Firms and Trade
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• Overall share of US firms exporting relatively small at 18% (Bernard et al., 2007)

• Also, share of firms exporting in each industry varies widely, e.g., 38% in computers and electronic products, 8% in apparel manufacturing

• Exporters ship relatively small share of total shipments overseas, share across firms being 14%

• Again wide variation across industries, e.g., 21% in computers and electronic products, to 7% in beverage and tobacco products

• Similar findings across countries (WTO, 2008)
<table>
<thead>
<tr>
<th>NAICS Industry</th>
<th>Percent of Firms</th>
<th>Percent of Firms that Export</th>
<th>Mean Exports as a Percent of Total Shipments</th>
</tr>
</thead>
<tbody>
<tr>
<td>311 Food Manufacturing</td>
<td>6.8</td>
<td>11.6</td>
<td>14.8</td>
</tr>
<tr>
<td>312 Beverage and Tobacco Product</td>
<td>0.7</td>
<td>22.9</td>
<td>7.4</td>
</tr>
<tr>
<td>313 Textile Mills</td>
<td>1.0</td>
<td>25.1</td>
<td>12.5</td>
</tr>
<tr>
<td>314 Textile Product Mills</td>
<td>1.9</td>
<td>12.2</td>
<td>11.7</td>
</tr>
<tr>
<td>315 Apparel Manufacturing</td>
<td>3.2</td>
<td>7.7</td>
<td>13.5</td>
</tr>
<tr>
<td>316 Leather and Allied Product</td>
<td>0.4</td>
<td>24.4</td>
<td>13.4</td>
</tr>
<tr>
<td>321 Wood Product Manufacturing</td>
<td>5.5</td>
<td>8.5</td>
<td>18.5</td>
</tr>
<tr>
<td>322 Paper Manufacturing</td>
<td>1.4</td>
<td>23.8</td>
<td>9.0</td>
</tr>
<tr>
<td>323 Printing and Related Support</td>
<td>11.9</td>
<td>5.5</td>
<td>14.4</td>
</tr>
<tr>
<td>324 Petroleum and Coal Products</td>
<td>0.4</td>
<td>17.8</td>
<td>11.5</td>
</tr>
<tr>
<td>325 Chemical Manufacturing</td>
<td>3.1</td>
<td>36.1</td>
<td>14.3</td>
</tr>
<tr>
<td>326 Plastics and Rubber Products</td>
<td>4.4</td>
<td>28.1</td>
<td>10.3</td>
</tr>
<tr>
<td>327 Nonmetallic Mineral Product</td>
<td>4.0</td>
<td>9.5</td>
<td>12.1</td>
</tr>
<tr>
<td>331 Primary Metal Manufacturing</td>
<td>1.5</td>
<td>30.2</td>
<td>10.4</td>
</tr>
<tr>
<td>332 Fabricated Metal Product</td>
<td>19.9</td>
<td>14.3</td>
<td>11.6</td>
</tr>
<tr>
<td>333 Machinery Manufacturing</td>
<td>9.0</td>
<td>33.0</td>
<td>15.5</td>
</tr>
<tr>
<td>334 Computer and Electronic Product</td>
<td>4.5</td>
<td>38.3</td>
<td>21.3</td>
</tr>
<tr>
<td>335 Electrical Equipment, Appliance,</td>
<td>1.7</td>
<td>37.7</td>
<td>12.9</td>
</tr>
<tr>
<td>336 Transportation Equipment</td>
<td>3.4</td>
<td>28.0</td>
<td>13.0</td>
</tr>
<tr>
<td>337 Furniture and Related Product</td>
<td>6.4</td>
<td>6.5</td>
<td>10.1</td>
</tr>
<tr>
<td>339 Miscellaneous Manufacturing</td>
<td>9.1</td>
<td>1.6</td>
<td>14.9</td>
</tr>
<tr>
<td><strong>Aggregate Manufacturing</strong></td>
<td><strong>100.0</strong></td>
<td><strong>17.6</strong></td>
<td><strong>14.1</strong></td>
</tr>
</tbody>
</table>

Source: Bernard et al. (2007).
Firms and Trade

- US exporters found to be larger, more skill and capital-intensive, more productive and pay higher wages (Bernard et al., 2007)

- Finding consistent with traditional model of comparative advantage

- However, evidence exporters are also more skill and capital-intensive in developing countries (Alavarez and Lopez, 2005)

- Not consistent with traditional model, as developing countries often abundant in unskilled labor
Firms and Trade Theory

- Systematic relationship appears to exist between characteristics of firms and their participation in both exporting and foreign direct investment (FDI)
- Key hypothesis proposed to explain higher productivity of exporters:
  - exporting requires extra resources in terms of transportation, distribution and marketing costs, workers with foreign managerial skills, and modification of products for export
  - only more productive firms can bear such costs
Firms and Trade Theory

- Role of fixed entry costs also important in both export and FDI-decisions
- Allowing for heterogeneous firms brings two new insights into trade models:
  - differences in productivity *within* industries matter
  - resource allocation happens within industries after trade liberalization, i.e., number of firms and volume of exports can change – *extensive* and *intensive* margins
- How is this captured in a simple model? Focus on Helpman *et al.* (2004)
Theoretical Framework

- N countries that use labor to produce goods in \( H+1 \) sectors; one sector produces homogeneous good with a unit of labor per unit of output; \( H \) sectors produce differentiated goods, \( h=1\ldots H \)
- \( \beta_h \) of income spent on \( h \), remaining fraction \( 1-\Sigma_h \beta_h \) spent on homogeneous good which is **numeraire**
- Country \( i \) endowed with \( L^i \) units of labor, wage rate is \( w^i \)
- Consider a particular sector \( h \), and drop \( h \) notation
Theoretical Framework

- Only factor of production is labor $L$, and to enter an industry, firms incur a fixed cost, $f_E$

- Upon entry, firms draw labor productivity coefficient $a$ (labor per unit output) from distribution $G(a)$

- With given $a$, firms in country $i$ have four choices:
  
  (i) Exit domestic market
  (ii) Serve domestic market only
  (iii) Export
  (iv) Set up foreign production (horizontal FDI)
Theoretical Framework

- If a firm chooses to produce for domestic market, bears fixed overhead labor costs $f_D$
- If firm chooses to export, it bears additional fixed costs $f_X$ per foreign market, where $f_X$ are costs of forming distribution and servicing network in foreign country
- If firm chooses FDI, it bears $f_I$ in every foreign market, which include costs of forming subsidiary in each country, and duplicating $f_D$
- Goods transported from $i$ to $j$ subject to iceberg transport costs of $\tau^{ij} > 1$
Theoretical Framework

- Firms engage in *monopolistic competition*

- Preferences across varieties of h modeled as CES utility with elasticity of substitution $\varepsilon = 1/(1-\alpha) > 1$

- These preferences generate demand function in i for every brand, $A^i p^{-\varepsilon}$, where demand level $A^i$ is treated as exogenous by individual firm

- Brand of monopolistic firm with labor coefficient $a$, offered at price $p = w^i a / \alpha$, where $1/\alpha$ is mark-up

- Effective domestic price is $w^i a / \alpha$, supplied by domestic firm or foreign affiliate, and if good is imported, effective price is $\tau^{ji} w^j a / \alpha$
Theoretical Framework

- Firm in country $i$ that remains in industry always serves domestic market through domestic production, but it may also serve market $j$ via exporting or FDI.

- Choice driven by proximity-concentration trade-off: relative to exports, FDI saves transport costs, but duplicates production facilities, i.e., higher fixed costs.

- In equilibrium no firm engages in both exports and FDI in a foreign market, assume:

$$\left( \frac{w^j}{w^i} \right)^{\varepsilon-1} f_i > (\tau^{ij})^{\varepsilon-1} f_X > f_D$$
Theoretical Framework

- Assume unit wages $w^i = 1$, operating profits for a firm serving domestic market are:
  \[ \pi^i_D = a^{1-\epsilon} B^i - f_D \]

  for a firm with productivity coefficient $a$, and $B^i = (1 - \alpha)A^i/\alpha^{1-\epsilon}$, where $B^i$ is demand level in $i$

- Additional profits from exporting to country $j$ are:
  \[ \pi^{ij}_x = (\tau^{ij}a)^{1-\epsilon} B^j - f_x \]

- Profits from FDI in $j$ are:
  \[ \pi^j_i = a^{1-\epsilon} B^j - f_i \]

- Profit functions are increasing and linear: more productive firms are profitable in all three activities
Theoretical Framework

- In Figure 1, along horizontal axis, firm productivity \( a = a^{1-\varepsilon} \) increases, while profits \( \pi \) are measured on vertical axis.
- Domestic and FDI profit functions have same slope, as countries \( i \) and \( j \) are assumed to be same in terms of demand, labor endowment and wages.
- However, if there were tariffs on imports by \( i \), slope of domestic profit function would be steeper.
- Profits from exporting scaled by existence of trade costs \( \tau \), so slope of export profit function is shallower.
- Sorting pattern of firms is consistent with empirical evidence (Helpman et al., 2004).
Figure 1: Profits from Domestic Sales, Exports and FDI
Firms and Trade Liberalization

- Suppose productivity pattern same as in Figure 1
- Trade liberalization is fall in $\tau_{ij}$, $\tau_{ji}$ raises (lowers) profits of existing exporters (non-exporters), and lowers (raises) their productivity cutoff (Figure 2)
- Firms previously only supplying domestic market may become exporters (extensive margin), and volume of exports also increases (intensive margin)
- Labor demand increases due to increase in both exports and number of firms exporting – wages bid up, reducing profits of non-exporting firms
Figure 2: Trade Liberalization

\[ a = a^{1-\varepsilon} \]

\[ a_D, a_D', a_X, a_X', a_I, a_I' \]
Firms and Trade Liberalization

- Induces low productivity firms to exit market, resulting in higher average industry productivity due to turnover of firms from domestic to export markets (Melitz, 2003; Bernard et al., 2007)

- Even though there are within industry gains, the gains are greater in any industry that has stronger comparative advantage – i.e., greater export opportunities intensify impact on wages, driving out more low-productivity firms

- Differential productivity growth across industries magnifies factor-abundance-based gains from trade
Conclusions

- Role of firms in traditional and new trade models limited – Ricardian/Heckscher-Ohlin models focus on industries, while monopolistic competition model of Krugman assumes identical firms.

- Empirical evidence indicates firms differ across and within industries of a country in multiple dimensions such as productivity.

- Implies comparative advantage (disadvantage) does not mean all firms in an industry export (import).

- Additional gains from trade from increased within-industry productivity is critical.