Offshore Profit Shifting and Domestic Productivity Measurement

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Profit shifting example: iPhone

► Developed in California, built by contract manufacturer in China

► Hypothetical numbers
  ► Parts and assembly labor $250
  ► Sale price $750
  ► No further costs, all phone sold outside the U.S.
  ► $500 gross profit: return to design, software, etc. made in U.S.

► $250 cogs is not U.S. GDP

► Is the $500 profit part of U.S. GDP?
  ► Depends on which part of Apple Inc. receives it...
MNE profit shifting

- Multinational enterprises (MNE)
  - Access to heterogeneous tax locations

- Creates an incentive to *profit shift*: Structure the firm (or transactions) to book profits in low-tax countries

- Many ways to shift profits; one popular method
  - MNE assigns assets to affiliates in low-tax countries
  - Profit accrues to those assets at low tax rates

- Facilitated by intangible assets
- Assignment does not necessarily reflect production
## Assets in U.S.-owned foreign affiliates, 2012

<table>
<thead>
<tr>
<th>Country</th>
<th>Ratio of U.S.-owned foreign affiliate total assets to PPE (mil. USD)</th>
<th>Compensation (mil. USD)</th>
<th>Employment (mil. USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>16.8</td>
<td>39.0</td>
<td>1.8</td>
</tr>
<tr>
<td>Canada</td>
<td>6.4</td>
<td>21.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Ireland</td>
<td>20.0</td>
<td>142.7</td>
<td>10.9</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>1,109.6</td>
<td>1,380.0</td>
<td>121.6</td>
</tr>
<tr>
<td>Netherlands</td>
<td>97.7</td>
<td>115.3</td>
<td>8.7</td>
</tr>
<tr>
<td>Switzerland</td>
<td>59.9</td>
<td>60.0</td>
<td>7.7</td>
</tr>
<tr>
<td>Barbados</td>
<td>41.8</td>
<td>1,444.7</td>
<td>43.3</td>
</tr>
<tr>
<td>Bermuda</td>
<td>130.8</td>
<td>1,475.5</td>
<td>155.8</td>
</tr>
<tr>
<td>U.K.I., Caribbean</td>
<td>101.2</td>
<td>3,330.2</td>
<td>199.8</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>40.3</td>
<td>39.3</td>
<td>2.7</td>
</tr>
<tr>
<td>Singapore</td>
<td>18.6</td>
<td>50.3</td>
<td>3.1</td>
</tr>
</tbody>
</table>

Total assets are the sum of all financial (e.g., cash, receivables) and non-financial (e.g., property, plant, and equipment, inventories) assets on a historic cost basis.

The United Kingdom Islands (U.K.I.), Caribbean, are made up of the British Virgin Islands, Cayman Islands, Montserrat, and Turks and Caicos Islands.
Profit shifting and mismeasurement

- If intangible capital (IC) is held by U.S. parent
  - Payment for IC booked in parent $\rightarrow + GDP$
  - Export of services from United States

- If intangible capital is held by the affiliate
  - Payment for IC booked in affiliate $\rightarrow +$ income on USDIA
  - Income on USDIA is not a part of GDP

\[ \text{GNP} = \text{GDP} + \text{income on USDIA} - \text{income on FDIUS} + \cdots \]
Profit shifting and mismeasurement

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  ► Income on USDIA is not a part of GDP

► Profit shifting decreases GDP, increases USDIA income

\[ GNP = GDP + \text{income on USDIA} - \text{income on FDIUS} + \cdots \]

► Income on USDIA explodes in the 2000s
Adjusting for profit shifting

- Reallocate income on USDIA across units of the MNE
- Reallocations to parent increase GDP

\[ GNP = GDP + \text{income on USDIA} - \text{income on FDIUS} + \cdots \]

- What part of income on USDIA is owed to the parent?
Adjusting for profit shifting

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- Reallocations to parent increase GDP

\[ GNP = GDP + \text{income on USDIA} - \text{income on FDIUS} + \cdots \]

- What part of income on USDIA is owed to the parent?
- Our approach: formulary adjustment
  - Popular multi-jurisdictional tax adjustment
- Allocate income proportional to apportionment factors
  - Apportionment factors: compensation and sales
- For data reasons, we focus on U.S.-owned MNEs operating abroad
  - Affiliates of foreign-owned MNEs operating in U.S. in progress
Overview of results

- In the aggregate, our adjustment adds
  - 1994–2014: ~ $3.6 trillion to U.S. GDP
  - 1994–2014: 1.5 pps to cumulative productivity (VA/hour) growth

Adjustment matters most for R&D-intensive industries

- 2008: adjustment is 8 percent of industry value added
- 1994–2014: 4.0 pps to cumulative productivity growth
- 2000–2008: 0.6 pps to annual productivity growth rate

Mismeasurement likely to continue (currently ~ 2.5 percent of VA)
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Aggregate adjustments to productivity
Formulary adjustment method

- Data from BEA MNE surveys
- For each year (suppressing time subscript)
- $m = 1, \ldots, M$ multinational enterprises
- Each MNE has one parent ($n = 1$) and $n = 2, \ldots, N_m$ foreign affiliates
- Apportionment weight for member $n$ in MNE $m$

$$
\omega_{mn} = \frac{1}{2} \times \frac{w_{mn} \ell_{mn}}{\sum_{i=1}^{N_m} w_{mi} \ell_{mi}} + \frac{1}{2} \times \frac{p_{mn} y_{mn}}{\sum_{i=1}^{N_m} p_{mi} y_{mi}}
$$
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- \( m = 1, \ldots, M \) multinational enterprises
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- **Apportionment weight** for member \( n \) in MNE \( m \)

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\]

- Allocate income across members of MNE

\[
\pi_{\omega mn} = \omega_{mn} \sum_{i=1}^{N_m} \pi_{mi} \quad n = 1, \ldots, N_m
\]

- And the *formulary adjustment* to each member is

\[
\epsilon_{mn} = \pi_{\omega mn} - \pi_{mn} \quad n = 1, \ldots, N_m
\]
Adjusted value added

► Focus on business-sector value added

► Add the parents’ adjustments to value added

\[ \tilde{V}_A = V_A + \sum_{m \in M} \epsilon_{m1} \]
Adjusted value added per hour

► Focus on business-sector value added

► Add the parents’ adjustments to value added

\[
\tilde{Y}^{VA} = Y^{VA} + \sum_{m \in M} \epsilon_{m1}
\]

► Adjusted productivity is adjusted value added per hour

\[
\tilde{A} = \frac{\tilde{Y}^{VA}}{L}
\]

► Unadjusted productivity is adjusted value added per hour

\[
A = \frac{Y^{VA}}{L}
\]
Increase in aggregate cumulative labor productivity growth

<table>
<thead>
<tr>
<th>Year Period</th>
<th>Cumulative Unadjusted</th>
<th>Cumulative Adjusted</th>
<th>Annual Unadjusted</th>
<th>Annual Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973–1994</td>
<td>32.2</td>
<td>32.5</td>
<td>1.53</td>
<td>1.55</td>
</tr>
<tr>
<td>1994–2014</td>
<td>44.5</td>
<td>46.0</td>
<td>2.23</td>
<td>2.30</td>
</tr>
</tbody>
</table>
Adjustments in other countries, 2012

- **Positive adjustments:** Japan, France, Italy, Russia, Argentina, Greece, Turkey, Libya, Germany, and Kenya
  - Adjustments are too small to pass confidentiality checks
  - Japan, France, Italy, Greece, and Germany have tax rates that exceed the OECD average

- **Negative adjustments:** Netherlands, Bermuda, Ireland, Luxembourg, U.K., Caribbean, Singapore, U.K., Switzerland, Canada, Qatar

**Tax havens:** Netherlands, Bermuda, Ireland, Luxembourg, U.K., Caribbean, Singapore, Switzerland

**Important locations of U.S. MNE production:** Canada, U.K.
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  - Tax havens: Netherlands, Bermuda, Ireland, Luxembourg, U.K.I. Caribbean, Singapore, Switzerland
  - Important locations of U.S. MNE production: Canada, U.K.
Reattribution of U.S. MNE earnings, 2012 (bil. USD)

United States: +$280.1
Canada: –$13.7
Bermuda: –$32.4
Ireland: –$29.5
United Kingdom: –$14.7
Luxembourg: –$23.6
Netherlands: –$73.0
Switzerland: –$12.7
U.K.I. Caribbean: –$22.0
Singapore: –$19.0
Qatar: –$10.0
Industry-level adjustments
## Adjustment by industry, 2012

<table>
<thead>
<tr>
<th>Industry Description</th>
<th>Adjustment share total adj.</th>
<th>Adjustment share of VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 Wood, paper, petrol., chem., plastics</td>
<td>0.42</td>
<td>0.16</td>
</tr>
<tr>
<td>52 Finance and insurance</td>
<td>0.14</td>
<td>0.04</td>
</tr>
<tr>
<td>33 Manufacturing (computers, elec. equip., vehicles)</td>
<td>0.12</td>
<td>0.03</td>
</tr>
<tr>
<td>51 Information services (data processing)</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>54 Prof. and sci. services (computer sys. design)</td>
<td>0.05</td>
<td>0.01</td>
</tr>
<tr>
<td>31 Food, textiles, apparel</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>21 Mining</td>
<td>0.04</td>
<td>0.03</td>
</tr>
<tr>
<td>44 Retail trade</td>
<td>0.03</td>
<td>0.01</td>
</tr>
<tr>
<td>42 Wholesale trade</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>55 Management companies</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>53 Real estate and leasing</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>22 Utilities</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>48 Transportation and warehousing</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>70 Arts, recreation, accommodation</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>23 Construction</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>80 Other services, except government</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>56 Administrative and waste management services</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>11 Agriculture, forestry, fishing, and hunting</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>60 Education, health care, and social assistance</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Industry-level adjustments by industry type

- Assign industries to groups based on
  - IT using, IT producing (Bloom et al 2012; Fernald 2014)
  - R&D intensity (75th percentile MNEs by R&D/Sales)
- As before, compute a formulary adjustment for each MNE
- Add the MNE’s adjustment to the industry value added

\[
\tilde{Y}^{RD} = \sum_{i \in I^{RD}} Y_i + \sum_{m \in M^{RD}} \epsilon_{m1}
\]
Increase in cumulative labor productivity growth: R&D intensity

<table>
<thead>
<tr>
<th>Year</th>
<th>R&amp;D Intensive</th>
<th>Non-R&amp;D Intensive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Adjusted</td>
</tr>
<tr>
<td>1973–1994</td>
<td>57.1</td>
<td>58.2</td>
</tr>
<tr>
<td>1994–2014</td>
<td>94.5</td>
<td>98.8</td>
</tr>
</tbody>
</table>
Summary

- Intangible capital and multinationals increasingly important
- Increasing potential for misattribution of value added
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- Formulary apportionment shows
  - Measurement error has increased since mid-1990s
  - Larger for R&D-intensive industries
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► Increasing potential for misattribution of value added

► Formulary apportionment shows
  ► Measurement error has increased since mid-1990s
  ► Larger for R&D-intensive industries

► Other places this mismeasurement could matter
  ► Capital’s share of income
  ► Importance of C- and S-corps in business income
  ► The current account vs. the trade balance
  ► U.S.-owned foreign assets and foreign-owned U.S. assets returns
Foreign MNEs operating in the United States
Adjusting for foreign-owned affiliates

- Survey: U.S.-owned affiliates operating abroad very good
- Survey: foreign parents operating affiliates in U.S. are incomplete
- U.S. tax rates create incentives to understate income earned in U.S. by affiliates of foreign multinationals (FDIUS)

\[
GNP = GDP + \text{income on USDIA} - \text{income on FDIUS} + \cdots
\]

overstated \hspace{2cm} understated
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\[
GNP = GDP + \text{income on USDIA} - \text{income on FDIUS} + \cdots
\]

- Match BEA data on affiliates in the U.S. with data from Orbis on the foreign parent. No common identifier.
- Match about 100 technology intensive foreign-owned affiliates operating in U.S.
Profits and production of foreign MNEs

MNEs with significant U.S. operations earn most of their profit outside of the United States.
Adjustment by IT usage and production

![Graph showing the share of group's unadjusted value added (percent) by IT usage and IT production from 1970 to 2015. The graph compares IT using and non-IT using, as well as IT producing and non-IT producing, with fluctuations over time.](image-url)
Increase in cumulative labor productivity growth: IT producing

<table>
<thead>
<tr>
<th>Year</th>
<th>IT producing</th>
<th>non-IT producing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Adjusted</td>
</tr>
<tr>
<td>1973–1994</td>
<td>96.2</td>
<td>96.1</td>
</tr>
<tr>
<td>1994–2014</td>
<td>142.3</td>
<td>146.0</td>
</tr>
</tbody>
</table>
Increase in cumulative labor productivity growth: IT using

<table>
<thead>
<tr>
<th>Year</th>
<th>IT using</th>
<th>Non-IT using</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted</td>
<td>Adjusted</td>
</tr>
<tr>
<td>1973–1994</td>
<td>52.4</td>
<td>52.7</td>
</tr>
<tr>
<td>1994–2014</td>
<td>72.5</td>
<td>73.9</td>
</tr>
</tbody>
</table>