# Tax and commercial illicit financial flows

*Workshop on the measurement of tax and commercial IFFs*

*Accra, Ghana*

*16-18 April 2024*

**Bojan Nastav, UNCTAD Stat**

# Outline

- Data process and availability
- Methods:
  - Trade misinvoicing
  - Profit shifting
- Material

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# Data process and availability

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# Key data sources

- International trade in goods and services statistics, customs data
- Tax data, transfer pricing disclosure forms, structural business statistics, statistical business registers
- Tax data, financial transactions data, tax audits, data from voluntary disclosure programmes, crime and criminal justice data
- Global data sources: UNCTAD, Comtrade, OECD, BIS …

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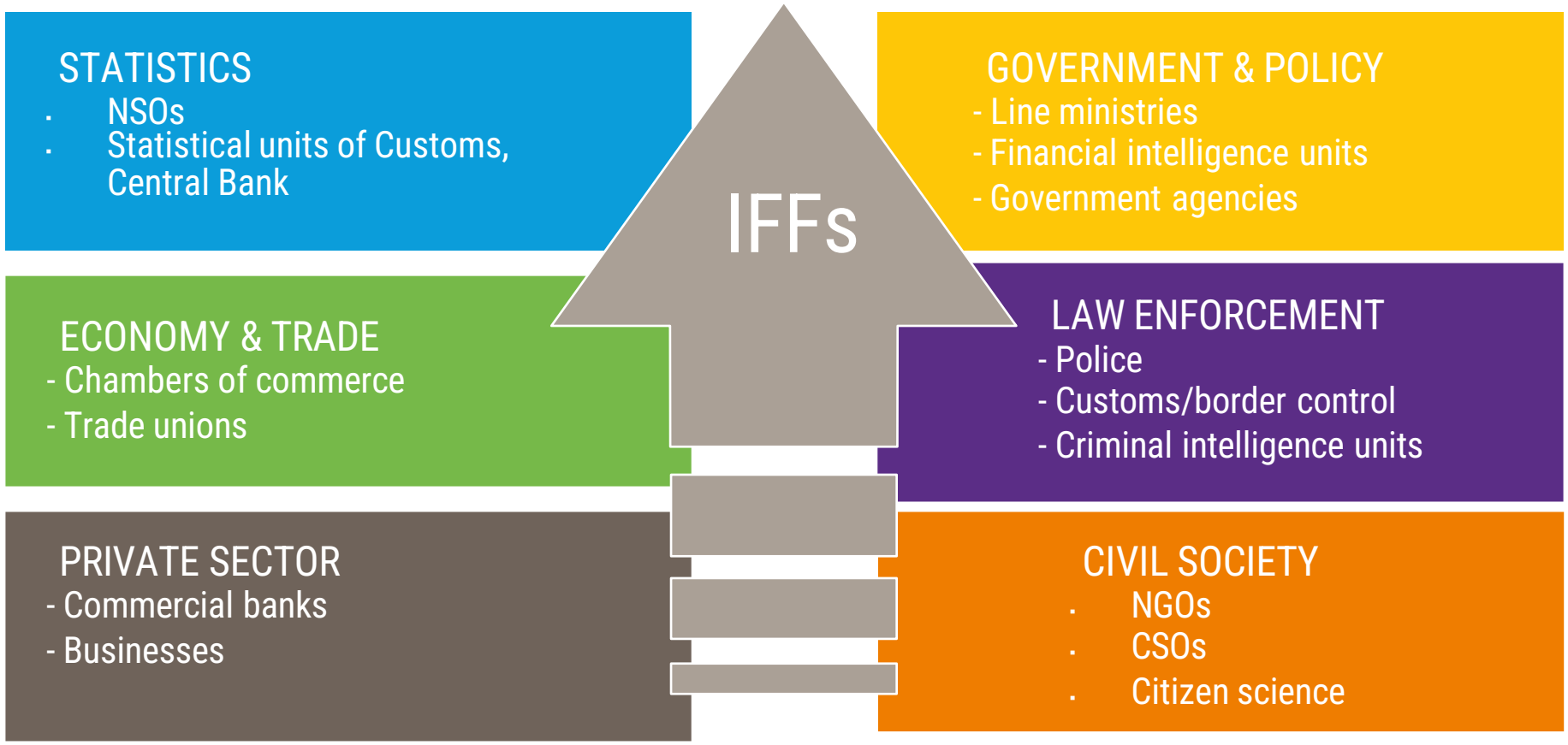
# Mapping of national institutions

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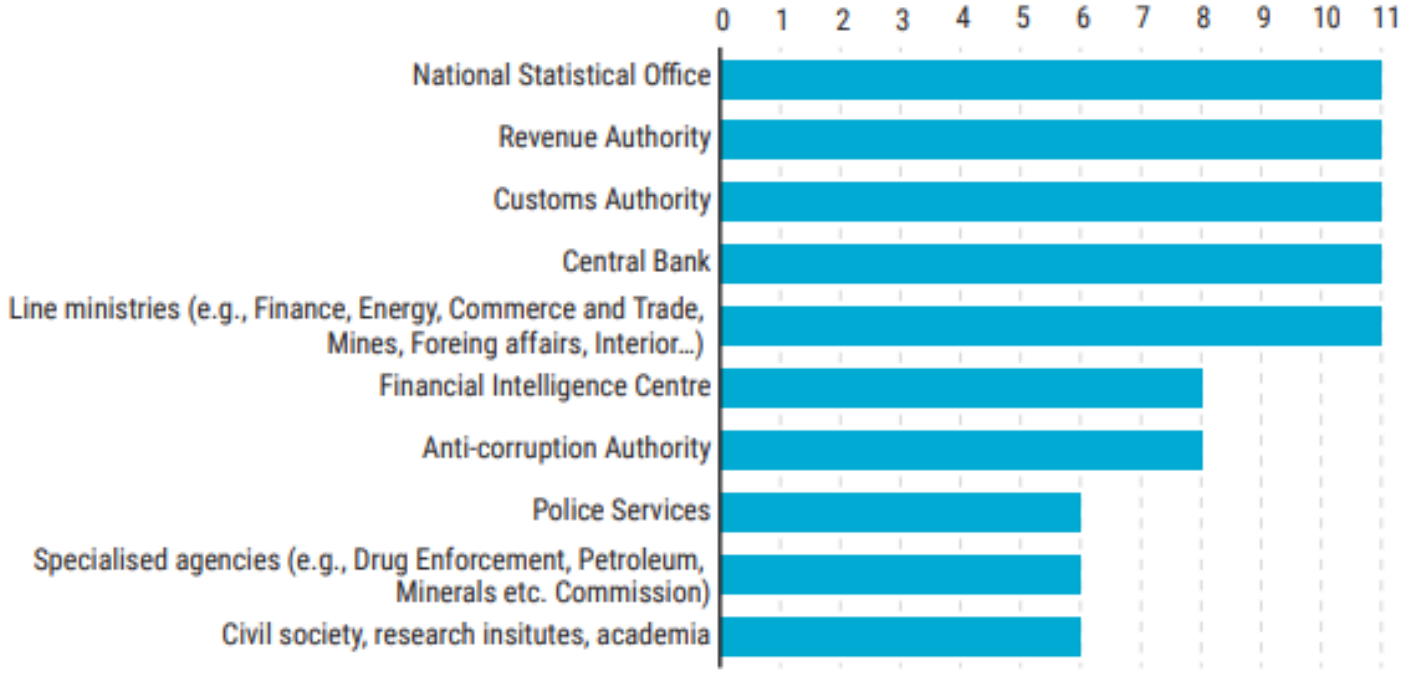
# Mapping of national institutions

Figure 11 The number of institutions involved in measuring tax and commercial IFFs in African countries

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# Data availability

- Pool, share, access data
- Data availability review

- **Variable/data needed**: listing the variable required for a particular method to measure IFFs.
- **Data source/agency**: listing which agency has the data and is considered a data source for this variable.
- **Frequency**: frequency of the reported variable.
- **Timeliness**: time lag of when data become available after the event.
- **Access**: how easily the data are accessible by an agency (group of agencies) compiling IFF statistics, including also legal setup.
- **Coverage**: what units and phenomena are measured by the variable selected, indicating whether there are potential gaps or overlaps in measurement.
- **Granularity**: what level of granularity for a variable is available.
- **Interoperability/format (linking)**: how is the variable integrated with other data, e.g., at which level and through which variable.
- **Alternative/proxy**: if variable is not available, what is the alternative variable and its source.
- **Fit for purpose**: is the variable in line with measurement requirements of IFFs?
- **Availability**: indicating whether variable/data with required quality are available or not.

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# Data availability - example

*Example of a data availability and quality review*

| Variable/ data needed | Data source/ agency | Frequency | Timeliness | Access | Coverage | Granularity | Interoperability/ format (linking) | Alternative/proxy | | Fit for purpose | Availability |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Variable | Source | | |
| *Value of imports* | *Customs office* | *Monthly* | *2 months* | *Access within NSS* | *No gaps* | *6-digit HS* | *Time and product-level* | *Value of imports* | *United Nations Comtrade* | *Yes* | *Yes* |
| *Value of partner's exports* | *Partner's Customs office* | *Monthly* | *2 months* | *Bilateral agreement* | *No gaps* | *6-digit HS* | *Time and product-level* | *Value of exports* | *United Nations Comtrade* | *Yes* | *Yes* |
| *Value of taxable profit of MNE's unit* | *Tax authority* | *Annual* | *6 months* | *Special agreement* | *Units above threshold* | *Firm-level* | *Firm's ID* | *Accounting profits* | *Tax authority* | *Yes* | *Yes* |
| *Offshore assets of citizens* | *BIS* | *Annual* | *12 months* | *Publicly available* | *Overlaps, including other units* | *Country-level* | *Country-level* | | | *Partially* | *Yes* |

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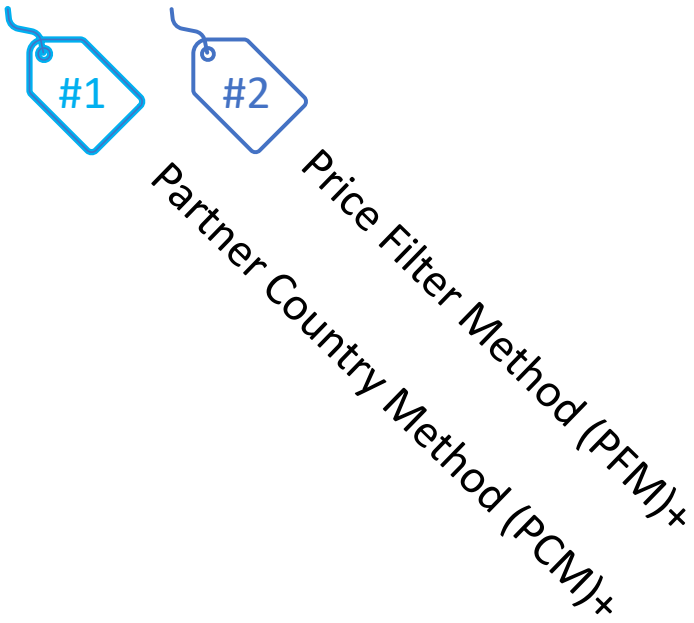


# Trade misinvoicing

Methods #1 and #2

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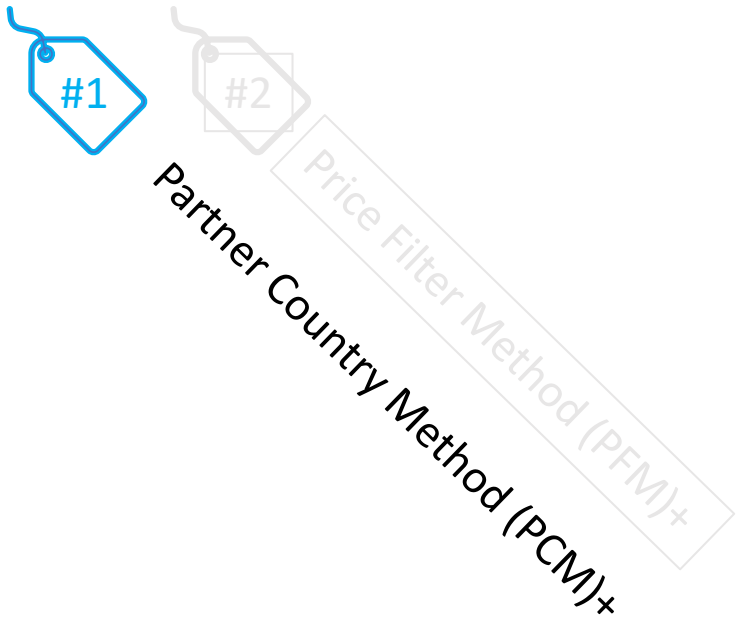


# PCM+

Method #1

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# Concept


- Mirroring trade values by trading partners
- (EX of A to B) vs (IM of B from A)
- Assuming a correct value of one partner -> critical!
- Many factors for discrepancies -> [inspect!]
  - Trade System
  - CIF/FOB
  - Partner country attribution
  - Other

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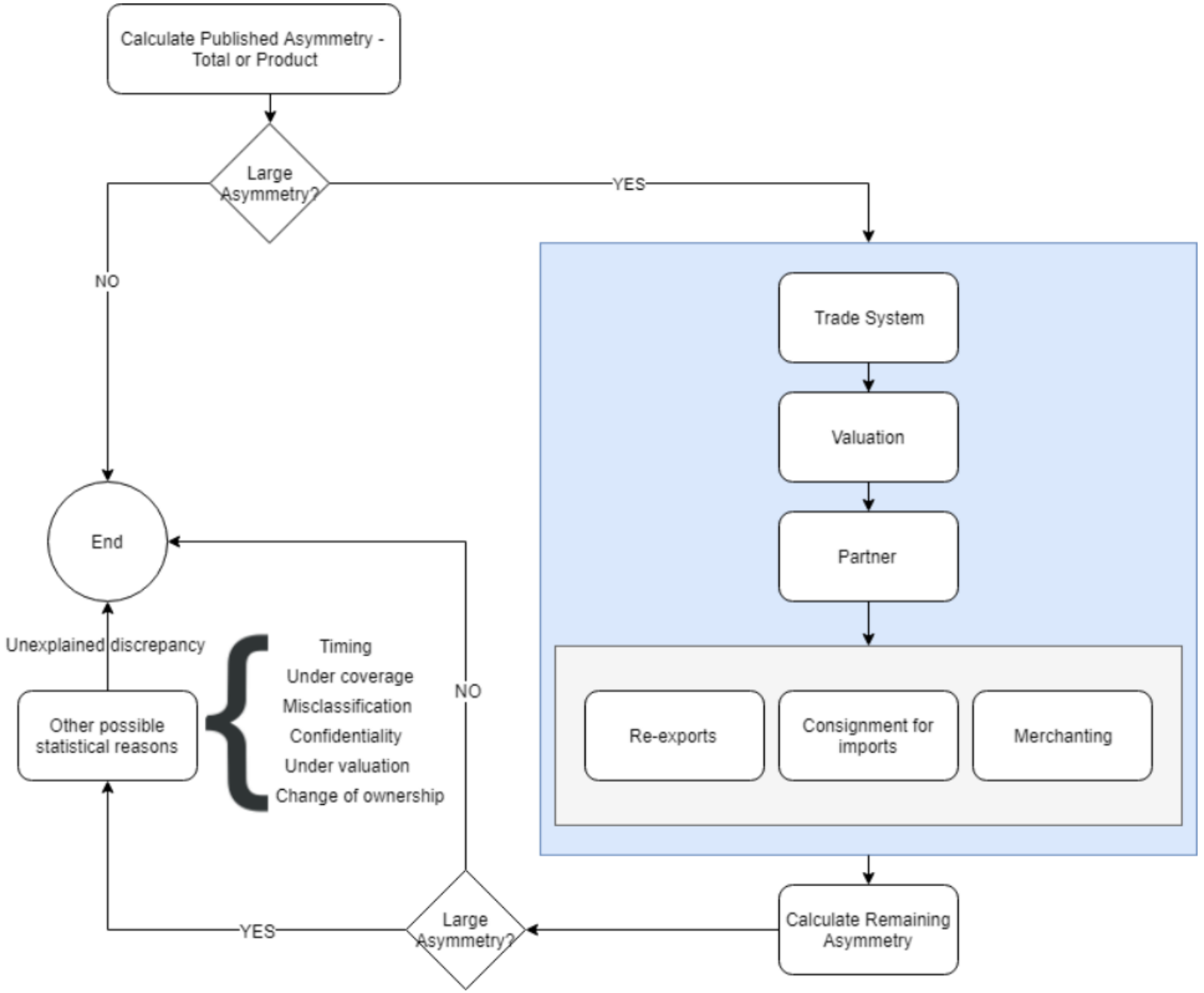
# Concept




#1

*Source: UNSD (2019)*

# Data


- Trade data (value, volume, quantity, price, CIF and/or FOB valuation, trading partner, country of origin/destination, type of flow – IM, EX, reIM, reEX)
- Collected nationally
- Granular level

- International sources:
  - UN Comtrade
  - IMF DOTS
  - UNCTAD Global Transport Costs database
  - OECD ITIC database

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# Calculation


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

*Source: UNSD (2019)*

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# Calculation


$$InwardIFFs_{c,r,p,t} = Overinvoiced\ EX_{c,r,p,t} + Underinvoiced\ IM_{c,r,p,t}$$

$$Underinvoiced\ IM_{c,r,p,t} = -1 * min\left(0, Inbound_{c,r,p,t}\right)$$
$$Overinvoiced\ EX_{c,r,p,t} = max\left(0, Outbound_{c,r,p,t}\right)$$

$$OutwardIFFs_{c,r,p,t} = Underinvoiced\ EX_{c,r,p,t} + Overinvoiced\ IM_{c,r,p,t}$$

$$Overinvoiced\ IM_{c,r,p,t} = max\left(0, Inbound_{c,r,p,t}\right)$$
$$Underinvoiced\ EX_{c,r,p,t} = -1 * min\left(0, Outbound_{c,r,p,t}\right)$$

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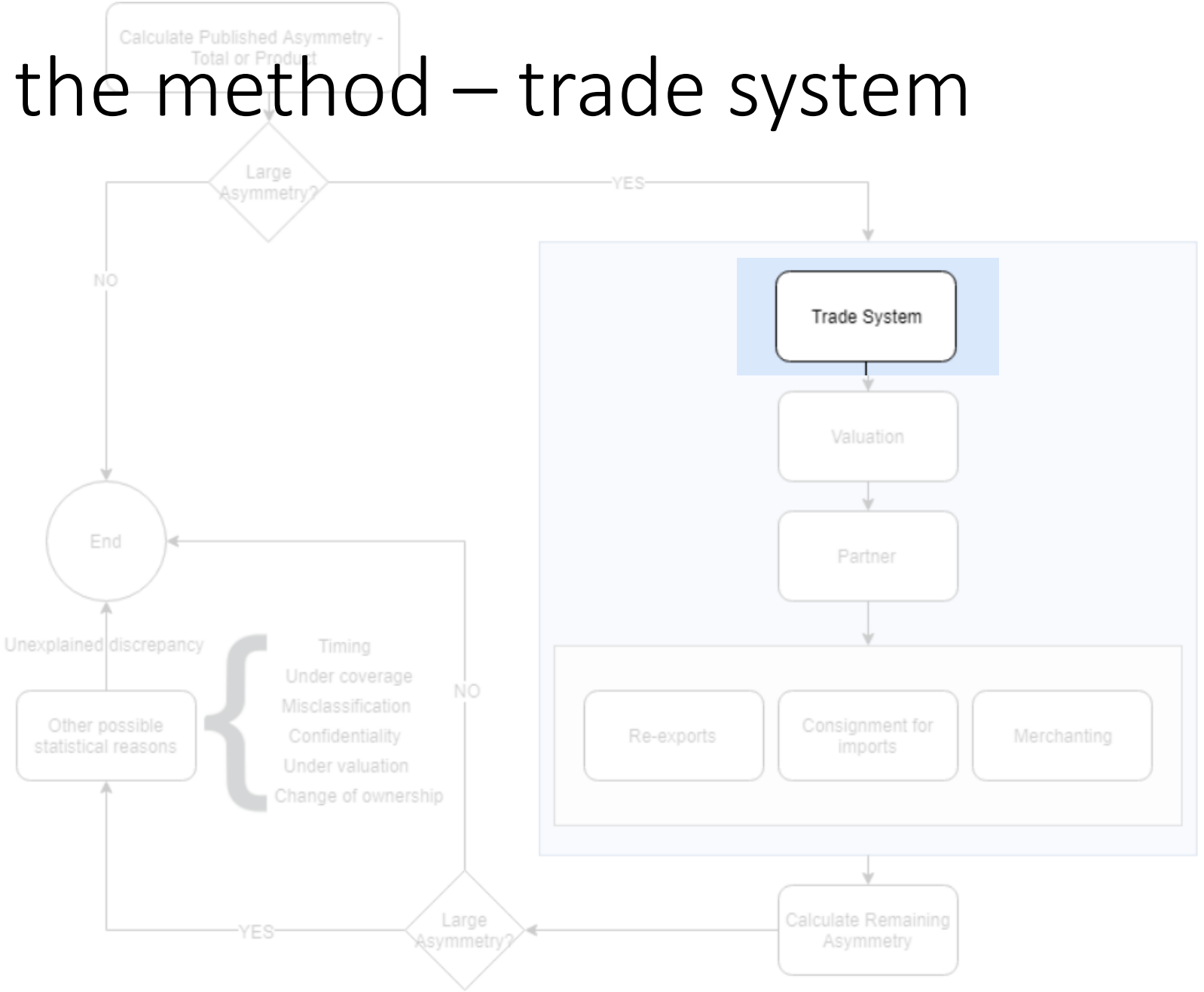
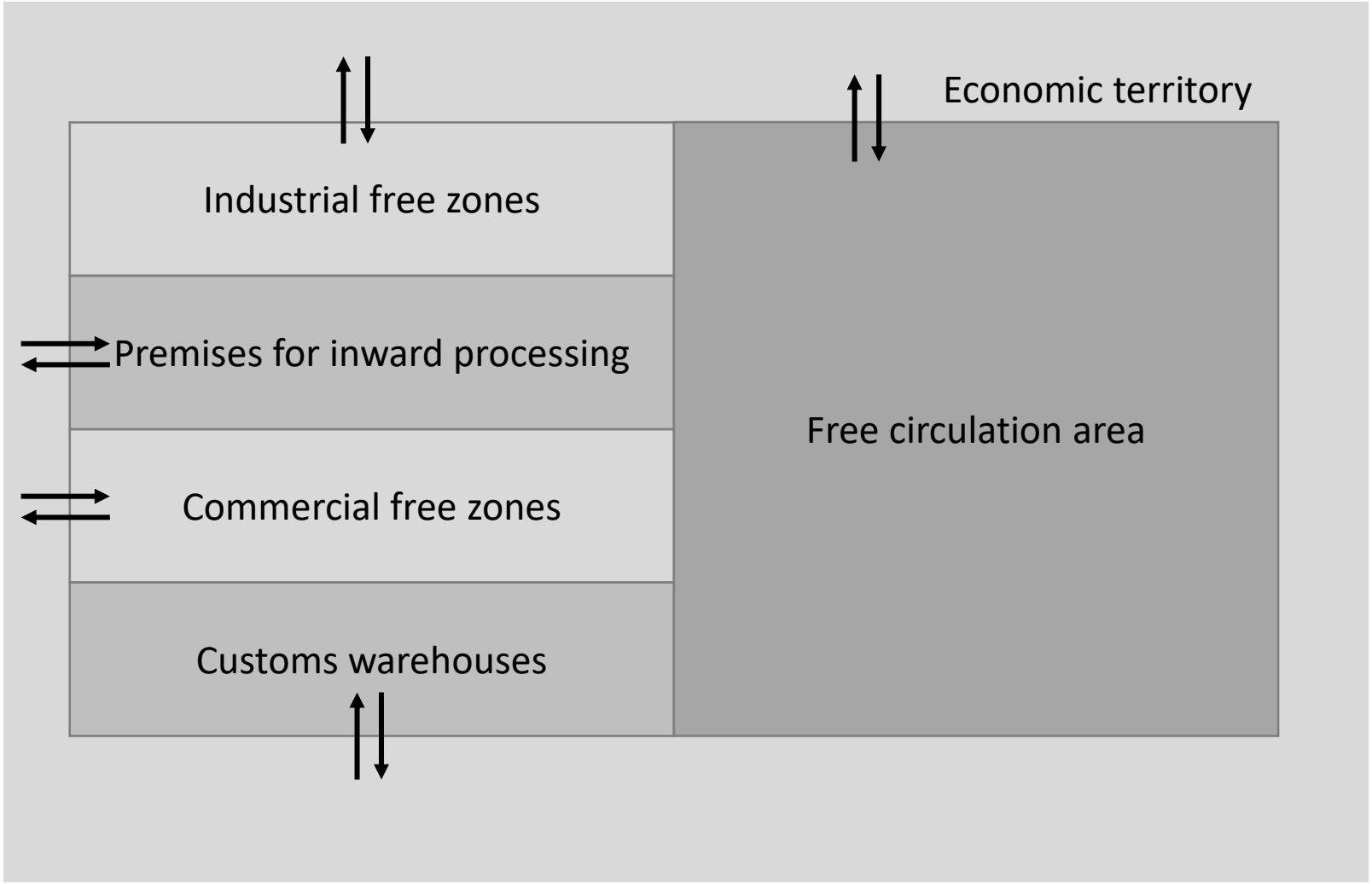
# Applying the method – trade system

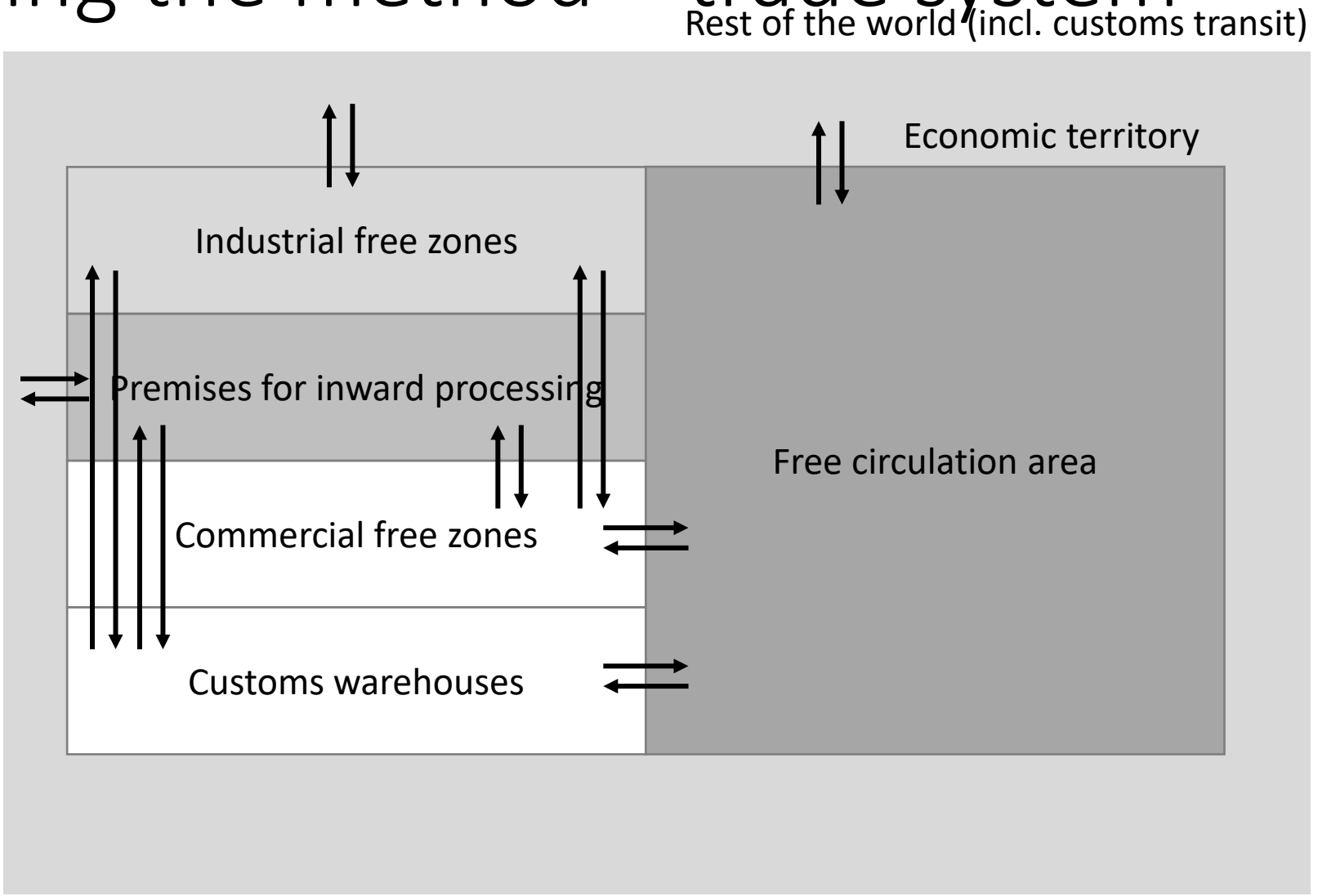


# Applying the method – trade system




Representing imports and exports under the respective trade system.

# Applying the method – trade system

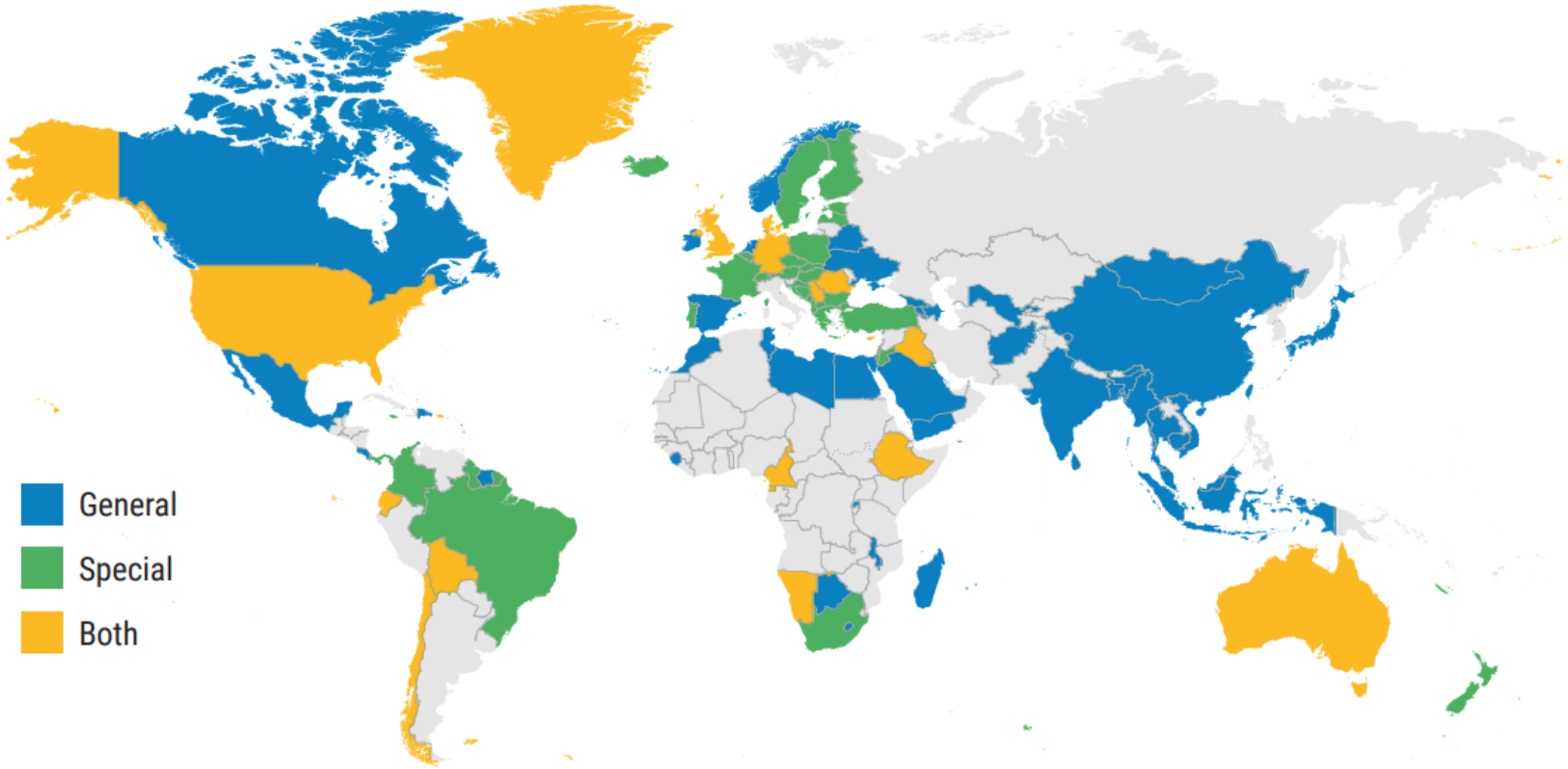



Representing imports and exports under the respective trade system.

# Applying the method – trade system

#1

Figure 13 Trade systems used by countries




The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

*Source*: Authors' deliberations based on responses from UN Comtrade survey in 2016.

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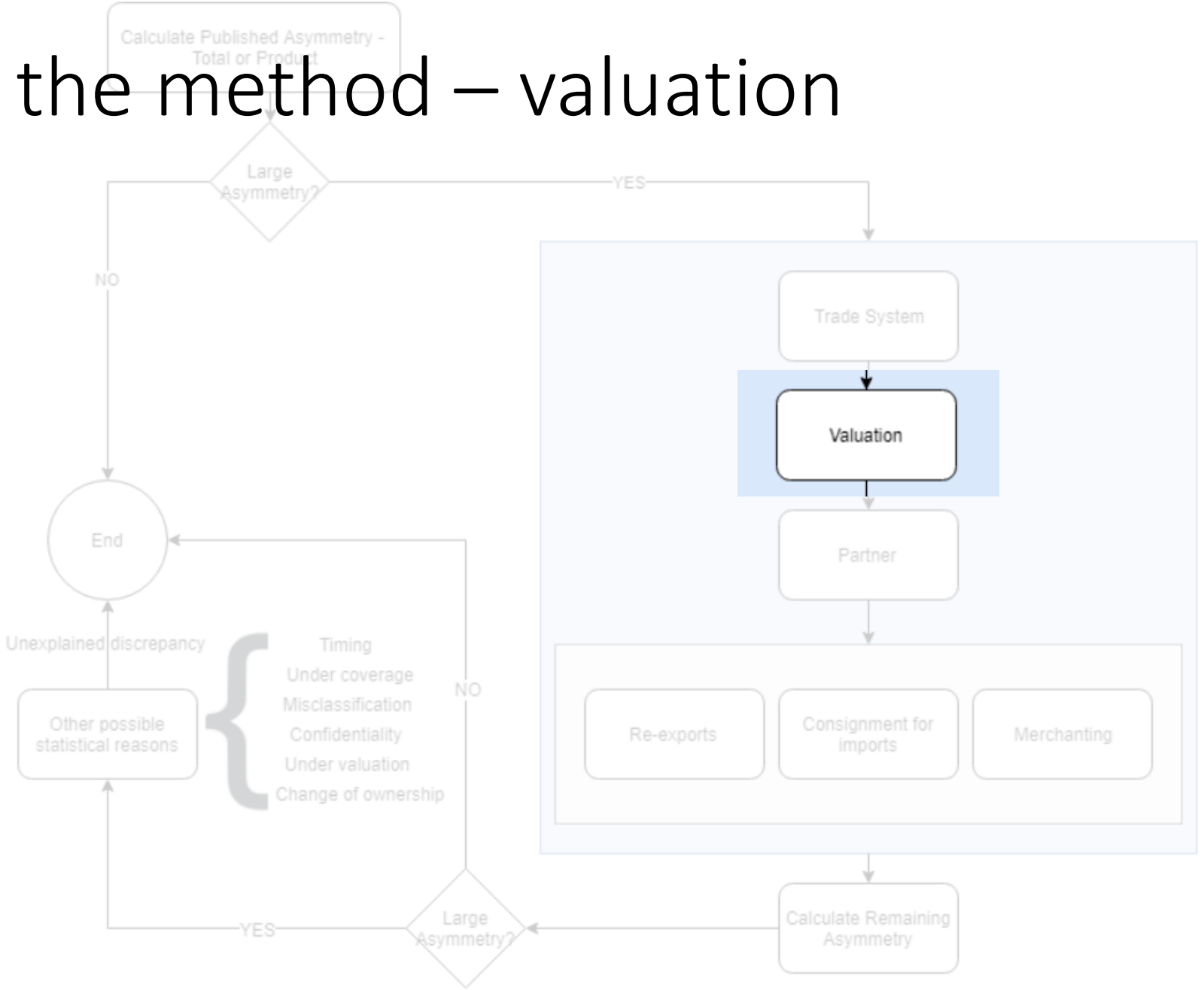
# Applying the method – valuation



# Applying the method – valuation


- CIF/FOB
- Refine and observe:
  - Origin
  - Destination
  - Commodity

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# Applying the method – valuation

| | Extracontinental | | | | Intra-African | | | |
|---|---|---|---|---|---|---|---|---|
| Commodity group | Mean CIF (%) | Standard deviation | Number of observations matched | Total number of observations | Mean CIF (%) | Standard deviation | Number of observations matched | Total number of observations |
| Gold | 2.4 | 0.020 | 1421 | 2254 | 3.0 | 0.020 | 44 | 192 |
| Platinum | 2.6 | 0.016 | 348 | 572 | 2.3 | 0.021 | 87 | 155 |
| Diamonds | 2.4 | 0.019 | 1351 | 2803 | 2.8 | 0.023 | 145 | 328 |
| Copper | 5.2 | 0.021 | 8899 | 14351 | 5.7 | 0.026 | 4639 | 6403 |
| Iron group | 8.6 | 0.029 | 11155 | 18023 | 8.9 | 0.030 | 8352 | 10818 |
| Aluminium | 6.0 | 0.026 | 9756 | 14991 | 6.7 | 0.027 | 6711 | 8720 |
| Petroleum | 6.5 | 0.028 | 7084 | 13073 | 8.2 | 0.030 | 5416 | 7084 |
| Manganese | 10.7 | 0.043 | 1798 | 2805 | 10.8 | 0.034 | 428 | 660 |
| Silver | 3.6 | 0.021 | 448 | 810 | 4.1 | 0.024 | 181 | 255 |
| Precious metal ores | 6.1 | 0.025 | 283 | 720 | 6.3 | 0.024 | 139 | 224 |
| Uranium | 6.2 | 0.024 | 947 | 1536 | 7.3 | 0.027 | 416 | 642 |
| Cobalt | 3.5 | 0.016 | 1313 | 1986 | 3.0 | 0.023 | 298 | 449 |
| Titanium | 7.2 | 0.035 | 1275 | 1950 | 6.9 | 0.029 | 699 | 934 |
| Chromium | 10.9 | 0.051 | 1207 | 1827 | 9.1 | 0.046 | 448 | 555 |
| Molybdenum | 3.1 | 0.019 | 182 | 277 | 3.1 | 0.022 | 128 | 213 |
| Rare-earth metals | 5.4 | 0.030 | 454 | 962 | 6.0 | 0.029 | 759 | 1017 |
| Conflict minerals | 5.7 | 0.041 | 1231 | 2141 | 5.8 | 0.034 | 1014 | 1913 |
| **Total** | **6.4** | **0.035** | **56354** | **88285** | **7.0** | **0.034** | **37855** | **48513** |

*Source*: Schuster and Davis (2020).

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# Applying the method – valuation

#1

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About | Data » | Country Profiles » | Data exploration » | Infographics | Documentation »

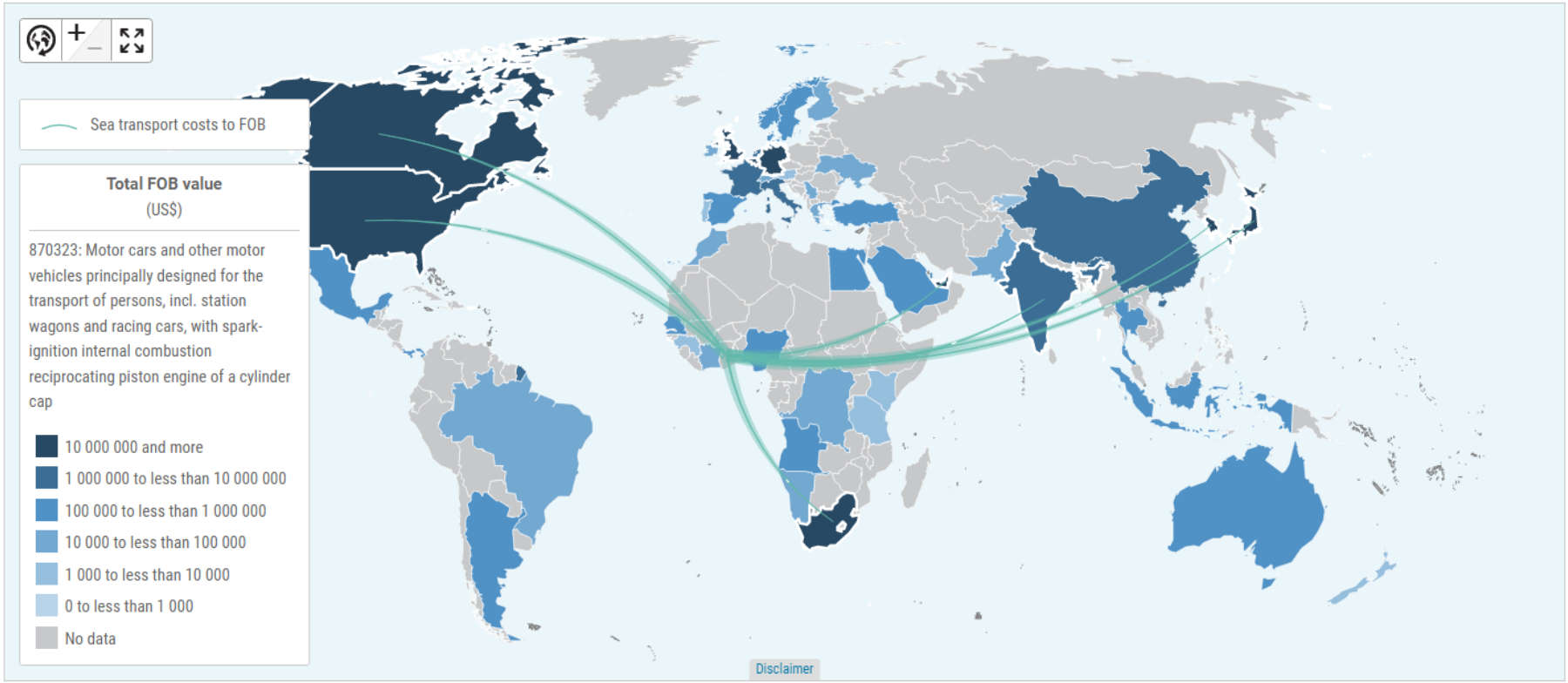
Biotrade | Processed food | Productive Capacities Index | Revealed comparative advantage | Transport cost

https://unctadstat.unctad.org/EN/TransportCost.html

**Global transport costs for international trade, 2016**

Ghana ×

870323: Motor cars and other motor vehicles principally designed for the transport of pers… ×

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# Applying the method – valuation

#1

https://stats.oecd.org/BrandedView.aspx?oecd_bv_id=itcs-data-en&doi=9c638cb6-en

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT OECD iLibrary

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## International Trade by Commodity Statistics

eISSN: 2074-4005 DOI: 10.1787/itcs-data-en

**Select data**

- SITC Revision 3
- SITC Revision 2
- Harmonised System 2017
- Harmonised System 2012
- Harmonised System 2007
- Harmonised System 2002
- Harmonised System 1996: All commodities
- Harmonised System 1988
- ITCS Exchange Rates
- International transport and insurance costs of merchandise trade - OECD
- Balanced merchandise trade statistics by CPA - OECD
- Merchandise Trade Price Index Database by CPA
- Archive 2010

>> *More statistics on OECD iLibrary*

**Related tables**

- Total trade: Australia
- 01 Live animals: Australia
- 02 Meat and edible meat offal: Australia
- 03 Fish, crustaceans, molluscs and other aquatic invertebrates: Australia
- 04 Dairy products; birds' eggs; natural honey; edible products of animal origin, n.e.s.: Australia

>> *More tables*

**International transport and insurance costs of merchandise trade - OECD**

Customise | Export | My Queries | Cite this database

Reporter Country: Austria

Commodity: 0101: Live horses, asses, mules and hinnies.

Measure: Value

| Time / Partner Country | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|
| Belgium | 0.077 | 0.075 | 0.075 | 0.076 | 0.075 | 0.072 |
| Canada | 0.105 | 0.105 | 0.093 | 0.094 | 0.093 | 0.09 |
| Chile | 0.101 | 0.1 | 0.1 | 0.1 | 0.1 | 0.097 |
| France | 0.077 | 0.075 | 0.076 | 0.077 | 0.076 | 0.072 |
| Germany | 0.051 | 0.05 | 0.05 | 0.051 | 0.05 | 0.048 |
| Hungary | 0.017 | 0.015 | 0.014 | 0.017 | 0.011 | 0.009 |
| Iceland | 0.105 | 0.091 | 0.091 | 0.091 | 0.091 | 0.088 |
| Ireland | 0.088 | 0.087 | 0.086 | 0.086 | 0.085 | 0.081 |
| Israel | 0.082 | 0.08 | 0.08 | 0.081 | 0.079 | 0.075 |
| New Zealand | 0.097 | 0.095 | 0.095 | 0.096 | 0.095 | 0.091 |
| Norway | 0.101 | 0.101 | 0.101 | 0.101 | 0.101 | 0.088 |
| Slovenia | 0.007 | 0.005 | 0.007 | 0.011 | 0.004 | 0.003 |
| Switzerland | 0.042 | 0.041 | 0.042 | 0.043 | 0.042 | 0.04 |
| Türkiye | 0.091 | 0.09 | 0.091 | 0.094 | 0.093 | 0.09 |
| United States | 0.1 | 0.098 | 0.098 | 0.099 | 0.098 | 0.095 |
| Argentina | 0.105 | 0.104 | 0.104 | 0.107 | 0.107 | 0.105 |
| Belarus | 0.081 | 0.081 | 0.081 | 0.081 | 0.079 | 0.075 |
| Brazil | 0.097 | 0.096 | 0.095 | 0.097 | 0.097 | 0.096 |
| Croatia | 0.039 | 0.035 | 0.031 | 0.033 | 0.028 | 0.024 |
| Hong Kong, China | 0.096 | 0.094 | 0.094 | 0.096 | 0.095 | 0.091 |
| Russia | 0.104 | 0.104 | 0.103 | 0.092 | 0.091 | 0.088 |
| Serbia | 0.062 | 0.061 | 0.061 | 0.062 | 0.059 | 0.053 |

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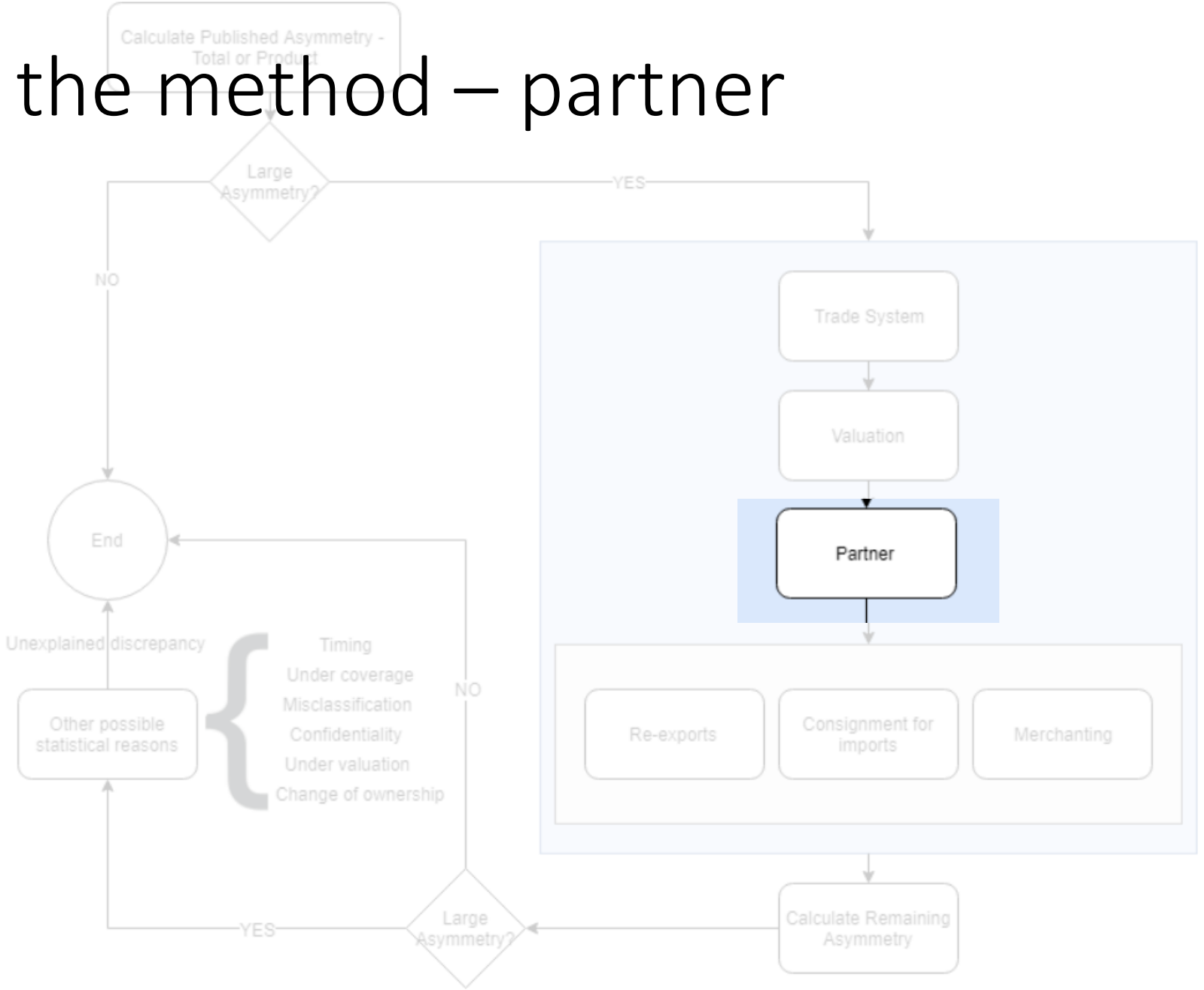
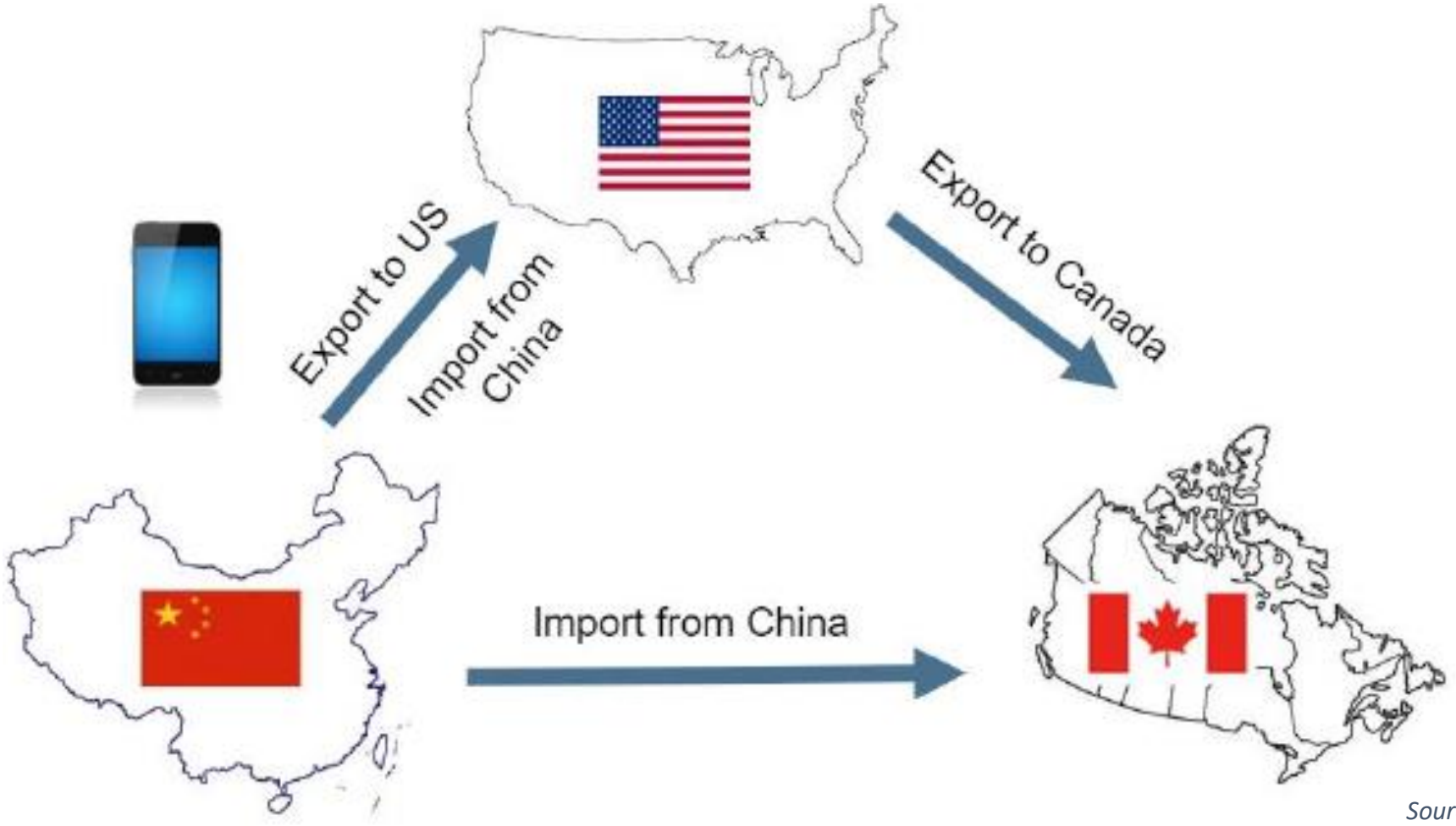
# Applying the method – partner



# Applying the method – partner




*Source: UNSD (2019)*

# Applying the method – partner

#1

***Bilateral inbound trade of mobile phones***

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

*Source: UNSD (2019)*

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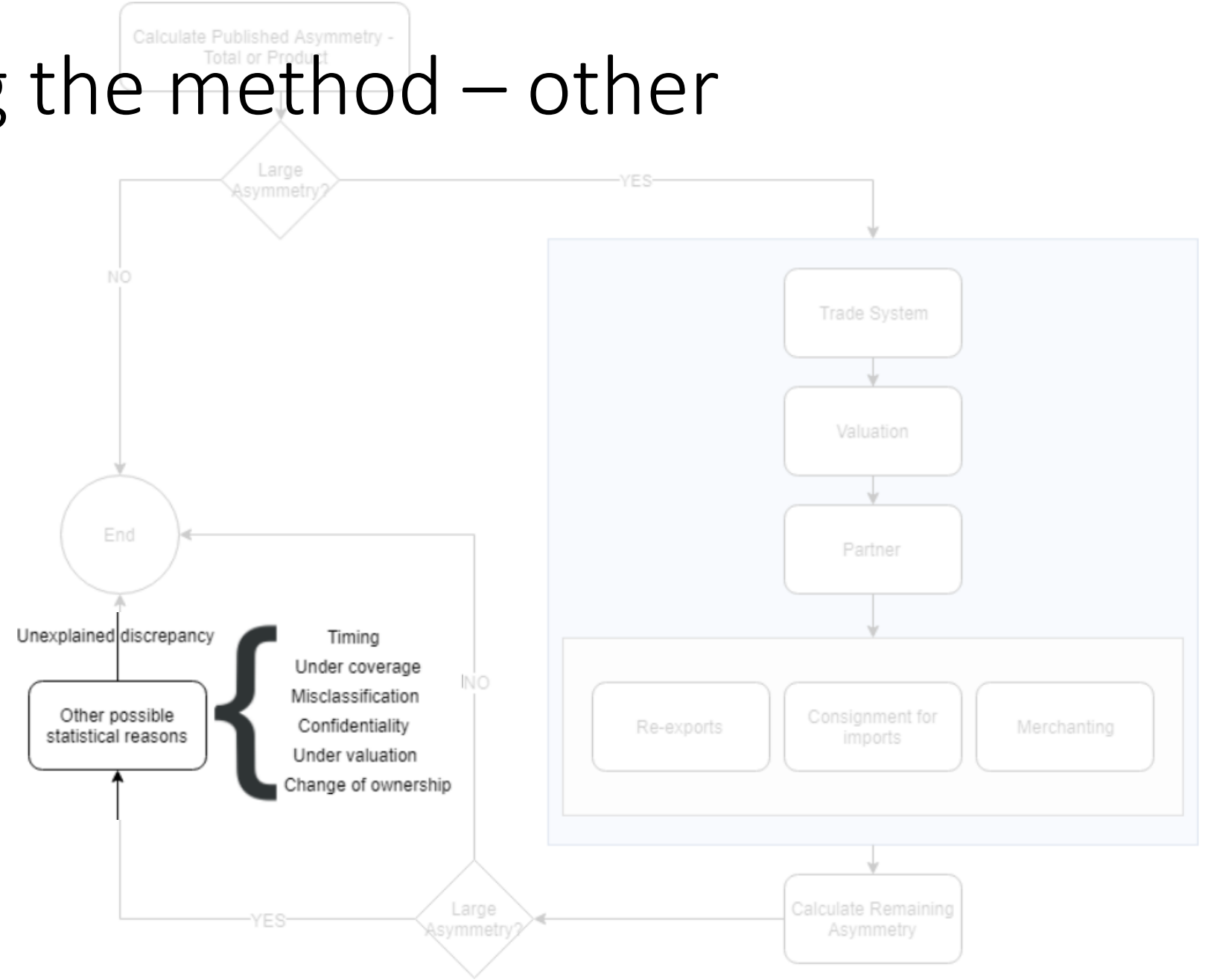
# Applying the method – other



# Applying the method – classification


- Within HS: HS 2002 – HS 2007 – … – HS 2017
- Between classifications: HS – SITC …

| FROM / TO | HS 2012 | HS 2007 | HS 2002 | HS 1996 | HS 1992 | SITC 4 | SITC 3 | SITC 2 | SITC 1 | BEC 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| HS 2017 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| HS 2012 | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| HS 2007 | - | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| HS 2002 | - | - | - | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ |
| HS 1996 | - | - | - | - | ✓ | - | ✓ | ✓ | ✓ | ✓ |
| HS 1992 | - | - | - | - | - | - | ✓ | ✓ | ✓ | - |
| SITC 4 | - | - | - | - | - | - | - | - | - | - |
| SITC 3 | - | - | - | - | - | - | - | ✓ | ✓ | ✓ |
| SITC 2 | - | - | - | - | - | - | - | - | ✓ | ✓ |

*Source: https://unstats.un.org/unsd/trade/classifications/correspondence-tables.asp*

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# PFM+

Method #2

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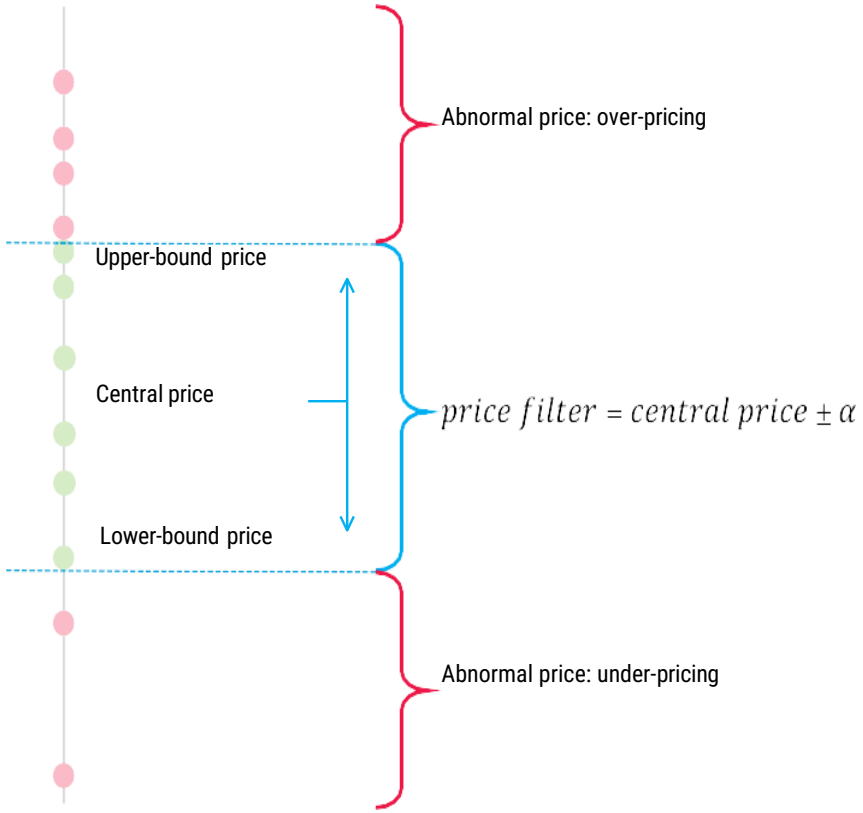
# Concept

- Detect abnormal prices, deviating from arm's length
- Price filter is a range

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# Concept


- Set price filter at detailed level
- Use free-market prices
- Consult experts

[heterogeneity of products]

[endogeneity of statistical price filters]

[contractual terms,
price volatility,
market circumstances]

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# Data


- International trade flows (flows, price, quantity, value, products, trading partners)
- Customs or other national authorities
- Transaction-level data
- Use microdata before adjustments

- International sources:
  - UNCTAD commodity prices
  - World Bank commodity market prices
  - UN Comtrade Standard Unit Value

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# Calculation


- Initial data analysis
  - Focus/narrow down the analysis:
    - Top 1-3-5 EX and IM
    - Notorious commodities, flows, partners?
    - Inputs from PCM+
  - Prepare the data
    - Raw data
    - HS level + commodity descriptions?
    - Exploratory data analysis – outliers, unusual values
    - Get data ready – any treatment? Aggregation (day/commodities/partners/markets)?

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# Calculation


- Define price filter
  - Central price
    - Observed vs free-market prices
    - Moving average
    - Market conditions
  - Range [LP, UP]
    - Statistical price filter – IQR
    - Variation around central price, α -> potentially asymmetrically

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# Calculation


- Over- and under-pricing
  - $Undervalued\ amount = Q * max(0, LP - P)$
  - $Overvalued\ amount = Q * max(0, P - UP)$

- Inward and outward IFFs
  - $Inward\ IFFs = Overvalued\ amount^{EX} + Undervalued\ amount^{IM}$
  - $Outward\ IFFs = Undervalued\ amount^{EX} + Overvalued\ amount^{IM}$

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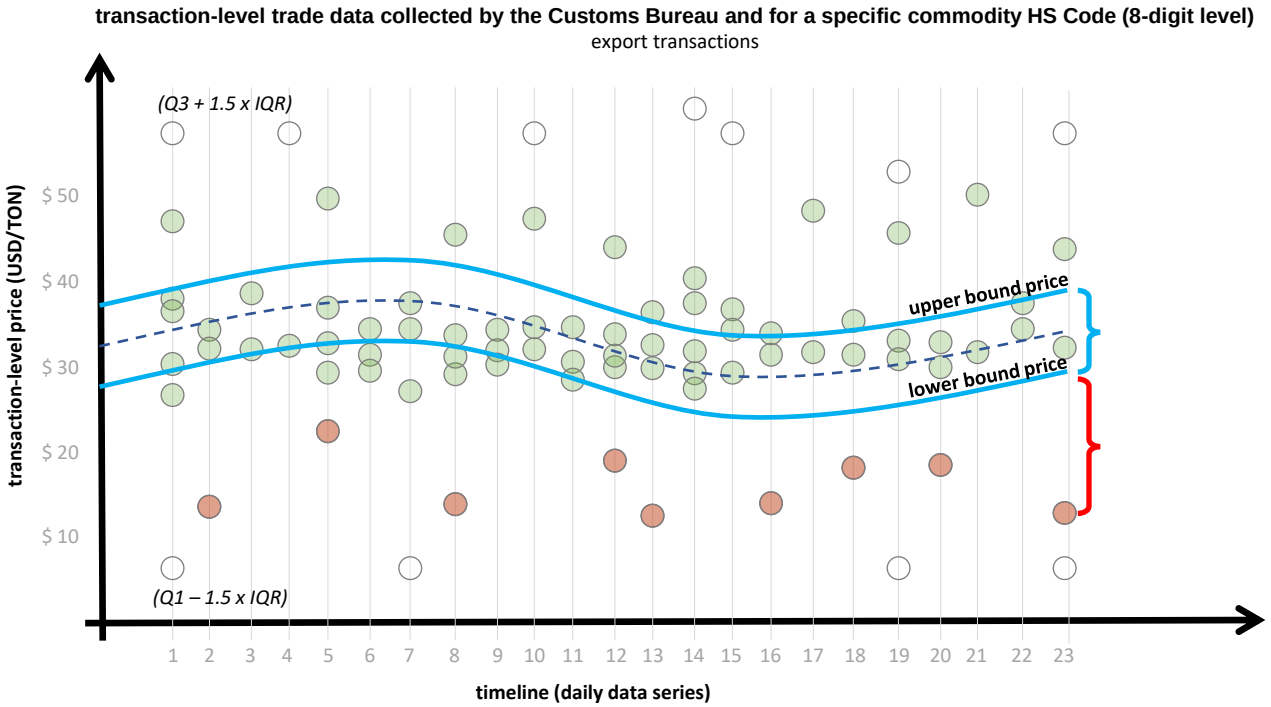
# Applying the method


**SOYA BEAN PRICE FILTER = [THREE-DAY WEIGHTED MOVING AVERAGE PRICE] +/- 1σ**




(1) $Outliers\ treatment = interquartile\ rante(IQR)$

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

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

(4) $Price\ Filter\ Range\ (t) = [Weighted\ Moving\ Average\ Price(t) \pm 1\sigma\ ]$

(5) $Total\ Estimated\ BEPS\ or\ tax\text{–}related\ IFFs = \sum_{t,i}^{n}[Lower\ Bound\ Price(t)\ -\ Invoice\ Price\ (t,i)]\ x\ Quantity(t,i)$

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# Applying the method


- Challenges in determining specific, detailed price filters
- Price filters in time, by commodity, by partner, by flow
- Consider identifying partners (related vs non-related) -> conceptual border-crossing with profit shifting

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# Applying the method



- Ongoing work on Ugandan customs data
  - Transaction-level: importer, exporter, station, HS code, value, units, taxes, …
- Challenges in determining a suitable price filter:
  - Which companies are multinationals?
  - Frequent vs. infrequent importers
  - Large vs. small firms
  - Duties, tariffs, VAT, environmental tax rates applied to various goods
  - Heterogeneity across goods within HS code
  - Obvious errors and inconsistencies in the data

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# Applying the method

#2

- Ugandan reform in 2018: Implementation of fixed cargo scanners
- Objective: Mitigate smuggling and tax abuse
- Expectations in terms of PFM+
- Preliminary findings:
  - Medium sized imports of non-taxed goods ↓
  - Unit values for taxed goods ↑


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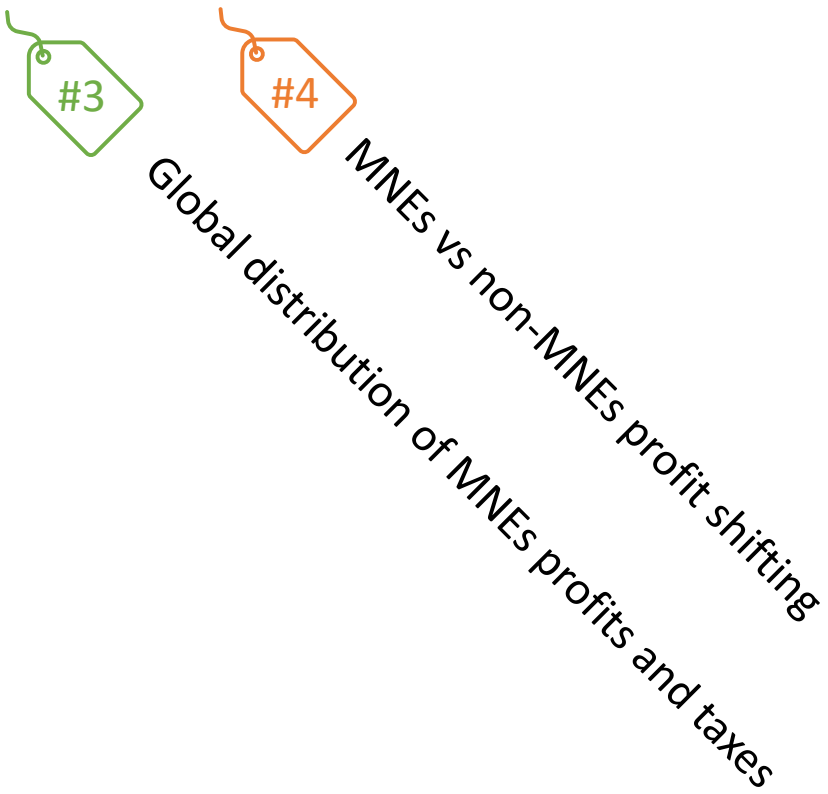
# Profit shifting

Methods #3 and #4

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# Global distribution of profits

Method #3

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# Concept


- Tax semi-elasticity approach
- Assuming shifting profits to lower-tax units
- Any systematic deviation from predicted profitability is a sign of potential profit shifting -> caution in interpretation!

- Which tax rate? [effective tax rates, non-linear tax sensitivity]
- Validate results? [location & economic activity of the unit]

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# Data


- Data on MNE and their units (profits before taxes, effective tax rates, number of employees, value of tangible assets)
- Microdata

- OECD CbCR
- Firm-level tax returns from Tax authority + ownership information

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# LCU


- How to organise MNE data collection?

- Establish a specialized unit for MNEs -> **Large Cases Unit – LCU**
- Improved quality of economic statistics
  - Collect timely and accurate data
  - Data consistency
  - Response burden
- International data sharing / data reconciliation
- 1 expert for 5 MNEs

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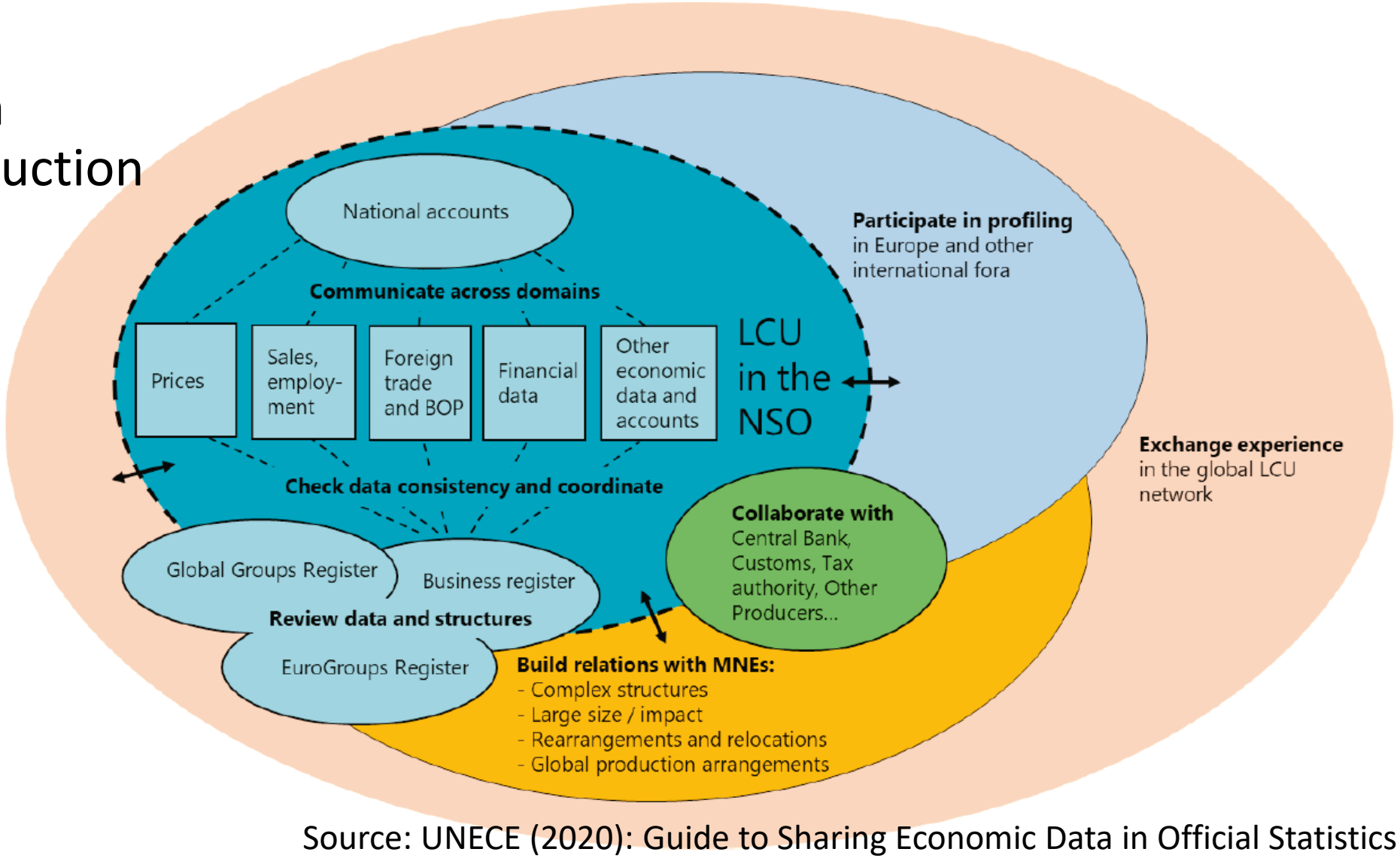
# LCU

#3

- Role of LCUs in statistical production




Source: UNECE (2020): Guide to Sharing Economic Data in Official Statistics

# LCU


- Data on MNEs?
- Various information sources
  - Business surveys
  - Register information (statistical business register, enterprise group registers, tax and customs registers)
  - Investment surveys
  - International trade in services
  - Corporate accounts
  - R&D
  - Producer price statsitics
  - Surveys on business outlook, ICT; enterprises‘ reports, balance sheets…
  - BoP
  - OECD ADIMA

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# LCU


- Data on MNEs?
  - Register-type information, identifiers
  - Structures of MNEs
  - Key globalization variables (FDI, IM, EX)
  - Revision-prone data (restructuring of MNEs)
  - Financial or operations data (sales, turnover, employment, income)
  - Accounting standards information

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# OECD CbCR

- Required data for the method #3 – microdata CbCR
- MNEs report for each tax jurisdiction in which they do business
  - Threshold €750 million consolidated revenue
  - Revenue, profit before income tax, tax paid, employees, capital, …
- Data limitations and (un)availability!
  - Full spectre of MNEs‘ units worldwide
  - Double counting for stateless entities
- Alternative sources
  - Firm-level tax returns from Tax authority
  - Aggregated OECD CbCR

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# OECD CbCR

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

OECD.Stat

- https://stats.oecd.org/Index.aspx?DataSetCode=CBCR_TABLEI

**Table I - Aggregate totals by jurisdiction**

Customise | Export | My Queries

Important data limitations with CbCR statistics have been identified. Please read the related document, the CbCR statistics data limitations disclaimer, where these issues are presented in detail, before downloading the data.

Year: 2017

Grouping: All Sub-Groups

| Ultimate Parent Jurisdiction | Partner Jurisdiction | Number of CbCRs | Number of CbCR Sub Groups | Number of Entities | Unrelated Party Revenues | Related Party Revenues | Total Revenues | Profit (Loss) before Income Tax | Income Tax Paid (on Cash Basis) | Income Tax Accrued - Current Year | Stated Capital | Accumulated Earnings | Number of Employees | Tangible Assets other than Cash and Cash Equivalents | Research and Development | Holding or Managing Intellectual Property | Purchasing or Procurement | Manufacturing or Production | Sales, Marketing or Distribution | Administrative, Management or Support Services | Prov Ser f Unre Pa |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Financial Variables | | | | | | | | | | | | | Business Activities | | | | | | |
| Australia | Australia | 125 | 125 | 8 554 | 464 757 922 213 | 54 801 394 828 | 519 559 317 040 | 88 858 573 419 | 16 988 089 318 | 20 104 335 271 | 1 066 027 997 430 | 117 755 797 852 | 1 130 082 | 461 333 945 337 | 94 | 165 | 167 | 335 | 574 | 377 | |
| | Austria | 9 | 9 | 16 | 168 019 825 | 115 815 108 | 283 834 932 | 15 158 430 | 4 130 295 | 3 460 590 | 36 336 172 | -63 079 421 | 360 | 54 661 806 | 1 | .. | .. | 1 | 5 | .. | |
| | Belgium | 17 | 17 | 37 | 1 000 733 719 | 203 435 534 | 1 204 169 252 | 93 358 172 | 30 019 491 | 13 435 390 | 267 157 563 | 664 171 167 | 1 571 | 543 787 414 | 2 | 1 | 1 | 3 | 7 | 4 | |
| | Canada | 35 | 35 | 170 | 3 626 983 570 | 635 205 497 | 4 262 189 068 | 137 722 251 | 80 243 391 | 123 885 194 | 10 420 136 681 | -1 186 721 571 | 11 901 | 5 266 651 327 | 5 | 1 | 6 | 17 | 22 | 23 | |
| | Chile | 19 | 19 | 48 | 7 154 834 770 | 256 129 267 | 7 410 964 035 | 739 613 199 | 333 585 269 | 825 017 379 | 4 038 842 823 | 14 983 447 940 | 21 993 | 18 229 661 026 | 3 | .. | 2 | 10 | 9 | 4 | |
| | Colombia | 14 | 14 | 25 | 308 844 968 | 380 189 980 | 689 034 949 | -45 925 930 | 7 912 334 | 14 085 385 | 127 372 673 | 515 067 678 | 2 315 | 868 650 556 | .. | .. | 1 | 5 | 5 | .. | |
| | Czech Republic | 11 | 11 | 16 | 72 920 216 | 27 413 226 | 100 333 440 | 10 179 413 | 1 059 080 | 4 501 | 27 188 621 | 34 976 195 | 294 | 39 775 551 | .. | .. | .. | 1 | 3 | 1 | |
| | Denmark | 11 | 11 | 15 | 132 861 288 | 13 918 956 | 146 780 245 | 72 249 609 | 13 073 924 | 2 091 326 | 350 020 221 | 104 645 143 | 347 | 66 521 799 | .. | .. | 1 | 1 | 3 | 1 | |
| | Finland | 7 | 7 | 8 | 74 003 373 | 1 905 148 | 75 908 521 | -1 994 587 | 448 903 | -361 277 | 32 947 621 | -10 260 779 | 301 | 32 896 562 | .. | .. | 1 | 1 | 3 | .. | |
| | France | 20 | 20 | 248 | 3 053 022 542 | 239 872 437 | 3 292 894 980 | 308 882 781 | 51 554 206 | 32 407 977 | 846 559 205 | 675 235 360 | 24 204 | 1 333 938 618 | .. | 1 | 4 | 13 | 7 | 11 | |
| | Germany | 27 | 27 | 182 | 2 836 358 293 | 3 232 072 699 | 6 068 430 990 | 1 523 456 308 | 296 842 839 | 318 950 668 | 6 151 982 833 | 1 266 129 085 | 11 970 | 2 110 340 565 | 7 | 2 | 5 | 20 | 12 | 13 | |
| | Greece | 6 | 6 | 9 | 25 392 418 | 395 569 | 25 787 988 | 2 291 391 | 216 546 | 293 118 | 1 548 330 | -4 215 146 | 91 | 4 618 878 | .. | .. | .. | .. | 2 | .. | |

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# Calculation

#3

- Step 1: determine presence of profit shifting

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

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

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# Tax variable

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

$$T_{i,c,t} = \tau_{i,c,t} - \bar{\tau}_{m-i,-c,t}$$

Tax rate faced by MNE unit *i* in country *c*

Average tax rate faced by other MNE units in other countries

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# Calculation


- Step 2: size of profit shifting
  - How would declared profits change without tax incentives?

$$S_{i,c,t} = \frac{y_{i,c,t} * \hat{\beta}T_{i,c,t}}{1 + \hat{\beta}T_{i,c,t}} \qquad \hat{\beta}T_{i,c} = \beta_1 T_{i,c} + \beta_2 T_{i,c}^2$$

$$OutwardIFFs_{i,c,t} = \left|min\left(0, S_{i,c,t}\right)\right|$$

$$InwardIFFs_{i,c,t} = max\left(0, S_{i,c,t}\right)$$

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# Applying the method


- Negative profits
- Negative taxes
- Insignificant statistical parameters

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# Applying the method

#3

| | | Scenarios | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variables | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| Profits | | X | X | X | | | | | | | | X | X | X | X | X | X | X | X | X | | | X | X | | |
| Profits (neg=1) | | | | | X | X | X | X | X | X | X | | | | | | | | | | X | X | | | X | X |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T | including negative profits and taxes | | | | X | | | | | | | X | X | | | | X | | | | X | X | | | X | X |
| T2 | including negative profits and taxes | | | | X | | | | | | | X | | | | | X | | | | | X | | | X | |
| T3 | including negative profits and taxes | | | | | | | | | | | X | | | | | | | | | | X | | | | |
| T | including negative taxes | X | X | | | X | X | | | | X | | | | | | | X | | | | | | | | |
| T2 | including negative taxes | X | | | | X | | | | | X | | | | | | | X | | | | | | | | |
| T3 | including negative taxes | | | | | | | | | | X | | | | | | | X | | | | | | | | |
| T | including negative profits | | | X | | | | | | | | | | | | | | | X | X | | | | | | |
| T2 | including negative profits | | | X | | | | | | | | | | | | | | | | X | | | | | | |
| T3 | including negative profits | | | | | | | | | | | | | | | | | | | X | | | | | | |
| T | | | | | | | | X | X | X | | | | X | X | X | | | | | | | X | X | | |
| T2 | | | | | | | | X | | X | | | | | X | X | | | | | | | | X | | |
| T3 | | | | | | | | | | X | | | | | | X | | | | | | | | | | |
| Assets | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Employees | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Sales | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X |
| Population | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| GDP Per Capita | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Control of Corruption | | | | | | | | | | | | | | | | | | | | | | | X | X | X | X |

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# Applying the method



1. Nigeria
   - Transfer pricing disclosure forms provide transaction-level data
   - Higher tax differentials between involved countries are linked to lower reported profits in Nigeria, but only for transactions usable for profit shifting
2. Slovakia
   - CbCR micro data shared via OECD information exchange
   - Low tax rates faced elsewhere linked with lower reported profits at home
3. State of Tax Justice reports
   - OECD's aggregate CbCR data
   - Misalignment method: large discrepancies between where economic activity takes place and where profits are reported

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# Applying the method: Nigeria

#3

$$\log(\pi_i) = \beta_0 + \beta_x \cdot \log(\mathbf{T}_{i,x}) + \gamma_x \cdot \log(\mathbf{V}_{i,x}) + \delta_\chi \cdot \chi_i + \epsilon, \qquad (3)$$

where $\mathbf{T}_{i,x}$ is a vector of hypothetical taxes applicable to transaction $x$; $\mathbf{V}_{i,x}$ is the value of transaction $x$; $\chi_i$ company's revenue; and $\epsilon$ is the error term.

Table 2: Results of the regression of transactions and the hypothetical tax on these transactions on reported profits

| | (1) | (2) ETR | (3) ETR | (4) LACIT | (5) LACIT |
|---|---|---|---|---|---|
| Log of total costs | | 0.050*** | | 0.054*** | |
| | | (0.016) | | (0.017) | |
| Log of hypothetical tax on costs | | | 0.437*** | | 0.443*** |
| | | | (0.057) | | (0.054) |
| Revenue | 0.002*** | 0.002*** | 0.002*** | 0.002*** | 0.002*** |
| | (0.001) | (0.001) | (0.000) | (0.001) | (0.000) |
| Constant | -0.070 | -0.096 | 0.729*** | -0.100 | 0.781*** |
| | (0.138) | (0.136) | (0.156) | (0.134) | (0.145) |
| Observations | 396 | 396 | 342 | 396 | 373 |
| $R^2$ | 0.153 | 0.166 | 0.330 | 0.173 | 0.336 |

*Note:* Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10. The dependent variable is the log of reported profits in Nigeria.

Table 3: Results of the regression of transactions and the hypothetical tax on these transactions on reported profits, types of cost transactions

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Log of total costs | 0.016** | 0.005*** | -0.001 | 0.004*** | 0.067*** |
| | (0.008) | (0.001) | (0.003) | (0.000) | (0.022) |
| Tangible goods | -0.015 | | | | |
| | (0.029) | | | | |
| Services and fees | | -0.030*** | | | |
| | | (0.004) | | | |
| Interest | | | 0.756** | | |
| | | | (0.307) | | |
| Reimbursements | | | | 0.021*** | |
| | | | | (0.006) | |
| Other | | | | | -0.143 |
| | | | | | (0.087) |
| Constant | 0.931*** | -0.318 | -0.135 | 0.533* | -0.371 |
| | (0.240) | (0.252) | (0.336) | (0.304) | (0.663) |
| Observations | 103 | 130 | 74 | 71 | 37 |
| $R^2$ | 0.102 | 0.068 | 0.270 | 0.156 | 0.292 |

*Note:* Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10. The dependent variable is the log of reported profits in Nigeria.

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# Applying the method: Slovakia

#3

- **Company-level CbCR data** provide good detail and should be accessible everywhere (with some effort)
- High negative correlation between tax rates faced in other countries (i.e. tax havens) and profitability in those countries

- Highlighting: companies to audit, countries that lose and gain, reform effects


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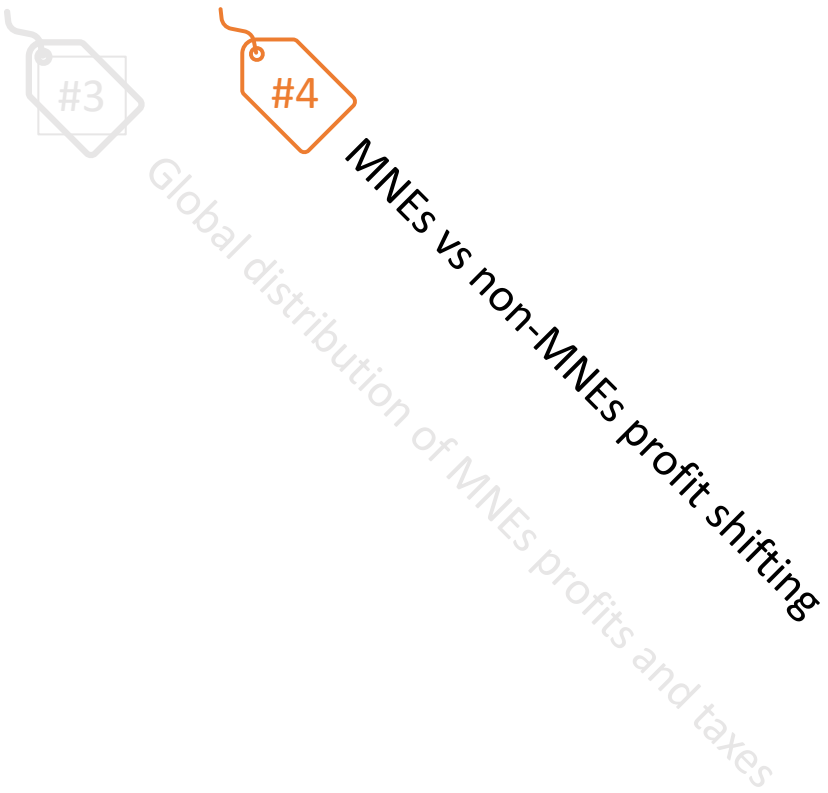


# Domestic vs MNEs

Method #4

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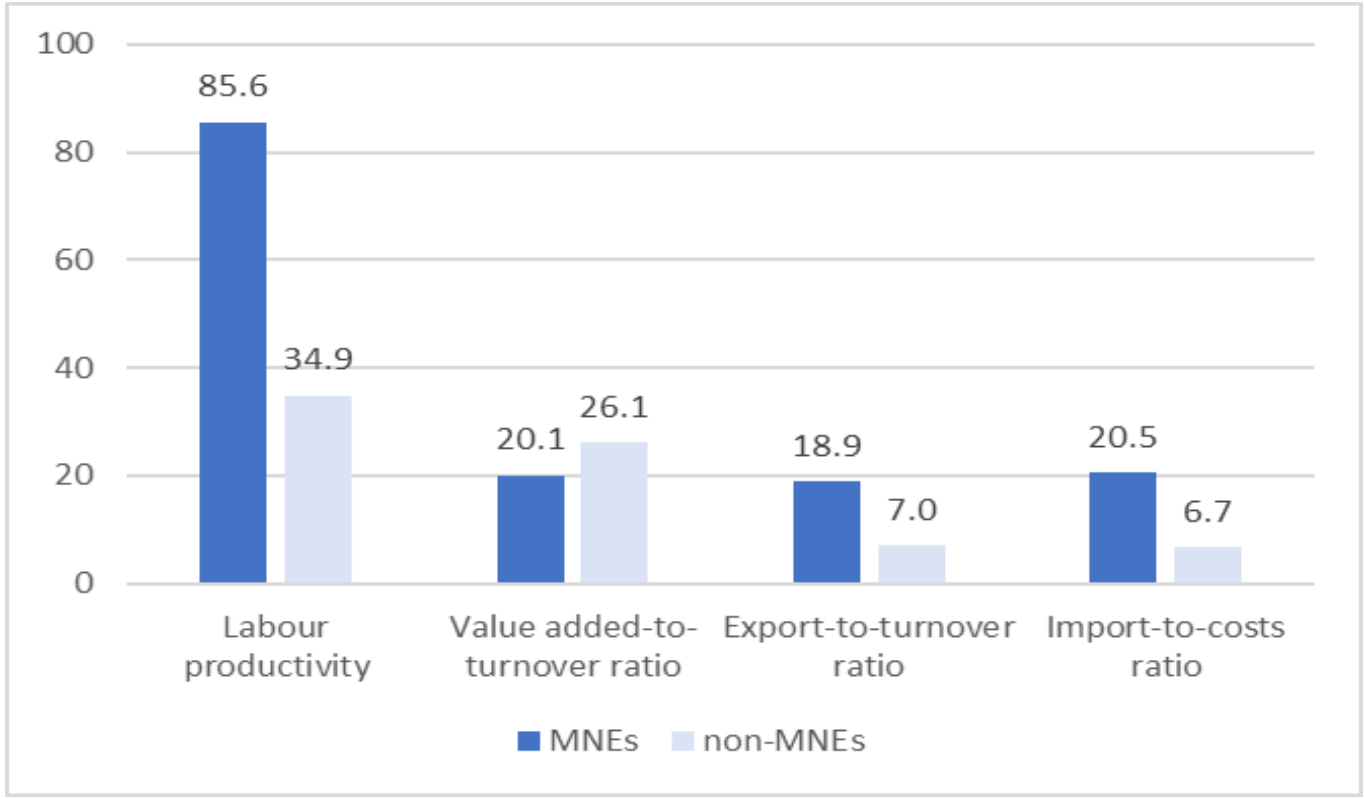
# Concept

#4

- Deviation from normality: domestic firms vs MNEs

***Multinational enterprises vs. non-multinational enterprises, 2015 (%)***




*Source: Sallusti (2021)*

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# Method


- Bottom-up method, based on enterprises microdata
- Processed in two phases:
  1) **Identification phase**: identify which MNEs are avoiding taxes
  2) **Measurement of BEPS** -> IFFs amount
- Similar but separate models for inward and outward IFFs

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# Calculation

#4

- Phase zero: country
  - Identification of either inward or outward IFFs
  - Tax practices, macroeconomic variables…

- Phase one: Identification phase
  - Between comparison - Propensity score (PS) matching
    - $Proxy$=1 (suspect, or indicator of “abnormality”):
      EBIT-to-turnover ratio < average of the control group
    - $Proxy$=0 (no suspect):
      EBIT-to-turnover ratio ≥ average of the control group.
  - Within comparison - Receiver operating characteristics (ROC)
    - Starting from proxy from previous step and defines final clustering
    - Factor analysis is used to build the composite indicator and identify threshold

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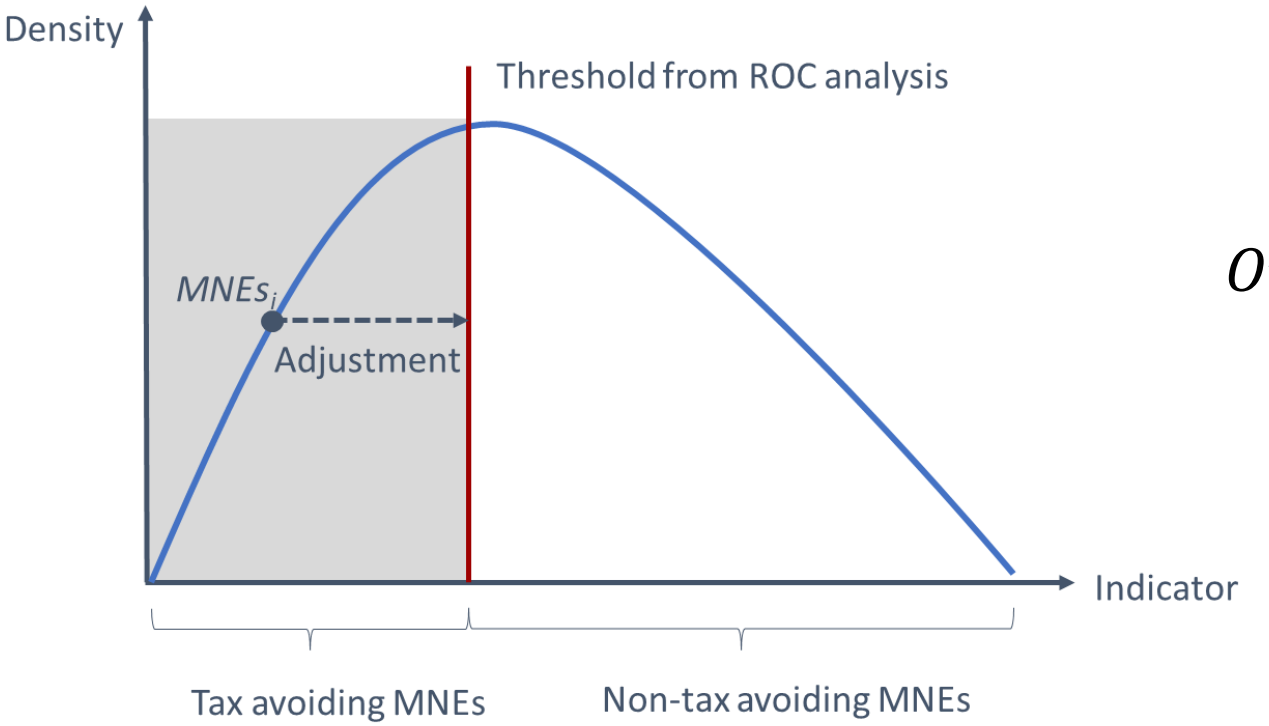
# Calculation

#4

- Phase two: Measurement phase




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

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

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

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# Controls and adjustments


- Control group into same region, economic activity and size class [other factors driving differences]

- Compare MNE units to domestic average [applying in smaller economies]

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# Data

#4

- Microdata available to NSO
- Economic and structural variables (value added, R&D spending, salaries/costs…)

- Structural business statistics
- Administrative data on taxable profits
- International trade, position within MNEs, FATS, LCU

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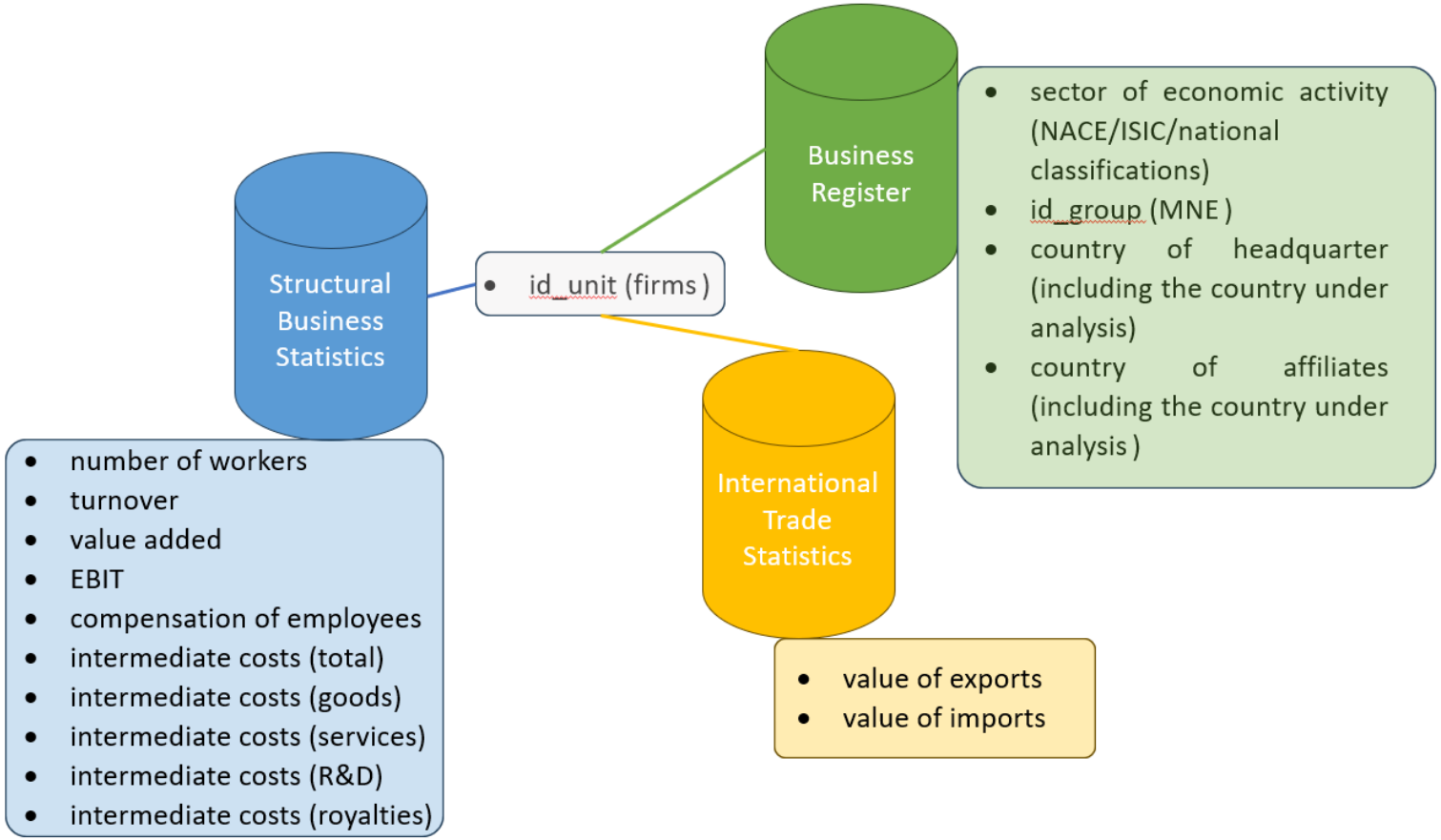
# Applying the method




*Source: Sallusti (2021)*

# Applying the method

#4

| Sector | Number of MNEs | Number of Tax avoiding | % of Tax avoiding MNEs | Declared EBIT | Adjustment | Incidence of adjustment (%) | Adjustment per MNE |
|---|---|---|---|---|---|---|---|
| Mining and quarrying | 78 | 59 | 75.6 | 112.6 | 49.8 | 30.7 | 0.8 |
| Food and beverage | 804 | 440 | 54.7 | 3729.9 | 1261.5 | 25.3 | 2.9 |
| Textile | 306 | 196 | 64.1 | 446.9 | 164.7 | 26.9 | 0.8 |
| Wearing apparel | 349 | 193 | 55.3 | 627.3 | 103.4 | 14.2 | 0.5 |
| Leather | 281 | 198 | 70.5 | 698.8 | 304.9 | 30.4 | 1.5 |
| Wood, Paper and print | 414 | 278 | 67.1 | 1048.7 | 445.9 | 29.8 | 1.6 |
| Chemical and pharmaceutics | 736 | 449 | 61.0 | 3879.7 | 1437.0 | 27.0 | 3.2 |
| Rubber and plastic | 691 | 406 | 58.8 | 1520.6 | 596.4 | 28.2 | 1.5 |
| Non-metallic minerals | 355 | 199 | 56.1 | 920.0 | 279.2 | 23.3 | 1.4 |
| Metals | 1607 | 930 | 57.9 | 3779.8 | 1823.5 | 32.5 | 2.0 |
| Electronics | 1124 | 683 | 60.8 | 2417.6 | 1013.9 | 29.5 | 1.5 |
| Machinery | 2091 | 1341 | 64.1 | 4704.7 | 1684.5 | 26.4 | 1.3 |
| Automotive | 526 | 387 | 73.6 | 2137.6 | 1042.0 | 32.8 | 2.7 |
| Other manufacturing and repair | 1042 | 583 | 56.0 | 1698.8 | 670.9 | 28.3 | 1.2 |
| Energy, water and waste | 2653 | 1473 | 55.5 | 15612.1 | 9812.5 | 38.6 | 6.7 |
| Construction | 2951 | 1466 | 49.7 | 1963.5 | 1342.6 | 40.6 | 0.9 |
| Wholesale and retail trade | 8102 | 4414 | 54.5 | 19865.8 | 5570.8 | 21.9 | 1.3 |
| Transportation and logistics | 1714 | 1271 | 74.2 | 12387.2 | 1973.1 | 13.7 | 1.6 |
| Hotel and restaurants | 1239 | 690 | 55.7 | 967.0 | 81.2 | 7.7 | 0.1 |
| Telecommunications | 689 | 473 | 68.7 | 13526.8 | 790.9 | 5.5 | 1.7 |
| Informatics | 2340 | 1652 | 70.6 | 2896.5 | 1744.8 | 37.6 | 1.1 |
| Real estate | 5503 | 2903 | 52.8 | 3716.4 | 531.1 | 12.5 | 0.2 |
| Business services | 6992 | 5769 | 82.5 | 11726.0 | 4584.4 | 28.1 | 0.8 |
| Personal services | 1780 | 1232 | 69.2 | 2972.5 | 866.7 | 22.6 | 0.7 |
| **Total** | **44367** | **27685** | **62.4** | **113356.6** | **38175.7** | **25.2** | **1.4** |

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*Source: Sallusti (2021)*

# Challenges


- No domestic control group
- Size of sample within each stratum is (too) small
- Linking data

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*Source: Sallusti (2021)*

# Material


- Conceptual Framework: https://unctad.org/publication/conceptual-framework-statistical-measurement-illicit-financial-flows
- Methodological Guidelines (draft): https://unctad.org/publication/methodological-guidelines-measure-tax-and-commercial-illicit-financial-flows-methods
- Statistical Measurement of Tax and Commercial Illicit Financial Flows: Pilot testing methodologies for SDG indicator 16.4.1: https://unctad.org/publication/statistical-measurement-tax-and-commercial-illicit-financial-flows
- Towards a Statistical Framework to measure tax and commercial IFFs: https://unctad.org/publication/towards-statistical-framework-measurement-tax-and-commercial-illicit-financial-flows
- Project website: https://unctad.org/project/measuring-and-curbing-illicit-financial-flows
- UNCTAD website: https://unctad.org/statistics/illicit-financial-flows

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