

Tariffs, vertical specialization and oligopoly

— WITS 2013 —

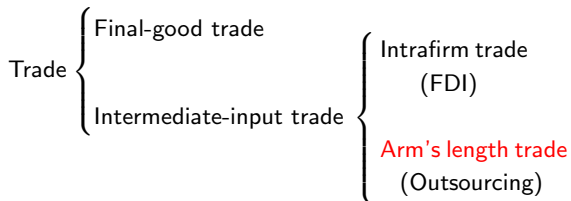
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Motivation

- Recent years have witnessed a significant increase in **vertical specialization**:



- The analysis of **trade policy** in this environment has been less developed:

*“Although the literature on organizations and trade has been largely concerned with matching **positive** features of reality, ... , much less attention has been given to the **normative and policy implications**” (Antràs and Rossi-Hansberg, 2009)*

Tariff: Vertical vs horizontal relationships

- **Horizontal** relationships — Home and Foreign firms' outputs are **substitutes**:
 - Tariffs raise cost for Foreign firms, shifting rents from Foreign firms to Home firms (*rent-shifting* motives)
- **Vertical** relationships — Home firms' output and Foreign firms' input are **complements**:
 - Tariffs raise Home firms' cost *as well as* Foreign firms' cost
 - Both Home firms and Home consumers are hurt by tariffs
- We investigate a distinctive role of tariffs in vertical relationships by explicitly analyzing firms' **bargaining power**

Questions and results

■ Research questions:

1. Should Home government set high tariffs due to low bargaining power of Home firms?
2. Is high bargaining power of Home firms bad for Foreign firms in vertical relationships?

■ Our answers:

1. Not necessarily \Rightarrow The relationship depends on the **market structure** (i.e. with/without free entry)
2. Not necessarily \Rightarrow Foreign firms *can* benefit from increased bargaining power of Home firms

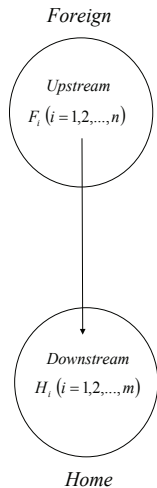
Outline of the paper

■ Exogenous market structure:

- Fixed number of firms
- Comparison with vertical oligopoly
 - Ishikawa and Lee (*JIE*, 1997)
 - Ishikawa and Spencer (*JIE*, 1999)

■ Endogenous market structure:

- Free entry (and random matching)
 - Horstmann and Markusen (*JIE*, 1986)
 - Venables (*JIE*, 1985)
 - Bagwell and Staiger (*JIE*, 2012a; *IER*, 2012b)



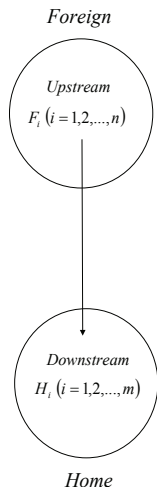
■ Two countries: Home and Foreign

- Upstream firms F_i ($i = 1, 2, \dots, n$)
- Downstream firms H_i ($i = 1, 2, \dots, m$)

■ Arm's length trade:

- No input market
- Number of successful matches s
e.g. $s = s(m, n) = \frac{mn}{m+n}$
- Bargaining over r_i and q_i

Model (cont.)



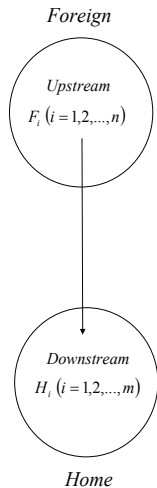
■ Preference:

$$U = U(Q) + y$$

■ Demand:

- World demand: $Q = Q(P)$
 - Home demand: $Q_H = \mu Q(P)$
 - Foreign demand: $Q_F = (1 - \mu)Q(P)$
 - Assume $\mu = 1$
- Inverse demand: $P = P(Q)$
 - $P'(Q) < 0$
 - $P'(Q) + QP''(Q) < 0$

Model (cont.)



■ Production:

	unit	entry
H_i	0	K_H
F_i	c	K_F

■ Timing:

1. Home government sets a tariff rate
2. Upon paying fixed entry costs, matching occurs between Home and Foreign firms
3. Bargaining (*within* a pair) and Cournot competition (*across* matched pairs)

Bargaining

■ Generalized Nash bargaining

- β : Home firms
- $1 - \beta$: Foreign firms

■ Taking (r_j, q_j) as given, each pair i chooses (r_i, q_i) to maximize

$$(\hat{r}_i, \hat{q}_i) = \arg \max_{r_i, q_i} \underbrace{\left[\left\{ P \left(q_i + \sum_{j \neq i}^s \hat{q}_j \right) - r_i \right\} q_i \right]}_{\pi_{H_i}}^\beta \underbrace{\left[(r_i - c - t) q_i \right]}_{\pi_{F_i}}^{1-\beta}$$

subject to

$$\pi_{H_i} \geq 0 \quad \text{and} \quad \pi_{F_i} \geq 0$$

Bargaining (cont.)

■ There exist a symmetric equilibrium (\hat{r}, \hat{q})

- $\hat{r}_1 = \hat{r}_2 = \dots = \hat{r}_s \equiv \hat{r}$
- $\hat{q}_1 = \hat{q}_2 = \dots = \hat{q}_s \equiv \hat{q}$

such that

$$\hat{q} = -\frac{P(\hat{Q}) - c - t}{P'(\hat{Q})}$$
$$\hat{r} = (1 - \beta)P(\hat{Q}) + \beta(c + t)$$

■ Note that

$$\frac{P(\hat{Q}) - \hat{r}}{\hat{r} - c - t} = \frac{\beta}{1 - \beta}$$

- The Home government chooses a tariff rate to maximize Home welfare:

$$W_H \equiv \underbrace{\int_0^{\hat{Q}(t)} P(y)dy - \hat{P}(t)\hat{Q}(t)}_{\text{Consumer surplus (CS)}} + \underbrace{(\hat{P}(t) - \hat{r}(t, \beta))\hat{Q}(t)}_{\text{Home profits } (\Pi_H)} + \underbrace{t\hat{Q}(t)}_{\text{Tariff revenues (TR)}}$$

- By applying $\frac{d\hat{Q}}{dt} < 0$ and $\frac{d\hat{r}}{dt} > 0$, we get

$$\left. \frac{dCS}{dt} \right|_{t=0} = - \left(\frac{s\hat{Q}(0)}{s+1+\hat{\epsilon}_0} \right) < 0$$

$$\left. \frac{d\Pi_H}{dt} \right|_{t=0} = - \left(\frac{\beta(2+\hat{\epsilon}_0)\hat{Q}(0)}{s+1+\hat{\epsilon}_0} \right) < 0$$

$$\left. \frac{dTR}{dt} \right|_{t=0} = \hat{Q}(0) > 0$$

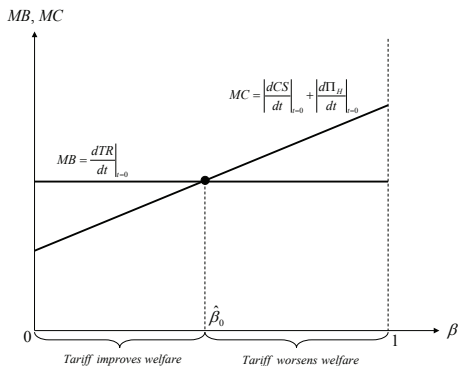
$$\text{where } \epsilon_0 = \left. \frac{QP''(Q)}{P'(Q)} \right|_{t=0}$$

Tariffs (cont.)

Proposition 1

Starting from free trade, a small increase in tariff rate raises Home welfare if and only if bargaining power of Home firms is lower than a critical threshold:

$$\left. \frac{dW_H}{dt} \right|_{t=0} \gtrless 0 \iff \beta \lesseqgtr \frac{1 + \hat{\epsilon}_0}{2 + \hat{\epsilon}_0} \equiv \hat{\beta}_0$$



Proposition 2

- (i) *The optimal tariff is positive if and only if bargaining power of Home firms is lower than the threshold $\hat{\beta}$:*

$$t(\beta) \begin{matrix} \geq \\ < \end{matrix} 0 \iff \beta \begin{matrix} \leq \\ > \end{matrix} \hat{\beta} \equiv \frac{1 + \hat{\epsilon}}{2 + \hat{\epsilon}}$$

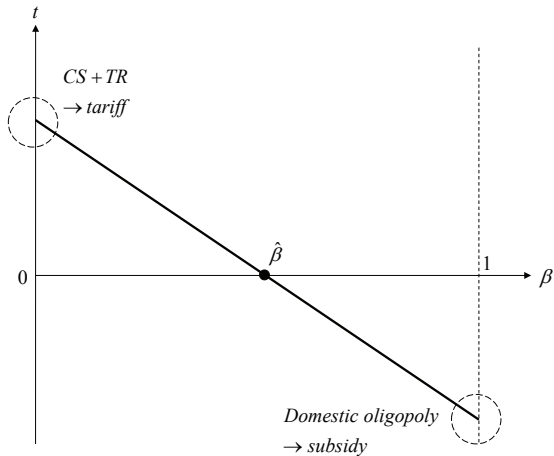
- (ii) *The optimal tariff is monotonically decreasing in bargaining power of Home firms:*

$$t'(\beta) < 0$$

- The optimal tariff is given by

$$t(\beta) = -\frac{P'(\hat{Q}(t))\hat{Q}(t)(2 + \hat{\epsilon})}{s} \left(\frac{1 + \hat{\epsilon}}{2 + \hat{\epsilon}} - \beta \right)$$

Tariffs (cont.)



The relationship between t and β is *monotone*

Foreign profits

- Consider the relationship between bargaining power of Home firms (β) and Foreign profits (Π_F), which are

$$\Pi_F = (\hat{r} - c - t)\hat{Q} = (1 - \beta)\Pi$$

- Marginal changes in β have two opposite effects on Π_F :

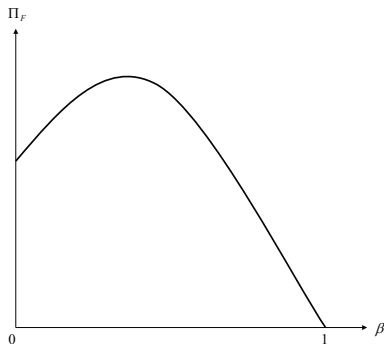
$$\frac{d\Pi_F}{d\beta} = \underbrace{-\Pi}_{\text{share effect}} + \underbrace{(1 - \beta)\frac{\partial \Pi}{\partial t}}_{\text{size effect}} \cdot \frac{dt}{d\beta}$$

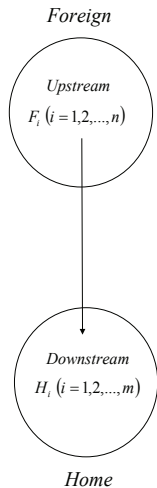
Foreign profits (cont.)

Proposition 3

An increase in bargaining power of Home firms can lead to an increase in Foreign profits if the number of matched pairs is sufficiently small:

$$\frac{d\Pi_F}{d\beta} > 0 \quad \text{if} \quad \beta < \max \left\{ 0, 1 - \frac{s}{2 + \hat{\epsilon}} \right\}$$





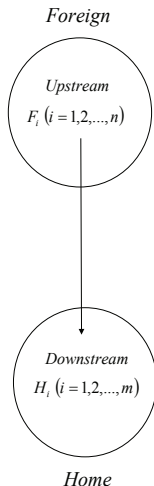
- What happens if input transactions take place through the **market competition**?
- The optimal tariff is

$$t(m, n) \gtrless 0 \iff n \lesseqgtr (1 + \epsilon)(m + 1 + \epsilon)$$

where

- $n \rightarrow \infty \implies r \rightarrow c + t$
- $m \rightarrow \infty \implies P \rightarrow r$

Discussion (cont.)



■ We find that:

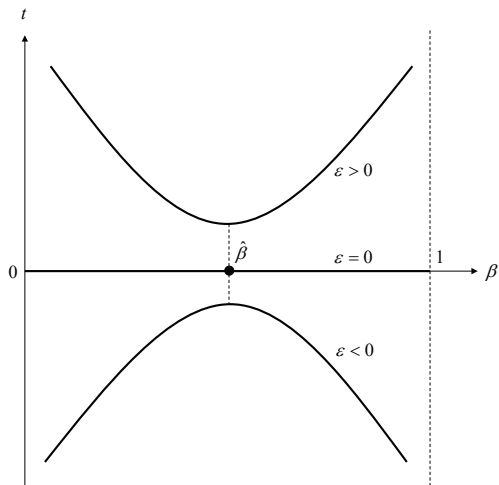
- The number of firms ("thickness of markets") is a proxy for bargaining power

$$\frac{P(\hat{Q}) - \hat{r}}{\hat{r} - c - t} = \frac{n}{m + 1 + \epsilon} \left(= \frac{\beta}{1 - \beta} \right)$$

- The counterintuitive result on Foreign profits occurs in **oligopolistic** markets

$$\left. \frac{d\Pi_F}{dn} \right|_{m=\infty} > 0 \quad \text{if} \quad n < \frac{1 + \sqrt{1 + 4(\epsilon + 1)(\epsilon + 2)}}{2}$$

Endogenous market structure



The relationship between t and β is *non-monotone*

Summary

- In the **exogenous** market structure:
 - An increase in bargaining power in Home firms reduces the optimum tariff (Prop 1 & 2)
 - Foreign firms could also benefit from an increase in Home firms' bargaining power (Prop 3)

- In the **endogenous** market structure:
 - The relationship between the optimal tariff and bargaining power is generally non-monotone