

Strategic Trade Policy in General Oligopolistic Equilibrium

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Outline

- 1 Motivation and Contribution
- 2 The GOLE Apparatus (Neary 2003, JEEA) in a Nutshell
- 3 Preview of Main Results: The Effect of More Protectionism Across Sectors
- 4 Methodology
- 5 Results
- 6 Conclusions

Research Questions

- ① How does strategic trade policy (STP) affect wage rates, countrywide aggregate profits, and social welfare in general equilibrium?
- ② What policy should a (benevolent) government set?

Why Important and Interesting?

- For both tradition and technical difficulties, most of oligopoly applications have not considered factor markets.
The emphasis has been on purely partial equilibrium analysis (for further discussions, see Neary 2003, JEEA; Neary 2010, World Economy).
- STP has not been immunized from the partial equilibrium approach.

Two Classical Results from the Partial Equilibrium Literature

In order to move the domestic firms towards their Stackelberg leadership points, the optimal policy is:

Importing Country - Segmented Markets

IMPORT TARIFF, under some conditions
(Brander and Spencer 1984, JIE).

Exporting Country - Third Market

EXPORT SUBSIDY, under some conditions
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Two Missing Key Features

- No general equilibrium feedback from factor markets.
- No interaction among sectors.

Which Benefits from a General Equilibrium Framework?

Analyzing how trade policy, applied to many sectors, affects

- aggregate variables (i.e., countrywide aggregate profits and social welfare), and
- income distribution (i.e., workers vs. entrepreneurs).

Theoretical Motivations

- Sector linkages arise when different sectors compete for the same **scarce** factors of production.
- Going beyond the simple use of an “outside” good.
- Hence, STP literature suffers from a lack of theoretical foundation in general equilibrium on which policymakers ought to rely their policy decisions.

Previous Literature on STP with Sector Linkages

One work only: Dixit and Grossman 1986, JIE.

- Third-market framework (implying export subsidies and no consumer's welfare).
- Domestic resource constraint only (even though the foreign resource constraint is briefly mentioned).

Helping all domestic sectors implies no help to anyone because this rises the domestic factor reward only!

They propose to target the most welfare-enhancing industries. This requires very demanding information though.

The Idea and Contribution to the Literature

- Embedding the simplest STP model in **general equilibrium** that addresses Dixit and Grossman (1986)'s concern about **resource constraints**.
- **Home-market** framework (considering consumption too): more suitable for policy indications (on this point, see the book by Helpman and Krugman, 1989, "Trade Policy and Market Structure").
- As in many international sectors firms imperfectly compete, analyzing the STP in a general equilibrium perspective brings **new policy implications**.

Key Features

- Both domestic **and foreign** firms compete for one scarce factor of production in their respective countries in a full, though simple, two-country model.
- Factor rewards bring the main theoretical findings: a cross-sector STP affects the competition within sectors and, in turn, indirectly influences the input demands.

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The Ingredients

The GOLE approach provides a theoretical consistent tool to embed oligopoly in general equilibrium.

Demand Side

- Representative consumer with quadratic preferences on a continuum of (homogeneous) goods.
- No “outside” good (viz. no sector catching all income effects).

Supply Side and Factor Markets

- A continuum of sectors each producing one good with a Ricardian technology.
- Few firms in each sector strategically compete on quantity (i.e., à la Cournot).
- Only one factor of production. Since many firms demand the scarce input, factor markets are perfectly competitive.

Insight: Large in the Small and Small in the Large

- Firms have market power within their sector and they strategically compete with their direct rivals,
- but they cannot affect economy-wide variables: factor rewards, other goods prices, and national income.

Much of the GOLE literature has focused on multiple topics about international trade but it has not analyzed any STP issue yet.

The GOLE Literature: Some Key References

Cross-border mergers: Neary (2007, RESTUD);

Wage inequality and skill-premium: Neary (2002, RIE), Bastos and Straume (2012, CJE), Neary and Tharakan (2012, JIE);

Multi-product firms: Eckel and Neary (2010, RESTUD);

Unions and unemployment: Basile and De Benedictis (2008, PapRegSci), Bastos and Kreickemeier (2009, JIE), Egger and Etzel (2012, EER), Egger and Koch (2012, CJE), Kreickemeier and Meland (2012, Economica).

Simplifications to Convey the Intuition

- ① Duopoly in each sector.
- ② Same technology within each sector (even though different among sectors).
- ③ Perfectly symmetric countries (standard in international trade literature). But the foreign one does not set any trade policy (i.e., no retaliation).
- ④ Homogeneous goods.

Home-market Framework

- Domestic firms are not allowed to export (i.e., they produce for the domestic market only).
- Foreign firms export all their production to the domestic country only.

Two-stage Game

First stage: the domestic government moves (i.e., sets the trade policy).

Second stage: firms in each sector move (i.e., choose how much to produce) by taking government's choice as given.

Solved by **backward induction**.

Remark: the paper's aim is to analyze STP effects on the aggregate variables.

The work does not establish an optimal policy for any single sector. The policy for single sectors is well known from the partial equilibrium literature (i.e., import tariff if both demand and cost functions are linear, as here). See Brander and Spencer (1984, JIE).

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The Effect of a Cross-sector Rise in the Tariff (t) on the Variables of Interest

Effect of $dt > 0$ on the Wage Rates

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Foreign: negative. This potentially gives an advantage to foreign firms!

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Always negative.

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Implications for income distributions and political economy design.

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Preferences and Consumer's Problem

Standard quasi-homothetic preferences (a case of Gorman's polar form):

$$U[\{X(z)\}] = \int_0^1 aX(z) - \frac{b}{2}[X(z)]^2 dz.$$

Utility function additively separable, strictly increasing and strictly concave with $a > 0$, $b > 0$, and $X(z) = x(z) + x^*(z)$. No inter-sectoral substitutability.

Preferences can be aggregated across individuals with different incomes, provided they share the same demand parameter b .

$$\max_{X(z) \in \mathbb{R}_+, z \in [0,1]} U[\{X(z)\}] \quad s.t. \quad \int_0^1 p(z)X(z)dz \leq I$$

Inverse Demands

$$\lambda p(z) = a - bX(z)$$

As goods are homogeneous, demand for any domestic good equals that for the foreign one, $p(z) = p^*(z)$.

I assume throughout that $p(z) > 0$ and $\lambda > 0$ (non satiation), so that there exists a positive demand for each good. This guarantees interior solutions.

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What is λ ?

λ is the marginal utility of national income and it is **endogenous**. It depends on economy-wide variables: factor rewards, goods prices, and national income.

Firms' Behavior

- Short run: no entry, no exit in any sector.
- No capacity constraint.
- Static Cournot game with complete information: firms take as given the direct rival's output, factor rewards, and the policy instrument.
- Firms are small with respect to the economy as a whole, namely they take λ as given. Hence, they **perceive** demands for goods as linear.
- I assume $\lambda = 1$ (numéraire), without affecting the implications of the model.

Technology

- Only a factor of production, say labor L . It is free to move across sectors without any cost but it cannot cross national borders. Hence, wage rates are fixed at the country level and are **strictly** positive.
- CRtS; zero fixed costs (any role without firm entry).
- Common technology within each sector (i.e., domestic and foreign firms have the same efficiency within each sector).
- Costs:

$$c(z) = w\beta(z) > 0, \quad c^*(z) = w^*\beta(z) > 0$$

- $\beta(z) \geq 1$ for any $z \in [0, 1]$: I normalize the unit labor requirement for the most efficient sector(s). Sectors are ordered in a continuum in terms of productivities.

Partial Equilibrium in Each Sector

No transport cost.

Specific tariff in each sector.

$$\max_{y(z) \in \mathbb{R}_+, z \in [0,1]} \pi(z) \equiv [p(z) - c(z)]y(z)$$

$$\max_{y^*(z) \in \mathbb{R}_+, z \in [0,1]} \pi^*(z) \equiv [p(z) - c^*(z) - t(z)]y^*(z)$$

Partial Equilibrium in Each Sector

$$y(z)^{CN} = \frac{a - 2w\beta(z) + w^*\beta(z) + t(z)}{3b} > 0$$

$$y^*(z)^{CN} = \frac{a + w\beta(z) - 2w^*\beta(z) - 2t(z)}{3b} > 0$$

FOC and SOC are satisfied.

Profits are given by the general result in Cournot oligopoly with linear demand: $\pi(z) = b[y(z)]^2$. Of course, this result also holds for any foreign firm's profits.

Labor Market and General Equilibrium

Assumption: $I = wL + \Pi + T$ with $\Pi \equiv \int_0^1 \pi(z)dz$ and $T \equiv \int_0^1 t(z)y^*(z)dz$.

$$L = \int_0^1 \beta(z)y(z)dz$$

$$w = \frac{a\mu_1^\beta + \text{cov}(t, \beta) - 3bL}{2\mu_2^\beta} + \frac{w^*}{2}$$

Similar derivations for the foreign wage rate:

$$w^* = \frac{a\mu_1^\beta - 2\text{cov}(t, \beta) - 3bL}{2\mu_2^\beta} + \frac{w}{2}$$

Simultaneous Derivation of the Wage Rates

$$w = \frac{a\mu_1^\beta - 3bL}{\mu_2^\beta}$$

$$w^* = \frac{a\mu_1^\beta - 3bL - \text{cov}(t, \beta)}{\mu_2^\beta} = w - \frac{\text{cov}(t, \beta)}{\mu_2^\beta} \leq w$$

$$\mu_1^\beta \equiv \int_0^1 \beta(z) dz, \quad \mu_2^\beta \equiv \int_0^1 [\beta(z)]^2 dz, \quad \text{cov}(t, \beta) \equiv \int_0^1 t(z)\beta(z) dz$$

To simplify further, during the exercises of comparative statics, I assume that $t(z) = t$ for each sector. Hence, I focus on a uniform import tariff.

Remark: in this model, the government does not aim to help every single domestic firm, but to increase the countrywide profits.

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Results

Table: The effect of a small rise in t on domestic and foreign wage rates, countrywide aggregate profits, and income distributions.

$v^2 > 0$					
w	Π^{CN}	wL/Π^{CN}	w^*	Π^{*CN}	w^*L/Π^{*CN}
$0(0)$	$+(+)$	$-(-)$	$-(-)$	$-(?^b)$	$?(?^c)$
$v^2 = 0$					
w	Π^{CN}	wL/Π^{CN}	w^*	Π^{*CN}	w^*L/Π^{*CN}
$0(0)$	$0(0)$	$0(0)$	$-(-)$	$0(0)$	$-(-)$

^a A '+', a '-', and a '0' indicate a positive, negative, and no change, respectively. Values outside parenthesis for partial derivatives valued at $t = 0$ whereas values within parenthesis for partial derivatives valued at $t > 0$.

^b - if $0 \leq t < a/2$; 0 if $t = a/2$; + if $t > a/2$.

^c ? if $0 \leq t < a/2$; - if $t = a/2$; - if $t > a/2$.

Indirect Utility

$$V = -\mu_2^p$$

with $\mu_2^p = \int_0^1 [p(z)]^2$. The representative consumer dislikes differences in goods prices across sectors. In terms of exogenous variables:

$$V = -\frac{(2bL - a\mu_1^\beta)^2}{\mu_2^\beta} - \frac{v^2(a+t)^2}{9\mu_2^\beta}$$

and

$$\frac{\partial V}{\partial t} = -\frac{2v^2(a+t)}{9\mu_2^\beta} \Big|_{t=0} = -\frac{2v^2a}{9\mu_2^\beta} \leq 0$$

A rise in t increases the goods prices in some sectors and decreases the goods prices in the remaining sectors.

The Underlying Mechanism

$$\frac{\partial (y(z) + y^*(z))}{\partial t} = \frac{1}{3b} \left(\beta(z) \frac{\mu_1^\beta}{\mu_2^\beta} - 1 \right)$$

For $\beta(z) > \mu_2^\beta / \mu_1^\beta$ (inefficient sectors? complex production processes?) the partial derivative is positive and the price falls.

Reverse result for $\beta(z) < \mu_2^\beta / \mu_1^\beta$ (efficient sectors? easy production processes).

No room for comparative advantage: same technology in each sector. The technological differences are across sectors only!

The Underlying Mechanism

$$\begin{aligned}\partial y(z)/\partial t &= \frac{1}{3b} \left\{ \left(-\beta(z) \mu_1^\beta / \mu_2^\beta \right) + 1 \right\} \\ \partial y^*(z)/\partial t &= \frac{2}{3b} \left\{ \left(\beta(z) \mu_1^\beta / \mu_2^\beta \right) - 1 \right\}\end{aligned}$$

If sectors have easy production processes the government intervention helps domestic firms and hits the foreign ones.

If sectors have complex production processes the government intervention hits domestic firms (**and helps the foreign one**, via the general equilibrium feedback from the foreign wage rate that is stronger than the direct and negative effect of the import tariff).

The Underlying Mechanism

The technological heterogeneity across sectors plays a prominent role. In fact

$$\int_0^1 \left[\frac{1}{3b} \left(\beta(z) \frac{\mu_1^\beta}{\mu_2^\beta} - 1 \right) \right] dz = \frac{1}{3b} \left(\frac{[\mu_1^\beta]^2}{\mu_2^\beta} - 1 \right) \leq 0$$

The right hand side is negative only if $\nu > 0$. Except for the featureless economy, one always has that $[\mu_1^\beta]^2 / \mu_2^\beta < 1$, implying that the sum of changes across all sectors shrinks with a rise in t . In the featureless economy it holds that $\nu = 0$ and therefore $[\mu_1^\beta]^2 / \mu_2^\beta = 1$, implying that the sum of changes across all sectors goes to zero with a rise in t .

Movements of Labor Workforce across Sectors

- Reallocation of labor towards the more efficient sectors in the domestic country.
- Reverse pattern for the foreign country.

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Why Important and Interesting?

The government ought to look at the general equilibrium scenarios to better understand trade policy effects on the economy as a whole.

The Theoretical Contribution

- STP in GOLE.
- Domestic and foreign wage rates are endogenously and simultaneously determined in equilibrium.
- Derivation of a nexus between STP and factor rewards.
- Domestic government would set a small cross-sector uniform import tariff to increase countrywide aggregate profits.
- However, this policy has a strong drawback: it always hits the social welfare. This can highlight political economy implications (sketched in the paper, not reported here).

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Many simplifications: caveats in interpreting the model findings.

Some Promising Avenues for Future Research

- ① Political economy motive to apply a trade policy across sectors.
- ② Retaliation.
- ③ Comparative advantages.
- ④ Imperfect labor markets.

Thank you for attention!