### Suggested methods – trade misinvoicing

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<tr>
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<th>Partner Country Method (PCM) +</th>
<th>Price Filter Method (PFM) +</th>
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<td>Trade asymmetries</td>
<td>Abnormal prices</td>
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<td>Partner's trade data are accurate</td>
<td>Prices outside price filter -&gt; mispricing</td>
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<td>Partner country data available also globally</td>
<td>Not rely on partner data</td>
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<td>Confounding reasons</td>
<td>Endogeneity of statistical filters</td>
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<td>Trade data, 6-level HS</td>
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<td>Mitigation of limitations</td>
<td>Involve Customs experts</td>
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</table>
Trade misinvoicing: PCM +

- Concept and assumptions
  - Top-down method
  - 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!

Trade misinvoicing: PCM +

- Limitations
  - Many factors contribute to trade asymmetries
    - Partner country attribution
    - CIF and FOB valuation
    - Trade systems
    - Time lags
    - Misclassification
    - Statistical measurement errors
    - ...
Overcoming limitations
- Compare national data with (major) trading partners
- Use granular national data (focus on prominent flows or products)
- Resolve CIF-FOB differences – apply region/country/commodity specific ratios
- Analyse remaining bilateral asymmetries
- Apply reliability weighting procedure – to address the doubt that larger gap is not misinvoicing
- Validate results using qualitative approach – interviews and consultations with customs and trade experts

Source 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
Trade misinvoicing: PCM +

Flow chart for analysing and reducing bilateral asymmetries

• Calculation

[Diagram]

Source: UNSD (2019)

Trade misinvoicing: PCM +

• Calculation – trade system

General trade system - territorial elements and potential imports and exports

[Diagram]

Source: UNSD (2013)
# Trade misinvoicing: PCM +

• Calculation – trade system

![Diagram of trade system](source: UNSD (2011))

- Use of specific databases
  - UNCTAD Global Transport Cost
  - OECD ITIC

• Calculation – valuation
  - Imports in FOB valuation
  - CIF/FOB ratio

\[
CFR_{c,r,p,t} = \frac{IM_{CIF,c,r,p,t}}{EX_{FOB,c,r,p,t}} = \frac{p_{CIF,c,r,p,t} \times q_{IM,c,r,p,t}}{p_{FOB,c,r,p,t} \times q_{EX,c,r,p,t}}
\]
Calculation – partner country attribution

- Challenge: country of export does not know the final country of destination
- IM
  - Country of origin
  - Country of consignment (country of exports)
- EX
  - Country of final (known) destination
  - Re-export flows

CASE STUDY

Bilateral inbound trade of mobile phones

<table>
<thead>
<tr>
<th>Inbound Trade</th>
<th>CAN imports</th>
<th>CHN exports</th>
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<tbody>
<tr>
<td>Official data</td>
<td>3,325</td>
<td>1,362</td>
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<td>Published asymmetry</td>
<td></td>
<td>1,967</td>
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<td>Adjustment:</td>
<td></td>
<td></td>
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<td>*CAN imports of CHN goods from countries of export (consignment) other than CHN</td>
<td>1,280</td>
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<td>Adjusted official data</td>
<td>2,045</td>
<td>1,362</td>
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<td>Remaining asymmetry</td>
<td></td>
<td>687</td>
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Source: UNSD (2019)
#1 Trade misinvoicing: PCM +

- Calculation – remaining asymmetries
  - Time lags in shipments
  - Seasonal trade cycles
  - Coverage
  - Misclassification
  - Measurement errors
  - ...

Trade misinvoicing: PCM +

Adjusting imports of reporting and exports of partner country to calculate the remaining asymmetry

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<tr>
<th>R IMPORTS</th>
<th>Official data</th>
<th>IM&lt;sub&gt;FOB&lt;/sub&gt;,&lt;i&gt;z&lt;/i&gt;,&lt;i&gt;p&lt;/i&gt;,&lt;i&gt;t&lt;/i&gt;</th>
<th>EX&lt;sub&gt;FOB&lt;/sub&gt;,&lt;i&gt;z&lt;/i&gt;,&lt;i&gt;p&lt;/i&gt;,&lt;i&gt;t&lt;/i&gt;</th>
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<td>ORIGINAL DATA</td>
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<tr>
<th>REMAINING ASYMMETRY</th>
<th>InboundRA = IM&lt;sub&gt;Adj&lt;/sub&gt;,&lt;i&gt;z&lt;/i&gt;,&lt;i&gt;p&lt;/i&gt;,&lt;i&gt;t&lt;/i&gt; - EX&lt;sub&gt;Adj&lt;/sub&gt;,&lt;i&gt;z&lt;/i&gt;,&lt;i&gt;p&lt;/i&gt;,&lt;i&gt;t&lt;/i&gt;</th>
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Source: UNSD (2019)
#1 Trade misinvoicing: PCM +

- Calculation – reliability weighting
  - Large trade gaps may not result from misinvoicing
  - Mitigate risk of unproportionally accounting

\[
w = 1 - \frac{|q_{IM,c,r,p,t} - q_{EX,c,r,p,t}|}{\max(q_{IM,c,r,p,t}, q_{EX,c,r,p,t})}
\]

\[
Inbound_{c,r,p,t} = w \cdot (\text{IM}_{FOB,c,r,p,t}^{Adj} - \text{EX}_{FOB,c,r,p,t}^{Adj})
\]

\[
Outbound_{c,r,p,t} = w \cdot (\text{EX}_{FOB,c,r,p,t}^{Adj} - \text{IM}_{FOB,c,r,p,t}^{Adj})
\]

#1 Trade misinvoicing: PCM +

- Calculation – inward IFFs

\[
\text{InwardIFFs}_{c,r,p,t} = \text{Overinvoiced EX}_{c,r,p,t} + \text{Underinvoiced IM}_{c,r,p,t}
\]

\[
\text{Underinvoiced IM}_{c,r,p,t} = -1 \cdot \min(0, \text{Inbound}_{c,r,p,t})
\]

\[
\text{Overinvoiced EX}_{c,r,p,t} = \max(0, \text{Outbound}_{c,r,p,t})
\]
Trade misinvoicing: PCM +

- Calculation – outward IFFs

\[
\text{Outward IFFs}_{c,r,p,t} = \text{Under invoiced EX}_{c,r,p,t} + \text{Over invoiced IM}_{c,r,p,t}
\]

\[
\text{Over invoiced IM}_{c,r,p,t} = \max \left( 0, \text{Inbound}_{c,r,p,t} \right)
\]

\[
\text{Under invoiced EX}_{c,r,p,t} = -1 \times \min \left( 0, \text{Outbound}_{c,r,p,t} \right)
\]