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A look offshore: unpacking the routes of misinvoicing in international trade

Catalin Dragomirescu-Gaina[1] and Leandro Elia[2]

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Abstract: We study whether misinvoicing in international trade is reflected in cross-border bank accounts as reported by offshore financial centres. We show that residents hold more offshore wealth when local misinvoicing practices thrive, especially for under-invoiced exports of natural resources. These results are driven by less-developed countries, autocracies, and resource-rich countries, which typically lack institutional capacity and/or political willingness to deter capital flight and misinvoicing practices. All our results are consistent with rent-seeking behaviour by local elites, and we provide corroborative evidence to support this claim.

Key words: trade misinvoicing, cross-border banking, offshore financial centres, natural resources

JEL classification: F14, F20, F38, K42

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[1]Università Cattolica del Sacro Cuore, Milan, Italy, catalin.dragomirescugaina@unicatt.it [2]Marche Polytechnic University, Ancona, Italy, l.elia@univpm.it

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Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

The amount of cross-border (XB) illegal movements of money and capital has dramatically grown worldwide. These capital flows can originate from illicit economic activities, corruption, terrorism, or organized crime, challenging public authorities in most countries, particularly in the least-developed and developing ones. By one estimate, US$88.6 billion per year left Africa between 2013 and 2015 (see UNCTAD 2020), corresponding to approximately 3.7 per cent of African gross domestic product (GDP). We focus here on illicit financial flows (IFFs) that originate from illicit tax and commercial practices such as trade misinvoicing, which is common to all countries with varying degrees of pervasiveness. While this heterogeneity can be exploited in empirical analyses, it can also raise challenges when identifying the right policy and regulatory remedies for each case. Recent advances in data availability combined with an effective identification strategy allow us to shed light on the mechanism linking trade misinvoicing and offshore bank accounts, thus helping to advance the policy debate on countering IFFs and capital flight.

Most XB capital flows are channelled through global banks and there is evidence that offshore financial centres (OFCs) are pivotal in strategies to hide and launder money and assets abroad (see Zucman 2017). Pellegrini et al. (2016) estimate that OFCs and tax havens hold the equivalent of 10 per cent of world GDP, but this offshore wealth is not uniformly distributed. According to Alstadsæter et al. (2018), some Latin American and Middle Eastern countries own as much as 60 per cent of GDP in offshore wealth, while for Scandinavian countries this amounts to only a few per cent of their GDP. The general problem we address here is whether residents own more offshore wealth when local misinvoicing practices thrive.[1] In other words, we study how misinvoicing in international trade is reflected in the XB bank accounts reported by OFCs. To address this question, we combine data on XB banks' exposures from the Bank for International Settlements (BIS) Locational Banking Statistics (LBS) with recent data on misinvoicing in international trade by Lépissier et al. (2021). With a sample covering approximately 160 countries over a two-decade period, our empirical investigation uncovers the ubiquity and strength of this relationship. We also provide evidence that, as a form of capital flight, trade misinvoicing is funnelled through OFCs not for corporate motivations (which imply access to high-quality financial services) but because OFCs offer the means to evade controls and preserve secrecy over the origin of the illicit capital (O'Donovan et al. 2019).

Recently, Andersen et al. (2022) show that foreign aid disbursements to a representative group of underdeveloped and poorly governed countries coincide with significant increases in offshore bank deposits. Additional data checks and estimates support the conclusion that local corrupt elites divert aid flows to bank accounts in OFCs. Andersen et al. (2017) illustrate a similar mechanism in oil-producing countries, where autocratic rulers divert their gains to offshore accounts. We follow their intuition and apply a similar approach to IFFs in our study.

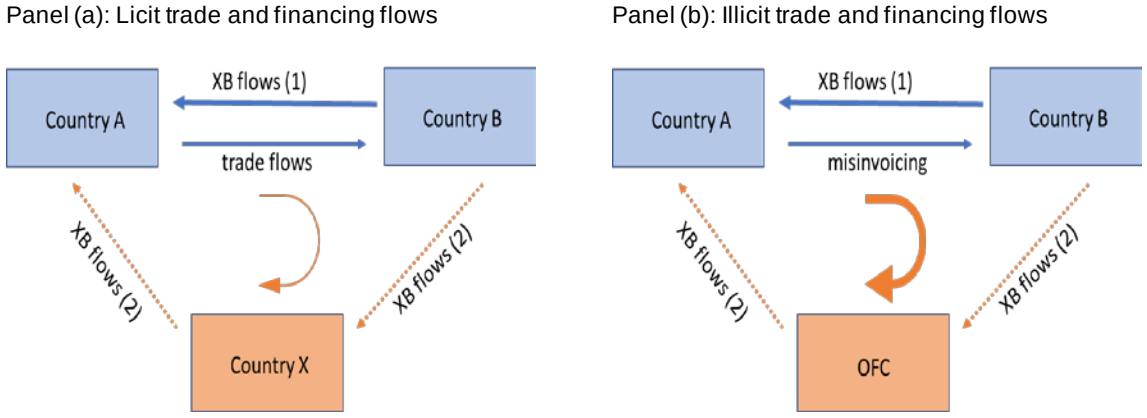
Some studies which discuss international trade practices (e.g. Niepmann and Schmidt-Eisenlohr 2017) or IFFs, capital flight, and money laundering (e.g. Forstater 2018) suggest that the

[1] The mirror problem is whether residents borrow more from offshore sources when local misinvoicing thrives. While this is less likely to happen for developed countries, it can be common in developing countries that lack capital for investment. Accordingly, rent-seeking investors may use illicit commercial practices to finance and gain control over local entities facing temporary capital/liquidity shortages. Black et al. (1999) describe the privatization of several Russian state-owned enterprises and discuss the role played by offshore capital.

mechanism we aim to reveal is plausible.[2] Lépissier et al. (2021) show that trade misinvoicing practices largely correlate with poor and developing countries, but Mehrotra and Carbonnier (2021) document substantial misinvoicing also by multinational corporations (MNCs) in the case of Swiss imports. Cross-country differences in regulatory and contractual standards affect the financing terms accepted for international trade, where financing is a function of transaction risk (Antras and Foley 2015). However, most of the risks confronting this sector can be reduced through a range of trade finance products (e.g., letters of credit, derivatives), which are offered by many banks today. Commercial misinvoicing practices thrive under certain conditions, particularly when it is possible to avoid scrutiny by moving money proceeds through offshore bank accounts characterized by higher discretion levels. With misinvoicing, therefore, the relationship between trade financing (including settlement) and trade completion risk is likely to weaken.

A more concrete example can be useful to consolidate the main idea and to describe the inherent identification challenges related to our approach. Suppose that a company from country A exports its goods to a customer in country B: the financial settlement of the trade is usually done through bank accounts from these two countries (see, e.g., the mechanisms described in Niepmann and Schmidt-Eisenlohr (2017)). It could be, however, that a third country X is involved in financially settling the trade,[3] for reasons related to the preferences of the two trade partners or the availability of banking and risk management services. Such triangulation can be entirely licit, as in the case, for example, when both companies are headquartered in that third country or prefer the same bank because of its services and global outreach. This mechanism is depicted in Figure 1, panel (a). With trade misinvoicing, however, such triangulation disguises the intention to hide money proceeds abroad. In such a case, it is more likely that the illicit proceeds from international trade are directed through OFCs specifically to evade controls and preserve secrecy. This channelling of the illicit proceeds from misinvoicing is depicted in Figure 1, panel (b) and is the main mechanism the present study aims to uncover.

Figure 1: Mechanisms involved in international trade financing



Note: panel (a) depicts the licit settlements of trade and financing flows between countries A and B, while panel (b) depicts the illicit settlement of the trade. In this latter case, misinvoicing is more likely to involve an offshore centre. XB flows (1) are labels used to denote direct cross-border banking flows between countries A

[2] Our mechanism is coherent with other pieces of evidence revealed in various recent investigations and leaks; various examples are reported at https://offshoreleaks.icij.org.

[3] Using a unique dataset from the Society for Worldwide Interbank Financial Telecommunications (SWIFT), Niepmann and Schmidt-Eisenlohr (2017) find discrepancies between bilateral trade flows and SWIFT message flows which they suggest can be attributed to the involvement of banks located in third countries.

and B, while XB flows (2) depict the triangulation mechanism described in the text involving a third country X or an offshore centre. The thicker the curved arrow, the larger are the financing flows.

Source: authors' graphical illustration.

The main challenge for our empirical approach is the lack of sufficiently detailed data to allow a precise identification of the merchandise trades and the settlement bank accounts involved across different jurisdictions, especially in the case of triangulation. As we do not know which OFC is chosen by which pair of partners/countries (trading with each other), we can only uncover whether, for example, misinvoicing outflows from country A are associated with higher XB banking exposures towards that same country A. Given the limited data availability on bilateral XB exposures, we believe that our identified effect would represent only a conservative estimate of the true effect underpinning the mechanisms in Figure 1. Based on our discussion so far, we can derive the following testable hypotheses:

(H1): Illicit outflows generated by under-invoiced exports departing from country A (and/or over-invoiced imports arriving in country A) are settled in offshore bank accounts. In this case we look at the offshore XB banks' *liabilities* (e.g. deposits) against residents of country A—denoting our expectations that country A residents reclaim the illicit proceeds from misinvoicing.

(H2): Illicit inflows generated by over-invoiced exports departing from country A (and/or under-invoiced imports arriving in country A) are settled in offshore bank accounts. In this case we look at the offshore XB banks' *claims* reported for residents of country A—denoting our expectations that country A residents will transfer the illicit proceeds from misinvoicing abroad.

Ideally, if data availability were not an issue, and countries A and B were symmetrically represented in all dimensions, the two hypotheses would be the mirror image of each other. However, if flows in one direction dominate the dataset, or within a particular subset of countries, then one hypothesis would be more likely than the other. In our analysis, we find that for less-developed countries and for autocratic regimes, H1 is more salient than H2. We also find that misinvoicing involving natural resources is more likely to be reflected in OFC accounts, pointing again to the same subset of countries as the origin of the IFFs generated through misinvoicing practices. These results are consistent with rent-seeking behaviour by political/economic elites in weakly institutionalized countries (Acemoglu et al. 2004; Besley and Persson 2011) and a wealth of empirical evidence suggesting elite capture (Andersen et al. 2017; Andersen et al. 2022).

To narrow the discussion around the possible mechanisms involved, we investigate the role of MNCs. Such corporations may prefer OFCs because of their better financial services, while their misinvoicing may be driven by corporate motivations such as profit shifting, regulatory arbitraging, or tax optimization.[4] While this could explain the association between misinvoicing and offshore wealth, we do not find support for this mechanism in the data. As discussed in Deng (2020), capital flows driven by corporate motivations are usually hedged against adverse currency movements. For the sake of argument, one can imagine a corporation hedging its foreign currency (FX) exposures, expecting its money to be reinvested back even when shifting capital across its many foreign subsidiaries and affiliates. In contrast, a corrupt elite from a low-income country is more concerned with the 'dollar value' of its wealth abroad and is not interested in hedging against local currency fluctuations. After controlling for the unobserved component of misinvoicing driven by

[4] Depending on the regulatory environment, local norms, and existing legal frameworks, such practices and behaviours may not be illicit per se. However, they over-penalize poor and developing countries with weak regulatory regimes and control institutions.

hedging motivations, which we proxy using local currency volatility, our main results remain valid and do not point to any significant role for MNCs' motivations in driving capital flight through misinvoicing.

The remainder of the paper is organized as follows. In Section 2 we provide a detailed description of our data and empirical methods. In Section 3 we present and discuss the main results along with some robustness checks. Finally, Section 4 concludes and discusses some policy implications of the results.

2 Data and methods

This section is composed of four parts. We describe the data on bank liabilities and claims reported in the BIS LBS in Section 2.1. We discuss the data on trade misinvoicing in Section 2.2 and the data sources for control variables in Section 2.3. Finally, the empirical approach is illustrated in Section 2.4.

2.1 Data on bank liabilities and claims

Our first data source is the LBS, which provides quarterly statistics on banks' liabilities and claims from 48 countries/jurisdictions, including many OFCs.[5] The data is based on report data from individual banks, compiled and aggregated by central banks, and then transmitted to the BIS. This dataset provides information, for example, on the amount of Swiss banks' liabilities (and claims) to foreign residents from more than 200 countries. The LBS keeps track of around 95 per cent of all XB banking activity.

We use publicly available LBS data on reported bilateral XB exposures. The LBS data is also employed in Alstadsæter et al. (2018) and Langenmayr and Zyska (2021). Non-public versions of LBS, including bilateral information about transactions in a larger sample of countries, are used in Andersen et al. (2022), Huizinga and Nicodème (2004), Johannesen (2014), Johannesen and Zucman (2014), and Menkhoff and Miethe (2019).

We follow Andersen et al. (2022) and classify as OFCs the following jurisdictions/countries: Switzerland, Jersey, Luxembourg, Guernsey, Hong Kong SAR, Macao SAR, Belgium, Austria, and Isle of Man. Our list includes fewer countries than the OFC list used in Andersen et al. (2021) because the publicly available LSB series provide bilateral XB bank transactions for only a selected group of banking centres. However, as shown in Andersen et al. (2022), the public dataset captures about two-thirds of all XB flows to OFCs.[6] We also use alternative OFC lists which i) consider a restricted group of jurisdictions (Zoromé 2007) or ii) identify OFCs using a data-driven approach based on network analysis (Garcia-Bernardo et al. 2017). Table A3 in the Appendix reports the OFCs used according to these different lists. We show later that our results are unaffected by which countries we include in the OFC list.

To take account of global trends in capital flows, we define the main dependent variable as the share of XB exposures (either liabilities or claims) reported by OFCs to the total exposures (either

[5] The list of countries is updated by BIS at the following link: https://www.bis.org/statistics/rep_countries.htm.

[6] The same list of OFCs is also used in Andersen et al. (2017) and Johannesen and Zucman (2014), and it adds to the group of tax havens blacklisted by the OECD (2008) for not sharing bank information with foreign governments, Macao SAR, Hong Kong SAR, Austria, and Belgium, which have bank secrecy rules comparable to the other OFCs.

liabilities or claims) reported by all countries. The LBS data covers all financial instruments (including loans and deposits) reported against all sectors (which are the counterparts of the reporting banks). To measure the XB exposures, we use data reported for all instruments and exposures to all sectors.[7] We take annual averages of the quarterly LBS data to match them with trade misinvoicing data, which is available on an annual basis.

2.2 Data on trade misinvoicing

Ferwerda and Unger (2021) offer a recent literature review on the available data sources for various IFF proxies. Among these sources, trade-based measures of IFFs are quite common and are proposed and used in several studies (e.g., Cobham and Jansky 2020; Zdanowicz 2009). In this paper, we rely on Lépissier et al. (2021), who provide a comprehensive atlas of IFFs ranging from 2000 to 2018 for approximately 160 countries. This dataset includes estimates of total gross inflows (import under-invoicing and export over-invoicing) and total gross outflows (import over-invoicing and export under-invoicing) as well as disaggregated values for imports and exports for nine sectors of activities. All estimates are based on UN Comtrade data and expressed in US dollars.

The main strategy adopted by Lépissier et al. (2021) to identify illicit trade leverages the principle of double-entry accounting in international trade statistics, i.e. the fact that trade transactions appear twice from both the perspective of the reporter and the corresponding partner. In principle, these values should mirror each other, i.e. imports from country *i* to country *j* are equal to exports from country *j* to country *i*. However, for several reasons, there are often discrepancies in reported values. For example, imports include the cost of insurance and freight, which inflates the import values when compared to the recorded export values. Other reasons pertain to statistical noise and the quality of countries' declarations. To provide robust estimates of illicit trade and reduce the uncertainty of mistakenly categorizing illicit trade gaps between reporter and partner which are due to other reasons, Lépissier et al. (2021) estimate misinvoiced imports (exports) as the difference between an *estimated* import (export) value, cleaned of the effect of known predictors of trade discrepancies, and the *reported* import (export) value. The cleaning process is carried out by taking the residuals from two gravity models, one for import gaps and another for export gaps, which control for a set of licit factors (i.e. distance, contiguity, dummies for landlocked country, dummies for year-specific idiosyncrasies, dummy for shipment arrival in different calendar year from when departed, and re-export to third countries) and a group of illicit determinants (i.e. corruption, regulatory quality, and tariffs).[8] These residuals measure the illicit component of trade discrepancies (plus statistical noise).

Moreover, the trade gaps account for the different qualities of countries' statistical reporting, which may affect transactions discrepancies. This 'harmonization' approach, originally proposed by Gaulier and Zignano (2010), considers weighted averages of reporter and partner declarations, where weights are calculated by a regression of trade gaps on reporter, partner, commodity, and year fixed effects so as to remove the influence of the relative quality of declarations.

These estimates of IFFs provided by Lépissier et al. (2021) do not capture all types of illicit activity. For instance, they do not include smuggling of goods such as illicit drugs or arms because these

[7] In our sample, the differences among the different indicators compiled based on different sectoral ownership or instruments are negligible as the correlation between them is always above 0.9.

[8] While these illicit determinants can be potential confounders for the relationship between trade misinvoicing and capital flows, we do not include them in our specifications to avoid overcontrolling.

transactions are not reflected in trade gaps. Therefore, this data represents a conservative estimate of the true size of IFFs, notably those related to misinvoicing in international trade. [9]

We construct our variables of interest by taking total gross illicit inflows (import under-invoicing and export over-invoicing) and total gross illicit outflows (import over-invoicing and export under-invoicing) rescaled by total trade to account for the size of a country's exposure to international trade. To investigate whether the size of offshore wealth is more responsive to imports or exports, we separate inflows and outflows by whether they originate from imports and exports. This leads us to construct four additional variables: i) illicit inflows from import under-invoicing, ii) illicit inflows from export over-invoicing, iii) illicit outflows from import over-invoicing, and iv) illicit outflows from export under-invoicing.

2.3 Data sources for control variables

In our empirical investigation, we also make use of a number of country-level characteristics that can affect the capital flow dynamics and their relationship with trade misinvoicing.

All specifications include the growth rate of per capita GDP, which controls for the fluctuations in domestic demand and the degree of economic wellbeing, and a binary indicator for whether a country suffers economic sanctions on at least one commodity, which captures a country's inclination to engage in misinvoicing. The growth rate of per capita GDP is taken from the World Bank's World Development Indicators dataset, while the trade sanctions indicator is taken from the Global Sanctions Data Base by Felbermayr et al. (2020)

We introduce controls for the economic, financial, and political environment which may be associated with XB capital flows and misinvoicing. These are: a binary variable for war from the PRIO Armed Conflict Dataset; a binary indicator for realized and threatened coups from the Coup D'état Project, developed by Peyton et al. (2020); an indicator for the presence of controls on both capital outflows and inflows from Fernandez et al. (2016); and an indicator of macroprudential policy regulation addressing systemic risk, with data taken from the International Monetary Fund (IMF) iMaPP database developed by Alam et al. (2019). Finally, we take IMF data on FX rates for the local currency expressed against the IMF Special Drawing Rights (SDR), which most countries must report on a regular basis. Based on this monthly data, we construct the annual standard deviation of the local FX rates against SDR. We use this variable as a proxy for the hedging activity of MNCs driven by corporate motivations (see Section 3.3 for a more detailed discussion)

2.4 Empirical approach

Our stylized empirical specification is given in equation (1) and links the share of XB banking exposures as reported by OFCs (to the residents of a given country) with misinvoicing data (involving that same country from where the goods trade originates). Note that both flows (merchandise and financing) overlap in the country representing the destination of the IFFs and the origin of the initial trade. [10] Our main model specification is:

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[9] Moreover, as the authors state, their data also represents a conservative estimate of the true size of misinvoicing in international trade because it fails to capture misinvoicing in services. Another possible drawback is that aggregation at a higher level of commodity type will result in within-sector netting (see Lépissier et al. 2021).

[10] Looking back at Figure 1, note that country A represents both the origin of the initial trade subject to misinvoicing and the destination of the IFFs reported by OFCs. Obviously, country B is the mirror image of country A in a stylized model representation.

$$XB\_flows_{c,t} = \alpha + \beta * IFF_{c,t} + \gamma * X_{c,t} + \mu_c + \tau_t + \varepsilon_{c,t} \quad (1)$$

where $XB\_flows_{c,t}$ denote the share of XB exposures (bank liabilities and claims) reported by all OFCs towards the residents of country c in year t; $IFF_{c,t}$ represents misinvoicing occurring in the same reference country c in year t; $X_{c,t}$ is a vector of control variables (i.e. per capita GDP growth, trade sanctions, war, coups, capital controls, macroprudential policy regulation); and μ_c and τ_t are country-specific and time-specific dummies, respectively. Some specifications also factor in country-specific time trends to control for the possible non-stationarity of the data.[11] Note that μ_c and τ_t can be interpreted as proxies for *pull* (idiosyncratic) and *push* (global common) factors, which are customary in the literature on modelling international capital flows (e.g. Fernandez-Arias 1996). The parameter β measures the extent to which trade misinvoicing is matched by XB flows and will be central to our discussion in the next section. We report standard errors clustered at the country level to account for potential serial and within-country correlation in the data.

There may be omitted factors that simultaneously cause capital flight and trade misinvoicing, leading to a spurious positive correlation. We mitigate concerns about endogeneity and get as close as possible to an estimate of a causal effect of misinvoicing on offshore banking exposures in three ways. First, we control for a full set of country and year fixed effects, so that the impact of misinvoicing is identified from within-country variation. Due to possible non-stationarity of the dependent variable, some specifications also include country-specific time trends. Second, we control for an array of country characteristics that could influence both misinvoicing and offshore capital flows. All specifications include the growth rate of per capita GDP and a binary indicator for the presence of economic sanctions. In the robustness analysis, we control for specific events such as wars and coups, for the presence of a regulatory regime on capital flows, and for the presence of macroprudential policies which aim to prevent disruptions in the credit and financial services. Third, we expand our baseline specification with one lead and one lag of the IFF variable. We find that the one-year lead of IFF is not statistically significant, therefore excluding reverse causality (i.e. the possibility that misinvoicing reacts to XB bank exposures reported by OFCs).

Finally, we probe the sensitivity of our results by using a dynamic specification following the approach of Arellano and Bond (1991) by considering the growth rate of XB exposures and by employing alternative lists of OFCs. Taken together, these strategies guard against spurious correlation and ensure proper identification of misinvoicing effects on IFFs.

3 Results

3.1 Main results

The first round of results is presented in Table 1. The different model specifications are arranged in the following way. In columns (1)–(3) the dependent variable is the country's share of XB liabilities reported by OFCs over the total XB liabilities, while the main independent variable is the indicator of illicit financial *outflows*, i.e. the sum of under-invoiced exports and over-invoiced imports. In columns (4)–(6), the dependent variable is the country's share of XB claims in OFCs over the total XB claims, while the IFF indicator measures only *inflows*, i.e. the sum of over-invoiced exports and under-invoiced imports. Hence, we estimate two versions of equation (1) involving

[11] Standard panel unit root tests, reported in the Appendix, point to non-stationarity dynamics mostly for countries in the non-OECD subgroup. Due to missing data, gaps, and the unbalanced nature of our dataset, we use Fisher-type unit root tests as proposed by Maddala and Wu (1999).

either *outflows* or *inflows*, which differ according to which specific hypothesis—H1 or H2—is tested. Therefore, to test H1, we use the indicator for *outflows* as the main regressor in equation (1), while to test H2 we use *inflows* as the regressor. All specifications include country and year fixed effects. The specifications in columns (2) and (5) include the per capita GDP growth rate and the indicator for the presence of trade sanctions, while columns (3) and (6) augment the specifications with country-specific linear trends. We find that larger illicit outflows are associated with above average XB liabilities (i.e. deposits) reported by OFCs, thus validating our H1 hypothesis. In fact, for model specifications (1)–(3), the coefficients are always statistically significant. A one percentage point increase in the share of illicit outflows is associated with a 0.04-0.026 percentage point increase in the share of liabilities reported by OFCs. The substantive effect corresponds to a 1 per cent increase in the capital flows towards OFCs. We can rule out the possibility that this positive association may be driven by confounding factors affecting capital transfers to other foreign banking sectors as the variable for XB exposure to OFCs is constructed in relation to the total flows to all banking centres. If shocks were to affect the outflows to every destination in the same way, we would expect to observe no significant impact on the share of XB liabilities reported by OFCs. Reassuringly, we do not find evidence of such an effect.

Turning our attention to the H2 hypothesis, we find that illicit inflows have no explanatory power for the share of XB bank claims (i.e. loans) reported by OFCs. Indeed, the coefficient of illicit inflows is not statistically significant in model specifications (4)–(6). Taken together, all these results point to an important difference associated with the *direction* of trade and capital flows, but they are in line with our discussion from the introduction. Countries in the dataset are most likely not symmetrically represented for various reasons (e.g., lack of statistical coverage, reporting gaps, etc.). Therefore flows in one direction dominate the data and show up in the estimation, each time revealing only one aspect of the main mechanism at work.

Table 1: Offshore liabilities (and claims) and illicit financial flows – main results

Dependent variable	Share of XB offshore liabilities			Share of XB offshore claims		
Hypothesis tested	H1: *Outflows*			H2: *Inflows*		
	(1)	(2)	(3)	(4)	(5)	(6)
IFF	0.040**	0.041**	0.026**	0.013	0.005	-0.029
	(0.017)	(0.017)	(0.011)	(0.023)	(0.025)	(0.027)
p.c. GDP growth		-0.240**	-0.125		-0.696***	-0.691**
		(0.119)	(0.099)		(0.244)	(0.273)
Trade sanction		2.732	1.202		10.881**	7.267
		(1.685)	(1.491)		(4.952)	(6.230)
Country and year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Country-specific trends	No	No	Yes	No	No	Yes
No. of observations	2,281	2,281	2,281	2,281	2,281	2,281
No. of countries	164	164	164	164	164	164
R^2	0.691	0.695	0.826	0.645	0.653	0.770

Note: unbalanced panel, time period: 2000–18. Standard errors clustered at the country level are reported in parentheses below the estimated coefficients. ***, **, and * denote significance at 1%, 5%, and 10% levels.

Source: authors' calculations.

We scrutinize our results using an array of alternative specifications which include additional confounding factors. We re-estimate equation (1) and factor in additional variables that could affect both misinvoicing and XB exposures. Due to missing values, we include the additional variables one by one to maximize the sample size. We report these results in Table 2. First, we show that our main result holds with the inclusion of a dummy for countries experiencing a war and a dummy for countries undergoing a coup d'état and coup attempts, i.e. for political events

that could trigger more capital flight. Specifically, we still find a positive association between illicit outflows and liabilities in column (1) which is very close to the baseline results, while we do not detect a statistically significant relationship between illicit inflows and claims in column (6).

Second, in columns (2) and (7), we control for the presence of macroprudential policy tools implemented by governments and regulatory bodies to contain systemic risk. We still find a positive association between misinvoicing and liabilities and a marginally statistically significant effect on claims. Third, to rule out the possibility that our main finding can be driven by the presence of restrictions that governments and central banks exert on foreign capital in and out of the domestic economy, we augment the baseline specification with an indicator of capital controls (which measures restrictions on outflows when we consider the regression for liabilities and restrictions on inflows for the specification for claims). Reassuringly, the positive association between misinvoicing and liabilities in column (3) is very similar to the baseline specification, whereas no relationship is found between misinvoicing and claims in column (8).

Fourth, as one possible concern with our identification is the composition of the list of OFCs, we re-estimate equation (1) by using two alternative lists of OFCs. We use the list of Garcia-Bernardo et al. (2017) which identifies the group of OFCs through network analysis on firm-level data and the list compiled by Zoromé (2007) which assembles IMF, Organisation for Economic Co-operation and Development (OECD), and other sources. Following Garcia-Bernardo et al. (2017) we include Jersey, Luxembourg, Taiwan SAR, and Hong Kong SAR, which are considered *sink*-OFCs (i.e. in which a disproportional amount of value disappears from the economic system), and Ireland, the Netherlands, Switzerland, and the United Kingdom, which are considered *conduit*-OFCs (i.e. because a disproportional amount of value moves toward sink-OFCs). From the list provided by Zoromé (2007), we take Guernsey, Hong Kong SAR, Isle of Man, Ireland, Jersey, Luxembourg, Macao SAR, Switzerland, and the United Kingdom.[12] The findings are shown in columns (4) and (5) for the outflows–liabilities nexus and (9) and (10) for inflows–claims. We clearly find that the results for liabilities are quantitatively similar to those in our baseline specification, but we still fail to find any significant effect on claims. All in all, these robustness checks corroborate our baseline results, validating the H1 hypothesis (about a positive relationship between illicit outflows and liabilities in offshore banks) but refuting the H2 hypothesis (on a relationship between inflows and offshore XB claims) due to the lack of sufficient evidence.

[12] The actual number of OFCs identified by Garcia-Bernardo et al. (2017) and Zoromé (2007) is larger than the one presented here. Due to the limited information provided by the public release of LBS, we can only consider a subset of the OFCs of Garcia-Bernardo et al. (2017) and Zoromé (2007) which can be matched with LBS data.

Table 2: Alternative specifications with additional control variables

Dependent variable	Share of XB offshore liabilities					Share of XB offshore claims				
Hypothesis tested	H1: *Outflows*					H2: *Inflows*				
	Political variables	Macro-prudential policy	Capital restrictions	OFCs Garcia-Bernardo et al. (2017)	OFCs Zoromé IMF (2007)	Political variables	Macro-Prudential policy	Capital restrictions	OFCs Garcia-Bernardo et al. (2017)	OFCs Zoromé IMF (2007)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
IFF	0.026**	0.030**	0.030**	0.031**	0.034***	-0.029	-0.063*	-0.041	0.011	-0.003
	(0.011)	(0.014)	(0.014)	(0.012)	(0.012)	(0.027)	(0.036)	(0.040)	(0.019)	(0.021)
p.c. GDP growth	-0.127	-0.079	0.051	-0.057	-0.020	-0.692**	-0.966**	-0.906**	-0.009	-0.309**
	(0.100)	(0.094)	(0.090)	(0.101)	(0.100)	(0.276)	(0.385)	(0.366)	(0.114)	(0.150)
Trade sanction	1.192	1.549	2.930**	-1.038	-1.370	7.276	7.040	11.617*	-2.005	0.012
	(1.492)	(1.576)	(1.440)	(1.164)	(1.163)	(6.247)	(6.655)	(6.744)	(1.721)	(3.461)
War	0.598					-0.312				
	(1.219)					(2.586)				
Coup	-0.497					-0.089				
	(1.154)					(1.781)				
MP policy		-0.233					-1.434**			
		(0.184)					(0.647)			
Capital restrictions			-5.955					-0.871		
			(5.138)					(9.554)		
No. of observations	2,281	1,853	1,567	2,281	2,281	2,281	1,853	1,567	2,281	2,281
No. of countries	164	122	98	164	164	164	122	98	164	164
R^2	0.826	0.774	0.781	0.878	0.874	0.770	0.769	0.745	0.829	0.824

Note: unbalanced panel, time period: 2000–18. Time and country fixed effects are included along with country-specific trends. Standard errors clustered at the country level are reported in parentheses below the estimated coefficients. ***, **, and * denote significance at 1%, 5%, and 10% levels.

Source: authors' calculations.

Before turning to more granular results in the next section, we present extra robustness checks to address concerns about endogeneity. First, we infer causality via the timing of illicit flow variation, i.e. we ask how quickly the share of XB bank exposures reported by OFCs react to illicit flows. If the XB exposure grows after an increase in misinvoicing in the way we hypothesize, we would expect it to respond to current and/or lagged misinvoicing and not to future misinvoicing. To explore these dynamics, we augment equation (1) with one lag and one lead of misinvoicing. We are unable to expand the length of the lags and leads further in order to avoid constricting the sample size and, thus, the statistical power too much. We present the results for liabilities in Table 3, column (1) and in column (4) for claims. The only significant results are those for liabilities, which suggest that offshore liabilities increase in the current and subsequent year when illicit capital flows out but they are not affected by future illicit outflows.

Our second check consists in estimating a dynamic panel data model following the approach of Arellano and Bond (1991). This model removes country-specific unobserved factors that could drive the relationship between XB exposure and misinvoicing and takes account of the dynamic nature of the dependent variable. We use ten internal instruments out of 18 and apply the two-step procedure proposed by Arellano and Bond (1991). We obtain robust standard errors using Windmeijer's (2005) finite sample correction. We report these estimates in columns (2) and (5) of Table 3. We obtain a larger and statistically significant effect of illicit outflows on the share of offshore liabilities (consistent with H1), while we detect no effect on claims.

Finally, we estimate a different version of equation (1), which considers the growth rate of the share of XB exposure. The findings are reported in columns (3) and (6) of Table 3. Once again, the only relevant effect is that on liabilities, indicating that a one percentage point increase in illicit outflows leads to an increase in the growth rate of offshore liabilities relative to total labilities by 0.001 percentage points.

We do not include country-specific trends in the Table 3 specifications as this would imply overfitting the data. For example, the country-specific trends from specifications (3) and (6) in Table 1, would reduce to country fixed effects once we take the first difference in the dependent variable as we do in columns (3) and (6) of Table 3.

Table 3: Additional robustness checks

Dependent variable	Share of XB offshore liabilities			Share of XB offshore claims		
Hypothesis tested	H1: *Outflows*			H2: *Inflows*		
	Dynamic	Arellano–Bond	Growth rate of the dependent variable	Dynamic	Arellano–Bond	Growth rate of the dependent variable
	(1)	(2)	(3)	(4)	(5)	(6)
IFF_{t+1}	0.014			0.012		
	(0.015)			(0.026)		
IFF_t	0.042**	0.082**	0.001*	0.017	-0.150	0.000
	(0.020)	(0.034)	(0.001)	(0.027)	(0.137)	(0.002)
IFF_{t-1}	0.023**			0.017		
	(0.011)			(0.027)		
Lag of dependent variable		0.809***			0.942***	
		(0.058)			(0.014)	
No. of observations	1,659	1,926	1,921	1,659	1,926	1,894
No. of countries	149	162	157	149	162	154
R^2	0.734	0.695	0.098	0.728	0.653	0.107

Note: unbalanced panel, time period: 2000–18. Time and country fixed effects, per capita GDP growth, and the dummy for trade sanctions are included in all specifications. Standard errors clustered at the country level are reported in parentheses below the estimated coefficients. ***, **, and * denote significance at 1%, 5%, and 10% levels.

Source: authors' calculations.

3.2 Heterogeneity

While our estimates presented so far reveal the ubiquity of the mechanism illustrated in Figure 1, heterogeneity is a key aspect that begs further inspection. In this section, we explore three dimensions of heterogeneity: the separate role of imports and exports, the sectoral breakdown of commodities and, the divide between high- and low-income countries as well as between democracies and autocracies.

We start by looking into the role of export under-invoicing and import over-invoicing in shaping the positive relationship between illicit outflows and offshore liabilities. We do not reiterate this investigation for offshore claims, as Table 1 shows no significant association with illicit inflows. These new estimates are reported in Table 4. We re-estimate the specification reported in column (3) of Table 1 and split the IFF variable into import over-invoicing and export under-invoicing—see Table 4, columns (1) and (2), respectively. Our findings suggest that shifting money abroad is more likely to be accomplished via export under-invoicing, which results in larger deposits reported by OFCs. In fact, under-invoicing the export of commodities can be used to conceal profits abroad, as commodities leave the country but the corresponding financial flows remain in the foreign bank account. This is consistent with recent findings by Mehrotra and Carbonnier (2001). We do not find evidence of a similar impact for import over-invoicing, i.e. when the value of imports is overstated.

Table 4: Offshore liabilities and illicit financial outflows by imports and exports

Dependent variable	Share of XB offshore liabilities	
Hypothesis tested	H1 *Outflows*	
	Import over-invoicing	Export under-invoicing
	(1)	(2)
IFF	0.083	0.025**
	(0.059)	(0.013)
No. of observations	2,281	2,281
No. of countries	164	164
R^2	0.826	0.826

Note: unbalanced panel, time period: 2000–18. Time and country fixed effects, country-specific linear trend, per capita GDP growth, and the dummy for trade sanctions are included in all specifications. Standard errors clustered at the country level are reported in parentheses below the estimated coefficients. ***, **, and * denote significance at 1%, 5%, and 10% levels.

Source: authors' calculations.

We now turn to explore the impact of misinvoicing on offshore liabilities, separating commodities by type. We exploit the information in the illicit flows dataset which provides trade misinvoicing for nine commodity sectors. We re-estimate equation (1) for offshore XB liabilities separately for the nine sectors and report the results in Table 5.

By unpacking the aggregate relationship between illicit outflows and the share of offshore liabilities, we notice that the bulk of the positive impact seems to be driven by the mineral sector (MF: column 8) and the miscellaneous manufactured equipment sector (MM: column 9). These results are consistent with recent evidence by Andersen et al. (2017) showing that oil-producing countries with autocratic rulers divert their gains to offshore accounts. Mineral industries are more

likely to engage in rent-seeking than other industries as they are typically monopolies and hence (more likely to be) exploited by political elites (mostly in autocracies) for their own gain (e.g. see Caselli and Tesei 2016).

We provide two additional analyses to better substantiate this last claim. We examine whether the relationship between illicit outflows and XB offshore liabilities varies according to i) a country's income level and ii) the type of political regime. In fact, as resource-rich countries usually have poorer economic outcomes and worse institutional and political developments, we should expect stronger effects in less-developed countries and in autocracies, where the lack of constraints favour ransacking by local elites (and politicians).

Table 5: Offshore liabilities and illicit financial outflows by commodity sector

Dependent variable	Share of XB offshore liabilities								
Hypothesis tested	H1 *Outflows*								
Commodity sector	AVO	BT	CH	CM	FLA	MT	MG	MF	MM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
IFF	-0.025	0.176	-0.001	0.006	-0.017	0.042	0.002	0.009***	0.036***
	(0.014)	(0.097)	(0.004)	(0.007)	(0.007)	(0.097)	(0.003)	(0.003)	(0.003)
No. of observations	2,251	2,108	2,214	1,869	1,928	2,187	2,215	2,200	2,210
No. of countries	162	147	158	135	145	156	158	159	158
R^2	0.826	0.822	0.827	0.795	0.824	0.825	0.825	0.827	0.827

Note: unbalanced panel, time period: 2000–18. Time and country fixed effects, country-specific linear trend, per capita GDP growth, and the dummy for trade sanctions are included in all specifications. AVO: Animal and vegetables oil, fats, and waxes; BT: Beverages and tobacco; CH: Chemicals and related products; CM: Crude materials, inedible, except fuels; FLA: Food and live animals; MT: Machinery and transport equipment; MG: Manufactured goods; MF: Mineral fuels, lubricants, and related materials; MM: Miscellaneous manufactured equipment. Standard errors clustered at the country level are reported in parentheses below the estimated coefficients. ***, **, and * denote significance at 1%, 5%, and 10% levels.

Source: authors' calculations.

In Table 6 we report separate estimates based on OECD membership status (our proxy for high- and low-income countries) as well as for autocratic versus democratic countries.[13] The estimates suggest that the illicit outflows–offshore liabilities nexus appears to be mostly driven by less-developed countries and autocracies, while no significant impact is found for the groups of OECD member countries and democracies.

Taken together, the results from Tables 5 and 6 indicate that the impact of misinvoicing on offshore liabilities is more salient for less-developed countries and for trade in mineral commodities, two features that are most likely associated with resource-rich autocracies.

[13] We use the Autocracies of the World dataset by Magaloni et al. (2013) to categorize all countries in our sample as autocratic and democratic.

Table 6: Offshore liabilities and illicit financial outflows by development level

Dependent variable	Share of XB offshore liabilities			
Hypothesis tested	H1 *Outflows*			
	OECD countries	Non-OECD countries	Democracies	Autocracies
	(1)	(2)		
IFF	0.004	0.028**	0.037	0.023*
	(0.012)	(0.012)	(0.025)	(0.012)
No. of observations	626	1,655	1,330	951
No. of countries	34	130	81	83
R^2	0.805	0.824	0.787	0.847

Note: unbalanced panel, time period: 2000–18. Time and country fixed effects, country-specific linear trend, per capita GDP growth, and the dummy for trade sanctions are included in all specifications. Standard errors clustered at the country level are reported in parentheses below the estimated coefficients. ***, **, and * denote significance at 1%, 5%, and 10% levels.

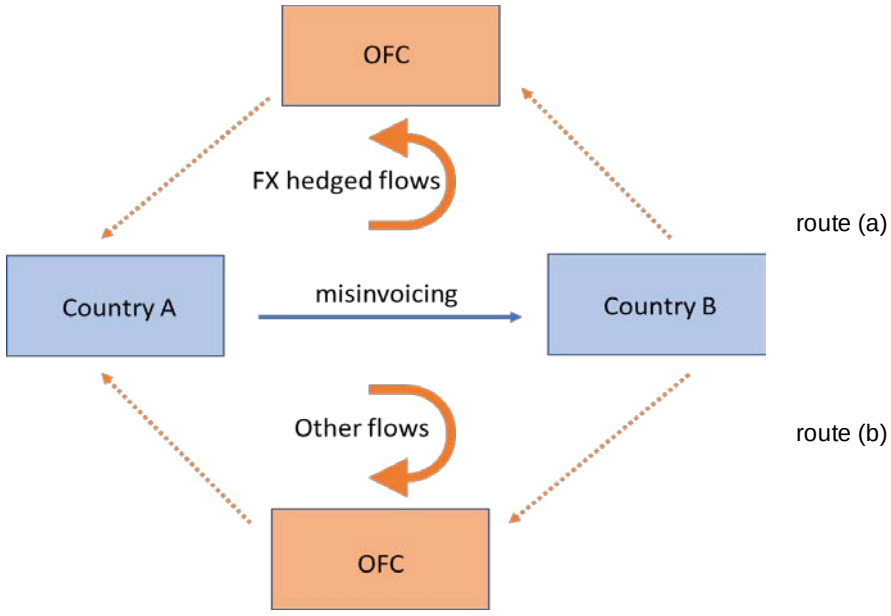
Source: authors' calculations.

3.3 Multinational corporations

In this section, we elaborate on the role played by MNCs in intermediating the link between misinvoicing and the reported OFC exposures. MNCs dominate international trade today, moving large amounts of capital across their foreign subsidiaries and affiliates, some of which are located in offshore centres. Misinvoicing by MNCs can be difficult to prove, as it can be concealed under practices where there is a thin separation line between what is considered licit and illicit. Some may argue that MNCs and their affiliates simply prefer OFCs because of their high-quality financial services, while at the same time engaging in 'misinvoicing' for reasons that have to do with corporate 'efficiency'. After all, regulatory arbitraging or tax optimization are not necessarily illegal per se, and many OFCs provide the means to achieve these corporate objectives on a cost-efficient basis. Our OFC list includes Hong Kong SAR, Luxembourg, and Switzerland, which are all internationally recognized financial hubs. MNCs and their practices may, therefore, intermediate the link between misinvoicing and OFCs' reported exposures, potentially confounding the mechanism we uncover in the data.

While most developed countries have a tax code that is convex and asymmetric (e.g., tax credits, tax loss carry forwards), this is further complicated by the existence of foreign tax credits that apply to MNCs. More specifically, Deng (2020) shows that US firms which shift more offshore income for tax incentives are those that engage in more currency hedging to lower their FX exposure costs. In a more general setting, Donohoe (2015) provides narrative evidence regarding the use of derivatives for tax avoidance purposes (see also Campbell et al. 2019).

Figure 2: Potential mechanisms linked to international trade misinvoicing



Source: authors' graphical illustration of the potential mechanisms.

In stark contrast to the behaviour and practices of MNCs, an agent acting on behalf of a corrupt local elite, for example, would only be concerned with the 'dollar value' of its offshore wealth. Accordingly, we can presume this agent does not intend to hedge against local FX fluctuations. In other words, this agent is indifferent to local FX volatility, as the trade is generally settled in a commonly accepted major currency such as the US dollar.[14]

Figure 2 provides a graphical illustration of the mechanisms which we aim to reveal in this section by separating the two motives mentioned above. Route (a) in Figure 2 describes the flows driven by the corporate motivations of MNCs, while route (b) indicates flows driven by *other* behaviours and practices.

To assess which mechanism is more salient, we alter equation (1) by adding the interaction of the misinvoicing term with a measure of local FX volatility. As there is very limited data available on the extent of FX hedging by MNCs, we use local currency volatility as a proxy for the hedging activity of MNCs (see Section 2.3 for details on the construction of this variable).

We focus only on outflows because this is where statistically significant results were found. Note that the interaction term captures the unobserved part of misinvoicing driven by the motivations of MNCs that imply hedging. These results are presented in Table 7. The specifications in column (1) confirm the non-statistically significant impact of import over-invoicing on XB offshore liabilities. The most interesting result is provided in column (2), where the coefficient of IFF is statistically significant but its interaction with FX volatility is not. It suggests that the positive

[14] Hence, illicit proceeds from misinvoicing can be sent directly to an OFC bank account. Note that most of the small OFCs have their domestic currencies fixed against one of the major world currencies. Most of the rich Middle Eastern countries (e.g., Saudi Arabia, Oman, Qatar) also have their local currencies fixed/pegged to the US dollar, so there is no need to hedge against local FX volatility.

relationship between illicit outflows and XB offshore liabilities is not likely to be driven by corporate motivations (e.g., profit shifting, tax optimization).

Having excluded the route related to the motivations of MNCs, the other possible channel we are left with is via rent-seeking behaviours perpetrated by elites in weakly institutionalized countries. Our data does not allow us to directly test for such a proposition, but the evidence provided here seems to be consistent with the evidence uncovered for autocracies and for non-OECD countries in Table 6. Taken together, these findings seem to indicate that autocracies and less-developed countries, which are mostly ruled by self-interested elites, are likely to be the origin of illicit flows generated through misinvoicing. In this case, the role of political and economic elites in weakly institutionalized countries is a salient and plausible one.

Table 7: FX hedging and misinvoicing

Dependent variable	Share of XB offshore liabilities	
Hypothesis tested	H1: *Outflows*	
	Import over-invoicing	Export under-invoicing
	(1)	(2)
IFF	0.138	0.043**
	(0.091)	(0.019)
FX st.dev.	0.024	0.096
	(0.032)	(0.079)
IFF * FX st.dev.	-0.041	-0.015
	(0.027)	(0.010)
No. of observations	2,281	2,281
No. of countries	164	164
R^2	0.826	0.826

Note: unbalanced panel, time period: 2000–18. Time and country fixed effects, country-specific linear trend, per capita GDP growth, and the dummy for trade sanctions are included in all specifications. Standard errors clustered at the country level are reported in parentheses below the estimated coefficients. ***, **, and * denote significance at 1%, 5%, and 10% levels.

Source: authors' calculations.

4 Conclusions and policy implications

We studied whether international trade misinvoicing, which is a common proxy for IFFs in the literature, is reflected in the bank accounts of OFCs. We used publicly available data on bilateral XB exposures from BIS LBS and relied on recent estimates for misinvoicing covering a large set of the world's economies by Lépissier et al. (2021). Our findings show that larger illicit outflows are associated with higher shares of XB offshore liabilities (i.e. deposits). In other words, residents end up owning more offshore wealth when local misinvoicing practices thrive. Our results are driven by the subgroup of less-developed countries and autocratic regimes, suggesting that illicit money is more likely to leave states which lack adequate institutional capacity and/or the political willingness to deter illicit practices and behaviours. We also found that the natural resources sector is more likely to be subject to such misinvoicing practices, generating illicit proceeds that are transferred to OFC banks. These results are robust to an array of sensitivity checks and different model specifications. We also looked at the role played by MNCs in intermediating the link between misinvoicing and offshore exposures. Assuming the part of misinvoicing driven by corporate motivations (such as profit shifting, tax optimization, or regulatory arbitrage) is hedged against local currency fluctuations, we find that this channel has no influence on our estimates.

Hence, our identified effects stem from illicit behaviours and practices that are unrelated to the corporate motivations of MNCs.

Our results paint a rather pessimistic image regarding the financial implications of misinvoicing, especially in less-developed countries. The existing literature discusses several remedies ranging from information exchange treaties to legislation on corporate transparency. Menkhoff and Miethe (2019) show that information exchange treaties are not very effective in countering IFFs, which can easily relocate to jurisdictions not covered by the treaty. Hence, only a successful, globally coordinated initiative can achieve a complete network of treaties to cover all countries. Mandatory automatic information exchanges would be ideal, but even on-request exchanges might help. The problem is that many poor and developing countries lack the institutional capacity to identify misinvoicing practices and the political willingness to overhaul the economic and financial system, which is usually tilted in favour of the local elites. Enforcing tight international laws in this context seems rather ineffective. The corporate transparency rules advocated by Allred et al. (2017) target the incorporation of anonymous shell companies, which play a key role in international money laundering. They find that larger, not smaller, countries are more likely to circumvent rules on governance transparency (see also Sharman 2011). Companies located in developed countries can find it easier to exploit their market (and bargaining) power when setting the trade terms, especially when there are companies from developing countries at the other end of the trade (Mehrotra and Carbonnier 2021). In more practical terms, we see a large role for legislation promoting transparency rules, particularly in reference to the origin of merchandise (e.g. transparency about fair trade practices used to gather/produce/exploit the local resources in developing countries).

International trade processes today are also undergoing large structural changes determined by the availability of newer technologies and by digital innovation, which have all been accelerated by recent crises. Blockchain technology is revolutionizing both finance and international trade (see Chang et al. 2019; Gurtu and Johny 2019). For example, on 6 September 2016, Ornua became the first organization in the world to complete a trade with its foreign partner using blockchain technology, helping it to cut time, costs, and paperwork.[15] The US$100,000 trade for butter and cheese with the Seychelles Trading Company was concluded in less than four hours, although it takes days on average to settle international trade. In a similar vein, blockchain technology can be used to track the entire supply chain, ensuring perfect transparency at each stage of the process. Chang et al. (2019) provide several examples of initiatives in this booming industry. We believe financial support from developed countries to incentivize this type of process transformation in international trade could help to counteract IFFs and misinvoicing for the benefit of all stakeholders, especially developing countries. Semi-public financial organizations that support international trade (e.g., development banks and credit agencies) could also be called on to play a bigger role in this transition, for example, by requiring that export credits are extended only under specific conditions (e.g. regarding the origin of the merchandise or transparency criteria that apply along the entire supply chain).

[15] See Ornua (2016) for more details. Many technology pioneers today (e.g., Provenance, Everledger) together with banks and ICT providers are already developing platforms and business solutions that can be economically efficient on a greater scale, thus revolutionizing international trade. See Everledger (n.d.) for an example of how this technology is applied in the market of diamonds..

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Appendix

A1 Panel unit root tests

Given the unbalanced nature of our panel, the short time span, and the presence of data gaps, readers should be cautious when drawing conclusions from unit root tests. Visual inspections of the time-series pertaining to the main dependent variable lends support to our modelling choice of including country-specific trends. Due to the large cross-sectional dimension of our sample, and the type of the hypotheses tested, we prefer to split the sample into two income groups: i.e. OECD and non-OECD groups.

Due to the unbalanced nature of our panel dataset, we use Fisher-type tests as proposed in Maddala and Wu (1999). As can be seen in Tables A1 and A2, for the non-OECD subgroup in particular, we find no compelling evidence to reject the null that all panels contain unit roots. Note that unit root testing on the entire sample would inherently lead us to reject this null in favour of the alternative hypothesis, despite some countries displaying non-stationary dynamics. Non-stationary dynamics in time-series can be driven by either stochastic (i.e. unit roots) or deterministic trends. By splitting the sample instead, we increase our chances of identifying non-stationary dynamics in the dependent variable.

Table A1: Fisher unit root tests: dependent variable – share of XB offshore liabilities in total

Country group	OECD		Non-OECD	
Test type	No trend	Trend	No trend	Trend
Inverse chi-squared P	268.78*	333.02*	76.45	44.25
Inverse normal Z	0.20	-0.22	-0.87	2.87
Inverse logit L*	-0.26	-2.18*	-0.94	2.87
Modified inverse chi-squared Pm	1.80*	4.80*	0.72	2.03
Number of panels	130		34	
Average number of periods	12.72		18.41	

Note: Fisher-type panel unit root tests reported above are based on ADF tests with 1 lag. Cross-sectional means were removed. Null hypothesis: all panels contain unit roots. Alternative hypothesis: at least one panel is stationary. A * denotes statistical significance at the 5% level.

Source: authors' calculations.

Table A2: Fisher unit root tests: dependent variable – share of XB offshore claims in total

Country group	OECD		Non-OECD	
Test type	No trend	Trend	No trend	Trend
Inverse chi-squared P	457.11*	353.30*	48.84	44.53
Inverse normal Z	-2.70*	0.53	0.86	3.93
Inverse logit L*	-7.05*	-2.52*	0.83	3.73
Modified inverse chi-squared Pm	10.60*	5.75*	-1.64	-2.01
Number of panels	130		34	
Average number of periods	12.72		18.41	

Note: Fisher-type panel unit root tests reported above are based on ADF tests with 1 lag. Cross-sectional means were removed. Null hypothesis: all panels contain unit roots. Alternative hypothesis: at least one panel is stationary. A * denotes statistical significance at the 5% level.

Source: authors' calculations.

A2 Different classifications of OFCs

Table A3: Lists of OFCs used in the analysis

	Andersen et al. (2022)	Garcia-Bernardo et al. (2017)	Zoromé (2007)
Anguilla		-	
Austria	✓		
Bahamas	-	-	-
Bahrain	-		-
Belgium	✓		
Belize		-	
Bermuda	-	-	-
British Virgin Islands		-	
Cayman Islands	-	-	-
Curacao		-	
Cyprus		-	-
Gibraltar		-	
Guernsey	✓		✓
Guyana		-	
Hong Kong SAR	✓	✓	✓
Ireland	-	✓	✓
Isle Of Man	-		✓
Jersey	✓	✓	✓
Liberia		-	
Liechtenstein	-	-	
Luxembourg	✓	✓	✓
Macao SAR	✓		
Malta		-	-
Marshall Islands		-	
Mauritius		-	
Monaco		-	
Nauru		-	
Netherlands Antilles	-		-
Panama	-		
Samoa		-	
Seychelles		-	
Singapore	-	-	-
St. Vincent & Grenadines		-	
Switzerland	✓	✓	✓
Taiwan	-	✓	
The Netherlands	-	✓	
The United Kingdom	-	✓	✓

Note: the hyphen indicates whether a country is an OFC according to the articles reported in the table header. The checkmark indicates the countries used in our analysis as OFCs, our selection depending exclusively on data availability from BIS LBS.

Source: sources are indicated in the first row of the table.