Where and how to dodge taxes and shift money abroad using trade misinvoicing: A beginner's guide

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Where and how to dodge taxes and shift money abroad using trade misinvoicing:
A beginner's guide

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Abstract

This study examines the prevalence of trade misinvoicing in Asia and the Pacific. Trade misinvoicing is closely related to the study of illicit financial flows (IFFs), combating which has been explicitly included as part of the 2030 Development Agenda (target 16.4). The motivations behind trade misinvoicing include avoiding stringent capital controls, profit shifting, capital flight, direct and indirect tax avoidance, tariff and non-tariff measures avoidance, as well as fraudulent acquisition of tax rebates and export subsidies. By comparing bilateral export and import data at HS6 digit level of aggregation, this study finds evidence of substantial illicit financials inflows and outflows within the Asia-Pacific region. As much as 7.6% of regional tax revenue may have been lost in 2016 due to fraudulent export and import value declarations. However, only examination of highly disaggregated bilateral data, ideally at transaction level, can paint a true picture of the scale of misinvoicing within the region. Furthermore, cases where misinvoicing applies on both import and export sides of a transaction cannot be effectively captured through trade matching techniques applied in this and other trade misinvoicing studies, and would require examination of unit price distributions. By closing loopholes enabling misinvoicing, substantial resources can be added to governments' revenues. The findings presented in this study highlight that the landscape of trade misinvoicing in the Asia-Pacific region is diverse and requires close cooperation between customs and tax offices in different countries, such as through *the Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific*.

Contents

1. Introduction

The purpose of this study is to estimate the extent of trade misinvoicing in Asia and the Pacific. Trade misinvoicing is used to minimize various tax obligations, access lucrative tax rebates and export subsidies, and shift money between jurisdiction bypassing capital controls. Although estimates derived should be treated with caution given the paucity and reliability of available data and the limitations of existing estimation techniques, this study finds that traders are currently defrauding governments in Asia-Pacific of an estimated 7.6% of the regional tax revenue. Trade misinvoicing is commonly associated with illicit financial flows (IFFs), of which trade misinvoicing is estimated to contribute 87 per cent (GFI, 2017). Combating IFFs has been explicitly included as part of the 2030 Development Agenda under target 16.4. In addition, reclaiming lost tax revenue will contribute to Target 17.1 "Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection", with the corresponding indicators 17.1.1 "Total government revenue as a proportion of GDP, by source" and 17.1.2 "Proportion of domestic budget funded by domestic taxes". Indirectly, the money collected and saved will be able to address all other goals and targets of the Sustainable Development Agenda.

The structure of the report is as follows. First, the concept of illicit financial flows is discussed. A description of the various motivations behind misinvoicing is presented next, together with specific examples from the region. Misinvoicing estimation methodologies used in the literature are briefly discussed, before describing the methods used in the study. Next, results of the estimation are presented. The report concludes with the way forward, with the main message being that to stop misinvoicing it is imperative to exchange trade data across countries, and the recently signed *Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific* can be used to help to achieve this ambition goal.

2. Trade misinvoicing and illicit financial flows

Discrepancies between exporting countries' reported exports and corresponding importing countries' reported imports have long been noted by trade researchers and policymakers (see appendix for a brief discussion). While many reasons are attributed to discrepancies, an emerging concern, is that some discrepancies are caused by deliberate actions by traders to bypass capital controls, and circumvent taxes and non-tariff measures, among other fraudulent motivations.

Studies addressing deliberate trade misinvoicing are often closely related to the topic of illicit financial flows (IFFs). The World Bank defines IFFs as "cross-border movement of capital associated with illegal activity or more explicitly, money that is illegally earned, transferred or used that crosses borders" (World Bank, 2016). The study of illicit financial flows has been popularized by Raymond Baker in his seminal work *Capitalism's Achilles Heel: Dirty Money and How to Renew the Free-market System* (Baker, 2005). Baker subsequently established the Global Financial Integrity – a think tanks "to curtail illicit financial flows by producing ground-breaking research, promoting pragmatic policy solutions, and advising governments" (GFI, 2018). The initial quantitative study on illicit financial outflows produced by GFI estimated that up to one trillion dollars has been lost by the developing countries through illicit financial flows (GFI, 2008). While the methodology of estimating the IFFs received some criticism (see Nitsch (2016)), increased

awareness of the issue has been widely attributed to the work of Baker and subsequently GFI (Reuter, 2017).

Combating IFFs has now been explicitly included as part of the 2030 Development Agenda. Target 16.4 is "By 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime", and the corresponding indicators is "16.4.1 Total value of inward and outward illicit financial flows (in current United States dollars)". Similarly, the G20 highlighted the importance of addressing IFFs, and vowed to continue to work on addressing cross-border financial flows derived from illicit activities, including deliberate trade misinvoicing (European Commission, 2016).

Measuring the illicit financial flows, however, is far from straightforward. Indeed, the definition provided by the World Bank is not universally accepted. There are arguments that 'illicit' can be understood as illegal as well as "forbidden by rules or custom", implying that the flows may not necessarily be illegal (Cobham & Janský, 2017). IFFs can thus include "legally ambiguous transfers" such as profit shifting through transfer pricing (Reuter, 2017). Weak legal frameworks in some developing countries may render such practices technically within the scope of the law, though "normatively unacceptable" (Reuter, 2017). Echoing such reservations, based on consultations with stakeholders in Central Asia, a report by Royal United Services Institute (RUSI) noted that the term 'illicit financial flows' is often misunderstood and confused by governments working on the issue for those activities that are implicated in IFFs, such as corruption or money laundering (2017).

IFFs can take many channels, including cash and precious metal smuggling. Recent rise in ICT advances provided further alternatives, such as cryptocurrencies and *hundi*[1] (Economist, 2017; Tropina, 2016). Mevel et al (2015) conceptualize the various channels through which illicit financial flows may occur (see figure 1). However, along with ambiguity in defining what constitutes illicit financial flows, quantifying such oblique practices remains problematic. Indeed, by design, the flows are meant to be obscured from scrutiny of government officials. Most studies quantifying the IFFs use trade mispricing as a proxy – a subset of IFFs.[2] A notable feature of such IFFs is that they can be estimated through matching declared import and export data. In their most recent report, GFI estimated that 87 per cent of illicit financial outflows were due to trade mispricing (GFI, 2017).

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[1] *Hundi* is an informal money-transfer system in which a money transfer made locally is matched by a money transfer made across the border to a desired recipient, thereby bypassing traditional banking system (Economist, 2017).

[2] One notable effort, however, is by OECD (2018) on IFF in West Africa. The report is a result of an extensive research exercise which in addition to secondary desk research included field research and interviews with 100 key informants, comprised of law enforcement officials, senior research and policy officers. The detailed report aimed to provide a qualitative understanding of how IFFs affect the economy, governance, development and human security.

Figure 1. IFF channels
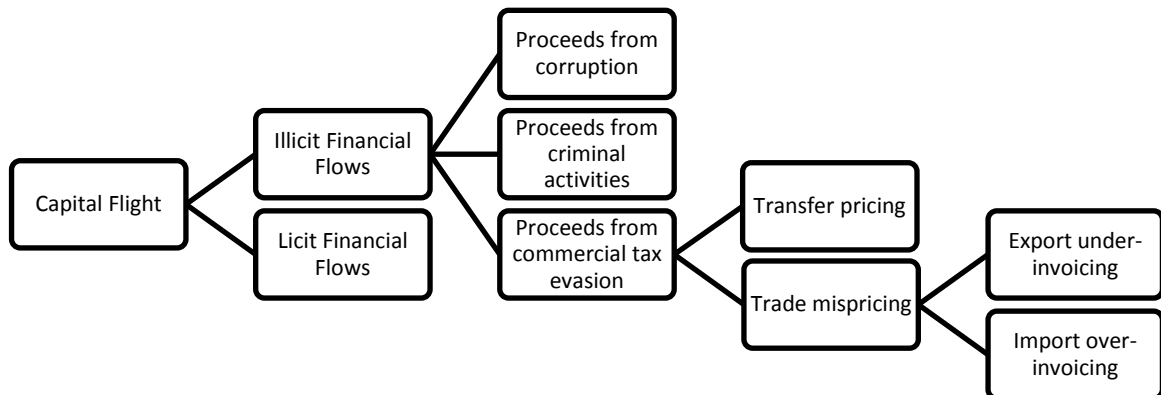
Source: Adapted from Mevel et al. (2015)

3. Motivations behind trade misinvoicing

Notably, the premise of the conceptualization depicted in figure 1 is that the motivation behind illicit financial flows through trade mispricing is capital flight. In a discussion on sources of misinvoicing, Nitsch (2017) concludes that focus on capital flight motives in light of diversity of misinvoicing behaviour seems misguided - capital flight is but one of the causes of misinvoicing. However, as Reuter (2017) notes, "the research on the drivers, consequences and policy aspects of IFFs has been minimal." This section aims to highlight relevant literature and case studies to draw attention to the different drivers of misinvoicing.

The motivation for each type of misinvoicing is different. A trader might want to understate the value of imports to avoid import duties and overstate the value of exports to increase indirect tax refunds (i.e. VAT, GST) or maximize export subsidies. Both of these misrepresentations would show up in estimates of IFFs as illicit inflows (i.e. exports values would be greater than corresponding import values, hence relatively more capital would flow to the exporting country.[3] At the same time, to bypass their own country's capital controls and/or evade direct tax, a trader may understate export values or overstate import values (resulting in illicit outflows). An additional possibility is multiple invoicing, whereby a money launderer sends multiple payments for delivery of the same shipment. Finally, false description of goods, as opposed to value, is an additional dimension to misinvoicing. The concordance between export/import under/over invoicing vis-à-vis effect on capital flows is summarized in Table 1.

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[3] i.e. when the invoice presented at export overvalues the consignment relative to the true market value of the goods being traded, or when the invoice presented at import undervalues the goods relative to their true value.

Table 1. Trade misinvoicing and the direction of illicit financial flows

	Overstated	**Understated**
Imports	Outflow • *Capital flight and profit shifting*	Inflow • *Capital flight and profit shifting* • *Tariff, non-tariff measures and indirect tax avoidance*
Exports	Inflow • *Capital flight and profit shifting* • *Indirect tax rebates and export subsidies*	Outflow • *Capital flight and profit shifting*

Source: Adapted from Spanjers (2017).

Empirical literature broadly supports the existence of fraudulent misinvoicing. The following studies and examples provide an overview of trade misinvoicing practices as well as their underlying drivers. A number of studies, however, point to trade misinvoicing occurring for several different reasons, where a number of different factors can be at work in influencing misinvoicing in any given country. Adding to the complexity, it is hard to distinguish whether exports are overstated, or imports understated. Furthermore, as discussed below, some cases of trade-related fraud do not rely on trade misinvoicing per se, but are explored in the present section of this paper nonetheless due to their significant impact on tax revenues, and the fact that suggested policy measures to combat trade misinvoicing can help to address them as well.

3.1. Capital flight and profit shifting

One of the most frequently cited reasons for trade misinvoicing is to shift capital from one jurisdiction to another. In the case of stringent capital controls, the primary reason is expatriation of funds or capital flight, whether illicit in themselves or not (Reuter, 2017). In other cases, where capital controls are not necessarily the main cause, traders take advantage of international transactions to minimize direct tax liability by directing financial flows to the jurisdiction with lower direct tax rates. The net effect, however, is the same as capital is moved out the country, denying the governments direct tax revenue and putting a downward pressure on the local currency.

In support of this argument, analysis of monthly data on the United States international trade prices between 1997 and 1999 showed substantial evidence of tax-motivated transfer pricing in United States intrafirm trade prices, supporting the notion of tax-motivated income shifting behaviour (Clausing, 2003). Feenstra & Hanson (2004) found evidence of price discrimination by traders across destination markets and use of transfer pricing to shift income from high-tax countries to Hong Kong. Day (2015) also found evidence of false invoicing of exports to Hong Kong and notes there could be incentives to disguise capital outflows by over-invoicing imports. Ferrantino, Liu, & Wang (2012) similarly identified indirect evidence of evasion of capital controls. Examining the capital flow from Africa through data deviations from average import and export prices as an indicator of capital flows, de Boyrie (2007) noted that it occurred mostly through undervalued exports which can facilitate tax evasion, money laundering, capital flight and mask illegal commissions.

Fisman & Wei (2004), through matching disaggregated data on imports and exports between Hong Kong, China and China found that misinvoicing is significantly correlated with higher tax rates in China (tariff plus value-added tax rates). Analysing import/export transactions between the U.S. and Russia, de Boyrie (2005) concluded that capital movement through trade misinvoicing can be attributed to either money laundering and/or tax evasion (2005). Cobham & Janský (2017) similarly concluded that examination of trade misinvoicing can reveal unrelated party transactions with the aim to shift income into a different jurisdiction.

Capital account openness is found to be insignificant in determining trade misinvoicing in their study of trade misinvoicing, though duty evasion (discussed below) is found to be a significant determinant in misinvoicing (Qureshi & Mahmood, 2016). The authors found a positive association in import under-invoicing and the interest rates, suggesting that higher return on capital in the inflow destination is also a consideration. Analysing a 53-country data set over a 26-year span, the authors identified capital account openness, differentials in interest rates, political stability, corruption, indebtedness and the exchange rate regime as factors related to trade misinvoicing (Patnaik, Gupta, & Shah, 2012).

Notably, trade misinvoicing is just one avenue for capital flight. After stringent capital controls were set up by regulators in China after the August 2015 yuan devaluation, it is estimated that $1.2 trillion left the Chinese economy (Bloomberg, 2017; Reuters, 2016). While it is difficult to attribute the exact amount that left through misinvoicing due to devaluation, this finding helps to explain why China has the highest net outflows in the region, as further discussed in the results section of this paper.

3.2. Tariff, non-tariff measures and indirect tax avoidance

In addition to capital flight and profit shifting to avoid direct taxes, trade misinvoicing has been shown to be motivated by indirect tax avoidance. In one of the earliest examples, Bhagwati (1964) conducted a pioneering analysis of trade discrepancies in Turkey's trade figures to find evidence of deliberate understating of the value of imports to avoid duties. Ferrantino, Liu, & Wang (2012) noted that despite decreasing role of Hong Kong, China as an entrepôt, the discrepancy in trade figures is actually increasing. They found strong statistical evidence of under-reporting exports at Chinese border to avoid paying value-added tax as well as tariff evasion at the U.S. border. Qureshi & Mahmood (2016) analysed trade data of Pakistan with 21 of its developed trading partners in 52 major traded commodities during between 1972 and 2013. The authors estimated that $21.2 billion was lost in tax revenue, with $11 billion attributed to evasion of customs duties and export withholding tax. The annual average net revenue loss due to trade misinvoicing was equivalent to 11 per cent of the total revenue generated from customs tariffs. In February 2018, European Commission send a letter of formal notice to the United Kingdom as importers evaded €2.7 billion in customs duties based on fictitious invoices and incorrect customs value declaration at importation of textiles and shoes from China between 2013-2016 (European Commission, 2018). Subsequently, France, Germany, Spain and Italy are estimated to have lost a combined €3.2 billion from 2013 to 2016 in VAT revenues, due to VAT-related fraud on the same merchandise – the mechanism is discussed in the next section (European Anti-Fraud Office, 2017).

As the importance of tariffs declines, a growing concern has been that trade misinvoicing is being used to bypass non-tariff measures (NTMs). A study by Kee & Nicita (2016) found that tariffs and NTMs are substitutes, and exporters or products that have higher ad valorem equivalents (AVEs) tend to have larger trade discrepancies, suggesting that firms mis-declare product codes or country of origin to circumvent the cumbersome and opaque NTMs.

Individual reported cases supporting tariff, non-tariff measures and GST/VAT evasion are abundant. For example, an Australian firm avoided paying AUD 200,000 in GST when it falsely claimed that imported goods were previously exported from Australia, rather than new overseas purchases (AUSTRAC, 2012). In one notable recent case, refined oil from the Republic of Korea destined for Taiwan, China has been transferred in the international waters to a ship of People's Democratic Republic of Korea, which was under the UN sanctions prohibiting such trade (BBC, 2017). In another case, a United States-based importer deliberately mis-declared more than 10 million pounds of catfish from Viet Nam as other fish to avoid paying anti-dumping duties and federal tariffs (Department of Justice, 2009). Highlighting that misreporting is not limited to values and quantities, Customs of India reported on a case of fraud whereby an importer falsely claimed regional value content to take advantage of preferential tax treatment under an FTA, resulting in a loss of $77 million in customs revenue (Nanda, 2017) .

3.3. Indirect tax rebates and export subsidies

While indirect taxes, such as tariffs and goods and services tax are generally in decline in the region, proportionally, due to liberalization efforts, revenue from trade taxes has declined significantly more since the 1990's. To offset these loses, governments have been increasing taxes on goods and services (VAT and GST). Since 1990, such taxes have increased from less than a fifth of indirect taxes to around one half (ESCAP, 2014). Goods and services tax, however, is also susceptible to dishonest behaviour. In addition to trying to minimize import values as discussed above, there are incentives to over-invoice exports to take advantage GST rebates which are given to goods that are not consumed within nations' borders.

Individual cases of outright fraud are abound. Indirect tax rebates have been at least partially responsible for increases in value of exports in Pakistan in the early 2000's (Aazim, 2003). In 2001, the Government of China uncovered a massive fraud scheme over tax rebates on fake exports totalling $500 million (Hewitt, 2001). In 2010 Bt3.209 billion (approx. USD 100 million) was disbursed as VAT refund in Thailand to non-existing operators to claimed to be exporters of metals and ores (Parpart, 2015). In Australia, a drawback scheme that allows importers who subsequently re-export imported goods and claim a refund of the import duty paid on goods that are exported. In one case, a liquor importer in Australia claimed such drawback on duties, only to be discovered later the exporting shipment containers included mineral water, with claimed fraud estimated to be AUD 285,000 (Australian National Audit Office, 2003). Similarly, over USD 1.8 million was defrauded from the Indian tax authorities by the way of duty drawbacks on non-existing exports (Prabhakar, 2017). At smaller scales, a number of cases in Singapore saw outbound tourists fraudulently claim GST returns on luxury goods on behalf local residents (Ting, 2017).

In the European Union, VAT fraud through missing trader and "carousel" schemes are estimated to add up to €53 billion per annum (European Commission, 2015). In the missing trader scheme, an importer (who must pay VAT to the revenue authorities) on-sells goods inclusive of

VAT, then disappears without paying the VAT obligations. For example, in Denmark, fraudsters imported carbon credits VAT-free, sold them in Denmark and disappeared while pocketing €5bn in VAT (Seager, 2009). Similarly, in the "carousel" schemes, the goods are further re-exported and benefit from a VAT refund. The revenue office does not only miss out the missing VAT payments, but also has to pay a VAT refund to the exporting firm (there is usually a chain of firms involved and it is difficult to link the exports to the original imports). The goods can go around multiple times across borders in such manner. While common in the European Union, cases of such schemes were now uncovered in Canada (LeBlanc, 2017). The prevalence of such fraud in Asia-Pacific is not known. To combat such fraud the European Commission recently proposed to shift the EU VAT regime from an origin-based system to destination based (European Commission, 2017).

While evidence of export over-invoicing for GST rebates should be technically easier to pick up when comparing export and import data, the case of missing trader fraud does not require over or under invoicing import/exports at the border. However, as in the recent case of fraud in the European Union of shoe and textile imports, the trades can be related (European Commission, 2017). This highlights that tax revenue authorities need to look even further than initial export/import transactions.

A related mechanism to defraud tax authorities is through export subsides. The reduction of export subsidies is a key staple of WTO Agenda, and the 2030 Sustainable Development Agenda under Target 2.b. While the total agricultural subsidies by the WTO members decreased from $4.6 trillion in 1995 to $180 billion in 2014 (UN, 2018), they are still prevalent in the region, and as such the tax revenues are susceptible to fraud.

An illustrative example of the perverse incentives offered through the export subsidies is in the United Kingdom. Irish Republican Army (IRA) would openly export pigs from Northern Ireland to the Irish Republic via the land border to take advantage of the £8 export subsidy per pig, then smuggle the pigs back and repeat. The result was "a considerable amount of cash and some very tired pigs" (Centre of Excellence Defence Against Terrorism, 2008). Celasun & Rodrik (1989) find that to take advantage of lucrative export subsidies, exporters over-invoiced the values, causing reported exports to substantially increase in Turkey. In one recent case in the region, fraudsters in Pakistan "paper exported" export to Afghanistan to gain export subsidies, with goods never leaving the warehouses (Mashhud, 2017).

3.4. Other reasons

As noted earlier, trade misinvoicing can be caused by a variety of reasons which are difficult to separate in analysis. Other motivations cited in the literature include money laundering, export surcharge avoidance, concealment of illegal commissions, justification of high domestic prices under price controls, or dumping at below market prices (Zdanowicz, 2009). Trade-based money laundering, in particular, is of concern as such efforts not only reduce revenues, but also, potentially, finance terrorism, facilitate the illicit drug trade and corruption as well as other illegal practices. Financial Action Task Force found that trade is one of three main avenues for money laundering and noted that as efforts to combat standard international money laundering techniques are becoming increasingly effective, trade-based money laundering is expected to take a more prominent role in the future (FATF, 2006).

4. Misinvoicing estimation practices

Current methods to estimate the levels of trade misinvoicing (and trade misinvoicing related IFFs) generally rely on comparing reported bilateral export and import data among trade partners, also known as mirror trade statistics method. The level of disaggregation of trade data varies. Following this approach, GFI (2017) uses bilateral differences between export and import values as reported by IMF Direction of Trade Statistics (DOTS):

$$\Delta X_{ij} = \left(V_{ji}^{M} - V_{ij}^{X} \right) \tag{1}$$
$$\Delta M_{ij} = \left(V_{ij}^{M} - V_{ji}^{X} \right) \tag{2}$$

Where i is the reporter, j is the partner, V is the trade value, X denotes exports and M denotes imports.
Source: Adapted from GFI (2017).

To adjust for c.i.f./f.o.b. unit differences, c.i.f. values are deflated by 1.1. Furthermore, where data availability allows, GFI calculates misinvoicing only with advanced economies as they are assumed to be more reliable, which is then scaled up for each country by dividing by the share of the country's trade with developed countries in its total trade. Where data availability is limited, they use trade with all countries in lieu of scaling up from trade with advanced countries alone. Furthermore, allowances are made for Hong Kong, China, to address entrepôt trade.[4]

Nitsch (2016, 2017), however, raised a number of concerns with the method. First, the c.i.f./f.o.b. deflation ratio that represents transit cost in practice has a wide distribution, and depends on distance, product value vis-à-vis weight, economies of scale, freight mode, among other factors in practice. Second, the high level of aggregation is likely to cancel some products' over-invoicing with other products' under-invoicing, which will reduce the estimated levels of illicit flows. High-level aggregation analysis is also likely to miss out on misdeclaration of commodity categories. Third, relying on trade with advanced economics alone assumes that trade misinvoicing is likely to have the same prevalence among advanced and less advanced economies. Given that motivations of misinvoicing includes more than capital flight, it is feasible that misinvoicing due to tax avoidance may occur more in trade with developing countries, that generally have higher barriers to trade. Fourth, misinvoicing on both ends of the trade would not be picked up as trade misinvoicing as the difference would be zero. Other concerns include entrepôt trade, time-lags, false quantities declared and outright smuggling. These limitations lead Nitsch to conclude that derived estimates lack any substantive meaning. Cobham & Janský (2017) further suggest any estimates based on merchandise trade data are likely to be conservative as this method does account for misinvoicing of services and intangibles.

Other methods have tried to address some of these issues. Mevel et al. (2015) extend the GFI methodology by using disaggregated HS 6-digit UNCTAD's data for export values, and CEPII's BACI data, which is adjusted econometrically to account for the c.i.f. component of imports and eliminate 'phantom' discrepancies that are in fact due to poor statistical practices in relevant customs authorities. Furthermore, the authors adjust for the time lag by taking into account the average number of days it takes to ship between countries. Similarly extending the GFI methodology, Berger & Nitsch (2008) used disaggregated 4-digit product level data for the

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[4] see Annex in GFI (2017) for details

world's five largest importers between 2002-2006. Zdanowicz (2009) advocated finding unit prices outside of bounds of certain thresholds as evidence of misinvoicing (even if the import and export values match). Chalendard, Raballand, & Rakotoarisoa (2016) go further by using detailed customs data in Madagascar, comparing them with publicly available matched export data at HS 6-digit disaggregation level. They extend this analysis to find evidence of misclassification as well as significant import overvaluation for individual products, based on prevalent international prices of certain goods. The analysis not only allowed the researchers to estimate losses accrued to customs offices (estimated at 30 per cent), but also to build risk profiles, which typically included new operators, or operators whose imports occurred in a specific time. Examining a specific case of banana imports in the United States, Hong, Pak, & Pak (2014) use free-market price of fresh banana and find that the average imports were undervalued by more than 50 per cent between 2000-2009.

5. Methodology

For the following analysis, 2016 UN Comtrade HS6 level trade data for exports and CEPII's BACI data for imports is used.[5] In total, there were 7,422,742 and 7,826,473 data rows for exports and imports, respectively. BACI data thus includes orphan imports - imports that have no matching exports. The data from two sources was combined by matching products, reporters and partners. The resultant data table was further reduced to 5,593,190 rows.

Based on the method described in Mevel et al. (2015) and Spanjers (2017), the difference between import and export values was calculated for all matched data – see equations (3) and (4) below. The differences were further weighted to adjust for discrepancies in volumes as proxied by reported weights in kg. The rationale of scaling the differences are that (1) large discrepancies in volumes are arguably more likely to be caused errors and different reporting practices (2), it mitigates the impact on values where large volume gaps exist (Spanjers, 2017).

$$\Delta X_{ijk} = \left(V_{jik}^{M} - V_{ijk}^{X}\right) \times \left[1 - \left(\frac{|Q_{jik}^{M} - Q_{ijk}^{X}|}{\max\left(Q_{jik}^{M}, Q_{ijk}^{X}\right)}\right)\right] \tag{3}$$

$$\Delta M_{ijk} = \left(V_{ijk}^{M} - V_{jik}^{X}\right) \times \left[1 - \left(\frac{|Q_{ijk}^{M} - Q_{jik}^{X}|}{\max\left(Q_{ijk}^{M}, Q_{jik}^{X}\right)}\right)\right] \tag{4}$$

Where i is the reporter, j is the partner, k is the product at HS6 level, V is the trade value, Q is the quantity in kg, X denotes exports and M denotes imports.
Source: Adapted from Spanjers (2017).

Notably, such weights scale down misinvoicing estimates when one product is misreported to belong to different subheading, when misinvoicing country of origin/destination is done on purpose for fraudulent reasons, when goods are smuggled through customs at either source or destination, or when volume misreporting is intentional. As such, more weight will be given to misinvoicing where quantities match better – an arguably more sensible approach to elicit evidence of deliberate misinvoicing at both ends of trade. As not all data rows contained

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[5] In BACI, imports' cif costs are estimated and removed from imports values to compute fob import values. Second, the reliability of country reporting is assessed based on the reporting distances among partners. These reporting qualities are used as weights in the reconciliation of each bilateral trade flow twice reported. See more at http://www.cepii.fr/cepii/en/bdd_modele/presentation.asp?id=1

respective weights, further 455,411 observations were dropped. Overall, 82% and 75% of total export and import values are used in the analysis, respectively.

The bilateral differences between export and import values (ΔX_{ijk}) and import and export values (ΔM_{ijk}) at HS6 product level can take on both positive and negative values. Negative values of ΔX_{ijk} (export over-invoicing) and ΔM_{ijk} (import under-invoicing) would then constitute misinvoiced inflows, whereas positive values of ΔX_{ijk} (export under-invoicing) and ΔM_{ijk} (import over-invoicing) would be misinvoiced outflows.

6. Results

6.1. Baseline results

The following table summarizes each misinvoicing scenario in Asia-Pacific region for 2016 using the available data, together with overall flows. As discussed later in the limitations, caution must be exercised when interpreting the estimates. Most importantly, export over-invoicing and import under-invoicing must necessarily cancel each other out – they are different entries of the same trade. As such, summing them up across countries would result in double counting. However, it is possible that fraudulent traders in one country resort to every type of misinvoicing – hence the country totals must be interpreted as top bounds. Finally, if one was to assume that CEPII's estimates of f.o.b. imports are true, only export over-invoicing and under-invoicing can be used as proxies for outflows and inflows. However, such assumption would inhibit calculation of import-under invoicing (which are widely acknowledged to exist) that has significant tax revenue implications.

Looking at the details of the table, China has the highest level of net outflows due to misinvoicing in 2016, whereas Hong Kong, China has the highest net inflows due to misinvoicing.[6] The large net outflows from China are as expected (due to 2015 devaluation discussed previously), and large net inflows in Hong Kong, China and Singapore are due to its low tax rates being used as a hub for profit shifting. On the other hand, significant net inflows in Japan and net outflows in India are harder to explain, suggesting that non-capital flight/profit shifting motivations are at play.

An important observation, is that aggregate net outflows hide substantial variation seen in different types of misinvoicing. For example, while Malaysia and Kyrgyzstan may have similar levels of net outflows, disaggregated data shows that Malaysia has much higher levels of both, misinvoiced inflows and outflows. Since each type of misinvoicing (that can potentially cancel the others out when inflows are netted off against outflows) has tax revenue implications, it is argued that analysis of misinvoicing should be carried out at a disaggregated level.

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[6] Markedly, using GFI method relying on IMF DOTS data from 2016 results in $350 billion net *inflow* to China.

Table 2. Trade misinvoicing flows in Asia-Pacific, 2016 (United States dollars, millions)

	Inflows		Outflows		total inflows	total outflows	net outflows
	Export over-invoicing	Import under-invoice	Export under-invoicing	Import over-invoicing			
Hong Kong, China	44 097	55 072	2 738	28 017	99 168	30 756	-68 413
Singapore	20 005	21 598	4 786	27 257	41 603	32 043	-9 560
India	17 532	21 224	14 678	16 806	38 756	31 484	-7 272
Australia	11 105	12 527	5 652	13 193	23 632	18 845	-4 788
Pakistan	1 175	5 966	1 733	2 390	7 141	4 124	-3 018
Kazakhstan	3 070	2 315	1 674	1 137	5 385	2 811	-2 574
Malaysia	11 411	20 873	18 741	12 263	32 284	31 004	-1 280
Kyrgyzstan	119	1 166	57	165	1 285	222	-1 063
Russian Federation	7 885	9 131	8 472	7 811	17 016	16 283	-733
Myanmar	593	389	353	133	982	486	-497
Macao, China	67	368	7	133	434	141	-293
Georgia	95	630	52	575	725	626	-99
Lao P.D.R.	110	83	72	56	193	127	-65
Fiji	50	222	51	191	272	241	-31
Solomon Islands	5	66	5	38	71	43	-28
Mongolia	48	264	67	218	313	285	-28
Samoa	0	59	3	30	59	33	-26
Kiribati	0	24	0	18	24	18	-6
Palau	0	10	0	7	10	7	-3
Maldives	6	229	38	225	235	263	28
Armenia	8	117	40	144	125	183	58
Sri Lanka	846	1 453	711	1 810	2 298	2 521	223
Cambodia	382	765	1 476	204	1 147	1 681	533
Azerbaijan	51	271	1 079	286	321	1 365	1 044
New Zealand	1 760	1 886	1 752	3 523	3 646	5 275	1 629
Korea (Rep. of)	27 502	25 086	31 686	22 578	52 588	54 264	1 675
Indonesia	9 853	10 890	15 560	7 750	20 743	23 310	2 566
Thailand	13 397	12 284	16 424	13 689	25 680	30 114	4 433
Turkey	7 585	8 811	9 818	13 217	16 397	23 035	6 638
Japan	35 257	20 302	49 852	37 556	55 559	87 408	31 850
China	161 363	50 577	206 793	43 182	211 940	249 975	38 035

Source: ESCAP calculations based on data from UNCTAD and CEPII

6.2. Effects of weights and aggregation bias

As discussed previously, product level aggregation is likely to add significant bias to the estimates as some outflows within a 6-digit aggregation may cancel out inflows. Additionally, aggregation masks deliberate product-level miscategorizations to take advantage of lower tariffs/bypass no-tariff measures. Ideally, detailed bilateral transaction level data would be used to conduct such analysis. In lieu of such data, higher level of aggregation of the same data is used based the same methodology, to demonstrate the aggregation bias. However, since weights in higher level of data aggregation are less meaningful, the weighting component in formulas (3) and (4) were left out.

Figure 2 summarises estimated inflows and outflows using aggregation subheading, heading, chapter and country level. In addition, baseline results using weights to adjust for discrepancies in volumes as reported in Table 2 are included for comparison. As expected, leaving the weighting procedure out, both inflow and outflows in the region are inflated significantly – by an order of 2.0 in case of outflows and 2.4 in case of inflows. When misinvoicing is estimated

using more aggregated data, the estimated flows reduce significantly, by nearly 50% in case of inflows and by more than 60% in case of outflows. As such, this shows that estimates derived using highly aggregated data, such as total bilateral flows are likely to significantly underestimate their prevalence. Moreover, even subheading level of disaggregation used in this study is likely to suffer from similar attenuation bias, demonstrating the need to use disaggregated, ideally transaction level data matching for more accurate estimates.

Figure 2. Effects of weighting and aggregation bias
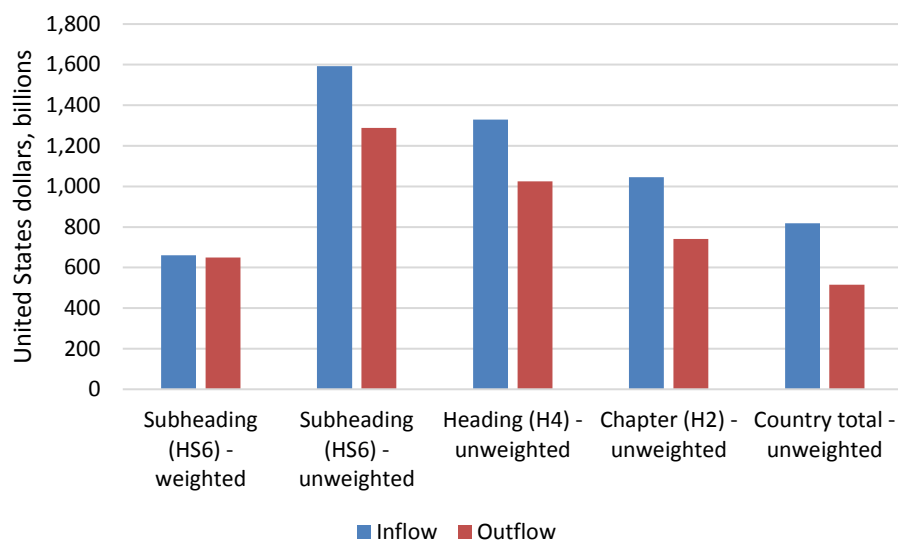
Source: ESCAP calculations based on data from UNCTAD and CEPII.
Note: The values are based on the sum of countries reported in Table 5. Products that do not have quantities reported on export side have been omitted to allow for comparison as described in the methodology section.

6.3. Sectoral decomposition

To highlight which sectors drive misinvoicing, each type of weighted misinvoicing is summed up across HS chapters and presented in Figure 3. In absolute terms Chapter XVI[7] ("Machinery and mechanical appliances; electrical equipment; parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers and parts and accessories of such articles") is the single biggest category, responsible for 35% and 45% of total outflows and inflows in the region, respectively (Figure 3a). Absolute values, however, mask the fact that Chapter XVI is also the most heavily traded sector, accounting for 27% and 28% of the regions' total imports and exports, respectively, used in this study.[8] When looking at misinvoicing relative to total imports in each chapter (Figure 3b), the results are more homogenous. Chapters XIII ("Articles of stone, plaster, cement, asbestos, mica or similar materials; ceramic products; glass and glassware") and XIV ("Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewellery; coin") show

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[7] See Appendix 2 for chapter description.
[8] Notably, these totals are only for which matching data was available, as described in the methodology section.

relatively higher propensity as vehicles for capital inflows, whereas trade in goods under chapter XVI result in highest relative level of net outflows.

Figure 3. Sectoral decomposition of misinvoicing in Asia and the Pacific in 2016

(a) Absolute values of misinvoicing by chapter, Asia-Pacific

(a) Misinvoicing relative to total chapter imports, Asia-Pacific
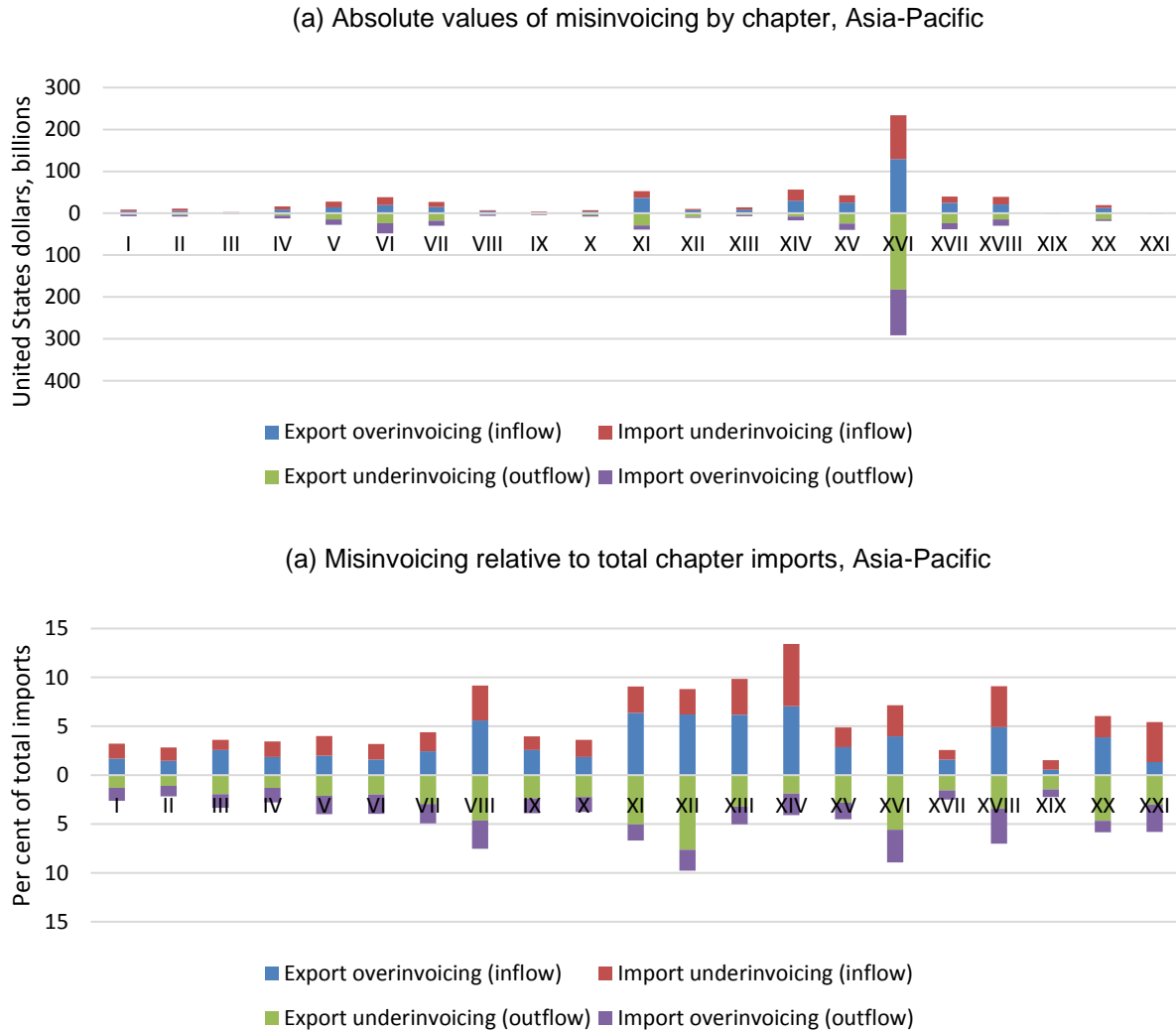
Source: Author's calculations based on data from UNCTAD and CEPII.

Conducting analysis at subheading level (HS6), shows that two largest categories responsible for inflows are high value jewellery and precious metals (Table 3a), followed by high-valued electronics and electronics components. High-value electronics and components also have the highest outflows through misinvoicing. The fact that products at the same heading category (HS4 code 8534) appear in both inflows and outflows suggests that either customs declaration standards are significantly different among importing/exporting countries, or that goods' product categories are deliberately mis-declared.

Table 3. Top misinvoiced commodities at HS6 level in Asia-Pacific in 2016 (United States dollars, millions)

(a). Misinvoicing resulting in net inflows

HS2012 code	Commodity description	total inflows	total outflows	net outflows
711319	Jewellery; of precious metal (excluding silver) whether or not plated or clad with precious metal, and parts thereof	18 430	2 422	-16 007
710812	Metals; gold, non-monetary, unwrought (but not powder)	22 210	7 857	-14 353
901380	Optical devices, appliances and instruments; n.e.s. in heading no. 9013 (including liquid crystal devices)	18 068	4 012	-14 055
853400	Circuits; printed	13 359	1 549	-11 809
854233	Electronic integrated circuits; amplifiers	13 138	2 235	-10 903

(a). Misinvoicing resulting in net outflows

HS2012 code	Commodity description	total inflows	total outflows	net outflows
854231	Electronic integrated circuits; processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits	1 556	8 650	7 093
851762	Communication apparatus (excluding telephone sets or base stations); machines for the reception, conversion and transmission or regeneration of voice, images or other data, including switching and routing apparatus	4 849	12 902	8 053
854239	Electronic integrated circuits; n.e.c. in heading no. 8542	6 639	18 019	11 381
851712	Telephones for cellular networks or for other wireless networks	11 418	24 641	13 223
847330	Machines; parts and accessories of automatic data processing, magnetic or optical readers, digital processing units	4 514	20 342	15 828

Source: Author's calculations based on data from UNCTAD and CEPII.

6.4. Scaling up to account for missing data

One notable shortcoming of the analysis is that not all available trade data was used as matched data were not available at either import or export side. This could be due to erroneous or deliberate misdeclaration of product code or country or origin/destination, as well as time-lag. Of the countries that had matching data for (31 in the original analysis), the matching export and import coverage was 82% and 75% of those countries total exports and imports, respectively. Such incomplete coverage is likely to understate the true value of misinvoicing. To scale the estimates up, an assumption was made that for non-matching commodity records the misinvoicing rates are the same – from both the import and export side. Following this assumption, the figures presented in Table 3 were scaled up by inverse of the proportion of total matched export and import coverage. The results presented in Table 4 show that the effect of scaling up leaves the ranking of countries vis-à-vis their net outflows largely the same, though as expected the flows, both gross and net, are increased.

Table 4. Trade misinvoicing flows in Asia-Pacific – scaled up, 2016 (United States dollars, millions)

	Export data used (%)	Import data used (%)	Inflows		Outflows		net outflows
			Export over-invoicing	Import under-invoice	Export under-invoicing	Import over-invoicing	
Hong Kong, China	70	75	63 050	73 798	3 915	37 544	-95 388
Singapore	44	66	45 294	32 489	10 837	41 001	-25 945
India	75	68	23 469	31 413	19 648	24 874	-10 359
Australia	85	81	13 039	15 439	6 636	16 259	-5 582
Pakistan	90	70	1 311	8 485	1 934	3 400	-4 463
Kazakhstan	97	79	3 157	2 939	1 721	1 444	-2 931
Malaysia	72	72	15 897	29 192	26 108	17 150	-1 830
Kyrgyzstan	92	79	130	1 471	62	209	-1 330
Russian Federation	66	86	11 924	10 593	12 813	9 061	-644
Myanmar	95	77	626	505	372	173	-586
Macao, China	38	75	175	487	19	177	-466
Georgia	95	77	100	819	54	747	-118
Lao P.D.R.	67	74	163	111	106	75	-93
Solomon Islands	28	52	19	126	17	73	-54
Mongolia	100	64	48	412	67	340	-54
Fiji	79	68	64	328	64	281	-46
Samoa	77	65	0	91	4	47	-41
Kiribati	85	56	0	42	0	31	-11
Palau	15	49	0	19	2	14	-4
Maldives	99	70	6	327	38	321	27
Armenia	93	57	8	207	43	253	81
Sri Lanka	91	74	934	1 959	785	2 441	333
Cambodia	93	76	413	1 006	1 593	269	442
Korea (Rep. of)	94	71	29 237	35 398	33 684	31 859	908
Azerbaijan	94	75	54	364	1 151	384	1 118
Indonesia	98	77	10 015	14 213	15 816	10 114	1 702
New Zealand	95	81	1 855	2 324	1 847	4 340	2 008
Thailand	85	75	15 819	16 359	19 395	18 231	5 447
Turkey	93	80	8 169	10 976	10 573	16 464	7 892
Japan	85	75	41 582	27 071	58 796	50 079	40 222
China	88	76	183 441	66 595	235 087	56 858	41 909

Source: Author's calculations based on data from UNCTAD and CEPII.

6.5. Effect on government revenue

The estimated losses to tax revenues of governments in the region due to trade misinvoicing are significant. Table 5 matches the trade misinvoicing figures with average tax rates to provide ball-park estimates on each type of illicit financial flow. Consumption tax excess refund is loss due to refunds arising from export over-invoicing. Next are losses when consumption tax is not collected in the case of import under-invoicing. Similarly, tariff revenue when under-invoicing imports. Outflows resulting from export under-invoicing and import over-invoicing result in lost profit tax revenues. The final column represents the sum of all losses as percentage of tax revenue in each economy. For the region as total, up to 6.1% of tax revenue is lost due to misinvoicing – 7.6% if upper-bound estimates are used.

Again, caution must be exercised with these estimates as some losses may potentially be offset. For example, a trader might over-invoice imports to shift money abroad (and pay less profit

tax) but be forced to pay higher consumption tax and tariffs. Furthermore, as export over-invoicing and import under-invoicing are two sides of the same transaction, tax gains for some countries are likely, as the aim for traders is minimizing tax expenses, rather than avoiding them entirely. Finally, as aggregated tax rates were used, the results do not take into account the diversity of regulations governing certain products, including any exceptions or other taxes (and subsidies) applied. On the other hand, data limitations also miss a substantial portion of trade flows, and it is likely that the true misinvoicing estimates are substantially greater.

Table 5. Effects of trade misinvoicing on tax revenues (millions United States dollars)

	consumption tax		lost tariff revenue	lost profit tax revenue	total lost (% of tax revenue)
	excess refund	not collected			
Azerbaijan	9	49	23	177	4.4%
Australia	1 110	1 253	287	4 900	2.8%
Armenia	2	23	6	32	2.8%
Solomon Islands	1	7	6	10	7.0%
Myanmar	30	19	16	131	N/A
Cambodia	38	77	95	328	17.6%
Sri Lanka	127	218	114	30	4.9%
China	27 432	8 598	3 925	26 997	6.2%
Fiji	4	20	27	49	9.0%
Georgia	17	113	8	90	6.7%
Kiribati	0	1	N/A	4	12.3%
Hong Kong, China	0	0	0	5 382	N/A
Indonesia	985	1 089	687	3 939	7.0%
Japan	2 821	1 624	477	22 901	4.9%
Kazakhstan	368	278	119	455	9.0%
Korea (Rep. of)	2 750	2 509	2 544	9 876	9.0%
Kyrgyzstan	14	140	53	14	19.2%
Lao P.D.R.	11	8	2	20	1.9%
Macao, China	0	0	0	N/A	0.0%
Malaysia	685	1 252	1 090	7 038	23.8%
Maldives	0	14	26	34	9.1%
Mongolia	5	26	13	29	4.2%
New Zealand	264	283	40	1 582	4.3%
Palau	0	0	0	5	8.2%
Pakistan	200	1 014	745	763	N/A
Russian Federation	1 419	1 644	489	1 433	4.3%
India	2 454	2 971	1 815	7 430	5.9%
Singapore	1 400	1 512	0	577	8.2%
Thailand	938	860	942	6 745	14.9%
Turkey	1 365	1 586	216	4 192	4.7%
Samoa	0	9	7	4	10.3%
Total	**44 450**	**27 197**	**13 771**	**105 169**	**6.1%***

Source: ESCAP calculations based on data from UNCTAD, CEPII and World Bank. Consumption tax rates were derived from multiple sources. Simple average tariff rates were used for tariff tax loss (not disaggregated). Data on tax revenue is for the latest years available.
Notes: *average percentage calculation excludes from total countries with missing tax revenue data.

### 6.6. Prices and misinvoicing

One of the main shortcoming of estimating misinvoicing through differential between export and import declared data is that it misses out instances where declaration is under/over valued at both sides of the border. Researchers and border control agencies are well aware of this method of misinvoicing and a number of papers and case studies specifically looked at

customs-level data to look at relative prices. Using UNCTAD's disaggregated export data only, the following analysis sought to provide a high-level overview of relative export prices by source and destination. First, to reduce the effect of outliers, entries in the top and bottom 5th percentiles of prices (measured as reported export value over reported export quantity in kg) were removed from further analysis. Next, for each commodity (HS6 level) standardized prices were obtained (see equation 5). Finally, a simple average of standardized prices was calculated by reported i, and destination, j. The results are presented in Figure 4.

$$\widetilde{Price}_{ijk} = \frac{\left(Price_{ijk} - \overline{Price}_k\right)}{\sqrt{\frac{\sum\left(Price_{ijk} - \overline{Price}_k\right)}{n-1}}} \tag{5}$$

Notes: Where i is the reporter, j is the partner, k is the product at HS6 level, $Price_{ijk}$ is reported export value divided by reported weight (in kg), $\overline{Price}_k$ is the simple average of commodity price across all reporters and partners.

Figure 4. Simple average of standardized export prices in Asia-Pacific (2016), by source and destination
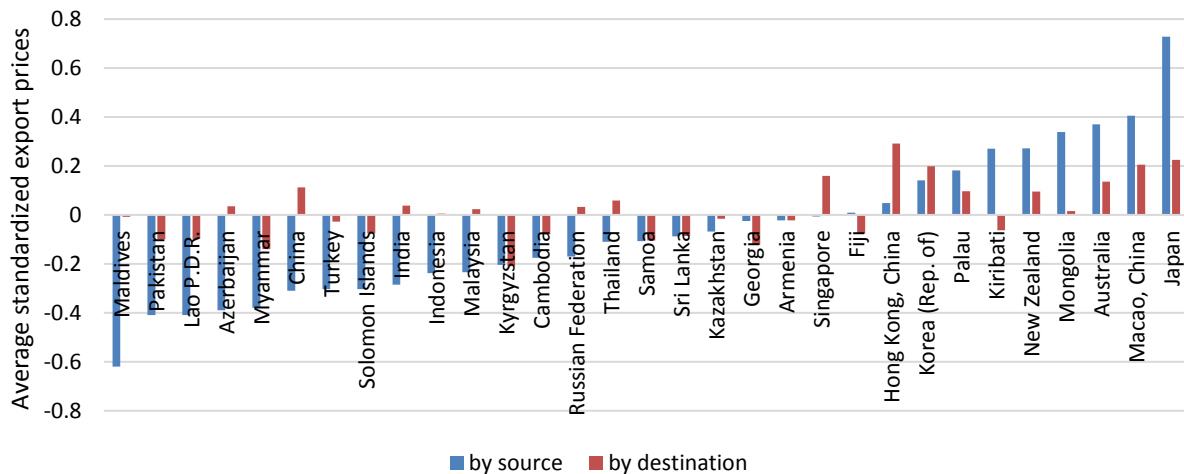
Source: Authors' calculations.

Notably, data availability inhibits transaction-level detailed analysis that is usually carried out by customs authorities when looking at acceptable price ranges for various products. Moreover, aggregation is likely to mask variations in quality and brand-value addition. Finally, averaging across economies is also likely to cancel out variation where some products are over/under prices for different reasons. Nevertheless, the heterogeneity in prices even at the aggregate levels examined does point to a systematic pattern. For example, as previously noted in the literature, Hong Kong, China acts as tax haven for trade with China. The fact that average export prices with Hong Kong, China as destination are the highest in the region broadly supports the hypothesis. China, on the other hand, has export prices below world averages. While this may just mean that products originating in China are competitively priced by international standards, it also supports the arguments that export under-invoicing is used as a method for financial outflows.

This is further supported by the fact that export prices with China as destination are above world average, further contributing to outflows.

6.7. Limitations

A number of limitations must be noted when using the results of the analysis in this study. First, as it is difficult to separate the evidence of export under-invoicing from import over-invoicing (and vice versa), double counting is inevitable when trying to estimate all four types of misinvoicing. Such analysis, however, reveals which countries, by source and destination, are likely to experience each type of misinvoicing, as well as how much revenue is potentially lost due to each method. For total net flows, under the assumption that import figures estimated by CEPII are correct, one would use only export over/under invoicing figures. Next, the CEPII import figures used in this study and elsewhere already account for some discrepancies between import and export figures. As such, they mask import over/under invoicing that would be evident if raw import figures were used. However, using raw import data (as reported by UNCTAD) would mean running into problems of c.i.f. to f.o.b. conversion. Next, aggregation at HS6 level, while allows more accurate estimation of export/import mismatch is still prone to aggregation bias as discussed above. Furthermore, using reported quantities as weights reduces estimates the larger the quantity difference. The quantitate differences could be due to different reporting practices, 'time-lag'. However, this will also remove those instances where origin/destination or product code were deliberately misreported. Using transaction level data at both import and export side could potentially remove all these limitations.

However, relying on the difference between reported imports and corresponding exports will not help identifying cases where matching misreporting is done on both sides of the trade. Even relying on comparable international transactions to identify under/overvalued trade may provide a poor benchmark if affected transactions comprise a large proportion of trade, depressing the benchmarking price against which deviations are compared.

The analysis on the impact of misinvoicing on revenue was not done at disaggregated level – impact on tariff revenue should be done at tariff lines level to more accurately estimate revenue loss. GST and VAT is applied on value added (and less if imports were used as imports), and there are many exemptions and specific rates for a number of products. In addition, export subsidies, as well as export taxes, license and royalty payments were not accounted for. Finally, shifting from high tax rate jurisdiction to low tax rate jurisdictions will result in net positive effect for a destination jurisdiction, which was not accounted for in this study.

Last but not least, an increasing proportion of world trade is in services. Detailed bilateral data, however, is not available. Trade in services could be used, arguably with more ease, for the purposes of capital flight or profit shifting, as well as avoidance of indirect taxes. As more detailed data becomes available, however, it is likely that this research area will gain more attention.

7. Conclusion and way forward

"If a statistic looks interesting, it is probably wrong."

- *Twyman's Law*

This study provided a discussion of trade misinvoicing and its implications on tax revenues in the Asia-Pacific region. As noted by Nitsch (2017) and demonstrated in this study, estimates of misinvoicing largely depend on the methodological assumptions, and analysis is severely constrained by lack of access to detailed, ideally transaction-level export and matching import data. As such, accurate estimation of misinvoicing was beyond the scope of this exercise. This study, however, aimed to highlight the issues driving misinvoicing and provide rough order of magnitude estimates of misinvoicing and resultant capital inflows and outflows. Measuring IFFs and misinvoicing is akin to measuring corruption or narcotics proceeds: estimates are imprecise but there is little doubt that they exist and substantially deplete region's tax revenues that could be used as much needed financing for sustainable development.

The findings show that in the region (based on available but incomplete data), nearly $200 billion was lost in tax revenues in 2016 – 6.1% of the regions total tax revenue (using low-end estimates). In comparison, the *global* net official development assistance and official aid received in 2016 was just under $160 billion (World Bank, 2016). Through closing loopholes enabling misinvoicing, substantial resources can be added to governments' revenues. As discussed in detail in the Asia-Pacific Trade and Investment Report 2017, a combination of good governance, together with targeted trade and investment policies, complementary domestic policies and trade facilitation have the potential to substantially contribute to the 2030 Sustainable Development Agenda (ESCAP, 2017a).

The findings further highlight that the landscape of trade misinvoicing in the Asia-Pacific region is diverse and requires close cooperation and exchange of information between customs and tax offices in different countries, such as through *the Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific* (ESCAP, 2017b).[9] The Framework Agreement was adopted on 19 May 2016 by the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), making it the newest UN treaty in the area of trade and development. The Framework Agreement is fully dedicated to the digitalization of trade processes and enabling the seamless electronic exchange and legal recognition of trade-related data and documents across borders, rather than only between stakeholders located in the same country. Implementation of the Agreement is expected to greatly reduce transaction time and costs as well as increase regulatory compliance. The Agreement is also expected to reduce misinvoicing, thereby increasing countries' import, income and expenditure tax revenues, providing much needed financing for development for the developing countries.

The study examined "unilateral misinvoicing", where over/under invoicing occurs on one side of trade. This is what is commonly estimated when studies are conducted using mirror statistics. Notably, these flows can be relatively easily estimated if detailed, ideally transaction-

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[9] For details of the Agreement see: http://www.unescap.org/resources/framework-agreement-facilitation-cross-border-paperless-trade-asia-and-pacific

level data, is matched on exporting and importing side. Any discrepancies then could be followed up on by relevant authorities. Crucially, while it is a low-hanging fruit with substantial benefits, such information exchange relies on data sharing between relevant government agencies across borders, which is currently not evident in the region. Ideally, through collaborative efforts across borders, disaggregated transaction-level data should include the following information:

- Departure dates and arrival
- Exchange rates at departure and arrival (with corresponding conversion to United States dollars)
- Units, volume
- Separated c.i.f. component
- Tariff rate applied
- Origin decomposition
- Certification required SPS, TBT, etc (to check against NTM avoidance)
- If entrepôt trade – origin, final destination
- VAT refund/collected
- Export subsidies, if any

With such data available, it would be evident if, for example, oil that was shipped from a port in the Republic of Korea destined for Taiwan, China was siphoned off to DPRK against sanctions. Matching bilateral data would help to identify unilateral (as well as bilateral – discussed below) misinvoicing where at one trade values are misidentified at one side. This will also help to combat fake exports (for subsidies and rebates) as well as imports (for drawbacks and inflated costs in profit tax avoidance). If data is further linked to payments, illicit transfers through multiple invoicing could be reduced.

There are currently only a few examples of such data sharing in action in the region: European Union-China Smart and Secure Trade Lanes (SSTL) pilot project and a pilot study of export and import exchange declaration between two Australia and New Zealand. In both projects, the aim was to facilitate trade through sharing of export-based information with customs authorities of the destination, obviating the needs to duplicate data entry on the importing side, thereby reducing the regulatory burden on the industry, improving risk assessment and reducing customs clearing time. An additional benefit of such initiatives, since detailed trade data is shared among customs agencies, is the promise to eliminate trade misinvoicing (if defined as deliberate efforts on the part of traders to provide different data to exporting and importing authorities).

Notably, even among the developed economies of Australia and New Zealand, the findings of the project reported that there was insufficient similarity between export data of overseas Governments and the data requirements of the Customs and Border Protection, suggesting that a lot of work has to be done to harmonize reporting practices to make such efforts viable. The SSTL pilot, on the other hand, showed more progress, and is hailed to be "the first and so far only viability test of the potential of the WCO SAFE Framework of Standards to secure and facilitate global trade".[10] The project specifically focuses on data quality, where standardize

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[10] https://ec.europa.eu/taxation_customs/general-information-customs/customs-security/smart-secure-trade-lanes-pilot-sstl_en

data sets are collected from the "source transactions", that, in some cases, is further supplemented by logistical data not known at the outset. The key to the success of the pilot, in addition to quality of the data, is trust between Customs administration and mutual recognition of controls on both sides of the border. The project recently entered into a new phase in which the first airfreights shipments from China to the European Union employed the system.[11]

This study also noted the phenomena of "bilateral misinvoicing", or when exports and related imports are mispriced on both sides of trade. While matching transaction data will not necessarily pick up discrepancies in values, systems should be in place to red-flag transactions that are below/above prices of similar products.[12] *GFTrade*, a system developed by GFI to highlight if goods are priced outside of typical ranges for comparable products, can for example, be used by customs official to help identify suspect cases.[13] Customs-to-customs information exchange can further facilitate fraud detection if transaction-level data are linked to individual traders, enabling wider comparison of their trade practices across different sources/destinations.

The risk of "Missing trader fraud", though not part of misinvoicing practices, can be substantially reduced if governments adopt a destination-based GST/VAT system, similar to the European Union's proposed destination VAT system. In such system, a trader would not receive VAT/GST rebate at the exporting side and separately pay VAT/GST at the importing side, but the net liability would depend on the difference in VAT/GST between source and destination rates. In the case of GST/VAT being higher at the destination side, the trader would pay only the net difference to the destination jurisdiction, with the balance to be settled by the source jurisdiction directly (bypassing the trader). In the case when GST/VAT is higher at the source (and hence requiring a rebate), the source jurisdiction would similarly settle the GST/VAT balance with the destination jurisdiction, but in this case, provide a refund of the balance to the trader. Such a system, in theory, should provide extra motivation for the relevant authorities to increase diligence at both, import and export side. This can only be achieved, however, when customs data sharing between jurisdictions is streamlined, and there is high level of trust and collaboration between government agencies across the border. The benefits, however, would include not only reduced fraud due to misinvoicing, but lower incentives for VAT/GST missing trade fraud (as only net amount would be the incentive rather than the whole VAT liability – the balance would be paid by the source jurisdiction directly to the destination jurisdiction). Additional benefit would include fewer transactions (and hence costs) as a trader would need to pay/get a rebate at just one point rather than two, and settlement of accounts between jurisdictions would likely to happen on monthly/quarterly basis (rather than after each transaction).

Combating IFFs has been explicitly included as part of the 2030 Development Agenda. Target 16.4 is "By 2030, significantly reduce illicit financial and arms flows, strengthen the

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[11] http://www.aircargonews.net/news/business/single-view/news/smart-and-secure-trade-lanes-gain-momentum.html

[12] See WCO (2018). Guidelines on the development and use of a national database as a risk assessment too. Available from http://www.wcoomd.org/en/topics/valuation/instruments-and-tools/guidelines.aspx

[13] For details, see GFI (2016). GFI Launches Database—GFTrade—to help Developing Countries Generate Millions in Additional Public Revenue. Available from: http://www.gfintegrity.org/press-release/gfi-launches-database-gftrade-to-help-developing-countries-generate-millions-in-additional-public-revenue/

recovery and return of stolen assets and combat all forms of organized crime". The corresponding indicator is 16.4.1 "Total value of inward and outward illicit financial flows (in current United States dollars). So far, no methodology to estimate IFFs has been agreed on, though there are proposed candidates (see Cobham & Janský (2017)). Although misinvoicing is but a part of illicit financial flows, customs data analysis should provide better estimates on this sub-category. Furthermore, data sharing and consequent reduction in misinvoicing will inevitably contribute to Target 17.1 "Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection", with the corresponding indicators 17.1.1 "Total government revenue as a proportion of GDP, by source" and 17.1.2 "Proportion of domestic budget funded by domestic taxes". Indirectly, the money collected and saved will be able to address all other goals and targets of the Sustainable Development Agenda.

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Appendix

Trade data discrepancies – an overview

The size of such discrepancies between reported imports and corresponding exports is considerable, reaching 26% of total exports in 2016.[14] This is not a recent phenomenon, and the figure has been consistently within 26%-27% range since 2000. While lack of data, particularly on exporting side has forced researchers to resort to using mirrored imports in place of missing export data, recent improvement in data collection still points to a large gap between reported exports and imports.

The most notable reason for the discrepancy is that exports are reported in "free on board" (f.o.b.) values, whereas imports are reported in "cost, insurance, freight" (c.i.f.) values. This means that import values are generally higher because they include additional costs associated with moving goods from exporting to importing countries. The difference between c.i.f. and f.o.b. values is a point of interest in its own right, with differences in values commonly attributed to trade costs (see Arvis et al. (2016)). Indeed, IMF, when faced with missing export data, commonly resorts to utilizing "mirrored imports" as proxy and adjusts them by a constant coefficient of 1.1 to account for f.o.b./c.i.f. difference.[15] However, difference in reporting units fails to account for instances when f.o.b. reported values are *larger* than reciprocal c.i.f. reported values (implying negative trade costs – 12% of world's total exports). Moreover, reported quantities of products, which in theory should be the same irrespective of dollar values, are also often mismatched. While some of these differences can be attributed to different practices in reporting or outright data-entry errors, it is generally acknowledged that other mechanisms also play a significant role.

Several other reasons have been given as explanations for the discrepancies.[16] These include goods passing through third countries, such as Singapore and Hong Kong, China, causing discrepancies between reported final destinations or country of origin, as well as re-exports of imported goods. The Statistics Working Group specifically looking at discrepancies in bilateral trade figures between China's and the United States found that in 2010, 47% of the discrepancies was caused by intermediary trade (Statistics Working Group, 2012). At the same time, 55% of eastbound trade was direct (without passing through intermediary jurisdictions) and the report notes that higher import prices recorded were due to mark-ups by intermediary parties. Different trading and clearing systems have also been cited as culprits (Carrere & Grigiriou, 2014). In addition, exports dispatched close to the end of the reporting year may appear as imports in the next financial year by the importer ('time-lag"); and exchange rate fluctuations may cause inadvertent swings in reported values that are commonly reported in United States dollars (ITC, n.d.). An emerging concern, however, is that some discrepancies are caused by deliberate actions

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[14] Defined as the share of the sum of absolute differences between bilateral exports and corresponding imports of world's total exports, based on the IMF DOTS data. Missing flow values have been treated as zeros for the calculation.

[15] Notably, the difference in IMF's data in 2016 between worlds' total exports and world's total imports is only a factor of 1.02.

[16] See Javorsek (2016) for a detailed overview of the potential sources of asymmetries in bilateral merchandise trade statistics.

by traders to bypass capital controls, and circumvent taxes and non-tariff measures, among other fraudulent motivations.

Supplementary tables

Table A1. Effects of aggregation bias – detailed output

	(i) Subheading (HS6) - weighted		(ii) Subheading (HS6) - unweighted		(iii) Heading (H4) - unweighted		(iv) Chapter (H2) - unweighted		(v) Country total - unweighted	
	inflow	outflow	inflow	outflow	inflow	outflow	inflow	outflow	inflow	outflow
Azerbaijan	321	1 365	427	2 656	373	2 601	257	2,486	108	2 337
Australia	23 632	18 845	47 688	46 592	35 303	34 207	25,741	24,645	16 177	15 082
Armenia	125	183	258	534	219	495	167	443	57	332
Solomon Islands	71	43	121	106	97	82	73	57	53	38
Myanmar	982	486	3 425	2 817	2 931	2 323	2,361	1,753	1 774	1 166
Cambodia	1 147	1 681	5 375	9 714	2 834	7 172	1,332	5,670	946	5 284
Sri Lanka	2 298	2 521	5 163	5 379	3 695	3 911	2,362	2,578	1 213	1 429
China	211 940	249 975	497 365	468 872	416 869	388 377	327,433	298,941	256 851	228 359
Fiji	272	241	600	784	336	520	214	397	99	283
Georgia	725	626	1 703	1 501	1 458	1 256	1,205	1,004	824	622
Hong Kong, China	99 168	30 756	366 584	66 509	349 861	49 786	324,867	24,792	308 341	8 266
Indonesia	20 743	23 310	45 487	44 238	33 808	32 559	25,177	23,928	16 174	14 925
Japan	55 559	87 408	109 847	170 039	73 185	133 377	39,284	99,475	20 535	80 726
Kazakhstan	5 385	2 811	16 165	7 178	15 448	6 461	14,471	5,483	13 606	4 619
Korea (Rep. of)	52 588	54 264	103 915	103 084	80 363	79 532	47,603	46,772	26 944	26 113
Kyrgyzstan	1 285	222	4 062	621	3 935	493	3,751	309	3 588	147
Lao P.D.R.	193	127	448	491	397	441	358	402	281	325
Macao, China	434	141	2 554	669	2 495	610	2,407	522	2 125	240
Malaysia	32 284	31 004	55 255	62 064	41 300	48 109	26,339	33,148	15 223	22 032
Maldives	235	263	415	678	298	562	154	417	33	296
Mongolia	313	285	655	638	528	511	403	386	172	155
New Zealand	3 646	5 275	8 114	10 881	6 146	8 913	4,500	7,267	2 718	5 484
Pakistan	7 141	4 124	13 417	10 620	9 646	6 850	7,182	4,385	5 304	2 507
Russian Federation	17 016	16 283	32 663	30 381	28 926	26 645	23,220	20,939	14 891	12 610
India	38 756	31 484	79 004	70 457	61 332	52 786	44,899	36,352	29 964	21 417
Singapore	41 603	32 043	105 330	63 339	94 073	52 083	79,556	37,566	60 046	18 056
Thailand	25 680	30 114	53 502	62 725	38 509	47 732	24,605	33,827	12 588	21 811
Turkey	16 397	23 035	33 221	45 038	24 833	36 649	15,571	27,388	8 237	20 054
Samoa	59	33	76	72	60	56	44	40	26	22
Total	**659 998**	**648 948**	**1 592 839**	**1 288 677**	**1 329 258**	**1 025 099**	**1 045 533**	**741 374**	**818 898**	**514 737**

Source: ESCAP calculations based on data from UNCTAD and CEPII

Table A1. HS chapter descriptions

Chapter I	Live animals; animal products.
Chapter II	Vegetable products
Chapter III	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes
Chapter IV	Prepared foodstuffs; beverages, spirits and vinegar; tobacco and manufactured tobacco substitutes
Chapter V	Mineral products
Chapter VI	Products of the chemical or allied
Chapter VII	Plastics and articles thereof; rubber and articles thereof
Chapter VIII	Raw hides and skins, leather, furskins and articles thereof; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)
Chapter IX	Wood and articles of wood; wood charcoal; cork and articles of cork; manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork
Chapter X	Pulp of wood or of other fibrous cellulosic material; waste and scrap of paper or paperboard; paper and paperboard and articles thereof
Chapter XI	Textiles and textiles articles
Chapter XII	Footwear, headgear, umbrellas, sun umbrellas, walking sticks, seat sticks, whips, riding-crops and parts thereof; prepared feathers and articles made therewith; artificial flowers; articles of human hair
Chapter XIII	Articles of stone, plaster, cement, asbestos, mica or similar materials; ceramic products; glass and glassware
Chapter XIV	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewellery; coin
Chapter XV	Base metals and articles of base metal
Chapter XVI	Machinery and mechanical appliances; electrical equipment; parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers and parts and accessories of such articles
Chapter XVII	Vehicles, aircraft, vessels and associated transport equipment
Chapter XVIII	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; clocks and watches; musical instruments; parts and accessories thereof
Chapter XIX	Arms and ammunition; parts and accessories thereof
Chapter XX	Miscellaneous manufactured articles
Chapter XXI	Works of art, collectors pieces and antiques

Source: Asycuda