The Rise of Vertical Specialization Trade

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Postwar Trade Growth

• World trade has grown significantly since the mid-1960s.

• Vertical Specialization (VS) trade has increased:
  Trade in goods incorporated in goods that are also traded.
  1997: 12 percent of U.S. exports.

Source: Chen, Kondratowicz and Yi (2005)
Why has VS trade increased?

• Not due to increasing trade in inputs.
  

• Type of intermediates trade has changed.
  
  Shift from raw materials to manufactured parts.

• Manufacturing trade grown faster than total trade...
  
  ...despite being a smaller share of output.

• Rise of VS trade is driven by increase in manufactured inputs trade.
Falling Share of Materials Trade: 
Paper Summary: Model Overview

- Tractable two country trade Ricardian model.

- Three stages of production:
  
  Raw materials used to make parts.

  Parts used to make consumption goods.
Paper Summary: Results

• Falling trade costs can account for:
  Increase in VS trade.
  Faster growth of mfg. trade.

• Key ingredients for result:
  Trade costs fall more for intermediate mfg. goods.
  Manufacturing less dependent on endowments, more sensitive to trade barriers.
Measuring Trade Costs by Use

- Allocate freight costs/tariffs to input-output codes.
- Assume import share is same across uses.
- Trade weight by good/use.
U.S. Import Costs

- Trade costs for mfg. fall more than raw materials.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1967</th>
<th>1997</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interm. (Mfg.)</td>
<td>14.4</td>
<td>7.1</td>
</tr>
<tr>
<td>Interm. (Non-Mfg.)</td>
<td>14.9</td>
<td>11.9</td>
</tr>
<tr>
<td>Final</td>
<td>14.2</td>
<td>6.6</td>
</tr>
</tbody>
</table>
Endowments: Materials vs. Manufacturing

• 1967 trade costs by good similar, but much more trade in materials.

• Materials more dependent on endowments:
  Copper mines have to be placed at copper deposits.
  → Strong comparative advantage.

• Manufacturing siting more flexible.
  Can ship in inputs.
  Weaker comparative advantage.
  → Need low trade costs to trade.
Households

- Two countries $i = 1, 2$
- Each with representative HH, endowed with labor $N^i = 1 \forall t$.
- Preferences over consumption $C^i$: $U = \left[ \sum_{j=1,2} \phi^i_j (C^i_j)^\rho \right]^{\frac{1}{\rho}}$.
- $\phi^i_j = \phi$ if $j = i$ and $\phi^i_j = 1 - \phi$ and if $j \neq i$.

Raw Materials Sector

- Each country produces a raw materials good $Y^i_m = A^i_m N^i_m$.
- Domestic good: $j = i$. 
Manufactured Parts Sector

- There is a continuum of manufactured parts \( x^i(z) \).

- Each country can produce parts:
  \[
  Y^i_x(z) = A^i_x(z)(N^i_x(z))^\alpha((\sum_j (M^i_j(z))^\sigma)^{\frac{1}{\sigma}})^{1-\alpha}.
  \]

- Mirror image productivity parameters: \( A^1(z) = \frac{1}{(1+z)\theta} \) and \( A^2(z) = \frac{1}{(2-z)\theta} \),

Final Goods Sector

- Each country produces a final good on same name as country:
  If \( i = j \),
  \[
  Y^i_{c,j} = A^i_c(N^i_c)^{\alpha_c}(\int_0^1 ln(x^i(z))dz)^{1-\alpha_c}
  \]
Trade

- All goods can be traded.
- Incur good specific iceberg transportation cost $f_k$ and tariff $\tau_k$ for $k \in \{m, x, c\}$
- Tariff revenue rebated lump sum to domestic HH.
Equilibrium

- Calibrate symmetric equilibrium.
  HH parameters, policies same in both countries.
  Production parameters mirror each other.

- Generates closed form solution.

Calibration

- Trade costs: U.S. import costs:
  Non-Mfg Interm: Materials.
  Mfg. Interm.: Parts.
  Mfg. Final goods: Final goods.

- Trade weighting biased downward.
  Use Mercantilist Trade Resistance Index (Anderson and Van Wincoop 2003): Uniform tariff that gives same trade.
  Scale up by 69%: MTRI/Trade wtd. tariff in Kee, et al. (2005).
Calibration (2)

- HH elasticity $\rho$: 0.85 (Ruhl 2003).

- Comp. Adv. in interm. mfg. $\theta$: 0.24 Set to match 1972 VS trade share = 0.06.

- Home bias $\phi$: 0.545 Set to match mfg. export share in 1967 = 9 percent.

- Interm. Share $\alpha, \alpha_c$: 0.5 (Jones 2008).

- Mat. elasticity $\sigma$: -1 (Jones 2008).

### Parameters

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\rho$</th>
<th>$\theta$</th>
<th>$\alpha$</th>
<th>$\alpha_c$</th>
<th>$\sigma$</th>
<th>$A_m$</th>
<th>$A_c$</th>
<th>$\phi$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>0.85</td>
<td>0.24</td>
<td>0.5</td>
<td>0.5</td>
<td>-1</td>
<td>1</td>
<td>1</td>
<td>0.545</td>
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</tbody>
</table>
Simulation Results

U.S. Exports/Value Added, Model and Data 1967-2006
## Other Moments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>VS Trade 1997</td>
<td>18.9</td>
<td>14.1</td>
</tr>
<tr>
<td>Interm. Trade Share 1972</td>
<td>53.4%</td>
<td>50.4%</td>
</tr>
<tr>
<td>Interm. Share Mfg. Trade 1997</td>
<td>38.4%</td>
<td>30.7%</td>
</tr>
<tr>
<td>Mat. trade share growth (67-02)</td>
<td>9.5%</td>
<td>26.0%</td>
</tr>
</tbody>
</table>

*Sources: Chen, et al. (2005); Athukorala & Yamashita (2006); BEA*
Conclusion

- Trade costs have an important role in explaining increase in and composition of VS trade.

To Be Done

- Add more years:
  Concord intervening years to trade costs data.