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**GETTING THE MEASURES
OF TRADE MISINVOICING RIGHT:
BILATERAL PANEL DATA APPROACH**

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ABSTRACT

Getting the Measures of Trade Misinvoicing Right: Bilateral Panel Data Approach

Trade misinvoicing has been traditionally used as one of the measures of illicit capital flows. The issue of capital flight has recently come to the centre of public attention due to increasing role of capital flows not only from developing but also from developed economies to countries with favourable tax environment. Yet, determinants of trade misinvoicing remain underinvestigated in the relevant literature. On top of that, we argue that traditional measures of capital flight based on trade misinvoicing tend to be biased due to the insufficient treatment of transportation and insurance costs. In this paper we construct large data set containing bilateral panel data on trade misinvoicing covering 194 countries over the period 2001-2015. This allows us to identify extent of misinvoicing practices at individual country level while acknowledging differences between incentives to misinvoice on exporter's and importer's part. We decompose the extent of misinvoicing into contributions of selected determinants, such as transaction costs, measures of economic and financial development, trade openness and tax policy variables.

KEYWORDS: trade misinvoicing, illicit capital flows

ABSTRAKT

Možnosti korekcie odhadov falošnej fakturácie v zahraničnom obchode: Prístup s využitím bilaterálneho panelového odhadu

Problém falošnej fakturácie v zahraničnom obchode sa tradične používa pri odhadoch úniku nelegitímneho kapitálu. Problém takých únikov kapitálu sa dostal aj do pozornosti širšej verejnosti v dôsledku zvyšujúcej sa úlohy presunov kapitálu nielen z rozvíjajúcich sa, ale aj rozvinutých ekonomík, predovšetkým do destinácií s výhodným daňovým prostredím. Na druhej strane však analýza determinantov problému falošnej fakturácie zostáva v teoretickej aj praktickej literatúre málo pokrytá. Je možné navyše skonštatovať, že tradičné odhady únikov kapitálu prostredníctvom falošnej fakturácie sú skreslené v dôsledku problému odhadu transakčných nákladov. Pomocou databázy zachytávajúcej dáta bilaterálnej povahy medzi vykazujúcimi exportérmi a importérmi v zahraničnom obchode pre 194 krajín za obdobie 2001 – 2015 tento článok identifikuje rozsah problému falošnej fakturácie na úrovni individuálnych krajín a zároveň odhaduje vplyv jednotlivých ekonomických premenných na motiváciu zapájať sa do falošnej fakturácie. Vplyv vybraných premenných je určený pomocou bilaterálneho panelového odhadu s fixnými efektmi. Pomocou vykonanej dekompozície vplyvu jednotlivých premenných určujeme príspevok transakčných nákladov, ukazovateľov ekonomického a finančného rozvoja, ako aj vybraných inštitucionálnych premenných k rozsahu existujúcej falošnej fakturácie na vzorke vybraných krajín.

KLÚČOVÉ SLOVÁ: falošná fakturácia, nelegitímny tok kapitálu

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1 Introduction

Volume of illicit capital flows has been steadily increasing over the last decade bringing about severe socio-economic consequences for countries affected (GFI (2017)). While historically believed that illicit capital flight targets predominantly low-income economies with insufficient quality of institutions, public trust and underdeveloped financial markets, recent financial crisis has also drawn attention of policy makers in developed countries when searching to cover dropout in fiscal revenues due to tax optimization purposes. Estimates of illicit capital flight volumes are, however, highly imprecise and offer only very vague guidance for anyone interested in estimating their impact on socio-economic development or conduct of economic policy, fiscal included.

Trade misinvoicing traditionally represents one of the partial measures of illicit capital flight accompanied by hot-flow approach (GFI (2017)), sources-and-uses method from balance of payments or other firm behaviour-based approaches (Johannesen and Pirttila (2016)). Trade misinvoicing represents a method used to move capital in or out of country's borders by misreporting a value of trade to custom offices (Spanjers and Foss (2015)). Since highly individualized firm's micro data on individual export and import prices are rarely available for analytical purposes, estimations of extent of trade misinvoicing on country level are based on aggregated trade bilateral data. This approach was firstly introduced in seminal paper by Bhagwati (1964) and since then been widely applied to quantify amount of misreporting practices (e.g. Ajayi and Ndikumana (2014), GFI (2017) or UNDP (2011)).

Several issues are linked to estimating the illicit capital flight with misinvoicing approach. Firstly and most crucially, various studies (e.g. Kar and Spanjers (2014), Ajayi and Ndikumana (2014)) implicitly or explicitly rely on the assumption of no-invoicing (as defined in Hong and Pak (2017)) in either all developed countries, or in one benchmark country, the US being the usual example. However, Hong and Pak (2017) shows that this assumption can not be accepted once looking at the dispersion of bilateral misinvoicing ratios within the group of top 25 developed countries and across time. While not attributing the extent of misreporting practices to any underlying cause, pure presence of mismatches in bilateral data for developed countries point to aggravated issue of inaccurate estimates in most of relevant empirical literature. Other flaws of this method, as listed in Johannesen and Pirttila (2016), include inclusion of statistical discrepancies due to different reporting standards on product-level (UNDP (2011)), or attributing the difference in export and import values to illicit motivations of firms rather than to statistical omissions and errors of custom or statistical offices.

Additionally, fixed assumption of transaction costs set at 10 per cent as per IMF standards is often explicitly used for deriving volume of illicit capital flows (GFI (2017)). Contrary to that, global estimates of costs of freight and insurance usually set lower threshold ranging from 2 per cent (Gaulier et al. (2008)), 3 percent (Gaulier and Zignano (2010)), 4 per cent (Gehlhar (1996)) up to 5-7 percent (Streicher and Stehrer (2013), Timmer et al. (2012)).

Last but not least, empirical measure of capital flight through misreporting practices and approximation of transaction costs in trade geography literature strongly overlaps but without

acknowledging their mutual interconnection. While measure employed by GFI (2017) derives extent of capital flight from CIF/FOB ratio in mirror trade statistics net of time and space invariant transaction costs, the trade gravity models (such as Bergstrand and Egger (2010)) take CIF/FOB ratio as a full approximation of transaction costs without netting out extent of possible misreporting practices. Hence, both streams of literature might benefit from the existing overlap leading to more precise estimates of capital flight and transaction costs.

The main contribution of this paper is therefore threefold. We acknowledge overlap in literature on capital flight and transaction costs and aim to empirically determine extent of misreporting practices once accounting for transaction costs, level of financial development and other relevant socio-economic factors. By modeling the transaction costs as dependable on distance, colonial links, trade agreements and development of financial sector we address common critique of fixed markup for transaction costs in relevant literature (Nitsch (2015)). On top of that we build an innovative bilatera panel data model to determine the extent of misreporting practices that allows us to specifically control for individual country-specific characteristics at exporter and importer side simultaneously. Thirdly, taking into account critique of no-invoicing assumption our analysis treats both developed and developing countries a priori as equally inclined to misreport once controlling for set of explanatory variables.

We conclude that increase in change in income taxes and customs is accompanied by an increase in CIF/FOB ratio which is consistent with identification of trade misreporting with illicit capital flows. Our model is more successful in explaining export misreporting than import misreporting, one of the most important conclusions being that countries with bigger current account deficits then to be more prone to export underinvoicing. On top of that, misreporting determinants are relevant for explaining cross-country differences in CIF/FOB ratio on both exporter's and importer's side. Our methodology and results might be further used to derive a more precise estimate of capital flight net of transaction costs as well as to provide a tool to deal with high unreliability of transaction costs estimates in trade geography literature.

The paper is structured as follows: Section 2 discusses the relevant literature. Section 3 introduces the bilateral panel data model and presents data. We provide the results in Section 4. Final Section concludes.

2 Related Literature

Seminal paper by Bhagwati (1964) is a first attempt to describe an issue of import underinvoicing that is usually conducted by reporting nominally lower value of import than its real value as a strategy to surpass severe import controls. On the other hand, overinvoicing of import serves to supply foreign exchange to domestic economic actors in presence of harsh capital control. Conversely, a firm interested in keeping foreign exchange abroad would underinvoice export values, while possible tax optimization purposes might stand behind the motivation to overinvoice export values in country with competitively lower tax rates. Hence, different motivations of economic actors might determine extent and direction of misreporting practices.

The misreporting practices might occur on both export and import side, simultaneously or individually. Since one transaction is recorded by both sides, once by custom office of an exporter and once by custom office of an importer, discrepancy in recorded values between both offices net of costs of freight and insurance might be attributed to either statistical errors or motivation of firms' to willingly misdeclare invoice sums reported to offices. The mirror-trade approach take advantage of this observation and use aggregate data on export and import from IMF or UNCTAD database to derive extent of misreporting practices. Recent estimates of misreporting practices for least developed countries amounts to 51 US bil. cumulatively for 2005-2008 period (UNDP (2011)). Global financial integrity reports estimate cumulative flows of illicit capital to 1750 US bil. over the 2005-2014 period for all developing countries (Spanjers and Foss (2015)). Out of total illicit capital flows, trade misreporting accounts for roughly 70 per cent on outflow sides (UNDP (2011)) and 97 per cent on inflows side (GFI (2017)).

Standard literature focusing on traditional determinants of misreporting practices highlights role of high custom duties and other types of trade barriers (de Boyrie et al. (2007), Boyce and Ndkumana (2001), Beja et al. (2005)) or fears of expropriation of capital and lack of trust in formal institutions (Schulze (1994)). Two recent empirical studies provide evidence on determinants of misreporting practices. Buehn and Eichler (2011) develops a small micro model specifying incentives to misinvoice on export and import side and use it to empirically test effect of selected determinants on extent of misreporting practices for export and import side separately in panel fixed effect model setting. Black market premium and trade taxes (import and export) belong to robustly statistically significant determinants explaining extent of misreporting practices in set of developed and developing countries (77 countries). Other variables, such as real exchange rate, income taxes or punishment costs deliver only mixed results. Patnaik et al. (2012) interprets misreporting practices as a way to capture de facto capital account openness in countries with active capital controls policies. Using extended dataset consisting of developed and developing countries (53 major economies) they find an evidence of prevailing misreporting practices among developing countries but with decreasing trend among top industrialized countries over the last 25 years. Different determinants were at play for export and import misreporting. Import overinvoicing is mainly influenced by current account deficit, custom duties, and currency overvaluation, while export underinvoicing is predominantly driven by current, capital and trade account openness, political instability and external indebtedness.

Patnaik et al. (2012) also argue that different set of factors drive misreporting practices in developed and industrialized countries.

From the different point of view, the CIF/FOB ratio might be used to approximate value of transaction costs in determining relations among trade partners in standard gravity trade models (e.g. Bergstrand and Egger (2010), Limao and Venables (2001)). Yet, while high level of inaccuracy in such approximation has been acknowledged (Hummels and Lugovskyy (2006)), and various studies attempted to calculate global estimates of transaction costs (e.g. Gaulier and Zignano (2010), Gehlhar (1996), Streicher and Stehrer (2013), Timmer et al. (2012)) only recently steps have been taken to analytically derive implicit transaction costs using econometrical tools (Gaulier et al. (2008), Miao and Fortanier (2017)). On top of that, studies remove outliers to ensure unbiased estimates of transactions costs (e.g. Miao and Fortanier (2017)) or exclude "incorrect" observations in form of negative CIF/FOB ratios (Gaulier et al. (2008), Gaulier and Zignano (2010)). Even if plausible from statistical point of view, both techniques, the exclusion of negative CIF/FOB ratios and outliers, remove a significant piece of information plausibly related to occurrence of misreporting activities. In order to net out effect of transaction costs in calculation of misreporting practices, this branch of literature needs to be acknowledged and incorporated into final estimations.

The misreporting practices evaluated in this paper do not include all possible strategies employed to transfer capital out or into an economy. Prominent example include shift of capital among branches of multinational companies located in different domiciles through violation of the arm's length principle. This violation occurs as a difference between invoiced sum set between two related parties at lower or higher price than its equivalent between non-related parties prevalent on the market. Since both sides engaged in trade between related parties report the same sum to their respective custom offices this transaction will not show up as a trade misreporting even if viewed as a clear violation of good practices and standard code of conduct in international trade and, on top of that, a way to optimize tax base across multinational company' subsidies.

3 Empirical Specification

In capital flight literature, values of exports and imports reported by country i are compared to values reported by its trade partners to estimate the extent of illicit capital flows. This methodology is usually used for developing countries assuming that whereas advanced countries report values of exports and imports truthfully, developing countries tend to. Illicit capital flows via trade misreporting can occur in two ways:

(a) Country i underreports volumes of exports to country j . For example, a portion of amount is not paid by importer in country j to exporter in country i , but it is deposited abroad on behalf of the exporter. This motivates comparison of volumes of trade reported by two partners in the following form:

$$ED_i = M_j/(1 + \omega) - X_i \quad (1)$$

where ED_i stands for export discrepancy, X_i is volume of exports from country i to country j reported by country i , M_j is volume reported as imports by the trade partner. Parameter ω captures costs of freight and insurance which are typically assumed to be 10 per cent.

Assuming that country j is advanced economy and reports volume of imports M_j truthfully, positive values of ED_i indicates underinvoicing practices by domestic exporters which can be interpreted as evidence of illicit capital outflow.

(b) Country i overreports volumes of imports from country j . For example, a portion of amount formally declared as payment for imported goods is deposited abroad in importer's name. Therefore, following trade volumes are compared:

$$ID_i = M_i/(1 + \omega) - X_j \quad (2)$$

where ID_i stands for export discrepancy, M_i is volume of imports to country i from country j reported by country i , X_j is volume reported as exports by the trade partner. Analogically to the case (a), assuming that country j is advanced economy and X_j reflects true value of trade, positive values of ID_i indicates import overinvoicing which can be linked to illicit capital outflow. In total, total illicit capital outflow from country i ($ICOF_i$) can be estimated as:

$$ICOF_i = ED_i + ID_i = \frac{M_j}{1 + \omega} - X_i + \frac{M_i}{1 + \omega} - X_j \quad (3)$$

Following the Siranova and Tiruneh (2015) the ω in 3 might be further decomposed to account for other factors creating discrepancies in mirror trade statistics by factor λ . These include role of re-export (Guo (2009), Cobham et al. (2014)), existence of cross-country differences in threshold for recording international transactions and not harmonized trade custom procedures, exchange rate fluctuations or pure statistical error. The misreporting practices will therefore be decomposed as follows:

$$ICOF_i = ED_i + ID_i = \frac{M_j}{(1 + \mu)(1 + \lambda)} - X_i + \frac{M_i}{(1 + \mu)(1 + \lambda)} - X_j \quad (4)$$

The decomposition of ω into real value of freight and transaction costs captured by μ and other factors, some of them possibly related to misreporting practices, included in λ is of utmost importance for more precise calculation of extent of capital flight.

Export discrepancies can also be expressed in relative terms, i.e.:

$$ed_i = \frac{ED_i}{X_i} \quad (5)$$

Analogically, the relative extent of misreporting practices on importer's side is as follows:

$$id_i = \frac{ID_i}{M_i} \quad (6)$$

The CIF/FOB ratio expressed in logarithmic form is therefore composed from two parts, including extent of misreporting as in 5 and transaction costs ω on exporter's side:

$$\ln \frac{M_j}{X_i} = ed_i + \omega \quad (7)$$

Similar logic applies on importer's side:

$$\ln \frac{M_i}{X_j} = id_i + \omega \quad (8)$$

3.1 Model

GFI (2017) investigate trade between developing and advanced economies. Using above mentioned assumption that advanced economies report volumes of trade truthfully and assuming $\omega = 0.1$, they estimate illicit capital flow from developing countries to advanced economies. Subsequently, they estimate ed and id for all developing countries in their trade relations with developed world and calculate total volume of illicit capital flight assuming that developing countries tend to misreport volumes of trade with other developing countries at the same rate as with advanced economies.

This approach suffers from several shortcomings:

(a) The assumption that transaction and insurance costs are always equal to 10 per cent is very restrictive. It seems reasonable to assume that costs of freight and insurance depend on distance between trading partners (but not necessarily linearly), on whether trading partners reside on the same continent, on whether there are trade agreement between exporting and importing countries and so on.

(b) Estimation of ed and id by (GFI (2017)) explicitly assumes that there are no illicit capital flows from advanced economies to developing world and that there are no illicit capital flows between advanced economies. This is also very restrictive especially in view of the fact that whereas for example Poland and Hungary are classified as 'Developing Europe', Slovakia,

Slovenia and Czech Republic are considered to be advanced economies. Therefore GSI methodology cannot be used to properly estimate capital flight in the region of Central and Eastern Europe since it explicitly assumes that there are no illicit capital flows in certain countries in the region.

To improve on GFI methodology we do not distinguish between developing countries and advanced economies. Instead, we assume that discrepancy between volumes of trade reported by exporter and importer always depends on three factors: (a) transaction costs, (b) exporter's tendency to misinvoice, (c) importer's tendency to misinvoice.

Instead of assuming that transaction costs are constant, we assume that they depend on economic distance between two countries. Both exporter's (importer's) tendency to misinvoice depends on level of development, set of observed characteristics explained below and exporter's (importer's) unobserved characteristics captured by fixed effect.

This motivates estimation of the following model using bilateral panel data:

$$tdi_{i,j,t} = \beta_0 + \beta \mathbf{D}_{i,j} + \boldsymbol{\delta}^E \cdot \mathbf{X}_{i,t}^E + \boldsymbol{\delta}^M \cdot \mathbf{X}_{j,t}^M + v_i^E + v_j^M + d_t + \epsilon_{i,j,t} \quad (9)$$

where $tdi_{i,j,t}$ stands for ratio measuring discrepancy between value of trade reported by importer j and value of trade reported by exporter i .

In particular:

$$tdi_{i,j,t} = \ln(\text{trade}_{i,j,t}^M) - \ln(\text{trade}_{i,j,t}^E) \quad (10)$$

where $\text{trade}_{i,j,t}^E$ ($\text{trade}_{i,j,t}^M$) stands for value reported by exporter (importer). Positive values of $tdi_{i,j,t}$ indicate export underinvoicing (import overinvoicing). Vector $\mathbf{D}_{i,j}$ is a vector controlling for economic distance between trade partners which consists both of geographical distance and economic variables controlling for existence of trade agreements and former colonial relationship. \mathbf{M}^E (\mathbf{M}^M) for vector of characteristics associated with exporting (importing) country j , v_i^E for exporting country's fixed effect and v_j^M for importing country's fixed effect.

Model 9 resembles model by Gaulier and Zignano (2010) who also use bilateral panel data to regress CIF/FOB ratio on set of geographical distance, GDP per capita and absolute value of GDP to estimate transportation costs. However, whereas Gaulier et al. (2008) assume that all variation in CIF/FOB ratio is driven by transaction costs, by including economic variables and fixed effects for both exporter's and importer's tendency to misinvoice we are able to isolate portion of CIF/FOB ratio caused by transaction costs and portion caused by trade misinvoicing. Miao and Fortanier (2017) use similar approach to estimate transaction costs. Instead of bilateral panel, they use four dimensional data adding fourth dimension corresponding to different product types. In addition to geographical variables they include dummy variable controlling for product type and trade partner. However, they do not control for economic variables other than GDP per capita and they do not include fixed effects for both trading partners.

Estimation of effects of time-varying variables on dependent variable in this setting can be potentially biased due to the correlation between fixed effects v^E or v^M and control variable in question. Two possible possible solutions are in order. Firstly, random effect model with full specification should deliver unbiased estimates but this approach is computationally not trivial in the bilateral panel set-up. Instead, we opt to estimate second-stage regression where fixed effects are regressed on average values of time-varying covariates during the period 2011-2015 ($\tilde{\mathbf{X}}_i^E$ and $\tilde{\mathbf{X}}_j^M$ respectively) and list of other time-invariant explanatory variables (\mathbf{Z}_i^E and \mathbf{Z}_i^E respectively). The second-stage estimation regressing exporting country's fixed effects takes the following form:

$$v_i^E = \beta_0 + \boldsymbol{\eta}^E \cdot \tilde{\mathbf{X}}_i^E + \boldsymbol{\theta}^E \cdot \mathbf{Z}_i^E + \epsilon_i \quad (11)$$

In the similar fashion, the second-stage regression for importing country's fixed effects is as follows:

$$v_j^M = \beta_0 + \boldsymbol{\eta}^M \cdot \tilde{\mathbf{X}}_j^M + \boldsymbol{\theta}^M \cdot \mathbf{Z}_j^M + \epsilon_j \quad (12)$$

The residuals from the 11 and 12, respectively, are treated as the true country-individual fixed effects on importer's and exporter's side.

In order to derive contribution of individual covariate k that enters both first and second stage regression to overall extent of misreporting on exporter's side the following transformation is used, with the US-type of economy taken as the benchmark:

$$\gamma_{i,k}^X = (\delta_k^E + \eta_k^E)(\tilde{X}_{i,k}^E - \tilde{X}_{0,k}^E) \quad (13)$$

In the similar fashion, the contribution of individual covariate k that enters both first and second stage regression to the extent of misreporting on importer's side is calculated in the following way, with the US-type of economy taken as the benchmark:

$$\gamma_{j,k}^M = (\delta_k^M + \eta_k^M)(\tilde{X}_{j,k}^M - \tilde{X}_{0,k}^M) \quad (14)$$

Contribution of time invariant covariates that enter only the second stage regression is derived using associated regression coefficients from 11 or 12, respectively.

4 Data

The bilateral dataset is constructed using country-level data from the UNCTAD bilateral trade statistics. The panel spans over 2001-2015 period and includes over 110 000 trade country-pairs. The measure of export-underinvoicing is calculated according to 10 for specification in logs.

The determinants of transaction costs and freight and insurance include measure of distance and distance squared in line with Miao and Fortanier (2017) and Gaulier et al. (2008). Since the transaction costs are observed to be lower for sea transportation, the bilateral dummy obtaining one in case of existence of sea connection is added (Miao and Fortanier (2017)). Socio-economic and cultural ties stemming from the shared colonial history that might positively decrease transaction costs due to presence of transportation networks are captured by the time-invariant colony dummy (Gaulier et al. (2008)). Following the similar line of reasoning, effect of membership in customs and free trade zones is controlled for by the time-varying dummy variable compiled by Dur et al. (2014).

Inclusion of GDP p.c. variable serves two purposes. Literature measuring transaction costs widely uses GDP p.c as proxy variable assuming lower costs associated with improvement in overall economic conditions, infrastructure predominantly (Limao and Venables (2001)). On the other hand, level of economic development is expected to be negatively associated with misreporting practices since the capital flight issue is generally presented as a phenomenon of developing countries. In the similar fashion, level of financial development approximated by domestic credit to GDP ratio from World Bank is expected to positively correlate with costs of insurance as better access to financial intermediation and width of financial services tend to decrease costs of such services. However, income from misreporting is often deposited in countries known for their sophisticated financial sector services and high level of secrecy. Thus, the financial development variable might indirectly serve as a control variable encapsulating this type of incentives.

Second set of variables in 9, 11 and 12 include possible determinants of misreporting practices as specified in relevant literature (Buehn and Eichler (2011), Patnaik et al. (2012)). Effect of more stringent tax policies (Fisman and Wei (2004)) and customs policies (de Boyrie et al. (2007), Boyce and Ndkumana (2001) or Beja et al. (2005)) is expected to positively affect incentives to misreport in order to avoid paying these duties. Since illicit capital flight is substantially driven by various insitutional factors in emitting economies, such as quality of institutions, public trust (World Bank (2012)) or corruption level (Fisman and Wei (2007), Berger and Nitsch (2008)), various measures of quality of socio-economic institutions from World Bank database are taken into considerations. The list is further expanded by inclusion of tax haven dummy based on European Commission and tax secrecy index as reported by Tax Justice Network. In line with Buehn and Eichler (2011) we control for trade openness as a ratio of export and import to GDP that measures effective size of tradable sector potentially offering higher number of opportunities to misreport. As argued in Patnaik et al. (2012), highly indebted countries might face risk of capital expropriation aligned with future economic and political instability that might prompt illicit capital outflows. Ratio of external debt on GDP is

expected to be positively associated with higher volume of capital flight, especially on export's side as statistically confirmed in Patnaik et al. (2012).

Current account balance might serve as an indirect measure of de-facto capital account openness in presence of strict capital controls. As argued in Buehn and Eichler (2011) persistent current account deficits might be interpreted as a manifestation of economic instability as perceived by capital-owners further inducing capital outflows.

Real interest rate differential, inflation rate and real exchange rate were also included in preliminary regressions, but since they were found not to be statistically significant, they were not used in the final model.

Table 1: **Determinants of Trade Misreporting and Their Expected Impact**

	Importer Side	Exporter Side
Transaction Costs		
Distance	jointly positive	jointly positive
Sea transport	jointly negative	jointly negative
Colony	jointly negative	jointly negative
Common Language	jointly negative	jointly negative
Area	positive	no effect
Trade Aggrement	negative	no effect
Institutional Factors		
Tax haven	positive	positive
Tax secrecy	positive	positive
Government effectiveness	negative	negative
Rule of Law	negative	negative
Control of Corruption	negative	negative
Customs	positive	no effect
Other Economic Factors		
Income tax	positive	positive
Current account balance	negative	no effect
Trade openness	positive	no effect
External debt	positive	negative
Economic development (GDP p.c.)	negative	negative
Domestic credit-to-GDP	positive	negative

Based on the overview of relevant literature, the Table 1 summarizes expected impact of selected determinants on on CIF/FOB ratio as expressed in 10 while differentiating between import and export side.

Naturally, CIF/FOB ratio is assumed to increase with economic distance measured by combination of variables including geographic distance and existence of trade agreements and common colonial history. Due to incentives to tax optimization, increase in tax burden is expected to lead to higher values of CIF/FOB ratio. Furthermore, since high CIF/FOB ratio indicates illicit capital flight, it is reasonable to assume higher values of CIF/FOB ratio when trade with tax havens and countries with high level of tax secrecy is considered. We expect

increase in level of economic development as well as quality of governance measured by indicators of rule of law and control of corruption to be accompanied by lower CIF/FOB ratios. We do not use any apriori assumption about effects of trade openness on trade misinvoicing. However, since literature Buehn and Eichler (2011) relates high current account deficits to de facto capital openness, we expect negative relationship between CIF/FOB ratio and current account.

We provide the summary statistics in the Table 2 and more detailed description of sources in the Appendix. Due to the asymmetrical coverage of country pairs descriptive statistics are provided across exporting and importing countries.

Table 2: **Descriptive statistics of misreporting determinants**

Variable	Observations	Mean	Std. Dev.	Min	Max
CIF/FOB ratio	112331	0.23	1.65	-15.55	15.88
Distance	112331	8.55	0.91	4.09	9.89
Distance*Sea	112331	2.47	3.69	0.00	9.36
Colony	112331	0.02	0.14	0.00	1.00
Trade agreements	112331	0.39	0.49	0.00	1.00
Ln(GDP p.c.) - Exporter	112331	9.57	1.02	6.82	11.80
Ln(GDP p.c.) - Importer	112331	9.52	1.04	6.82	11.80
Income Taxes - Exporter	112331	25.01	13.01	0.45	75.24
Income Taxes - Importer	112331	24.79	13.02	0.45	75.24
DC/GDP - Exporter	112331	69.74	49.58	0.19	312.15
DC/GDP - Importer	112331	67.96	49.36	0.19	312.15
Trade openness - Exporter	112331	95.02	60.14	21.85	439.66
Trade openness - Importer	112331	94.72	58.76	0.92	439.66
Current account - Exporter	112331	-1.39	8.51	-46.72	40.99
Current account - Importer	112331	-1.81	9.07	-46.72	40.99
External debt - Exporter	71574	1.80	4.24	0.00	42.61
External debt - Importer	67947	1.75	4.00	0.00	42.61
ln(Area) - Exporter	112331	11.88	2.31	3.22	16.65
ln(Area) - Importer	112331	11.75	2.43	3.22	16.65
Control of corruption - Exporter	112331	0.36	1.05	-1.64	2.59
Control of corruption - Importer	112331	0.33	1.05	-1.64	2.59
Govern. effectiveness - Exporter	112331	0.48	0.95	-1.60	2.43
Govern. effectiveness - Importer	112331	0.43	0.95	-1.60	2.43
Rule of law - Exporter	112331	0.38	0.97	-1.94	2.12
Rule of law - Importer	112331	0.34	0.96	-1.94	2.12
Customs	87982	9.89	12.56	-0.06	87.91
Tax haven - Exporter	111094	0.04	0.19	0.00	1.00
Tax haven - Importer	111283	0.05	0.23	0.00	1.00
Tax secrecy (1) - Exporter	62454	278.03	342.79	19.43	1466.13
Tax secrecy (1) - Importer	61564	274.32	341.27	19.43	1466.13
Tax secrecy (2) - Exporter	62454	50.70	13.75	30.87	85.89
Tax secrecy (2) - Importer	61564	52.01	14.56	30.87	85.89
Tax secrecy (3) - Exporter	62454	1.74	3.87	0.00	19.60
Tax secrecy (3) - Importer	61564	1.70	3.85	0.00	19.60

5 Results

As demonstrated in Hong and Pak (2017) the accuracy assumption at the aggregate level can not be confirmed for developed countries once focusing on characteristics of distribution of bilateral CIF/FOB ratios. In an optimal case, the mean of the CIF/FOB ratio should be centered around transactions costs ω on both exporter's and importer's side with a standard deviation conditional on degree of geographical trade diversification. On top of that, high values of kurtosis signify tight clustering around mean and small skeweness to the right no tendency to misreport in either direction except economically justified distribution of transaction costs close to zero in positive interval. From the trade partner point of view, similar properties are to be achieved for a country whose trade partners do not tend to misreport in any direction once accounting for transaction costs. Only if this is true for bilateral exposure towards trade partners belonging to the most developed economies, the accuracy assumption can be accepted. Yet, only handful of countries from both developed and developing economies group meet these criteria, as shown in the A1.

Figure 1: Distribution of CIF/FOB ratio for import country, average 2011-2015 against ROW (upper row) and against top 26 advanced economies (bottom row)



In order to illustrate this point, we pick one representative from advanced countries

(Austria) along with US serving as a benchmark in most of empirical studies and one representative of developing group and plot distributions of their CIF/FOB ratios on importer's side (1) and exporter's side (2) covering all trading partners (upper row) and only 26 most advanced economies (bottom row) as listed in Hong and Pak (2017).

Whereas CIF/FOB ratio in all three countries is centred around zero, mean value of CIF/FOB in both Austria and Mexico is higher than in US. Furthermore, even though Austria is one of the most developed countries in the world, distribution of CIF/FOB ratio is very wide, ranging from -0.5 to +1.5 on imports and from almost -6 to +2 on exports. Although one might assume that extreme values are recorded due to trade relations with less developed countries, focusing only on trade with advanced economies still yields CIF/FOB ratio from -0.5 to +1.5. Existence of negative CIF/FOB ratios in all three countries even against the set of developed countries stresses out possible issue of overexporting and/or underimporting with specific trade partners.

Figure 2: Distribution of CIF/FOB ratio for export country, average 2011-2015 against ROW (upper row) and against top 26 advanced economies (bottom row)

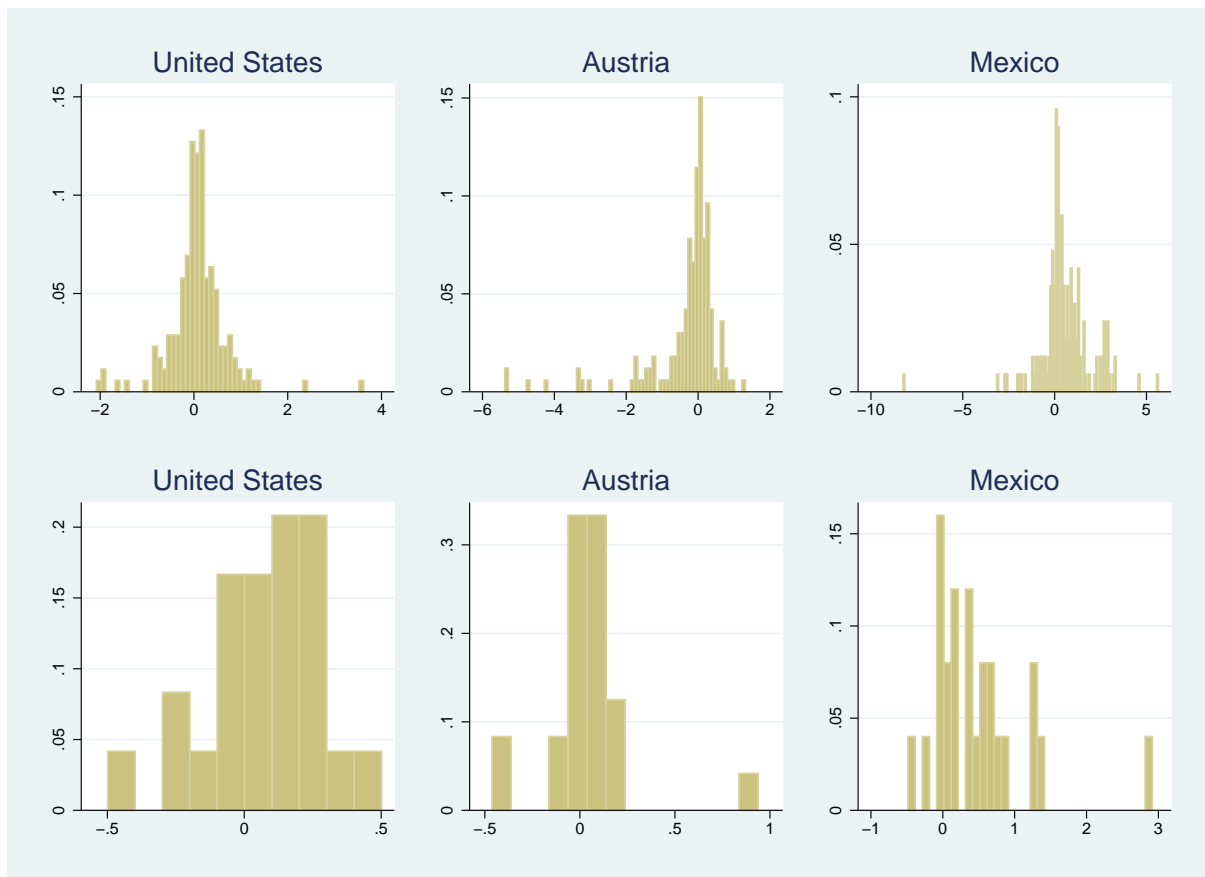


Table 3 gives results of the first stage regression as in 9. As predicted, CIF/FOB ratio increases with the distance between two partners due to transaction costs, marginal costs with

respect to distance are decreasing. Additionally, transport over sea is cheaper than over land and existence of trade agreement and especially shared colonial history tends to decrease the cost of transactions. Elasticity of CIF/FOB ratio with respect to GDP per capita of importing country is positive and statistically significant in all specifications which is consistent neither with the hypothesis that higher level of economic development indicates more efficient infrastructure which reduces CIF/FOB ratio due to lower transaction costs, nor with hypothesis that since high discrepancies between trade values reported by trade partners indicates illicit capital flight, CIF/FOB ratio should decrease with the GDP per capita.

However, since the level of economic development does not usually dramatically change over the period of 15 years and it is well controlled for by fixed effects, positive elasticity of CIF/FOB ratio with respect to GDP per capita rather indicates that rapidly growing economies tend to misreport their imports. On the other hand, we did not find any significant and robust relationship between export misinvoicing and GDP per capita.

Furthermore, estimation of second stage regressions for exporter's (11) and importer's side (12) indicates that there is a negative correlation between importer's fixed effects and GDP per capita. Therefore, coefficient of elasticity tend to be biased upward and a true net effect of one percent increase in GDP per capita on CIF/FOB ratio is lower than 0.277 percent as estimated in specification 6 (Table 3). In particular, following 14, true effect can be estimated as $0.277 + (-0.164) = 0.093$.

Similarly, we find that elasticity of CIF/FOB ratio with respect to income tax in exporting country is negative. On the other hand, there is a high positive correlation between fixed effect exporter's unobserved tendency to export misinvoicing, true effect of increase in exporter's income taxes on export misreporting tend to be positive ($-0.006 + 0.016 = 0.01$). Neither tendency of countries operating as tax haven destinations prove to be statistically significant in the second stage regression, nor different measures of degree of secrecy in financial services provided by them. In other words, while income tax policy might affect motivation of economic individuals to engage in misreporting practices, we do not find evidence that firms located in tax haven countries or trade partners of firms located in tax haven countries are more prone to misreport. However, it is important to acknowledge that the result might be driven by need to include more detailed data on various aspects of tax haven characteristics.

Same holds for effects of volume of current surpluses on export misinvoicing. Combining estimations of elasticities δ^E , δ^M , ϵ^E and ϵ^M corresponding to current account we identify negative relationship between current account surpluses and trade misinvoicing in exporting countries and positive relationship in importing countries. However, economically more significant effect is on export underinvoicing. In other words, export underinvoicing tend to occur in countries with trade deficits which is in line with Patnaik et al. (2012) who interprets trade misreporting as capturing de facto capital account openness in case of capital controls.

Based on equation 14 we calculate each country's tendency to export and import misinvoicing taking U.S. as a benchmark which can be found in Table A1 ('Against U.S.'). There is a significant correlation between our estimates of export and import misinvoicing on the part of

Table 3: Determinants of Trade Misreporting, 2001-2015

	(1)	(2)	(3)	(4)	(5)	(6)
Distance	<i>0.359***</i> (0.000)	<i>0.360***</i> (0.000)	<i>0.361***</i> (0.000)	<i>0.361***</i> (0.000)	-0.066 (0.335)	<i>0.360***</i> (0.000)
Distance*Distance	<i>-0.013***</i> (0.001)	<i>-0.013***</i> (0.001)	<i>-0.013***</i> (0.001)	<i>-0.013***</i> (0.001)	<i>0.015***</i> (0.001)	<i>-0.013***</i> (0.001)
Distance*Sea	<i>-0.006***</i> (0.003)	<i>-0.006***</i> (0.003)	<i>-0.006***</i> (0.003)	<i>-0.006***</i> (0.003)	<i>-0.009***</i> (0.000)	<i>-0.006***</i> (0.003)
Colony	<i>-0.122***</i> (0.000)	<i>-0.122***</i> (0.000)	<i>-0.122***</i> (0.000)	<i>-0.122***</i> (0.000)	<i>-0.121***</i> (0.000)	<i>-0.122***</i> (0.000)
Trade agreement	<i>-0.069***</i> (0.000)	<i>-0.068***</i> (0.000)	<i>-0.067***</i> (0.000)	<i>-0.068***</i> (0.000)	<i>-0.060***</i> (0.000)	<i>-0.068***</i> (0.000)
Ln(GDP p.c.) - Exporter	-0.038 (0.556)	<i>-0.104*</i> (0.093)	-0.102 (0.102)	-0.079 (0.216)	<i>-0.209**</i> (0.017)	-0.005 (0.943)
Ln(GDP p.c.) - Importer	<i>0.358***</i> (0.000)	<i>0.388***</i> (0.000)	<i>0.365***</i> (0.000)	<i>0.325***</i> (0.000)	<i>0.340***</i> (0.000)	<i>0.277***</i> (0.000)
Income Taxes - Exporter	<i>-0.006***</i> (0.000)					<i>-0.006***</i> (0.000)
Income Taxes - Importer	<i>0.002*</i> (0.078)					0.002 (0.113)
DC/GDP - Exporter		<i>0.001**</i> (0.027)				<i>0.001**</i> (0.013)
DC/GDP - Importer		<i>-0.001***</i> (0.003)				<i>-0.002***</i> (0.000)
Trade openness - Exporter			0.000 (0.829)			0.000 (0.997)
Trade openness - Importer			<i>-0.001***</i> (0.003)			<i>-0.001**</i> (0.013)
Current account - Exporter				0.002 (0.106)		<i>0.003*</i> (0.065)
Current account - Importer				<i>-0.006***</i> (0.000)		<i>-0.006***</i> (0.000)
External debt - Exporter					<i>0.012***</i> (0.009)	
External debt - Importer					<i>0.013**</i> (0.017)	
Constant	<i>-5.314***</i> (0.000)	<i>-5.086***</i> (0.000)	<i>-4.900***</i> (0.000)	<i>-4.758***</i> (0.000)	-2.119 (0.131)	<i>-4.681***</i> (0.000)
Exporter dummy	YES	YES	YES	YES	YES	YES
Importer dummy	YES	YES	YES	YES	YES	YES
Time dummies	YES	YES	YES	YES	YES	YES
N	112 331	112 331	112 331	112 331	45 150	112 331
R ₂	0.15	0.15	0.15	0.15	0.17	0.15
F	58.58	58.50	58.53	58.62	40.05	57.59

Note: *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively. P-values in brackets.

Table 4: Determinants of Trade Misreporting, Fixed effects, 2001-2015

	Export Misinvoicing			Import Misinvoicing		
	(1)	(2)	(3)	(4)	(5)	(6)
Ln(GDP p.c.)	0.079 (0.264)	-0.068 (0.617)	-0.081 (0.569)	-0.164** (0.046)	-0.012 (0.941)	-0.102 (0.517)
Income Taxes	0.016*** (0.002)	0.006 (0.267)	0.007 (0.210)	-0.006 (0.137)	-0.009 (0.254)	-0.010 (0.208)
DC/GDP	-0.001 (0.310)	-0.001 (0.780)	-0.001 (0.629)	-0.001 (0.377)	-0.001 (0.535)	0.000 (0.876)
Trade openness	-0.002 (0.103)	-0.002 (0.158)	-0.003 (0.119)	0.002 (0.120)	0.002 (0.196)	0.003 (0.132)
Current account	-0.040** (0.025)	-0.008 (0.563)	-0.011 (0.428)	0.016* (0.075)	-0.003 (0.850)	0.001 (0.977)
ln(Area)	-0.110*** (0.001)	-0.092** (0.035)	-0.109** (0.018)	0.050 (0.101)	0.081 (0.105)	0.091* (0.063)
Rule of law	-0.010 (0.810)	0.010 (0.889)	0.029 (0.931)	0.021 (0.697)	0.001 (0.993)	-0.511 (0.133)
Customs	0.015*** (0.007)	0.006 (0.145)	0.009 (0.127)	-0.010** (0.041)	-0.003 (0.609)	-0.008 (0.268)
Tax haven	-0.305 (0.357)	0.030 (0.927)	0.099 (0.777)	-0.258 (0.464)	-0.343 (0.499)	-0.495 (0.307)
Tax secrecy (1)		0.000 (0.385)	0.000 (0.484)		0.000 (0.956)	0.000 (0.889)
Tax secrecy (2)		0.009 (0.338)	0.004 (0.736)		-0.007 (0.456)	-0.003 (0.725)
Tax secrecy (3)		0.029 (0.252)	0.024 (0.324)		-0.014 (0.706)	-0.014 (0.705)
Control of corruption			-0.286 (0.437)			0.546 (0.222)
Government effectiveness			0.282* (0.092)			0.019 (0.956)
Constant	0.361 (0.685)	1.573 (0.430)	2.189 (0.263)	1.568* (0.084)	0.031 (0.989)	0.523 (0.797)
F	4.75	5.64	6.52	2.44	1.52	2.23
N	99	42	42	99	42	42
R2_adj	0.41	0.49	0.49	0.16	0.10	0.09

Note: *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

individual countries and CIF/FOB ratio calculated on aggregate level (see Figure ??). Tables A2 and A3 bring decomposition of tendency to export and import misinvoicing according of individual countries based on equation 14. Each country is compared to U.S. which serves as a benchmark. Column ‘Time invariant’ groups together effects of time-invariant variables Z_i^E and Z_j^M (see equations 11 and 12), i.e. log of area and average value of customs and rule of law over the period 2011-2015.

While investigating contribution of different factors to overall CIF/FOB ratio, hence extent of misreporting practicis, on individual country level is definitely a worth-while step, at this stage we leave it to future research and now turn our attention to investigating overall properties of our decomposition exercise. Cross-country link between determinants of misreporting practices as presented in A2 and A3 and empirical mean is presented in Figure ?. On both, export and import side increase in values of underlying determinants of misreporting practices leads to increase in empirical CIF/FOB ratio mean. From this perspective the CIF/FOB ratio does incorporate a specific portion of misreporting practices that should be taken into account when using it as a proxy for transaction costs. On the other hand, determinants of transaction costs are positively associated with evolution of CIF/FOB ratio across countries, a finding needs to be accounted for when estimating extent of capital flight in the relevant literature. Inclusion of fixed effects improves overall fit of the model, yet without more detailed analysis its internal composition remains a mystery.

One of the most striking results is the fact that among the 12 countries with highest estimated values of tendency to overreport their imports there are ten countries from the region of extended Central and Eastern Europe: Austria, Bulgaria, Czech Republic, Slovakia, Macedonia, Poland, Croatia, Moldova and Slovenia. This might indicate significant levels of illicit capital flows from the region or a specific feature driving the CIF/FOB ratio evolution common among the group of these CEE countries.

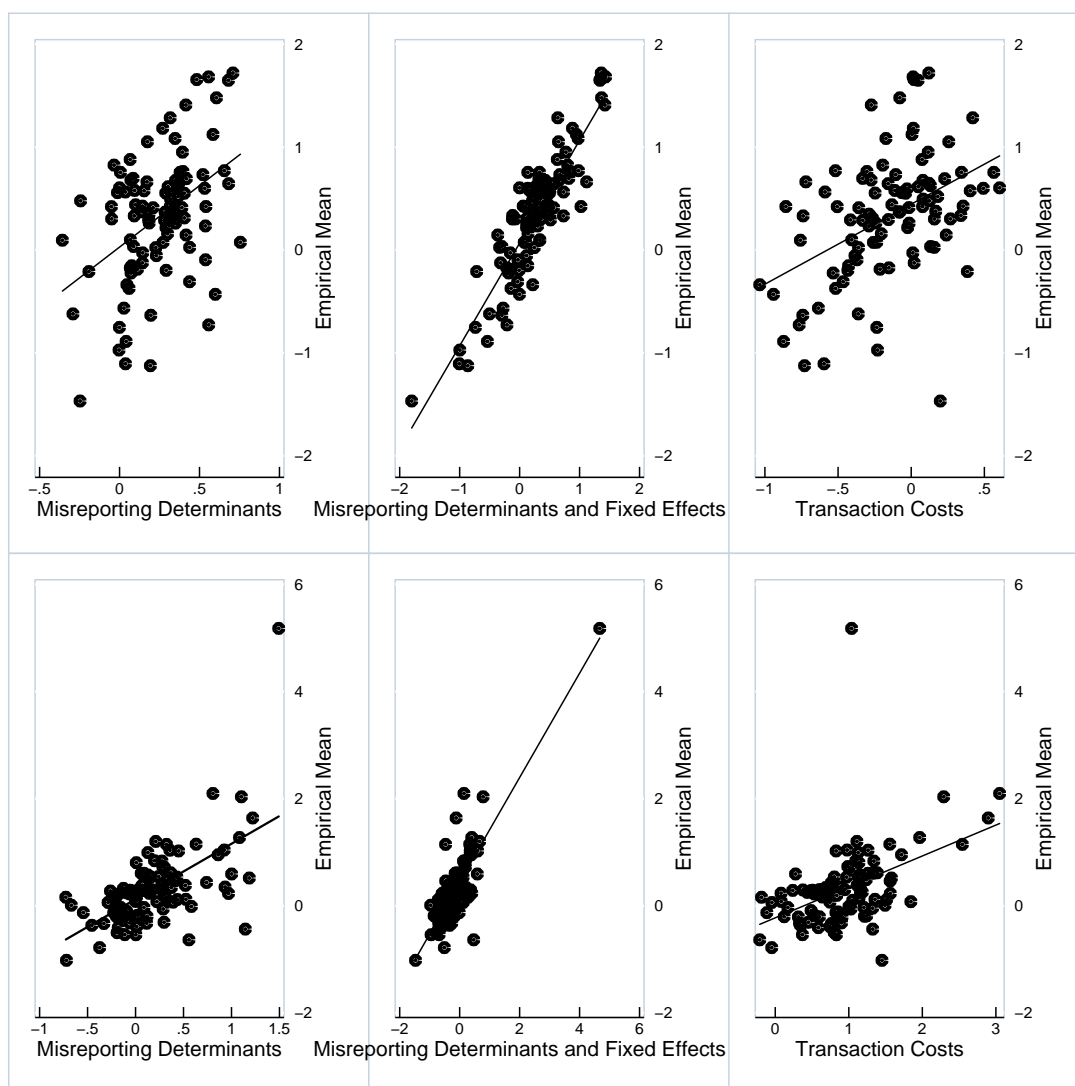
Table 5: **Fixed effects variance decomposition**

	Export			Import		
	Coefficient	Std.Error	Shapley %R2	Coefficient	Std.Error	Shapley %R2
Ln(GDP p.c.)	0.999***	0.002	2.18	0.999***	0.001	3.27
Income Taxes	1.001***	0.001	1.38	1.000***	0.002	0.52
DC/GDP	0.994***	0.015	0.92	0.999***	0.001	1.42
Trade openness	0.998***	0.001	1.47	1.004***	0.002	0.45
Current account balance	1.000***	0.000	17.62	1.000***	0.001	3.93
Customs	1.000***	0.000	7.38	1.000***	0.001	6.15
Area	0.999***	0.001	11.50	1.001***	0.001	4.53
Time invariant	1.001***	0.001	10.29	1.000***	0.002	3.31
Fixed effects	1.001***	0.000	47.26	1.000***	0.000	76.43
Intercept	0.000***	0.000		-0.000***	0.000	

Note: *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

To decompose variation in individual country’s tendency to export/import misinvoicing into contribution of individual covariates, we use methodology developed by Huettner and Sander (2012) which is usually used to decompose R2 of OLS regressions into contribution of

Figure 3: Relationship between empirical mean and contribution of selected determinants of CIF/FOB ratio on importer's (upper row) and exporter's side (bottom row)



Note: Misreporting determinants are calculated as a sum of contributions of $\ln(\text{GDP p.c.})$, DC/GDP , income taxes, trade openness, current account balance, customs and time-invariant characteristics as presented in the Table A2 and A3. Transaction costs are calculated as the difference between empirical mean as in A1 and area and contribution of misreporting determinants with fixed effects included.

individual regressors. As apparent from the Table 5, most variation in countries' tendency to misreport remains unexplained, i.e. is explained by variation in fixed effects. However, 19% of variation in export misreporting can be explained by variation in time invariant variables (i.e. area, rule of law, average customs and whether country is tax haven or not). Another 19% is explained by difference in current account. As already mentioned, we found positive relationship between current account deficits and trade misreporting. Our model is less successful in explaining differences in import misreporting, where over three quarters of variance is still accounted for by fixed effects. This might indicate that most of trade misreporting is done by exporters.

6 Concluding Remarks

Trade misreporting is one of the most sources of illicit capital flows. However, discrepancies between volumes of trade reported by exporters and importers stem not only from capital flight but also from the existence of transaction costs which vary with geographical distance. Estimation of capital flight also cannot rely on common assumption of no inclination towards trade misreporting among advanced countries. Using innovative bilateral panel data approach we are able to decompose CIF/FOB ratio on commonly used as a measure of capital flight for individual countries into contribution of (a) transaction costs, and (b) determinants of export and (c) import misinvoicing. Our methodology and results might be further used to derive a more precise estimate of capital flight net of transaction costs as well as to provide a tool to deal with high unreliability of transaction costs estimates in trade geography literature.

We conclude that increase in taxes and customs is accompanied by an increase in CIF/FOB ratio which is consistent with identification of trade misreporting with illicit capital flows. Our model is more successful in explaining export misreporting than import misreporting, one of the most important conclusions being that countries with bigger current account deficits then to be more prone to export underinvoicing. We identify extended region of the Central of Eastern Europe to be the area most troubled by import overinvoicing which might potentially indicate significant illicit capital outflows from the region.

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Appendix

Table A1: Export and Import Misinvoicing Estimates

ID	ISO	Country	Import					Export					Against the US
			Mean	Stdev	Skewness	Kurtosis	Against the US	Mean	Stdev	Skewness	Kurtosis	Against the US	
1	USA	USA	0.60	1.51	4.51	35.54	0.00	0.62	0.56	10.47	0.00		
2	ABW	Aruba	-0.06	1.11	-0.43	6.67	2.53	3.55	1.50	5.53			
3	AFG	Afghanistan	-1.47	2.18	0.17	5.07	-1.93	1.80	-0.16	4.82	0.65		
4	AGO	Angola	0.41	1.54	1.49	6.63	0.23	2.71	-1.82	6.06	-0.28		
6	ALB	Albania	0.28	1.93	-0.82	8.77	0.25	2.42	-0.31	4.90	1.25		
7	AND	Andorra	0.42	2.56	-1.03	5.33	1.63	2.95	0.58	3.27			
9	ARE	United Arab Emirates	0.42	1.88	3.47	32.16	0.10	1.30	0.23	4.22			
10	ARG	Argentina	0.51	1.58	2.68	21.20	0.16	1.13	1.13	13.88			
11	ARM	Armenia	1.18	2.03	0.74	4.52	0.60	2.43	-1.31	9.28	0.17		
12	ATG	Antigua and Barbuda	-1.11	2.61	-1.34	4.62	-1.50	3.03	0.49	3.58	1.24		
13	AUS	Australia	0.43	1.28	1.63	11.04	0.05	0.70	0.13	5.70	0.10		
14	AUT	Austria	1.68	2.09	0.83	3.72	1.20	1.04	-2.76	11.90	-0.18		
15	AZE	Azerbaijan	0.08	2.11	2.15	12.16	-0.16	2.47	-0.57	4.73	-0.45		
16	BDI	Burundi	0.46	1.55	0.22	5.65	-0.47	2.93	-0.94	4.29			
17	BEL	Belgium	0.55	1.47	0.38	7.82	0.14	0.96	-3.55	23.87	-0.20		
18	BEN	Benin	-0.75	1.61	1.29	8.85	-0.96	2.62	-0.25	4.79	0.30		
19	BFA	Burkina Faso	0.88	2.04	1.69	7.86	0.45	2.97	-0.79	4.55	0.13		
20	BGD	Bangladesh	0.56	1.92	0.67	6.87	0.21	1.74	0.97	4.40	0.34		
21	BGR	Bulgaria	0.23	1.86	0.50	7.38	0.08	1.43	-1.71	9.13	0.03		
22	BHR	Bahrain	0.42	1.55	-0.61	6.64	-0.02	2.16	-0.41	4.80	1.04		
23	BHS	Bahamas	-2.17	3.06	-0.47	4.29	2.20	3.27	0.17	2.67			
24	BIH	Bosnia Herzegovina	1.41	2.56	-0.34	8.34	1.16	1.64	-0.01	4.42	0.43		
25	BLR	Belarus	1.48	2.11	1.83	8.42	1.18	1.61	-1.52	7.35	-0.53		
26	BLZ	Belize	-1.08	2.65	-1.18	4.86	-1.28	2.31	0.46	3.96	1.39		
27	BMU	Bermuda	-0.53	2.40	-1.30	7.24	2.28	2.67	0.63	3.76			
28	BOL	Bolivia (Plurinational State of)	0.41	2.21	-0.96	8.73	0.34	1.96	1.31	9.39			

Table A1: Export and Import Misinvoicing Estimates

ID	ISO	Country	Import					Export					Against the US
			Mean	Stdev	Skewness	Kurtosis	Against the US	Mean	Stdev	Skewness	Kurtosis		
29	BRA	Brazil	0.38	1.84	0.29	8.50	0.20	1.27	-0.45	12.31	0.13		
30	BRB	Barbados	0.33	1.81	-1.25	11.29	0.95	2.22	0.40	3.79			
31	BRN	Brunei Darussalam	-0.09	1.59	-1.36	7.53	0.01	2.35	0.75	3.92			
32	BTN	Bhutan	0.66	2.60	-0.50	10.16	0.85	2.70	-0.57	3.92	0.63		
33	BWA	Botswana	0.02	1.72	-1.70	9.39	0.11	2.41	-0.26	6.01	-0.10		
34	CAF	Central African Rep.	-0.13	2.39	0.55	7.52	-0.33	3.33	-0.68	3.18			
35	CAN	Canada	0.78	1.76	2.68	14.39	-0.06	0.87	-2.34	12.12			
36	CHE	Switzerland	0.15	2.02	-0.26	6.25	-0.63	1.12	1.34	8.35	0.32		
37	CHL	Chile	0.22	1.27	0.87	10.96	-0.01	1.02	-0.69	6.56	0.18		
38	CHN	China	0.58	1.18	-0.61	10.22	0.17	0.98	-0.66	5.97	-0.01		
39	CIV	Cote d'Ivoire	0.10	1.91	-0.27	8.31	0.17	2.50	0.93	7.53	0.02		
40	CMR	Cameroon	-0.08	1.83	-1.44	6.98	0.60	1.99	0.66	8.31			
41	COG	Congo	-0.77	1.75	0.58	4.78	0.09	2.52	-0.76	3.71			
42	COK	Cook Isds	-2.03	2.72	-1.38	4.72	0.73	1.46	-1.30	4.12			
43	COL	Colombia	0.30	2.02	-1.07	9.21	0.24	1.75	1.39	10.18	0.25		
44	COM	Comoros	-0.73	1.71	1.21	5.91	0.76	1.41	-0.58	3.80			
45	CPV	Cabo Verde	0.06	1.44	0.72	14.87	-0.94	2.72	-0.79	3.48			
46	CRI	Costa Rica	0.55	1.86	0.53	6.80	0.07	2.21	0.61	5.24	1.24		
48	CYP	Cyprus	-0.56	1.38	-0.84	4.94	-0.62	1.51	0.29	4.96	0.78		
49	CZE	Czechia	1.72	2.24	1.58	6.73	1.12	1.33	-2.09	10.47	-0.25		
50	DEU	Germany	0.73	1.49	2.66	15.59	0.36	0.72	-3.53	24.12	-0.02		
52	DMA	Dominica	-1.12	1.98	-1.33	6.27	-1.33	2.86	-0.42	3.38	1.82		
53	DNK	Denmark	0.46	1.59	0.49	8.13	0.08	0.77	-0.90	8.09	0.27		
54	DOM	Dominican Rep.	0.30	1.94	0.97	7.90	-0.38	2.13	0.08	5.59	0.94		
55	DZA	Algeria	0.49	1.74	0.67	5.92	0.28	3.07	-0.57	6.49	0.10		
56	ECU	Ecuador	0.67	2.07	0.33	7.49	0.72	1.82	2.28	15.62			

Table A1: Export and Import Misinvoicing Estimates

ID	ISO	Country	Import					Export					Against the US
			Mean	Stdev	Skewness	Kurtosis	Against the US	Mean	Stdev	Skewness	Kurtosis	Against the US	
57	EGY	Egypt	0.34	1.34	0.80	7.01	-0.23	1.33	-2.31	20.26	0.65		
59	ESP	Spain	0.65	1.68	3.70	20.59	0.23	0.86	-2.54	10.22	0.01		
60	EST	Estonia	0.62	1.59	0.68	6.14	0.54	1.53	-1.02	8.43	-0.05		
61	ETH	Ethiopia	0.41	2.13	-1.15	5.86	0.23	1.65	-0.59	4.76	0.08		
62	FIN	Finland	0.63	1.67	0.41	7.45	0.23	0.95	-1.81	14.23	0.08		
63	FJI	Fiji	0.26	1.67	-0.85	9.51	-0.12	1.77	0.43	4.59	-0.02		
64	FRA	France	0.69	1.74	3.53	20.21	0.18	0.79	-4.08	31.22	0.05		
66	FSM	FS Micronesia	-0.86	2.41	-0.69	3.88	1.01	0.00	0.00	0.00	0.00		
68	GBR	United Kingdom	0.26	1.23	1.50	9.67	-0.07	0.75	-1.72	8.76	0.10		
69	GEO	Georgia	-0.20	1.30	-1.66	10.71	-0.25	1.74	-0.13	5.88	0.65		
70	GHA	Ghana	-0.19	1.78	-1.80	11.19	-0.34	2.24	0.11	7.45	1.01		
71	GIN	Guinea	-0.89	1.74	-1.48	8.33	0.83	2.47	0.22	3.52	0.00		
72	GMB	Gambia	-1.26	1.93	0.14	13.34	0.91	2.32	-0.87	3.85	0.00		
74	GRC	Greece	0.62	1.54	2.05	9.38	0.07	1.64	-2.90	15.70	-0.19		
76	GRL	Greenland	1.31	2.56	-0.21	3.67	2.74	3.52	0.26	2.04	0.00		
77	GTM	Guatemala	0.16	1.73	-0.24	6.34	-0.08	1.64	-0.69	6.72	0.34		
78	GUY	Guyana	-0.08	1.73	-0.53	9.40	0.03	2.56	-0.20	5.35	0.00		
79	HKG	China- Hong Kong SAR	0.31	1.44	0.06	9.60	-0.32	1.26	-0.19	3.33	-0.47		
80	HND	Honduras	0.37	1.83	0.80	7.18	0.01	1.35	1.08	4.39	0.84		
81	HRV	Croatia	0.42	1.79	0.06	13.63	0.77	1.34	-0.94	9.69	-0.11		
82	HUN	Hungary	0.64	1.70	2.13	8.83	0.34	1.32	-1.12	7.66	-0.08		
83	IDN	Indonesia	0.76	1.91	-0.07	13.64	0.25	1.13	1.31	9.96	0.17		
84	IND	India	0.75	1.83	2.99	17.39	0.08	0.80	-1.61	15.20	0.03		
85	IRL	Ireland	0.55	1.72	1.62	9.02	0.25	0.92	0.79	8.52	0.34		
86	IRN	Iran	-0.13	1.97	0.04	9.31	0.64	1.77	-0.71	7.51	0.00		
87	IRQ	Iraq	-1.17	1.93	-0.39	3.37	5.60	4.71	0.13	1.84	0.00		

Table A1: Export and Import Misinvoicing Estimates

ID	ISO	Country	Import					Export					Against the US
			Mean	Stdev	Skewness	Kurtosis	Against the US	Mean	Stdev	Skewness	Kurtosis	Against the US	
88	ISL	Iceland	0.76	2.07	-0.42	5.29	0.62	0.81	2.28	-1.38	9.68	0.66	
89	ISR	Israel	-0.10	2.41	0.70	9.76	-0.33	-0.19	1.36	-2.27	11.97	-0.07	
90	ITA	Italy	0.56	1.62	3.13	18.00	0.03	-0.16	0.74	-2.54	14.47	-0.03	
91	JAM	Jamaica	0.29	1.46	1.76	14.71	-0.05	1.15	2.37	1.02	8.69	1.08	
92	JOR	Jordan	0.07	1.63	0.94	12.74	-0.13	0.30	1.08	0.71	7.83	0.16	
93	JPN	Japan	0.85	1.64	1.56	11.50	0.28	0.39	1.03	-0.72	12.85	0.26	
94	KAZ	Kazakhstan	0.95	2.05	1.29	5.76	0.71	-0.20	2.30	-0.52	5.23	-0.05	
95	KEN	Kenya	-0.15	1.68	-0.92	8.50	0.00	0.20	1.71	-0.86	8.41	0.11	
96	KGZ	Kyrgyzstan	0.29	1.73	-0.36	4.97	0.32	0.15	2.27	0.43	5.05	-0.14	
97	KHM	Cambodia	0.03	1.37	1.16	7.27	-0.49	0.84	1.97	-0.21	5.42	0.62	
98	KIR	Kiribati	-1.15	2.44	-0.76	4.40		0.97	4.28	-0.49	3.63		
99	KNA	Saint Kitts and Nevis	-0.89	2.72	-1.36	4.77	-1.06	0.95	2.37	0.63	2.43	1.54	
100	KOR	Rep. of Korea	1.28	1.83	1.45	4.59	0.41	-0.21	1.16	-1.55	9.90	-0.11	
101	KWT	Kuwait	0.69	1.91	1.04	8.69		1.51	2.51	0.36	4.11		
102	LBN	Lebanon	0.33	1.49	-0.74	6.87	0.39	0.23	1.01	-0.59	8.45	0.17	
104	LCA	Saint Lucia	-0.34	1.70	-1.47	5.67	-0.26	-0.43	2.54	0.60	5.10	0.36	
105	LKA	Sri Lanka	0.42	2.28	0.53	12.40	-0.15	-0.06	1.31	-0.43	6.44	0.01	
106	LSO	Lesotho	-1.38	1.93	-0.95	4.36		0.28	2.06	-0.60	3.73		
107	LTU	Lithuania	-0.42	1.68	-1.01	6.18	-0.04	0.06	1.43	-0.05	4.70	0.08	
108	LUX	Luxembourg	0.47	2.88	-0.17	5.95	-0.06	0.00	1.31	-0.56	5.42	-0.09	
109	LVA	Latvia	-0.73	1.51	-1.03	6.14	-0.46	-0.11	1.50	-0.59	4.93	0.13	
110	MAC	China- Macao SAR	0.80	2.26	0.15	6.48	1.00	2.36	2.30	-0.70	5.51	1.42	
111	MAR	Morocco	0.35	2.05	-0.51	9.46	0.38	0.30	1.12	0.05	4.62	0.27	
112	MDA	Rep. of Moldova	1.08	1.95	1.07	4.23	0.70	0.58	2.03	0.18	6.41	0.67	
113	MDG	Madagascar	0.48	1.75	0.64	8.79	0.08	0.38	1.71	-0.43	6.76	0.24	
114	MDV	Maldives	0.10	0.88	0.29	4.25	-0.18	1.64	1.58	1.28	3.90	1.03	

Table A1: Export and Import Misinvoicing Estimates

ID	ISO	Country	Import					Export					Against the US
			Mean	Stdev	Skewness	Kurtosis	Against the US	Mean	Stdev	Skewness	Kurtosis		
115	MEX	Mexico	1.16	1.65	1.97	8.29	0.56	1.43	-0.94	11.59			
116	MKD	TFYR of Macedonia	1.66	2.19	1.43	5.02	1.05	0.61	1.56	0.17	9.36	0.65	
117	MLI	Mali	0.37	2.04	0.61	5.77	0.25	-0.54	2.75	-0.43	3.57	-0.46	
118	MLT	Malta	-0.43	1.94	-1.26	10.46	-0.51	0.08	2.31	-0.46	5.06	0.50	
120	MNE	Montenegro	0.27	1.32	-0.49	4.68	0.68	2.02	0.53	3.78			
121	MNG	Mongolia	0.44	1.87	-2.07	15.08	0.39	0.44	2.35	0.85	7.24	0.07	
122	MOZ	Mozambique	-0.21	1.78	1.13	4.85	-0.84	0.59	2.33	-1.65	10.01	0.86	
123	MRT	Mauritania	-0.66	2.51	1.34	9.04	0.56	2.95	-0.13	5.78			
124	MSR	Montserrat	-0.63	2.15	-0.58	3.73	-0.21	1.93	0.17	1.27			
125	MUS	Mauritius	0.56	1.35	-0.52	8.01	0.31	1.15	2.08	0.95	5.06	0.46	
126	MWI	Malawi	0.82	1.56	0.56	4.60	0.58	-0.01	1.98	-0.76	9.78	-0.05	
127	MYS	Malaysia	0.68	1.99	0.88	9.95	0.26	0.16	1.10	-0.60	9.13	0.26	
129	NAM	Namibia	-0.16	2.11	1.30	17.04	-0.07	2.81	-1.26	6.35	0.04		
130	NCL	New Caledonia	1.05	1.54	1.31	6.88	0.46	2.10	0.08	3.60			
131	NER	Niger	-0.11	2.00	0.31	4.64	-0.38	3.20	0.14	3.01			
132	NGA	Nigeria	0.30	2.25	1.30	6.75	-0.02	-0.46	2.98	-0.39	5.00	-0.12	
133	NIC	Nicaragua	-0.05	2.16	-1.21	5.91	-0.10	0.72	1.72	-0.46	6.80	0.65	
134	NLD	Netherlands	0.01	1.22	0.33	7.43	-0.31	-0.24	0.69	-1.71	9.72	-0.07	
135	NOR	Norway	0.73	1.59	0.59	7.32	0.50	-0.36	1.68	-2.59	12.10	0.04	
136	NPL	Nepal	0.70	2.27	-1.42	11.02	0.61	0.33	1.49	0.15	6.31	0.09	
137	NZL	New Zealand	0.66	1.50	1.50	8.87	0.18	0.99	1.29	10.63			
138	OMN	Oman	-0.31	1.74	-1.84	8.36	-0.22	0.25	1.72	0.61	7.15	-0.09	
139	PAK	Pakistan	0.60	1.93	1.52	7.43	0.12	0.54	1.53	1.18	5.68	0.12	
140	PAN	Panama	-1.24	1.58	-0.31	5.58	-2.01	2.07	2.23	-0.38	3.93	2.62	
141	PER	Peru	0.52	1.97	2.89	22.59	0.14	0.22	1.49	0.24	5.72	0.13	
142	PHL	Philippines	-0.12	1.81	0.21	5.17	-0.49	0.54	1.48	-0.70	7.15	0.50	

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ID	ISO	Country	Import					Export					Against the US
			Mean	Stdev	Skewness	Kurtosis	Against the US	Mean	Stdev	Skewness	Kurtosis	Against the US	
143	PLW	Palau	-0.19	2.78	-0.67	4.30	-0.52	2.48	-0.81	2.72			
144	PNG	Papua New Guinea	0.29	2.03	0.13	6.52	-0.12	1.91	-1.40	7.47			
145	POL	Poland	1.12	2.12	1.60	9.08	0.78	1.71	-3.38	20.14	-0.24		
146	PRT	Portugal	0.62	1.54	2.33	10.99	0.11	0.83	0.17	13.48	0.07		
147	PRY	Paraguay	0.26	2.26	-0.70	7.35	-0.04	1.57	-2.41	13.91	-0.11		
148	PSE	State of Palestine	1.60	1.46	0.26	3.33	-0.38	1.71	-0.63	6.56			
149	PYF	French Polynesia	0.99	1.68	-0.19	7.26	0.83	2.43	0.42	6.32			
150	QAT	Qatar	0.98	1.89	1.44	6.92	-0.20	1.27	-0.43	4.73			
151	ROU	Romania	0.29	1.81	4.23	34.96	0.42	1.19	-0.71	6.49	0.02		
152	RUS	Russian Federation	0.60	1.95	-0.01	9.13	0.16	1.58	-2.12	11.90	0.22		
153	RWA	Rwanda	0.68	1.60	-0.81	7.78	0.37	2.90	-0.03	2.68	0.06		
154	SAU	Saudi Arabia	0.58	1.54	0.70	5.71	0.78	1.90	-0.50	4.75			
156	SDN	Sudan	-0.01	2.04	1.10	6.15	2.32	3.13	0.91	4.00			
157	SEN	Senegal	-0.17	1.62	0.13	7.09	-0.41	2.09	-1.13	4.60	0.10		
158	SGP	Singapore	0.51	1.89	0.41	7.08	0.07	1.74	-1.91	8.54	-0.33		
159	SLB	Solomon Isds	-0.37	1.48	-0.31	5.39	-0.43	1.54	0.91	5.36	0.76		
160	SLE	Sierra Leone	-0.62	1.89	0.57	4.89	-0.74	4.65	-0.14	2.89	5.21		
161	SLV	El Salvador	0.55	1.37	2.14	14.90	0.19	1.62	-0.85	8.24	0.58		
162	SRB	Serbia	1.14	2.34	0.45	5.03	-0.40	2.04	-1.49	6.55			
163	STP	Sao Tome and Principe	-0.65	1.68	-1.18	5.21	-0.15	2.26	-0.16	3.79			
164	SUR	Suriname	0.03	1.89	1.51	6.75	-0.53	2.79	0.29	4.26	0.81		
165	SVK	Slovakia	1.65	2.57	1.35	6.93	1.08	1.34	0.73	7.99	-0.27		
166	SVN	Slovenia	0.77	1.88	1.28	7.95	0.68	1.05	0.05	8.09	-0.01		
167	SWE	Sweden	0.42	1.87	1.05	10.00	0.05	0.71	-2.25	13.76	0.12		
169	SYC	Seychelles	-0.22	2.31	-0.12	6.91	-0.68	2.41	0.21	3.87	1.50		
171	TCA	Turks and Caicos Isds	-2.13	1.88	0.16	3.27	2.00	1.77	0.59	2.07			

Table A1: Export and Import Misinvoicing Estimates

ID	ISO	Country	Import					Export				
			Mean	Stdev	Skewness	Kurtosis	Against the US	Mean	Stdev	Skewness	Kurtosis	Against the US
172	TGO	Togo	-0.97	1.82	1.00	7.56	-1.25	2.31	-0.25	4.07	0.78	
173	THA	Thailand	1.05	1.87	2.01	9.54	0.50	0.81	0.66	7.58	0.10	
174	TLS	Timor-Leste	0.19	1.54	0.63	4.21	0.01	3.88	0.46	3.27		
175	TON	Tonga	-0.54	2.19	-1.96	11.23	2.24	3.78	0.87	3.51		
177	TUN	Tunisia	0.41	1.62	-0.32	6.80	0.37	1.93	1.56	10.47	0.64	
178	TUR	Turkey	0.59	1.78	1.91	11.58	0.37	1.60	-2.27	19.99	0.03	
180	TZA	United Rep. of Tanzania	-0.03	1.78	1.31	11.28	-0.27	1.83	-0.68	5.99	0.13	
181	UGA	Uganda	0.58	1.98	0.72	5.49	0.33	1.98	0.03	5.34	0.46	
182	UKR	Ukraine	0.65	1.72	0.58	7.23	0.25	1.40	-1.12	8.11	-0.03	
183	URY	Uruguay					-0.24	0.00	0.00	0.00	0.41	
184	VCT	Saint Vincent and the Grenadines	-0.84	2.40	-0.30	4.94	0.47	2.40	0.18	3.86		
185	VEN	Venezuela	0.52	2.11	1.01	7.33	3.04	2.50	0.54	3.16		
187	VUT	Vanuatu	-0.26	2.44	-2.65	14.43	0.01	2.75	0.47	3.75		
188	WSM	Samoa	-0.63	1.90	-0.18	5.32	-0.70	2.80	0.04	3.78	1.36	
189	YEM	Yemen	-0.11	1.22	0.78	6.09	-0.01	2.25	-1.63	8.42		
190	ZAF	South Africa	0.30	1.87	-0.41	7.15	-0.17	1.41	-0.43	8.95	0.12	
191	ZMB	Zambia	0.55	1.84	1.11	9.75	0.02	3.09	0.02	4.19	0.72	
192	ZWE	Zimbabwe	0.11	1.93	-0.40	6.17	2.70	2.67	-0.05	2.89		
193	CYM	Cayman Isds	-1.06	2.45	-0.43	3.98						

Table A2: Export Misinvoicing Decomposition, USA as bechmark, 2011-2015

		Export										
ISO	Country	Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect	Total	
1	USA	United States	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	ABW	Aruba	-0.03	.	0.02	-0.21	0.28	.	.	.	.	.
3	AFG	Afghanistan	-0.25	-0.46	0.03	-0.04	0.77	0.57	0.30	0.30	-0.57	0.65
4	AGO	Angola	-0.15	-0.22	0.03	-0.11	-0.23	0.08	0.22	0.22	-0.13	-0.28
6	ALB	Albania	-0.12	-0.37	0.03	-0.09	0.34	.	.	.	.	.
9	ARE	United Arab Emir.	0.01	.	0.02	-0.24	.	-0.03	0.52	0.49	.	.
10	ARG	Argentina	-0.07	.	0.03	0.00	-0.04	.	.	.	.	.
11	ARM	Armenia	-0.14	-0.26	0.02	-0.07	0.19	0.05	0.63	0.63	-0.88	0.17
12	ATG	Antigua and Barb.	-0.07	-0.38	0.02	-0.13	0.42	0.17	1.10	0.77	-0.66	1.24
13	AUS	Australia	-0.01	0.10	0.01	-0.02	0.04	0.00	0.02	0.00	-0.05	0.10
14	AUT	Austria	-0.01	-0.24	0.02	-0.12	-0.16	-0.03	0.52	0.49	-0.64	-0.18
15	AZE	Azerbaijan	-0.08	-0.37	0.03	-0.08	-0.67	0.02	0.52	0.49	-0.30	-0.45
16	BDI	Burundi	-0.32	.	0.03	-0.02	0.33	.	.	.	.	.
17	BEL	Belgium	-0.02	-0.16	0.02	-0.23	-0.08	.	.	.	.	.
18	BEN	Benin	-0.25	-0.34	0.03	-0.06	0.19	0.34	0.49	0.48	-0.58	0.30
19	BFA	Burkina Faso	-0.26	-0.31	0.03	-0.06	0.11	0.22	0.39	0.38	-0.38	0.13
20	BGD	Bangladesh	-0.21	-0.28	0.02	-0.03	-0.13	0.42	0.46	0.44	-0.36	0.34
21	BGR	Bulgaria	-0.09	-0.36	0.02	-0.16	-0.10	-0.02	0.49	0.48	-0.24	0.03
22	BHR	Bahrain	-0.02	-0.49	0.02	-0.15	-0.37	1.17	1.05	1.03	-1.20	1.04
23	BHS	Bahamas, The	-0.06	.	0.02	-0.12	0.57	.	.	.	.	.
24	BIH	Bosnia and Herzeg.	-0.12	-0.43	0.02	-0.10	0.18	-0.03	0.58	0.57	-0.24	0.43
25	BLR	Belarus	-0.08	-0.47	0.03	-0.18	0.15	0.16	0.42	0.40	-0.95	-0.53
26	BLZ	Belize	-0.14	-0.23	0.02	-0.17	0.10	.	.	.	.	.
27	BMU	Bermuda	0.00	.	.	-0.08	-0.69	.	.	.	.	.
28	BOL	Bolivia	-0.16	.	0.02	-0.08	-0.15	.	.	.	.	.
29	BRA	Brazil	-0.09	-0.27	0.02	0.01	0.03	0.03	0.01	-0.01	0.41	0.13

Table A2: Export Misinvoicing Decomposition, USA as bechmark, 2011-2015

ISO	Country	Export										Total
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect		
30	BRB	Barbados	-0.09	-0.22	.	-0.10	0.17	0.09	1.10	0.79	.	.
31	BRN	Brunei Daruss.	0.03	.	0.03	-0.12	-1.08	.	.	.	.	.
32	BTN	Bhutan	-0.14	-0.26	0.02	-0.12	0.87	0.01	0.59	0.56	-0.89	0.63
33	BWA	Botswana	-0.09	-0.24	0.03	-0.14	-0.35	0.52	0.30	0.29	-0.43	-0.10
34	CAF	Central Afr. Rep.	-0.32	-0.40	0.03	-0.02	.	0.30	0.30	0.30	.	.
35	CAN	Canada	-0.01	0.00	.	-0.06	0.02	.	.	.	.	.
36	CHE	Switzerland	0.01	-0.30	0.00	-0.16	-0.47	0.07	0.60	0.57	-0.02	0.32
37	CHL	Chile	-0.06	-0.22	0.01	-0.06	-0.01	-0.01	0.28	0.27	-0.02	0.18
38	CHN	China	-0.11	-0.27	0.01	-0.03	-0.18	0.04	0.00	-0.01	0.53	-0.01
39	CIV	Cote d'Ivoire	-0.21	-0.29	0.03	-0.09	-0.19	0.45	0.37	0.37	-0.43	0.02
40	CMR	Cameroon	-0.22	.	0.03	-0.03	0.03	.	.	.	.	.
41	COG	Congo, Rep.	-0.16	-0.42	0.03	-0.20	.	0.21	0.37	0.36	.	.
43	COL	Colombia	-0.11	-0.32	0.02	-0.01	0.06	0.07	0.23	0.23	0.07	0.25
44	COM	Comoros	-0.27	.	0.03	-0.07	0.22	.	.	.	.	.
45	CPV	Cabo Verde	-0.16	.	0.02	-0.12	0.27	0.27	0.85	0.84	.	.
46	CRI	Costa Rica	-0.10	-0.35	0.02	-0.06	0.09	0.05	0.58	0.56	0.46	1.24
48	CYP	Cyprus	-0.04	-0.25	-0.01	-0.14	0.07	-0.03	0.76	0.74	-0.32	0.78
49	CZE	Czech Republic	-0.04	-0.36	0.02	-0.20	-0.07	-0.03	0.53	0.49	-0.58	-0.25
50	DEU	Germany	-0.01	-0.35	0.02	-0.09	-0.36	.	.	.	.	.
52	DMA	Dominica	-0.12	-0.36	0.02	-0.10	0.49	0.14	1.04	1.03	-0.32	1.82
53	DNK	Denmark	-0.01	-0.10	0.00	-0.12	-0.33	.	.	.	.	.
54	DOM	Dominican Republic	-0.11	-0.26	0.03	-0.05	0.08	0.08	0.58	0.58	0.00	0.94
55	DZA	Algeria	-0.10	0.07	0.03	-0.06	-0.05	0.03	0.15	0.15	-0.11	0.10
56	ECU	Ecuador	-0.12	.	0.03	-0.05	-0.06	.	.	.	.	.
57	EGY	Egypt, Arab Rep.	-0.12	-0.25	0.03	-0.02	0.00	0.09	0.25	0.24	0.43	0.65
59	ESP	Spain	-0.04	-0.19	0.01	-0.05	-0.10	.	.	.	.	.

Table A2: Export Misinvoicing Decomposition, USA as bechmark, 2011-2015

ISO	Country	Export										Total	
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect			
60	EST	Estonia	-0.05	-0.41	0.02	-0.23	-0.11	.	.	.	.	.	.
61	ETH	Ethiopia	-0.27	-0.35	.	-0.02	0.08	0.64	0.23	0.23	0.23	.	.
62	FIN	Finland	-0.02	-0.36	0.02	-0.08	-0.04	.	.	.	.	.	.
63	FJI	Fiji	-0.14	-0.26	0.02	-0.15	0.10	0.21	0.69	0.66	0.66	-1.14	<i>-0.02</i>
64	FRA	France	-0.02	-0.26	0.02	-0.05	-0.06	-0.03	0.31	0.31	0.31	-0.16	<i>0.05</i>
66	FSM	Micronesia, Fed. Sts.	-0.20	-0.39	0.03	.	0.05	0.46	1.05	1.02	1.02	.	.
68	GBR	United Kingdom	-0.02	-0.18	0.01	-0.05	0.05	.	.	.	.	.	.
69	GEO	Georgia	-0.14	-0.16	0.03	-0.12	0.30	-0.01	0.54	0.53	0.53	-0.32	<i>0.65</i>
70	GHA	Ghana	-0.19	-0.26	0.03	-0.10	0.28	0.33	0.41	0.38	0.41	0.15	<i>1.01</i>
71	GIN	Guinea	-0.28	.	0.03	-0.09	0.65	.	.	.	.	.	.
72	GMB	Gambia, The	-0.26	.	0.03	-0.06	-0.44	.	.	.	.	.	.
74	GRC	Greece	-0.05	-0.33	0.01	-0.06	0.02	-0.03	0.47	0.45	0.45	-0.67	<i>-0.19</i>
77	GTM	Guatemala	-0.15	-0.21	0.03	-0.05	-0.02	0.06	0.49	0.49	0.49	-0.31	<i>0.34</i>
78	GUY	Guyana	-0.15	.	0.02	-0.17	0.35	.	.	.	.	.	.
79	HKG	Hong Kong SAR, China	0.00	-0.50	0.00	-0.69	-0.19	-0.02	1.00	0.68	0.68	-0.75	<i>-0.47</i>
80	HND	Honduras	-0.18	-0.29	0.02	-0.14	0.20	0.05	0.49	0.46	0.46	0.23	<i>0.84</i>
81	HRV	Croatia	-0.07	-0.43	0.02	-0.10	-0.14	0.01	0.56	0.55	0.55	-0.52	<i>-0.11</i>
82	HUN	Hungary	-0.06	-0.35	0.02	-0.23	-0.18	-0.03	0.51	0.50	0.50	-0.26	<i>-0.08</i>
83	IDN	Indonesia	-0.12	-0.17	0.03	-0.03	-0.01	0.01	0.18	0.14	0.14	0.14	<i>0.17</i>
84	IND	India	-0.17	-0.06	0.02	-0.04	0.01	0.21	0.12	0.12	0.12	-0.17	<i>0.03</i>
85	IRL	Ireland	0.00	-0.15	0.02	-0.29	-0.28	.	.	.	.	.	.
86	IRN	Iran, Islamic Rep.	-0.08	.	0.02	-0.02	.	0.29	0.19	0.17	0.17	.	.
87	IRQ	Iraq	-0.09	-0.48	0.03	-0.06	-0.61	.	.	.	.	.	.
88	ISL	Iceland	-0.02	-0.22	0.01	-0.13	-0.13	0.00	0.50	0.50	0.50	0.16	<i>0.66</i>
89	ISR	Israel	-0.04	-0.23	0.02	-0.06	-0.21	-0.01	0.67	0.64	0.64	-0.86	<i>-0.07</i>
90	ITA	Italy	-0.03	-0.20	0.02	-0.04	-0.10	.	.	.	.	.	.

Table A2: Export Misinvoicing Decomposition, USA as bechmark, 2011-2015

ISO	Country	Export										Total
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect		
91	JAM	Jamaica	-0.14	-0.22	0.03	-0.09	0.24	0.07	0.74	0.74	-0.30	1.08
92	JOR	Jordan	-0.12	-0.38	0.02	-0.14	0.29	0.10	0.51	0.50	-0.63	0.16
93	JPN	Japan	-0.02	-0.07	0.00	-0.01	-0.15	.	.	.	.	.
94	KAZ	Kazakhstan	-0.06	-0.19	0.03	-0.06	-0.14	0.12	0.14	0.14	-0.03	-0.05
95	KEN	Kenya	-0.22	-0.09	0.03	-0.04	0.25	0.09	0.31	0.28	-0.50	0.11
96	KGZ	Kyrgyz Republic	-0.21	-0.34	0.03	-0.17	0.39	0.19	0.43	0.42	-0.88	-0.14
97	KHM	Cambodia	-0.21	-0.37	0.02	-0.16	0.20	0.28	0.44	0.43	-0.02	0.62
98	KIR	Kiribati	-0.25	-0.42	.	-0.13	-0.23	0.83	1.04	1.04	.	.
99	KNA	St. Kitts and Nevis	-0.06	-0.27	0.02	-0.10	0.32	0.13	1.15	0.83	-0.47	1.54
100	KOR	Korea, Rep.	-0.03	-0.25	0.01	-0.12	-0.29	0.05	0.50	0.50	-0.48	-0.11
101	KWT	Kuwait	0.03	.	0.02	-0.12	-1.36	.	.	.	.	.
102	LBN	Lebanon	-0.10	-0.31	0.02	-0.15	0.67	0.09	0.75	0.75	-1.55	0.17
104	LCA	St. Lucia	-0.12	-0.25	0.01	-0.12	0.41	0.17	1.06	1.04	-1.84	0.96
105	LKA	Sri Lanka	-0.12	-0.34	0.03	-0.03	0.06	0.16	0.55	0.53	-0.83	0.01
106	LSO	Lesotho	-0.22	-0.29	0.03	.	0.23	.	.	.	.	.
107	LTU	Lithuania	-0.05	-0.36	0.02	-0.22	-0.08	.	.	.	.	.
108	LUX	Luxembourg	0.04	-0.23	0.02	-0.56	-0.30	.	.	.	.	.
109	LVA	Latvia	-0.06	-0.41	0.02	-0.16	0.00	-0.02	0.55	0.55	-0.33	0.13
110	MAC	Macao SAR, China	0.07	-0.46	0.02	-0.15	-1.46	.	.	.	.	.
111	MAR	Morocco	-0.15	-0.26	0.02	-0.09	0.15	0.07	0.29	0.29	-0.04	0.27
112	MDA	Moldova	-0.18	-0.47	0.03	-0.16	0.21	0.09	0.62	0.61	-0.08	0.67
113	MDG	Madagascar	-0.27	-0.31	0.03	-0.07	0.16	0.68	0.31	0.30	-0.59	0.24
114	MDV	Maldives	-0.11	-0.39	0.03	-0.27	0.20	0.94	1.14	0.82	-1.34	1.03
115	MEX	Mexico	-0.09	.	0.03	-0.06	-0.02	.	.	.	.	.
116	MKD	Macedonia, FYR	-0.11	-0.40	0.02	-0.14	-0.02	0.06	0.65	0.63	-0.06	0.65
117	MLI	Mali	-0.25	-0.27	0.03	-0.04	0.04	0.17	0.22	0.21	-0.57	-0.46

Table A2: Export Misinvoicing Decomposition, USA as bechmark, 2011-2015

ISO	Country	Export										Total
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect		
118	MLT	Malta	-0.04	-0.19	0.01	-0.46	-0.20	-0.03	1.13	1.13	-0.85	0.50
120	MNE	Montenegro	-0.09	.	0.02	-0.13	0.50	.	.	.	.	.
121	MING	Mongolia	-0.12	-0.37	0.02	-0.13	1.01	0.14	0.20	0.19	-0.87	0.07
122	MOZ	Mozambique	-0.29	-0.23	0.03	-0.13	1.28	0.08	0.27	0.26	-0.41	0.86
123	MRT	Mauritania	-0.20	.	0.03	-0.15	0.81	.	.	.	.	.
125	MUS	Mauritius	-0.08	-0.31	0.02	-0.14	0.18	0.04	0.93	0.61	-0.79	0.46
126	MWI	Malawi	-0.29	-0.18	0.03	-0.06	0.50	0.11	0.48	0.48	-1.11	-0.05
127	MYS	Malaysia	-0.06	-0.01	0.01	-0.19	-0.30	0.00	0.37	0.34	0.10	0.26
129	NAM	Namibia	-0.13	-0.16	0.02	-0.13	0.16	.	.	.	.	.
131	NER	Niger	-0.30	.	0.03	-0.05	0.55	.	.	.	.	.
132	NGA	Nigeria	-0.17	-0.23	0.03	-0.01	-0.15	.	.	.	.	.
133	NIC	Nicaragua	-0.18	-0.20	0.03	-0.12	0.27	0.04	0.47	0.47	-0.12	0.65
134	NLD	Netherlands	-0.01	-0.27	0.01	-0.21	-0.45	.	.	.	.	.
135	NOR	Norway	0.02	-0.23	0.01	-0.07	-0.51	-0.03	0.37	0.35	0.12	0.04
136	NPL	Nepal	-0.23	-0.32	0.02	-0.03	-0.28	0.28	0.46	0.44	-0.24	0.09
137	NZL	New Zealand	-0.03	-0.08	.	-0.05	0.03	0.02	0.39	0.39	.	.
138	OMN	Oman	-0.02	-0.47	0.02	-0.15	-0.24	0.43	0.42	0.41	-0.50	-0.09
139	PAK	Pakistan	-0.18	-0.24	0.03	0.00	-0.05	.	.	.	.	.
140	PAN	Panama	-0.07	-0.50	0.02	-0.18	0.28	.	.	.	.	.
141	PER	Peru	-0.11	-0.20	0.03	-0.03	0.04	0.01	0.22	0.21	-0.03	0.13
142	PHL	Philippines	-0.16	-0.10	0.03	-0.06	-0.21	0.30	0.38	0.36	-0.05	0.50
143	PLW	Palau	-0.10	.	.	-0.19	0.47	.	.	.	.	.
144	PNG	Papua New Guinea	-0.22	.	0.03	.	0.13	.	.	.	.	.
145	POL	Poland	-0.06	-0.38	0.02	-0.10	0.00	-0.02	0.38	0.35	-0.44	-0.24
146	PRT	Portugal	-0.05	-0.27	0.01	-0.08	-0.05	-0.03	0.51	0.49	-0.45	0.07
147	PRY	Paraguay	-0.14	-0.39	0.02	-0.11	-0.08	0.15	0.35	0.34	-0.26	-0.11

Table A2: Export Misinvoicing Decomposition, USA as bechmark, 2011-2015

ISO	Country	Export										Total
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect		
150	QAT	Qatar	0.07	.	0.02	-0.12	-1.04	0.05	0.74	0.72	.	.
151	ROU	Romania	-0.07	-0.33	0.03	-0.09	0.00	.	.	.	.	.
152	RUS	Russian Federation	-0.05	-0.48	0.02	-0.03	-0.23	0.11	-0.06	-0.07	1.01	0.22
153	RWA	Rwanda	-0.26	-0.29	0.03	-0.03	0.32	0.11	0.65	0.64	-1.11	0.06
154	SAU	Saudi Arabia	0.00	.	0.02	-0.09	-0.59	.	.	.	.	.
156	SDN	Sudan	-0.19	.	0.03	0.01	0.14	.	.	.	.	.
157	SEN	Senegal	-0.23	-0.29	0.03	-0.08	0.26	0.19	0.43	0.42	-0.63	0.10
158	SGP	Singapore	0.03	-0.18	0.01	-0.55	-0.81	.	.	.	.	.
159	SLB	Solomon Islands	-0.24	-0.28	0.03	-0.15	-0.02	0.29	0.63	0.65	-0.15	0.76
160	SLE	Sierra Leone	-0.26	-0.23	0.03	-0.09	1.12	0.39	0.54	0.53	3.18	5.21
161	SLV	El Salvador	-0.14	-0.27	0.02	-0.07	0.10	0.05	0.67	0.67	-0.46	0.58
162	SRB	Serbia	-0.10	-0.42	0.02	-0.11	0.20	.	.	.	.	.
163	STP	Sao Tome & Prin.	-0.21	-0.38	0.03	.	1.12	0.35	1.01	1.01	.	.
164	SUR	Suriname	-0.09	-0.21	0.03	-0.12	0.01	0.14	0.45	0.41	0.19	0.81
165	SVK	Slovak Republic	-0.05	-0.29	0.02	-0.25	-0.09	-0.03	0.58	0.56	-0.72	-0.27
166	SVN	Slovenia	-0.04	-0.39	0.02	-0.19	-0.24	-0.03	0.68	0.67	-0.49	-0.01
167	SWE	Sweden	-0.01	-0.37	0.01	-0.09	-0.29	.	.	.	.	.
169	SYC	Seychelles	-0.06	-0.28	0.03	-0.27	0.60	0.29	1.09	0.78	-0.68	1.50
172	TGO	Togo	-0.27	-0.40	0.03	-0.13	0.28	0.32	0.56	0.55	-0.16	0.78
173	THA	Thailand	-0.09	-0.16	0.01	-0.17	-0.19	0.05	0.32	0.32	0.02	0.10
175	TON	Tonga	-0.17	.	0.03	-0.08	0.35	.	.	.	.	.
177	TUN	Tunisia	-0.12	-0.24	0.02	-0.12	0.22	0.09	0.45	0.43	-0.09	0.64
178	TUR	Turkey	-0.07	-0.33	0.02	-0.05	0.15	-0.01	0.28	0.28	-0.24	0.03
180	TZA	Tanzania	-0.23	-0.24	0.03	-0.04	0.29	0.09	0.25	0.24	-0.27	0.13
181	UGA	Uganda	-0.25	-0.20	0.03	-0.03	0.22	0.12	0.40	0.39	-0.22	0.46
182	UKR	Ukraine	-0.14	-0.39	0.02	-0.12	0.11	0.05	0.30	0.27	-0.14	-0.03

Table A2: Export Misinvoicing Decomposition, USA as bechmark, 2011-2015

		Export										
ISO	Country	Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect	<i>Total</i>	
183	URY	Uruguay	-0.07	-0.32	0.03	-0.03	0.05	.	.	.	.
184	VCT	St. Vincent & Gren.	-0.12	.	0.02	-0.09	0.98	.	.	.	.
185	VEN	Venezuela, RB	-0.08	.	0.03	-0.03	-0.18	.	.	.	.
187	VUT	Vanuatu	-0.21	.	0.02	-0.11	0.10	0.52	0.71	0.40	.	
188	WSM	Samoa	-0.16	-0.32	0.02	-0.08	0.11	0.12	0.89	0.87	1.36	
189	YEM	Yemen, Rep.	-0.20	.	0.03	-0.04	0.04	.	.	.	.
190	ZAF	South Africa	-0.11	-0.04	0.01	-0.05	0.08	0.03	0.23	0.23	0.12	
191	ZMB	Zambia	-0.20	-0.05	0.03	-0.09	-0.13	.	.	.	.
192	ZWE	Zimbabwe	-0.26	.	.	-0.11	0.52	.	.	.	.

Table A3: Import Misinvoicing Decomposition, USA as bechmark, 2011-2015

ISO	Country	Import										Total		
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect				
1	USA	United States	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	ABW	Aruba	-0.04	.	0.35	0.13	-0.07
3	AFG	Afghanistan	-0.38	0.22	0.50	0.02	-0.20	-0.40	-0.13	-0.01	-0.01	-1.55	-1.93	
4	AGO	Angola	-0.23	0.10	0.45	0.06	0.06	-0.05	-0.10	0.00	-0.06	-0.06	0.23	
6	ALB	Albania	-0.18	0.17	0.41	0.05	-0.09	.	.	.	.	.	.
9	ARE	United Arab Emir.	0.02	.	0.33	0.14	.	0.02	-0.23	0.06	.	.	.	
10	ARG	Argentina	-0.11	.	0.47	0.00	0.01	.	.	.	.	.	.
11	ARM	Armenia	-0.22	0.13	0.39	0.04	-0.05	-0.03	-0.29	0.01	0.61	0.61	0.60	
12	ATG	Antigua and Barb.	-0.10	0.18	0.33	0.07	-0.11	-0.12	-0.49	-0.21	-1.04	-1.04	-1.50	
13	AUS	Australia	-0.02	-0.05	0.16	0.01	-0.01	0.00	-0.01	0.05	-0.08	-0.08	0.05	
14	AUT	Austria	-0.02	0.11	0.26	0.07	0.04	0.02	-0.23	0.06	0.88	0.88	1.20	
15	AZE	Azerbaijan	-0.13	0.18	0.44	0.05	0.18	-0.02	-0.23	0.06	-0.68	-0.68	-0.16	
16	BDI	Burundi	-0.49	.	0.46	0.01	-0.09	.	.	.	.	.	.
17	BEL	Belgium	-0.02	0.08	0.35	0.13	0.02	.	.	.	.	.	.
18	BEN	Benin	-0.38	0.16	0.45	0.04	-0.05	-0.24	-0.22	0.01	-0.74	-0.74	-0.96	
19	BFA	Burkina Faso	-0.40	0.15	0.45	0.03	-0.03	-0.15	-0.18	0.02	0.56	0.56	0.45	
20	BGD	Bangladesh	-0.33	0.13	0.39	0.02	0.03	-0.29	-0.21	0.03	0.43	0.43	0.21	
21	BGR	Bulgaria	-0.13	0.17	0.34	0.10	0.03	0.01	-0.22	0.02	-0.24	-0.24	0.08	
22	BHR	Bahrain	-0.02	0.23	0.32	0.09	0.10	-0.81	-0.47	0.04	0.50	0.50	-0.02	
23	BHS	Bahamas, The	-0.09	.	0.30	0.07	-0.15	.	.	.	.	.	.
24	BIH	Bosnia and Herzeg.	-0.19	0.21	0.36	0.06	-0.05	0.02	-0.26	0.00	1.01	1.01	1.16	
25	BLR	Belarus	-0.13	0.22	0.50	0.11	-0.04	-0.11	-0.19	0.05	0.76	0.76	1.18	
26	BLZ	Belize	-0.21	0.11	0.35	0.10	-0.03	.	.	.	.	.	.
27	BMU	Bermuda	0.00	.	.	0.05	0.18	.	.	.	.	.	.
28	BOL	Bolivia	-0.24	.	0.38	0.05	0.04	.	.	.	.	.	.
29	BRA	Brazil	-0.14	0.13	0.33	0.00	-0.01	-0.02	-0.01	0.04	-0.13	-0.13	0.20	

Table A3: Import Misinvoicing Decomposition, USA as bechmark, 2011-2015

ISO	Country	Import										Total
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect		
30	BRB	Barbados	-0.14	0.11	.	0.06	-0.04	-0.07	-0.50	-0.25	.	.
31	BRN	Brunei Daruss.	0.05	.	0.42	0.07	0.28	.	.	.	.	.
32	BTN	Bhutan	-0.22	0.13	0.39	0.07	-0.23	-0.01	-0.26	0.04	0.95	0.85
33	BWA	Botswana	-0.14	0.11	0.42	0.08	0.09	-0.36	-0.14	0.02	0.02	0.11
34	CAF	Central Afr. Rep.	-0.49	0.19	0.47	0.01	.	-0.21	-0.14	-0.01	.	.
35	CAN	Canada	-0.02	0.00	.	0.03	0.00	.	.	.	.	.
36	CHE	Switzerland	0.01	0.14	0.05	0.09	0.12	-0.05	-0.27	0.05	-0.78	-0.63
37	CHL	Chile	-0.10	0.11	0.22	0.04	0.00	0.01	-0.13	0.02	-0.17	-0.01
38	CHN	China	-0.17	0.13	0.14	0.02	0.05	-0.03	0.00	0.02	0.02	0.17
39	CIV	Cote d'Ivoire	-0.33	0.14	0.46	0.05	0.05	-0.31	-0.17	0.01	0.27	0.17
40	CMR	Cameroon	-0.33	.	0.47	0.02	-0.01	.	.	.	.	.
41	COG	Congo, Rep.	-0.25	0.20	0.47	0.12	.	-0.14	-0.17	0.01	.	.
43	COL	Colombia	-0.16	0.15	0.38	0.01	-0.02	-0.05	-0.11	0.01	0.03	0.24
44	COM	Comoros	-0.41	.	0.45	0.04	-0.06	.	.	.	.	.
45	CPV	Cabo Verde	-0.24	.	0.34	0.07	-0.07	-0.19	-0.39	0.04	.	.
46	CRI	Costa Rica	-0.15	0.17	0.37	0.04	-0.02	-0.03	-0.26	0.04	-0.07	0.07
48	CYP	Cyprus	-0.06	0.12	-0.17	0.09	-0.02	0.02	-0.34	0.05	-0.30	-0.62
49	CZE	Czech Republic	-0.06	0.17	0.37	0.12	0.02	0.02	-0.24	0.07	0.65	1.12
50	DEU	Germany	-0.02	0.17	0.29	0.05	0.09	.	.	.	.	.
52	DMA	Dominica	-0.18	0.17	0.36	0.06	-0.13	-0.10	-0.47	0.01	-1.06	-1.93
53	DNK	Denmark	-0.02	0.05	0.02	0.07	0.09	.	.	.	.	.
54	DOM	Dominican Republic	-0.16	0.12	0.44	0.03	-0.02	-0.06	-0.26	0.00	-0.47	-0.38
55	DZA	Algeria	-0.15	-0.03	0.46	0.03	0.01	-0.02	-0.07	0.01	0.03	0.28
56	ECU	Ecuador	-0.18	.	0.44	0.03	0.02	.	.	.	.	.
57	EGY	Egypt, Arab Rep.	-0.18	0.12	0.43	0.01	0.00	-0.06	-0.11	0.01	-0.44	-0.23
59	ESP	Spain	-0.05	0.09	0.12	0.03	0.03

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ISO	Country	Import										Total	
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect			
60	EST	Estonia	-0.08	0.20	0.31	0.13	0.03	.	.	.	.	.	.
61	ETH	Ethiopia	-0.41	0.17	.	0.01	-0.02	-0.44	-0.11	0.01	.	.	.
62	FIN	Finland	-0.03	0.17	0.26	0.05	0.01	.	.	.	.	.	.
63	FJI	Fiji	-0.21	0.12	0.30	0.09	-0.03	-0.14	-0.31	0.06	0.01	0.01	-0.12
64	FRA	France	-0.04	0.12	0.25	0.03	0.02	0.02	-0.14	0.01	-0.10	-0.10	0.18
66	FSM	Micronesia, Fed. Sts.	-0.31	0.18	0.45	.	-0.01	-0.32	-0.47	0.05	.	.	.
68	GBR	United Kingdom	-0.04	0.09	0.09	0.03	-0.01	.	.	.	.	.	.
69	GEO	Georgia	-0.21	0.07	0.40	0.07	-0.08	0.01	-0.24	0.03	-0.30	-0.30	-0.25
70	GHA	Ghana	-0.30	0.13	0.46	0.06	-0.07	-0.23	-0.18	0.06	-0.27	-0.27	-0.34
71	GIN	Guinea	-0.43	.	0.48	0.05	-0.17	.	.	.	.	.	.
72	GMB	Gambia, The	-0.40	.	0.47	0.04	0.12	.	.	.	.	.	.
74	GRC	Greece	-0.08	0.16	0.19	0.03	-0.01	0.02	-0.21	0.05	-0.08	-0.08	0.07
77	GTM	Guatemala	-0.23	0.10	0.43	0.03	0.00	-0.04	-0.22	0.01	-0.16	-0.16	-0.08
78	GUY	Guyana	-0.23	.	0.39	0.10	-0.09	.	.	.	.	.	.
79	HKG	Hong Kong SAR, China	0.00	0.24	-0.07	0.41	0.05	0.02	-0.45	-0.23	-0.28	-0.28	-0.32
80	HND	Honduras	-0.27	0.14	0.37	0.09	-0.05	-0.04	-0.22	0.06	-0.06	-0.06	0.01
81	HRV	Croatia	-0.10	0.20	0.32	0.06	0.04	-0.01	-0.25	0.03	0.48	0.48	0.77
82	HUN	Hungary	-0.09	0.17	0.38	0.14	0.05	0.02	-0.23	0.01	-0.11	-0.11	0.34
83	IDN	Indonesia	-0.19	0.08	0.41	0.02	0.00	-0.01	-0.08	0.06	-0.05	-0.05	0.25
84	IND	India	-0.26	0.03	0.37	0.02	0.00	-0.14	-0.05	-0.01	0.13	0.13	0.08
85	IRL	Ireland	-0.01	0.07	0.26	0.17	0.07	.	.	.	.	.	.
86	IRN	Iran, Islamic Rep.	-0.13	.	0.36	0.01	.	-0.20	-0.09	0.05	.	.	.
87	IRQ	Iraq	-0.14	0.23	0.49	0.03	0.16	.	.	.	.	.	.
88	ISL	Iceland	-0.03	0.11	0.20	0.07	0.03	0.00	-0.22	0.01	0.44	0.44	0.62
89	ISR	Israel	-0.06	0.11	0.33	0.04	0.05	0.01	-0.30	0.06	-0.57	-0.57	-0.33
90	ITA	Italy	-0.04	0.09	0.26	0.03	0.03

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ISO	Country	Import										Total	
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect			
91	JAM	Jamaica	-0.21	0.10	0.43	0.05	-0.06	-0.05	-0.34	0.01	0.00	0.00	-0.05
92	JOR	Jordan	-0.18	0.18	0.31	0.08	-0.08	-0.07	-0.23	0.03	-0.17	-0.17	-0.13
93	JPN	Japan	-0.04	0.03	0.02	0.00	0.04	.	.	.	.	.	.
94	KAZ	Kazakhstan	-0.09	0.09	0.41	0.04	0.04	-0.08	-0.06	0.00	0.38	0.38	0.71
95	KEN	Kenya	-0.33	0.04	0.42	0.02	-0.07	-0.06	-0.14	0.05	0.06	0.06	0.00
96	KGZ	Kyrgyz Republic	-0.32	0.16	0.46	0.10	-0.10	-0.13	-0.19	0.01	0.33	0.33	0.32
97	KHM	Cambodia	-0.32	0.18	0.38	0.09	-0.05	-0.20	-0.20	0.01	-0.38	-0.38	-0.49
98	KIR	Kiribati	-0.38	0.20	.	0.07	0.06	-0.58	-0.47	0.01	.	.	.
99	KNA	St. Kitts and Nevis	-0.10	0.13	0.34	0.06	-0.08	-0.09	-0.52	-0.22	-0.58	-0.58	-1.06
100	KOR	Korea, Rep.	-0.05	0.12	0.13	0.07	0.08	-0.03	-0.23	0.00	0.32	0.32	0.41
101	KWT	Kuwait	0.04	.	0.32	0.07	0.36	.	.	.	.	.	.
102	LBN	Lebanon	-0.15	0.15	0.24	0.09	-0.18	-0.06	-0.34	0.00	0.64	0.64	0.39
104	LCA	St. Lucia	-0.18	0.12	0.22	0.07	-0.11	-0.12	-0.48	0.04	0.17	0.17	-0.26
105	LKA	Sri Lanka	-0.18	0.16	0.41	0.02	-0.02	-0.11	-0.25	0.04	-0.22	-0.22	-0.15
106	LSO	Lesotho	-0.34	0.14	0.46	.	-0.06	.	.	.	.	.	.
107	LTU	Lithuania	-0.08	0.17	0.39	0.13	0.02	.	.	.	.	.	.
108	LUX	Luxembourg	0.06	0.11	0.26	0.33	0.08	.	.	.	.	.	.
109	LVA	Latvia	-0.10	0.20	0.35	0.09	0.00	0.02	-0.25	0.01	-0.77	-0.77	-0.46
110	MAC	Macao SAR, China	0.10	0.22	0.31	0.09	0.38	.	.	.	.	.	.
111	MAR	Morocco	-0.23	0.12	0.32	0.05	-0.04	-0.05	-0.13	0.00	0.32	0.32	0.38
112	MDA	Moldova	-0.28	0.22	0.41	0.09	-0.06	-0.06	-0.28	0.02	0.63	0.63	0.70
113	MDG	Madagascar	-0.41	0.15	0.48	0.04	-0.04	-0.47	-0.14	0.01	0.46	0.46	0.08
114	MDV	Maldives	-0.17	0.18	0.40	0.16	-0.05	-0.65	-0.51	-0.23	0.69	0.69	-0.18
115	MEX	Mexico	-0.13	.	0.43	0.04	0.01	.	.	.	.	.	.
116	MKD	Macedonia, FYR	-0.16	0.19	0.38	0.08	0.01	-0.04	-0.29	0.04	0.86	0.86	1.05
117	MLI	Mali	-0.38	0.13	0.46	0.03	-0.01	-0.12	-0.10	0.04	0.21	0.21	0.25

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ISO	Country	Import										Total
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect		
118	MLT	Malta	-0.06	0.09	0.21	0.27	0.05	0.02	-0.51	0.01	-0.60	-0.51
120	MNE	Montenegro	-0.14	.	0.36	0.07	-0.13	.	.	.	.	.
121	MING	Mongolia	-0.18	0.18	0.37	0.08	-0.27	-0.09	-0.09	0.02	0.38	0.39
122	MOZ	Mozambique	-0.44	0.11	0.43	0.08	-0.34	-0.06	-0.12	0.03	-0.52	-0.84
123	MRT	Mauritania	-0.30	.	0.45	0.09	-0.21	.	.	.	.	.
125	MUS	Mauritius	-0.12	0.15	0.24	0.08	-0.05	-0.03	-0.42	-0.23	0.70	0.31
126	MWI	Malawi	-0.44	0.09	0.47	0.04	-0.13	-0.08	-0.22	0.01	0.84	0.58
127	MYS	Malaysia	-0.09	0.00	0.19	0.11	0.08	0.00	-0.17	0.05	0.08	0.26
129	NAM	Namibia	-0.20	0.08	0.37	0.07	-0.04	.	.	.	.	.
131	NER	Niger	-0.46	.	0.47	0.03	-0.15	.	.	.	.	.
132	NGA	Nigeria	-0.25	0.11	0.47	0.01	0.04	.	.	.	.	.
133	NIC	Nicaragua	-0.28	0.10	0.42	0.07	-0.07	-0.03	-0.21	0.01	-0.11	-0.10
134	NLD	Netherlands	-0.01	0.13	0.19	0.12	0.12	.	.	.	.	.
135	NOR	Norway	0.02	0.11	0.16	0.04	0.13	0.02	-0.17	0.04	0.15	0.50
136	NPL	Nepal	-0.36	0.15	0.35	0.02	0.07	-0.19	-0.21	0.04	0.74	0.61
137	NZL	New Zealand	-0.05	0.04	.	0.03	-0.01	-0.01	-0.18	0.01	.	.
138	OMN	Oman	-0.03	0.23	0.38	0.09	0.06	-0.30	-0.19	0.01	-0.47	-0.22
139	PAK	Pakistan	-0.28	0.12	0.46	0.00	0.01	.	.	.	.	.
140	PAN	Panama	-0.11	0.24	0.29	0.11	-0.07	.	.	.	.	.
141	PER	Peru	-0.17	0.09	0.42	0.02	-0.01	0.00	-0.10	0.02	-0.13	0.14
142	PHL	Philippines	-0.24	0.05	0.41	0.03	0.06	-0.21	-0.17	0.04	-0.46	-0.49
143	PLW	Palau	-0.15	.	.	0.11	-0.12	.	.	.	.	.
144	PNG	Papua New Guinea	-0.34	.	0.42	.	-0.04	.	.	.	.	.
145	POL	Poland	-0.09	0.18	0.37	0.06	0.00	0.01	-0.17	0.05	0.36	0.78
146	PRT	Portugal	-0.08	0.13	0.13	0.05	0.01	0.02	-0.23	0.04	0.03	0.11
147	PRY	Paraguay	-0.21	0.18	0.38	0.06	0.02	-0.10	-0.16	0.01	-0.23	-0.04

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ISO	Country	Import										Total
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect		
150	QAT	Qatar	0.11	.	0.38	0.07	0.27	-0.03	-0.33	0.05	.	.
151	ROU	Romania	-0.11	0.16	0.42	0.05	0.00	.	.	.	.	.
152	RUS	Russian Federation	-0.08	0.23	0.38	0.02	0.06	-0.08	0.03	0.01	-0.40	0.16
153	RWA	Rwanda	-0.40	0.14	0.46	0.01	-0.09	-0.08	-0.29	0.02	0.59	0.37
154	SAU	Saudi Arabia	0.00	.	0.39	0.05	0.15	.	.	.	.	.
156	SDN	Sudan	-0.29	.	0.48	-0.01	-0.04	.	.	.	.	.
157	SEN	Senegal	-0.36	0.14	0.42	0.05	-0.07	-0.13	-0.19	0.02	-0.28	-0.41
158	SGP	Singapore	0.05	0.09	0.18	0.33	0.21	.	.	.	.	.
159	SLB	Solomon Islands	-0.37	0.13	0.42	0.09	0.00	-0.20	-0.29	-0.03	-0.20	-0.43
160	SLE	Sierra Leone	-0.39	0.11	0.49	0.05	-0.29	-0.27	-0.24	0.01	-0.21	-0.74
161	SLV	El Salvador	-0.21	0.13	0.39	0.04	-0.03	-0.03	-0.30	0.00	0.21	0.19
162	SRB	Serbia	-0.15	0.20	0.39	0.06	-0.05	.	.	.	.	.
163	STP	Sao Tome & Prin.	-0.33	0.18	0.42	.	-0.30	-0.25	-0.46	0.01	.	.
164	SUR	Suriname	-0.14	0.10	0.43	0.07	0.00	-0.10	-0.20	0.07	-0.77	-0.53
165	SVK	Slovak Republic	-0.07	0.14	0.38	0.15	0.02	0.02	-0.26	0.05	0.66	1.08
166	SVN	Slovenia	-0.07	0.19	0.33	0.11	0.06	0.02	-0.31	0.01	0.33	0.68
167	SWE	Sweden	-0.02	0.18	0.15	0.06	0.08	.	.	.	.	.
169	SYC	Seychelles	-0.08	0.14	0.45	0.16	-0.16	-0.20	-0.49	-0.23	-0.26	-0.68
172	TGO	Togo	-0.42	0.19	0.42	0.08	-0.07	-0.22	-0.25	0.02	-0.99	-1.25
173	THA	Thailand	-0.14	0.08	0.12	0.10	0.05	-0.04	-0.14	0.00	0.47	0.50
175	TON	Tonga	-0.26	.	0.43	0.05	-0.09	.	.	.	.	.
177	TUN	Tunisia	-0.18	0.12	0.30	0.07	-0.06	-0.06	-0.20	0.03	0.36	0.37
178	TUR	Turkey	-0.11	0.16	0.33	0.03	-0.04	0.00	-0.12	0.00	0.14	0.37
180	TZA	Tanzania	-0.35	0.11	0.47	0.02	-0.08	-0.06	-0.11	0.02	-0.30	-0.27
181	UGA	Uganda	-0.39	0.09	0.47	0.02	-0.06	-0.08	-0.18	0.04	0.41	0.33
182	UKR	Ukraine	-0.21	0.19	0.32	0.07	-0.03	-0.03	-0.14	0.06	0.02	0.25

Table A3: Import Misinvoicing Decomposition, USA as bechmark, 2011-2015

ISO	Country	Import										Total
		Ln (GDP p.c.)	Income taxes	DC/GDP	Trade openn.	CA	Customs	Area	Time invariant	Fixed effect		
183	URY	Uruguay	-0.11	0.15	0.44	0.02	-0.01	.	.	.	.	.
184	VCT	St. Vincent & Gren.	-0.18	.	0.37	0.05	-0.26	.	.	.	.	.
185	VEN	Venezuela, RB	-0.12	.	0.44	0.02	0.05	.	.	.	.	.
187	VUT	Vanuatu	-0.33	.	0.32	0.07	-0.03	-0.36	-0.32	-0.24	.	.
188	WSM	Samoa	-0.25	0.15	0.32	0.05	-0.03	-0.09	-0.40	0.04	-0.49	-0.70
189	YEM	Yemen, Rep.	-0.30	.	0.50	0.02	-0.01	.	.	.	.	.
190	ZAF	South Africa	-0.16	0.02	0.11	0.03	-0.02	-0.02	-0.10	-0.01	-0.02	-0.17
191	ZMB	Zambia	-0.30	0.02	0.47	0.05	0.03	.	.	.	.	.
192	ZWE	Zimbabwe	-0.39	.	.	0.06	-0.14	.	.	.	.	.

Data Definitions

CIF/FOB ratio Log of ratio of import value reported by selected country to export value as reported by all her trading partners. UN Commtrade.

Distance Log of simple distance (most populated cities, km). CEPII.

Sea Dummy variable for pairs not located at the same continent or island countries. Own construction.

Colony Dummy variable if pairs were ever in a colonial relationship. CEPII.

Trade agreement Time-varying dummy variable if pairs are in trade agreement (base treaty or accession), one year after entry force year. Dur et al. (2014).

GDP p.c. Log of GDP per capita, PPP (constant 2011 international USD). WB World Development Indicators.

Income Taxes Taxes on income, profits and capital gains (percent of revenue). Taxes on income, profits, and capital gains are levied on the actual or presumptive net income of individuals, on the profits of corporations and enterprises, and on capital gains, whether realized or not, on land, securities, and other assets. Intragovernmental payments are eliminated in consolidation. WB World Development Indicators.

DC/GDP Domestic credit to private sector (percent of GDP). WB World Development Indicators.

Trade Openness Trade as a percent of GDP. WB World Development Indicators.

Current Account Current account balance as a percent of GDP. WB World Development Indicators.

External Debt Gross external debt position as a percent of GDP. Quarterly External Debt Statistics, WB World Development Indicators.

Area Log of Area (sq km). CEPII.

Rule of Law Rule of Law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.. WB Worldwide Governance Indicators.

Customs Customs and other import duties (percent of tax revenue). Customs and other import duties are all levies collected on goods that are entering the country or services delivered by nonresidents to residents. They include levies imposed for revenue or protection purposes and determined on a specific or ad valorem basis as long as they are restricted to imported goods or services. WB World Development Indicators

Tax haven Dummy for country listed in tax havens blacklist released by European Commission for 2016. European Commission.

Tax secrecy (1) Financial Secrecy Index Value calculated by multiplying the cube of the Secrecy Score (Tax Secrecy (2)) with the cube root of the Global Scale Weight (Tax Secrecy (3)) for year 2015. Tax Justice Network.

Tax secrecy (2) The Secrecy Score for 2015 is calculated based on 15 indicators including banking secrecy, trust and foundations register, recorded company and public company ownership, public company accounts, country by country reporting, fit for information exchange, efficiency of tax administration, avoids promoting tax evasion, harmful legal vehicles, anti-money laundering, automatic information exchange, bilateral treaties, international transparency commitments and international judicial cooperation. Tax Justice Network.

Tax secrecy (3) The Global Scale Weight represent a jurisdiction's share in global financial services provided to non-resident clients for year 2015. Tax Justice Network.

Control of corruption Control of Corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.. WB Worldwide Governance Indicators.

Government effectiveness Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5. WB Worldwide Governance Indicators.