Discussion of: Innovation and the Elasticity of Trade Volumes to Tariff Reductions

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May 12, 2010
Summary: Model of Trade and Innovation ⇒ High Trade Elasticity


Features:
- Innovation increases with underlying productivity
- Discrete jump in innovation as export status changes

Calibration:
- Firm size data
- Productivity gain from NAFTA
- Key: No apparent high elasticity built in.

Result: Simulation of NAFTA ⇒ high trade elasticity as in data.
Plan of My Discussion

My own model of innovation and trade

Helps me identify three issues

• Mechanism behind the results

• Calibration

• Motivating the enterprise
My Model of Innovation

Eaton and Kortum (2002) style model:

• A continuum of tradable goods \( x(j), j \in [0, 1] \).

• CES demand.
Production

Representative firm producing good $j$ faces the problem:

$$\max_{z,n} \ p\theta zn - wn - \theta z^\alpha wn$$

$\theta =$ productivity specific to good $j$

$n =$ labor

$z =$ innovation

$\alpha > 1$
Production

Representative firm producing good $j$ faces the problem:

$$\max_{z,n} p\theta zn - wn - \theta z^\alpha wn$$

Basically, an “AK” model . . .

with convex adjustment cost where . . .

- Higher $\theta \rightarrow$ more costly to innovate
- Higher wage bill $\rightarrow$ more costly to innovate

Intuition: “It’s costly to turn an oil supertanker”
Innovation Choice

Optimal innovation choice for producer of good $j$

$$z^* = (\alpha - 1)^{-\frac{1}{\alpha}} \times \theta^{-\frac{1}{\alpha}}$$

Innovation decreases in $\theta$.

More intuition:

- If you are born productive, no need to innovate
- If you are born unproductive, innovate to overcome bad draw
Prices

Price sold at home . . .

\[ p = \lambda \frac{w}{\theta \frac{\alpha - 1}{\alpha}} \]

Key result:

- Innovation compresses ex-ante heterogeneity in \( \theta \)
- Catch-up through innovation is the driving force
- As \( \alpha \to \infty \), it collapses to standard Eaton and Kortum type Ricardian model.
θ Distribution
\( \theta^{\frac{\alpha - 1}{\alpha}} \) Distribution
Calibration

Preferences: $\sigma = 2$

Distributions: Truncated Pareto with $\eta = 2, \bar{\theta} = 20$

Countries: 2 symmetric

Exercise:

- Pick an $\alpha$
- Put in some trade costs
- Liberalize
- Measure the change in trade flows relative to change in trade costs
Results

<table>
<thead>
<tr>
<th>$\alpha$</th>
<th>1.20</th>
<th>1.30</th>
<th>2.00</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elasticity</td>
<td>15.5</td>
<td>10.6</td>
<td>5.3</td>
<td>2.7</td>
</tr>
</tbody>
</table>
What’s Behind These Results?

Intuition:

• Innovation choice compresses ex-ante heterogeneity in productivity

• Thus small changes in trade costs ⇒ large changes in trade volumes

• In Eaton and Kortum (2002) terminology:
  It’s endogenizing the shape parameter on the Fréchet distribution to be higher.
Very different forces in Rubini (2010)

Rubini (2010):

1. Innovation choice increases with underlying productivity
2. Extensive margin + discrete change in innovation choice

Point one works in the wrong direction in my model:

- Suppose innovation amplified ex-ante heterogeneity in productivity
- Then small changes in trade costs ⇒ small changes in trade volumes

Point two must be the dominant force in Rubini (2010)

- I’m kind of guessing here, but I want to know...
- My main comment: Explain this force in a clear and transparent way.
Rubini’s (2010) Modeling Choices Facilitate Calibration

My model:

- Could I every identify $\alpha$ versus ex-ante heterogeneity?
- Is Bill Gates rich because he had a good draw . . . or innovated?

Rubini (2010):

- Discrete jump in productivity with export status $\Rightarrow \Delta$ in productivity identifies $\alpha$ versus ex-ante heterogeneity
- This is great, but more space/time should be devoted to this. This is the key calibration issue.
What’s the Point?

My model:

• I endogenized the shape parameter in the distribution. But why not just start with a large (low variance) shape parameter . . .

• Skip the “oil tanker story”.

Rubini (2010):

• Subject to the same critique.

Yi (2003) and Ruhl (2008) have answers . . .

• But does Rubini (2010) generate non-linearities or low “high-frequency” elasticity?

• Mine has neither.