Imperfect Competition
Extensions based on A Comparative Analysis of the EU-Morocco FTA vs. Multilateral Liberalization, by Aziz Elbehri and Thomas Hertel

August 25, 2012
Outline

- Highlights of paper by Elbehri and Hertel

- Extensions
  - Team 1: Welfare
  - Team 2: Sectoral analysis
  - Team 3: Output scaling effect
Highlights of paper by Elbehri and Hertel

• Why is this paper interesting?
  ◦ Comparison of multilateral vs. bilateral liberalization
  ◦ Innovative modeling of imperfect competition
    • Scale effects
    • Mark-ups
    • Entry/exit of firms
Scale effects

• Cost disadvantage ratio: A measure of unexploited scale economies

\[ CDR = \frac{AC(x) - MC(x)}{AC(x)} = \frac{FC}{TC(x)} \]

• \(1/(1-CDR)\) = Output elasticity
Scale Effects

\[ \hat{x} = \hat{Z} + \frac{CDR}{1 - CDR} \times \hat{Z} \]

(all, i, OLIG_COMM)(all, r, REG)

\[ \text{OSCALE}(i, r) = \text{SCALE}(i, r) \times \left[ \text{qva}(i, r) - \text{firms}(i, r) \right] - \text{ao}(i, r); \]

Exogenous variable = 0

\[ \frac{CDR}{1 - CDR} \]

Input level on a per firm basis

\[ \hat{x} - \hat{Z} \]

Endogenous “change” in CRTS technology: observationally equivalent to IRTS
Mark-ups

- Mark-ups are inversely related to output per firm:

\[ \hat{M} = -\frac{\Omega_F}{1 - \Omega_{\Pi}} \hat{\chi} \]
Mark-up in supply price equation

\[ ps(i,r) = to(i,r) + pm(i,r) - p_{AC\_MARKUP}(i,r); \]

- Power a.v. subsidy
- Mark-up acts like a tax = -subsidy
I. Welfare

• Comparison of three scenarios:
  ◦ FTA
    • Morocco eliminates all tariffs on EU manufactures
  ◦ Multilateral (base)
    • All countries cut tariffs by 30% across all sectors.
  ◦ Multilateral (extension)
    • All countries cut tariffs by 5% across all sectors.

• No entry/exit and full employment
Welfare Change

\[
\frac{dV}{V_E} = t \times dm - m \times dp + \left[ p + t - a \right] \times dX - X \times a_x \times dx
\]

Terms of Trade Effect

Trade Volume = Alloc. Efficiency Effect

Scale Effect

Profit Shifting Effect

V: indirect utility function

V_E: marginal utility of expenditure

m: net imports; p: prices

t: tariffs

X: industry output

x: output per firm

a: average cost; a_x: ∂a/∂x
In GTAP

Equation EV_DECOMPOSITION

\[ EV_{ALT}(r) = \ldots + \left[ \sum_{i,NSAV\_COMM} PTAX(i,r) \times [qo(i,r) - pop(r)] \right] + \]

Profit shifting effect (output tax in standard model)

\[ \ldots + \sum_{i,PROD\_COMM} VOA(i,r) \times ao(i,r) \ldots \]

Scale effect (technical change in standard model)
## Welfare effects

<table>
<thead>
<tr>
<th></th>
<th>FTA (Morocco industrial tariffs cut to 0)</th>
<th>Multilateral: Base (30%)</th>
<th>Multilateral: Extension (5%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total welfare</td>
<td>-189.5</td>
<td>414.6</td>
<td>64.09</td>
</tr>
<tr>
<td>Allocative efficiency</td>
<td>620.5</td>
<td>622.1</td>
<td>97.36</td>
</tr>
<tr>
<td>Scale economies</td>
<td>-313.8</td>
<td>-18.7</td>
<td>-5.88</td>
</tr>
<tr>
<td>Terms of trade</td>
<td>-660.3</td>
<td>-188.7</td>
<td>-27.39</td>
</tr>
<tr>
<td><em>Transfer from EU</em></td>
<td>164</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No entry/exit and full employment, all scenarios
## Welfare effects: allocative efficiency

<table>
<thead>
<tr>
<th></th>
<th>Multilateral: Extension (5%)</th>
<th>FTA (Morocco industrial tariffs cut to 0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocative efficiency</td>
<td>97.36</td>
<td>620.5</td>
</tr>
<tr>
<td>Profit-shifting</td>
<td>1.7</td>
<td>153.9</td>
</tr>
<tr>
<td>Input tax</td>
<td>-0.3</td>
<td>-27.7</td>
</tr>
<tr>
<td>Consumption tax</td>
<td>1.3</td>
<td>-74.1</td>
</tr>
<tr>
<td>Export tax</td>
<td>6.2</td>
<td>118</td>
</tr>
<tr>
<td>Import tax</td>
<td>88.4</td>
<td>450.4</td>
</tr>
</tbody>
</table>

No entry/exit and full employment
2. SECTORAL ANALYSIS

- GE linkages with & without perfect competition and IRS

- Sectoral analysis:
  - Motor vehicle and parts
  - Light manufacturing
PERFECT COMPETITIVE MARKET

• Manufacture’s import tax has been removed.
  \[ p_{ms} = t_m + t_{ms} + p_{cif} \]
  \(<0 \quad 0 \quad <0 \quad 0\)

• Import demand (qxs) is driven by a trade creation and diversion effect. Under FTA: Morocco imports more, mostly from EU and less from ROW.

• Morocco substitutes away from domestically produced manufactures.

• Pressure to reduce market price and therefore to reduce the supply price:
  \[ p_{s} = t_o + p_{m} \]

• Therefore: \(\downarrow p_{m} = \downarrow p_{s}\) so output likely to decline & few expand (GE effect).
IMPERFECT COMPETITION & IRS

- Manufacture’s import tax has been removed.
  \[ pms = tm + tms + pcif \]
  \[ <0 \quad 0 \quad <0 \quad 0 \]

- Import demand is driven by a trade creation and diversion effect.

- Moroccan consumers substitute away from domestically produced manufactures.

- Pressure to reduce market price but
  \[ ps = to + pm + \text{markup} \]

- Perfect comp: \( \downarrow pm = \downarrow ps \)
- Imperfect comp: \( \text{markup} = \downarrow pm - \text{depends on} \ ps \)

- \( ps \) zero profit if \( ps = \text{weighted sum average of input prices} - ao \)

- \( \text{OSCALE} = \text{SCALE} \times [\text{qva - firms}] - ao \)

- \( \text{Exo vari} = 0 \)

FTA/NOENTRY

Endogenous “change” in CRTS technology: observationally equivalent to IRTS
MOTOR VEHICLES SECTOR

- **PRICES:**
  
  \[ p_{\text{ms}}(mvt,EU,Mor) = f(tms, pcif) \]
  
  -21.2 -21.2

- **IMPORT DEMAND OF MOROCCO:**
  
  \[ q_{\text{x}}(mvt,EU,Mor) = \text{trade creation effect} + \text{trade diversion effect} \]
  
  >0 >0
MOTOR VEHICLES SECTOR

- IMPORT MARKET CLEARING COND:
  \[ q_{im}(mvt, Mor) = f(q_{fm}, q_{pm}, q_{gm}) \]
  
  \[ \begin{array}{cccc}
  48.1 & 42.2 & 2.1 & 3.8 \\
  \end{array} \]

- DOMESTIC MARKET CLEARING COND:
  \[ q_{ds}(mvt, Mor) = f(q_{fd}, q_{pd}, q_{gd}) \]
  
  \[ \begin{array}{cccc}
  -46.8 & -43.8 & -1.6 & -1.4 \\
  \end{array} \]
MOTOR VEHICLES SECTOR

- **MARKET CLEARING CONDITION:**
  \[ q_0(mvt, Mor) = f(q_{ds}, q_{xs}) \]
  
  \[
  \begin{array}{ccc}
  -39 & -46.8 & 6.4 \\
  \end{array}
  \]

- **SUPPLY PRICES:**
  \[ ps(mvt, Mor) = f(pm, markup) \]
  
  \[
  \begin{array}{ccc}
  6.2 & -10.2 & -15.5 \\
  \end{array}
  \]
# Light Manufacturing - Values

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>tms(lmn,EU,MOR)</td>
<td>-10.6</td>
<td>tariff on EU-sourced goods removed</td>
</tr>
<tr>
<td>pms(lmn,EU,MOR)</td>
<td>-10.6</td>
<td>EU-sourced goods fall in price in MOR</td>
</tr>
<tr>
<td>pcif(lmn,EU,MOR)</td>
<td>.02</td>
<td>negligible change</td>
</tr>
<tr>
<td>qxs(lmn,EU,MOR)</td>
<td>27.25</td>
<td>increased imports from EU</td>
</tr>
<tr>
<td>qim(lmn,MOR)</td>
<td>12.82</td>
<td>increased imports into MOR</td>
</tr>
<tr>
<td>pim(lmn,MOR)</td>
<td>-8.66</td>
<td>price of imports into MOR fall</td>
</tr>
<tr>
<td>qxs(lmn,MOR,else)</td>
<td>43</td>
<td>quantity exported from MOR increases</td>
</tr>
<tr>
<td>qds(lmn,MOR)</td>
<td>-3.4</td>
<td>fall in domestic demand for dom. product</td>
</tr>
<tr>
<td>ps(lmn,MOR)</td>
<td>-7.03</td>
<td>supply price falls due to returns to scale</td>
</tr>
<tr>
<td>pm(lmn,MOR)</td>
<td>-6.31</td>
<td>MOR market price falls</td>
</tr>
<tr>
<td>p_AC_MARKUP(lmn,MOR)</td>
<td>.77</td>
<td>markup increases slightly</td>
</tr>
</tbody>
</table>
LIGHT MANUFACTURING

Formulas

- MKTPRICES: \( p_{ms(lmn,r,s)} = f(tms,pcif) \)

- IMPORTDEMAND: \( q_{xs(lmn,r,s)} = f(q_{im}, p_{ms}, p_{im}) \)

- MKTCLTRD_NMRG: \( q_{o(lmn,r)} = f(q_{ds}, q_{xs}) \)

- SUPPLYPRICES: \( p_{s(lmn,r)} = f(pm, p_{AC\_MARKUP}) \)
Tentative Conclusion (n=2)

- High markups are decimated by new competition

- With increasing returns, competitive sectors have opportunity to benefit from increased scale of production
3. Output scaling effect

Clothing and Metal Industries
No Entry/Exit vs Entry/Exit
3. Output scaling effect

Clothing and Metal Industries
No Entry/Exit vs Entry/Exit
Production structure

Moroccan Metal sector

\[ q_0(j, r) \]

CES (ESUBT=0)

\[ q_v a(j, r) \]
\[ q_f(i, j, r) \]

CES, ESUBD=5.6

\[ q_{fd}(i, j, r) \]
\[ q_{fm}(i, j, r) \]

CES, ESUBM= 5.6

EU

ROW
Scale Economies

SE equation in TAB

OSCALE(i, r) = SCALE(i, r) * [qva(i, r) - firms(i, r)] - ao(i, r),

where SCALE: CDR/(1-CDR)
firms: % change in # of firms,
ao: Returns to scale measured by % change in output per firm, % change in composite input level per firm
Changes in Industry output

Percent changes in qo with No Entry/Exit

<table>
<thead>
<tr>
<th></th>
<th>MOR</th>
<th>EU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clothing</td>
<td>7.71</td>
<td>0.07</td>
</tr>
<tr>
<td>Metal</td>
<td>-13.18</td>
<td>0.05</td>
</tr>
</tbody>
</table>
# Input Analysis

## Moroccan Side Entry/Exit vs No Entry/Exit

<table>
<thead>
<tr>
<th></th>
<th>No Entry/Exit</th>
<th></th>
<th>Entry/Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Clothing</td>
<td>Metal</td>
<td>Clothing</td>
</tr>
<tr>
<td>qo (Change in total output)</td>
<td>7.71</td>
<td>-13.18</td>
<td>14.36</td>
</tr>
<tr>
<td>qva</td>
<td>7.615</td>
<td>-12.024</td>
<td>14.046</td>
</tr>
<tr>
<td>Input per Firm</td>
<td>7.615</td>
<td>-12.024</td>
<td>26.6481</td>
</tr>
<tr>
<td>Change in No. of firms</td>
<td>0</td>
<td>0</td>
<td>-12.602</td>
</tr>
<tr>
<td>ao (returns to scale)</td>
<td>0.08446</td>
<td>-1.31211</td>
<td>0.27888</td>
</tr>
</tbody>
</table>
## Industry Cost Shares

### Clothing and Metal Industries

<table>
<thead>
<tr>
<th></th>
<th>Clothing</th>
<th>Metal</th>
</tr>
</thead>
<tbody>
<tr>
<td>UnSkLab</td>
<td>0.589</td>
<td>0.418</td>
</tr>
<tr>
<td>SkLab</td>
<td>0.09</td>
<td>0.074</td>
</tr>
<tr>
<td>Capital</td>
<td>0.321</td>
<td>0.508</td>
</tr>
</tbody>
</table>