathrm{Adj}}_{\mathrm{FOB},c,r,p,t}$	

Source: UNSD (2019)
** Depending on how CIF-FOB differences are dealt with, $IM_{FOB,c,r,p,t}$ can be calculated as $IM_{CIF,c,r,p,t} - A_{CIF-FOB,c,r,p,t}$, or, if CIF/FOB ratios are used, as in equation (1).*

Analogous adjustment is processed for exports of reporting country and partner country imports (to obtain *OutboundRA*). If any additional sources of asymmetries are detected at this point, they need to be considered.

5. The reliability weighting procedure

The next phase brings in the reliability weighting procedure to mitigate risk of unproportionally privileging large trade gaps, which have higher potential of not indicating mispricing. The weights are applied to records of inbound flows from reporter's side using the weights:

$$w = 1 - \frac{\left|q_{IM,c,r,p,t} - q_{EX,c,r,p,t}\right|}{max\left(q_{IM,c,r,p,t}, q_{EX,c,r,p,t}\right)} \qquad \textit{Equation (3)}$$

In an analogous fashion, weights are applied to outbound flows, i.e., exports of reporter. By applying these weights, the inbound (imports) and outbound (exports) flows are expressed as:

$$Inbound_{c,r,p,t} = w * \left(IM^{Adj}_{FOB,c,r,p,t} - EX^{Adj}_{FOB,c,r,p,t}\right) \qquad \textit{Equation (4)}$$

$$Outbound_{c,r,p,t} = w * \left(EX^{Adj}_{FOB,c,r,p,t} - IM^{Adj}_{FOB,c,r,p,t}\right) \qquad \textit{Equation (5)}$$

We (can) assume they refer to misinvoicing. UNECLAC (2016), similarly, applies a weighting procedure outlined in Case study 5.

Case study 5. Weighting discrepancies in international goods trade volumes by UNECLAC

In their study of IFFs in the countries of Latin America and the Caribbean, UNECLAC (2016) focuses on gross outflows from misinvoicing, using data on international goods trade from the Comtrade and the International Trade Database (BACI) operated by the Centre for International Prospective Studies and Information (CEPII), at HS 6-digit level with exports valued at FOB and imports at CIF, using econometric modelling to adjust to FOB.

Asymmetries in bilateral statistics result in large discrepancies in international goods trade volumes at the partner and product level. To mitigate this, the **discrepancies are weighted by the degree of concordance between the import and export volumes** (ImpVol and ExpVol) reported by the two partners.

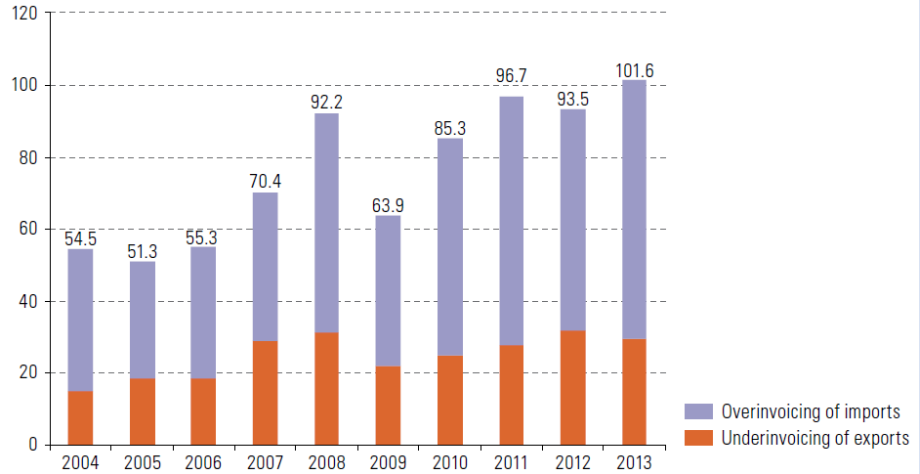
$$ExpDisc_{i,j,hs6,t} = \left(ImpVal_{j,i,hs6,t} - ExpVal_{i,j,hs6,t}\right) * \left(1 - \left(\frac{\left|ImpVol_{j,i,hs6,t} - ExpVol_{i,j,hs6,t}\right|}{\max\left(ImpVol_{j,i,hs6,t}, ExpVol_{i,j,hs6,t}\right)}\right)\right)$$

$$ImpDisc_{i,j,hs6,t} = \left(ImpVal_{i,j,hs6,t} - ExpVal_{j,i,hs6,t}\right) * \left(1 - \left(\frac{\left|ImpVol_{j,i,hs6,t} - ExpVol_{i,j,hs6,t}\right|}{\max\left(ImpVol_{j,i,hs6,t}, ExpVol_{i,j,hs6,t}\right)}\right)\right)$$

The analysis combines export underinvoicing (*ExpDisc*) and import overinvoicing (*ImpDisc*) as the gross outflows from misinvoicing, to produce a lower bound to the IFFs from the region:

$$Gross\ outflows\ from\ misinvoicing = \sum ExpDisc_{i,j,hs6} + \sum ImpDisc_{i,j,hs6},\ for\ ExpDisc > 0\ and\ ImpDisc > 0$$

Estimated value of trade misinvoicing in Latin America and the Caribbean (US$ billions)



Source: UNECLAC (2016)

6. Calculate inward and outward IFFs

The final phase is to calculate inward and outward IFFs. Inward IFFs refer to over-invoiced exports and/or under-invoiced imports; and outward IFFs refer to under-invoiced exports and/or over-invoiced imports, as in:

$$Overinvoiced\ IM_{c,r,p,t} = max\left(0, Inbound_{c,r,p,t}\right) \qquad \textit{Equation (6)}$$

$$Underinvoiced\ IM_{c,r,p,t} = -1 * min\left(0, Inbound_{c,r,p,t}\right) \qquad \textit{Equation (7)}$$

$$Overinvoiced\ EX_{c,r,p,t} = max\left(0, Outbound_{c,r,p,t}\right) \qquad \textit{Equation (8)}$$

$$Underinvoiced\ EX_{c,r,p,t} = -1 * min\left(0, Outbound_{c,r,p,t}\right) \qquad \textit{Equation (9)}$$

To compile inward and outward IFFs the following equations are used:

$$InwardIFFs_{c,r,p,t} = Overinvoiced\ EX_{c,r,p,t} + Underinvoiced\ IM_{c,r,p,t} \qquad \textit{Equation (10)}$$

$$OutwardIFFs_{c,r,p,t} = Underinvoiced\ EX_{c,r,p,t} + Overinvoiced\ IM_{c,r,p,t} \qquad \textit{Equation (11)}$$

Finally, aggregation at national level is obtained by[30]:

$$InwardIFFs_{r,t} = \sum_{c,p} InwardIFFs_{c,r,p,t} \qquad \textit{Equation (12)}$$

[30] For a single measure of IFFs in a country, the inflows and outflows can be summed, not netted, as per: $IFFs_{r,t} = InwardIFFs_{r,t} + OutwardIFFs_{r,t}$. Subtracting outflows from inflows of IFFs would indicate the net effect of IFFs on the country. However, in a case that inflows and outflows balance out, the country may be perceived as if no threat or danger from IFFs are present, whereas each flow, inward and outward, may be of significant scale. Therefore, their sum would be used to indicate the overall IFFs in a country, if relevant.

$$OutwardIFFs_{r,t} = \sum_{c,p} OutwardIFFs_{c,r,p,t}$$ *Equation (13)*

There are many applications of PCM covering different countries or regions. Case study 6 showcases an application of PCM for South African imports, a study by the UNESCWA in the Arab region, a study in Asia and the Pacific, and a recent application for African continent paying particular attention to continental circumstances and the characteristics of commodities.

Case study 6. Partner Country Method applications in South Africa, Arab region, Asia and the Pacific, and Africa

WCO (2018) analysed South African imports between 2010 and 2015 with PCM to identify trade misinvoicing, using bilateral trade data from the United Nations Comtrade database. In this period, United Nations Comtrade included approximately 628 000 records of South African imports. However, only matching entries for imports value and volume can be used, comprising only about 45 per cent of the total available. South Africa already reports imports on an FOB basis; therefore, no adjustment was needed in comparison to partners' exports. However, adjustment for Chinese re-exports via Hong Kong was done and reliability weights applied. The results reveal that import undervaluation (12 per cent of the value of imports in the sample) is a greater risk for South Africa than overvaluation of imports (9 per cent of imports).

An UNESCWA (2016) study on IFFs in the Arab region focused on all four conduits of trade misinvoicing, namely underinvoicing and overinvoicing of export and imports. The report finds that Arab economies fall prey to at least US$60.3 to US$77.5 billion per year in damages due to IFFs associated with trade misinvoicing. Misinvoicing appears more pervasive for non-resource-based economies and for non-oil product categories at the HS 6-digit level and follow a general upward trend. Variability in the scope of misinvoicing has also been found to permeate both preferential and nonpreferential trade. The UNESCWA report also compares the results of PCM without any enhancements and bilateral corrections, noting that *"until mirror data are supplemented and can be matched against data at firm and transaction levels, misinvoicing estimates will remain a matter of faith".*

A study by Kravchenko (2018) in Asia and the Pacific applies the PCM method to bilateral trade flows at HS 6-digit level and finds that in 2016 as much as 7.6 per cent of regional tax revenue may have been lost in the region due to fraudulent export and import value declarations. The study also addresses some of the method's shortcomings, noting that:

1. Not all available trade data can be used due to lack of matched data (at either side, i.e., import or exports). This could be due to erroneous or deliberate misdeclaration of product code or country of origin or destination, as well as time lag. The coverage of matching exports and imports varies significantly. Therefore, the assumption must be made that the estimated misinvoicing rates are the same also for the non-matching records.
2. Aggregated data on differences in declared exports and imports, do not identify cases where declaration is misvalued at both sides of the border. Kravchenko looks at relative export prices by source and destination and finds substantial differences. He further notes that aggregation is likely to mask variations in quality and brand-value addition and averaging across economies is also likely to cancel out variation where some products are over or underpriced for different reasons.

Schuster and Davis (2020) note that both intra- and extracontinental African mirror trade gaps should be analysed to obtain a full(er) picture of IFFs. They underline lack of information on how trade statistics are recorded as a major obstacle. The authors use PCM to study IFFs in Africa, noting that it is important to consider continental and country or commodity specific circumstances when conducting PCM analysis. For instance, a negative value of trade discrepancy cannot be directly linked to IFFs since: (a) illicit inflows in the context of extractive industries in Africa is counterintuitive; and (b) large negative trade gaps (i.e., larger exports than imports by partner country) are likely to be linked to specific primary commodities and their trade patterns, for example, copper storage in bonded warehouses, or upstream transformation in industrial free zones.

Their results confirm that new metals like manganese, chromium, molybdenum and other rare-earth metals have the largest trade gaps, more than 200 per cent for the rare-earth metal group (indium, cadmium, lithium). Imports by the rest of the world are three times larger than exports reported by the continent. The overall intra-African trade gap is relatively small with inconsistent trend and mainly negative, driven largely by West African gold exports to South Africa. These patterns cannot easily be attributed to errors in trade recording and systemic illicit behaviour.

1.2. Price Filter Method (PFM) +

Concept and assumptions

The PFM is a bottom-up method which estimates a price filter for each commodity and uses it as a proxy for arm's length prices. Trade mispricing occurs when the unit price of a given transaction differs from the normal prices assumed by a price filter, i.e., when an abnormal price of a particular transaction is identified. Price filters vary between transactions depending on the circumstances of a given transaction, such as economic circumstances, business strategies of the buyer/seller, contractual terms etc. Price filter's upper and lower bound prices may be obtained from observable market prices or statistical estimates for each commodity (e.g., quartiles).

The main advantage of PFM is that it uses transaction level data. This means that it operates efficiently and at low costs. First, for administrative purposes it can help with automated monitoring of transactions in real time, allowing for inspection of historical records. Moreover, PFM does not rely on the partner's transaction data – it can detect mispricing also in the case of collusion of both, importer and exporter, which would not be detected by PCM.

The major drawback of PFM is the fact that statistical price filters will always find transactions with abnormal prices. Statistical price filters, namely, are generated endogenously, i.e., using all available transactions, including abnormally priced transactions. They are constructed by using, for example, the inter-quartile range. PFM will, therefore, always find transactions falling outside the statistical filter.

The next limitation comes with the heterogeneity of products even at transaction level. The transactions need to be classified using product classifications, and even at the most detailed level, they include products of varying degree of heterogeneity. These would inherently have different prices that would be picked up as abnormal prices using the price filter, while that would not necessarily be a sign of mispricing (e.g., high-end quality products within the same product code would have high(er) prices, potentially identified as abnormal prices, whereas in reality they simply reflect the quality of the product).

Moreover, PFM suffers from the inability to identify legitimate unusual prices, e.g., lower prices offered by long-term contracts, but also cases of volatile prices during the price filter estimation period, e.g., using annual price filters for crude oil when monthly crude oil price ranged between US$56/barrel and US$110/barrel in 2014 (see WCO, 2018). Similarly, when declared prices are different from true prices only by a small margin, PFM will not detect them as abnormal prices. Lastly, as in other methods, there is a difficulty to identify recording errors[31].

Overcoming limitations

These issues can, however, be mitigated by a detailed examination of trade records and/or refinement of price filters for selected commodities, or partners (e.g., accounting for transfer pricing). Although this requires significant efforts by compilers, such commodity or partners country enhancement of the PFM (hence, PFM+) produces better accuracy of estimating IFFs:

1. ***Set price filter at a detailed level.*** Price filters identified at the most detailed HS-code level depict segmented market features better and lead to a better identification of abnormal prices. Even at the lowest level of product classification, products can exhibit varying quality

[31] PFM is subject to an important limitation: it does not capture mis-recording of quantities (which may not be insignificant, specifically in cases of only small-scale mispricing).

levels. Supplementing a low-level product code with a description of the commodity may address the problem of false identification of abnormal prices, where in fact, different products are being sold (e.g., high, medium, and low-quality products). Gold[32], technical or IT products seem like natural candidates for such quality variations within a single product code. As in adjustment number 3 below, experts' knowledge is essential here too. A statistical tool of hedonic prices (see ILO et al., 2004) can also be applied, though the approach has not been tested yet.

Moreover, price filters can be refined for each trading partner. Since the input data are at the transactions level, it is possible to look at companies as trading partners (as compared to countries in PCM). It may be useful to detect separately trade mispricing, an activity within IFFs from illegal commercial activities, and transfer mispricing, an activity within IFFs from aggressive tax avoidance. This helps identify potentially different level of abnormality among partners that are members of the same MNE[33]. This, however, requires additional data to identify units belonging to the same MNE, e.g., from the statistics business register, the global groups register (in the future) or based on other inputs from the LCU. Transfer mispricing, however, is more prevalent with respect to services and intangibles in general.

2. ***Use free-market prices for the filter.*** To avoid the issue of endogeneity in setting up the price filter, compilers can rely on free-market prices for traded commodities. These may set a more objective price filter. However, this would require benchmark prices that are easily available and commonly acceptable. These may not be readily available for all products, e.g., without an established commodity market. To counteract this, moving averages of observed transaction prices can also be used in statistical filters.
3. ***Consult experts of international trade and examine trade documents.*** Applying expert knowledge in determining the price filter is crucial for reliability. The price filter is set as a central price (average, moving-average, free-market price) +/- some level of variation. Experts' inputs are essential for selecting the central price, but also to set the upper and lower bounds of the price filter. Commodity specialists from national agencies, such as Customs, or related institutions are best placed to support this exercise. Within NSOs, LCUs may have expertise related to strategic pricing by MNEs. Application of mixed research methods, both qualitative and quantitative approaches, allows for a richer insight. Moreover, expert knowledge is also required in additional checks and examination of trade documents in cases of suspicious transactions. These, identified by PFM, need to be examined to avoid false positives. Collaboration of national authorities (NSOs, Customs and others) can help build the knowledge for identifying abnormal prices and addressing IFFs from trade misinvoicing.

Source data

Transaction level data on international trade flows from Customs or other relevant national authorities are used as a source. These contain data on trading partners (companies), flows, price, value, quantity, products at the most detailed level of HS classification, and whenever possible, additionally to the detailed code, also a description of the commodity. It is useful for the NSO and Customs to work together to prepare, clean and classify these datasets. Moreover, it is important to use microdata before certain adjustments are made. For instance, statistical authorities may correct for abnormal prices to produce better quality statistics from the trade transactions data. The IMTS manual (UNSD, 2013) recommends adjustment of invoice values of related partner transactions so that the price matches the market price.

[32] For a case of gold purity, see Carbonnier and Mehrotra (2020).

[33] Carbonnier and Mehrotra (2020) point out that if international trade in a particular commodity is dominated by related parties with an incentive to deviate from arm's length prices, the estimated interquartile range [price filter] may be biased.

Free-market prices of commodities can be sourced from international data sources, such as UNCTAD commodity prices or the World Bank's commodity market prices. Similarly, United Nations Comtrade offers a range of standard unit values (SUV) with global unit values including their acceptable range unit value for each HS sub-heading. These sources may be overly aggregated, however alongside experts' inputs they provide good basis for at least some of the commodities being heavily traded worldwide. Additional insight from (national) experts are required to determine specific commodity price filters.

In cases of bringing trading partners (companies) into analysis (e.g., transfer pricing), structural business statistics at micro-level need to be linked to transactions data, combining them also, when appropriate or available, with automatic exchange of economic data with respect to MNEs (such as OECD's CbCR data or ADIMA database).

Calculation

Once source data are gathered and prepared, PFM is implemented in the following phases[34]:

1. Exploratory data analysis and preparation of the data

For the analysis, as the *first step*, the unit of observation is normally defined as a daily aggregation of transactions for a specific commodity (at most detailed available level, e.g., at 8-digit HS) per trading partners (at company levels). This *first step* involves also obtaining data for imports and exports.

Second step involves aggregating or grouping transactions into groups of similar trades, by commodity, trading partners, time period (depending on volatility, seasonality of prices, this can be from days, to weeks, months, or even a year; we propose daily aggregations), units of measurement (if applicable).

Third step builds on the previous and checks data for outliers, inspects them thoroughly also with experts, and defines the way they are treated (one obvious treatment would be their removal). Case study 7 presents an example of basic treatment of source data held by the South African Revenue Service (SARS) before the application of PFM.

Case study 7. The basic treatment of SARS data prior to applying the PFM

WCO (2018) applied PFM to South Africa's imports using transaction data by SARS. Basic treatment of these data before the application of PFM itself involved three passes through the data, with each applying standard statistical criteria to screen out extreme values. The PFM was, namely, applied to the SARS sample that required first elimination of outliers that could be the result of errors and would potentially exert undue influence on the results, if included. WCO (2018) notes that with a large sample, such as the SARS database, the potential for such overly influential observations is not negligible. It is also important to note that the PFM was implemented by organizing SARS price data into groups of similar trades, defined by the year of the transaction, commodity traded (8-digit SARS commodity classification) and the unit of measurement.

1. On the first pass to identify admissible groups of transactions, size of the group was checked. Groups with fewer than five observations were eliminated outright and those groups with five or more observations but limited variability in the prices were also eliminated from further analysis.
2. The second pass to identify admissible price observations within groups checked individual prices within the groups passing through first pass, removing the within-group outliers.

[34] Like PCM, also before implementing PFM an exploratory analysis can be conducted, narrowing down the scope, e.g., to only the top-10 traded products, or covering at least 75 per cent of the total trade. This choice will depend on the national circumstances and availability of resources.

3. Third pass aimed at identifying admissible price observations across groups, whereby first standardizing remaining prices to allow comparison across groups. Outliers were removed.

The triple-pass treatment reduced the number of distinct groups from 40 737 to 36 487, and the number of admissible records in the SARS database to just over 7 million. The PFM procedure was then applied to each surviving record in the SARS sample.

2. Including experts of international trade

Second phase is the inclusion of trade experts in the process of applying PFM. We list this as a second phase, although it can be done in first phase already and is to be continued throughout the process of PFM application. Extensive desktop research is crucial to identify relevant national stakeholders (see Part III, Chapter 2). Depending on national circumstances, agencies or institutions these experts come from vary, but could include Customs, frontier or border agencies, private and public agencies specialising in imports and exports procedures, Tax authorities, think tanks and economic-research institutes. Different commodities may require different institutions and/or experts to be involved. Case study 8 showcases this phase in the study of mispricing of gold and cocoa exports from Ghana (Ahene-Codjoe et. al., 2020).

Case study 8. Identifying national experts to support the application of the Price Filter Method

In their study of mispricing related to gold and cocoa exports from Ghana, Ahene-Codjoe et al. (2020) conducted extensive research to identify national experts for interviews during other statistical analyses.

List of institutions contacted in Ghana

Cocoa Beans and Cocoa Paste	
Role of Institution	**Name of Institution**
Production	Ghana Cocoa Board (COCOBOD)
Transportation	
Export	Cocoa Marketing Company (CMC) (COCOBOD), Ghana Export Promotion Authority (GEPA)
Gold	
Role of Institution	**Name of Institution**
Regulator	Minerals Commission
Private Sector Organisation	Ghana Chamber of Mines, Freight Forwarding Agency, Gold Exporting Agencies 1, 2
Assaying/Valuation	Precious Minerals Marketing Company (PMMC)
Civil Society Organisations	Ghana Extractive Industries Transparency Initiative (GHEITI), Integrated Social Development Centre (ISODEC)
Natural Resource Sector Governance	
Purpose of Institution	**Name of Institution**
Regulator/Tax Authority	Customs Division (Ghana Revenue Authority)
Regulator/Central Bank	Bank of Ghana
Business Promotion	Ghana Investment Promotion Centre (GIPC)

Source: Ahene-Codjoe et al. (2020)

3. Defining the price filter

Third phase defines the price filter. Several options are possible, including various enhancements as described above. Regardless, setting-up the price filter is composed of two steps: first, to define the central price, cp, and second to define the range, α:

$$pricefilter_{f,c,r,p,t,u} = cp_{f,c,r,p,t,u} \pm \alpha_{f,c,r,p,t,u} \qquad \textit{Equation (14)}$$

First, decisions need to be made on the price series to use throughout the PFM. Options include relying on observed prices from transactions or applying a free-market price. In both cases, further decisions include the level of commodity classification, *c*, for which prices are used; the timeframe applied, *t*; flow *f*, i.e., focusing on only imports or exports, or both; reporting, *r*, and trading partner, *p*; or units of measurement, *u*. We look at each in turn.

Using observed prices has an advantage of employing the same data source, yet, by doing so, any mispricing present can be integrated in the price filter, hence making price filter vulnerable to bias. Free-market price remedies this drawback, yet it suffers from being applicable only to the commodities for which a clear, commonly accepted market exists, and can be easily identifiable. We propose to use **as much as possible independent, free-market prices**.

In line with adjustments above, we propose to use a price at the **most detailed product classification level** possible, potentially enhancing it further with product descriptions. This will bring on board discussions on varying product characteristics (see Case study 9) and will inherently require heavy involvement of commodity and trade experts.

Case study 9. Calculating benchmark prices for gold

Gold is identified as a commodity with variations in its characteristic, the contents of gold, or other metals. In their application of PFM to gold imports to Switzerland, Carbonnier and Mehrotra (2020) use free market price to determine the arm's length price range, concretely the London Bullion Market Association (LBMA)'s daily spot price series for refined gold bars. As they note, according to the Metals Focus Gold Silver Dore Service database, gold doré bars produced and traded internally can contain between 2-95 per cent pure gold by weight, silver (ranging between 0-92% by weight) and other impurities (up to 5 per cent by weight). Consequently, they use the country-level gold and silver content in doré produced, and use formulas to calculate a maximum and minimum benchmark prices:

Maximum benchmark price =
*(daily price of gold * maximum gold content in doré) + (price of silver * minimum silver content)*

Minimum benchmark price =
*(daily price of silver * maximum silver content in doré) + (price of gold * minimum gold content)*

Time dimension, furthermore, is important from two perspectives: first, which timeframe to use in the sense of including only the current price, or rather incorporate a longer period, to account for some of the variations in the market. Second, whether to use the rolling-value, such as moving average, or simply use one fixed value for entire studied period. We propose to avoid using a fixed value for a longer period yet do base the central price on multiple-period observations. To encompass this, a **moving-average** for a shorter period, e.g., three days, is proposed (see Case study 10). Again, experts' inputs are relevant also at this point.

Whenever possible, specific observations for both reporting and partner companies may be of valuable input to determine whether the mispricing refers to free-market circumstances, or is the phenomenon of transfer pricing included. In such instances, using a common identifier is required to link a company from transactions database to either structural business or relevant MNEs databases.

Seeking expert knowledge (including those of trading partner abroad) is helpful also in cases where specific market conditions impact the observed and true prices on the market, such as long-term contracts. A particular market condition is also the prevalence (or domination) of trade flows by the use of intermediary entities located in low-tax jurisdictions (e.g., tax havens), such as observed in Brazil

as high reliance on triangular operations through offshore intermediary entities located in low-tax jurisdictions (see Box 1 for the concept and Case study 10 for application of PFM).

Second, define the range of the price filter, be it either as clearly defining lower- and upper-bound price, or defining an amount of variation around central price from first step. There are two main approaches to defining the price filter. The first one is the use of statistical filter and is linked to using transactions-based prices in also determining the central price; and the second, the use of free-market prices and related range.

With reference to statistical price filters, using **inter-quartile range** (IQR) assumes that the range between first and third quartiles (25th and 75th percentile, respectively) for a particular case represents its arm's length price range. Corresponding price filter, lower-bound price (*LP*) and upper-bound price (*UP*) are determined as:

$$pricefilter_{f,c,r,p,t,u} = IQR_{f,c,r,p,t,u} \qquad \textit{Equation (15)}$$

$$LP_{f,c,r,p,t,u} = 25thPercentile_{f,c,r,p,t,u} \qquad \textit{Equation (16)}$$

$$UP_{f,c,r,p,t,u} = 75thPercentile_{f,c,r,p,t,u} \qquad \textit{Equation (17)}$$

Other percentiles can also be used to define lower and upper bounds of the price filter. These deviations from the IQR, however, would need to be supported by expert's inputs. According to statistical price filter, transaction prices lower than the price filter's lower bound (1st quartile if IQR is used) are marked as abnormal low prices; prices above price filter's upper bound (at 3rd quartile in IQR) represent abnormal high prices; and the transaction prices within the price filter are referred to as normal prices.

Using the **free-market price filter**, an actual transaction price is compared to the free-market price (or its moving average as per discussion above in determining the central price) for a particular commodity, where the arm's length is determined by an assumed range of deviation from the central price, α from equation (14), determining lower- and upper-bound prices as:

$$LP_{f,c,r,p,t,u} = cp_{f,c,r,p,t,u} - \alpha_{f,c,,p,t,u} \qquad \textit{Equation (18)}$$

$$UP_{f,c,r,p,t,u} = cp_{f,c,r,p,t,u} + \alpha_{f,c,r,p,t,u} \qquad \textit{Equation (19)}$$

This variation is to account for product specific circumstances, price volatility, contractual terms or other business conditions, transportation costs (if relevant), any political, economic or environmental shocks that may impact the prices of a particular commodity. Again, prices within the price filter's range are taken to be normally priced, while any prices outside this range are considered abnormal prices. Experts are heavily involved in this step to determine the magnitude of normal price deviations around the central price.

4. Over and underpricing

In fourth phase, the amount of over and underpricing is determined. As noted above, lower and upper bound prices are used to identify abnormal prices. Undervalued amount refers to the amount

(value) of a transaction with price below lower bound price, using quantity (volume) *Q* from the individual transaction:

$$Undervalued\ amount_{f,c,r,p,t,u} = Q_{f,c,r,p,t,u} * max\left(0, LP_{f,c,r,p,t,u} - P_{f,c,r,p,t,u}\right) \qquad \textit{Equation (20)}$$

Analogously, overvalued amount is represented by:

$$Overvalued\ amount_{f,c,r,p,t,u} = Q_{f,c,r,p,t,u} * max\left(0, P_{f,c,r,p,t,u} - UP_{f,c,r,p,t,u}\right) \qquad \textit{Equation (21)}$$

5. Inward and outward IFFs

In final phase, inward and outward IFFs are calculated via aggregation. Again, inward IFFs are overvalued exports and/or undervalued imports; and outward IFFs refer to undervalued exports and/or overvalued imports. Using notations in this section, replacing subscript *f* with a superscript of either *EX* for exports or *IM* for imports, they are defined as:

$$InwardIFFs_{c,r,p,t,u} = Overvalued\ amount^{EX}_{c,r,p,t,u} + Undervalued\ amount^{IM}_{c,r,p,t,u} \qquad \textit{Equation (22)}$$

$$OutwardIFFs_{c,r,p,t,u} = Undervalued\ amount^{EX}_{c,r,p,t,u} + Overvalued\ amount^{IM}_{c,r,p,t,u} \qquad \textit{Equation (23)}$$

Finally, aggregation at national and annual levels is obtained by (assuming *t* referred to less-than annual level, e.g., daily frequency and its summation/aggregation therefore refers to an annual value):

$$InwardIFFs = \sum_{c,r,p,t,u} InwardIFFs_{c,r,p,t,u} \qquad \textit{Equation (24)}$$

$$OutwardIFFs = \sum_{c,r,p,t,u} OutwardIFFs_{c,r,p,t,u} \qquad \textit{Equation (25)}$$

Case study 10. Price Filter Method for the Soya Bean exports in Brazil

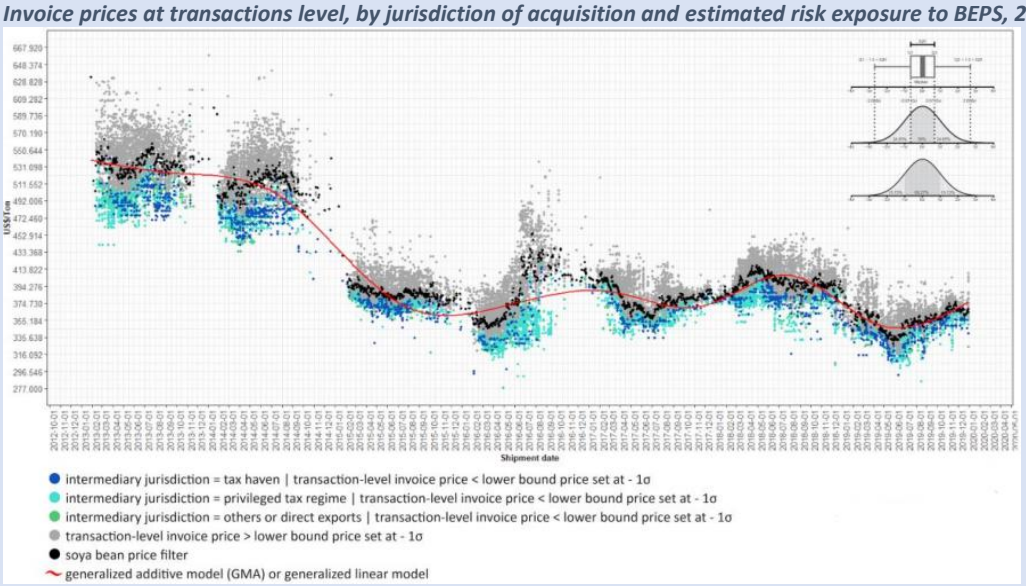
Amaral and Barcarolo (2020) applied the PFM to Brazilian soya bean exports. In Brazilian market the soya bean price is composed of the commodity future market quoted price and a premium basis, that is paid to the exporters. The soya bean price filter is therefore calculated as:

SOYA BEAN PRICE FILTER = [QUOTED PRICE + PREMIUM BASIS] +/- α (%)

Price filter was statistically estimated using a three-day weighted moving average price, based on the transaction-level data collected by the Customs Bureau. Outlier treatment was applied using IQR before estimating the weighted moving average price.

The case is important also in the refining of the PFM analysis by considering economic substance. Particularly, this refers to observing high-risk transactions in terms of their exposure to BEPS and segregating transactions by country of acquisition into tax havens, privileged regimes, or other jurisdictions (following national regulation). Suspicious abnormally underpriced invoices are presented in the following chart.

Invoice prices at transactions level, by jurisdiction of acquisition and estimated risk exposure to BEPS, 2012-2020



Source: SISCOMEX Customs Database, Amaral and Barcarolo (2020)

The potential tax IFFs were estimated as follows:

$$(a)\ Weighted\ Average\ Price(t) = \sum_{i=1}^{n}[Invoice\ Price\ (t{:}\,i)\ x\ Quantity(t{:}\,i)]\ /\ \sum_{i=1}^{n}[Quantity(t{:}\,i)]$$

$$(b)\ Weighted\ Moving\ Average\ Price(t) = \sum_{t'=t-3}^{t}[Weighted\ Average\ Price(t')\ x\ TIN(t')\ x\ E(t')\ ]\ /\ \sum_{t'=t-3}^{t}[TIN(t')\ x\ E(t')]$$

$$(c)\ Price\ Filter\ Range(t)' = [Weighted\ Moving\ Average\ Price(t') \pm 1\sigma\ ]$$

$$(d)\ Total\ Estimated\ BEPS\text{-}related\ FF = \sum_{i=1}^{n}[Lower\ Bound\ Price(t)' - Invoice\ Price\ (t{:}\,i)]\ x\ Quantity(t{:}\,i)$$

Where:

- **Weighted Average Price (t):** daily average price weighted by transaction-level invoice prices and quantity in tons.
- **Weighted Moving Average Price (t):** three-day moving average price weighted by quantity of tax payers (exporters) and by quantity of exports transactions.
- **Price Filter Range (t):** upper and lower bound prices set at the three-day weighted moving average price +/- 1σ (standard deviation).
- **Lower Bound Price (t):** three-day weighted moving average price - 1σ (standard deviation).
- **Total Estimated BEPS-related FF:** the sum of the differences between the lower bound prices and transaction-level invoice prices below the lower bound (potential underinvoiced exports) in the period from date *t=1* to *t=n*, wherein *1* represents the first and *n* the last day.
- **TIN (t'):** quantity of taxpayers (exporters) in a date *t*.
- **E(t'):** quantity of export transactions in a date *t*.
- **Invoice Price (i):** transaction-level invoice price in a date *t*.
- **Quantity(i):** weight in tons by transaction-level invoice price in a date *t*.

Estimated tax-related IFFs on export side amount to just below 1 per cent of total exports, around US$504 million. The authors further note that considering that around 99 per cent of export transactions happen between affiliated entities located in favoured taxation jurisdictions, the price filter for the soya bean trade market (estimated using transaction level trade data by the Customs) are likely biased down due to aggressive tax planning strategies. Applying a free-market rather than statistical price filter is required in such cases to guarantee reliability of the results in further applications of the method.

Estimated BEPS-related financial flows

Estimated BEPS-related financial flows
Period: 2017 to 2019

country of acquisition	triangular transactions	Incoterms	total exports US$	quantity TON	estimated BEPS-related FFs US$
Art.1º - Tax Haven	Yes	FOB	18.128.478.967	47.964.971	162.298.531
Art.2º - Privileged Tax Regime	Yes	FOB	29.913.890.618	79.024.100	300.401.808
Other jurisdictions	Yes	FOB	5.552.651.496	14.590.957	38.643.608
Other jurisdictions	No	FOB	150.150.582	407.331	2.507.883
Total			**53.745.171.664**	**141.987.359**	**503.851.830**

Source: Amaral and Barcarolo (2020)

2. Aggressive tax avoidance or profit shifting by MNEs

Observing discrepancies in aggregated statistics (such as BoP) provides a starting point for estimating profit shifting by MNEs. As Case study 11 describes, profit shifting will not lead to distortions in aggregate account balances, but it will affect their components (Hebous et al., 2021); profit shifting flows are also linked to concepts of BoP (Cobham et al., 2021). Analysis of aggregate data can offer valuable insight into profit shifting. Similarly, using statistics on FDI (or their ratio to GDP) can provide signs of profit shifting (see case studies 15 and 19) or help estimate IFFs (see UNCTAD, 2015; Janský and Palanský, 2019). FATS macro data have been used by Tørsløv et al. (2020) to compare profitability levels of MNE units in different jurisdictions. However, these macro approaches may not capture all IFFs or separate them sufficiently from other flows to provide an accurate measure.

With significant recent development in methodologies to measure MNE profit shifting, albeit differing model specifications and approaches, one concept is firmly rooted in existing economic theory used by many papers: that declared profits are composed of real, unobserved profits and the shifted profits. Three main approaches have evolved in research literature addressing the issue.

First, the **profit misalignment** method compares reported profits by MNEs with economic activity in the same country, judging any misalignment between the global shares of these as possibly due to profit shifting (for example, OECD, 2015, Cobham and Janský, 2020, Garcia-Bernardo & Janský, 2021).

Second, the **tax semi-elasticity** method starts from a regression with reported profits on the left-hand side and tax rate on the right-hand side, controlling for proxies of capital and labour and potentially other characteristics. With the regression estimated, the scale of profit shifting is derived by removing the effect of tax rates or, in other words, simulating hypothetical scenarios in which tax rates did not differ (for example, Hines & Rice, 1994, Huizinga & Laeven, 2008, Dharmapala, 2014, Clausing, 2016, Wier and Reynolds, 2018, Beer et al., 2018, Fuest et al., 2021, Garcia-Bernardo & Janský, 2021).

Third, the method of **comparing MNEs with domestic firms** builds on the idea that, absent profit shifting, the profitability of MNEs should be similar to that of domestic firms; any systematic differences between the two are then attributed to profit shifting (for example, Bilicka, 2019, Tørsløv et al., 2020, Sallusti, 2021).

All approaches share the disadvantage of providing only an approximate estimation of tax avoidance by MNEs, with profit misalignment somewhat further suffering from identified misalignment not necessarily be tax-induced profit shifting. Two methods to estimate international tax avoidance by MNEs are presented. First, a tax semi-elasticity method analysing the global distribution of MNEs' profits and their corresponding corporate taxes. And second, a method comparing MNEs to similar

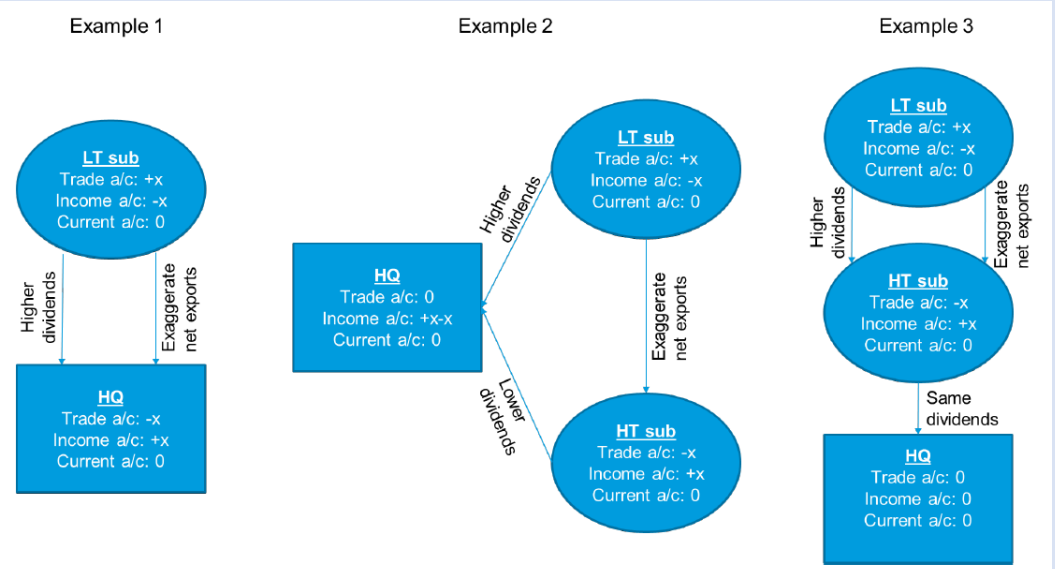
domestic companies using microdata to determine aggressive tax avoiding behaviour and estimate IFFs.

Case study 11. How does profit shifting reflect on the balance of payments?

Hebous et al. (2021) studied how tax strategies of MNEs shifting profits to jurisdictions with lower tax rates reflect on international flows. Using a panel of 81 countries for a period from 1990 to 2018, they find that the current account balance is not affected by statutory corporate tax rate, yet higher tax rates are associated with lower trade balances and higher income balances. Transfer mispricing flows (F3) affect import and export statistics; debt shifting (F4) and assets and intellectual property shifting (F5) affect international flows of interests, royalties and licence fees. Thus, profit shifting affects various components of the BoP.

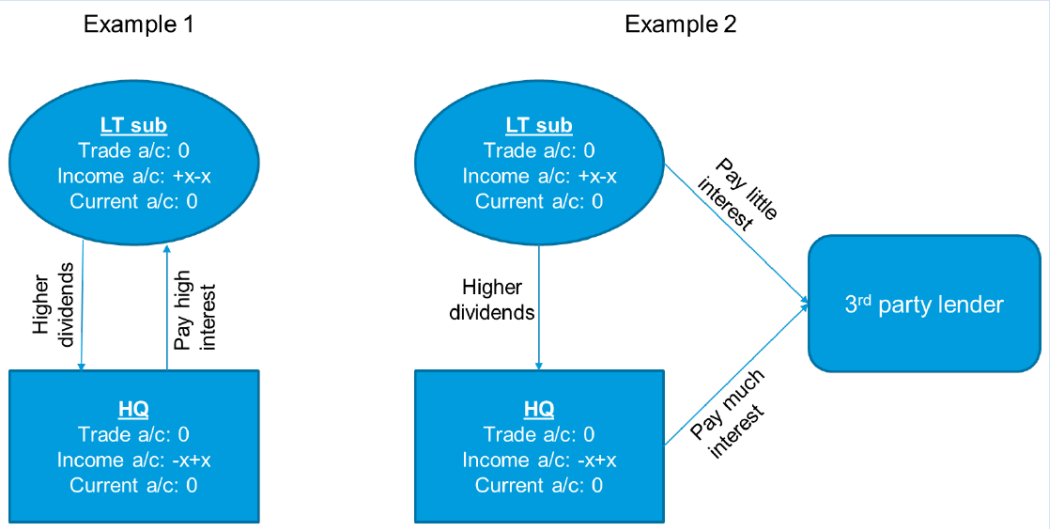
Examples of how (1) transfer price manipulation and (2) profit shifting via intragroup lending impact the BoP are presented in figures below. The authors note that transfer price manipulation can affect bilateral current account balances, but not the aggregate level (except indirectly through changes in tax liabilities). With debt shifting, on the other hand, no impact is observed in the trade balance, yet credits and debits do occur in the income account.

Graphical representation of BoP impact of (1) transfer price manipulation



Notes: An amount x is shifted. LT indicates a low-tax jurisdiction, HT a high-tax jurisdiction. HQ denotes the country of the headquarters' location, which also has high taxes. Instead of higher dividends, there could also be an increase in liabilities through retained earnings with the same impact.

(2) profit shifting via intragroup lending



Notes: An amount x is shifted. LT indicates a low-tax jurisdiction, HT a high-tax jurisdiction. HQ denotes the country of the headquarters' location, which also has high taxes. Instead of higher dividends, there could also be an increase in liabilities through retained earnings with the same impact.

Source: Hebous et al. (2021)

Cobham et al. (2021) provide an overview of how specific profit shifting flows (as defined in Table 1) can be linked to the BoP.

Overview of the variables in the Balance of Payments Statistics that are related to flows of profit shifting by multinational companies

Profit shifting method	Corresponding concept in BPM	Reasoning
Strategic location of intangible assets (F5)	Primary income account / Investment income / Direct investment / Income on equity and investment fund shares	Profit shifting made possible by the mobility of intangible capital
Strategic location of liabilities (F4)	Primary income account / Investment income / Direct investment / Interest	Profit shifting made possible by debt shifting (earning stripping)
Transfer mispricing in trade in goods (F3)	Goods and services account / Total goods	Profit shifting made possible by the vagueness of arm's length pricing rules
Transfer mispricing in trade in services (F3)	Goods and services account / Other business services Goods and services account / Financial services Goods and services account / Charges for the use of intellectual property n.i.e.	Profit shifting made possible by the mobility of intangible capital

Source: Cobham et al. (2021)

2.1. Global distribution of MNEs' profits and corporate taxes

Concept and assumptions

The method looks at the distribution of profits of an MNE among its units globally based on microdata and relates it to the corresponding corporate (effective) tax rates and underlying economic activity of a particular unit. It assumes that an MNE unit is likely to shift profits out of the country if another unit's tax regime induces a lower tax rate. Following empirical literature on corporate profit shifting, the method tests a regression model, linking MNE unit's profits as dependent variable, with its economic activity identified through employment and assets; general conditions of a country which it operates

in, such as population size and GDP per capita; and tax rate differences between rates faced by the MNE unit in a country and rates faced by units in other countries (Garcia-Bernardo and Janský, 2021; Fuest et al., 2021; Bratta et al., 2021).

The method assumes that any systematic deviation from predicted profitability of the unit based on its economic activity and circumstances of the host country, is a sign of potential profit shifting. This is evaluated through semi-elasticity of profits to tax rates. Identified deviations are further quantified to propose a measure of IFFs from profit shifting (flows F3-F5). Caution should be exercised when interpreting the results, and they could be analysed together with estimates compiled using other methods. There is uncertainty about whether the method underestimates or overestimates profit shifting, and this could vary by country.

Determining the tax rate that MNE units face in a particular country may not be straightforward. Certain incomes may face different tax rates, e.g., patent box regimes offering lower rates on certain income, specific tax-reducing arrangements with governments for certain activities, such as research and development (R&D) (Fuest et al., 2021); there may also be other, non-tax incentives to shift profits, such as the fear of expropriation (Reynolds and Wier, 2016). Moreover, tax differentials between domestic MNE unit and another MNE unit may not fully capture incentive to shift profits. Finally, tax sensitivity of profits may vary across different tax regimes, e.g., between high and low-tax jurisdictions, or depending on the size of the MNE (Wier and Reynolds, 2018; Fuest et al., 2021).

Overcoming some of the limitations

Some of the above limitations can be mitigated with the following:

1. ***Use effective (average) tax rate***. The effective (average) tax rate provides a more comprehensive representation of country's corporate income taxation (Bratta el al., 2021) and is thus better suited for the analysis than statutory tax rate. The latter is deemed an inaccurate measure for the actual tax burden in a country by some studies, as Fuest et al. (2021), pointing out with an example of Luxembourg and Malta, whose statutory tax rates are nominally high (above 25 per cent), although the countries have been consistently labelled as tax havens. Statutory tax rate, however, is usually the data available by countries and hence used in various research, whereas effective tax rate may require further calculation as proposed in the section below. Using micro data would provide potential solutions to overcome these data limitation issues as effective tax rates can be calculated from the microdata themself.

2. ***Use quadratic tax variable specification***. To account for uneven tax-sensitivity across various tax jurisdictions, alternative non-linear specifications of tax variable have been applied: quadratic by Fuest et al. (2021); cubic by Bratta et al. (2021), or, in cases of extreme non-linearity, logarithmic model as applied in Garcia-Bernardo and Janský (2021). We suggest adding a squared tax variable to the specification of the model, i.e., using quadratic specification. In cases when such specification would turn out inappropriate, or insufficient, listed alternatives in literature could be applied.

3. ***Use quartiles of consolidated revenues to form subsamples***. To address potentially varying tax sensitivity depending on the size of MNE existing research applied various approaches, such as estimating the model on each of the sub-samples based on MNE's consolidated revenues and estimations compared and combined for the profit shifting estimates (Fuest et al., 2021), or applying weighted regression (Wier and Reynolds, 2018; see Case study 12). Data

availability and sample size will determine the application of these mitigations. When applicable, we propose to break sample into four sub-samples based on the quartiles of total consolidate revenues (see Case study 13).

4. ***Use tools to confirm and interpret results***. Two tools serving as proxies for the role of the unit within MNE are proposed: (1) Location of the unit which relates to tax system, labour costs, etc. to identify the role of the unit in the tax strategy of the MNE. (2) Economic activity of a unit to assess to a certain degree the technological nature and role of each unit within the MNE's production chain. These tools can be based on aggregated data (e.g., analysing profits per employee, outward FDI, effective average tax rates, or intra-firm revenues across non-havens and tax havens as in Fuest et al., 2021, or Fortier-Labonté and Schaffter, 2019 – see also Case study 15), or firm level data. Comparing results from regression analysis to a comparable unit or MNE (or a control group), on a case-by-case basis, can help validate the results. As such process is inevitably resource intensive, it lends itself perfectly to LCU tasks. International collaboration of LCUs (where established) or experts of MNE data would support application of the method; LCUs are already engaged in the mapping of global MNE structures and roles of MNE units.

Source data

This method requires data on MNEs and their units, including variables such as profits before taxes, effective tax rates, number of employees, value of tangible assets and similar. These data can be found in OECD's CbCR data, especially by national authorities with access to microdata. Using CbCR data also requires extrapolations for the profit shifting of smaller companies which are not covered by the data.

Important limitation lies in data availability and coverage. In an ideal scenario, MNE-unit microdata and covering entire web of units within all MNEs in any way related to a country of interest, would be available. This, however, is usually not the case; statistical authorities mostly have data on domestic MNEs (headquartered in a country of interest) with information on their units in other countries, and data on foreign-owned (headquartered) MNE units in the domestic economy, but not their units abroad. National authorities of participating countries to CbCR can access[35] CbCR microdata, i.e., at the level of each individual MNE unit (see Fuest et al., 2021 in Case study 13 for Germany; or Bratta et al., 2021 in Case study 14 for Italy).

CbCR reporting is required for MNE groups with more than €750 million of consolidated group revenue. Therefore, the dataset is limited in coverage, but studies have shown that the largest MNEs account for the bulk of profit shifting flows (see Wier and Reynolds, 2018; see Case study 12).

There may be some "double counting" of items in CbCR microdata, i.e., with reference to stateless entities (not resident anywhere for tax purposes) when reporting revenue and profit as "stateless" in both, the transparent unit and in the jurisdiction in which units operate (OECD, 2020a). However, as Fuest at al. (2021) show, along with additional guidance to the actual reporting by OECD (e.g., also on intracompany dividends), this problem is only of minor relevance.

National statistical authorities can access detailed data on MNE units active in the country (see Case study 12 for analysis based on firm-level tax returns from national Tax authority) from business

[35] Conditions for access and automatic exchange of information, such as bilateral or multilateral tax treaties or tax information exchange agreements, are outlined in OECD (2019).

statistics or tax data, etc., and these can be analysed in combination with CbCR microdata. Whether tax return microdata can be used successfully also depends on whether (i) analysts can identify MNEs, (ii) whether they collect data on related parties abroad, and (iii) whether they observe enough MNE entities to produce a meaningful estimate. Some legal settings exist also for the exchange of economic data among national statistical authorities, e.g., within the European Statistical System, to gain access to data on MNE units abroad beyond the CbCR threshold. Additional global data sources can also be used, as appropriate, such as OECD's databases (ADIMA, AMNE and Tax Database), GGR, EuroGroups register or similar.

The method requires data on conditions of countries in which MNEs operate, such as population size, GDP per capita and tax rate. Several global data bases of international organisations provide data on population and GDP by country (such as UN Data or UNCTAD Statistical Database). KPMG's Corporate Tax Survey and EY's Annual Worldwide Corporate Tax Guides and the Orbis database provide tax information.

Calculation

The method estimates profit shifting in two steps: first, determine the presence of profit shifting via a semi-elasticity of profits on taxes, and second, measure the size of profit shifting flows.

1. Determining the presence of profit shifting

Following Fuest et al. (2021), the empirical model is specified as:

$$log(y_{i,c,t}) = \alpha_i + \beta_1 T_{i,c,t} + \beta_2 T_{i,c,t}^2 + \gamma' Firm_{i,c,t} + \delta' Country_{c,t} + \theta_t + \varepsilon_{i,c,t} \qquad \textit{Equation (26)}$$

where:

$y_{i,c,t}$	… sum of profits before taxes of MNE unit's *i* in country *c*
$T_{i,c,t}$	… tax variable of MNE unit's *i* in country *c*
$Firm_{i,c,t}$	… vector including variables describing unit's *i* activities in country *c*
$Country_{c,t}$	… vector including variables describing conditions in country *c*
	… Subscript *t* denotes time

For dependent variable, $y_{i,c,t}$, we propose to use the logarithm of sum of profits before taxes of MNE unit's *i* in country *c* to estimate the size of profits shifted.

From the above equation, the tax variable $T_{i,c,t}$ is of our interest. This tax variable is defined as the difference between tax rate faced by MNE *m*'s unit *i* in country *c*, $\tau_{i,c,t}$, and the unweighted average of tax rates applied to the units of the same MNE *m* in all the countries apart from *c*, $\bar{\tau}_{m-i,-c,t}$. Therefore, $T_{i,c,t} = \tau_{i,c,t} - \bar{\tau}_{m-i,-c,t}$.[36] As mentioned, we propose using the effective average tax rate instead of statutory tax rate. If effective tax rates by different countries cannot be obtained from global data sources, such as OECD's Tax Database, at country level, they need to be calculated for a particular unit.

Depending on data availability, multiple options are available. Fuest et al. (2021) calculate the effective average tax rate from microdata in country $\tau_{i,c,t}$ as the sum of taxes MNEs pay in country *c* divided by

[36] In case where tax difference is being constantly referenced to the same "domestic" country c, as is the case of Fuest at al. (2021) where observations are only made for German MNEs, average tax rates faced by units of the same MNE abroad can be used alone instead of differences in tax rates.

the sum of profits these units report in country *c*. To avoid the potential endogeneity problem they propose to determine the effective average tax rate for unit *i* in country *c* only based on information on taxes paid and profits reported by other MNE units in country *c*. If data availability is limited, however, the approach by Bratta et al. (2021) may be more feasible, whereby effective tax rate is imposed to be zero if statutory tax rate is zero; for other countries for which effective tax rates are not available, they are calculated as the difference between statutory tax rate of the country and the median difference between statutory and effective tax rates observed in the (populated) dataset.

Firm vector includes variables depicting unit's economic activity: logarithms of (i) number of employees and (ii) value of tangible assets.

Vector *Country* includes (i) logarithm value of GDP per capita adjusted for purchasing power parity (PPP) and (ii) logarithm of population. α_i refers to MNE unit's fixed effects and θ_t to year fixed effects (conditioned on data availability).

As the specification above is quadratic, related coefficients β_1 and β_2 constitute the semi-elasticity of profits with respect to tax rate. In their interpretation, however, we need to compute a (combined) marginal effect of a tax rate at certain effective tax rate (e.g., 10 or 25 per cent; see Fuest et al., 2021; Bratta et al., 2021), as it is no longer constant with the addition of $\beta_2 T_{i,c,t}^2$. Negative marginal effect of 0.01, for example, would show that a 1 percentage point higher tax rate is associated with a 1 per cent lower (reported) profits. The estimated parameters of semi-elasticities of profits with respect to tax rate are the result of first step and used directly in the second step (as outlined below) to observe the measured profit shifting flows.

2. Measuring the size of profit shifting flows

To provide a dollar-measure of IFFs from MNE profit shifting (to low-tax countries), we observe how the actual profits declared in country *c*, $y_{i,c,t}$, would change if a different (lower) tax rate was applied and hence tax incentive to shift profits removed (assuming other factors are accounted for in the model specification). This is processed in the following way (following Bratta et al., 2021; see Case study 14).

First, we recognize that actual, declared profits can be decomposed into part *R,* related to real economic activity, and part S, related to differences in tax rates, i.e., (tax-induced profit shifting):

$$y_{i,c} = R_{i,c} + S_{i,c} \qquad \textit{Equation (27)}$$

Second, we note that shifted profits are a part of real profits, R. This part is defined through semi-elasticity from step 1 and corresponding tax variable, together marking the marginal effect of tax rate: how much do real profits change with tax rate change. Hence, we can write:

$$y_{i,c} = R_{i,c} + \hat{\beta} T_{i,c} * R_{i,c} \qquad \textit{Equation (28)}$$

where: $\hat{\beta} T_{i,c} = \beta_1 T_{i,c} + \beta_2 T_{i,c}^2$.

Finally, rearranging slightly to obtain $R_{i,c} = \frac{y_{i,c}}{1+\hat{\beta} T_{i,c}}$ and inserting into $S_{i,c} = y_{i,c} - R_{i,c}$ we obtain the final equation to measure the size of profit shifting:

$$S_{i,c,t} = \frac{y_{i,c,t} * \hat{\beta} T_{i,c,t}}{1 + \hat{\beta} T_{i,c,t}}$$ *Equation (29)*

where $T_{i,c,t}$ is defined as the difference of effective tax rate of country *c* and the unweighted average effective tax rate applied to other units than unit *i* of MNE (*m-i*) in other countries (*-c*).
Results will be calculated for each MNE and per country where the MNE's unit is present (and in time *t*, depending on data availability). A negative value of $S_{i,c,t}$ indicates that profits are being shifted out of a country, with reverse holding for positive values of $S_{i,c,t}$, meaning profits are being shifted into a country.[37]

Therefore, building on equation (29), each flow of profits is determined either as an outward or inward IFF as per:

$$OutwardIFFs_{i,c,t} = \left|min\left(0, S_{i,c,t}\right)\right|$$ *Equation (30)*
$$InwardIFFs_{i,c,t} = max\left(0, S_{i,c,t}\right)$$ *Equation (31)*

Underestimation of the results stemming from data coverage (e.g., excluding firms below a certain threshold, such as the €750 million in CbCR, or potentially not accounting for foreign-owned MNE units in domestic country) can be mitigated by scaling up of obtained results with a cautious approach and using other microdata sources, if possible. Examples are found in Clausing (2016) for United States or Fuest et al. (2021; see also Case study 13) for Germany. This, however, may be more problematic in countries with a variety of combinations and effects of MNEs' presence, roles and related profit shifting. In the absence of specific national circumstances and data availability, the suggested method for pilot testing (still potentially subject to national enhancements) uses the following to determine IFFs at national level:

$$OutwardIFFs_t = \sum_{i,c} OutwardIFFs_{i,c,t}$$ *Equation (32)*
$$InwardIFFs_t = \sum_{i,c} InwardIFFs_{i,c,t}$$ *Equation (33)*

Case study 12. Estimating profit shifting in South Africa using firm-level tax returns

Reynolds and Wier (2016) use firm tax returns from Tax authority in South Africa for the period from 2009 to 2014 to analyse variables, including labour costs, fixed capital, accounting profits and taxable profits. The analysis includes MNE units in South Africa with sales of over 1 million South African Rand (ZAR) that are at least 70 per cent owned by a foreign parent. All other MNE units are excluded due to data limitations, including cases where South African unit is the parent of the MNE. With about 2 000 MNE units, only a small number compared to nearly one million firms in South Africa, these subsidiaries are markedly larger than the average South African firm. The observed average parent tax rate is similar to domestic corporate tax rate. The authors estimate the following specification:

$$\log(taxable\ income_{it}) = \alpha_{Ind,t} + \beta_1 \log(fixed\ capital_{it}) + \beta_2 \log(labour\ expenses_{it}) + \beta_3 \cdot parent\ tax\ rate_{it} + \varepsilon_i \quad (1)$$

The semi-elasticity of taxable income with respect to the parent tax rate is estimated to be 1.7, meaning that a 10 percentage points lower parent tax rate is associated with a 17 per cent lower taxable income in the South African unit of

[37] Underlying assumption is the »correct« results from the first step, i.e., the marginal effect is negative. If this, however, cannot be proven econometrically, the model specification is unsuitable for the country at hand and will not produce reliable IFFs estimates. In such cases, in-depth knowledge is required to either reformulate the model in step 1, or apply other approaches (see step 4 in overcoming limitations of this method above).

that MNE. Accordingly, they estimate the loss of MNE units profits due to profit shifting at 7 per cent of these units' income, or 1 per cent of the total corporate tax base in South Africa.

In another study, Wier and Reynolds (2018) investigate the link between firm size and profit shifting. They find that the major portion of profit shifting takes place with the largest of MNEs, with the majority of firms shifting only very limited amount of profits. By not considering heterogeneities in profit shifting across firms of different sizes may lead to significant underestimation of profit shifting. Accordingly, the authors account for differences in size by dividing the sample into ten groups according to wage bills and run regressions within each of these groups. They show that in larger MNE units, the estimated impact on profitability is significantly larger and also statistically significant. Alternative way to account for the size of firms is to apply a weighted regression using wage bill as the weight.

Results are significantly larger when properly accounting for firm size. Authors also note that combining high profits with aggressive tax avoidance implies that the largest 10 per cent of foreign-owned firms account for as much as 98 per cent of all profits shifted. As these findings are not unique to South Africa, authors note the findings can help in explaining the gap between micro and macro estimates of profit shifting often observed in studies.

Case study 13. Profit shifting in Germany using Country-by-Country Reporting data

Fuest et al. (2021) analyse CbCR data for German-headquartered MNEs at the level of each MNE unit. They estimate tax-induced profit shifting using the quadratic specification (to account for non-linearity of tax sensitivity):

$$y_{ict} = \dot{\alpha}_i + \dot{\beta}_1 \tau_{ct} + \dot{\beta}_2 \tau_{ct}^2 + \dot{\gamma}' Firm_{ict} + \dot{\delta}' Country_{ct} + \dot{\theta}_t + \dot{\epsilon}_{ict}$$

The authors use two alternatives for dependent variable: statutory tax rate and effective tax rate to show that statutory tax rate is an inaccurate measure of the actual tax burden in a country. In the vector Firm, they also use the unrelated revenues. Given the granularity and richness of their dataset, they further use dummy variables to test whether tax havens (divided into European and non-European) play a key role in profit shifting by German MNEs – and show this is the case, whereby confirm the bivariate graphical analysis conducted at the beginning of their study revealing that MNE units in non-haven countries have smaller profits per employee, whereas effective average tax rates are higher in non-havens (with just above 20 per cent) than in both European and non-European tax havens (10 and 11 per cent, respectively).

Fuest et al. (2021) further test whether tax sensitivity varies depending on the size of the MNE, whereby they break down the entire sample into four sub-samples based on the quartiles of MNEs' consolidated revenues. The findings confirm that larger MNEs shift more profits. Results of the regression model (with only a linear tax sensitivity) are presented in the following table.

Semi-elasticities by firm size

Dependent Variable	log(profits)							
	1st quartile		2nd quartile		3rd quartile		4th quartile	
Statutory tax rate	-0.535		0.849		0.926		0.950	
	(0.525)		(0.480)		(0.571)		(0.494)	
Effective tax rate		0.015		-0.359		-0.306		-0.271
		(0.359)		(0.303)		(0.324)		(0.365)
European tax havens	0.433**	0.452**	0.584***	0.540***	0.780***	0.738***	0.872***	0.815***
	(0.139)	(0.137)	(0.153)	(0.147)	(0.149)	(0.148)	(0.152)	(0.162)
Non-Eur. tax havens	0.345	0.373	0.228	0.141	0.662***	0.605***	0.476**	0.418**
	(0.215)	(0.214)	(0.210)	(0.212)	(0.170)	(0.175)	(0.139)	(0.133)
Dependent Variable	log(intra-firm revenues)							
	1st quartile		2nd quartile		3rd quartile		4th quartile	
Statutory tax rate	1.765*		1.699		0.658		1.198	
	(0.890)		(1.024)		(0.836)		(0.651)	
Effective tax rate		-0.666		-1.413		-0.101		-1.072**
		(0.795)		(0.797)		(0.453)		(0.371)
European tax havens	0.192	0.074	0.807**	0.725*	1.060***	1.025***	1.155***	1.050***
	(0.242)	(0.240)	(0.295)	(0.283)	(0.206)	(0.204)	(0.189)	(0.180)
Non-Eur. tax havens	0.898**	0.704**	1.277***	1.139***	1.287***	1.232***	0.962***	0.907**
	(0.280)	(0.256)	(0.349)	(0.325)	(0.300)	(0.296)	(0.254)	(0.259)

Notes: Results are based on OLS regression. Coefficients of control variables are omitted to conserve space. All specifications include corporate group fixed effects. Standard errors shown in parentheses are clustered at the corporate group level. */**/*** indicate significance at the 5%/1%/0.1% level.

Source: Fuest et al. (2021)

In the last step, the authors estimated the total of profits shifted to tax havens by large German MNEs to amount to approximately €18.3 billion for 2016 and 2017 combined, roughly 40 per cent of total profits reported by MNEs in tax havens. With this estimate, the authors also note that profits shifted by German subsidiaries of foreign MNEs are excluded, as well as the ones by domestic MNEs with revenues below the threshold €750 million to be included in CbCR. To account for those, scaling-up is processed assuming, first, that the three groups (German MNEs, domestic MNEs with revenues below threshold, and German subsidiaries of foreign MNEs) contribute to the total profits reported in the same way as they contribute to gross operating surplus (for which the distribution is available); and second, that the latter two groups shift the same share profits to tax havens as German MNEs covered in CbCR. The resulting figure is €19.1 billion on average per year.

Case study 14. Profit shifting in Italy using Country-by-Country Reporting data

Bratta et al. (2021) study profit shifting in the case of Italy (Italian MNEs and foreign MNEs operating in Italy) using cubic specification:

$$ln(\pi_{c,m}) = \beta_0 + \delta_1 \ln(\mathrm{K_{c,m}}) + \delta_2 \ln(L_{c,m}) + \delta_3 \ln(R_{c,m}) + \beta_1 \mathrm{T_{c,m}} + \beta_2 \mathrm{T_{c,m}^2} + \beta_3 \mathrm{T_{c,m}^3} + \boldsymbol{X}_m + \boldsymbol{\Psi}_c + \epsilon_{c,m}$$

Authors study scenarios differing based on what tax rate they use (statutory corporate income tax rate or effective average tax rate) and whether they use the tax rate itself or the rate differential, i.e., the difference between the tax rate of the country where the MNE unit is located and the average rate faced by other units of the same group operating in all other countries. Based on the results of different specifications, they show how semi-elasticity and marginal effects differ: the table shows the percentage change in profit in a country due to an increase of tax rate by one percentage point, and how, in their case, cubic function performs intuitively correct (always a negative marginal effect).

Semi-elasticities of statutory CIT rates and tax rate differential in linear, quadratic and cubic formulation

Changes in tax rates	Semi-elasticity		
	Linear	Quadratic	Cubic
From 1% to 2%	-0.7	-1.84254	-4.24371
From 24% to 25%	-0.7	-0.77396	-0.24516
From 35% to 36%	-0.7	-0.2629	-0.31875

Changes in difference between tax rates	Semi-elasticity		
	Linear	Quadratic	Cubic
From -30% to -29%	-0.684	-2.1856	-5.5903
From 1% to 2%	-0.684	-0.69698	-0.27885
From 16% to 17%	-0.684	+0.02332	-0.588168

Source: Bratta et al. (2021)

Bratta et al. (2021) estimate profits shifted using the following formula:

$$S_{m,c} = \frac{\pi_{m,c}\hat{\beta}\, f(C_{m,c})}{1 + \hat{\beta}\, f(C_{m,c})} = \frac{\pi_{m,c}(\widehat{\beta_1}C_{m,c} + \widehat{\beta_2}C_{m,c}^2 + \widehat{\beta_3}C_{m,c}^3)}{1 + (\widehat{\beta_1}C_{m,c} + \widehat{\beta_2}C_{m,c}^2 + \widehat{\beta_3}C_{m,c}^3)}$$

Since they use a larger data base than Fuest et al. (2021), i.e., they also take into account other MNEs in Italy, their results provide for the global level of profit shifting. Adjustments need to be made for coverage (MNEs below €750 mio and MNEs not having a unit in Italy) and the authors estimate that in 2017 a total amount of €887 billion of profits was shifted due to differences in tax rates (Bratta et al., 2021).

2.2. MNE vs comparable non-MNE profit shifting

Concept and assumptions

Like PFM, the MNE vs comparable non-MNE profit shifting method also grounds its concept on the idea of deviation from normality. This is a bottom-up method, processed in two phases: first, to identify the tax-avoiding MNEs, and second, to measure the related amount of BEPS[38]. The method identifies abnormalities in structural and economic variables of MNEs in comparison to the behaviour of similar domestic enterprises. The method exploits the information coming from a double comparison: between MNEs and non-MNEs (by propensity score matching) and within the group of MNEs (by receiver operating characteristics analysis, ROC) (Sallusti, 2021). This method estimates BEPS as the difference between profits that are declared and those that should have been declared.

The identification phase is composed of two steps. The first focuses on a "between" comparison, assessing the abnormalities of MNEs with respect to the similar non-MNEs, i.e., domestic firms, which are unable to freely manage the allocation of their production and finances geographically. The control group of domestic firms is determined through propensity score (PS) matching using variables, such as territory, economic activity, employment etc.[39] Comparing profit-to-turnover ratio of a particular MNE with that ratio of domestic control group leads to identifying a proxy for abnormal behaviour of MNEs.

Second, referred to as the "within" comparison, the receiver operating characteristics (ROC) analysis is conducted, resulting in defining the threshold of normality (calculation provided below). This

[38] The method touches upon the concept of BEPS by OECD and is related to its indicator 4 of BEPS, namely MNE versus comparable non-MNE effective tax rate differentials (OECD, 2015). However, the method takes additional steps representing an innovation in the measurement of BEPS (Sallusti, 2021).

[39] See the application of the method by Sallusti (2021) in Case study 16.

threshold is set to identify tax-avoiding MNEs among the total population of MNEs. This step starts from the proxy of first step and uses indicators capturing economic and strategic behaviours of MNEs. An important advantage of this method using this second step is that it does not treat all MNEs equally in the sense that not all MNEs are tax-avoiding. Therefore, ROC analysis also tends to adjust the suspect indicator provided by the proxy in the "between" comparison.

The subsequent measurement of the related amount of BEPS (second phase) is obtained by calculating the amount of profits identified tax-avoiding MNEs should have declared to classify them as non-tax avoiding. The method uses Earnings Before Interest and Tax (EBIT) as the variable to be adjusted.

To measure BEPS of tax avoiding MNEs, the indicator uses a vertical strategy, focusing only on the MNEs in the same country (rather than on all firms of a given MNE in all the countries the group operates, something not readily available in any statistical system). This strategy assesses BEPS by analysing incoherencies between a given MNE and other (local) MNEs with similar characteristics.

Overcoming limitations

Comparing MNEs and Non-MNEs is challenging because the differences between the two groups could be driven by a range of different factors beyond BEPS (e.g., productivity, economies of scale). This drawback is eased somewhat by forcing the control group into same size class. This, true, may still pose a problematic issue in smaller economies, where it might be more difficult to identify an appropriate domestic match for the subsidiaries of large multinationals (at the same time bearing in mind that the size refers to the local subsidiary itself and not the holding). Even in larger economies it might be hard to find a good match for very large MNEs. To overcome this, MNE units can be compared to either an average of the domestic firms with respect to available size or industry classes (clusters), or in cases where capacity does not allow for such comparison, comparing all MNE units to all domestic firms could be considered as the solution of last resort.

Another limitation of the method is that a proposed set of matching variables includes mainly ratios (except for the number of employees, sector and region), which could result in a poor match in terms of size. However, the issue is eased by imposing that each domestic firm in the control group is included in the same size class (additionally to the same sector and region) of the related MNE. Another way to control for the size-related comparability may be represented by including, if data permits, the size of assets as in the case in Bilicka (2019).

The method suffers, like the previous method, also from the confounding effect, where other reasons may contribute to, or lead altogether the identified BEPS activity.

Main drawback of the method from SDG reporting is that a country first needs to be defined as being prone to either outward (BEPS generating) or inward (BEPS collecting) flows of IFFs. Namely, the first step of defining a proxy is by design such that it requires this decision to be made prior to using the method. The presented method is for outward IFFs, whereas a symmetrical approach (with a different first phase) is presented in Box 5.

Source data

This method uses microdata available to NSOs (SBS) in a country and as such provides the possibility of linking with national accounts. These data are likely to be more complete relative to the CbCR data which have a threshold for inclusion of entities. The source data include firm-level data containing economic and structural variables (e.g., value added, research and development (R&D) spending, share

of salaries to total costs, etc. – see also Case study 16). The NSO's structural business statistics and other relevant sources with firm-level data can be used. Research showed that in some cases data from administrative data on taxable profits directly from the tax returns may be better suited than financial accounts (accounting profits). Foreign multinational subsidiaries seem to be reporting positive profits in their accounts, while at the same time reporting zero taxable profits on their tax returns. This would bias downwards the estimates of profit shifting obtained using accounting data (Bilicka, 2019). These microdata are further integrated with statistics on these firms' international trade by products and trading partners (country of origin/destination), and position of national firms within MNEs (sourced from, preferably, national Groups Register[40]), where relevant. FATS, if available, can provide a useful additional data source. Moreover, LCU, if established in the NSO, can help with the integration of various data sources.

Calculation

The method is described in Sallusti (2021) for the case of Italian MNEs (see also Case study 16). Main phases of the application of MNE vs comparable non-MNE profit shifting method by NSOs are listed below.

Phase zero is the identification of either inward or outward IFFs nature of your country. Inspection of tax practices and other macroeconomic variables is used to process this classification of the country. Using OECD's dashboard approach of BEPS indicators (OECD, 2015) an example of quantifying MNEs impacts on Canadian tax base is presented (and can be applied in this phase) by Fortier-Labonté and Schaffter (2019) – see Case study 15.

Case study 15. Indicators of profit shifting by multinational enterprises operating in Canada

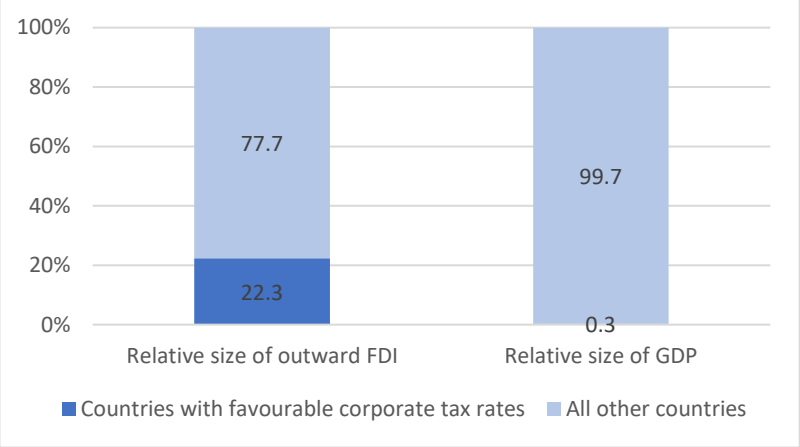
Indicators of profit shifting by MNEs in Canada have been studied by Fortier-Labonté and Schaffter (2019), whereby they apply the BEPS indicators of OECD (2015) to identify whether Canada experiences MNEs performing BEPS activities. Specifically, they look for mismatches between financial and real economic activity using macroeconomic data from Statistics Canada and the World Bank. The mismatch may indicate income not being reported, and therefore not taxed, where it was earned.

The data are from Statistics Canada's Balance of Payments program, specifically the outward foreign direct investment statistics and the activities of Canadian majority-owned affiliates abroad. Two indicators are studied:

1. BEPS Indicator 1A: Mismatches between stocks of Canadian outward FDI and GDP of recipient countries for countries with favourable corporate income tax rates, revealing that a high level of Canadian outward FDI was directed to countries with favourable corporate tax rates.

[40] In absence of national register with business groups structures, alternative registers can be used, if available. One example is the EuroGroups Register (European Commission, 2020b).

Relative size of Canadian outward FDI and of GDP for ten countries with highest stocks of Canadian FDI, 2016



Source: Fortier-Labonté and Schaffter (2019), based on Statistics Canada (NDM table 36-10-0008-01) and the World Development Indicators.

2. BEPS Indicator 1B: Mismatches between assets, employment and sales for countries with favourable corporate tax rates. Results showed that in 2016, in countries with favourable corporate tax rates, foreign subsidiaries reported having 23 employees per billion dollars of assets. For the other countries, foreign subsidiaries reported having 270 employees per billion of assets. These results suggest that investment in countries with favourable corporate tax rates by the subsidiaries of MNEs operating in Canada is not driven by real economic factors.

Overall, using these indicators, Canada can be interpreted as an outward IFFs country.

1. Identification phase

The identification phase is processed in two steps: the between and within comparison. They are presented in turn.

Between comparison of the identification phase first applies the PS to define, for each MNE, the most efficient control group of domestic firms. Characterization is based on variables including territory, economic activity, employment, indicators of internationalization, structure of costs and revenues (see Case study 16).

Next, clustering between MNEs with "normal" and "abnormal" behaviour in comparison to similar non-MNEs is processed based on a proxy for each MNE-control group pair (at unit, i.e., enterprise level):

- $Proxy$=1 (suspect, or indicator of "abnormality") if EBIT-to-turnover ratio of the given MNE is lower than the average of the control group; and
- $Proxy$=0 (no suspect) if EBIT-to-turnover ratio of the given MNE is higher than (or equal to) the average of the control group.

Within comparison of the identification phase, is processed using ROC analysis to determine the extent to which status outlined by the proxy binary variable from previous step can be reliably confirmed when variables of economic performance, strategies and contextual variable are taken into account. Put differently, ROC analysis is used to define the final clustering between tax avoiding and non tax-avoiding MNEs starting from the proxy variable from previous step. To that end, first, the classifier is represented by a **composite indicator** built from the following set of characteristics (Sallusti, 2021): EBIT-to-turnover ratio; Value added-to-turnover ratio; R&D spending with respect to turnover; share of royalties on total costs; share of salaries on total costs; share of services on total

costs; export-to-turnover ratio; import-to-total cost ratio; average differential in income taxation among (related) countries.

To account for differences in economic activities, they are treated separately in strata. For each such stratum, the composite indicator for the i-th MNEs (Ii) is constructed using factor analysis on the whole set of selected characteristics, and then aggregating the first two factors[41] using the relative share of explained variance as weight (ω_i):

$$I_i = \omega_1 \left(\sum_j \gamma_{j,1} x_{j,i} \right) + \omega_2 \left(\sum_j \gamma_{j,2} x_{j,i} \right) \qquad \textit{Equation (34)}$$

where:

$\gamma_{j,1}$, $\gamma_{j,2}$ … loadings of variable *j* in factors 1 and 2
$x_{j,i}$ … value of variable *j* for observation *i*[42].

Here, γj,1 and γj,2 are the loadings of variable *j* in factors 1 and 2, xj,i is the value of the j-th variable for the i-th observation, and ω1 and ω2 are weights in term of explained variance.

Next, the composite indicator calculated in Equation (34) is then used as explanatory variable in a logit model having as dependent the proxy of "suspect" ($Proxy$=1).

As a result of the ROC analysis[43], the threshold observation is identified (for each stratum). The value of its composite indicator can be interpreted as the threshold value ($\bar{I}$) above or below which other MNEs can be classified. Specifically, MNEs will be considered as tax avoiding if $I_i < \bar{I}$, while they will be considered as non-tax avoiding if $I_i \geq \bar{I}$.

2. Measurement of BEPS

For each MNE that was identified as tax avoiding in the previous phase, i.e., confirmed by the model, estimate of the BEPS is provided using the amount of EBIT concealed using aggressive tax avoidance[44].

Next, for each tax avoiding MNE, BEPS is calculated as the difference between the theoretical profits (amount of profits that they should have declared in order to be classified as non-tax avoiding) and the actually declared profits. The measurement of BEPS is carried out by increasing the EBIT-to-turnover ratio (x_h), keeping the other variables (x_{-h}) unchanged so as to obtain $I_i = \bar{I}$. Applying this to equation (34), the adjusted value of EBIT-to-turnover ratio in line with the threshold shifting from tax avoiding to non-tax avoiding MNE *i* is presented as:

[41] Two factors are proposed here, although this may vary given the data at hand. The share of explained variance by the factors should be at least about 80 per cent.
[42] Factor analysis is based on correlation matrix of variables.
[43] The value of parameter *h*, weight to manage the trade-off between true and false positives in ROC, is set to a neutral 0.5 (Sallusti, 2021).
[44] This is equal to value added if the labour cost is given. As Sallusti (2021) notes the conceptual correspondence of EBIT and value added under the condition of fixed amount of labour costs is relevant if one is willing to use the estimates in the context of the measurement of GDP and GNI in national accounts.

$$\tilde{x}_{h,i} = \frac{\bar{I} - \left(\omega_1 \sum_{-h} \gamma_{-h,1} x_{-h,2} + \omega_2 \sum_{-h} \gamma_{-h,2} x_{-h,2}\right)}{\omega_1 \gamma_{h,1} + \omega_2 \gamma_{h,2}} \qquad \textit{Equation (35)}$$

Finally, the amount of EBIT connected with BEPS, termed outward IFFs here, is calculated, for each tax avoiding MNE *i*, as:

$$OutwardIFFs_i = \left(\tilde{x}_{h,i} - x_{j,i}\right) * Turnover_i \qquad \textit{Equation (36)}$$

where

$x_{,i}$ … the declared value of EBIT to turnover ratio;

$\tilde{x}_{h,i}$ … the threshold value of the EBIT to turnover ratio in order to be classified as non-tax avoiding MNE.

At national level and for a given year, the aggregate value of IFFs is obtained by aggregating over all MNEs in a country:

$$OutwardIFFs = \sum_i OutwardIFFs_i \qquad \textit{Equation (37)}$$

Application of the method to provide for inward IFFs is depicted in Box 5.

Box 5. Inward IFFs in MNE vs comparable non-MNE profit shifting

The procedure described above in section 2.2 of Part II is intended to identify and measure the amount of BEPS generated by tax avoiding MNEs in a given country, which in turn represents outward IFFs (see equation (36)). However, the method can also be used to account for the symmetric case, in which BEPS (outward IFFs in Country A) are collected by an MNE unit in Country B, where it represents an **inward IFFs**.

Following the conceptual framework proposed for the case of BEPS generation (outward IFFs), in the case of BEPS collection (inward IFFs) the assumption is that BEPS-collecting MNEs should have a level of profits higher than the "normal" level of similar non-MNEs in the same Country. Accordingly, the shape of structural, economic, and behavioural variables should be different with respect to the case of BEPS generation. In particular, the structure of revenues, instead of the structure of costs should be focused on. Other characteristics (such as the international tax framework and the participation in international markets) are the same, but they need be modified to account for the symmetric behaviour (e.g., the tax differential should in case of BEPS-collecting MNEs have an inverse relationship with the "suspect").

To identify and measure BEPS collection (and the related inward IFFs), all the steps in the procedure are modified according to the different context of analysis. In particular:

1. The **first step of the identification phase** (PS matching) is modified to provide a coherent proxy of "suspect". Indeed, it relates to a level of EBIT-to-turnover ratio for the given MNE that is higher (instead of lower) than the average of the control group. In this context, however, the definition of the control group (method, confounding variables, and constraints) is the same as in the case of BEPS generation. Similarly as in procedure described for identifying outward IFFs, also here comparison of MNE units to domestic firms can be adjusted to meet national statistical capacity, i.e., when comparable domestic firms cannot be identified, comparison can be made to an average of certain size or industry class, or, eventually, simply comparing all MNE units to all domestic firms.
2. In the **second step of the identification phase** (ROC analysis) the set of considered variables changes to account for structural and behavioural indicators that signal the presence of a MNE that collects eroded profits from MNEs residing in other Countries. In this case the following set of variables should be considered (take into account that variables should be positively correlated with the proxy of "suspect", which, in case of BEPS collection, is represented by higher profits with respect to the average of the control group of non-MNEs):
   - EBIT-to-turnover ratio (reversed with respect to the case of BEPS generation)
   - Value added-to-turnover ratio (reversed with respect to the case of BEPS generation)

- R&D spending with respect to turnover
- share of royalties on turnover
- share of salaries on total costs
- share of services on turnover
- export-to-turnover ratio
- import-to-total cost ratio
- average differential in income taxation among (related) countries (reversed with respect to the case of BEPS generation)

Given the change in the second step of identification, the **measurement phase** of BEPS-collecting MNEs (inward IFFs) is analogous as in the case of BEPS-generating MNEs (outward IFFs). Indeed, the definition of the threshold does not conceptually change. In this case, however, $x_{j,i}$ for MNEs that are considered as collecting BEPS from other countries should be **higher** than $\tilde{x}_{h,i}$, which is the level of the EBIT-to-turnover ratio representing the threshold. This produces the reversed sign with respect to the case of outward IFFs (BEPS generating MNEs, see equation (36)), meaning that the total level of EBIT for these MNEs has to be reduced with respect to the one they have declared. Therefore, the amount of EBIT connected with BEPS-collecting, termed inward IFFs here, is calculated, for each BEPS-colleting MNE *i*, with a negative sign to account for the reversal:

$$InwardIFFs_i = -\left(\tilde{x}_{h,i} - x_{j,i}\right) * Turnover_i \qquad \textit{Equation (38)}$$

At national level and for a given year, the aggregate value of inward IFFs is obtained by aggregating over all MNEs in a country:

$$InwardIFFs = \sum_i InwardIFFs_i \qquad \textit{Equation (39)}$$

Similar as for outward IFFs, once the country is classified as inward or outward IFFs prone, its value of total IFFs will equal that category, here $IFFs = InwardIFFs$.

Given the concept of the method, a particular country can be prone to either outward IFFs or inward IFFs. Hence, once the country is classified accordingly, its value of total IFFs will equal that category, e.g., $IFFs = OutwardIFFs$ for the case at hand in equation (37). Using this methodology, therefore, a breakdown of IFFs by the direction of flows cannot be achieved.

Case study 16. Measuring profit shifting in Italy

A PS-ROC method to measure BEPS is described in Sallusti (2021) for the case of Italian MNEs. The case uses **firm-level data** collected by Istat and referred to 2015. For each Italian firm (MNEs and non-MNEs), Sallusti (2021) integrates three databases:

- The archive Frame-SBS (Structural Business Statistics), which includes the information about the structure and economic variables for the whole set of 4.4 million of firms.
- The archive COE-TEC (Integrated International Trade Database), which includes the information about imports and exports (by product and origin/destination Country) for the whole set of firms.
- The archive ASIA-Groups (Italian version of European EGR), which includes the information about firms involved in domestic and foreign groups.

A final database for the analysis contains 3.6 million firms, where about 400 thousand are internationalized (export and/or import) and 61.706 belong to MNEs. Initial cleaning of the database included also removing firms with negative or zero value added or turnover, or employing less than 1 worker, as well as business units operating in industries characterized by regulated markets such as tobacco, coke and refined petroleum products, and financial intermediaries.

The method's **identification phase** first looks at **"between" comparison**. Domestic firms were characterized by nine variables which are used for the PS matching:

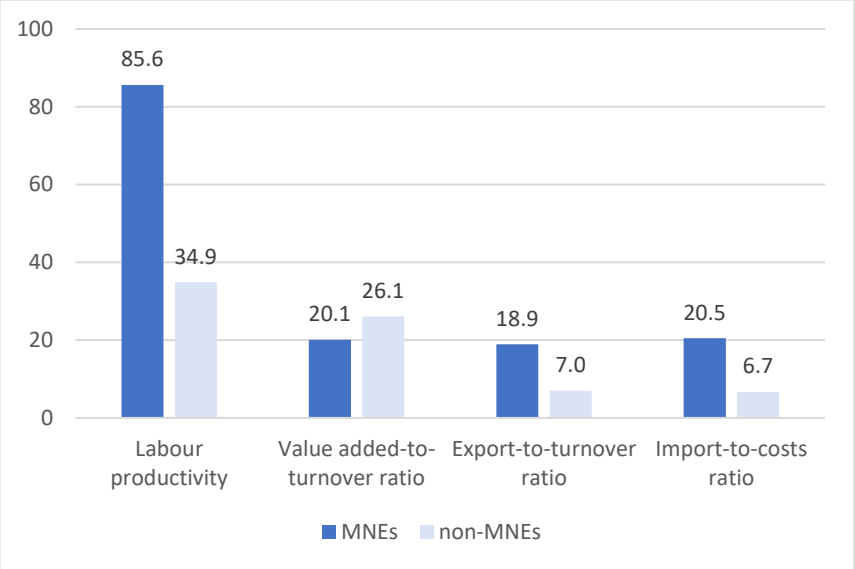
- region (NUTS2)
- industry (3-digit NACE rev. 2)
- per-capita turnover
- persons employed
- export-to-turnover ratio
- import-to-total costs ratio
- share of salaries on total costs
- share of services on turnover

- share of goods and services on total costs

The matching, however, is carried out in clusters of domestic companies in control groups, comprised of 10 non-MNEs with the highest level of similarity with respect to region, industry, size class (1-2, 2-5, 5-10, 10-20, 20-50, 50-100, 100-250, 250-500, more than 500 workers).

Differences between MNEs and non-MNEs (domestic firms) exist specifically in labour productivity, but also export-to-turnover ratios and import-to-costs ratio.

Multinational enterprises vs. non-multinational enterprises, 2015 (percentage)



Source: Sallusti (2021)

The **within comparison** of the identification phase assumes the equal weights assigned to manage the trade-off between true and false positives, therefore *h=0.5*.

A "vertical" strategy has been chosen to **measure BEPS**. In this strategy, analysing possible incoherencies between the given MNE and others MNEs (with similar characteristics) in the same country assesses BEPS. Obvious constraint for choosing this strategy are availability and reliability of data related to foreign business units belonging to MNE in which Italian business units are involved.

Analyzing 61 191 MNEs in 2015, the PS-ROC methods reveals that tax avoiding units represent **60.1 per cent of Italian MNEs**, strongly differing by sectors: incidence of tax avoiding units ranges from 43.3 per cent in real estate activities to 78.8 per cent in informatics. Results also show that BEPS amounts to €32.3 billion, accounting for about **2 per cent of the Italian GDP** at current prices. Results also confirm that, generally speaking, tax avoiding MNEs are smaller (26.5 vs 94.2 workers on average) and less productive (€77.0 vs. €89.9 thousands) than non-tax avoiding ones. They also generate higher turnover (€26.3 vs. €17.9 million on average), value added (€8.5 vs. €2.0 million) and, particularly, EBIT (€8.2 vs. €1.4 million). Consequently, tax avoiding MNEs are characterized by lower levels of EBIT-to-turnover ratio (7.9 per cent vs. 31.2 per cent).

3. Transfer of wealth to evade taxes by individuals

Flows of offshore wealth are difficult to match with the concept of IFFs. First, the stock of offshore wealth tells us little about how it was generated: it can result from legally earned incomes or from illegal activities. Simply being offshore does not mean it is illegal, or illicit. It can be perfectly compliant with tax and other regulations. Second, offshore wealth is a stock and while IFFs are flows. If we assign a share of offshore wealth to IFFs, it opens up challenges related to the origin, transfer, or use of these flows. Central banks have developed some tools for this, as outlined in Case study 17 and Case study 18.

The application of so-called gravity models to tax and commercial IFFs is worth exploring (see Box 6) in the future. While the methods suggested for pilot testing do not include gravity models, some elements of IFFs may be analysed using them (see Case study 20). Rather, the methods suggested for pilot testing attempt to transform offshore wealth to flows (F1).

Box 6. Gravity model

Concept
Gravity models have traditionally been used in the context of international trade to estimate bilateral trade flows between country *i* and country *j*, though they can be used to model any flow between two countries. The basic premise is that these flows are a function of each country's economic size and the distance between them, analogous to mass and distance in Newton's law of universal gravitation, hence their name.

$$F_{ijt} = G \times \frac{M_{it} M_{jt}}{D_{ij}} \qquad (1)$$

Formula (1) illustrates a gravity model in its simplest form, where the trade flows from country *i* to country *j* at time *t*, F_{ijt}, are represented by *G*, a constant, M_{it} and M_{jt}, the economic sizes of countries *i* and *j*, respectively, and D_{ij}, the distance between countries *i* and *j*.

For econometric modelling, this formula is transformed using a natural logarithm to obtain what is considered a "*very simple and thus appealing*" (Cassetta et al., 2014, p. 7) econometric formula:

$$\log F_{ijt} = g + \beta_1 \log M_{it} + \beta_2 \log M_{jt} - \beta_3 \log D_{ij} + \epsilon_{ijt} \qquad (2)$$

This formula can be extended to better suit the context of estimating IFFs by including parameters such as corruption levels, banking secrecy, shared language and so on. With modifications in specifications of the model, the method of estimating IFFs from gravity models would estimate normal trade flows between two countries and compare this estimated value with observed values. Deviations from the predicted levels can then potentially be attributed to IFFs.

Strengths
While gravity models perform well in the context of bilateral trade, their use to measure IFFs and money laundering is less well validated. Still, the approach has advantages, primarily around its data requirements. In order to estimate a gravity model for IFFs, only commonly available economic and geographic data in addition to other domain-specific data, such as corruption levels, are required. More research needs to be carried out to validate their usefulness in the IFFs context, but the approach can be an appealing one as a starting point for countries lacking other types of data.

Limitations
The outputs of gravity models are entirely estimated, with no attempt to directly measure IFFs or incorporate any hard data on them. This potentially limits their usefulness in generating indicator data. Furthermore, in several applications, the approach attempts to model flows at a macro level, making disaggregation into particular sectors difficult, also limiting their usefulness in informing policy.

Applications
Given the limitations of gravity models, they can be used for comparison or validation of the results of other methods to measure IFFs. With microdata, these models may provide detailed insight, such as the study of Italian cross-border bank transfers (Case study 17) or application of a gravity model on foreign securities owned by the Cayman Islands (Case study 20).

3.1. Flows of undeclared offshore assets indicator

Concept and assumptions

The undeclared offshore assets indicator (outlined in Cobham and Janský, 2020) is a top-down method which addresses offshore tax evasion by individuals. It does so by measuring the excess of the value of citizens' assets declared by (partner) countries, over the value declared by citizens for tax purposes. The indicator does not distinguish between various categories of IFFs and will also include assets from

illegal activities. Hence, double counting is a serious limitation of the method. Moreover, it only focuses on the side of IFFs that leave, or are outside the studied country, hence linking to outward IFFs only.

The indicator is reported by each territory, i.e., country. This means that for a particular country A, first, the sum of assets of country A's citizens reported as being held in all other countries is calculated. This is then compared to the sum of assets declared by the citizens of country A as being held in all those countries. The difference is the amount of undeclared assets. Financial institutions are required to confirm the citizenship of accountholders. At the same time, the indicator requires that Tax authorities aggregate their data on citizens' self-declaration of assets held abroad for comparison.

The application of the method involves some difficulties. For instance, the concept of citizenship is used, although it does not always imply tax liability. Tax authorities and national regulations may differ in how they treat dual citizenship or how they define tax residency, i.e., residency for tax purposes. The so-called citizenship-by-investment programmes can obscure the measurement of tax evasion by individuals. Using data on cross-border bank deposits, Langenmayr and Zyska (2020) find that deposits in tax havens increase after a country starts offering a citizenship-by-investment program, providing indirect evidence that these programmes are used by tax evaders.

Overcoming limitations

While the methodology proposed is conceptually simple, it has limitations, and the general availability of data and cross-country comparability of results will pose significant challenges. Data exchange among national authorities and data transferred from financial institutions to Tax authorities are required to overcome issues with data availability and improve quality of estimates. Recent developments in the area, including the OECD Common Reporting Standard (CRS) provide substantial support in such measurement of IFFs. It should be noted that data exchange between authorities, within or across national borders, need to strictly abide by relevant competent authority agreements and respect of statistical confidentiality.

Building on estimated stock of undeclared wealth, the stock measure needs to be transformed into a flow measure. This can be achieved in theory by taking the difference of two subsequent stock measures. In addition, changes in the values of assets need to be considered first before assigning them to IFFs. The growth of wealth through measures of capital gains is accounted for, but the method does not provide means to consider the consumption of wealth.

Source data

Source data are available from the BIS, where data are published by location. Although these are considered the most consistent data currently available for this purpose by Cobham and Janský (2020), this source has limitations, however, in terms of countries covered. Moreover, certain asset classes (e.g., art, real estate, or cryptocurrencies) are not considered. An alternative international source is the OECD CRS covering signatory economies, with similar coverage issues as BIS. Financial institutions report to national Tax authorities, and the latter would provide an important and relevant data source, yet practice has shown data access limitations. Data are reported on annual level, end-of-year stock.

Calculation

Calculation of the indicator is straightforward and stems from its definition as the excess of the value of country *i*'s citizens' assets declared being held in countries *j* over the value declared by citizens of country *i*:

$$\phi_i = \sum_j \beta_{j,i} - \alpha_i \qquad \textit{Equation (40)}$$

where:

- ϕ_i … undeclared assets of citizens of country *i*
- $\beta_{j,i}$ … the sum of assets of citizens of country *i* reported as being held in country *j*
- α_i … the sum of assets declared by citizens of country *i* as being held in other countries *j=1, …, n*, where $j \neq i$

There are, however, two methodologically important issues we need to address in relation to measuring the IFFs:

1. As already mentioned, this indicator only addresses the assets held abroad, as a result of outflows (relating to **outward IFFs only**).
2. The indicator measures the assets, therefore **a stock**, and does not refer to flows.

We address the **second issue** first. To obtain the value of **flows** (outflows of IFFs) based on this indicator for a given year, *t*, we will need to calculate the indicator in equation (40) also for a preceding period, *t-1*. With the assumption that the difference in two successive stocks can be assigned to the flows, such difference could be a measure of related IFFs. With this, however, transformation of the assets, such as consumption, is not accounted for, leading to a potential overestimation of IFFs. At the same time, also capital gains in an offshore jurisdiction, if not accounted for, would be conflated with IFFs. The latter can, however, be addressed by including a factor of market valuation of the offshore wealth, v_t, thus, the flows of assets held abroad by citizens of country *i* in period *t* are calculated as:

$$flow_{i,t} = \phi_{i,t} - \phi_{i,t-1}(1 + v_t) \qquad \textit{Equation (41)}$$

To determine the yearly rate of increase of assets captured in v_t, the MSCI world price index is used (MSCI 2020).

If these flows from equation (41) are positive, citizens of country *i* are, by assumption, shifting assets abroad without declaring that to domestic authorities, even though they may be fully compliant with destination's jurisdiction. Here the challenge is that increases could refer to capital gains on offshore assets, and decreases could point to consumption of offshore assets. Further, some offshore wealth may fall under limited reporting responsibility whereby a citizen is not required to report the wealth held abroad. Country pilots could consider ways of adjusting for some of these limitations. In the lack of corrections for the previous challenges, we can only assume the positive result of equation (41) corresponds to outflows of IFFs by citizens (for country *i* in time *t*):

$$OutwardIFFs_{i,t} = max\left(0, flow_{i,t}\right) \qquad \textit{Equation (42)}$$

If the flows, however, are negative, this only indicates that the undeclared assets are "less undeclared" – be it because reporting or detection has improved, or the assets have been transformed into consumption or other form of capital. We cannot treat the negative flows (defined by equation (41)) as inflows of IFFs into country *i*.

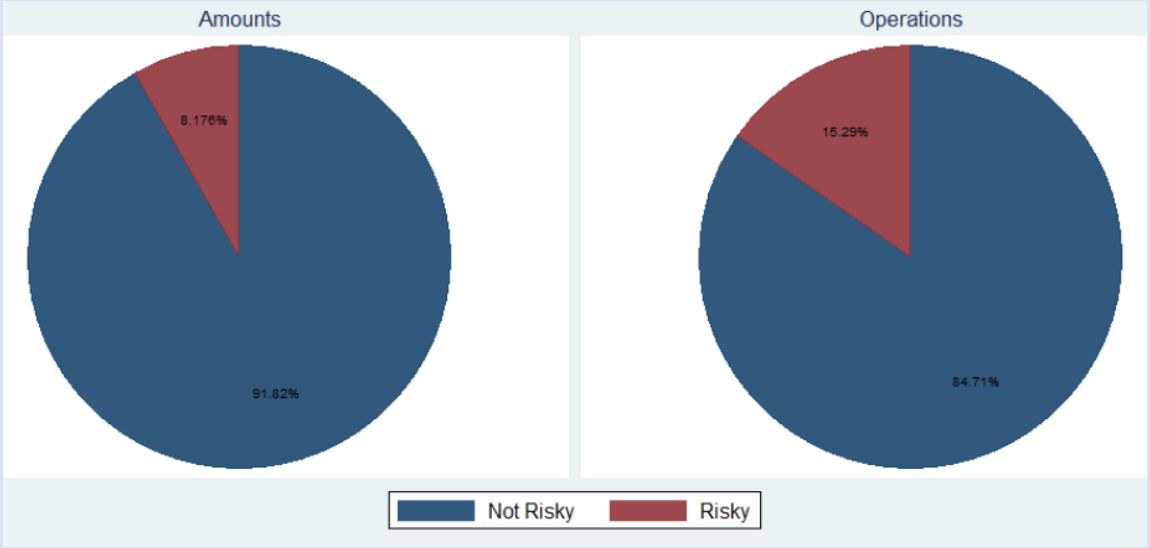
Addressing the **first of the issues** outlined above, to be able to determine the **inward IFFs**, the mirror image of all countries in *j* with respect to country *i* would need to be studied and aggregated. Also here, methodological and practical (data availability) limitations arise.

Without a clear concept supporting measurement of inward and outward IFFs the use of this indicator is limited to outward IFFs only. In absence of better alternatives, the indicator is still suggested for pilot testing, with further developments of the methodology and data availability required. The following case study is not an application of this presented method; rather it showcases the analyses of cross-border bank transfers with gravity model.

Case study 17. Italian cross-border bank transfers

Studying the Italian cross-border bank transfers between 2007 and 2010, Cassetta et al. (2014) use the gravity model to identify flows appearing to be abnormally above the predicted values by the model itself. Only cross border wire transfers made by private customers of Italian banks are considered in the study. National financial intelligence unit (FIU) classified destination countries as risky or not risky.

Destinations of cross-border financial flows



Source: Cassetta et al. (2014)

Using the original dataset by the FIU and adding a set of socio-economic and demographic variables for province of origin and country of destination (e.g., GDP per capita, average firm-level taxation, FDI per capita, dummy variable of shared border as a proxy for distance between areas, employment rate, personal taxable income, etc.), authors reveal the positive correlation between financial flows and foreign GDP and population, FDI and proximity to Italian provinces; and a negative correlation with firm-level tax rate.

The study is important not only for the application of gravity model to observe cross-border risky financial flows, but also to complement empirical analysis by contextual interpretation, shedding important light on the (illicit) financial flows in terms of, if not measuring IFFs directly, their risk assessment.

3.2. Flows of offshore financial wealth by country

Concept and assumptions

As in previous method, this method focuses on wealth held by individuals outside their countries and unreported to the Tax authorities where they are a resident. It is a top-down method. Offshore financial wealth by country as proposed here is a three-step approach to estimate international tax

evasion by individuals by country as presented in the European Commission (2019). The steps, or phases, are:

a) Estimation of global offshore financial wealth, focusing on global level imbalance between international portfolio liabilities and assets. As these discrepancies may be driven by measurements errors in international investment statistics rather than illicit activity, they need to be inspected with caution by experts in the field before moving ahead with the method application. Case study 18 illustrates how the Central Bank of France identifies hidden securities assets in the BoP.
b) Breakdown of data by country of ownership and by International Financial Centre (IFC), conducted using data on offshore deposits to allocate estimated global offshore wealth to each individual country of ownership and IFC.
c) Estimation of international tax evasion by country applied only partially in the guidelines to account for IFFs; the non-compliance rate on offshore wealth is applied and followed by transformation of stock measure to flow to identify the level of illicit flows. This step captures capital gains, but not wealth consumption; and it only produces grounds to estimate IFF outflows, not inflows.

In view of tax and commercial IFFs the method further suffers from collating other categories of IFFs into this category, specifically, criminal activities (to generate the income located abroad or conceal the proceeds of crime or corruption).

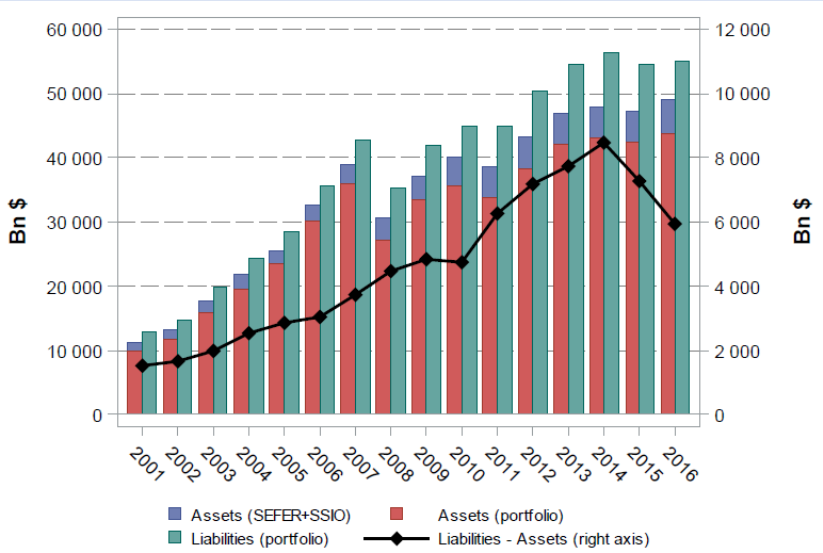
Another critical point lies in the challenges related to associating deposits with their origin: various screening arrangements, e.g., shell companies, prevent direct estimation of ownership shares of undeclared offshore wealth. Such arrangements are normally located in an IFC, not the country of residency of the actual owner(s), hence incorrectly assigning deposits to IFC instead of the country of actual owner.

Case study 18. Identifying hidden assets in the Balance of Payments by Bank of France

The Bank of France analysed how the discrepancy between assets and liability in international investment positions statistics can be attributed to hidden investments. Authors do, however, point out that caution is needed in using this methodology for statistical purposes (Gervais and Quang, 2018).

The below figure presents the global discrepancy between assets and liabilities in international securities statistics. Different coverage of participating countries in surveys and the inability of BoP compilers to collect data on resident portfolios held in other jurisdictions contribute to the discrepancy.

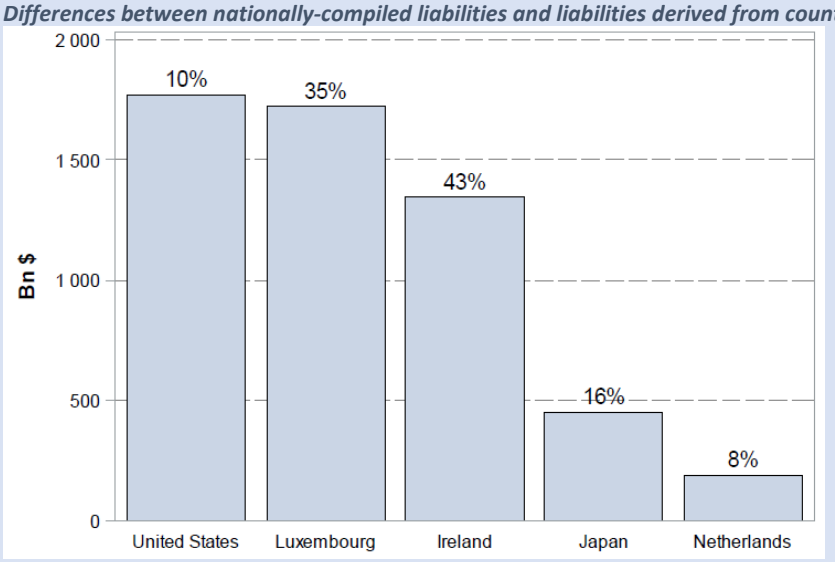
Global discrepancy between assets and liabilities in international securities statistics



Source: Gervais and Quang (2018).

The authors assume that financial assets are well collected except for the part that is owned by households in offshore centres. They plot top five countries in differences between liabilities as reported by national compilers and liabilities derived from assets in other sources.

Differences between nationally-compiled liabilities and liabilities derived from counterparts assets



Source: Gervais and Quang (2018).

European regulation requires financial corporations to report directly to national compilers, whereas non-financial corporations and households are not. Hence, one can assume that "hidden assets" are held by these two sectors.

Gervais and Quang (2018) conclude that academic findings cannot be directly used in BoP statistics since:

1. Adjustment to statistical methodologies and concept may be required prior to their use in statistics compilation.
2. Data limitations prevent establishing longer time series.
3. It is not natural to assume inconsistencies are explained by a single source, i.e., households' hidden assets.

According to authors, sharing data on third-party holdings can solve the problem, i.e., requiring participating or contributing countries to provide data, bringing in various stakeholders, also investment companies and private banks.

Overcoming limitations

Major drawback in the practical application of the method is data availability. Several assumptions are therefore required for the method to reach results. An assumption is also required to divide offshore wealth into deposits and portfolio investments, assuming a 25 – 75 per cent division. A crucial assumption also relates to the 75 per cent non-compliance rate. According to the European Commission (2019), a large part of offshore wealth is not likely to be reported through tax returns. These assumptions may need constant validation and calibration.

The coverage of assets is also limited: only portfolio assets and deposits are considered, whereas other asset classes (real estate assets, artwork, life insurance contracts, cash money and cryptocurrencies) are not included.

Source data

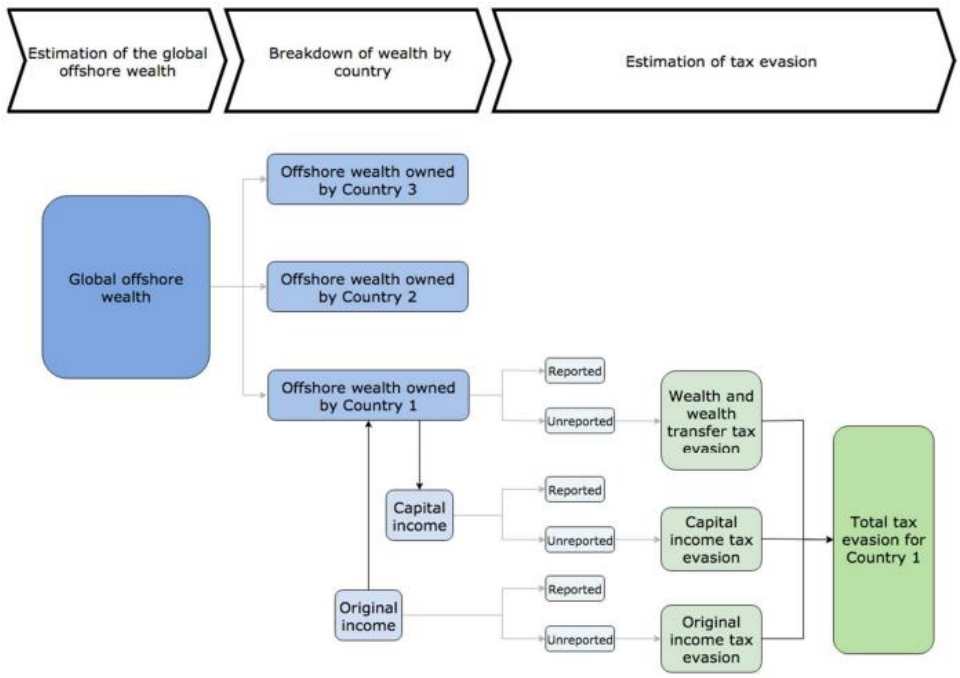
Source data are spread in various international databases and are found in statistics on international portfolio securities and on foreign deposits. Three global databases provide reliable global data on portfolio securities: the IMF's Coordinated Portfolio Investment Survey (CPIS), the IMF's International Investment Position (IIP) and the External Wealth of Nations Mark II database (EWN). These have limitations, above all their coverage of countries.

The Central Bank of Switzerland publishes detailed statistics on bank deposits, portfolios of equities, bonds, and mutual fund shares managed by Swiss banks on behalf of foreigners. Data on foreign deposits are sourced from BIS locational banking statistics, with limitations in terms of coverage, confidentiality restrictions, and difficulty to distinguish between individuals and entities.

Calculation

The method arrives at the result in three phases, as per original three-step approach by the European Commission (2019).

Figure 15. Three-step approach to estimating tax evasion by individuals



Source: The European Commission (2019)

1. Estimating the global offshore financial wealth

First, an assumption is made that the financial wealth held offshore by individuals (households) is comprised of: (i) **portfolio assets**; and (ii) **deposits**.

$$offFinW_{G,t} = offPFW_{G,t} + Deposits_{G,t} \qquad \textit{Equation (43)}$$

where:

$offFinW_{G,t}$ … global (*G*) offshore financial wealth in time *t*;
$offPFW_{G,t}$ … global (*G*) offshore portfolio wealth in time *t*;
$Deposits_{G,t}$ … global (*G*) offshore deposits in time *t*.

For estimating the (i) **global offshore portfolio wealth** held by individuals, the global excess of international portfolio liability positions over international portfolio asset positions is taken:

$$offPFW_{G,t} = \sum_{i} IPFliabilities_{i,t} - \sum_{i} IPFassets_{i,t} \qquad \textit{Equation (44)}$$

where:

$offPFW_{G,t}$ … global (*G*) offshore portfolio wealth in time *t*;
$IPFliabilities_{i,t}$ … international portfolio liability position for country *i* in time *t*;
$IPFassets_{i,t}$ … international portfolio asset position for country *i* in time *t*.

The European Commission (2019, Appendix 1) lists relevant and required data corrections to assess the global portfolio assets and liabilities.

Next, to estimate the (ii) **offshore deposits** in IFCs, following procedure in the European Commission (2019), an assumption is made that 25 per cent of financial wealth is held in the form of deposits and the remaining 75 per cent in the form of portfolio securities. Therefore:

$$Deposits_{G,t} = offPFW_{G,t} * \frac{25}{75} \qquad \textit{Equation (45)}$$

2. Dividing global offshore financial wealth by country of ownership and by IFC

In the second phase, the global offshore financial wealth from first phase is broken down by country of ownership and by IFC.

First, **estimate the breakdown by country of ownership** using ownership shares of cross-border deposits held by individuals in IFCs as proxies (see European Commission, 2019). These are sourced from BIS locational banking statistics, which, however, do not distinguish between cross-border deposits from individuals and those from entities. They are, however, becoming more often available on disaggregated counterparty ownership of bank deposits. Corrections are made on the assumption

that a country with a large outgoing FDI stock (relative to GDP) is assumed to have a large proportion of outgoing corporate deposits, and vice versa, as presented in Case study 19. These data will likely be available to NSOs.

Case study 19. Using foreign direct investment data to identify cross-border deposits from individuals

Statistics on deposits by non-financial institutions, as provided by the BIS, do not distinguish between individuals and corporations – but we need to get as close as possible to cross-borders deposits of individuals. Recognising that the share of cross-border deposits by corporations is positively correlated with the level of FDI, a correction is applied to the BIS statistics. Outgoing cross-border deposits by a given country *i* in a year *t* are given by the following formula:

$$d_{i,t} = w_{i,t} * d_{i,t}^{bis},$$

where

$$w_{i,t} = \frac{\frac{3}{2}\frac{gdp_{i,t}}{\sum gdp_{i,t}} + \frac{1}{2}\frac{fdi_{i,t}}{\sum fdi_{i,t}}}{\frac{gdp_{i,t}}{\sum gdp_{i,t}} + \frac{fdi_{i,t}}{\sum fdi_{i,t}}}$$

The weight $w_{i,t}$ is applied to $d_{i,t}^{bis}$, the outgoing deposits of country i in year t. It is decreasing with the share of FDI by country i with respect to the total world FDI and increasing with its share of GDP. It has been specified to be equal to 1 for countries with a share of FDI equal to their share of GDP.[172] The FDI statistics used for the computation of these weights are taken from the United Nations Conference on Trade and Development.

Second step in this phase refers to **breakdown by IFC**. Offshore wealth in each IFC is estimated using either direct observation of Swiss National Bank (SNB) data for Swiss IFCs or using BIS data to supplement the estimation. Within this phase, two types of IFCs need to be identified (see European Commission, 2019) namely:

- Type I IFC as a wealth-receiving IFC, where a large number of non-residents own a bank account with offshore wealth invested in third countries.
- Type II IFC providing shell companies and other screening means, whereby international deposits are incorrectly assigned to residents of that IFC[45].

Case study 20. Gravity model to estimate total foreign securities owned by the Cayman Islands

Estimating international tax evasion by individuals requires global offshore wealth to be, first, estimated, and second, distributed among countries. Applying the gravity model to estimate total foreign securities owned by the Cayman Islands stems from available data by the United States Treasury: information on the value of United States securities held by the Cayman Islands, $A_{KY,US,t}$. It is then estimated with the following gravity-like model of bilateral cross-border portfolio holdings (European Commission, 2019):

$$\log(1 + A_{i,j,t}) = \phi_j + \theta_t + \beta Z_{i,j,t} + \gamma X_{i,t} + \epsilon_{i,j,t},$$

where $A_{i,j,t}$ denotes the portfolio holdings of country i in country j in year t (as declared in the CPIS database), ϕ_j denotes host-country fixed effects, θ_t year fixed-effects, $Z_{i,j,t}$ is a vector of bilateral controls (distance, GDP gap, dummies for common language, etc.), and $X_{i,t}$ a vector of source-level controls (population, GDP per capita, etc.).

From the predicted bilateral claims $A_{i,j,t}^{p}$, one can compute the predicted share of each country j in i's portfolio at time t as:

$$\omega_{i,j,t}^{p} = \frac{A_{i,j,t}^{p}}{\sum_k A_{i,k,t}^{p}}.$$

The estimated value of total foreign securities owned by the Cayman Islands is then equal to $A_{KY,US,t}/\omega_{KY,US,t}^{p}$.

[45] Not to overestimate the offshore wealth held by residents of Type II IFC, data on wealth channelled through shell companies are needed (European Commission, 2019).

Results of the estimation are presented in the following table.

Gravity Model Estimation

	(1) Log equities b/se	(2) Log debt b/se
Log distance	-0.676***	-0.746***
	(0.015)	(0.012)
Common language	1.396***	0.542***
	(0.036)	(0.030)
Colony dummy	0.942***	0.582***
	(0.063)	(0.054)
Industrial pair du~y	2.059***	1.963***
	(0.046)	(0.037)
Log of GDP gap	0.112***	0.193***
	(0.010)	(0.008)
Log of GDP p.c. gap	-0.120***	-0.037***
	(0.011)	(0.009)
Sce ctry OFC	0.883***	1.609***
	(0.175)	(0.146)
Latitude of source~y	-0.000	0.007***
	(0.001)	(0.000)
Sce ctry landlocked	-0.645***	-0.263***
	(0.035)	(0.028)
Log of sce ctry po~n	0.600***	0.565***
	(0.009)	(0.007)
Log of sce ct..c.	0.000***	0.000***
	(0.000)	(0.000)
Observations	56857	61878
Adjusted R-squared	0.561	0.575

* p<0.05, ** p<0.01, *** p<0.001

Source: European Commission (2019)

3. Estimate IFFs based on offshore wealth using non-compliance rate

The final phase reflects the estimation of IFFs, which is based on the set non-compliance rate of 75 per cent and applied to entire offshore wealth held by individuals, estimated in the previous phase. Crucial assumption is being further constructed on the calculation of the flows from estimated stocks of wealth: flow in a given year is calculated as the difference of offshore wealth of the current year and the previous year (similar to method in section 3.1). To account for the possibility that wealth increase from one year to another can also stem from an increase of portfolio assets valuation (and not because additional investments or inflows have been made), such market valuation effects are considered. Applying the rate of variation of the market asset price level in a given year, v_t, the flow of assets for country *i* in time *t* is calculated by:

$$flow_{i,t} = offFinW_{i,t} - offFinW_{i,t-1} * (1 + v_t) \qquad \textit{Equation (46)}$$

To determine the yearly rate of increase of assets captured in v_t, the MSCI world price index is used (MSCI 2020).

If these flows are positive, citizens of country *i* are shifting assets out of their country. Applying the non-compliance rate, r_n, we obtain the outward IFFs as:

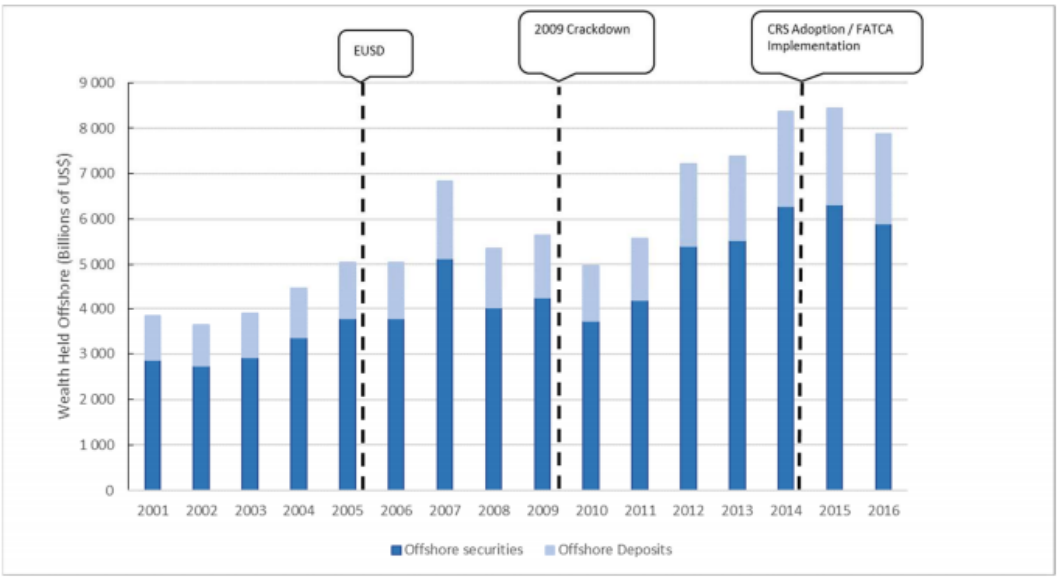
$$OutwardIFFs_{i,t} = \max(0, flow_{i,t}) * r_n \qquad \textit{Equation (47)}$$

On the other hand, when the wealth from one period to another is diminishing, the negative value of outward IFFs does not represent inward IFFs. The mirror image would be required to calculate inward IFFs, i.e., calculating for all other countries their respective outward IFFs, but only specifically into a given country studied for its inflows. Their positive sum would present inward IFFs of studied country. However, with current data availability, dictating also the first phase of presented methodology, this calculation is not viable.

Case study 21. International tax evasion for the EU-28

The European Commission (2019) applies this method for 28 EU member states. Their results estimate global offshore wealth at US$7.8 trillion in 2016 (€7.5 trillion), or 10.4 per cent of global GDP. Dynamics and breakdown by offshore securities and deposits is depicted in the following chart**Error! Reference source not found.**.

Estimated global offshore wealth (US$ billions)



Source: The European Commission (2019) based on computations by the European Commission and World Bank Indicators for global GDP

Offshore wealth held by EU residents is estimated at US$1.6 trillion (€1.5 trillion) in 2016, leading to the estimated €46 billion or 0.32 per cent of GDP of revenue lost to international tax evasions for the EU-28 in 2016.

III. Guidance for national statistical authorities

Effective policies to curb IFFs require reliable and granular IFF statistics, tailored to national circumstances. Part III provides concrete and operational recommendations for national statistical authorities, NSOs and other compilers of official statistics for the measurement of tax and commercial IFFs. It provides guidance on steps to take to start compiling estimates of tax and commercial IFFs. First, it suggests a consideration of national circumstances, information needs and prominent types of IFFs (Chapter 1). These can also help identify relevant stakeholders, as it is important to map out the national system of relevant authorities (Chapter 2) to organize the necessary collaboration to measure IFFs. It may be as useful to identify the relevant authorities and stakeholders before conducting an IFF risk assessment to seek their input on the assessment from the outset. Chapters 1 and 2 are, therefore, not necessarily steps 1 and 2, but could be reversed, intertwined, or processed in iterations. This enables the review of data availability (Chapter 3) and selection of data sources across agencies to capture the most prominent types of tax and commercial IFFs. A tier classification of methods (Chapter 4) considers national set up and capacity, existing data sources and related methods used in official statistics, legal and regulatory frameworks, and other criteria. This guides the selection of method to measure IFFs. Often an operational definition of IFFs (Chapter 5) is needed to meet the national data needs and ensure feasibility considering available data, methodology and capacity. The definition is influenced by which methods is used (again, also the reverse holds, these processes being intertwined, running in parallel, and/or in iterations). Compilation and dissemination of IFFs statistics (Chapter 6) require some consideration due to the requirements of SDG reporting. Finally, we give a listing of practical recommendations to NSOs in their work in coordinating and/or compiling tax and commercial IFFs (Chapter 7).

This part will form the basis of a more generic guidance for national statistical authorities in the compilation of IFF statistics, including from crime. Some extensions will be needed to account for the agencies and data needed for IFFs from crime, but a similar approach can be followed. Tools are proposed in Part IV, such as a workflow (Chapter 3, Section F) and step-by-step check list (Chapter 3, Section G) to guide through the overall process of IFF statistics compilation, with other more specific tools identified in corresponding chapters throughout this part.

1. Identifying illicit financial flow risks and information needs

As countries differ, so does their exposure to IFFs. This refers not only to the level of IFFs affecting a particular country, but also to the types of IFFs prominent in a country. The IFF categories, activities, or types of flows vary across countries, including the direction of flows, inflows or outflows, as well as partners. Different IFFs require different data and methods for their measurement. Moreover, different starting points reflected by specific national circumstances also influence the approach to measuring tax and commercial IFFs.

A useful first step would be to carry out **an IFF risk assessment** to collate and review information already available about IFFs in the country and the conditions enabling them. It can help to get to know the national circumstances related to IFFs. It aims at identifying what IFF activities may take place in the country and what the prominent types of IFFs that should be measured are. The risk assessment can use available literature, magazines, news articles, and interviews with and studies carried out by government officials, the private sector, academia, and civil society. The review can be conducted by

the NSO or another statistical authority in the country, while others may form an inter-agency working group to oversee and contribute to the review process.

The IFF risk assessment should take as a starting point work accomplished to date in **official statistics**, including the existing national information on illegal activities, informal economy and the non-observed economy in the national accounts and balance of payments statistics.

Review of relevant research, studies and literature comprises not only academic research, but also practical studies conducted by tax or Customs inspectors and other experts. Journalists and reporters often carry out investigations for the **media** to reveal malpractice also related to IFFs.

In the absence of nationally conducted or country-specific research on IFFs, the work of international organisations can be helpful. Country-specific information can also be found from some international sources, including investigative reporting, such as the International Consortium of Investigative Journalists, documents from Swiss Leaks, Panama and Paradise Papers (see European Commission, 2019). Lack of national data can also be supplemented by regional studies or by identifying a benchmark country with similar national conditions.

Interviews with government experts can provide important insights into major areas of IFFs in the country and shed light on policy information needs and data gaps. The private sector may also provide essential input to the risk assessment with their specialised knowledge and information sources:

- **Financial institutions and banks** may have conducted risk assessments of their own, especially related to money laundering, and can contribute with their knowledge to the assessment of prominent IFFs and their measurement. They have valuable information on the structure, organisation, and size of IFFs they have reviewed, and features and characteristics of particular financial products to determine IFF risks.
- **Trade and industry associations** may provide aggregated statistics on transaction volumes and types of manufactured and traded products, and related vulnerabilities and risks.
- **Researchers, criminologists and IFF experts** can provide their perspectives, for example, on what constitutes tax and commercial IFFs. They may have produced reports and analysis related to IFFs or developed risk assessment methods as part of their (scientific) research.
- **Criminals** could also be a valuable source of information, e.g., to explain the reasons why one sector or product or transaction or (more broadly) modus operandi was chosen rather than another. While it may be difficult to obtain such information from them directly, there may be indirect methods such as research papers, court reports, sentencing and transcript records.

The following box provides an example of issues that could be covered in an IFF risk assessment. The economic and regulatory environment of a country can significantly influence the prominence and types of IFFs. For this purpose, the IFF risk assessment should reflect on issues, such as the formal and informal economy, the financial system and its vulnerabilities, major trade and investment flows and partner countries as well as the conditions for tax collection and the current tax gap. For instance, major trade discrepancies can be identified using the United Nations Comtrade data and can signal potential areas with increased risk of IFFs (products, trading partners, flows) that merit further investigation.

Box 7. Possible contents of an illicit financial flows risk assessment and data needs

Tentative contents of a risk assessment

I. Identification – environment for IFFs
- Formal and informal economy
- Financial system and its vulnerabilities
- Major trade and investment flows and partners
- Tax collection and tax gap

II. Analysis – assessment of IFFs
- Categories of IFFs present in the country
- Types of tax and commercial IFFs and activities generating them
- Commodities and service categories prone to IFFs
- Enablers, likelihood, magnitude and effects of IFFs

III. Evaluation
- Priorities for statistical work

Furthermore, the IFF risk assessment should aim at identifying main categories of IFFs present in the country using the UNCTAD and UNODC (2020) conceptual framework. The above-mentioned data sources can help to do an early assessment of activities and flows at risk of tax and commercial IFFs and to pinpoint commodities and service categories that may be most prone to IFFs. The IFF risk assessment can also collate available information on the potential enablers of IFFs, for instance weaknesses of the national framework, share varying estimates on the likelihood and magnitude of IFFs and consider their effects on the economy, government finances and development. Finally, the idea is to identify priorities for the statistical measurement of IFFs. These phases and contents are roughly in line with the national risk assessment guidance, developed by the Financial Action Task Force (FATF, 2013), for National Money Laundering and Terrorist Financing. A self-assessment questionnaire in Part IV (Chapter 3, Section A) supports comprehensive and systematic collection of relevant information from national stakeholders.

Figure 16. Framework for risk assessment

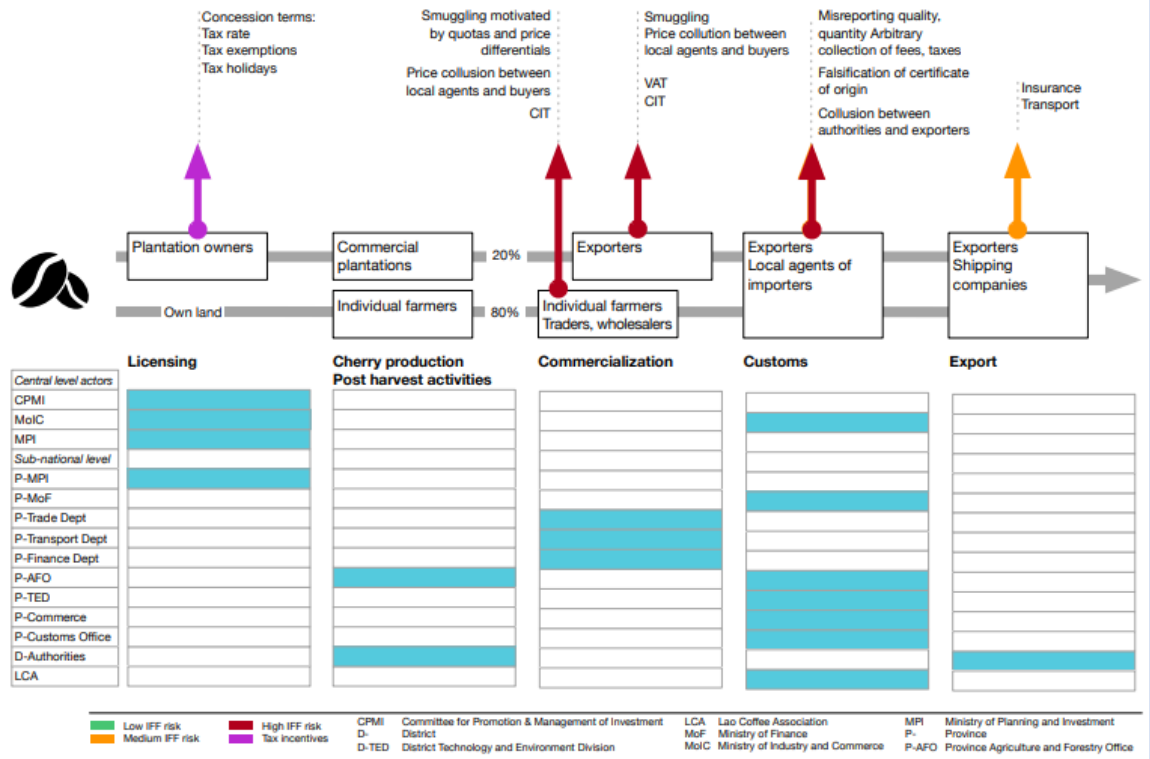
Source: FATF (2013).

Brugger and Engebretsen (2019) developed so-called **value chain risk maps** to track specific commodity through all levels in its value chain. Case study 22 highlights its use in analysing IFFs for coffee in Lao. Although its application requires in-depth research, it is a valuable tool in identifying specific phases in commodity's value chain, hence identifying which parts of the value chain are IFFs-prone, but also supports identifying critical stakeholders. This can be especially useful when mapping the value chains of major IFFs before their statistical measurement.

Case study 22. Value chain risk map as a risk assessment tool

Using the value chain risk maps, Nolintha et al. (2020) illustrate how stakeholders in the coffee value chain in Lao contribute to IFFs. Specifically, local agents of importers are considered at high risk for IFFs in the value chain. This involves misreporting quality, quantity arbitrary, collection of fees and taxes, falsification of a certificate of origin, and the collusion between authorities and exporters. For this reason, the function of local agents is attributed as a significant risk for trade mispricing from the Lao coffee sector.

Illicit financial flow risks in Lao's coffee value chain



Source: Brugger and Engebretsen (2019)

The early analysis of prominent IFF types and data needs is important for identifying priorities for statistical measurement. It makes sense to focus the measurement on prominent types of IFFs and the pressing data needs to curb those IFFs. It is also likely that the attempt to collect existing information for the IFF risk assessment will highlight gaps and challenges to be addressed in further work.

2. Mapping of the national system of agencies

Properly addressing IFFs requires the relevant stakeholders to be, first, identified, and second, involved in the process of IFF risk assessment[46], data collection and/or measurement. The mapping of the relevant agencies provides a review of the institutional system that needs to be considered when measuring IFFs. The agencies are likely to focus on different aspects of IFFs from the policy or statistical perspective, and the measurement of all tax and commercial IFFs is likely to require data and capacity pooling between agencies.

[46] Remember that steps in this and the previous chapter can be reversed, joined, or processed in iterations until all relevant stakeholders are identified and the IFF risk assessment finalised.

The stakeholders[47] that may have a role to play in the collection, provision or compilation of data related to IFFs include, for instance:

- **National statistical authorities**: The NSO is a key player as it has the coordinating role of the national statistical system and holds a lot of relevant data, e.g., on businesses and individuals and often compiles the national accounts for the country. Important unit within the NSO is the LCU, with expertise and integrated data on MNEs from various statistical domains within NSS. The statistical units of Customs hold trade transactions data which are essential for analysing the commercial IFFs, including trade misinvoicing. The statistical units of Central Banks are typically in charge of compiling the balance of payments statistics and other financial and government statistics. Statistical units dealing with relevant data may also be hosted by the ministries of finance, justice, foreign trade, economy etc.
- **Policy-making bodies**: Policy-making bodies should, where relevant, be included in the mapping – not as providers of information, but as the principal users – in order to ensure that statistical development considers high-level questions that require data. They have a role to play in expressing data needs but cannot participate in methodological decisions.
- **Tax and other regulatory and supervisory authorities** gain a unique knowledge and data basis of transactions related to income, tax, types of institutions, products, sectors and associated customers, and have expertise on related policies, procedures and controls. They can provide views on particular risks and how to adequately identify those. Tax authorities typically possess large data sets for assessing the tax gap, part of which consists of IFFs crossing country borders, and they can engage in international data exchange, as necessary.
- **Financial intelligence centres (FICs) and intelligence and/or security services**: FICs are ideally placed to identify threats and vulnerabilities based on the suspicious transaction reports and other information and analysis they have. They can also advise on analysis techniques, methods and trends, and may have access to databases on specific products or transaction types. Intelligence agencies have specialised expertise on intelligence analysis and can review or validate risk and vulnerability assessments.
- **Law enforcement and prosecutorial authorities** include police, Customs/border control, and criminal intelligence agencies and anti-corruption bodies where appropriate. These authorities may be able to provide information on specific cases, share substantive knowledge and assist in data provision. They may have relevant statistics on investigations, prosecutions and convictions, assets seized, confiscated, repatriated etc. or hold information about criminals' modus operandi obtained in their investigations. They may also be able to provide information on new trends and risks, and assist in identifying vulnerabilities.
- **Ministries of foreign affairs and trade, chambers of commerce** etc. may hold relevant information on trade-related IFF risks, exporters and importers, trade flows and the related international collaboration and initiatives.
- **International and foreign partners** may or may not be relevant in the national mapping of agencies. However, they provide useful guidance, e.g., the materials related to SDG indicator 16.4.1 by UNCTAD and UNODC. FATF-style regional bodies of which a country is a member may be a useful source of information on risk and on work carried out elsewhere in the region to identify and understand IFFs. Similarly, foreign partners, such as statistical and other authorities from other countries, may also be a potential source of information.

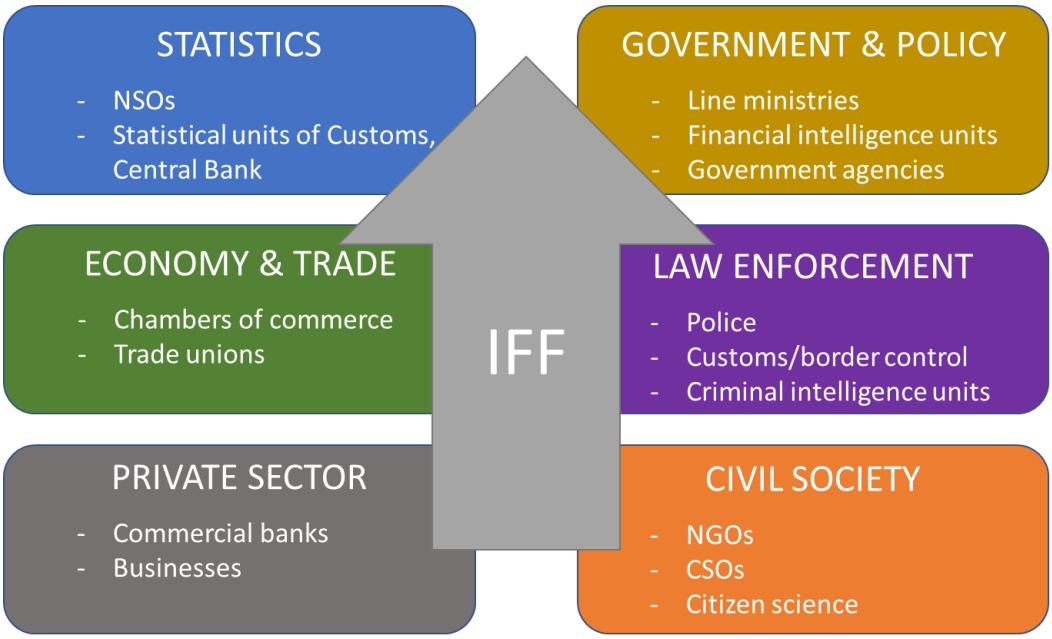
[47] The list of stakeholders has been selected and extended by UNCTAD based on FATF (2013).

The identification of relevant agencies can draw on agencies involved in carrying out or informing existing research, reports and studies collated for the IFF risk assessment. Furthermore, the identification process can be supported by a few questions:

1. Which national institutions cover the identified prominent IFF types, in terms of regulatory or policy work (work, environment, consumers, etc.), monitoring of operations, financial support?
2. Which national institutions collect the data relevant for IFFs as part of their administrative or statistical work?
3. Which national institutions produce impact assessments of policy proposals or other analytical studies of IFFs, e.g., macroeconomic research units, unions, etc.?
4. Which stakeholders and institutions are affected by IFFs directly or indirectly?[48]

The mapping needs to consider the economy and society at large, including the government units, but also major stakeholders in the economy, services, legal side and the private sector and the effects on them. Financial institutions and banks, non-governmental organisations (NGOs), citizen-science projects, individual experts, trade and industry associations, law associations, civil society organisations (CSOs), etc. can contribute to the understanding of IFFs, as mentioned in the previous chapter. A proposal on how to ensure the comprehensive identification of agencies and stakeholders with their mapping by area is shown in Figure 17. Sometimes such mapping is needed at a more detailed level. Case study 8 shows an example of a way to identify experts from relevant national institutions in mispricing related to gold and cocoa exports from Ghana (Ahene-Codjoe et.al., 2020).

Figure 17. Identification of area-wise relevant institutions to measure IFFs



Source: Authors' deliberations.

Once the identification is done, a mapping of how the entities relate to each other and form a national system is due to take place. As countries differ significantly in their regulatory and institutional setup,

[48] Direct impact refers to, for example, Customs, as they are affected by trade misinvoicing in their work. Indirect impact could be the reduced quality of key statistics due to the effect of IFFs that is not quantified.

a universal solution cannot be offered. However, regardless of the composition, the relevant stakeholders should be brought to the same table to establish a good collaboration. A tool for mapping of national agencies and their roles is presented in Part IV (Chapter 3, Section B).

All agencies are not equally involved in specific IFF types. The mapping of agencies should identify their roles, such as:

- **Lead agency** (or agencies) leading the measurement of IFFs. The NSO is usually tasked with the coordination of the national statistical system and is thus central to the process. In some member states another agency could be the assigned leader, e.g., Customs, Central Bank or Tax office. The lead agency should have the statistical expertise and data or access to them, but it is not necessarily the agency that carries out the calculations; and
- **Supporting agencies** providing administrative data, methodological, infrastructural (field, IT), legal, administrative, substantive, or other support. These agencies can also include relevant private sector representatives.
- **Other stakeholders** are agencies that can be affected by IFFs or the related work, whose input and feedback can be essential or who have substantive knowledge and insights into specific IFFs.

Role of agencies can further be defined by their involvement in the statistical process, hence identified as:

- **Compiling agencies** may vary depending on the country. The NSO may be tasked with the compilation of tax and commercial IFFs or the entire SDG indicator 16.4.1 with all its subcomponents based on data received from the other agencies. Alternatively, several agencies (e.g., Customs, Tax, Central Bank, NSO) could compile indicators of different IFFs to be aggregated into one index by one agency, such as the NSO. Whatever the solution, the results should be internationally comparable and fully aligned with the Fundamental Principles of Official Statistics as required for the global SDG reporting; or
- **Data-providing agencies** are those who provide source data for the calculations that they collect or possess to carry out their mandate. Their involvement is essential as they pose expert knowledge on the data and behaviours they deal with.

Mandate of the agencies should be considered when assigning task and expected outputs. Some of the agencies' mandates may be statistical, while others have a more administrative mandate.

Operating procedures define the roles and interactions among all involved agencies or other stakeholders. Setting up a technical working group, or an expert group, with a clear mandate to measure IFFs is essential. Regardless of the agency, preferably its statistical unit would serve as a focal point.

3. Data availability review and selection

The IFF risk assessment and the mapping of agencies provide a good basis for assessing what data are available in the national system of agencies on the most prominent IFFs and to see where the gaps are. Statistical work relies on good data, even more so for IFFs where significant gaps exist. OECD's (2015) concern about BEPS indicators, is true for IFFs in general: "*Having a proper understanding of the available data and its limitations is a fundamental issue for the development of indicators…*". Limitations often lie in data availability, granularity and accuracy, i.e., whether they truly measure IFFs

or measure other factors in combination with IFFs. Data availability and accuracy will always be problematic when measuring IFFs as they are hidden by nature.

Data availability will inherently affect the selection of method(s). Therefore, it is carried out first. The first step is to see what data are available, the second is to assess their usefulness and quality. The review of data availability should consider practical questions such as:

- Who (which agency) has the data?
- What variables are available and which acts generating IFFs they cover?
- In what frequency (annual, quarterly, monthly) are the data?
- What format the data are in?
- What is the quality of the data in terms of the six quality aspects?
- What are the limitations of and gaps in the data?
- What regulatory frameworks need to be considered to access the data? (while the statistical law typically provides access to all data needed for statistical purposes)
- What procedures are required for accessing the data?
- Who is best placed to compile aggregates from the data?
- What are the potential overlaps with other data?

It will also be useful to consider if there are international data sources that could be used. They can provide better international comparability, but mainly supplement national data where gaps exist and enable access to data from other countries, e.g., for mirror trade statistics. A list of potential international sources is provided in Part IV.

The data availability review can focus on data needed for the IFFs to be measured according to the priorities identified in the IFF risk assessment unless new priorities come up. The following table provides a generic listing of possible national datasets that could be included in the review. The list of data needed should be adjusted to the national context and the relevant IFFs (and selected methodology) in question. Similar tables by each suggested method to measure IFFs are proposed in Part IV (Chapter 3, Section C).

Table 4. National data availability review

Data needed	**Agency**	**Key variables**	**Frequency**	**Timeliness** (lag)	**Access**	**Coverage** (gaps/overlap)	**Granularity** (units)	**Format** (linking)	**Legal setup**	**Type of IFFs**	**Fit for purpose**
Value added tax											
Personal income tax											
Capital gain and assets tax											
Corporate income tax											
International trade in goods statistics											
International trade in services statistics											
Trade transactions											
International transport cost and insurance											
Financial transactions											

Data needed	**Agency**	**Key variables**	**Frequency**	**Timeliness** (lag)	**Access**	**Coverage** (gaps/overlap)	**Granularity** (units)	**Format** (linking)	**Legal setup**	**Type of IFFs**	**Fit for purpose**
Consumer prices											
Exchange rates											
Producer prices											
Businesses' financial and balance sheets											
Business characteristics											
Short-term business statistics											
National accounts											
Sector accounts											
Government finances											
Balance of payments											
Foreign affiliates											
Commercial databases											
Big data sources											

Source: Authors' deliberations.

Source data can be reviewed with respect to six quality aspects, namely: timeliness, availability, fit-for-purpose, coverage, granularity and interoperability. Almost all data relevant for the measurement of IFFs are collected and intended for other purposes than the measurement of IFFs. It may be useful to assess if and how their fit-for-purpose could be improved, e.g., by adding or adjusting a question in an existing data collection or other means.

Table 5. Assessing the quality of source data under the IFF quality assessment framework

Category	No.	CRITERIA	CRITERIA explained
Source data	8	Timeliness	What is the delay of data becoming available after reference period?
	9	Availability	How easily available are these data to statistical authorities? Are these available in many/most countries?
	10	Fit for purpose	Do these data provide information on IFFs, directly or indirectly? Which IFFs do they address?
	11	Coverage	Do the data cover the issues to be measured? Which IFFs are covered? What are the gaps and overlaps?
	12	Granularity	How detailed are the data?
	13	Interoperability	Can the data be integrated with other data? Does the dataset include identifiers and classifiers?

Source: Authors' deliberations.
Note: Column No. *refers to numbering in the quality assessment framework (see Part IV).*

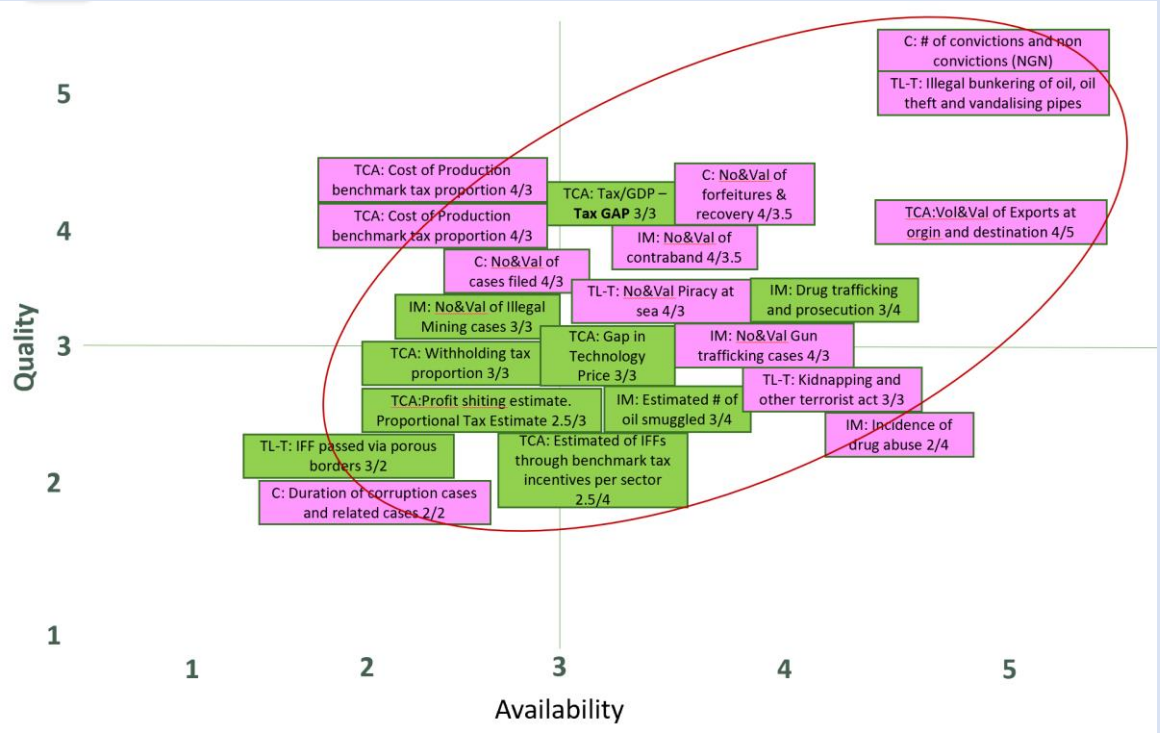
It will also be useful to consider what estimates or indicators of IFFs or similar issues exist in the country, compiled by the government or the private sector. What is the quality and availability of these indicators: Are they regularly produced or one-off exercises? Are they presented in scientific research papers, official government reports or other releases? Are any of them already applying a method

recommended in these guidelines or could they provide input to new indicators on IFFs? The following case study showcases a mapping of IFF-related indicators in Nigeria.

Case study 23. Mapping of the quality and availability of IFF-related indicators in Nigeria

Nigeria was the first African pilot country to bring together relevant agencies and review data availability. The pilot mission under auspices of UNECA took place in 2019 and noted that the bulk of IFFs in Nigeria emerge in tax and commercial practices, and corruption. A preliminary exploration into potential indicators of IFFs and related issues was carried out, including indicators of profit shifting, cost of production (commercial transactions with offshore companies), tax-GDP ratio, volume of tax incentives, revenue to GDP ratio etc. The indicators were further assessed in terms of quality and availability (see findings in the below chart).

Quality and availability of indicators related to illicit financial flows in Nigeria



Source: UNECA briefing on the pilot mission with Nigeria.
Note: TCA refers to tax and commercial practices; C refers to corruption; TL-T refers to theft-like and terrorism; and IM refers to illegal markets. Green is for macro data sets or ones that rely on estimations; and Cerise is for transactional data sets.

Pilot testing in interested member states will show more fully the data availability and feasibility of measuring certain IFFs. This guidance on data sources will be refined based on pilot test results.

4. Tier classification and the use of methods

The guidelines focus on methods, selected considering not only methodological and data quality aspects, but also applicability to varying national circumstances. The criteria used in the evaluation framework are divided into three categories with several subcategories in each (see Part IV, Chapter 3, Section D). Table 6 looks into the category soundness of methods.

Table 6. Assessing the soundness of methods under the IFF quality assessment framework

Category	No.	CRITERIA	CRITERIA explained
Soundness	1	Relevance of scope	Content validity – What is measured? Which IFFs does it cover?
	2	Clarity of concepts	Construct validity – Does it measure what it is supposed to? Is it clearly defined? Is a classification used? Is it discrete, exhaustive, and mutually exclusive (are there gaps or overlaps)?
	3	Robustness	How stable are the results produced by the method? Will a repetition lead to similar results? What if conditions change?
	4	Transferability	How easy it is for someone else to use the method? Availability of empirical research or application of the method
	5	Equivalence	Does the method yield similar results when compared to other (sound) methods?
	6	Statistical alignment	Is the method similar to those applied in official statistics? Are the concepts and classifications aligned with official?
	7	Capacity requirements	How much resources and capacity are required for using the method?

Source: Authors' deliberations.
Note: Column No. *refers to numbering in the quality assessment framework (see Part IV).*

The methods suggested for pilot testing have been tier-classified[49] applying the IFF quality assessment framework to support statistical authorities in the selection of methods. However, the quality of estimates is also affected by the availability and quality of national source data and the quality of resulting estimates. The tier-classification is based on a generic assessment of the country-specific items and is, therefore, indicative only. Furthermore, the exercise is based on an assessment of methods enhanced as described in Part II.

A **three-tier classification** is proposed. Tier 1 is the method that is preferred, scoring highest, while tier 2 is proposed as a fallback option, if tier 1 method cannot be applied. If neither are applicable, a tier 3 method could be used. Tier 1 method scored 40 or more points (of the 57 maximum); tier 2 30 or more (and less than 40 points); and tier 3 methods less than 30 points. Generic results of the classification exercise of the suggested six methods are presented in Table 7. For full details of the evaluation refer to Part IV, Chapter 3, Section D.

Table 7. Tier classification of suggested methods

Group	Method	Soundness	Source data	Results	Overall	Tier class
Trade misinvoicing by entities	#1 Partner Country Method (PCM+)	11	11	12	34	2
	#2 Price Filter Method (PFM+)	14	15	15	44	1
Aggressive tax avoidance or	#3 Global distribution of MNEs' profits	12	8	9	29	3

[49] Only the methods suggested for pilot testing have been evaluated and tier-classified.

Group	Method	Soundness	Source data	Results	Overall	Tier class
profit shifting by MNEs	and corporate taxes					
	#4 MNEs vs comparable non-MNEs	13	14	14	41	1
Transfer of wealth to evade taxes by individuals	#5 Flows of undeclared offshore assets indicator	9	10	10	29	3
	#6 Flows of offshore financial wealth by country	8	9	10	27	3

Source: Authors' deliberations.

The above assessment of methods to measure different tax and commercial IFFs yields different results in the country context because of differences in nationally available source data and their quality. The assessment can guide the selection of methods together with considerations on available source data and statistical capacity. Method fact sheets in Part IV (Chapter 3, Section E) are designed to further enable easier comparison of methods in their selection process.

Selection of methods to measure trade misinvoicing by entities:

- If a country has transactions level Customs data with low non-reporting and a good capacity to analyse those data, method #2, the Price Filter Method (PFM+) is a natural choice as a tier 1 method. Ideally, the data would be used at the most detailed level, even at transactions level, for PFM+. This is important to account for the heterogeneity of products and quality aspects. The Customs data should also include a description of the commodity, and information on exporters and importers etc.
- If such rich data and high capacity are not there, the Partner Country Method (PCM+), method #1, may be a better first option. There, on the other hand, more work is needed to account for discrepancies not driven by IFFs. Here bilateral and international collaboration of statistical authorities to address statistical trade asymmetries would be essential. Such partnerships could be formed in the pilot testing to share lessons learned.

Selection of methods to measure aggressive tax avoidance or profit shifting by MNEs:

- If statistical authorities have comprehensive firm-level data with economic variables, such as value added, R&D spending, share of salaries to total costs and the ability to link to firms' international trade by products and trading partners (country of origin/destination), and business register information on MNEs, the method analysing MNE vs. comparable non-MNEs, method #4, would be the ideal choice. It could be useful to experiment further with the variables that are used to make the comparison. This method will require more from source data and analytical capacity.
- Otherwise, global distribution of MNEs' profits and corporate taxes, method #3, could be a feasible choice. This method can be performed on microdata from CbCR, if available; alternatively, OECD published aggregate CbCR should provide some starting ground in

application of this method. Assumptions and country-specific alterations including national experts may be required to operationalise this method in practice.

Selection of methods to measure transfer of wealth to evade taxes by individuals:

- In the case of availability of granular data from individual tax administration records on foreign income and wealth, the method of flows of undeclared offshore assets indicator (method #5) is a preferred method to measure international tax avoidance of individuals. The exchange of data between financial institutions and Tax authorities, including across borders, can further improve the method's reliability. Pilot testing will reveal further potential of the method application, as well as its limitations in data use.
- Offshore financial wealth by country, method #6, is a suitable fall-back option due to its comprehensiveness in coverage, achieved through combining various datasets covering portfolio assets and liabilities, and bank deposits. Nevertheless, the underlying assumptions for conducting the analysis require careful consideration. Testing its robustness to assumptions will be required to ensure proper international comparability of the results.

The guidelines suggest two methods for each of the three main areas of tax and commercial IFFs to allow flexibility to select a feasible method considering the national capacity, existing data sources and other methods used in statistics, legal and regulatory frameworks, and other conditions. **Member states are encouraged to select one or two methods for pilot testing**, ideally a microdata-based method if the national data environment allows. This will enable the comparison of feasibility and robustness and will accumulate information on the methods. Statistical authorities are also encouraged to carry out an in-depth study of IFFs at regular intervals by using more resource intensive methods, e.g., in a base year in combination with less resource-intensive measures of IFF dynamics for other years. The in-depth study could include additional direct data collection.

Recommendations with respect to the use of methods are as follows:

- Use **tier 1 method**, whenever possible
- If possible, crosscheck results with **another method** to allow for triangulation – of methods, data sources, as well as IFFs activities and/or types of flows.
- If resources do not allow for multiple methods to be applied, apply the following:
    - Select **a base year** and use tier 1 method for it, perhaps in combination with additional data collection to address gaps and seek more information.
    - Use simpler methods to estimate **dynamics in between base years**.

It may prove useful to triangulate methods by applying more than one method for compiling certain IFFs to check robustness of results. In case of uncertainties, it may be useful to produce a range of estimates or a confidence interval to guide users. It is also a good practice to be transparent about expected revisions. Results are to be presented on an annual level, while base year studies can provide more structural detail at regular intervals.

5. Operational definition of tax and commercial illicit financial flows for statistics

IFFs are defined as *Financial flows that are illicit in origin, transfer or use, that reflect an exchange of value and that cross country borders*. But what does that mean in practice? In practice, an exhaustive measure of all IFFs will be difficult to achieve. Data availability or lack of it may dictate measurement choices. As explained in Part II, one method can only cover some IFFs, e.g., the partner country method,

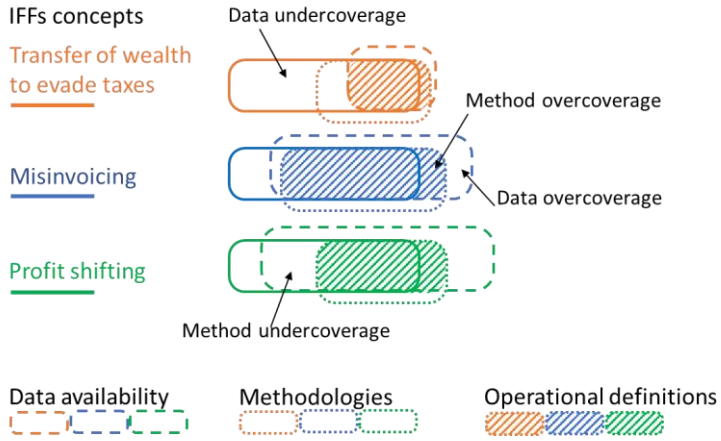
and there is a risk of overlap with some data and methods, e.g., flows of undeclared wealth by individuals is likely to capture some IFFs that originate in the illegal economy. Some data sources may not be fully reliable for various reasons, such as underreporting. All these limit measurement possibilities and call for an operational definition of IFFs.

The measurement of tax and commercial IFFs aims to contribute to the overall indicator 16.4.1, *total value of inward and outward illicit financial flows (in current United States dollars)*. Therefore, their measurement should be as internationally comparable as possible. Thus, the starting point has to be the definition of IFFs for SDG 16.4.1 or its elements. However, feasibility should be a key consideration. If certain types of IFFs are not significant in a country, it is not cost-efficient to try and measure those regularly. Instead, measurement can focus on prominent types of IFFs and the most pressing data needs, as long as the selected methods follow international recommendations. Operational definition is not a policy decision on which IFFs should be measured and which ones should not be measured. The operational definition of IFFs is to be drafted in full professional independence by statistical authorities. The statistical authorities can consult experts and stakeholders to seek input. The IFF risk assessment provides a good basis for drafting an operational definition.

An operational definition is a clear, concise and detailed description of what an indicator is attempting to capture. For tax and commercial IFFs, it could be, for instance, an indicator of IFFs from illegal commercial and tax activities, and IFFs from aggressive tax avoidance, excluding a part of IFFs that is difficult to measure in the country, e.g., due to lack of data. Deviations from the scope of IFFs, as defined by UNCTAD and UNODC (2020), and their reasons are transparently documented. The measure could exclude IFFs that are not typical to the country. For instance, some countries are recipients of aggressive tax avoidance inflows, while others experience outflows. In summary, the operational definition covers the prominent IFFs for which data and methods are available. In Figure 18 their overlap, i.e., the operational definition is shown with a pattern.

The operational definition will inevitably differ based on the choice of method to measure IFFs, for instance inward IFFs cannot be currently compiled using methods for transfer of wealth to evade taxes by individuals. In the case of misinvoicing, the operational definition of IFFs will exclude cases where discrepancies are not captured (e.g., some cases of collusion between both importer and exporter); on the other hand, transactions not classified as IFFs could be included (e.g., errors in statistical coverage, or mistakes due to heterogeneity of products), referred to as method overcoverage. Profit shifting is likewise prone to deviation of coverage due to method overcoverage, e.g., productivity differences could be mistakenly interpreted as IFFs; but also method undercoverage when, for example, only tax incentives comparing a domestic MNE unit to other units within an MNE are considered. The operational definition should clearly state the limitations of scope brought by the available data and selected method.

Figure 18. Operational definition as a mapping of main illicit financial flow concepts, available data and feasible methods



Source: Authors' deliberations.
Note: Scales are not indicating true relations, simply presented for illustrative purposes.

As the goal is to capture the most significant flows at country level a certain level of international comparability can be achieved (if countries manage to cover significant IFFs only leaving less important IFFs out of scope), and country differences in coverage can be partially seen in available aggregates. A gradual process of improving the exhaustiveness of the IFF measures is expected, following the model of measuring illegal economic activities and the non-observed economy in the balance of payments and national accounts.

6. Compilation and dissemination of tax and commercial illicit financial flows estimates

These guidelines aim to support the pilot testing of the measurement of tax and commercial IFFs, not necessarily their publication. However, national statistical authorities may decide to publish some of the results of pilots as experimental statistics if they are of suitable quality. Early estimates can provide valuable information for policy action to curb IFFs.

In the longer term, tax and commercial IFFs comprise part of SDG indicator 16.4.1 selected to the global SDG indicator framework, adopted by the General Assembly in 2017 (A/RES/71/313). While the indicator framework only requires an aggregate index to be published, a more granular measurement of IFFs helps to identify the main sources and types of IFFs to guide interventions.

We recommend disaggregation of the index by relevant types of IFFs, as a minimum to publish separately the following four elements:

- IFFs from illicit commercial and tax practices,
- IFFs from illegal markets,
- IFFs from corruption, and
- IFFs from exploitation-type and financing of crime and terrorism.

In addition, member states may decide to disaggregate the IFF indicator, where relevant, by:

- payment method (cash / trade flows / crypto currencies)
- resulting assets (offshore wealth / real estate etc.)
- actors (characters of individuals / types of businesses etc.)

- industries, commodities or service categories

Countries are affected by different types of IFFs. Therefore, we suggest that the main types of IFFs to be published are defined at country level following the operational definition. Concerning tax and commercial IFFs, a division into two is recommended as a minimum: IFFs from illegal commercial and tax practices; and IFFs from aggressive tax avoidance. As higher uncertainties relate to the latter grouping, it is better to provide the estimate also separately.

Tax and commercial IFFs could also be disseminated by types of flows or groups of flows, such as:

- Transfer of wealth to evade taxes (F1)
- Misinvoicing (F2)
- Profit shifting (F3-F5) etc.

Further development of methods to account for double counting will be needed. In the context of adopting the SDG indicator framework, the General Assembly (A/RES/71/313) stressed that all activities of the global statistical system must be conducted in full adherence to the Fundamental Principles of Official Statistics.

IFFs are a particularly difficult phenomenon to interpret and a sensitive issue to many stakeholders. It is, thus, important that IFF releases are published in a sufficiently comprehensive form, accessible to all citizens and presented in such a way that the main results are understood with no need for specialised statistical knowledge.

The first Principle (United Nations, 2014) requires official statistics to be compiled and made available on an impartial basis to honour citizens' entitlement to public information. Statistical releases should be presented according to scientific standards on the sources, methods and procedures to facilitate a correct interpretation (Principle 3). All releases should be accompanied by comprehensive metadata explaining limitations of use and guiding interpretation, and including information related to data sources, methods, missing data and exhaustiveness of the indicator.

Some IFF estimates are on the borderline of licit and illicit activities. The underlying datasets are highly sensitive which should also be considered in the planning of publications. The underlying individual data, on natural or legal persons, are to be strictly confidential (Principle 6). A confidentiality breach and even very detailed aggregates could be stigmatizing for statistical units or for an industry. Importantly, statistical agencies are entitled to comment on erroneous interpretation and misuse of statistics (Principle 4).

Historical time series would be useful for the analysis of development over time. Feasibility of constructing historical time series data will need to be reviewed by national statistical authorities. It may be possible only for certain IFFs for which suitable data sources exist.

Considering the wide range of source data needed, compilers will have to strike a balance between exhaustiveness and timeliness when setting a dissemination date. In practice, the data sources that become available with the longest delay, influence the timeliness of the indicator. One option is also to apply a revision strategy by releasing a preliminary estimate before more comprehensive datasets become available. The potentially preliminary or experimental status of the indicator should be clearly communicated to the public. It is good to review the IFF estimates against the quality criteria and ensure transparent communication about the quality of released figures.

Table 8. Assessing the quality of results under the IFF quality assessment framework

Category	No.	CRITERIA	CRITERIA explained
Results	14	Relevance for use	Are the results helpful for assessing IFFs or curbing different types of IFFs? How many uses are there for these results?
	15	Accuracy	Do the results describe what is intended? Are there large revisions?
	16	Timeliness	How quickly will the results be available? Are they available on time to help solve problems?
	17	Clarity	How easy are the results to use and interpret?
	18	Comparability	How comparable are the results in different conditions, across time and countries?
	19	Coherence	How coherent are the results internally? Can they be used together with other IFF estimates?

Source: Authors' deliberations.
Note: Column No. *refers to numbering in the quality assessment framework (see Part IV).*

Better international comparability of IFF estimates may be achieved, especially in the beginning, by reporting at more disaggregated level(s), rather than only with a single, top-level aggregated value for all types of IFFs. Approaches combining various values into a single representation, such as dashboard approach (OECD, 2015) or scoreboards (European Commission, 2020a) may be a possible solution for publishing different IFFs nationally.

7. Recommendations on the pilot compilation of tax and commercial illicit financial flows

These recommendations are aimed at supporting national efforts by statistical systems to compile statistics on tax and commercial IFFs.

1. **Dedicate resources to the pilot measurement of IFFs.** When significant, IFFs can distort key economic statistics in a way that may lead to wrong policy conclusions. Sufficient resources are needed not only to measure IFFs, but also to improve the quality of key indicators, such as GDP and the exhaustiveness and accuracy of the SNA and BoP. The results of the pilot testing can help inform these efforts and mobilise resources for the purpose to increase the efficiency of interventions to curb IFFs.
2. **Pool national and international expertise on IFFs**. Successful measurement of IFFs requires collaboration across disciplines as illicit phenomena cut across the society. Data exist but are scattered among many government and private organisations. IFFs cannot be monitored or captured fully using a single data source. It is important to map the roles of organisations and identify key partners to measure tax and commercial IFFs. Identification of key stakeholders can go hand in hand with IFF risk assessment (recommendation 4). Clear organisation of national work into a working group or a task force is likely to increase efficiency. Bilateral and international collaboration of statistical authorities of other countries to advance methodological development and address asymmetries (in, e.g., trade or declared wealth) is more efficient than working in isolation.
3. **Involve official statisticians in a leading role.** Official statistics and the NSO play a crucial role in the measurement of IFFs, as part of the SDG indicator framework. The General Assembly

resolution (A/RES/71/313) "*stresses that official statistics and data from national statistical systems constitute the basis needed for the global indicator framework, …, and stresses the role of National Statistical Offices as the coordinator of the national statistical system*." Measurement of the many types of IFFs in a coherent way can only be done in close collaboration within the NSS and with data providers. The statistical expertise and professional independence of the NSO is a key enabler of the compilation of tax and commercial IFFs as an impartial statistical activity in line with the Fundamental Principles of Official Statistics.

4. **Assess IFF risks and data availability.** Countries' exposure to IFF risks differs. The IFF categories, activities and flows typical to a country vary, including whether there are inflows or outflows, and what are the destination or origin countries of IFFs. Different IFFs require different data and methods for their measurement. There is no one size fits all model. A useful first step is to carry out an IFF risk assessment to collate information already available about IFFs in the country to identify prominent types of IFFs and who has relevant data to enable measurement. The guidelines offer tools and approaches for IFF risk assessment and a data availability review with partner agencies (see Part III, Chapters 1, 2 and 3).
5. **Conduct an in-depth study of IFFs for the base-year.** Statisticians need to strike a balance between accuracy and cost-effectiveness. Therefore, we recommend a more thorough study of IFFs to be carried out for the base-year at the start, and at regular intervals, focusing on all aspects of IFFs, as feasible, activities, flows, actors, destinations and origins etc. This involves mobilising relevant agencies, identifying possible data sources and resources, including administrative data, and relying on available expertise and experience across disciplines. The in-depth study produces a so-called base-year structure for tax and commercial IFFs in the country.
6. **Narrow down the scope of focus.** National circumstances dictate not only the resources availability and statistical capacity, but also which IFFs activities and/or flows are prevalent in the economy. With the aim of maintaining comparability in space and time, the IFFs compilation should aim at exhaustiveness. Given the nature of IFFs and national circumstances, however, identifying the significant flows (e.g., certain commodities or types of IFFs) to represent national IFFs, may prove to be a good trade-off in producing reliable and robust IFFs statistics over time. If the national statistical capacity and data availability are limited, less resource-intensive methods to produce estimates of IFFs in between base years can be applied.
7. **Publish IFF estimates clearly and transparently.** IFFs are a particularly difficult phenomenon to interpret and a sensitive issue to many stakeholders. It is up to each country to decide whether to release pilot test results to the public. Even experimental releases can be very informative for policy action in an area that lacks statistics. IFF releases, like official statistics, should be published in a sufficiently comprehensive form, accessible to all citizens and presented in such a way that the main results are understood with no need for specialised statistical knowledge. It is important to highlight the main findings, but also limitations. Metadata should inform users transparently about the data sources, methods and quality of estimates. A dashboard approach, i.e., presenting a set of results can be helpful to shed light on the complex phenomenon.
8. **Share, learn and improve.** More insight into country circumstances, IFF activities, flows and other features will be obtained as experience with statistical measurement accumulates. Sharing of findings and lessons learned from pilots in the national and international context is important for learning. National training of experts, e.g., custom officers, financial investigators, official statisticians can be useful; sharing of outcomes in international seminars and webinars can help learn from other countries' experience to copy-paste best practices.

Data exchange within a safe statistical environment, where possible, or an exchange of resulting estimates can be crucial for learning and improvement.

9. **Spill-over effects on other statistics and statistical frameworks.** Better information on IFFs can help improve the accuracy of other statistics, including key economic statistics. In addition, as IFFs are hidden and they are often measured indirectly through traces they leave in other statistics, there may also be opportunities to enhance the quality of IFF estimates by making small changes to data available from other statistics, e.g., merchandise trade statistics, trade in services, the SNA and BoP statistics, price statistics, etc.

IV. Resources

This part of the guidelines provides resources to support national statistical authorities in their task to compile tax and commercial IFFs.

Chapter 1 presents a stock taking of international or national studies on tax and commercial IFFs. Rather than providing a comprehensive list, it is intended as a starting point for finding examples of previous work carried out. The inclusion or exclusion of examples on the list does not imply any judgement of the methods applied.

Chapter 2 presents a list of global data sources which can also support national work. International data sources can sometimes supplement, but not replace, national data sources and infrastructure.

Chapter 3 provides practical tools to national authorities when setting off to compile IFF statistics. These are designed to support actions presented in Part III of the guidelines. Section A presents a template self-assessment questionnaire to review national statistical context to measure IFFs; Section B proposes a tool for mapping of national agencies and their roles; Section C outlines tables for data availability and quality review by methods; and Section D proposes a methods evaluation framework; Section E presents method fact sheets which summarize the concept, strengths and limitations of the method, data requirements and other useful information; Section F presents a workflow for compiling IFF estimates; and Section G a step-by-step check list for national authorities.

Chapter 4 provides a glossary of terms on IFFs, used throughout the guidelines.

1. A stock taking of studies on illicit financial flows

This section lists studies attempting to measure and understand tax and commercial IFFs. The list is not meant to be exhaustive. The list is presented in an alphabetical order and does in no way imply any preferences or deliberate exclusions. It provides a starting point for reviewing current experience and should not limit national authorities' work. We do, however, believe that the list can help to learn from others.

Table 9. List of studies on tax and trade related IFFs

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
Ahene-Codjoe et al. (2020)	Trade misinvoicing	F2	PFM	Experts' interviews	Ghana	2011-2017	Gold; Cocoa	Microdata: Transaction-level	Ghana Revenue Authority; Metal Focus Gold-Silver Dore Service database	Gold: 11%; Cocoa: 1-7%
Alstadsæter et al. (2017)	Undeclared offshore assets	F1	Discrepancy between global portfolio liabilities and assets	Only measures offshore wealth in tax havens, not flows; Country-by-country estimates of offshorewealth	Globally	2007		Aggregated at country level	Central bank of Switzerland; BIS bilateral banking statistics	The equivalent of 10% of world GDP is held in tax havens globally, but this average masks a great deal of heterogeneity from a few per cent of GDP in Scandinavia, to about 15% in Continental Europe, and 60% in Gulf countries and some Latin American economies.
Amaral and Barcarolo (2020)	Trade misinvoicing	F2	PFM	Price filter statistically estimated using a three-day	Brazil	2017-2019	Soya beans	Microdata: transaction-level	Customs Bureau of Brazil	Estimated tax-related IFFs on export side amount to just below 1 per cent of

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
				weighted moving average price						total exports, around US$504 million
Bilicka (2019)	Profit shifting	F3-F5	MNE vs domestic firms via Propensity Score Matching	Comparison of taxable and accounting profits	UK	2000-2014		Microdata: Firm-level unconsolidated corporation tax returns	UK Tax authority; FAME dataset collected by Bureau van Dijk	Revenue gains in the absence of profit-shifting would be 10% in 2000 and 64% in 2014
Bratta et al. (2021)	Profit shifting	F3-F5		Analysing also the existence of nonlinear responses to taxation; introducing cubic estimation	Italy	2017		Microdata: Firm-level	OECD's CbCR; OECD's corporate tax statistics dataset; KMPG CIT rates table; Oxford University Centre for Business Taxation dataset; National sources	We find that profit allocation in a country is non-linearly dependant to the differences in tax rate with respect to the average CIT rate faced by the MNEs in the rest of the world. We find that in 2017 a total of € 887 billion of profits was shifted due to differences in tax rates with a global revenue loss of € 245 billion.
Bruner et al. (2018)	Profit shifting	F3-F5	Profit misalignment	Formulary Apportionment using only compensation	US	2014		Microdata: firm-level on the financial and	US Bureau of Economic Analysis; OECD AMNE	Our adjustments yield a 3.5 per cent increase in U.S. operating surplus, which

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
				and sales; Effects of profit shifting cascade throughout a set of economic accounts				operating activities; direct investment income transactions		generates a 1.5 per cent increase in U.S. GDP.
Carbonnier and Mehrotra (2020)	Trade misinvoicing	F2	PCM	No details regarding the quality and type of each commodity transaction	Switzerland	2011-2017	Gold; Copper; Cocoa; Coffee	Microdata: Transaction-level import statistics	Swiss Federal Customs Administration; United Nations Comtrade	Large asymmetries between Swiss imports and partners' exports to Switzerland: - positive for gold, cocoa, and coffee; - negative for copper
Carbonnier and Mehrotra (2020)	Trade misinvoicing	F2	PFM	Calculating the interquartile range by product, source and year	Switzerland	2011-2017	Gold; Copper; Cocoa; Coffee	Microdata: Transaction-level	Swiss Federal Customs Administration; Datastream by Thomson Reuters; Metals Focus database	Undervalued imports of: - gold (4.5% of total imports); - cocoa (5%); - coffee (3%);
Cassetta et al. (2014)	Tax evasion of individuals	F1	Gravity model	Italian cross border bank transfers, confounding all flows, not	Italy	2007-2010		Aggregated transactions (cross-border flows)	Italian Financial Intelligence Unit	Almost 15% of the cross-border transfers from Italy refer to risky countries, accounting for almost 8% of

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
				addressing only IFFs						the overall amount of outward flows.
Clausing (2016)	Profit shifting	F3-F5	Semi-elasticities between profits and tax rates of foreign countries	Economic activity defined through employment, property/plant/ equipment, assets, sales and income	USA	1983-2012		Microdata: firm-level (US-based MNEs and their affiliates)	Bureau of Economic Analysis survey data	The revenue cost to the U.S. government from profit shifting has been increasing steadily over the previous decades, reaching $77 billion to $111 billion by 2012, over 30 per cent of U.S. corporate income tax revenues.
Cobham and Janský (2018)	Profit shifting	F3-F5	Model of base spillovers as a response to corporate tax rate	Build on Crivelli et al. (2015) and consider the spillovers by country size; Introduce additional data source	49 to 120 countries	1980-2013	Excluding resource-rich countries	Aggregated at country level	Data by Crivelli at el. (2015); UNU-WIDER's GRD	Our findings support a somewhat lower estimate of global revenue losses of around US$500 billion annually and indicate that the greatest intensity of losses occurs in low-income and lower middle-income countries.
Cobham and Janský (2020)	Profit shifting	F3-F5	Profit misalignment	Formulary apportionment (capturing only employment and sales);	Countries where an MNE operates (Vodafone)	2016-2017	MNE: Vodafone	Microdata: firm-level	CbCR	Vodafone's misaligned profit of €3.574bn. Of the nearly €1.5bn declared in Luxembourg, more than 99.5 per cent is not aligned with the real

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
				indicator constructed at the firm level.						economic activity taking place there.
Cobham and Janský (2020)	Flows of undeclared offshore assets	F1	Undeclared offshore assets indicator	Global-level; Not measuring flows; Not actually applying the methodology					Proposes OECD's CRS	For application see TJN (2020b)
Crivelli et al. (2015)	Profit shifting	F3-F5	Model of base spillovers as a response to corporate tax rate		173 countries	1980-2013	Developing countries	Aggregated at country level	IMF's Fiscal Affairs Department database; World Development Indicators (WDI) database; IMF's International Financial Statistics (IFS) database	The results suggest that spillover effects on the tax base are if anything a greater concern for developing countries than for advanced—and a significant one. Evaluated at a mean CIT base of 8.59 per cent of GDP, this implies a (short run) semi-elasticity of the corporate tax base with respect to its own rate of −0.9: that is, a one percentage point higher CIT rate reduces its own base by just under one per cent.
Dyreng and Markle (2015)	Profit shifting	F3-F5	Specific econometric model (outbound		US	1998-2011		Microdata: Firm-level financial statements	Compustat	The mean (median) constrained firm shifts $16 million ($7 million) out of the U.S. each year while the

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
			and inbound profit shifting)							mean (median) unconstrained firm shifts $321 million ($134 million) out of the U.S. each year
European Commission (2019)	Tax evasion by individuals	F1	Offshore financial wealth and tax evasion by individuals		EU-28	2001-2016		Country-level aggregated data	The IMF's CPIS, the IMF's IIP and the EWN database; SNB; BIS	Offshore wealth held by EU residents is estimated at US$1.6 trillion (€1.5 trillion) in 2016, leading to the estimated €46 billion or 0.32 per cent of GDP of revenue lost to international tax evasions for the EU-28 in 2016
Fuest et al. (2021)	Profit shifting	F3-F5	Global distribution of profits and corporate taxes	Imbalance of (i) profits and (ii) intra-firm revenues with respect to firms' activity (employees, tangible assets, unrelated revenues from sales); using statutory and effective tax rates	Germany (333 German MNEs)	2016, 2017	Exclude all non-corporate and public MNEs	Microdata: MNE-level	OECD's CbCR; Penn World Table 9.1; Amnesty International 's Corruption Perception Index; KPMG's Corporate Tax Surveys; EY's Annual Worldwide Corporate Tax Guides;	We show that 82% of the German multinationals subject to CbC reporting have tax haven subsidiaries and that these subsidiaries are notably more profitable than those in non-havens. An overall estimate for profits shifted out of Germany to tax havens is EUR 19.1 billion per year, corresponding to 4.3% of the profits reported by these firms in Germany. This implies a tax revenue loss due to corporate profit

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
									Orbis database	shifting to tax havens of EUR 5.7 billion per year.
Garcia-Bernardo and Janský (2021)	Profit shifting	F3-F5	Semi-elasticity model; Misalignment model	Using logarithmic model for tax sensitivity	11 OECD countries	2016		Aggregated at country level	OECD's CbCR; ILO	Over 40 per cent of profit shifting takes place towards countries with effective tax rate below 1 per cent. Estimated value of profits shifted is US$994 billion.
Gervais and Quang (2018)	Flows of undeclared offshore wealth	F1	Discrepancy between assets and liability in International investment positions	Differences between liabilities as reported by national compilers and liabilities derives from assets in other sources; Observing applicability of academic findings to statistical work, not a measurement study	France	2016	Household hidden assets	Aggregated at country level	IMF IIP; IMF CPIS	Hidden assets are held by non-financial corporations and households.
GFI (2019)	Trade misinvoicing	F2	PCM	Comparing DOTS- and	148 Developing economies	2006-2015		Aggregated data: imports and	United Nations Comtrade;	IFFs accounted for over 20 per cent of developing country trade,

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
				Comtrade-based estimates				exports at six-digit level of the HS	IMF DOTS; IMF BOP	on average, with a nearly even split between outflows and inflows
Hanni and Podestá (2019)	Trade misinvoicing	F2	PFM	Considers industry's standard contractual terms, and insurance and freight costs	Chile, Peru	2006-2016	Copper	Microdata: Transaction-level	Customs declarations for exports of copper products from Chile and Peru; UNCTAD Stat Free market prices	Underinvoiced exports of copper concentrates totalled US$ 3.035 billion in Chile (2.2% of the value exported) and US$ 1.083 billion (1.8% of the value exported, assuming a grade of 25%) in Peru. Underinvoiced amounts in sales of refined copper cathodes were US$ 3.833 billion in Chile (3.2% of the value exported) and US$ 369 million in Peru (1.6% of the value exported).
Henry (2012)	Flows of undeclared offshore assets	F1	Multiple approaches of unrecorded offshore flows	Supplements the four models used with other evidence (e.g., mispricing)	139 countries	2010		Varied from aggregated to bank-level	World Bank; IMF; UN; Central banks; National accounts	At least $21 to $32 trillion has been invested virtually tax-free through the world's more than 80 "offshore" secrecy jurisdictions.

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
Hines and Rice (1994)	Profit shifting	F3-F5	Tax semi-elasticity: shifted income is determined by the tax incentive to move income	United States firms reporting profits in low-tax foreign jurisdictions	United States of America and 41 countries and regions as tax havens	1982		Aggregated at country level	US Commerce Department	Tax variable from the OLS regression exerts a negative effect on reported non-financial profits. Based on the coefficients, raising a tax haven's tax rate from zero to 1% would lower reported nonfinancial earnings by 7%, holding the returns to real factors (capital and labour) constant.
Huizinga and Laeven (2008)	Profit shifting	F3-F5	A model of the opportunities and incentives generated by international tax differences for international profit shifting by multinationals	Not comparing only tax differences between parent and affiliates, but also between affiliates	European Union	1999		Firm-level	Amadeus database by Bureau Van Dijk; Other data sources, e.g. International Bureau of Fiscal Documentation; PriceWaterhouseCoopers ; Ernst & Young	On average, we find a semi-elasticity of reported profits with respect to the top statutory tax rate of 1.43. International profit shifting leads to a substantial redistribution of national corporate tax revenues. Many European nations appear to gain revenues from profit shifting by multinationals largely at the expense of Germany.
Janský and Palanský (2019)	Profit shifting	F3-F5	Estimating profit shifting using FDI data	The model allows for effects that	79 countries	2016		Aggregated at country level	IMF's CDIS; IMF's BOPS; OECD's FDI;	Around $420 billion in corporate profits are shifted from the 79 countries in our

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
				are heterogeneous across regions and income groups. Focus only on FDI from tax Havens.					KPMG; World Bank; United Nations; CIA; ICTD/UNU-WIDER	sample annually, amounting to almost 1% of these countries' GDP.
Kravchenko (2018)	Trade misinvoicing	F2	PCM	Scaling-up of unmatched import-export data; Considering relative export prices by source and destination	Asia-Pacific countries	2016		Aggregated data: imports and exports at six-digit level of the HS	United Nations Comtrade	As much as 7.6% of regional tax revenue may have been lost in 2016 due to fraudulent export and import value declarations
Nolintha et al. (2020)	Trade misinvoicing	F2	PFM	Interviews with commodity experts	Lao, P.D.R.	2012-2017	Copper; Coffee	Microdata: Transaction-level export data at 8-digit level of HS	Lao Customs Department; London Metal Exchange; Thomson Reuter Datastream; International Coffee Organization	Undervalued export for copper cathodes, copper concentrate and coffee beans equalled USD 9.47 million (0.32 per cent of total copper cathode export value), USD 124.9 million (6.8 per cent of total copper concentrate export value), and USD 260 million (77.1 per cent of total coffee

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
										export value) respectively during 2012-2017.
Reynolds and Wier (2016)	Profit shifting	F3-F5	Profit shifting based on MNEs' taxable income	Estimating semi-elasticity of taxable income with respect to parent tax rate	South Africa	2009-2014		Microdata: firm-level tax returns	Tax authority in South Africa	The semi-elasticity of taxable income with respect to the parent tax rate is estimated to be 1.7, meaning that a 10 percentage points lower parent tax rate is associated with a 17 per cent lower taxable income in the South African unit of that MNE. The loss of MNE units profits due to profit shifting at 7 per cent of these units' income, or 1 per cent of the total corporate tax base.
Sallusti (2021)	Profit shifting	F3-F5	Comparing MNEs to domestic firms, using PS-ROC	Two-stage comparison: between and within; Profits shifted out of the country	Italy	2015		Microdata: firm-level data	Frame-SBS (Structural Business Statistics); COE-TEC (Integrated International Trade Database); Archive ASIA-Groups (Italian	BEPS amounts to €32.3 billion, accounting for about 2 per cent of the Italian GDP at current prices

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
									version of European EGR)	
Schuster and Davis (2020); UNCTAD (2020)	Trade misinvoicing	F2	PCM	Commodity specific trade flows and CIF estimated product-specific	African countries	2000-2018	Extractive commodities	Aggregated data: imports and exports at commodity-level	United Nations Comtrade; OECD ITIC	The estimated $40 billion trade gap in 2015 derived from extractive commodities, 77 per cent were concentrated in the gold supply chain, followed by diamonds (12 per cent) and platinum (six per cent)
TJN (2020b)	Flows of undeclared offshore assets	F1	Undeclared offshore assets indicator	Global-level; Not measuring flows	Globally	2016		Aggregated at country-level	BIS Locational Banking Statistics, some country data (GDP, …)	Many of the countries with the biggest losses themselves, such as the USA, UK, Ireland and Luxembourg, also impose major losses on others. Cayman is responsible for the largest share on this metric (at 26 per cent), alone causing a tax revenue loss of $47.6 billion globally.
TJN (2020b)	Profit shifting	F3-F5	Profit misalignment	Formulary Apportionment using only labour inputs and sales	Globally	2016		Different levels: from firm-level to country-level	CbCR; CEPII; United Nations Comtrade; World Bank	The 95 per cent confidence interval of total profit shifted was found to be US$901 to US$1 482 billion.

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
Tørsløv et al. (2020)	Profit shifting	F3-F5	Profit-to-wage ratio of foreign vs domestic firms using FATS	Analyse how the location of corporate profits would change if all countries adopted the same effective corporate tax rate	US	2015	Tax havens	Aggregated at country level	National accounts data; FATS; BoP	Affiliates of foreign multinational firms are an order of magnitude more profitable than local firms in low-tax countries. By contrast, affiliates of foreign multinationals are less profitable than local firms in high-tax countries. We estimate that close to 40% of multinational profits are shifted to tax havens globally.
UNCTAD (2015)	Profit shifting	F3-F5	FDI-based analytical toolkit	Focus specifically on the role and the impact of offshore hubs as immediate investors into developing economies.	Developing economies	2012		Aggregated: country level	IMF's BOPS; IMF's CDIS	An estimated $100 billion annual tax revenue loss for developing countries is related to inward investment stocks directly linked to offshore investment hubs.
UNECA (2015)	Trade misinvoicing	F2	PCM	The ECA approach "nets off" the IFF estimates; An econometric model estimating	Africa	2000-2008		Aggregated data: imports and exports at six-digit level of the HS	United Nations Comtrade; International Trade Database	Cumulative IFFs from Africa estimated at $242 billion.

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
				transport costs is used to assess CIF values and mirror flows at FOB prices; ad valorem equivalent of time lags in the export/import process					(BACI) - CEPII	
UNECLAC (2016)	Trade misinvoicing	F2	PCM	Reliability weighting of discrepancies	Countries in UNECLAC region	2004-2013		Aggregated data: imports and exports at six-digit level of the 1996 HS	United Nations Comtrade; International Trade Database (BACI) - CEPII	These flows averaged 1.8% of regional GDP over the 10 years considered, implying a cumulative total of US$ 765 billion in 2004-2013 (two thirds being due to overinvoicing of imports and a third to underinvoicing of exports). Illicit outflows climbed to US$ 101.6 billion in 2013
UNESCWA (2018)	Trade misinvoicing	F2	PCM	Intraregional and extra-regional preferential and non-preferential trade	22 members countries of the League of	2008-2015		Aggregated data: imports and exports at six-digit level	United Nations Comtrade; International Trade Database	$60.3 billion–$77.5 billion per year

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
				misinvoicing; Reliability weighting of discrepancies	Arab States			of the 1996 HS	(BACI) - CEPII	
WCO (2018)	Trade misinvoicing	F2	PCM	Reliability weighting of discrepancies	South Africa	2010-2015		Aggregated data: imports and exports at six-digit level of the HS	United Nations Comtrade	Undervaluation (12 per cent of the value of imports) was slightly larger than the magnitude of overvaluation (9 per cent of imports).
WCO (2018)	Trade misinvoicing	F2	PFM		South Africa	2010-2015		Aggregated data: imports and exports at eight-digit level of the HS	South African Revenue Service	Undervaluation (24 per cent of the value of imports) was larger than the magnitude of overvaluation (6 per cent of imports).
WCO (2018)	Trade misinvoicing	F2	PCM		US	2016		Aggregated data: imports and exports at six-digit level of the HS	United Nations Comtrade	The U.S. import over-invoicing amount from top 10 countries is $234 billion (20.4% of total imports from top 10 countries).
WCO (2018)	Trade misinvoicing	F2	PFM	Statistical price filters for every commodity category	US	2016		Aggregated data: imports and exports at ten-digit level of the HS	U.S. Census Bureau Customs data	The U.S. import over-invoicing amount from top 10 countries is $143 billion (11.8% of total imports from top 10 countries).

Author(s)	IFFs targeted	IFF flows	Method(s) applied	Methodological focus, limitations, or enhancements	Countries covered	Year(s)	Specific activities/ sectors covered	Granularity of data and source data	Data sources	Results
Wier and Reynolds (2018)	Profit shifting	F3-F5	Profit shifting based on MNEs' taxable income	Estimating semi-elasticity of taxable income with respect to parent tax rate, weighting for size of the firm (weighted OLS)	South Africa	2010-2014		Microdata: firm-level tax returns	Tax authority in South Africa	We estimate that firms owned by a parent in a tax haven avoid taxation on as much as 80 per cent of their true income. However, this aggregate tax loss conceals large differences across firms. The majority of firms shift little income to tax havens, while a few large firms shift a lot. The top decile of foreign-owned firms accounts for 98 per cent of the total estimated tax loss.
Zucman (2013)	Flows of undeclared offshore assets	F1	Global Portfolio Assets–Liabilities Gap	Only concerned with wealth, i.e., a stock measure	Global	2008		Various, from aggregated at country level to firm-level	External Wealth of Nations data set; Swiss National Bank; US Treasury liabilities survey	Around 8% of the global financial wealth of households is held in tax havens, three-quarters of which goes unrecorded.

2. Global data sources

Some global data sources (listed alphabetically by custodian in the following table) can be useful for estimating tax and commercial IFFs, while national datasets are a preferred option. Potentially useful national data sources are listed in Part I, Chapter 4.

Table 10. Global data sources

Database	Custodian	Data on	Time and place	Variables/attributes	Link
BIS Statistics	BIS	Debt and derivatives statistics, liquidity indicators and related banking statistics	**Time:** Varies by variable, from daily to monthly, quarterly and annual, from 1978 **Place:** 32 countries	Amounts outstanding, foreign deposits, various instruments, by location of reporting bank, by country, by nationality of reporting bank…	https://www.bis.org/statistics/index.htm?m=6%7C37
BACI	CEPII	BACI provides disaggregated data on bilateral trade flows for more than 5000 products and 200 countries.	**Time:** Annual from 1994 **Place:** 200 countries	Trade flows at 6-digit HS level	http://www.cepii.fr/cepii/en/bdd_modele/presentation.asp?id=37
Comptes Harmonisés sur les Echanges et L'Economie Mondiale (CHELEM) database	CEPII	CHELEM database on the World Economy, provides a complete and coherent representation of international trade flows, balances of payments and world revenues. The CHELEM database is composed of three databases: CHELEM-International Trade, CHELEM-Gross Domestic Product and CHELEM-Balance of payments.	**Time:** Depending on availability, mostly annual from 1960 **Place:** Various countries, 95 covered		http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=17 (more on other databases by CEPII at: http://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele.asp)
Tax in Europe Database (TEDB)	European Commission	Covers main taxes in force in EU member states, information regarding all taxable income including special rules.	**Time:** 2007(partial) / 2010 (full)-2016 **Place:** EU member states	Direct taxes, indirect taxes, social security contributions	https://ec.europa.eu/taxation_customs/tedb/splSearchForm.html

Database	Custodian	Data on	Time and place	Variables/attributes	Link
Balance of Payments Statistics (BOPS)	IMF	The balance of payments (BoP) is a statistical statement summarizing transactions between residents and nonresidents in a given period. It consists of the goods and services account, the primary and secondary income accounts, the capital account and the financial account.	**Time:** Annual and quarterly from 1910-2025, coverage varies **Place:** Countries of the world, coverage varies	BoP accounts: current (goods, services, primary and secondary incomes), capital, financial (direct investment, portfolio investments, financial derivatives) accounts	https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52
Coordinated Direct Investment Survey (CDIS)	IMF	Worldwide statistical data collection by IMF presenting detailed data on inward and outward direct investment position	**Time:** 2009-2019 **Place:** Countries of the world	Direct investment into the reporting economy, cross-classified by economy of immediate investor, direct investment abroad by the reporting economy cross-classified by economy of immediate investor	https://data.imf.org/?sk=40313609-F037-48C1-84B1-E1F1CE54D6D5
Coordinated Portfolio Investment Survey (CPIS)	IMF	A voluntary database on participating country's portfolio investment securities	**Time:** Annual, end of year, from 2001 **Place:** Participating countries	Assets and liabilities, equity and investment fund shares, long-term debt instruments, short-term debt instruments	https://data.imf.org/?sk=B981B4E3-4E58-467E-9B90-9DE0C3367363
Direction of Trade Statistics (DOTS)	IMF	Value of merchandise exports and imports, disaggregated according to country's primary trading partners.	**Time:** Annually from 1947, Monthly and quarterly from Jan 1960, **Place:** Primarily IMF members, but also other countries	**Trade flows:** Imports (CIF), exports (FOB)	https://data.imf.org/?sk=9D6028D4-F14A-464C-A2F2-59B2CD424B85
International Financial Statistics (IFS)	IMF	IMF's principal statistics database providing a range of international financial statistics	**Time:** Annual and quarterly from 1948 (depending on series) **Place:** Most of IMF member states	Exchange rates, international liquidity, monetary statistics, interest rates, prices, etc.	https://data.imf.org/?sk=4C514D48-B6BA-49ED-8AB9-52B0C1A0179B

Database	Custodian	Data on	Time and place	Variables/attributes	Link
International investment positions (IIP)	IMF	A statement that shows at a point in time the value of: financial assets of residents of an economy that are claims on non-residents or are gold bullion held as reserve assets; and the liabilities of residents of an economy to non-residents	**Time:** Annual and quarterly from 1910-2025, coverage varies **Place:** Countries of the world, coverage varies	Assets and liabilities (direct investment, portfolio investment, other investments), international investment position	https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52
Analytical Database on Individual Multinationals and Affiliates (ADIMA)	OECD	A four-component database offering comprehensive view of each MNE and its subsidiaries	**Time:** Current status (year 2016), Monitor: Monthly from Jan 2019 **Place:** 500 MNEs	**Physical register:** MNEs and their subsidiaries **Digital register:** Websites of MNEs **Indicators:** Global level of MNE: headquarters, affiliates, jurisdictions **Monitor:** Events of, and within MNEs	https://www.oecd.org/sdd/its/statistical-insights-the-adima-database-on-multinational-enterprises.htm
Activity of Multinational Enterprises Database (AMNE)	OECD	The AMNE database presents detailed data on the activities of foreign affiliates in OECD countries (inward and outward activity of multinationals).	**Time:** Mostly from 2008 onwards **Place:** 31 OECD countries	AMNE contains 17 variables broken down by country of origin (inward investment) or location (outward investment) and by industrial sector for a large number of OECD countries.	https://www.oecd.org/sti/ind/amne.htm
Country-By-Country Reporting (CbCR)	OECD	Anonymised and aggregated CbCR statistics represent an important new source of data on the global tax and economic activities of multinational enterprises.	**Time:** 2016 **Place:** Parent (28) and Partner jurisdictions (208)	Number of entities, total revenues, profits, income tax paid, number of employees, etc.	https://stats.oecd.org/Index.aspx?DataSetCode=CBCR_TABLEI
Foreign Direct Investment Statistics	OECD	Statistics on foreign direct investment flows and stocks.	**Time:** Annual 2005 – 2019, quarterly Q1 2013 – Q3 2020 **Place:**	FDI flows, FDI stocks, inward and outward	https://data.oecd.org/fdi/fdi-flows.htm

Database	Custodian	Data on	Time and place	Variables/attributes	Link
			OECD and EU countries		
International Transport and Insurance Costs of Merchandise Trade (ITIC)	OECD	The database details the bilateral, product level international trade and insurance costs	**Time:** Annual data 1995-2016 **Place:** for more than 180 countries and partners, over 1 000 individual products.	**CIF-FOB margin**	https://stats.oecd.org/Index.aspx?DataSetCode=CIF_FOB_ITIC
The Global Revenue Statistics Database	OECD	It provides detailed comparable tax revenue data	**Time:** 1990 onwards **Place:** 100+ countries	**Aggregation:** general level of government and also at the sub-national and social security fund levels	https://stats.oecd.org/Index.aspx?DataSetCode=RS_GBL
Tax Database	OECD	It provides comparative information on a range of tax rates and statistics, corporate tax statistics and effective tax rates	**Time:** 2000-2020 **Place:** OECD countries	A range of tax statistics: personal income tax rates and social security contributions applying to labour income; corporate tax rates and statistics, effective tax rates; tax rates on consumption; and environmental taxes	https://www.oecd.org/tax/tax-policy/tax-database/
Financial Secrecy Index (FSI)	TJN	The Financial Secrecy Index ranks jurisdictions according to their secrecy and the scale of their offshore financial activities. A politically neutral ranking, it is a tool for understanding global financial secrecy, tax havens or secrecy jurisdictions, and illicit financial flows or capital flight.	**Time:** 2020 **Place:** 133 countries	FSI Value, share, secrecy score and global scale weight	https://fsi.taxjustice.net/en/
Foreign direct investment (FDI)	UNCTAD	Providing statistics on foreign direct investment	**Time:** 1970-2019 **Place:** All countries	Inward and outward flows and stock	https://unctadstat.unctad.org/wds/TableViewer/tableVie

Database	Custodian	Data on	Time and place	Variables/attributes	Link
					w.aspx?ReportId=96740
UNCTAD global transport costs database for international trade	UNCTAD	transport costs (in US$, nominal), transport costs per unit (in US$, nominal), transport costs per unit and km (in US$, nominal) and transport costs to FOB (percentage of the FOB value) for international trade transported by sea, air, railway and road. The database is based on bilateral trade data as reported by countries in Comtrade Plus and as edited and imputed by UNCTAD, World Bank and partners	**Time:** 2016 **Place:** All countries	Transport costs, Transport costs to FOB value, CIF, FOB, mode of transport	https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx (Transport costs)
Global Groups Register (GGR)	UNSD	The GGR is a publicly available register of the world's largest MNEs. GGR is built from publicly available sources.	**Time:** 2020 **Place:** largest 100+ MNEs	Names of MNEs, entity type, country, industry sector, ownership, other information on MNE	https://unstats.un.org/unsd/business-stat/GGR/
Standard Unit Values (SUV)	UNSD	This indicator is calculated from original datasets to determine global unit values including their acceptable range unit value for each HS sub-heading. These SUVs are also being used in UN Comtrade data processing to detect outliers and to estimate non-match/missing quantity information.	**Time:** Annual 2000-2020 **Place:** Global	Standard unit value, upper and lower limits of unit values by HS sub-heading	https://unstats.un.org/unsd/trade/data/tables.asp#SUV

Database	Custodian	Data on	Time and place	Variables/attributes	Link
United Nations Comtrade	UNSD	Detailed international trade in goods and services statistics, disaggregated by partners, classification and trade flows.	**Time:** Annually from 1962, Monthly from Jan 2000, **Place:** All countries	**Trade flows:** Imports, exports, re-imports, re-exports **Classifications:** HS, SITC, BEC **Products:** Goods, services	https://comtrade.un.org/
UN data	UNSD	Data portal comprising 32 databases with over 60 million records, covering areas of population, education, labour market, prices, energy, crime, finance, etc.	**Time:** Varying annual series **Place:** All countries	Various covering specific statistics.	https://data.un.org/
Penn World Table version 10.0 (PWT 10.0)	University of Groningen	PWT version 10.0 is a database with information on relative levels of income, output, input and productivity	**Time:** 1950-2019 **Place:** 183 countries	Real GDP, expenditure-side real GDP, exports, imports, etc.	https://www.rug.nl/ggdc/productivity/pwt/
Government Revenue Dataset (GRD)	UNU-WIDER	The GRD aims to present a complete picture of government revenue and tax trends over time and allows for analysis at the country, regional or cross-country level.	**Time:** 1980-2014 **Place:** Countries of the world	Total government revenues, total tax revenues, various taxes	https://www.wider.unu.edu/project/government-revenue-dataset

There are, of course, other databases important to related research. National sources in some cases have been used extensively in research of international offshore wealth, such as Swiss National Bank's database or US Treasury International Capital System. Contextually related sources, although not considered official statistics sources, yet carrying significant information for in-depth analysis, and require their mentioning here, are the International Consortium of Investigate Journalists' Swiss Leaks, Panama, and Paradise Papers on offshore leaks. Other sources, with global coverage, are considered proprietary research databases often with restricted (i.e., paid) access, e.g., External Wealth of Nations Mark II database, Orbis database by Bureau van Dijk, Panjiva Supply Chain Intelligence, Bloomberg, Thomson Reuters, Taxes Explorer by IBFD, KPMG, EY and many others.

3. Tools for national statistical authorities

A. Self-assessment questionnaire to prepare for the measurement of IFFs

This self-assessment questionnaire serves to gather nationally relevant information on IFFs to comprehensively conduct IFF risk assessment and mapping of the national system of agencies. At the end of the questionnaire, please provide contact information of the person providing information in the questionnaire, as well as indicate which sections of the questionnaire they provided information on. Thank you.

I. National framework and agencies

i. Does your country have statistical legislation?

☐ Yes ☐ No

If yes, does that legislation allow access to secondary[50]/administrative[51] data for statistical purposes?

Click or tap here to enter text.

If yes, are there any restrictions?

Click or tap here to enter text.

ii. In practice does the National Statistical Office (NSO) have access to data held by other government departments/agencies/central bank?

☐ Yes ☐ No

If not, what are the barriers?

Click or tap here to enter text.

iii. Is there a National Statistical System (NSS) in place?

☐ Yes ☐ No

If yes, who is the head? Which institutions are involved?

Click or tap here to enter text.

Are there other formal/informal coordination or liaison mechanisms in place between NSO and other government institutions?

Click or tap here to enter text.

[50] Primary data are those collected for statistical purposes and secondary data refer to all other data.
[51] Administrative data can be defined as data collected by sources external to statistical offices. In the traditional sense, these comprise only data collected by public sector organizations for other than statistical purposes.

iv. Which national institutions cover the prominent illicit financial flows (IFFs)[52] types, in terms of regulatory or policy work (work, environment, consumers, etc.), monitoring of operations, financial support?

Click or tap here to enter text.

v. Which national institutions collect (or would be assumed to collect) the data relevant for IFFs as part of their administrative or statistical work?

Click or tap here to enter text.

vi. Which national institutions produce impact assessments of policy proposals or other analytical studies of IFFs, e.g., macroeconomic research units, unions etc.?

Click or tap here to enter text.

vii. Which stakeholders and institutions are affected by IFFs directly or indirectly?

Click or tap here to enter text.

viii. Do you have contacts with other agencies who have data and expertise on different IFFs?

☐ Yes ☐ No

Please describe current forms of collaboration, e.g., with the National Statistical Office, Customs and Revenue office, Ministry of Finance, Central Bank, Financial Intelligence Unit, Tax authorities and other relevant agencies, also in other areas than IFFs.

Click or tap here to enter text.

[52] Illicit financial flows describe the value illicitly generated, transferred or utilized that is moved from one country to another. Illicit financial flows can be generated by tax and commercial activities; illegal markets; theft and terrorism financing; and corruption.

II. National practice and priorities

i. Based on information available to you, which IFFs are most relevant for your country?
Please mention the most relevant areas only.

☐ IFFs from aggressive tax avoidance

☐ IFFs from illegal commercial and tax practices

☐ IFFs from illegal markets

☐ IFFs from corruption

☐ IFFs from exploitation-type activities and financing terrorism

Or more specifically, for example:

☐ IFFs from tax evasion by individuals

☐ IFFs from trade misinvoicing

☐ IFFs from multinational profit shifting

☐ IFFs from smuggling of migrants

☐ IFFs from drugs markets

☐ IFFs from corruption

☐ Industry-specific IFFs: IFFs from extractive industries

☐ Other, please describe: Click or tap here to enter text.

ii. Is there a demand for better information on IFFs in your country (e.g., from Non-Governmental Organisations, Civil-Society Organisations, communities, Academia, among others)?

☐ Yes ☐ No

Please describe the situation.

Click or tap here to enter text.

iii. Does your office or other national authorities have data that could be useful for measuring IFFs?

☐ Yes ☐ No

Please describe potentially useful data.
These could include, for instance data on taxes paid by multinationals and individuals; trade transactions; commodity prices; business turnover, profits and number of employees; goods produced; minerals extracted; crimes committed, etc.

Click or tap here to enter text.

iv. Does your country already have national estimates of IFFs or components of such flows?

☐ Yes ☐ No

Please mention also if related estimates have been compiled, such as estimates of the illegal, non-observed or informal economy. What methodology is used to produce them? What are the data sources? What are the main uses for these estimates?

Click or tap here to enter text.

v. Has your office been involved in the estimation of IFFs, illegal markets, non-observed or informal economy?

☐ Yes ☐ Partially ☐ No

If yes/partially: What were the main issues and challenges faced, and what solutions were found?

Click or tap here to enter text.

If no: What issues and challenges might arise in the attempt to measure IFFs, and what solutions might be possible?

Click or tap here to enter text.

If your country does not currently have estimates of IFFs or would like to improve them or extend them to cover additional components of illicit financial flows,

vi. What are your priorities for national estimates of IFFs?

Click or tap here to enter text.

vii. Which type(s) of IFFs would you be most interested to measure?

☐ IFFs from aggressive tax avoidance

☐ IFFs from illegal commercial and tax practices

☐ IFFs from illegal markets

☐ IFFs from corruption

☐ IFFs from exploitation-type activities and financing terrorism

Or more specifically, for example:

☐ IFFs from tax evasion by individuals

☐ IFFs from trade misinvoicing

☐ IFFs from multinational profit shifting

☐ IFFs from smuggling of migrants

☐ IFFs from drugs markets

☐ IFFs from corruption

☐ Industry-specific IFFs: IFFs from extractive industries

☐ Other, please describe: Click or tap here to enter text.

viii. Which types of disaggregation would be needed in your country?

- ☐ By policy area (taxation, international trade, crime etc.)
- ☐ By type of events and behaviours that generate IFFs (tax evasion, trade misinvoicing, profit shifting, criminal activities, etc.)
- ☐ By sources generating IFFs (e.g., drug trafficking, criminal economy, trade, etc.)
- ☐ By flow types of IFFs (e.g., trade misinvoicing, transfer mispricing, strategic location of debt, assets, etc.)
- ☐ By resulting assets (e.g., offshore wealth, real estate, other assets, etc.)
- ☐ By actors (e.g., individual or business, types of economic activities involved, etc.)
- ☐ By payment method (e.g., cash, trade flows, crypto currencies)
- ☐ By industries, commodities or service categories (e.g., extractive industries, raw material)
- ☐ Other, please describe: Click or tap here to enter text.

ix. Which methodology you think is the most appropriate for your country?

Trade misinvoicing by entities

- ☐ #1 – Partner Country Method (PCM) + (see UNCTAD, 2021, p. 40)[53]
- ☐ #2 – Price Filter Method (PFM) + (see UNCTAD, 2021, p. 53)

Aggressive tax avoidance or profit shifting by MNEs

- ☐ #3 – Global distribution of MNEs' profits and corporate taxes (see UNCTAD, 2021, p. 63)
- ☐ #4 – MNE vs comparable non-MNE profit shifting (see UNCTAD, 2021, p. 71)

Transfer of wealth to evade taxes by individuals

- ☐ #5 – Flows of undeclared offshore assets indicator (see UNCTAD, 2021, p. 79)
- ☐ #6 – Flows of offshore financial wealth by country (see UNCTAD, 2021, p. 82)

- ☐ Other methods to measure IFFs from crime
- ☐ Other useful methodology, please describe: Click or tap here to enter text.

[53] UNCTAD (2021): Methodological Guidelines to measure Tax and Commercial Illicit Financial Flows – Methods for pilot testing. Geneva, 2021.

III. Availability and quality of specific data

A) Profit shifting and multinational enterprise groups (National Statistical Office, Tax authority)

i. Do you collate data and publish structural business statistics, by economic activity (International Standard Industrial Classification of All Economic Activities (ISIC) or comparable) and products (Central Product Classification (CPC) or comparable)?

These include, for instance, persons employed, turnover, share of salaries in total costs, share of services in total costs, share of royalties in total costs, EBIT-to-turnover ratio, value added-to-turnover ratio, research and development spending.

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

ii. Do you receive or access OECD standard Country-by-Country Reporting data?

☐ Yes ☐ No

How many multinational enterprise group units are covered? Click or tap here to enter text.

Which organisation is in charge? Click or tap here to enter text.

iii. Do you collect data and compile Foreign Affiliate Statistics (FATS)?

☐ Yes ☐ No

Are local subsidiaries of foreign multinational enterprise groups required to provide any data on the multinational group of which they are part?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

iv. Do you maintain a statistical business register?

☐ Yes ☐ No

Does it include information on ownership and enterprise group structures?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

B) Offshore assets (Tax authority, Customs and Revenue, Ministry of Finance)

i. Do you receive directly, or collect from public sources, data on Bank of International Settlements and/or Common-Reporting-Standard-able assets held offshore by your tax residents?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

ii. Do you collate and/or publish data on the offshore assets held by your tax residents or assets held by foreign citizens in your country, aggregated by jurisdiction?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

iii. Do you collate and/or publish data on the international financial flows by your tax residents or flows by foreign citizens in your country, aggregated by jurisdiction?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

iv. Do you collate data and/or compile estimates on the tax gap, aggregated by type of tax (value added tax, income tax, corporate tax)?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

C) Bank assets (National Statistics Office, Central Bank, financial regulator)

i. Do you collate and/or publish data and/or share on bank assets - cross-border banking liabilities and their bilateral country level breakdown (as published via the Bank for International Settlements and/or in more detailed form)?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

ii. Do you collate and/or publish and/or share data on the assets held by or through financial institutions domestically, which belong to tax residents of other jurisdictions? (This would include data for OECD Common Reporting Standard reporting to other states and FATCA reporting to the United States of America).

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

D) Trade and investment (National Statistical Office, Central Bank, Ministry of Trade, Finance, Customs and Revenue)

i. Do you collate and/or publish data on trade in goods (as reported in United Nations Comtrade and/or in more detailed form such as transaction-level data)?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

ii. Do you collate and/or publish data on trade in services (as presented in UNCTADStat and/or in more detailed form such as transaction-level data)?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

iii. Do you collate and/or publish data on Balance of Payments, including trade in financial services (as reported in IMF Balance of Payments and/or in more detailed form)?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

iv. Do you collate and/or publish data on direct investment (as presented in UNCTADStat Foreign Direct Investment tables, IMF Coordinated Direct Investment Survey and/or in more detailed form)?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

v. Do you collate and/or publish data on trade in direct and portfolio investment (as in IMF Coordinated Portfolio Investment Survey and/or in more detailed form such as transaction-level data)?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

E) Crime-related IFFs (National Statistics Office, Central Bank, financial regulator, law enforcement, Police, Justice)

i. Do you collate and/or publish data on illegal migration, smuggling of migrants, associated fees and expenses?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

ii. Do you collate and/or publish data on drugs production and trafficking and breakdown by location, mode of transport?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

iii. Do you collate and/or publish data on production and trafficking of firearms and breakdown by location, mode of transport?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

iv. Do you collate and/or publish data on corruption (including bribery, embezzlement, abuse of functions, trading in influence, illicit enrichment and other acts) crossing border?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

v. Do you collate and/or publish data on exploitation-type (including slavery and exploitation, extortion, trafficking in persons and kidnapping) and financing terrorism activities crossing border?

☐ Yes ☐ No

Which organisation is in charge? Click or tap here to enter text.

IV. National capacity and support needed

i. Do you have the infrastructure (technology, systems, material, internet connection, etc.) and staff resources to assign expert(s) to measure IFFs in collaboration with other national agencies?

☐ Yes ☐ No

ii. What kind of support, training and guidance would be needed for your office/country?

☐ Training courses

☐ Methodological materials

☐ Practical guidelines including instructions

☐ Help with data cleaning

☐ Linking and analysis

☐ Other, please describe: Click or tap here to enter text.

iii. What are the main obstacles and challenges for compiling IFFs estimates in your country?

Click or tap here to enter text.

Please provide the contact information for the person, responsible for filling in the questionnaire by section for potential further clarifications. Please add rows, as necessary.

		I	**II**	**III.A**	**III.B**	**III.C**	**III.D**	**III.E**	**IV**
Institution		☐	☐	☐	☐	☐	☐	☐	☐
Person		☐	☐	☐	☐	☐	☐	☐	☐
E-mail		☐	☐	☐	☐	☐	☐	☐	☐
Institution		☐	☐	☐	☐	☐	☐	☐	☐
Person		☐	☐	☐	☐	☐	☐	☐	☐
E-mail		☐	☐	☐	☐	☐	☐	☐	☐

B. Tool for mapping of national agencies and their roles

The below table has been designed to help identify and map out various national agencies relevant for the compilation of IFF statistics, including their roles in the process. For ease of use, we provide an example table, listing various agencies under different stakeholder groups as identified in Part III, Chapter 2, and how they contribute to the measurement of IFFs and what their corresponding roles are.

Example of mapping of national agencies and their roles

	STATISTICS					ECONOMY & TRADE					PRIVATE SECTOR					GOVERNMENT & POLICY					LAW ENFORCEMENT					CIVIL SOCIETY				
	S1	*NSO*				**E1**	*Chamber of commerce*				**P1**	*Bank A*				**G1**	*FIU*				**L1**	*Police*				**C1**	*NGO A*			
	S2	*Central Bank*				**E2**					**P2**	*Bank B*				**G2**	*Ministry of Planning*				**L2**	*Customs control*				**C2**				
	S3	*Customs statistics*				**E3**					**P3**	*IM-EX forwarder*				**G3**					**L3**					**C3**				
	S4					**E4**					**P4**	*EXPORT Gold Ltd*				**G4**					**L4**					**C4**				
	S5					**E5**					**P5**	*IMPORT Tech Ltd*				**G5**					**L5**					**C5**				
Contributing	**S1**	**S2**	**S3**	**S4**	**S5**	**E1**	**E2**	**E3**	**E4**	**E5**	**P1**	**P2**	**P3**	**P4**	**P5**	**G1**	**G2**	**G3**	**G4**	**G5**	**L1**	**L2**	**L3**	**L4**	**L5**	**C1**	**C2**	**C3**	**C4**	**C5**
Data	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Expertise	☒	☒	☒	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☐	☐	☐	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐
Roles	**S1**	**S2**	**S3**	**S4**	**S5**	**E1**	**E2**	**E3**	**E4**	**E5**	**P1**	**P2**	**P3**	**P4**	**P5**	**G 1**	**G2**	**G 3**	**G4**	**G5**	**L1**	**L2**	**L3**	**L4**	**L5**	**C1**	**C2**	**C3**	**C4**	**C5**
Lead agency	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Supporting agency	☐	☐	☒	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other stakeholder	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☒	☒	☐	☐	☐	☒	☐	☐	☐	☐
Compiling agency	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Data-providing agency	☐	☒	☒	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Tool for mapping of national agencies and their roles

	STATISTICS					ECONOMY & TRADE					PRIVATE SECTOR					GOVERNMENT & POLICY					LAW ENFORCEMENT					CIVIL SOCIETY				
	S1					**E1**					**P1**					**G1**					**L1**					**C1**				
	S2					**E2**					**P2**					**G2**					**L2**					**C2**				
	S3					**E3**					**P3**					**G3**					**L3**					**C3**				
	S4					**E4**					**P4**					**G4**					**L4**					**C4**				
	S5					**E5**					**P5**					**G5**					**L5**					**C5**				
Contributing	**S1**	**S2**	**S3**	**S4**	**S5**	**E1**	**E2**	**E3**	**E4**	**E5**	**P1**	**P2**	**P3**	**P4**	**P5**	**G1**	**G2**	**G3**	**G4**	**G5**	**L1**	**L2**	**L3**	**L4**	**L5**	**C1**	**C2**	**C3**	**C4**	**C5**
Data	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Expertise	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Roles	**S1**	**S2**	**S3**	**S4**	**S5**	**E1**	**E2**	**E3**	**E4**	**E5**	**P1**	**P2**	**P3**	**P4**	**P5**	**G1**	**G2**	**G3**	**G4**	**G5**	**L1**	**L2**	**L3**	**L4**	**L5**	**C1**	**C2**	**C3**	**C4**	**C5**
Lead agency	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Supporting agency	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other stakeholder	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Compiling agency	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Data-providing agency	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Lead agency has the statistical expertise and data or access to them, but it is not necessarily the agency that carries out the calculations.
Supporting agency provides administrative data, methodological, infrastructural (field, IT), legal, administrative, substantive, or other support.
Other stakeholders are agencies, whose input and feedback can be essential or who have substantive knowledge and insights into specific IFFs.

For more definitions and explanations on various roles of relevant national agencies, refer to UNCTAD (2021), Part III, Chapter 2.

C. Data availability and quality review by method

The below tables have been designed to help evaluate data availability and quality. For ease of use, we provide one table for each method. This is an indicative list of variables and the final selection will depend on the national data environment. Four variables are listed in the following walk-through example: imports; exports; taxable profits of MNE units in a country; and offshore portfolio wealth of citizens of a country. The following elements are evaluated:

- **Variable/data needed**: listing the variable required for a particular method to measure IFFs.
- **Data source/agency**: listing which agency has the data and is considered a data source for this variable.
- **Frequency**: frequency of the reported variable.
- **Timeliness**: time lag of when data become available after the event.
- **Access**: how easily the data are accessible by an agency (group of agencies) compiling IFF statistics, including also legal setup.
- **Coverage**: what units and phenomena are measured by the variable selected, indicating whether there are potential gaps or overlaps in measurement.
- **Granularity**: what level of granularity for a variable is available.
- **Interoperability/format (linking)**: how is the variable integrated with other data, e.g., at which level and through which variable.
- **Alternative/proxy**: if variable is not available, what is the alternative variable and its source.
- **Fit for purpose**: is the variable in line with measurement requirements of IFFs?
- **Availability**: indicating whether variable/data with required quality are available or not.

Example of a data availability and quality review

Variable/ data needed	Data source/ agency	Frequency	Timeliness	Access	Coverage	Granularity	Interoperability/ format (linking)	Alternative/proxy		Fit for purpose	Availability
								Variable	Source		
Value of imports	*Customs office*	*Monthly*	*2 months*	*Access within NSS*	*No gaps*	*6-digit HS*	*Time and product-level*	*Value of imports*	*United Nations Comtrade*	*Yes*	*Yes*
Value of partner's exports	*Partner's Customs office*	*Monthly*	*2 months*	*Bilateral agreement*	*No gaps*	*6-digit HS*	*Time and product-level*	*Value of exports*	*United Nations Comtrade*	*Yes*	*Yes*
Value of taxable profit of MNE's unit	*Tax authority*	*Annual*	*6 months*	*Special agreement*	*Units above threshold*	*Firm-level*	*Firm's ID*	*Accounting profits*	*Tax authority*	*Yes*	*Yes*
Offshore assets of citizens	*BIS*	*Annual*	*12 months*	*Publicly available*	*Overlaps, including other units*	*Country-level*	*Country-level*			*Partially*	*Yes*

Method #1 - Data availability and quality review: Partner Country Method (PCM) +

Variable/ data needed	Data source/ agency	Frequency	Timeliness	Access	Coverage	Granularity	Interoperability/ format (linking)	Alternative/proxy Variable	Source	Fit for purpose	Availability
Value of imports											
Value of exports											
Value of re-imports											
Value of re-exports											
Volume of imports											
Volume of exports											
Volume of re-imports											
Volume of re-exports											
Transport costs to FOB value											
CIF-FOB margins											
CIF price declared by importer											
FOB price declared by exporter											
Trade system											
Mark-up by third country											
…											
…											
…											

Method #2 - Data availability and quality review: Price Filter Method (PFM) +

Variable/ data needed	Data source/ agency	Frequency	Timeliness	Access	Coverage	Granularity	Interoperability/ format (linking)	Alternative/proxy Variable	Source	Fit for purpose	Availability
Export prices											
Import prices											
Volume of imports											
Volume of exports											
Volume of re-imports											
Volume of re-exports											
Transport costs											
CIF price declared by importer											
FOB price declared by exporter											
Free-market prices											
Partner member of the same MNE											
Contractual terms											
…											
…											
…											

Method #3 - Data availability and quality review: Global distribution of MNEs' profits and corporate taxes

Variable/ data needed	Data source/ agency	Frequency	Timeliness	Access	Coverage	Granularity	Interoperability/ format (linking)	Alternative/proxy Variable	Source	Fit for purpose	Availability
Profits before taxes of MNE units											
Effective tax rate of countries											
Value of taxes paid by MNEs											
Number of employees of MNE units											
Value of tangible assets of MNE units											
GDP per capita in PPP of countries											
Population of countries											
Corruption Perception Index of countries											
…											
…											
…											

Method #4 - Data availability and quality review: MNE vs comparable non-MNE profit shifting

Variable/ data needed	Data source/ agency	Frequency	Timeliness	Access	Coverage	Granularity	Interoperability/ format (linking)	Alternative/proxy Variable	Source	Fit for purpose	Availability
Per capita turnover											
Persons employed											
Share of goods and services on total costs											
Export-to-turnover ratio											
Import-to-cost ratio											
Share of salaries on total costs											
Share of services on turnover											
Share of services on total costs											
EBIT-to-turnover ratio											
Value added-to-turnover ratio											
R&D spending											
Share of royalties on total costs											
Average taxation on productive income in foreign countries											

Method #5 - Data availability and quality review: Flows of undeclared offshore assets indicator

Variable/ data needed	Data source/ agency	Frequency	Timeliness	Access	Coverage	Granularity	Interoperability/ format (linking)	Alternative/proxy Variable	Source	Fit for purpose	Availability
Domestically reported offshore assets of citizens											
Cross-border positions											
Offshore assets of citizens reported by partner jurisdictions											
MSCI world price index											
Financial flows of citizens											
…											
…											
…											

Method #6 - Data availability and quality review: Flows of offshore financial wealth by country

Variable/ data needed	Data source/ agency	Frequency	Timeliness	Access	Coverage	Granularity	Interoperability/ format (linking)	Alternative/proxy Variable	Source	Fit for purpose	Availability
International portfolio liability positions											
International portfolio asset positions											
Cross-border deposits											
FDI-to-GDP											
MSCI world price index											
Financial flows of citizens											
Division of offshore wealth into deposits and portfolio investments											
Non-compliance rate											
…											
…											
…											

D. Criteria for assigning points in the quality assessment framework

Category	No.	Subcategory	Subcategory explained	1 point	2 points	3 points
Soundness of methods	1	Relevance of scope	Content validity – What is measured? Which IFFs does it cover?	Single IFFs activity is covered, not clearly delineated from others.	Single IFFs activity is covered, clearly delineated from others.	Several IFFs activities are covered, all clearly delineated from each other and the ones potentially left outside the scope.
	2	Clarity of concepts	Construct validity – Does it measure what it is supposed to? Is it clearly defined? Is a classification used? Is it discrete, exhaustive, and mutually exclusive (are there gaps or overlaps)?	Concept defined only partially, significant overlaps and gaps exist.	Clearly defined concept, yet either exhaustiveness or mutual exclusiveness are not guaranteed.	Clearly defined concept, exhaustive and mutually exclusive of other (IFFs) concepts.
	3	Robustness	How stable are the results produced by the method? Will a repetition lead to similar results? What if conditions change?	Methodology is based on several assumptions, requiring constant verification of the method to produce results.	Several assumptions are required for the methodology to work, yet these are stable in space and time.	Only a limited number of stable assumptions are required to produce statistics.
	4	Transferability	How easy it is for someone else to use the method? Availability of empirical research or application of the method	Clear methodology and concept are set, yet poorly documented and without empirical research available.	Clear methodology and concept are well documented, yet without or only little empirical research to test the methodology.	Clear methodology and concept are well documented with abundant empirical testing available in literature.

Category	No.	Subcategory	Subcategory explained	1 point	2 points	3 points
	5	Equivalence	Does the method yield similar results when compared to other (sound) methods?	Both levels and dynamics estimated by this method do not reasonably match with other methods' results.	Results differ from other methods with respect to the level of measured IFFs, whereas overall dynamics is in line with the other estimates.	Results are in line with other methods applied to the same IFFs measurement.
	6	Statistical alignment	Is the method similar to those applied in official statistics? Are the concepts and classifications aligned with official?	Only limited amount of method's concepts is related to the ones used in official statistics.	About half of concepts used in the methodology are aligned with those used in official statistics.	Method's concepts are fully compatible with official statistics' frameworks.
	7	Capacity requirements	How much resources and capacity are required for using the method?	Data are poorly available, or available but without proper methodological support and institutional collaboration required.	Some data are already available, methodologically developed to a certain degree.	Data, methodology and required collaboration are already in place in existing national statistical system.
Source data	8	Timeliness	What is the delay of data becoming available after reference period?	Data are available with a time lag of more than one year.	Data are available with a time lag of a quarter to a year.	Data are available immediately or with a time lag of less than a quarter of a year.

Category	No.	Subcategory	Subcategory explained	1 point	2 points	3 points
	9	Availability	How easily available are these data to statistical authorities? Are these available in many/most countries?	Data are readily available only in a few countries (issues with sensitivity, privacy, confidentiality, unwillingness to cooperate).	Data are readily available in some countries, but not in others, e.g., developing countries.	Data are readily available with little to no barriers to access.
	10	Fit for purpose	Do these data provide information on IFFs, directly or indirectly? Which IFFs do they address?	Data are provided indirectly for only some IFFs activities.	Data are provided only indirectly for most of IFFs activities.	Data on IFFs are provided directly, covering all IFFs activities.
	11	Coverage	Do the data cover the issues to be measured? Which IFFs are covered? What are the gaps and overlaps?	Data provide only limited IFFs coverage in terms of activities, breakdown, or actors.	Data cover most of the IFFs and provide required breakdown, yet gaps and overlaps exist.	Complete and exhaustive coverage of the IFFs activities and actors (individuals and entities).
	12	Granularity	How detailed are the data? Frequency.	Data are aggregated at country-level and annually.	Data are aggregated at middle-level, e.g., product-level, available on a monthly or less frequent periodicity.	Data are transaction-level microdata.

Category	No.	Subcategory	Subcategory explained	1 point	2 points	3 points
	13	Interoperability	Can the data be integrated with other data? Does the dataset include identifiers and classifiers?	Only limited integration of data with other data sources is readily available; significant resources would be needed for a full integration.	Data are partly integrated with other data sources, or some resources are needed to bring integration at practical level.	Data are fully integrated with other sources within national statistical system, using a full scale of identifiers.
Results	14	Relevance for use	Are the results helpful for assessing IFFs or curbing different types of IFFs? How many uses are there for these results?	Results have limited relevance for policy formulation, addressing only one IFFs activity, with present overlaps or gaps, applicable only to a small circle of countries.	Results consider clearly defined IFFs activities, confounding effects may be present; applicability is limited to several (groups of) countries, but not universally.	Results are directly applicable for policies, directed at specific and clearly delineated IFFs activities; relevance for countries is almost universal.
	15	Accuracy	Do the results describe what is intended? Are there large revisions?	Limited comprehensiveness of concepts and methodology, assumptions sensitive to changes.	Limitations in comprehensiveness of defined concepts are adjusted by several assumptions.	Clearly defined concepts, advanced statistical techniques used, limited reliance on assumption all produce results accurately representing the measured reality.

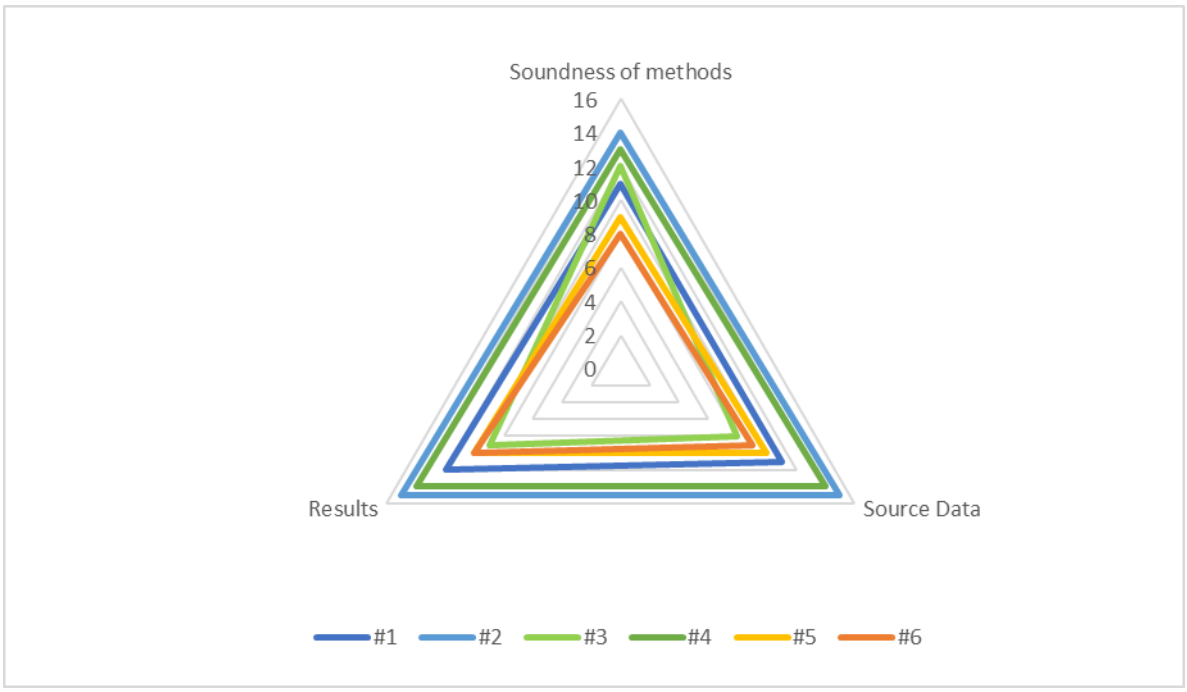
Category	No.	Subcategory	Subcategory explained	1 point	2 points	3 points
	16	Timeliness	How quickly will the results be available? Are they available on time to help solve problems?	Adjustments to data and/or methodology are significant enough to impair simple replication in majority of countries.	Some data are harder to obtain, or some methodological adjustments are needed for each replication of the calculations.	Given the data, replication of the method is quick and straightforward in all, or most countries.
	17	Clarity	How easy are the results to use and interpret?	Significant additional effort is required by statistics compilers in most countries for users to properly use the results.	Results are mostly simple to interpret and connect to practical concerns of IFFs, but mostly only in certain groups of countries (e.g., developed).	Results are straightforward to interpret with respect to IFFs typologies (activities, breakdown) for most part and in most countries.
	18	Comparability	How comparable are the results in different conditions, across time and countries?	Significant limitations in comparability of results between various countries exist.	Limitations in methodology and/or data requires caution in direct comparison of results across time and countries of different groups (e.g., developed vs developing).	Data and methodology are comprehensive enough to allow for straightforward comparability of results across time and countries and variations in conditions.

Category	No.	Subcategory	Subcategory explained	1 point	2 points	3 points
	19	Coherence	How coherent are the results internally? Can they be used together with other IFF estimates?	Using IFF estimates in combination with other estimates (categories or activities) is limited to only a narrow set of countries.	Broad distinction and consistency between activities and categories of IFFs allows for safe comparison of results in most countries.	Results refer to clearly delineated IFFs activities and are directly used with other IFFs categories in most countries.

Scores of the evaluation for the suggested methods

* The assessment for source data and results is indicative only as it will depend on national data. Similarly, the assessment of soundness of methods may vary depending on the context of implementation.

		Methods	#1	#2	#3	#4	#5	#6
Criteria		(points)	PCM+	PFM+	Global distribution of MNEs' profits and corporate taxes	MNE vs comparable non-MNE profit shifting	Flows of undeclared offshore assets indicator	Flows of offshore financial wealth by country
Category	No.	Subcategory						
Soundness of methods	1	Relevance of scope	1	1	1	1	1	1
	2	Clarity of concepts	1	2	1	1	1	1
	3	Robustness	1	2	2	2	2	1
	4	Transferability	2	3	2	2	1	1
	5	Equivalence	2	2	2	2	2	2
	6	Statistical alignment	2	2	2	2	1	1
	7	Capacity requirements	2	2	2	3	1	1
Source Data	8	Timeliness	2	3	1	2	2	2
	9	Availability	2	3	1	2	2	1
	10	Fit for purpose	2	2	2	2	2	2
	11	Coverage	1	1	1	2	1	1
	12	Granularity	2	3	1	3	1	1
	13	Interoperability	2	3	2	3	2	2
Results	14	Relevance for use	2	2	1	2	1	1
	15	Accuracy	2	3	1	2	2	2
	16	Timeliness	2	2	2	2	2	2
	17	Clarity	2	3	1	3	2	2
	18	Comparability	2	3	2	3	2	2
	19	Coherence	2	2	2	2	1	1
			#1	#2	#3	#4	#5	#6
		Soundness of methods	11	14	12	13	9	8
		Source Data	11	15	8	14	10	9
		Results	12	15	9	14	10	10
		Total	**34**	**44**	**29**	**41**	**29**	**27**


Soundness of methods
16
14
12
10
8
6
4
2
0
Results
Source Data
#1
#2
#3
#4
#5
#6

E. Method fact sheets

Method fact sheet	**METHODOLOGICAL GUIDELINES TO MEASURE TAX AND COMMERCIAL ILLICIT FINANCIAL FLOWS** **Methods for pilot testing**		
Method title	#1 Partner Country Method (PCM) +		
Alternative title(s)	Trade asymmetries, mirror-data analysis		
Method group	Trade misinvoicing		
Targeted IFFs flow type	F2 Trade misinvoicing by entities	**Tier classification**	Tier 2

Concept

The concept of PCM is based on the trade gap, defined as discrepancy in the values of a trade transaction in goods (import, export), independently reported by both trading partners.

Assumptions

1. Partner's trade statistics are sufficiently accurate and comparable to treat remaining differences (after adjustments) in mirror statistics as misinvoicing.
2. Depending on product detail, assumptions relate to product homogeneity under a particular HS code.

Strengths	**Limitations**
1. Accessible data. 2. Clear concept. 3. Abundant literature and cases.	1. Top-down approach. 2. Mixing other reasons of trade discrepancy with IFFs, including a known methodological cause, notably partner attribution.
Data sources	**Mitigation of limitations**
1. Bilateral trade statistics (national sources, including that of partner countries, or United Nations Comtrade, IMF DOTS). 2. UNCTAD Global Transport Costs database, OECD's ITIC or similar to address CIF-FOB discrepancies.	1. Use as granular level data as possible, lowest category within product classification (i.e., HS sub-heading for international comparability). Additionally, use individual partners for at least the majority of trade (e.g., to cover more than 75% of the trade). 2. Thoroughly inspect discrepancies at lowest-category commodity using various inputs, including experts' knowledge.

Calculation

1. Observe discrepancy at lowest-level aggregation of products.
2. Calculate and apply CIF/FOB ratio by commodity, if applicable.
3. Inspect remaining discrepancy and check what underlying factors drive them.
4. Apply reliability weighting.
5. Treat remaining discrepancy at lowest-level aggregation of products as misinvoicing, hence tax and commercial IFFs' inflows and outflows.
6. Aggregate #5.

Results

Results are presented for a total economy on an annual level: inward IFFs and outward IFFs.

Special note(s)
Close collaboration with statistical units at Customs authorities.
Case studies
1. CIF by commodity (Schuster and Davis, 2020). 2. Country of consignment in mobile phone trade between Canada and China (UNSD, 2019). 3. Bilateral trade asymmetries joint studies (European Commission, 2009; Statistics Canada, 2019). 4. Weighting discrepancies (UNECLAC, 2016). 5. PCM for South Africa imports (WCO, 2018). 6. Trade misinvoicing in the Arab region (UNESCWA, 2016). 7. Trade misinvoicing in Asia and the Pacific (Kravchenko, 2018). 8. Mirror trade gap in Africa (Schuster and Davis, 2020).

Method fact sheet	METHODOLOGICAL GUIDELINES TO MEASURE TAX AND COMMERCIAL ILLICIT FINANCIAL FLOWS Methods for pilot testing		
Method title	#2 Price Filter Method (PFM) +		
Alternative title(s)	Abnormal prices		
Method group	Trade misinvoicing		
Targeted IFFs flow type	F2 Trade misinvoicing by entities	**Tier classification**	Tier 1

Concept

Trade mispricing occurs when the unit price of a given transaction differs from the normal prices (arms-length transaction) assumed by a price filter, i.e., when an abnormal price of a particular transaction is identified.

Assumptions

1. Prices outside price filter are attributed to mispricing.

Strengths	**Limitations**
1. Transaction-level microdata. 2. Does not rely on the partner's transaction data. 3. Abundant literature and cases.	1. Statistical price filters will always find transactions with abnormal prices (endogeneity). 2. Heterogeneity of products even at transaction-level. 3. Inability to identify legitimate unusual prices, e.g. lower prices offered by long-term contracts. 4. Refers only to mispricing (as a subset of misinvoicing). 5. Overall weakness on recording of quantity information.
Data sources	**Mitigation of limitations**
1. Transaction-level data from Customs authorities. Important to use data before adjustments to correct for abnormal prices for statistical purposes take place. 2. Free-market commodity prices from international sources (UNCTAD, World Bank). 3. Ranges of standard unit values by HS sub-headings (United Nations Comtrade).	1. Set price filters specific for trade determinants, such as commodity, partner, periods, mode of transport. 2. Use free-market prices for the price filter. 3. Involve and consult experts, including from Customs, on detected outliers (whether or not there is an explanation).

Calculation

1. Exploratory data analysis and preparation of the data (removing outliers).
2. Include experts.
3. Define the price filter(s).
4. Calculate amount of over- and underpricing.
5. Aggregate to obtain inward, outward and total IFFs.

Results

Results are presented for a total economy on an annual level: inward IFFs and outward IFFs.

Special note(s)

Close collaboration with statistical units at Customs authorities.
If a high reliance on triangular operations through offshore intermediary entities located in low-tax jurisdictions is present, the price filter should not be statistically estimated (downward bias).

Case studies

1. The basic treatment of SARS data using three passes (WCO, 2018).
2. Identifying national experts to support PFM application (Ahene-Codjoe et al., 2020).
3. Calculating benchmark prices for gold (Carbonnier and Mehrotra, 2020).
4. PFM for the Soya Bean exports in Brazil (Amaral and Barcarolo, 2020).
5. Trade misinvoicing in copper products: a case study of Chile and Peru (Hanni and Podestá, 2019).

Method fact sheet	METHODOLOGICAL GUIDELINES TO MEASURE TAX AND COMMERCIAL ILLICIT FINANCIAL FLOWS Methods for pilot testing		
Method title	#3 Global distribution of MNEs' profits and corporate taxes		
Alternative title(s)	Semi-elasticity model		
Method group	Aggressive tax avoidance or profit shifting by MNEs		
Targeted IFFs flow type	F3-F5 Profit shifting	**Tier classification**	Tier 3

Concept

The method looks at the distribution of profits of an MNE among its units globally and relates it to the corresponding corporate (effective) tax rates and underlying economic activity of a particular unit. The method assumes that an MNE unit is likely to shift profits out of the country if another unit's tax regime induces a lower tax rate.

Assumptions

1. Any systematic deviation from predicted profitability of the unit is a sign of profit shifting.
2. If domestic tax rates are higher than in partner country, profits are being shifted out of a country.
3. Marginal effect of tax rate change translates to the amount of profits shifted.

Strengths	**Limitations**
1. Straightforward concept. 2. Data availability. 3. Potential for enhancements.	1. Underestimates the amount of profit shifting. 2. Hard to determine tax rate faced by MNE unit. 3. Tax sensitivity may vary across different tax regimes or size of an MNE. 4. Data limitations usually do not account for entire web of MNEs' units.
Data sources	**Mitigation of limitations**
1. OECD's CbCR microdata or, if unavailable, aggregated at country level. 2. If CbCR unavailable, build dataset from other sources, such as OECD's databases (ADIMA, AMNE and Tax Database), GGR, EuroGroups register or similar. 3. Supplementing with UN Data, KPMG, Orbis	1. Use effective average tax rate. 2. Introduce a squared tax variable to account for uneven tax sensitivity across tax jurisdictions. 3. Supplement econometric analysis by interpretation using location, economic activity, and comparison to comparable group. 4. Given data availability and sample size, apply also size-variations in model specification (e.g., quartile regression, weighted regression).

Calculation

1. Determine profit shifting via semi-elasticity of profits on taxes.
2. Measure the amount of profits shifted.
3. Aggregate to obtain inward, outward and total IFFs.

Results

Results are presented for a total economy on an annual level: inward IFFs and outward IFFs.

Special note(s)

Premise of the method is that profits are shifted out of a country, being studies from high-tax jurisdiction; potentially it can be used for low-tax jurisdiction, in both cases the method will most likely only provide either inward or outward IFFs. With sufficient coverage of all, domestic and foreign MNEs' units, simultaneous results of both flows of IFFs are expected to be achieved.

Case studies

1. Estimating profit shifting in South Africa using firm-level tax returns (Reynolds and Wier, 2016; Wier and Reynolds, 2018).
2. Profit shifting in Germany using Country-by-Country Reporting data (Fuest et al., 2021).

Method fact sheet	METHODOLOGICAL GUIDELINES TO MEASURE TAX AND COMMERCIAL ILLICIT FINANCIAL FLOWS Methods for pilot testing		
Method title	#4 MNE vs comparable non-MNE profit shifting		
Alternative title(s)			
Method group	Aggressive tax avoidance or profit shifting by MNEs		
Targeted IFFs flow type	F3-F5 Profit shifting	**Tier classification**	Tier 1

Concept

The method identifies tax-avoiding MNEs applying both between (MNEs to comparable non-MNEs) and within (tax-avoiding to non-tax-avoiding MNEs) comparisons and measures related amount of BEPS.

Assumptions

1. Identified differences between MNE and domestic entities are not driven by other factors (e.g., productivity, economies of scale).
2. Size of the entity and industry in which it operates are sufficient absolute indicators to ensure proper comparison of an MNE to control group.

Strengths	**Limitations**
1. Firm-level microdata. 2. It does not treat all MNEs equally in the sense that not all MNEs are tax-avoiding. 3. Clear concept.	1. Does not distinguish aggressive tax avoidance from the overall profit shifting flows. 2. Problems finding a control group of domestic firms in small economies. 3. A country is defined either as inward or outward IFFs and cannot have both flows identified (nor measured).
Data sources	**Mitigation of limitations**
Firm-level microdata from: 1. Structural business statisics, 2. International trade statistics, 3. Position of national firms within MNEs (national or regional Groups register). 4. FATS. 5. LCUs.	Detailed and additional data (e.g., include size of assets) and interpret results in the context of the particular MNE units' role within MNE, its activity (industry) and overall country's economic environment (including effective tax rates).

Calculation

1. Phase zero of exploring country's inward or outward IFFs nature.
2. Identification phase, between comparison (apply PS).
3. Identification phase, within comparison: obtain composite indicator by factor analysis.
4. Identification phase, within comparison: Logit model using composite indicator to obtain proxy (0,1).
5. Identification phase, within comparison: threshold observation is obtained.
6. Identification phase, within comparison: classify MNEs into tax avoiding and non-tax avoiding.
7. Measurement phase: calculate adjusted value of EBIT-to-turnover ratio for each MNE.
8. Calculate IFF for each MNE.
9. Aggregate to obtain total IFFs in a country (inward or outward - see special note).

Results
Results are presented for a total economy on an annual level: only either inward or outward IFFs.
Special note(s)
Prior analysis is required to start the model for either inward or outward IFFs. A country cannot have both flows identified or measured with this method.
Case studies
1. Indicators of profit shifting by MNEs in Canada (Fortier-Labonté and Schaffter, 2019). 2. Profit shifting in Italy (Sallusti, 2021).

Method fact sheet	**METHODOLOGICAL GUIDELINES TO MEASURE TAX AND COMMERCIAL ILLICIT FINANCIAL FLOWS** **Methods for pilot testing**		
Method title	#5 Flows of undeclared offshore assets indicator		
Alternative title(s)			
Method group	Transfer of wealth to evade taxes by individuals		
Targeted IFFs flow type	F1 Transfer of wealth to evade taxes	**Tier classification**	Tier 3

Concept

The method measures the excess of the value of citizens' assets declared by countries, over the value declared by citizens themselves for tax purposes.

Assumptions

1. Measured discrepancy can be attributed to IFFs alone.
2. Difference between two subsequent stock measures is considered the corresponding flow.

Strengths	**Limitations**
1. Relatively straightforward to calculate the offshore wealth.	1. Macro approach. 2. Overlap with other categories of IFFs. 3. Requires transformation of stock to flow measure. 4. Consumption of wealth is not considered. 5. Certain asset classes (e.g., art, real estate, or cryptocurrencies) are not considered. 6. Data (un)availability. 7. Produces only outward IFFs under certain circumstances.
Data sources	**Mitigation of limitations**
1. Bank of International Settlements (BIS), by location. 2. OECD Common Reporting Standard. 3. National tax authorities.	Detailed and additional data by countries, including data exchange in safe statistical environment.

Calculation

1. Calculate undeclared assets of citizens.
2. Transform to flows.
3. Determine outflows of IFFs.

Results

Results are presented for a total economy on an annual level: only outward IFFs.

Special note(s)

Outflows are obtained only using assumptions and if circumstances are right. Determining inflows of IFFs using this method is not readily available.

Case studies

1. Italian cross-border bank transfers (Cassetta et al., 2014).

Method fact sheet	METHODOLOGICAL GUIDELINES TO MEASURE TAX AND COMMERCIAL ILLICIT FINANCIAL FLOWS Methods for pilot testing		
Method title	#6 Flows of offshore financial wealth by country		
Alternative title(s)			
Method group	Transfer of wealth to evade taxes by individuals		
Targeted IFFs flow type	F1 Transfer of wealth to evade taxes	**Tier classification**	Tier 3

Concept

The method starts from global level imbalance between international portfolio liabilities and assets, assigning it to the wealth held by individuals outside their countries and unreported to the tax authorities where they are a resident. Non-compliance rate on offshore wealth is applied, followed by transformation of stock measure to flow to identify the level of illicit flows.

Assumptions

1. Offshore financial wealth comprised of portfolio assets and deposits only (real estate assets, artwork, life insurance, cash money, cryptocurrencies excluded).
2. Divide offshore wealth into deposits and portfolio investments with a 25% - 75% ratio.
3. Ownership shares of cross-border deposits held by individuals in IFCs as proxies.
4. A country with a large outgoing FDI stock (relative to GDP) is assumed to have a large proportion of outgoing corporate deposits.
5. Non-compliance rate is 75%.
6. The difference between the value of offshore wealth in the current year and in the previous year (corrected for assets valuation) is a measure of IFFs outflows.

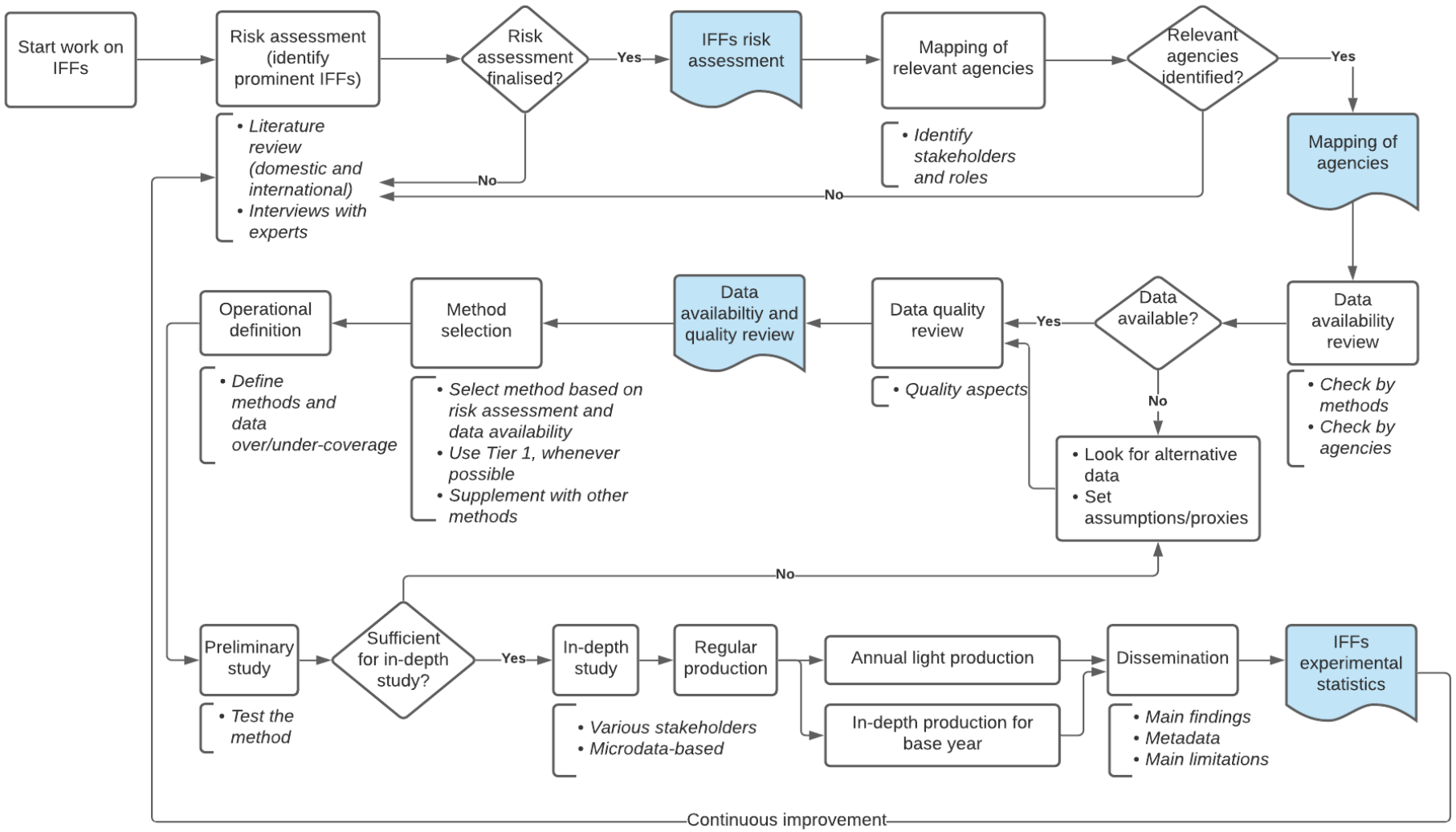
Strengths	**Limitations**
1. Concept starting from global level imbalance between international portfolio liabilities and assets.	1. Macro approach. 2. Associating deposits with their origin: various screening arrangements, e.g., shell companies, prevent direct estimation of ownership shares of undeclared offshore wealth. 3. Cannot distinguish cross-border deposits from individuals and those from corporations. 4. Relying on various assumptions. 5. Produces only outward IFFs under certain circumstances.
Data sources	**Mitigation of limitations**
1. IMF's CPIS. 2. IMF's IIP. 3. EWN database. 4. BIS. 5. Central bank of Switzerland.	Detailed and additional data by countries, including data exchange in safe statistical environment.

Calculation

1. Estimate the global offshore financial wealth, as the sum of global offshore portfolio wealth and offshore deposits.
2. Global offshore financial wealth is broken down by country of ownership and by IFC.

3. Apply non-compliance rate of 75 per cent to offshore wealth held by individuals to obtain undeclared offshore wealth. 4. Estimate flows from stock measures. 5. Estimate outflows of IFFs.
Results
Results are presented for a total economy on an annual level: only outward IFFs.
Special note(s)
Outflows are obtained only using assumptions and if circumstances are right. Determining inflows of IFFs using this method is not readily available.
Case studies
1. Identifying hidden assets in the Balance of Payments by Bank of France (Gervais and Quang, 2018). 2. International tax evasion on original income (European Commission, 2019).

F. Workflow to compile illicit financial flows statistics



G. Step-by-step check list for starting to estimate IFFs

Step	Activity	Reference in guidelines	Check
IFF risk assessment	Review official statistics on illegal economy, informal economy, non-observed economy.	Part III, Chapter 1, p. 79	☑
	Review research, studies, literature on IFFs.	Part III, Chapter 1, p. 79	☑
	Interviews with experts.	Part III, Chapter 1, p. 79	☑
	Preliminary analysis (early assessment) of IFFs.	Part III, Chapter 1, p. 80	☑
	Develop priorities for statistical work.	Part III, Chapter 1, p. 80	☑
Mapping of national agencies	Identify relevant national agencies through a set of questions.	Part III, Chapter 2, p. 82-83	☑
	Determine roles of agencies: lead, supporting, other.	Part III, Chapter 2, p. 84; Part IV, Chapter 3, Section B, p. 129	☑
	Determine agencies' involvement in the statistical process: compiling or data-providing agency.	Part III, Chapter 2, p. 84; Part IV, Chapter 3, Section B, p. 129	☑
Data availability	Consider practical questions, such as who has the data, what data etc.	Part III, Chapter 3, p. 85	☑
	Assess national statistical context for measuring IFFs.	Part IV, Chapter 3, Section A, p. 119	☑
	Process data availability and quality review of data sources by method.	Part IV, Chapter 3, Section C, p. 133-139	☑
Method selection	Select method(s) to measure IFFs using evaluation framework, tier-classification of methods and method fact sheets, basing decision also on data availability.	Part III, Chapter 4, p. 88-90;	☑
	If possible, triangulate methods, use more than one method.	Part IV, Chapter 3, Sections D and E, p. 140-158	☑
Operational definition	Based on IFFs risk assessments, available data and feasible methods, and consultation with experts and stakeholders, the statistical authority defines what is feasible to measure - operational definition.	Part III, Chapter 5, p. 91	☑
Compile and disseminate IFF statistics	Test the measurement of IFFs covering only some aspects or sectors, produce preliminary and early estimates of IFF statistics.	Part III, Chapter 6, p. 92	☑
	Conduct in-depth and thorough analysis of IFFs, when possible.	Part III, Chapter 6, p. 92	☑
	Compile estimates disaggregated by relevant types of IFFs (minimum and additional disaggregation levels).	Part III, Chapter 6, p. 92	☑
	Publish IFF estimates clearly and transparently.	Part III, Chapter 6, p. 93	☑

4. Glossary of terms

A

Aggressive tax avoidance — See Aggressive tax planning.

Aggressive tax planning — Taking advantage of the technicalities of a tax system or of mismatches between two or more tax systems for the purpose of reducing tax liability (European Commission, 2017, p. 23).

Arm's length principle — The arm's length principle is a valuation principle commonly applied to commercial and financial transactions between related companies. According to it transactions should be valued as if they had been carried out between unrelated parties, each acting in their own best interest. (OECD, 2006, p. 176)

B

Base Erosion and Profit Shifting (BEPS) — Base Erosion and Profit Shifting **(**BEPS) refers to tax planning activities of some multinational enterprise groups (MNEs) taking advantage of the mismatches and gaps in the international tax rules, separating taxable profits from the underlying value-creating activity (OECD, 2015, p. 15).

Bottom-up method — Attempt to measure IFFs by analysing the functioning of relevant illicit activities, identifying the set of flows that can be identified as IFFs and producing estimates for each. Overall estimates are obtained by aggregating from a lower to a higher level; for example, by IFF type or source (UNCTAD and UNODC, 2020, p. 19).

C

Conduit entity — See 'Roles of units within MNE'.

Corporate inversion — Corporates can avoid repatriation taxes by changing the residence of the corporation or by inverting roles in the corporate group. Corporate inversions can take the form of a merger with a foreign entity, which then results in the former domestic parent becoming a subsidiary of the new foreign parent (even though the shareholders of the original domestic company may retain more than 50 per cent of the shares in the new corporation) (Beer et al., 2018, p. 10).

Cost-sharing agreement — A cost-sharing agreement is a contract between related parties specifying how they will share the costs of developing intangible assets, and how they will arrange the rights to exploit the intangible assets once developed (Dyreng and Markle, 2015, p. 8).

Country-by-Country reporting (CbCR) Country-by-Country reporting (CbCR) includes reports by multinational enterprises with aggregate data on the global allocation of income, profit, taxes paid and economic activity among tax jurisdictions in which it operates (United Nations, 2021, p. 51). CbCR is required under Action 13 of the Inclusive Framework on Base Erosion and Profit Shifting, coordinated by the OECD.

Country of consignment A country of consignment is the country from which goods were dispatched to the importing country (or to which goods were dispatched from the exporting country), without any commercial transactions or other operations (UNSD, 2013, p. 94).

Country of destination The country in which the merchandise is to be consumed, further processed or manufactured; the final country of destination as known to the exporter at the time of shipment or the country of ultimate destination as shown on the validated export license (UNSD, 2013, p. 95).

Country of final destination See Country of destination.

Country of ultimate destination See Country of destination.

Country of origin Country from which the goods originate. It is as established in accordance with the country‘s rules of origin (UNSD, 2013, p. 95).

D

Debt shifting Debt shifting is relocation of debt among units of the same MNE through intracompany loans and related interest payments, which can manifest as excessive borrowing in high-tax countries and lending to low-tax countries (based on Beer et al., 2018).

Double taxation Where a company or individual incurs a tax liability in more than one country, the two countries’ claims on the taxing rights can overlap, resulting in double taxation of the same declared income. Some tax avoidance strategies exploit international tax instruments in ways that were not intended, for example by ensuring that the right to tax a transaction is allocated to a country that levies no or low taxation on it (UNECA, 2015, p. 9).

E

Effective tax rate (ETR) The effective tax rate is the rate at which a taxpayer would be taxed if his tax liability were taxed at a constant rate rather

	than progressively. This rate is computed by determining what percentage the taxpayer's tax liability is of his total taxable income (OECD, 2021). The effective tax rate for a corporation is the average rate at which its pre-tax profits are taxed, while the statutory tax rate is the legal percentage established by law.
Economic flows	Economic flows reflect the creation, transformation, exchange, transfer or extinction of economic value; they involve changes in the volume, composition, or value of an institutional unit's assets and liabilities. Economic flows consist of transactions and other flows. (United Nations et al., 2008, para. 3.6)
Exploitation-type activities	Exploitation-type activities are illegal activities that entail a forced and/or involuntary transfer of economic resources between two actors. They fall outside the scope of the SNA, since there is no mutual agreement between parties (UNCTAD and UNODC, 2020, p. 14).

F

Fiscal transparency	"Looking through" an entity and attributing profits and losses directly to the entity's members. The profits of certain forms of enterprises are taxed in the hands of the members rather than at the level of the enterprise. Often occurs in the case of a partnership for example (OECD, 2021).

G

General trade system	The general trade system is in use when the statistical territory coincides with the economic territory (UNSD, 2011, p. 27).
Grey economy	See Shadow Economy.

H

Headquarters	See 'Roles of units within MNE'.
Hybrid instruments and entities	These are instruments or entities that are treated differently in two countries for tax purposes. Examples cover treating an instrument as a debt in one country and as an equity in another, resulting in "an interest deduction in the first country and nontaxable income in the second country (as the income is treated as a tax-exempt dividend)" (OECD, 2015, p. 140).

I

Illegal	In breach of the law (Musselli and Bonanomi, 2020, p. 2).
Inflows of IFFs	See Inward IFFs.

Informal economy

The informal economy comprises (i) the production of goods and market services of households; and (ii) the activities of corporations (illegal; underground) that may not be covered in the regular data collection framework for compiling macroeconomic statistics. This scope of the informal economy considers not only the domestic activities, but also the cross-border transactions of resident units […] (IMF, 2019, p. 30).

Insider dealing

See Insider trading.

Insider trading

Insider trading is defined as possessing inside information and using that information by acquiring or disposing of, for its own account or for the account of a third party, directly or indirectly, financial instruments to which that information relates (UNODC, 2015 p. 80).

Inter-quartile range (IQR)

A range between first quartile (25^{th} percentile) and third quartile (75^{th} percentile).

Interest rate

An interest rate is the cost or price of borrowing, or the gain from lending, normally expressed as an annual percentage amount (Moles and Terry, 1997, p. 203).

Intracompany loans

Intra-company refers to transactions between parts of the same company or the same group (World Bank et al., 1988, p. 170). Cross-country differences in rates of corporate income taxes create opportunities for lending from low-tax countries to affiliates in high-tax countries or by locating external borrowing in high-tax countries through intra-company loans (Beer et al., 2018, p. 9).

Invoicing (under/over)

See Trade misinvoicing.

Illicit

Unethical, even if not technically illegal (Musselli and Bonanomi, 2020, p. 2).

Illicit financial flows (IFFs)

Illicit financial flows are illicit in origin, transfer or use, that reflect an exchange of value and that cross-country borders (UNCTAD and UNODC, 2020, p. 12).

Illicit tax and commercial IFFs

These include illicit practices by legal entities as well as arrangements by individuals with the objective of concealing revenues and reducing tax burden through evading controls and regulations (UNCTAD and UNODC, 2020, p. 14)

Inward IFFs

They occur when illicit goods and services are exported abroad (UNCTAD and UNODC, 2020, p. 20).

J

Jurisdiction

Jurisdiction has the power, right, or authority to interpret and apply tax laws or decisions (OECD, 2021).

L

Large Cases Unit (LCU)

Every country with a significant number of MNEs should consider establishing a specialized unit responsible for MNEs. Such a specialized unit is often called a large cases unit (LCU) as it deals with large and complex cases of MNEs trading across borders and within national boundaries. (…) One of the key roles of an LCU is to facilitate the cultural change needed by bridging any cultural divide within the organization and/or across organizations. (Hussain et al., 2019, p. 46)

Lower tax entity

See 'Roles of units within MNE'.

M

Market manipulation

Is defined as entering into a transaction, placing an order to trade or any other behaviour which gives a false or misleading signal as to the supply of, demand for, or price of, a financial instrument or a related spot commodity contract; or secures the price of one or several financial instruments or a related spot commodity contract at an abnormal or artificial level (UNODC, 2015, p. 80).

Mirror data analysis

See Partner Country Method.

Misinvoicing

See Trade misinvoicing.

Mispricing

See Trade mispricing.

MTIC fraud

MTIC fraud occurs when a fraudulent business (or "missing trader") purchases goods from a supplier located in another EU Member State. The missing trader then sells the goods to a business in its Member State and charges VAT. The purchaser, who may be an innocent party, reclaims the VAT charged by the missing trader. The missing trader then disappears without paying the VAT to the Tax Authorities of the Member State in which the VAT is due (European Commission, 2015, p. 9).

N

Non-observed economy

The groups of activities most likely to be non-observed are those that are underground, illegal, informal sector, or undertaken by households for their own final use. Activities may also be missed because of deficiencies in the basic statistical data collection programme. These groups of activities are referred to (in the NOE Handbook) as the problem areas. Activities not included in the basic data because they are in one or more of these problem areas are collectively said to comprise the non-observed economy (NOE) (OECD, 2002, p. 12).

O

Offshore wealth — Offshore wealth is defined as holdings held by non-residents in a given jurisdiction (European Commission, 2019, p. 8).

Outflows — See Outward IFFs.

Outward IFFs — occur when intermediate inputs are imported against payments from abroad (e.g. drugs imported for further domestic sale) or when final illicit goods and services are imported (UNCTAD and UNODC, 2020, p. 20).

Other flows — Other flows are changes in the value of assets and liabilities that do not result from transactions. Examples are losses due to natural disasters and the effect of price changes on the value of assets and liabilities (United Nations et al., 2008, para. 3.7).

P

Partner Country Method (PCM) — The Partner Country Method (PCM) is a top-down method comparing import (or export) values reported by one country with the corresponding export (or import) values reported by its partner country. The concept of PCM is based on a trade gap, defined as discrepancy in the values of a trade transaction, independently reported by both trading partners.

Phantom corporation — Phantom firms are secretive companies or trusts used by international criminals and corrupt businesses to hide money, rip off governments and siphon off cash that could be used to pay for health care, education or vital infrastructure investment (ONE, 2013).

Price Filter Method (PFM) — The PFM is a bottom-up method which estimates a price filter for each commodity and uses it as a proxy for arm's length prices. Trade mispricing occurs when the unit price of a given transaction differs from the normal prices assumed by a price filter, i.e., when an abnormal price of a particular transaction is identified.

Pricing (under/over) — Setting the price (too low/too high given the true price).

Profit shifting — Allocation of income and expenses between related corporations or branches of the same legal entity (e.g. by using transfer pricing) in order to reduce the overall tax liability of the group or corporation (OECD, 2021).

R

Roles of units within MNE — Four roles of units within MNE are identified: (1) headquarters; (2) target entity, being the part of MNE that loses tax base as the result of aggressive tax planning; (3) lower tax entity as the counterpart to the target entity; and

	(4) conduit entity, being neither of the previous roles. (European Commission, 2017, p. 29, 36, 37)
Risk assessment	The systematic determination of risk management priorities by evaluating and comparing the level of risk against predetermined standards, target risk levels or other criteria (WCO Guidelines on the Development and Use of a National Valuation Database as a Risk Assessment Tool, p. 4).
Risk assessment	Risk assessment should aim at identifying main categories of IFFs present in a country. The IFF risk assessment collates available information on the potential enablers of IFFs, for instance weaknesses of the national framework, shares estimates on the likelihood and magnitude of IFFs and considers their effects on the economy, government finances and development, and finally, identifies priorities for the statistical measurement of IFFs, roughly as envisaged by the FATF (2013) national risk assessment guidance for National Money Laundering and Terrorist Financing.

S

Secrecy jurisdiction	Secrecy jurisdictions are cities, states or countries whose laws allow banking or financial information to be kept private under all or all but few circumstances. Such jurisdictions may create a legal structure specifically for the use of non-residents. The originators of illicit financial flows may need to prevent the authorities in the country of origin from identifying them (e. g. if the money is the proceeds of tax evasion), in which case the flow will be directed to a secrecy jurisdiction. Because those directing IFFs seek out low taxes and secrecy, many tax havens are also secrecy jurisdictions, but the concepts are not identical (UNECA, 2015, p. 9).
Shadow economy	The shadow economy includes all economic activities which are hidden from official authorities for monetary, regulatory, and institutional reasons (Medina and Schneider, 2018, p. 4).
Shell company	A company set up by fraudulent operators as a front to conceal tax evasion schemes (OECD, 2021). A company without a real economic activity in the country of registration. This generally means that these companies have no (or few) employees, and/or no (or little) production, and/or no (or little) physical presence in the country of registration (EPRS, 2018, p. 12).
Special purpose entity (SPE)	A special purpose entity **(**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 (IMF, 2018, p. 6). SPEs are a type of shell companies.
Special trade system	The special trade system is in use when the statistical territory comprises only a particular part of the economic territory, so that certain flows of goods which are in the scope of IMTS 2010 are not included in either import or export statistics of the compiling country. Countries may apply various definitions of special trade (UNSD, 2011, p. 29).
Stocks	Stocks are a position in, or holdings of, assets and liabilities at a point in time (United Nations et al., 2008, para. 3.4).

T

Target entity	See 'Roles of units within MNE'.
Tax and trade related IFFs	See Tax and Commercial IFFs.
Tax avoidance	The legal practice of seeking to minimize a tax bill by taking advantage of a loophole or exception to tax regulations or adopting an unintended interpretation of the tax code (United Nations, 2021, p. 52).
Tax evasion	Actions by a taxpayer to escape a tax liability by concealing from the revenue authority the income on which the tax liability has arisen (United Nations, 2021, p. 52).
Tax gap	Difference between the tax that should have been paid and the tax actually collected (European Commission, 2018b, p. 5).
Tax havens	Jurisdictions whose legal regime is exploited by non-residents to avoid or evade taxes. A tax haven usually has low or zero tax rates on accounts held or transactions by foreign persons or corporations. This is in combination with one or more other factors, including the lack of effective exchange of tax information with other countries, lack of transparency in the tax system and no requirement to have substantial activities in the jurisdiction to qualify for tax residence. Tax havens are the main channel for laundering the proceeds of tax evasion and routing funds to avoid taxes (UNECA, 2015, p. 10).
Tax planning	Tax planning refers to the arrangement of a person's business and /or private affairs in order to minimize tax liability (OECD, 2021). It could also be defined as using tax reliefs for the purpose for which they were intended, for example, taking legitimate tax deductions included in the tax code to lower the tax bill, as intended by the law. It is sometimes referred to as “lawful tax avoidance” or “legitimate tax planning” (Musselli and Bonanomi, 2020, p. 4).

Tax regime	Encompasses the system or a regime wherein the range of taxes are levied (based on United Nations et al., 2008, para. 14.151).
Tax transparent	See Fiscal transparency.
Tax treaty shopping	The attempt by a person to indirectly access the benefits of a tax agreement between two jurisdictions without being a resident of one of those jurisdictions. (United Nations, 2021, p. 52).
Top-down method	Attempt to measure IFFs by interpreting or modelling inconsistencies in different types of aggregated data, such as currency demand, international trade and the capital account of the balance of payments. Methods such as mirror statistics can be used as a source of information on some tax and trade-related IFFs that are generated as part of licit economic activities but are transferred in an illicit way (UNCTAD and UNODC, 2020, p. 19)
Trade discrepancy	See Trade Gap.
Trade gap	Discrepancy (if any) in the value of a particular international trade transaction as independently reported by the two partners to the transaction (WCO, 2018, p. 32).
Trade misinvoicing	Trade misinvoicing refers to the act of misrepresenting the price or quantity of imports or exports in order to hide or accumulate money in other jurisdictions (United Nations, 2021, p. 52). Trade misinvoicing occurs when exporters and/or importers deliberately misreport the value, quantity or nature of goods and services in a trade transaction allowing them to shift financial capital between different countries or legal jurisdictions. This involves under or over-invoicing of goods, multiple invoicing, over or under shipment, misclassification of tariff categories, etc. (Carbonnier and Mehrotra, 2018, p. 5).
Trade mispricing	Willful falsification of the prices in transactions in international flows**.** Trade mispricing is often used synonymously with trade misinvoicing. However, misinvoicing refers to a broader phenomenon including fraudulent reporting beyond an individual transaction's price (Carbonnier and Mehrotra, 2018, p. 5).
Transaction	A transaction is an economic flow that is an interaction between institutional units by mutual agreement or an action within an institutional unit that it is analytically useful to treat like a transaction, often because the unit is operating in two different capacities (United Nations et al., 2008, para. 3.7).

Transfer pricing	The price of transactions occurring between related companies, in particular companies within the same multinational enterprise group (UNECA, 2015, p. 11).

U

Underground economy	Underground economy consists of activities that are productive in an economic sense and quite legal (provided certain standards or regulations are complied with), but which are deliberately concealed from public authorities for the following reasons: (i) to avoid the payment of income, value added or other taxes; (ii) to avoid payment of social security contributions; (iii) to avoid meeting certain legal standards such as minimum wages, maximum hours, safety or health standards, etc; or (iv) to avoid complying with certain administrative procedures, such as completing statistical questionnaires or other administrative forms (United Nations et. al., 1993, para 6.34).

V

Value added tax (VAT)	Value added tax (VAT) is a specific type of turnover tax levied at each stage in the production and distribution process. Although VAT ultimately bears on individual consumption of goods or services, liability for VAT is on the supplier of goods or services. VAT normally utilizes a system of tax credits to place the ultimate and real burden of the tax on the final consumer and to relieve the intermediaries of any final tax cost (OECD, 2021).
Value added tax (VAT) gap	The value added tax (VAT) gap is defined as the difference between the theoretical VAT liability and the actual value of VAT collected by Tax Authorities (European Commission, 2015, p. 10).

5. References

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