

# Reciprocal Dumping under Dichotomous Regulation

## Energy Markets 2018

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# Introduction

# Model

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# Competition policies and international trade

## Markets

- ▶ Competition Policies : Bounds limiting strategic behavior (merger, mark-up, etc.)
  - ▶ Matter of local sovereignty (Becker, 2007, JCLE)
  - ▶ WTO : Failure of the Doha round (Bagwell, 2016, JEL)
  - ▶ Preferential Trade Agreements : 70% enact non-distortion of competition, 2% enact coordination (Dür et al., 2014, RIO)

## State-Owned firms (OECD)

- ▶ In 2011, 19% of the value of international trade (Przemyslaw and Katernya, 2015, OECD).

# Dichotomous Regulation

- ▶ Competition policies aims at protecting local consumers, but foreign consumers are not in their jurisdiction
- ▶ Export Cartel Exemptions (Becker, 2007, JCLE)
  - ▶ US : the Sherman Act shall not apply to export cartel, as long as the effect on the local economy is incidental and insubstantial
  - ▶ EU : Focus on anticompetitive effects *within* the Common Market

## Research Question

Is there any rationale for export cartels to bias their home market ?  
To what extent this effect can be substantial ?

# The structure of international trade

## The theory of Comparative Advantages

- ▶ Each country should specialize in what it does the best, relatively to the other
- ▶ Inter-industry trade

## The reality of Intra-industry trade

- ▶ 60% of EU and US trade is intra-industry<sup>a</sup>

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a. Figures from <https://opentextbc.ca/principlesofeconomics/chapter/33-3-intra-industry-trade-between-similar-economies/>

# Intra-industry trade and reciprocal dumping

## Definitions

- ▶ Intra-industry trade : trade between the same industry sector
- ▶ Reciprocal dumping : Intra-industry trade where both country sell at a foreign price lower than the local one, including transport cost

## Reciprocal dumping in the New Trade Theory

- ▶ Reciprocal dumping is a matter of price discrimination between price-making producers
- ▶ May be desirable to mitigate market power : Brander (1981, JIE), Brander & Krugman (BK, 1983, JIE), Weinstein (1992, JIE), Yomogida (2008, IREF)

# Our setup

## Extending Brander & Krugman (1983)

- ▶ Two local monopolies acting à la Cournot
- ▶ Transport cost must be paid to export
- ▶ **Sequential Decision : Exports first, then produces and sells locally**
  - ▶ Eden (2007, JIE) : “delivery to order” (forward contracts)

## Taking into account dichotomous regulation

- ▶ The subgame (local sales) become regulated : Marginal-cost pricing

## Assymetries in cost and demand



## Remark : what results involves sequential decisions ?

### Allaz & Villa (1993, JET)

- ▶ 2 players à la Cournot
- ▶ Linear inverse demand and cost function
- ▶ Adding layers of forward (Cournot) markets improves efficiency

### Kreps & Scheinkman (1983, RAND)

- ▶ 2 symmetric players
- ▶ deciding production (investment) à la Cournot
- ▶ then sales (costless production) à la Bertrand
- ▶ Equilibrium is Cournot
- ▶ When the two stages have different rational, it may impede efficiency

# Main results

## Cournot Subgame

More trade, but doesn't change the nature of the game

## Regulated Subgame

- ▶ Exports can be used as a tool to create scarcity
- ▶ But increasing marginal cost is a necessary condition.
  - ▶ Standard assumption in the “New” New Trade Theory : Melitz (2003, Econometrica), Edmond et al. (2015, AER)
- ▶ Symmetric equilibrium is of reciprocal dumping
- ▶ Symmetric equilibrium is Pareto-dominated by autarky (competitive benchmark)
- ▶ Characterize the necessary conditions for the asymmetric equilibrium to be of reciprocal or unilateral dumping

## Example : Electricity market regulation in the U.S.

- ▶ Local regulation is strongly enforced
- ▶ Market prices in North-eastern markets (ISONE, NYISO, PJM) are “competitive”.
- ▶ Merchant HVDC transmission investors can bilaterally negotiate for the whole capacity allocation (FERC, 2013).
- ▶ Releasing rule of rights are enforced close to real-time
- ▶ With interconnected regulated area, no public price is available  $\implies$  impossibility to measure the price-spread

### Application

Debia et al. (*Forthcoming*, EJ) : A new HVDC interconnection between Québec and New York City may destroy wealth if strategic interactions are not monitored correctly.

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## The model

Each local monopolist  $i$  exports to the other market  $j$  while anticipating the local market clearing in both markets :

$$\max_{x_i \geq 0} g x_i P_j(\hat{y}_j(\mathbf{x}), g x_i) + \hat{y}_i(\mathbf{x}) P_i(\hat{y}_i(\mathbf{x}), g x_j) - C_i(\hat{y}_i(\mathbf{x}), x_i),$$

where, for all  $k$ ,

$$\hat{y}_k(\mathbf{x}) = \begin{cases} [\text{Cournot}] & 0 \leq y_k \perp C'_k(y_k, x_k) \geq MR_k(y_k, g x_{-k}), \\ [\text{Regulated}] & 0 \leq y_k \perp C'_k(y_k, x_k) \geq P_k(y_k, g x_{-k}), \end{cases}$$

and  $g \in [0, 1]$  : “Iceberg” transportation cost.

## Initial assumptions

After Gaudet and Salant (1991, JPE)

- A1.** There exists  $\xi_i \in (0, \infty)$  such that  $P_i(Z_i) > 0$  for  $Z_i \in [0, \xi_i)$ ,  $i = 1, 2$ .
- A2.** The inverse demand function  $P_i(Z_i)$  is twice-continuously differentiable and  $P'_i \leq 0$  for  $Z_i \in [0, \xi_i)$ ,  $i = 1, 2$ .
- A3.** The cost function  $C_i(Q_i)$  is twice-continuously differentiable with  $C_i(0) \geq 0$  and, for any  $Q_i > 0$ ,  $C'_i(Q_i) > 0$  and  $C''_i(Q_i) \geq 0$ ,  $i = 1, 2$ .<sup>3</sup>
- A4.**  $y_i P''_i(Z_i) + P'_i(Z_i) < 0$  for any  $Z_i \in [0, \xi_i)$ ,  $y_i \in [0, Z_i]$ .

where,

$$Z_i = y_i + gx_j, \quad Q_i = y_i + x_i$$

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3. In Gaudet and Salant (1991, JPE),  $P'_i - C''_i < 0$  instead of  $C''_i \geq 0$ .

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## The first-order condition in the regulated subgame

Let  $s_i(\mathbf{x})$  be the marginal rate of substitution between local sales  $y_i$  and imports  $x_j$ , net of the transport cost, that is

$$s_i(\mathbf{x}) = \frac{1}{g} \frac{\partial \hat{y}_i(\mathbf{x})}{\partial x_j} = \frac{-P'_i(Z_i)}{P'_i(Z_i) - C''_i(Q_i)} \in [-1; 0]$$

The FOC is :

$$0 \leq x_j \perp \underbrace{-\hat{y}_i(\mathbf{x})(1 + s_i(\mathbf{x}))P'_i}_{\text{Local sales } MR_i > 0} + g \underbrace{\left[ gx_j(1 + s_j(\mathbf{x}))P'_j + P_j \right]}_{\text{Exports } MR_i} \leq C'_i$$



## Rationale for overexporting with the regulated subgame

### Definition : Optimal international trade

International trade is optimal if at equilibrium the free-on-board (FOB) terms-of-trade is unity, that is,

$$0 \leq x_i \perp \frac{P_i}{P_j} \geq g$$

### Proposition 1

A regulated monopolist  $i$  overexports only if the cost function is strictly convex.

**A3'**. The cost function  $C_i(Q_i)$  is twice-continuously differentiable with  $C_i(0) \geq 0$  and, for any  $Q_i > 0$ ,  $C_i'(Q_i) > 0$  and  $C_i''(Q_i) > 0$ ,  $i = 1, 2$ .

# Elasticities

## Inverse elasticity of the market

$$\theta_i \equiv \frac{1 + s_i}{\epsilon_i} = \frac{1}{\epsilon_i + \gamma_i}$$

where

- ▶  $\epsilon_i = \frac{-P_i}{Z_i P_i'}$  : (opposite) price-elasticity of the demand,
- ▶  $\gamma_i = \frac{C_i'}{Z_i C_i''}$  : price-elasticity of the “local supply”

## Elasticity formulation of the FOC

$$0 \leq \sigma_j \perp P_i [(1 - \sigma_i)\theta_i - 1] + gP_j [1 - \sigma_j\theta_j] \leq 0.$$

where  $\sigma_j \in [0, 1]$  is the share of imports of market  $j$ .

# Symmetric equilibrium

## Competitive Benchmark : Autarky

By symmetry, no gains can be realized with trade

## Reciprocal Dumping Equilibrium

$$\sigma = \frac{1}{1+g} \left( 1 - \frac{1-g}{\theta} \right)$$

There is reciprocal dumping as long as  $\theta > 1 - g$ .

## Theorem

The symmetric equilibrium is strictly Pareto-dominated by autarky if  $g < 1$ .

# Unilateral exporter : local market

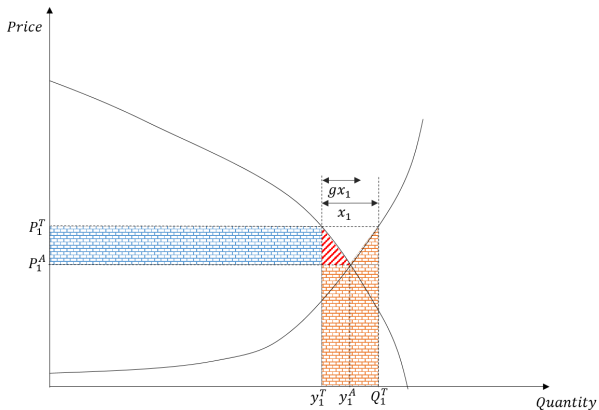


Figure – Surplus variation in the local market

# Unilateral exporter : foreign market

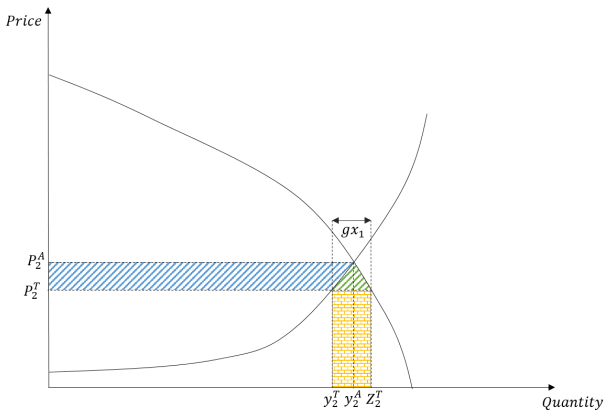


Figure – Surplus variation in the foreign market

# Unilateral exporter : total surplus variation

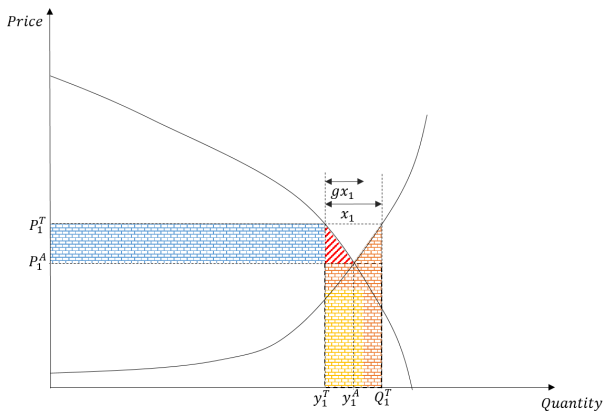
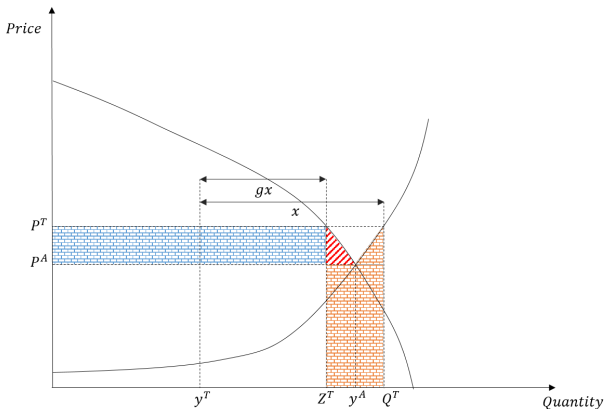


Figure – Player 1 total surplus variation

At equilibrium, each player's strategy cancels the other

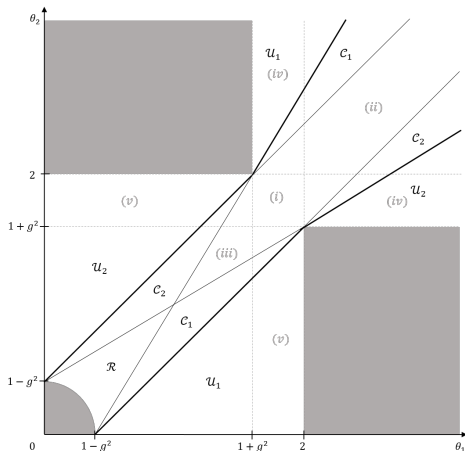


## Asymmetric equilibrium

- ▶ In our framework, asymmetry in the  $\theta_i$  is sufficient to cover asymmetry in the supply and demand structure of each market.
- ▶ The transport cost  $g$  remains symmetric.
- ▶ The level of endogeneity between the share of imports  $\sigma_i$  and the price ratio  $P_i/P_j$  is too important to obtain single-valued equilibrium point.
- ▶ Reasoning in terms of interior  $\sigma$ 's and set of prices
  - ▶ What are the necessary conditions for both  $\sigma$ 's to be interior?
  - ▶ Under these conditions, how is defined  $P_i/P_j$ ?



# Asymmetric interior equilibrium characterization



## Asymmetric interior equilibrium characterization

- ▶ The higher is  $\theta_i$ , the stronger is market  $i$ 's price reaction to trade volume variation :
  - ▶ player  $i$ 's dumping is more efficient w.r.t. withholding,
  - ▶ player  $j$ 's withholding is more efficient w.r.t. dumping.
- ▶ If  $\theta_j < 1 + g^2$  : the higher is  $\theta_i$ , the higher is  $P_i/P_j$ 
  - ▶  $i$ 's dumping becomes dominant
- ▶ If  $\theta_j > 2$  : the higher is  $\theta_i$ , the lower is  $P_i/P_j$ 
  - ▶  $i$ 's withholding becomes dominant
- ▶ If  $\theta_j \in [1 + g^2; 2]$  :  $i$ 's withholding is dominant for any

$$\theta_i \notin \left[ 1 - \frac{1 - \theta_j}{g^2}; 1 - g^2(1 - \theta_j) \right]$$

# Conclusion

## Main Results

- ▶ Marginal cost-pricing increases producers' willingness to dump
- ▶ Inefficient : the symmetric equilibrium is a Prisoner's Dilemma
- ▶ The Prisoner's Dilemma can be extended to weakly asymmetric cases.

## Discussion : How to mitigate the effect ?

- ▶ In this perfect information setting, anti-dumping policies would be efficient
  - ▶ Perfect information does not fit well with reality
- ▶ Harmonization of competition policies between countries is not sufficient
  - ▶ Coordination should be improved