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## Curbing Illicit Financial Flows from Resource-rich Developing Countries: Improving Natural Resource Governance to Finance the SDGs

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### Trade-related Illicit Financial Flows: Conceptual Framework and Empirical Methods

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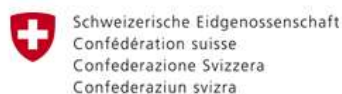
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## Executive Summary

Illicit financial flows (IFFs) from low-income countries have emerged as an urgent development challenge which features prominently in contemporary policy debates at national and international level. This urgency is driven by the consensus that official development assistance (ODA) from rich, advanced nations will be inadequate to fund the estimated costs of financing the development needs in low-income countries. This has led to a sustained focus on policies to reduce this financing gap by boosting domestic revenue collection capacities in low-income countries. The issue gains additional importance in resource-rich, developing nations which depend upon revenue collections from mineral extraction and trading activities to finance domestic investment. Furthermore, after the global financial crisis of 2008, there is an emerging international consensus by both developed and developing nations to strengthen their domestic economic governance and regulatory capacities in order to help them effectively respond to future economic shocks. Finally, there is also a growing concern that national and international tax governance systems are increasingly obsolete in their applicability for the modern economic system. Increasing complexity in national tax rules and the corresponding lack of international coherence generates loopholes for international actors to legally shift taxable income to decrease revenue contributions in high-tax jurisdictions.

Despite this clear urgency, research on IFFs is limited due to significant challenges relating to disagreement over the conceptual framework, legal assessment of various channels, and appropriate statistical measurement techniques. As a result, the evidence base for ongoing policy reform initiatives remains limited to aggregate estimates and local case studies. While this research provides valuable insights, an integrated conceptual framework and robust, statistical measurements are needed to inform effective policymaking.

This research proposes an integrated conceptual framework on IFFs by distinguishing between the various, overlapping channels contributing to aggregate IFFs according to the source of their illicitness - illicitly generated, transferred, or used. Next, we connect these channels to corresponding empirical measurement techniques, data sources, political economy and regulatory drivers, and proposed national and international policy reform initiatives. Finally, we review the existing empirical methods and evidence on commodity trade related-IFFs, focusing on the most prominent channels identified by the literature including: trade misinvoicing and transfer pricing. We also consider the related literature on profit shifting focusing on tax motivated financial flows across jurisdictions by multi-national firms.

## 1. Introduction

Over the last decade, illicit financial flows (IFFs) from developing countries have emerged as a prominent topic in policy discussions regarding development finance and corporate taxation, particularly relating to the natural resource sector. A large theoretical and empirical economics literature has focused on IFF-related practices, including capital flight and corruption in international trade over the years (Bhagwati, 1964, 1967, 1985; Cuddington, 1986; Giovannini & Hines, 1990; Pastor, 1990). However, Baker (2005) gave shape to the contemporary conceptual framework for IFFs from developing countries which incorporates both legal commercial channels and criminal activity. The IFF agenda gained prominence through advocacy efforts of non-government organizations devoted to curbing illicit finance and boosting tax capacity in developing countries, as well as international development finance institutions receiving the mandate from member governments to provide technical support to achieve these goals.<sup>1</sup> Recent empirical research by academic and policy institutions have built on the existing economic literature and the Baker (2005) framework using new data sources to estimate a range of magnitudes for the various channels which collectively contribute to IFFs. However, some significant challenges constrain this empirical research: first, disagreement over whether the conceptual scope of IFFs should be limited to explicitly illegal activities, or expanded to include legal but aggressive tax planning practices of multi-national firms; second, disagreement over appropriate empirical methodologies and data sources to be used for robust measurement. As a result, the existing evidence base for IFF research remains limited.

This paper aims to propose an integrated conceptual framework for the various channels that contribute to IFFs, which incorporates the corresponding empirical measurement techniques and data sources, political economy and regulatory drivers, and proposed policy responses. Next, we critically review the empirical methods used to estimate commodity trade related-IFFs, focusing on the most prominent, overlapping channels identified by the literature including: trade misinvoicing and transfer mispricing. In addition, we also consider the related literature on profit shifting which more broadly refers to international financial flows generated by aggressive tax-motivated business practices of multi-national firms.

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<sup>1</sup> Prominent advocacy groups focusing on IFFs and related practices include Global Financial Integrity, Natural Resource Governance Institute, and Tax Justice Network. International development finance institutions working on policy frameworks to curb IFF-related activities include the World Bank, International Monetary Fund, and Organization for Economic Cooperation and Development, among others.

*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. These practices involve customs or tax fraud and are outwardly illegal, and even criminal; across most jurisdictions *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. This distinction has implications for the empirical methodology used to estimate the magnitude of trade-related IFFs (Forstater, 2017; Nitsch, 2016). Meanwhile, *transfer pricing* is a business practice that consists of setting a price for the purchase of goods or services between two related parties. Transfer pricing becomes abusive, also referred to as transfer mispricing, when the related parties distort the price of these transactions to minimize their taxable income. The definition of related parties can differ by legal jurisdiction. For example: according to U.S. Foreign Trade Statistics Regulations, firms are related if either party owns, directly or indirectly, 10% or more of the other party.<sup>2</sup> Finally, *profit shifting* refers to corporate tax planning strategies used by multinationals designed to shift profits from higher-tax jurisdictions to lower-tax jurisdictions, thus eroding the tax-base of the higher-tax jurisdictions.<sup>3</sup>

The main driver identified for these practices are corporate tax-rate differentials between different legal jurisdictions. Additional economic drivers for trade-related IFFs analyzed by the literature include inflation rates in source country, interest rate differentials between source and destination countries, and overvaluation of source country exchange rates (Pastor, 1990). The broader social science literature has also analyzed the role of push-factors like institutional quality, weak natural resource governance, and political corruption in resource-rich countries, as well as pull-factors for IFFs including tax incentives and banking secrecy with a particular focus on commodity trading and financial hubs.<sup>4</sup>

## 1.1. Research Motivation

This research is motivated by the need to develop and test a robust methodology for estimating the magnitude of commodity trade-related IFFs from resource-rich countries. Despite the significant

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<sup>2</sup> Indeed, it is also possible to have different definitions of 'control' and 'related parties' for different legal purposes, within the same jurisdiction.

<sup>3</sup> The OECD defines tax base erosion and profit shifting (BEPS) as corporate strategies which exploit gaps and mismatches in tax rules to artificially shift profits to low or no-tax locations. Source: <http://www.oecd.org/tax/beeps/>

<sup>4</sup> See Reuter (2011) for a complete overview.

research interest in measurement, there is currently no broad consensus regarding a precise and robust empirical methodology for estimating the magnitude of various channels which contribute to aggregate IFFs. In the absence of robust evidence, current research and policy discussions rely on estimates based on asymmetries in the comparison of aggregate country-level trade flows and balance-of-payments data, as well as individual case studies. While these studies may lack precise statistical measurement or generalizability, they indicate that IFFs are a significant challenge for raising adequate domestic resources in developing countries (Yikona, et al. 2011). This phenomenon gains prominence due to the current global policy focus on helping developing countries raise the financial resources required to fund their development programs, through a combination of foreign aid, technical assistance, business investment, and promoting domestic capacity to curb the leakage of financial flows through illicit and corrupt activities.

The global funding requirements for the United Nations' 2030 Agenda for Sustainable Development, which incorporates the 17 Sustainable Development Goals and 169 targets, are estimated to exceed US\$ 2.5 trillion per year. Meanwhile, Official Development Assistance (ODA) from industrialized nations equals approximately US\$ 132 billion per year, which does not get close to meeting the SDG funding requirements (Jenks, Topping, and Keijzers, 2017). Domestic financial resources generated by tax revenues are relatively scarce in many developing countries. Average tax-to-GDP ratios for developing countries are between 10-14%, which is significantly lower than 20-30% for developed countries (World Bank, 2013). Broadening the tax base, improving tax administration, and thereby curbing IFFs will be crucial for enhancing domestic resource mobilization required to finance the sustainable development agenda.

Theoretically speaking, high levels of IFFs can erode the valuable financial capital and tax base in developing countries. Financial capital invested abroad remains outside the scope of domestic tax enforcement. However, tax and revenue authorities in developing countries often face a range of capacity constraints in collecting revenues from often very sophisticated multinational firms operating in their jurisdictions. These constraints can relate to an absence of appropriate legal regulations to govern trade and transfer mispricing, inadequate administrative structures, or lack of coordination due to information silos between relevant functions. These issues are further exacerbated in the case of resource-rich developing countries which disproportionately rely on natural resource revenues in the form of corporate income taxes and royalties for domestic financing needs.

## 2. Illicit Financial Flows: Definitions and Conceptual Framework

Although an international commitment exists to significantly reduce IFFs by 2030 (SDG Target 16.4.1), there is an intense on-going legal debate regarding the definition of IFFs. The language used to define this phenomenon has important implications, both in terms of generating reliable empirical estimations and identifying appropriate legal assessment frameworks.

Global Financial Integrity (GFI) is among the oldest and most active advocacy organizations working on IFFs, which defines the phenomenon as “*funds that are illegally earned, transferred, and/or utilized.*” Meanwhile, the Organization for Economic Cooperation and Development (OECD), which was tasked by the G-20 countries to analyze this issue, defines IFFs as any financial flows “*generated by methods, practices and crimes aiming to transfer financial capital out of a country in contravention of national or international laws.*” Many other organizations and research groups have used identical or similar definitions, converging around the core concept of financial transfers that are: a) international, and b) related to illegal activity. While both the GFI and OECD definitions refer to illegality, there is an ongoing debate about the distinction between illegal and illicit, and neither the GFI nor the OECD definition is specific on which components of the definition need to be illegal for an international flow of funds or financial capital to qualify as an IFF.

According to Forstater (2017), this leads to two types of definition: 1) a ‘narrow’ definition whereby IFFs are directly generated by illegal activities, including money laundering, drug trafficking, bribery, terrorism, misreporting of international transactions to evade taxes or tariffs, and capital flight in contravention of capital controls; and 2) a wider ‘normative’ definition used in policy debates which is not limited to illegality, but includes ‘illicit’ flows that result from aggressive (but legal, until successfully challenged by the appropriate authority) tax avoidance, transfer pricing, profit shifting, or thin capitalization activities.<sup>5</sup>

As an illustration: several developing countries lack appropriate transfer pricing and thin capitalization laws and as a result, any abusive mispricing of physical or financial transactions between affiliates of multinational firms located in these countries cannot be deemed to be in violation of existing legal frameworks. However, the counter-argument states that while no law is being violated, the transaction can be deemed normatively unacceptable and therefore an illicit cross-border transaction which fits under the broad definition of IFFs.

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<sup>5</sup> For a discussion on the legal and policy implications of the different definitions, see Forstater (2017).



As per Musselli and Bürgi Bonanomi (2019) and Eriksson (2017) , the main points of contention relating to the legal assessment of potentially illicit cross-border flows are related to:

- **Types of flows:** Limit legal assessments to financial transfers, or expand scope to include all financial capital which includes any assets with financial value
- **Stage of assessment:** Assess legality of the source of cross-border flows, or the mechanism used for international transfer, or the final use of funds
- **Degree or type of illegality:** Use ‘narrow’ definition of explicitly illegal activities, or challenge ‘grey area’ of aggressive tax avoidance
- **Appropriate legal standard:** Apply domestic legal frameworks, or international law (which may or may not have been ratified in particular jurisdictions), or some other normative principles or standards

In order to map these various channels into a coherent framework, we present a conceptual matrix graphically presented in Figure 1 (see below). The main components of this matrix are briefly summarized below:

1. **Definitions:** The matrix first introduces the most prominent definitions of IFFs, as suggested by GFI and OECD, alongside their main points of legal contention, i.e. narrow versus broad scope of activities.
2. **Degree of differentiation:** Next, we classify the most significantly studied IFF channels according to the main levels of differentiation – illicit sources, illicit transfer mechanisms, and illicit end uses (as per Musselli and Bürgi Bonanomi, 2019). At the next level, we also distinguish IFF channels according to the ‘narrow’ versus ‘wide’ interpretations of IFFs (as per Forstater, 2017), which include:
  - **Illegal activities** considered to be in clear contravention of common legal frameworks either in the generation, transfer or final use, including customs fraud, capital controls evasion, money laundering, smuggling, and terrorism financing
  - **Legal but normatively immoral activities** which may require reforms to existing domestic and/or international legal frameworks to be classified as illegal <sup>6</sup>

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<sup>6</sup> Please refer to Musselli and Bürgi Bonanomi (2019) for their discussion on problematizing legal versus normatively immoral activities.

**Figure 1: Illicit Financial Flows - Map of Concepts, Measurement Methods, Selected Drivers & Responses**

<b>Definition</b>	<p><b>Musselli and Bürgi Bonanomi (2019):</b> Cross-border flows of funds that are <i>illicitly</i> earned, transferred, and/or utilized.</p> <p><b>OECD:</b> Financial flows generated by methods, practices and crimes aiming to transfer financial capital abroad in contravention of national or international laws.</p> <p><b>Ongoing debate:</b> Narrow (■) vs. Broad (■)</p>						
<b>Differentiation</b>	<b>Illicitly Transferred</b>			<b>Illicitly Used</b>		<b>Illicitly Sourced</b>	
<b>Channels</b>	<p><b>Trade Misinvoicing:</b> Customs fraud</p> <p>■</p>	<p><b>Transfer Mispricing:</b> Tax avoidance</p> <p>■</p>	<p><b>Profit Shifting:</b> Tax planning</p> <p>■</p>	<p><b>Evading Capital Controls:</b> Informal finance (hawala)</p> <p>■</p>	<p><b>Money Laundering:</b> Corruption, Bribery, and Criminal proceeds</p> <p>■</p>	<p><b>Terrorism &amp; Conflict Financing:</b> Financing armed groups in fragile regions</p> <p>■</p>	<p><b>Smuggling &amp; Trafficking:</b> Natural resources, drugs, humans, flora &amp; fauna</p> <p>■</p>
<b>Empirical Measurement &amp; Data Sources</b>	<p><b>Mirror Trade Analysis;</b> <b>Price Filter Analysis</b></p> <p><b>Data Source:</b> Customs, Tax &amp; Revenue; UN – IMF Statistics</p>	<p><b>Price-wedge between Related vs. Arm’s Length transactions</b></p> <p><b>Data Source:</b> Firms; Customs, Tax &amp; Revenue</p>	<p><b>Mismatch between Economic Activities &amp; Reported Profits</b></p> <p><b>Data Source:</b> Firms, Financial Regulators</p>	<p><b>Precise and systematic measurements complicated due to hidden nature of illicit activities, however:</b></p> <ol style="list-style-type: none"> <li><b>Balance of Payments Errors &amp; Omissions</b> used to provide approximate total magnitude</li> <li><b>Country-level frameworks</b> based on demand-supply of illicit activities under consideration</li> </ol> <p><b>Data Sources:</b> Law Enforcement Agencies; Central Banks</p>			
<b>Selected Drivers: Regulatory and Governance Challenges</b>	<p>Lack of customs valuation and minerals assaying infrastructure</p>	<p>Absence of transfer pricing laws, tax governance capacity</p>	<p>Tax treaty shopping, Hybrid Mismatch Arrangements; Intangible products</p>	<p>Lack of adequate financial regulations, law enforcement and monitoring capacity</p>			
<b>Proposed Policy Responses</b>	<p>Customs Capacity, De-silofication of Regulatory Authorities, Business Transparency</p>	<p>Transfer Pricing Laws; Beneficial Ownership Registry; Exchange of Tax Information</p>	<p>Country-by-Country Reporting; Controlled Foreign Corporation Rules</p>	<p>Financial Action Task Force (FATF) recommendations: Anti-Money Laundering, Countering the Financing of Terrorism, Bribery, Corruption, and Anti-trafficking Laws</p>			

- 3. IFF Channels:** Using the first degree of differentiation, we next list the most prominent channels for IFFs identified by the academic and policy literature. The channels linked with illicit origins of financial flows include criminal trafficking in natural resources, wildlife, drugs and narcotics, as well as human trafficking. The channels linked to illicit cross-border transfer mechanisms include trade misinvoicing (between unrelated or related parties), abusive transfer pricing (between related parties), profit shifting (between affiliates of multi-national firms), as well as capital control evasion.<sup>7</sup> Finally, IFFs generated by illicit uses may include terrorism and conflict financing. These channels will be further elaborated upon in the next section, with a particular focus on commodity trade-related IFFs.
- 4. Empirical Measurement Methods and Data Sources:** Moving on, we list the empirical methodologies used to estimate the magnitude of each corresponding IFF channel, alongside the primary institution or administrative agencies responsible for recording these transactions. It is useful to highlight here that data on IFFs arising from legal activities is usually recorded systematically by the administrative service which facilitates their transit. However, IFFs arising from illegal activities generally remain unrecorded to avoid investigation by regulatory or law enforcement agencies. Therefore, their aggregate magnitude is usually approximated using imprecise proxies like the Errors and Omissions category of a relevant country's Balance of Payments or other country-specific frameworks developed by regulators or law enforcement agencies. See Hunter (2018) for an overview of aggregate methodologies used to estimate IFFs from illegal activities.
- 5. Drivers of IFFs:** Next, we map the drivers of IFFs to the corresponding channels with a focus on regulatory and governance factors. For IFFs arising from illicit transfer mechanisms, lack of governance capacity and appropriate regulatory or legal frameworks are identified as prominent drivers. Similarly, lack of law enforcement capacity and weak penal frameworks may allow the proceeds from illegal activities and/or funds to be used for illicit activities to be transferred across legal jurisdictions.
- 6. Regulatory Responses:** Given the high level of public and private sector focus on IFFs and related economic challenges, there are a number of ongoing policy discussions and initiatives at

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<sup>7</sup> Thin capitalization refers to the situation in which a company is financed through a relatively high level of debt compared to equity. This capital structure has a significant impact on a company's tax liability since tax rules generally allow a deduction for interest payments. Multi-national firms often retain the capacity to structure their financing arrangements in order to minimize their overall tax liabilities (OECD, 2016).

various stages of discussion and implementation. These regulatory responses are being discussed by both developing and advanced countries at risk for illicit financial inflows and outflows. For IFFs arising from legal activities, regulatory responses include implementing mechanisms which allow for regulators to monitor IFF channels and enacting appropriate legal frameworks required to enforce legal action to curb illicit activities. Meanwhile, the international Financial Action Task Force (FATF) has a series of recommendations regarding flows from illegal and criminal activities.

- 7. Governance and Regulatory Actors:** Finally, this matrix lists the main actors involved in the regulation and governance of the main IFF channels identified in the literature. For IFFs arising from international trade and commerce, the main governance actors include customs and revenue agencies, and financial regulators of the corporate sector given their role in enforcing existing legal frameworks and revenue collection. National parliaments are also included given their role as the highest law-making bodies with the authority to enact the appropriate legislation needed for national agencies to curb IFFs.

### 3. Trade-related Illicit Financial Flows: Empirical Measurements

Reliable empirical estimates of IFFs are necessary to inform effective policy responses. As noted previously, empirical studies conducted by academics, policy institutes, and advocacy groups have used different methodologies and data sources to estimate a range of magnitudes for the various channels which collectively contribute to IFFs. However, these estimates remain highly debated due to challenges associated with data availability and methodological approaches.

Many practices contributing to IFFs from developing countries, such as money-laundering, smuggling, and international trafficking, remain outside the purview of any systematic statistical measurement system by their very nature. Therefore, such flows are inconsistently recorded or missing in any available official statistical repository. Moreover, the methodologies used to generate aggregate, macroeconomic estimates of all such channels of IFFs often differ conceptually and capture different aspects of the problem. Some focus on measuring the proceeds of the illegal economy, while others aim to estimate lost tax revenues via manipulation of import and export invoices. Despite these limitations, the need for reliable measurements is clear to inform targeted, rather than wasteful, policy-making.

In this section, we will categorize and critically review the existing empirical literature based on official trade statistics. Firstly, the research on trade gaps estimated using partner-country, mirror statistics will be

discussed. Next, we will focus on the more limited price-filter analysis literature which relies on transaction-level trade microdata. We will conclude by reviewing the emerging, state-of-the-art literature on studying transfer pricing using firm-transaction level trade data between affiliates of international enterprises. Our objective is to use this review to develop our research plan to estimate commodity trade-related IFFs, based on a refined methodology which effectively addresses the main critiques of the existing research.

### **3.1. Trade Mispricing**

International trade data is of great economic interest for many reasons. Trade in goods and services have significant effects on a country's economic activity, while contributing a significant share of government revenue through Customs duties. However, researchers have also shown that trade data can be used to study corruption, capital flight, trade misinvoicing, and transfer mispricing.

Misinvoicing of international trade transactions is a prominent channel for IFFs from developing countries. It refers to the practice of exporting firms understating their trade values on Customs invoices, or importers overstating their import expenditures, with the motivation of transferring financial capital abroad either for private gain or for reducing corporate tax liabilities. In order to quantify the extent of this phenomenon, researchers have analyzed asymmetries in matched, partner trade statistics or examined price anomalies in transaction-level data.

#### **3.1.1. Partner-Country Trade Gaps, using Mirror Statistics**

Partner-country trade gap analysis is the predominant approach used in the policy and advocacy literature for quantifying the extent of trade misinvoicing. Bhagwati (1964, 1967, 1985) provided the first analysis based on partner-country trade gaps including a discussion on the incentives involved for trading firms. This methodology is based on the principle of double-counting in international trade statistics, whereby the exporting country's statistics are compared to the importing partner's corresponding statistics, i.e. mirror statistics. It is assumed that advanced countries' trade statistics are reliable and that any unexplained asymmetries in reported trade statistics between advanced and developing country partners is an indication of trade-based IFFs.

More recent applications of this approach include the empirical literature on IFFs conducted by advocacy organizations and policy institutions. Kar & Cartwright-Smith (2009) was the first in a series of papers by the advocacy group, Global Financial Integrity, to estimate the volume and pattern of aggregate IFFs from all developing countries between 2002-06. Their paper reviews competing capital flight models used

to study IFFs, including partner-country trade gap analysis referred to by them as DOTS-based Trade Mispricing Model (based on Direction of Trade Statistics DOTS database compiled by the International Monetary Fund). Using this methodology, the authors concluded that developing countries lost an estimated US\$ 858.6 billion –1.06 trillion in illicit financial outflows in 2006 alone. Kar (2011) expanded this analysis to the time period 1990-2008 for 48 Least Developed Countries (LDCs) finding that IFFs from LDCs increased from US\$ 9.7 billion in 1990 to US\$ 26.3 billion in 2008 (lower bound from US\$7.9 billion in 1990 to US\$20.2 billion in 2008). Similar methodologies are used to estimate IFFs developing countries over the decade 2000-2009 by Kar & Freitas (2011), who additionally also attempt to conduct principal-component analysis to understand the components of IFFs driving their estimates.

Further Global Financial Integrity reports analyzing IFFs for major developing and emerging economies include (Kar, 2010) for India, (Kar, 2012) for Mexico, (Kar & Freitas, 2013) for Russia, and Baker, et al. (2014) for Ghana, Kenya, Mozambique, Tanzania and Uganda. Finally, in a recent report, the international economic policy organization UNCTAD also used partner-country trade gap analysis to estimate IFFs from Chile, Côte d'Ivoire, Nigeria, South Africa and Zambia (UNCTAD, 2016).

**Methodological Critiques of Partner-Country Trade Gap Literature:** The large estimates of trade-based IFFs generated using this methodology have been critiqued by a number of academic studies (De Wulf, 1981; K. P. Hong & Pak, 2017; Nitsch, 2016; Reuter, 2012). In their latest report, Global Financial Integrity (2017) acknowledges these limitations which can be briefly summarized as follows:

1. **Incorrect to assume that trade statistics in advanced economies exhibit no misinvoicing:** The main underlying assumption of P-C, mirror trade analysis is to consider advanced economies' trade statistics as arms-length values for comparison with developing countries' trade statistics. However, Hong and Pak (2017) use both transaction-level trade data from Customs agencies and aggregate trade statistics from the IMF DOTS database to show that a significant degree of trade misinvoicing also exists between advanced economies, thereby making it hard to justify this crucial assumption.
2. **Unobserved trade costs:** Import transactions are valued on a cost, plus insurance and freight (CIF) basis which must be artificially set to the free-on-board (FOB) valuation conventionally used for exports before trade gaps can be calculated. Since data on transactions costs of trade are not generally recorded, a 10% rule-of-thumb adjustment has been used for these conversions. This rule of thumb is derived from aggregate differences between global export and import values. Therefore, a standard 10% estimate of trade costs has limited applicability for reliably converting bilateral trade values across all commodities with varying shipping and insurance costs.

3. **Use of aggregate trade statistics:** A majority of this literature focuses on calculating aggregate trade gaps, using total annual exports and imports figures. However, in many cases, bilateral data between trading partners may not be available for all goods and commodities being traded leading to the generation of highly misleading estimates of trade gaps. Furthermore, aggregate trade gaps can mask under or over-invoicing in particular commodities which cancel out in the aggregate.
4. **Data unavailability for certain countries, years, or commodities:** Consistent time-series of bilateral trade statistics for all commodities is not generally available for all countries engaged in international trade. This can lead to misleading estimates of trade gaps being calculated.
5. **Exports and import transactions can be recorded in different years:** Depending upon the mode of transport and distance between trading points, international trade can take significant time to complete. This could lead to partners often recording the same transaction in different years, while the annual trade gaps are calculated using statistics for the same year.
6. **Entrepôt trade:** For several commodities, the source and destination countries recorded in the statistics reflects reporting from intermediate ports where the shipment is warehoused for a time before being shipped to the ultimate destination in other countries. Furthermore, international commodity trading firms can decide to divert shipments in transit to storage warehouses to benefit from arbitrage opportunities when market prices fluctuate. When exports and imports passing through these entrepôt ports are reported by both the entrepôt countries and the exporting-importing partners, this leads to double-counting in official data and generation of artificial trade gaps.
7. **Exchange rates used for currency conversion:** International trade transactions can be conducted either in certain vehicle currencies (e.g., the U.S. dollar) or in local currencies. If different exchange rates are used by trading partners to convert their trade values to USD, this can lead to gaps in their mirror trade statistics. Some developing countries can also maintain multiple exchange rate regimes, thereby amplifying the possibility for such errors.
8. **Country idiosyncrasies:** Any international estimation of trade gaps can also be affected by particular countries who do not report bilateral trade flows for particular goods for particular years

for one reason or another. For example: Switzerland is a major destination for gold refining, however it did not report its international trade in unwrought gold until 2012.

### 3.1.2. Price Filter Analysis

Price filter analysis is an alternative methodology to analyze trade mispricing developed by Simon Pak and his co-authors. This methodology relies on a single country's transaction-level trade microdata on product-type (based on the Harmonized Commodity Description and Coding System or HS code), quantity, and unit value. This data is used to identify the unit price range for particular products or commodities over a given time period. This price range is then used to distinguish between normally and abnormally priced transactions using two main approaches:

- 1) **Inter-quartile range filter:** This methodology assumes that the inter-quartile range, between the 25<sup>th</sup> and 75<sup>th</sup> percentile, of the observed distribution of unit prices for a particular commodity represents the arm's-length price range. Transactions which are priced outside this filter are determined to be abnormally priced. This approach is based on the United States' Internal Revenue Service (IRS) regulations on transfer pricing, whereby the inter-quartile price is adopted as a criteria to determine the validity of transfer prices, i.e. prices used for transactions between related parties, in international trade.
- 2) **Arm's length price filter:** This framework compares actual transaction-level unit prices for a particular commodity with their contemporaneous free-market price, plus-minus a reasonable filter of 5-10% to account for usual price volatility. Transactions which deviate significantly from arm's length prices beyond what can be explained by reasonable price volatility are then determined to be abnormally priced.

A number of studies have used the price filter methodology, but mainly focusing on the United States due to data availability (Boyrie, et al. 2005; Cathey, et al. 2017; de Boyrie, et al., 2005; Pak, et al. 2003). Using price-filter frameworks, these studies have analyzed millions of import and export transactions to estimate the extent of trade mispricing between the United States and its trading partners. Zdanowicz, et al. (1999) analyzed trade between Brazil and United States to document the amount of capital flight disguised through mispriced commodity trade. Their results indicate that capital flight in the range of US\$ 2-4 billion took place from Brazil into the United States via trade mispricing in a single year 1995.

Pak, et al. (2003) utilized a similar methodology to analyze trade mispricing between Greece and the United States. The authors find that mispriced transactions were used to shift between US\$ 132-276



million from Greece to the U.S. and approximately US\$ 5.5 billion from Greece to the rest of the world in 1995. Boyrie, et al. (2005) study trade data between Switzerland and the United States for the period 1995-2000 to show that trade mispricing was used to shift US\$ 31 billion from Switzerland to the U.S. Finally, Boyrie, et al. (2005) analyzed import and export transactions between Russia and the United States between 1995-1999 to find US\$ 7.24 billion in under-invoiced exports from Russia and US\$ 1.68 billion in over-invoiced imports into Russia.

Hong, et al. (2014) compared estimates of trade mispricing in banana trade for United States with Latin America and Caribbean countries derived using interquartile price filter, arm's length price filter, and partner-country mirror statistics. The authors find that while inter-quartile filter and partner-country trade analysis shows little evidence of significant mispricing, the use of free-market, arm's length price based filter demonstrates the presence of significant mispricing. The results show that undervalued transactions correspond to 54% of total banana imports declared by US importers during the period 2000-2009.

**Methodological Critiques of Price-Filter Analysis:** According to Reuter (2011) and Carbonnier & Zweynert de Cadena (2015), price filter analysis based on trade micro-data is generally intuitive, but is still prone to the following methodological limitations:

1. **Endogeneity of the chosen price filter:** For defining the interquartile price range, the lower- and upper-quartile bounds are estimated based on observed trade transactions. Therefore, as long as there is at least some variation in prices within each commodity, this method will always produce some overpriced and underpriced transactions.
2. **Sensitivity to outliers:** Since price filters are often estimated using the entire distribution of prices, the occurrence of statistical outliers, potentially due to human recording error, may lead to a reclassification of transactions from normal to abnormally priced and vice versa.
3. **Potentially disproportionate impact of related party transactions:** Without specific information on the trading firms, price filter analysis cannot distinguish transactions between related or unrelated entities. This implies 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 may be biased.
4. **Product heterogeneity:** Price filter analysis is usually based on product classification at a high level of disaggregation, usually by distinguishing them at the 10-digit level of the HS code. However, for

products which are very heterogeneous in terms of quality and prices, this method can still incorrectly identify high-end products as overpriced and low-end products as undervalued. Meanwhile, abnormally priced transactions of mid-range products might be wrongly classified as legitimate transactions.

5. **Limitations in product classification system:** While most traded products are clearly defined under the HS system, there also exist product codes which are used to collect different types of products which do not fit the existing classification. For example, in the 2009 harmonized tariff schedule 12,581 out of 28,985 product categories include a catch-all “other” sub-category. Therefore, in a combined analysis of multiple product sub-categories, this method can be imprecise in the estimation of appropriate price filters.
6. **Quantity faking:** Applications of price filter analysis across multiple commodities often do not take into account the potential misinvoicing of quantities instead of prices, i.e. under or over reporting of trade quantities. Since price filter analysis relies on unit prices of transactions, an over or under-reporting of quantities will also bias the estimates of trade mispricing.
7. **Large quantity transactions with small price differences:** Large quantity transactions where declared prices differ from arm’s length prices only by a small margin are harder to detect since the declared unit prices may still fall within the arm’s length price range, although the total mispriced amount could be substantial.

### 3.2. Transfer Pricing Literature

In recent years, a new state-of-the-art empirical literature has emerged which relies on limited-access, administrative micro-data at the firm-transaction level, which is additionally able to distinguish between related-parties and arm’s-length trade. This data is systematically recorded for transfer pricing audits and has been made available to academic researchers only in select countries. As a result, the available evidence is limited to the study of firms in United States, Denmark, and France.<sup>8</sup> Due to the presence of proprietary firm-level information on business practices, there are confidentiality requirements for researchers using this data. In the United States, for example, academic researchers were accorded the status of Special Sworn Status researchers of the U.S. Census Bureau for accessing this data.

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<sup>8</sup> This is based on an initial survey of the empirical literature based on firm-transaction level trade micro-data. There is a much larger accounting, legal, and economic literature on transfer pricing using different types of data and methodologies which can be reviewed and included in an updated version of this paper.

**A. U.S. Transfer Pricing Studies:** Bernard, et al (2006) is the first academic research paper to use the U.S. Longitudinal Firm Trade Transaction Database (LFTTD) which links individual trade transactions to firms to study transfer pricing in international trade by U.S. multinational firms. This dataset has two components. The first component includes all U.S. transaction-level trade data from the U.S. Census Bureau and the U.S. Customs Bureau, including product classification, value, quantity, shipment date, destination (or source), transport mode, and crucially, whether the transaction takes place at ‘arm’s length’ or between ‘related parties.’ Related-party or intra-firm trade refers to shipments between U.S. companies and their foreign subsidiaries as well as trade between U.S. subsidiaries of foreign companies and their affiliates abroad. For export transactions, firms are related if either party owns, directly or indirectly, 10 percent or more of the other party, as per U.S. Foreign Trade Statistics Regulations. The second component of the LFTTD is the Longitudinal Business Database (LBD) from the U.S. Census Bureau, which includes annual information for U.S. firms at the establishment level. Matching the LBD to the transaction-level trade data produces the LFTTD.

Bernard, et al (2006) use the LFTTD to analyze how prices set by multinational firms vary across arm’s-length and related-party transactions. They focus on estimating the ‘wedge’ between multinational firms’ arm’s-length and related-party prices and the extent to which this wedge varies with product and firm characteristics, market structure, and government policy. The authors find that export prices for intrafirm transactions are significantly lower than prices for the same good sent to an arm’s-length customer. After matching related-party sales by a firm to arm’s-length sales by the same firm for the same product to the same country in the same month using the same mode of transport, they find that the average arm’s-length price is 43% higher than the related-party price. Product characteristics are influential in determining this price difference, the authors find that the price wedge for commodities is on average 8.8% while that for differentiated goods is 66.7%. Firm and market attributes are also influential since the price wedge is higher for goods shipped by larger firms, for firms with higher export shares, and those firms in product-country markets served by fewer exporters.

Furthermore, consistent with incentives to minimize taxation and import duties, Bernard, et al (2006) find that the wedge between arm’s-length and related-party prices is negatively associated with destination-country corporate tax rates and positively associated with destination-country import tariffs. For a one-percentage point reduction in the foreign tax rate they find an increase in the price wedge of 0.56 to 0.66%. A one percentage point increase in the foreign customs duty increases the price wedge by 0.56 to 0.60%. These results show that multinational firms make substantial price adjustments to variation in country tax and tariff rates. The authors’ back-of-the-envelope calculations suggest that pricing responses

to tax rate differences across countries led to US\$ 5.5 billion in lost U.S. corporate tax revenues and a US\$ 15 billion increase in the merchandise trade deficit in 2004.

In a recent paper based on the Bernard, et al (2006) methodology and the LFTTD, Flaaen (2017) first calculates a measure of the transfer-price wedge between arm's-length and related-party transactions. Next, the researcher uses the 2004 Homeland Investment Act (HIA), a one-time tax repatriation holiday which generated a discreet change in the incentives for U.S. firms to shift profits to low-tax jurisdictions, to estimate a difference-in-difference strategy. The results show that following passage of the HIA, the export transfer price wedge increased in low-tax relative to high-tax countries, while the import transfer price wedge exhibited the opposite behavior. Consistent with the form of tax avoidance known as 'round-tripping,' the results imply approximately US\$ 6 billion of under-reported U.S. exports, US\$ 7 billion of over-reported U.S. imports, and US\$ 2 billion in foregone U.S. corporate tax receipts.<sup>9</sup>

**B. French Transfer Pricing Study:** Using a unique firm identifier for French firms, Davies, et al. (2015) combined three datasets including detailed information on the firm-level export values and quantities by destination, whether each transaction is intra-firm or arm's length, and information on country-level characteristics including corporate tax rates, distances, tariffs, and per-capita income. The transaction-level trade data is from French Customs, reporting the FOB values and quantities of exports by firm, 8-digit HS product category, and destination. Information on whether each transaction is intra-firm or arm's length is obtained from a confidential L'Institut national de la statistique et des études économiques (INSEE) firm-level survey on the foreign activities of French multinational firms conducted only in 1999 for budget reasons. Finally, a unique French firm-level dataset on financial linkages between firms is used to determine whether a firm in the French Customs data is a multi-national firm and, if so, determine its nationality and the country locations of its related parties.

The authors argue that France is particularly well suited to analyzing the transfer pricing practices of multi-national firms since it exempts foreign income from taxation providing a cleaner mapping between tax differences and firm incentives. By comparison, when a U.S. firm earns profits overseas, it adds up its worldwide income into a single income basket and calculates the U.S. tax owed on this amount when it repatriates these foreign earnings. The U.S. tax authorities then grant a credit against this liability, which is equal to the taxes already paid to foreign governments on the firm's overseas income. If the firm has paid more taxes overseas than what is owed to the U.S., it is in an excess credit position and owes no taxes to the U.S. If not, it is in an excess limit case and it must pay the remainder to the U.S. tax authorities.

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<sup>9</sup> Round tripping refers to the strategic practice of shifting profits outside a legal jurisdiction through transfer pricing, declaring these profits in low-tax jurisdictions, and finally repatriating them under the terms of the tax repatriation holiday, for example the 2004 U.S. Homeland Investment Act.

Complicating the issue further, the U.S. tax liability is not triggered until profits are repatriated or used and excess credits in a year can be carried into the future or applied retroactively, introducing a dynamic aspect to the firm's profit shifting problem. In an exemption system such as France's, none of these considerations arise, meaning that a much simpler comparison of the French and destination tax rates can be used to study the trading firms' profit shifting motives.

Based on this understanding, the authors propose a difference-in-difference estimation strategy that compares intra-firm prices charged by a particular firm for a particular product across markets with the arm's length prices of exports for the same product exported in the same markets. Controlling for a set of triadic fixed effects at the firm, product, and export mode levels, their estimation strategy captures any difference between intra-firm prices and their arm's length counterparts which is systematically related to the corporate tax in the destination country.

The results suggest that export prices drop with the destination corporate tax rate only for intra-firm transactions. They also show that above a certain threshold, differences in the corporate tax rates have no effect and transfer pricing is essentially directed to countries with very low tax rates. The bulk of tax avoidance is attributable to the transfer pricing of exports to tax havens, with low corporate tax rates and an overall tax environment that facilitates profit shifting.

**C. Danish Transfer Pricing Study:** Cristea & Nguyen (2016) use detailed firm and transaction-level data for Denmark for the period 1999–2006 to estimate the extent to which multinational firms manipulate both transfer prices to controlled affiliates and arm's length prices to uncontrolled third parties, in order to reduce their global tax burdens. This study examines an overlooked prediction of the standard transfer pricing theory: firms will also manipulate their arm's length prices in the direction of the transfer price as a result of corporate tax differences across locations. This manipulation of prices for goods shipped to uncontrolled third-parties obscures the extent of price manipulations to affiliated parties, allowing multinational firms to comply with the arm's length principle of taxation while engaging in income shifting. The total income shifted internationally through the pricing of cross-border transactions is the accumulation of these two manipulations.

The authors argue that previous studies that focused only on movements in transfer prices underestimate the full amount of tax revenue lost to manipulative transfer pricing of tangibles. This study's prediction that firms distort arm's length prices for tax-saving purposes has important implications for the validity of such prices as arm's length prices. By using the MNC's own arm's length prices as CUPs, previous

researchers may have underestimated the extent to which firms manipulate prices in order to shift profits.

This paper's main contribution is to mitigate this bias by using a triple-difference-in-difference estimation strategy to estimate the gap between a multinational firm's export unit value and a true reference price that conforms to the arm's length principle. The MNC export unit value comprises both the transfer price and the arm's length price. Its deviation from the true arm's length price, multiplied by the quantity traded, provides the total revenue shifted by firms out of their home country. The econometric analysis then investigates the extent to which differences in tax rates generate transfer-pricing manipulations.

For implementing their analysis, the authors exploit two sources of data variation: information on multinational firms that establish new foreign affiliates in markets to which they export and information on changes in foreign corporate tax rates over time. By comparing the export unit values before and after acquiring an affiliate in a foreign country, they can identify the effect that foreign ownership has on export unit values. Therefore, by using this triple difference method, they are able to discern what fraction of the overall changes in export unit values is associated with differences in corporate tax rates across jurisdictions, as opposed to non-tax related factors, such as an internal reorganization of the firm following an affiliate acquisition. Their results show that Danish multinationals reduce the unit values of their exports to low tax countries between 5.7 to 9.1%, which corresponds to a tax revenue loss of 3.24% of Danish multinationals' tax returns.

### **3.3. Profit Shifting Literature**

Finally, we briefly make note the related literature on profit shifting by multinational firms. This literature is more extensive and despite methodological limitations, continues to be relevant in order to provide supporting evidence for new policy initiatives, for example, the OECD's Base Erosion and Profit Shifting (BEPS) initiative. However, this research is less actionable due to the lack of systematically collected and comparable data on commodity trading firms at the firm-affiliate level, particularly in developing countries. Since a majority of international firms involved in commodity trade remain privately held, they are not required to report detailed financial data for all their worldwide affiliates. Moreover, the few publicly listed firms are based across a wide range of legal jurisdictions, including United States, United Kingdom, and Singapore with affiliates based in developing countries. Therefore, any profit shifting analysis of commodity trading firms would first require an extensive firm mapping exercise and systematic release of private financial and operational data.

The basic premise of the profit shifting literature, based on Grubert & Mutti (1991) and Hines & Rice (1994), is that the observed pre-tax income of an affiliate represents the sum of ‘true’ income and ‘shifted’ income (where the latter can be either positive or negative). True income is generated by the affiliate using capital and labor inputs. Thus, measures of the capital and labor inputs used by the affiliate (such as fixed tangible assets and employment compensation, respectively) are included in the analysis to predict the true level of income. Shifted income is determined by the tax incentive to move income into or out of the affiliate. In the simplest scenario, this would be the tax rate difference between the parent and the affiliate. However, more advanced recent literature also takes into account of the overall pattern of tax rates faced by all the affiliates of a multinational firm. Therefore, income reported by a low-tax affiliate which cannot be accounted for by the affiliate’s own labor and capital inputs is attributed to income shifting. Dharmapala (2014) provides the latest review of the methodological approaches used in this literature.

In order to derive estimates of profit shifting behavior, researchers use country-level or more recently, firm-level data to study where there is a significant relationship between reported pre-tax profits of affiliates (i.e. the tax base) and the difference in tax rates between the affiliate and parent company. Most often, this relationship is reported in terms of semi-elasticities, i.e. the percentage change in pre-tax income associated with a 1-percentage point change in tax differentials between parent company and foreign affiliate. With the availability of commercial, firm-level financial databases, including Compustat, Orbis, and Amadeus, this literature is becoming more sophisticated by allowing the use of panel data estimation techniques to produce more robust estimates of profit shifting. However, it must be noted that: 1) less emphasis is paid to the potential channels used for profit shifting, whether it is be transfer mispricing or trade mispricing; 2) by and large, this research does not pay emphasis to econometric identification of causal relationships, being limited to the estimation of semi-elasticities.

In a meta-analysis of the widely-varying magnitudes of the estimates generated by this literature, Heckemeyer & Overesch (2013) conducted a meta-analysis of this literature by collect 238 estimated semi-elasticities from 25 separate academic studies of profit shifting. They show that more recent studies using panel data methods are strongly associated with smaller estimated magnitudes of profit shifting, indicating a bias in earlier cross-sectional analyses. They also identify a ‘consensus’ estimate from this extensive literature – a semi-elasticity of approximately 0.8, i.e. a 10% increase in the tax rate difference between an affiliate and its parent increases the pre-tax income reported by the affiliate by 8%. Dharmapala (2014) uses this 0.8 semi-elasticity for illustrative purposes to summarize the current consensus that emerges from the profit shifting literature.

## 4. Conclusion

This paper proposes an integrated conceptual framework for the study of IFFs, which distinguishes between various channels according to the source of their illicit character (illicitly generated, transferred and used), while also proposing corresponding empirical measurement techniques, political economy and regulatory drivers, and policy responses. We focus on a critical review of empirical methods used to estimate commodity trade related-IFFs, especially on: trade misinvoicing and abusive transfer pricing. IFFs generated by physical trade in commodities are distinguished from purely monetary transfers, which require different empirical methods and corresponding data requirements. Finally, we critically evaluate the characteristics and limitations of the different statistical methods. This comprehensive understanding will be applied to conduct robust empirical research on measuring IFFs focusing on disaggregated, micro-level data analysis alongside primary research on push-pull factors and critical junctures in commodity value chains which drive IFF-related activities.



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