Comparative Advantage and Optimal Trade Taxes

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Motivation

• Two central questions...
  
  1. Why do nations trade?
  2. How should they conduct trade policy?

• Theory of comparative advantage
  → Influential answer to #1
  → Virtually no impact on #2
This Paper

• Take canonical Ricardian model
  • simplest and oldest theory of CA
  • new workhorse model for theoretical and quantitative work
• Explore relationship...

CA ↔ Optimal Trade Taxes
Main Result

• Optimal trade taxes:
  1. uniform across imported goods
  2. monotone in CA across exported goods
Main Result

• Examples:

  zero import tariff + export taxes increasing in CA

  Positive import tariff + export subsidies decreasing in CA
Simple Economics
Simple Economics

- More room to manipulate prices in comparative advantage sectors
Simple Economics

- More room to manipulate prices in comparative advantage sectors
- New perspective on targeted industrial policy
Simple Economics

• More room to manipulate prices in comparative advantage sectors

• New perspective on targeted industrial policy

• larger subsidies for less competitive sectors not from desire to expand output ...
Simple Economics

• More room to manipulate prices in comparative advantage sectors

• New perspective on targeted industrial policy
  
  • larger subsidies for less competitive sectors not from desire to expand output ...

• ... but greater constraints to contract exports to exploit monopoly power
Two Applications

- Agriculture and Manufacturing examples
- GT under optimal trade taxes are 20% and 33% larger than under no taxes
- GT under under optimal uniform tariff are only 9% larger than under no taxes

Micro-level heterogeneity matters for design and gains from optimal trade policy
Related Literature

• Optimal Taxes in an Open Economy:
  • General results: Dixit (85), Bond (90)
  • Ricardo: Itoh Kiyono (87), Opp (09)

• Lagrangian Methods:
  • Lagrangian methods in infinite dimensional space: AWA (06), Amador Bagwell (13)
  • Cell-problems: Everett (63), CLW (13)
Roadmap

• Basic Environment
• Optimal Allocation
• Optimal Trade Taxes
• Applications
Basic Environment
A Ricardian Economy

- Two countries: Home and Foreign
- Labor endowments: $L$ and $L^*$
- CES utility over continuum of goods:
  \[ U \equiv \int u_i(c_i) \, di \]
  \[ u_i(c_i) \equiv \beta_i \left( c_i^{1 - 1/\sigma} - 1 \right) / (1 - 1/\sigma) \]
- Constant unit labor requirements: $a_i$ and $a_i^*$
- Home sets trade taxes $t \equiv (t_i)$ and lump-sum transfer $T$
- Foreign is passive
Competitive Equilibrium
Competitive Equilibrium

\[c \in \arg \max_{\tilde{c} \geq 0} \left\{ \int_{i} u_i(\tilde{c}_i) di \mid \int_{i} p_i (1 + t_i) \tilde{c}_i di \leq wL + T \right\}\]
Competitive Equilibrium

\[ c \in \arg\max_{\tilde{c} \geq 0} \left\{ \int_{i} u_{i}(\tilde{c}_{i})di \left| \int_{i} p_{i} (1 + t_{i}) \tilde{c}_{i}di \leq wL + T \right. \right\} \]

\[ q_{i} \in \arg\max_{\tilde{q}_{i} \geq 0} \left\{ p_{i} (1 + t_{i}) \tilde{q}_{i} - wa_{i} \tilde{q}_{i} \right\} \]
Competitive Equilibrium

\[ c \in \operatorname{argmax}_{\tilde{c}_i \geq 0} \left\{ \int_i u_i(\tilde{c}_i) di \left| \int_i p_i (1 + t_i) \tilde{c}_i di \leq wL + T \right\} \]

\[ q_i \in \operatorname{argmax}_{\tilde{q}_i \geq 0} \left\{ p_i (1 + t_i) \tilde{q}_i - wa_i \tilde{q}_i \right\} \]

\[ T = \int_i p_i t_i (c_i - q_i) di \]
Competitive Equilibrium

\[ c \in \arg \max_{\tilde{c} \geq 0} \left\{ \int_i u_i(\tilde{c}_i)di \left| \int_i p_i (1 + t_i) \tilde{c}_i di \leq wL + T \right. \right\} \]

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\[ T = \int_i p_i t_i (c_i - q_i) di \]

\[ c^* \in \arg \max_{\tilde{c} \geq 0} \left\{ \int_i u_i^*(\tilde{c}_i)di \left| \int_i p_i \tilde{c}_i di \leq w^*L^* \right. \right\} \]
Competitive Equilibrium

\[c \in \arg\max_{\tilde{c} \geq 0} \left\{ \int_i u_i(\tilde{c}_i)di \mid \int_i p_i (1 + t_i) \tilde{c}_i di \leq wL + T \right\}\]

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\[c^* \in \arg\max_{\tilde{c} \geq 0} \left\{ \int_i u_i^*(\tilde{c}_i)di \mid \int_i p_i \tilde{c}_i di \leq w^*L^* \right\}\]

\[q^*_i \in \arg\max_{\tilde{q}_i \geq 0} \left\{ p_i \tilde{q}_i - w^*a_i \tilde{q}_i \right\}\]
Competitive Equilibrium

\[ c \in \arg\max_{\tilde{c} \geq 0} \left\{ \int_i u_i(\tilde{c}_i)di \left| \int_i p_i (1 + t_i) \tilde{c}_i di \leq wL + T \right. \right\} \]

\[ q_i \in \arg\max_{\tilde{q}_i \geq 0} \left\{ p_i (1 + t_i) \tilde{q}_i - wa_i \tilde{q}_i \right\} \]

\[ T = \int_i p_i t_i (c_i - q_i) di \]

\[ c^* \in \arg\max_{\tilde{c} \geq 0} \left\{ \int_i u_i^*(\tilde{c}_i)di \left| \int_i p_i \tilde{c}_i di \leq w^* L^* \right. \right\} \]

\[ q_i^* \in \arg\max_{\tilde{q}_i \geq 0} \left\{ p_i \tilde{q}_i - w^* a_i \tilde{q}_i \right\} \]

\[ c_i + c_i^* = q_i + q_i^*, \]
Competitive Equilibrium

\[ c \in \text{argmax}_{\tilde{c} \geq 0} \left\{ \int u_i(\tilde{c}_i) \, di \left| \int p_i (1 + t_i) \, \tilde{c}_i \, di \leq wL + T \right. \right\} \]

\[ q_i \in \text{argmax}_{\tilde{q}_i \geq 0} \left\{ p_i (1 + t_i) \, \tilde{q}_i - w a_i \tilde{q}_i \right\} \]

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\[ c_i + c_i^* = q_i + q_i^* , \]

\[ \int a_i q_i \, di = L , \]
Competitive Equilibrium

c \in \operatorname{argmax}_{\tilde{c} \geq 0} \left\{ \int u_i(\tilde{c}_i)di \left| \int p_i (1 + t_i) \tilde{c}_i di \leq wL + T \right. \right\}

q_i \in \operatorname{argmax}_{\tilde{q}_i \geq 0} \left\{ p_i (1 + t_i) \tilde{q}_i - wa_i \tilde{q}_i \right\}

T = \int p_i t_i (c_i - q_i) di

c^* \in \operatorname{argmax}_{\tilde{c} \geq 0} \left\{ \int u^*_i(\tilde{c}_i)di \left| \int p_i \tilde{c}_i di \leq w^*L^* \right. \right\}

q^*_i \in \operatorname{argmax}_{\tilde{q}_i \geq 0} \left\{ p_i \tilde{q}_i - w^* a_i \tilde{q}_i \right\}

c_i + c^*_i = q_i + q^*_i,

\int a_i q_i di = L,

\int a^*_i q^*_i di = L^*. 
Government Problem
Government Problem

c \in \text{argmax}_{\tilde{c} \geq 0} \left\{ \int_{i} u_{i}(\tilde{c}_{i}) \, di \Big| \int_{i} p_{i} (1 + t_{i}) \tilde{c}_{i} \, di \leq wL + T \right\}

q_{i} \in \text{argmax}_{\tilde{q}_{i} \geq 0} \left\{ p_{i} (1 + t_{i}) \tilde{q}_{i} - wa_{i} \tilde{q}_{i} \right\}

T = \int_{i} p_{i} t_{i} (c_{i} - q_{i}) \, di

c^{*} \in \text{argmax}_{\tilde{c} \geq 0} \left\{ \int_{i} u^{*}_{i}(\tilde{c}_{i}) \, di \Big| \int_{i} p_{i} \tilde{c}_{i} \, di \leq w^{*}L^{*} \right\}

q^{*}_{i} \in \text{argmax}_{\tilde{q}_{i} \geq 0} \left\{ p_{i} \tilde{q}_{i} - w^{*} a^{*}_{i} \tilde{q}_{i} \right\}

c_{i} + c^{*}_{i} = q_{i} + q^{*}_{i}

\int_{i} a_{i} q_{i} \, di = L,

\int_{i} a_{i}^{*} q^{*}_{i} \, di = L^{*}. 
Government Problem

\[
\max_{t, T, w, w^*, p, c, c^*, q, q^*} \quad U(c)
\]

\[s.t.
\]
\[
c \in \arg\max_{\tilde{c} \geq 0} \left\{ \int_i u_i(\tilde{c}_i)di \bigg| \int_i p_i (1 + t_i) \tilde{c}_i di \leq wL + T \right\}
\]
\[
q_i \in \arg\max_{\tilde{q}_i \geq 0} \left\{ p_i (1 + t_i) \tilde{q}_i - wa_i \tilde{q}_i \right\}
\]
\[
T = \int_i p_i t_i (c_i - q_i) di
\]
\[
c^* \in \arg\max_{\tilde{c} \geq 0} \left\{ \int_i u^*_i(\tilde{c}_i)di \bigg| \int_i p_i \tilde{c}_i di \leq w^* L^* \right\}
\]
\[
q^*_i \in \arg\max_{\tilde{q}_i \geq 0} \left\{ p_i \tilde{q}_i - w^* a_i^* \tilde{q}_i \right\}
\]
\[
c_i + c^*_i = q_i + q^*_i
\]
\[
\int_i a_i q_i di = L,
\]
\[
\int_i a^*_i q^*_i di = L^*.
\]
Optimal Allocation
Let us Relax

• Primal approach (Baldwin 48, Dixit 85):
  
  → No taxes, no competitive markets at home
  
  → Domestic government directly controls domestic consumption, $c$, and output, $q$
Planning Problem

\[
\begin{align*}
\text{max} \quad & U(c) \\
\text{s.t.} \quad & t, T, w, w^*, p, c, c^*, q, q^* \\
& c \in \arg\max_{\tilde{c} \geq 0} \left\{ \int_i u_i(\tilde{c}_i)di \bigg| \int_i p_i(1 + t_i)\tilde{c}_i di \leq wL + T \right\} \\
& q_i \in \arg\max_{\tilde{q}_i \geq 0} \left\{ p_i(1 + t_i)\tilde{q}_i - wa_i\tilde{q}_i \right\} \\
& T = \int_i p_i t_i (c_i - q_i) di \\
& c^* \in \arg\max_{\tilde{c} \geq 0} \left\{ \int_i u^*_i(\tilde{c}_i)di \bigg| \int_i p_i\tilde{c}_i di \leq w^*L^* \right\} \\
& q^*_i \in \arg\max_{\tilde{q}_i \geq 0} \left\{ p_i\tilde{q}_i - w^*a_i\tilde{q}_i \right\} \\
& c_i + c^*_i = q_i + q^*_i \\
& \int_i a_iq_idi = L, \\
& \int_i a^*_i q^*_id = L^*. 
\end{align*}
\]
Planning Problem

\[
\begin{align*}
\max & \quad U(c) \\
\text{s.t.} & \quad c^* \in \arg\max_{c \geq 0} \left\{ \int_i u_i^*(\tilde{c}_i) di \bigg| \int_i p_i \tilde{c}_i di \leq w^* L^* \right\} \\
& \quad q_i^* \in \arg\max_{\tilde{q}_i \geq 0} \left\{ p_i \tilde{q}_i - w^* a_i^* \tilde{q}_i \right\} \\
& \quad c_i + c_i^* = q_i + q_i^* \\
& \quad \int_i a_i q_i di = L, \\
& \quad \int_i a_i^* q_i^* di = L^*. 
\end{align*}
\]
Planning Problem

\[
\max_{w^*, p, c, c^*, q, q^*} U(c)
\]

s.t.
\[
c^* \in \arg\max_{\tilde{c} \geq 0} \left\{ \int_i u^*_i(\tilde{c}_i)di \text{ s.t. } \int_i p_i \tilde{c}_i di \leq w^* L^* \right\}
\]
\[
q_i^* \in \arg\max_{\tilde{q}_i \geq 0} \left\{ p_i \tilde{q}_i - w^* a^*_i \tilde{q}_i \right\}
\]
\[
c_i + c^*_i = q_i + q^*_i
\]
\[
\int_i a_i q_i di = L,
\]
\[
\int_i a^*_i q^*_i di = L^*.
\]
Planning Problem

• Convenient to focus on 3 key controls:

\[ q, m = c - q, w^* \]

• Equilibrium abroad requires...

\[
\begin{align*}
p_i (m_i, w^*) &\equiv \min \{ u_i' (-m_i), w^* a_i^* \}, \\
q_i^* (m_i, w^*) &\equiv \max \{ m_i + d_i^* (w^* a_i^*), 0 \}
\end{align*}
\]
Planning Problem

\[
\max_{w^*, p, c, c^*, q, q^*} U(c)
\]

s.t.

\[
c^* \in \arg\max_{\tilde{c} \geq 0} \left\{ \int_i u_i^*(\tilde{c}_i)di \left| \int_i p_i \tilde{c}_i di \leq w^* L^* \right. \right\}
\]

\[
q_i^* \in \arg\max_{\tilde{q}_i \geq 0} \{ p_i \tilde{q}_i - w^* a_i^* \tilde{q}_i \}
\]

\[
c_i + c_i^* = q_i + q_i^*
\]

\[
\int_i a_i q_i di = L,
\]

\[
\int_i a_i^* q_i^* di = L^*.
\]
Planning Problem

\[ \max_{w^*, p, c, c^*, q, q^*} U(c) \]
Planning Problem

\[
\max_{w^*, p, c, c^*, q, q^*} \quad U(c)
\]

s.t.

\[
\int_i a_i q_i \, di \leq L,
\]
Planning Problem

\[
\begin{align*}
\max & \quad U(c) \\
\text{s.t.} & \quad a_i q_i (m_i, w^*) \leq L^*, \\
& \quad \int a_i q_i di \leq L,
\end{align*}
\]
Planning Problem

\[
\begin{align*}
\text{max} & \quad U(c) \\
\text{s.t.} & \quad w^*, p, c, c^*, q, q^* \\
& \quad \int a_i q_i di \leq L, \\
& \quad \int a_i^* q_i^* (m_i, w^*) di \leq L^*, \\
& \quad \int p_i(m_i, w^*) m_i di \leq 0
\end{align*}
\]
Planning Problem

\[
\max_{w^*, m, q} \quad U(c)
\]

s.t.

\[
\int_i a_i q_i di \leq L,
\]

\[
\int_i a_i^* q_i^* (m_i, w^*) di \leq L^*,
\]

\[
\int_i p_i(m_i, w^*) m_idi \leq 0
\]
Planning Problem

\[
\max_{w^*, m, q} \quad U(m + q)
\]

s.t.

\[
\int a_i q_i \, di \leq L,
\]

\[
\int a^*_i q^*_i (m_i, w^*) \, di \leq L^*,
\]

\[
\int p_i(m_i, w^*) m_i \, di \leq 0
\]
Three Steps

1. Decompose
   (i) inner problem $m, q$
   (ii) outer problem $w^*$

2. Concavity of inner problem
   Lagrangian Theorems (Luenberger 69)

3. Additive separability implies... (Everett 63)
   one infinite-dimensional problem
   many low-dimensional problems
Inner Problem

\[
\begin{align*}
\max_{w^*, m, q} & \quad U(m + q) \\
\text{s.t.} & \quad \int_i a_i q_i \, di \leq L, \\
& \quad \int_i a^* q^*_i (m_i, w^*) \, di \leq L^*, \\
& \quad \int_i p_i(m_i, w^*) m_i \, di \leq 0
\end{align*}
\]
Inner Problem

\[
\begin{align*}
\text{max} \quad U(m + q) \\
\text{s.t.} \quad m, q \\
\quad \int_i a_i q_i \, di \leq L, \\
\quad \int_i a_i^* q_i^* (m_i, w^*) \, di \leq L^*, \\
\quad \int_i p_i(m_i, w^*) m_i \, di \leq 0
\end{align*}
\]
Lagrangian

\[ \mathcal{L} (m, q, \lambda, \lambda^*, \mu; w^*) \equiv \int \mathcal{L}_i (m_i, q_i, \lambda, \lambda^*, \mu; w^*) \, di \]

\[ \mathcal{L}_i (m_i, q_i, \lambda, \lambda^*, \mu; w^*) \equiv u_i (q_i + m_i) - \lambda a_i q_i - \lambda^* a_i^* q_i^* (m_i, w^*) - \mu p_i (m_i, w^*) m_i \]
Lagrangian Theorem

• $(m^0, q^0)$ solves inner problem iff

$$\max_{m,q} \mathcal{L} (m, q, \lambda, \lambda^*, \mu; w^*)$$

for some $(\lambda, \lambda^*, \mu)$ and

$$\lambda \geq 0, \int_i a_i q_i^0 di \leq L, \text{ with complementary slackness},$$

$$\lambda^* \geq 0, \int_i a_i^* q_i^* (m_i^0, w^*) di \leq L^*, \text{ with complementary slackness},$$

$$\mu \geq 0, \int_i p_i(m_i, w^*)m_i^0 di \leq 0, \text{ with complementary slackness}.$$
Cell Structure

• $(m^0, q^0)$ solves inner problem iff $(m_i^0, q_i^0)$ solves

$$\max_{m_i, q_i} \mathcal{L}_i (m_i, q_i, \lambda, \lambda^*, \mu; w^*)$$

for some $(\lambda, \lambda^*, \mu)$ and

$$\lambda \geq 0, \int_i a_i q_i^0 \, di \leq L, \text{ with complementary slackness},$$

$$\lambda^* \geq 0, \int_i a_i q_i^* (m_i^0, w^*) \, di \leq L^*, \text{ with complementary slackness},$$

$$\mu \geq 0, \int_i p_i(m_i, w^*)m_i^0 \, di \leq 0, \text{ with complementary slackness}.$$
High-School Math: Optimal Output
High-School Math: Optimal Output

\[ q_i, q_i^* \]

\[ m_i \]

\[ M_{i}^{I} \quad 0 \quad M_{i}^{II} \]
High-School Math: Optimal Net Imports
High-School Math: Optimal Net Imports

Figure 1: Optimal net imports.

(a) $a_i/a_i^* < A^I$.

(b) $a_i/a_i^* \in [A^I, A^{II})$.

(c) $a_i/a_i^* = A^{II}$.

(d) $a_i/a_i^* > A^{II}$.
Optimal Trade Taxes
Wedges

• Wedges at planning problem’s solution:

\[ \tau_i^0 \equiv \frac{u_i'(c_i^0)}{p_i^0} - 1 \]

• Previous analysis implies:

\[
\tau_i^0 = \begin{cases} 
\frac{\sigma^* - 1}{\sigma^*} \mu^0 - 1, & \text{if } \frac{a_i}{a_i^*} < A^I \equiv \frac{\sigma^* - 1}{\sigma^*} \frac{\mu^0 w^{0*}}{\lambda^0}; \\
\frac{\lambda^0 a_i}{w^{0*} a_i^*} - 1, & \text{if } A^I < \frac{a_i}{a_i^*} \leq A^{II} \equiv \frac{\mu^0 w^{0*} + \lambda^0}{\lambda^0}; \\
\frac{\lambda^{0*}}{w^{0*}} + \mu^0 - 1, & \text{if } \frac{a_i}{a_i^*} > A^{II}.
\end{cases}
\]
Optimal Trade Taxes

- Any solution to Home's planning problem can be implemented by \( t^0 = \tau^0 \)

- Conversely, if \( t^0 \) solves the domestic's government problem, then the associated allocation and prices must solve Home’s planning problem and satisfy:

\[
\begin{align*}
\tau_i^0 &= \frac{u'_i (c_i^0)}{\theta p_i^0} - 1 \\
1 + t_i^0 &= \frac{1 + \tau_i^0}{\theta}
\end{align*}
\]
Optimal Trade Taxes
Optimal Trade Taxes

\[ \bar{t} = \frac{A^I}{A^II} - 1 \]

(a) Export taxes

(b) Export subsidies and import tariffs
Intuition

• When $a_i/a_i^* < A^I$, Home has incentives to charge *constant monopoly markup*

• When $a_i/a_i^* \in [A^I, A^{III}]$, there is *limit pricing*: foreign firms are exactly indifferent between producing and not producing those goods

• When $a_i/a_i^* > A^{III}$, *uniform tariff* is optimal: Home cannot manipulate relative prices
Industrial Policy Revisited
Industrial Policy Revisited

• At the optimal policy, governments protects a subset of less competitive industries

• but targeted/non-uniform subsidies do not stem from a greater desire to *expand* production...

• ...they reflect tighter constraints on ability to exploit monopoly power by *contracting* exports
Industrial Policy Revisited

- At the optimal policy, governments protect a subset of less competitive industries
- but targeted/non-uniform subsidies do not stem from a greater desire to expand production...
- ...they reflect tighter constraints on ability to exploit monopoly power by contracting exports
- Countries have more room to manipulate world prices in their comparative-advantage sectors
Robustness

- Similar qualitative results hold in more general environments:
  - Iceberg trade costs
  - Separable, but non-CES utility

- Additional considerations:
  - Trade costs imply that zero imports are optimal for some goods at solution of Home’s planning problem
  - Non-CES utility leads to variable markups for goods with strongest CA
Applications
Agricultural Example

- Home = U.S.  Foreign = R.O.W.
- Each good corresponds to 1 of 39 crops
- Land is the only factor of production
  - Productivity from FAO’s GAEZ project
  - Land endowments match acreage devoted to 39 crops in U.S. and R.O.W.
- Symmetric CES utility with $\sigma=2.9$ as in BW (06)
Optimal Trade Taxes
Optimal Trade Taxes

Figure 3: Optimal trade taxes for the agricultural case. The left panel assumes no trade costs, $d = 0$. The right panel assumes trade costs, $d = 1.72$.

crops $i$ as a function of comparative advantage, $a_i / a_i^*$, in the calibrated examples without trade costs, $d = 1$, and with trade costs, $d = 1.72$, respectively.

The region between the two vertical lines in the right panel corresponds to goods that are not traded at the solution of Home's planning problem.

As discussed in Section 4.2, the overall level of taxes is indeterminate. Figure 3 focuses on a normalization with zero import tariffs. In both cases, the maximum export tax is close to the optimal monopoly markup that a domestic firm would have charged on the foreign market, $s / (s - 1)$. The only difference between the two markups comes from the fact that the domestic government internalizes the effect that the net imports of each good have on the foreign wage. Specifically, if the Lagrange multiplier on the foreign resource constraint, $l_0^*$, was equal to zero, then the maximum export tax, which is equal to $A_{II} / A_{II}$, would simplify into the firm-level markup, $s / (s - 1)$. In other words, such general equilibrium considerations appear to have small effects on the design of optimal trade taxes for goods in which the U.S. comparative advantage is the strongest. In light of the discussion in Section 4.3, these quantitative results suggest that if domestic firms were to act as monopolists rather than take prices as given, then the domestic government could get close to the optimal allocation by only using consumption...
Gains from Trade
## Gains from Trade

<table>
<thead>
<tr>
<th></th>
<th>No Trade Costs</th>
<th>Trade Costs</th>
</tr>
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<tbody>
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<td>U.S.</td>
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<tr>
<td>Laissez-Faire</td>
<td>39.15%</td>
<td>3.02%</td>
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<td>Uniform Tariff</td>
<td>42.60%</td>
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<td>Optimal Taxes</td>
<td>46.92%</td>
<td>0.12%</td>
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<td></td>
<td>5.44%</td>
<td>0.16%</td>
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<td></td>
<td>5.71%</td>
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Manufacturing Example

- Home=U.S. and Foreign=R.O.W.
- 400 goods. Labor is the only factor of production
- Labor endowments set to match population in U.S. and R.O.W.
- Productivity is distributed Fréchet:

\[ a_i = \left( \frac{i}{T} \right)^{\frac{1}{\theta}} \quad \text{and} \quad a_i^* = \left( \frac{1 - i}{T^*} \right)^{\frac{1}{\theta}} \]

- \( \theta=5 \) set to match average trade elasticity in HM (13).
- \( T \) and \( T^* \) set to match U.S. share of world GDP.
- Symmetric CES utility with \( \sigma=2.5 \) as in BW (06)
Optimal Trade Taxes
Optimal Trade Taxes

Figure 4: Optimal trade taxes for the manufacturing case. The left panel assumes no trade costs, $d = 0$. The right panel assumes trade costs, $d = 1.44$.

Results.

Table 2 displays welfare gains in the manufacturing sector. In the absence of trade costs, as shown in the first two columns, gains from trade for the U.S. are 33% larger under optimal trade taxes than in the absence of any trade taxes ($36.85/27.70 = 0.33$) and 86% smaller for the R.O.W. ($1/6.59 = 0.86$). This again suggests large inefficiencies from terms-of-trade manipulation at the world level. Compared to our agricultural exercise of Section 6.1, the share of the U.S. gains arising from the use of non-uniform trade taxes is now even larger: more than two thirds ($30.09/27.70 = 0.09$).

As in Section 6.1, although the gains from trade are dramatically reduced by trade costs—they go down to 6.18% and 2.02% for the U.S. and the R.O.W, respectively—the importance of non-uniform trade taxes relative to uniform tariffs remains broadly stable. In the presence of trade costs, gains from trade for the U.S., reported in the third column, are 49% larger under optimal trade taxes than in the absence of any trade taxes.
Gains from Trade
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Concluding Remarks

• First stab at how CA affects optimal trade policy
• Simple economics: countries have more room to manipulate prices in their CA sectors
• New perspective on targeted industrial policy
  • Larger subsidies are not about desire to expand, but constraint on ability to contract
Concluding Remarks

- More applications of our techniques ≠ market structures (e.g. BEJK, 2003; Melitz, 2003)
- Results suggest design and gains from trade policy depends on micro-level heterogeneity