International Economics B
4. International oligopoly 1: Third market model

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The Brander–Spencer model and strategic trade policy

- **Brander, J.A. and B.J. Spencer (1985), Export Subsidies and International Market Share Rivalry,** *Journal of International Economics* **18, pp.83–100.**
- **Motivation: To explain why export subsidies might be attractive policies from a domestic point of view**
  - **Based on competitive trade models, domestic welfare is increased by trade restriction, not by subsidization of trade $\Rightarrow$ Discussing export subsidies does not make sense.**
  - **In reality, effective subsidization of firms engaged in international rivalry has been a common practice in Western economies (e.g., Boeing and Airbus).**

- **In competitive trade models:**
  - **Large country (affecting world prices): trade restriction $\Rightarrow$ relative price of exporting good $\uparrow$ (improvement in terms of trade)**
    $\Rightarrow$ possibility of welfare gain
  - **Trade expansion has an opposite effect; even a possibility of lower welfare than under autarky**

- **Brander and Spencer's finding:**
  - **It is beneficial for a country to capture a large share of the production of profit-earning imperfectly competitive industries, and export subsidies can be used to carry out such "profit-shifting" policies.**
- **Pioneering research in the field of "strategic trade policy"**
  - **Strategic trade policy: trade policy that affects the outcome of strategic interactions between firms in an actual or potential international oligopoly.**
  - **Main idea: trade policies can raise domestic welfare by shifting profits from foreign to domestic firms.**

Setup of the model

- Three countries: two producer countries and one consumer country
- Cournot duopoly: one domestic firm (quantity x) & one foreign firm (y), producing homogeneous products
  - Competing in the consumer country's market (third country)
  - No consumption takes place in the producing countries
- Domestic government: understands the structure of the industry, and is able to set a credible subsidy on exports in advance of the quantity decision by firms

- **Domestic firm's profit:**

$$\pi(x, y; s) = p(x + y) \cdot x - c(x) + s \cdot x$$

  - $p(x + y)$: **inverse world demand**
  - $c(x)$: **cost**
  - s: **per unit subsidy**

- **Domestic firm chooses x so as to maximize π, taking s and y as given**
  $\Rightarrow$ **FOC:**

$$\pi_x(x, y; s) = xp'(x + y) + p(x + y) - c'(x) + s = 0$$

  - **Second-order condition is assumed to be satisfied:** $\pi_{xx} < 0$

- **Foreign firm's profit:**

$$\pi^*(x, y) = p(x + y) \cdot y - c^*(y)$$

  - **Foreign government is assumed to be passive**

- **Foreign firm chooses y so as to maximize π^*, taking s and x as given**
  $\Rightarrow$ First-order condition:

$$\pi_y^*(x, y) = yp'(x + y) + p(x + y) - c^{*\prime}(y) = 0$$

  - **SOC is assumed to be satisfied: $\pi_{yy}^* < 0$**

- **Additional assumptions**
  - $\pi_{xy} < 0$ **&** $\pi^*_{yx} < 0$: **own marginal revenue declines with an increase in the output of the other firm**
    - **Equivalent (given satisfaction of the second-order conditions) to reaction functions being downward sloping**
  - $\pi_{xx} < \pi_{xy}$ **&** $\pi^*_{yy} < \pi^*_{yx}$: **own effects of output on marginal profit dominate cross effects**
- $\Rightarrow D \equiv \pi_{xx}\pi^*_{yy} - \pi_{xy}\pi^*_{yx} > 0$
  - **Guaranteeing uniqueness and stability of the Cournot-Nash equilibrium**

Effects of subsidy

- **Comparative static effects of a change in s**
- **Total differentiation of FOCs:**

$$\pi_{xx}dx + \pi_{xy}dy + \pi_{xs}ds = 0,$$
$$\pi^*_{yx}dx + \pi^*_{yy}dy + \pi^*_{ys}ds = 0$$

- $\pi_{xs} = 1$ **&** $\pi^*_{ys} = 0 \Rightarrow$ **Solutions to the above system:**

$$\frac{dx}{ds} = -\frac{\pi^*_{yy}}{D} > 0, \quad \frac{dy}{ds} = \frac{\pi^*_{yx}}{D} < 0$$

  - **An increase in the export subsidy shifts out the reaction function of the domestic firm $\Rightarrow$ increases domestic exports and reduces the output of the foreign firm**

- **Effect on the equilibrium price:**

$$\frac{dp(x(s)+y(s))}{ds} = p'\left(\frac{dx}{ds}+\frac{dy}{ds}\right) = p'\frac{\pi^*_{yx}-\pi^*_{yy}}{D} < 0$$

- **Effects on the equilibrium profits:**

$$\begin{aligned}\frac{d\pi(x(s),y(s);s)}{ds} &= \underbrace{\pi_x}_{0}\frac{dx}{ds} + \pi_y\frac{dy}{ds} + \pi_s \\ &= xp'\frac{dy}{ds} + x > 0, \\ \frac{d\pi^*(x(s),y(s))}{ds} &= \pi^*_x\frac{dx}{ds} + \underbrace{\pi^*_y}_{0}\frac{dy}{ds} = yp'\frac{dx}{ds} < 0\end{aligned}$$

Proposition

An increase in the domestic subsidy

1. **lowers the world price of the good ($dp/ds < 0$);**
2. **increases domestic profit ($d\pi/ds > 0$); and**
3. **reduces foreign profit ($d\pi^*/ds < 0$).**

Optimal export policy

- No domestic consumption $\Rightarrow$ Domestic surplus is the profit of the domestic firm (earned from exports) minus the cost of the subsidy:

$$G(s) = \pi(x(s), y(s); s) - s \cdot x(s)$$

- Effect of a change in s on $G(s)$:

$$\begin{aligned} G'(s) &= \underbrace{\pi_x}_{0} \frac{dx}{ds} + \pi_y \frac{dy}{ds} + \underbrace{\pi_s - x}_{0} - s\frac{dx}{ds} \\ &= xp' \frac{dy}{ds} - s\frac{dx}{ds} \end{aligned}$$

- At $s = 0$, $G' > 0$
  - A marginal increase in the subsidy will increase welfare.

- **Setting $G' = 0$ to obtain the optimal subsidy:**

$$s^o = xp' \frac{dy/ds}{dx/ds} > 0$$

Proposition

The domestic country has a unilateral incentive to offer an export subsidy to the domestic firm.

- **Export subsidies, shifting the foreign firm's profit to the domestic firm, enable the domestic firm to capture a larger share of profitable international markets.**

- **In acting first, the domestic government can actually move the domestic firm to the Stackelberg leader position in output space.**

Proposition

The optimal export subsidy moves the industry equilibrium to what would, in the absence of a subsidy, be the Stackelberg leader–follower position in output space with the domestic firm as leader.

Extensions of the basic model

1. **Domestic consumption**
   - $\Rightarrow p \downarrow$ caused by $s \uparrow$ implies a deterioration of the domestic country's terms of trade.
   - Nevertheless, a small subsidy always increases domestic welfare through an expansion of profitable exports.
2. **Foreign country's action**
   - $\Rightarrow$ Noncooperative Nash equilibrium in subsidies
   - Both $s > 0$ and $s^* > 0$ in the Nash equilibrium.
   - Noncooperative solution is jointly suboptimal for the producing countries; joint welfare would be higher if subsidies were reduced below the Nash equilibrium levels.

3. **Third (i.e., consuming) country's action**
    - **$\Rightarrow$ Nash tariff and subsidy equilibrium by three gov'ts**
    - **In the "usual" case, export subsidies and import tariff in the Nash equilibrium.**

Criticism of the Brander–Spencer model

- **Not justified from the global welfare point of view.**
  - **Any intervention will likely diminish global welfare, even if it may increase the welfare of one or more countries.**
  - **$\Rightarrow$ It is always better to achieve agreement on the elimination of unfair trade.**
- **Results of the BS model and its policy prescriptions: very sensitive to the underlying assumptions on the nature of the industry, the information available to the national government, etc.**
  - **A slight difference in assumptions can produce completely different results.**
  - **If firms compete in prices rather than in quantities, then the optimal policy is not a subsidy but an export tax: Eaton and Grossman (1986).**

Strategic export policy under Bertrand competition

- **Eaton, J. and G. Grossman (1986), Optimal Trade and Industrial Policy Under Oligopoly,** *Quarterly Journal of Economics* **101, pp.383–406.**
- **Duopoly with production differentiation**
  - **Home firm's profit:**

$$\pi(p,P) = (1-t)pd(p,P) - c(d(p,P))$$

    - t: **ad valorem output (or export) tax**
  - **Foreign firm's profit:**

$$\Pi(p,P) = PD(p,P) - C(D(p,P))$$

- **Two stage game:**
  1. **Domestic gov't determines t so as to maximize national welfare.**
  2. **Domestic and foreign firms play Bertrand game in the third market.**
- **Equilibrium in the 2nd stage**
  - **Each firm sets its price to maximize its profit, taking the other firm's price as given.**
  - **FOCs:**

$$\frac{\partial \pi}{\partial p} = (1-t)(d + pd_1) - c'd_1 = 0$$
$$\frac{\partial \Pi}{\partial P} = D + (P - C')D_2 = 0$$

$\Rightarrow$ **p and P depend on t.**

- **Optimal export policy in the 1st stage**
  - **Domestic welfare:** $w = \pi(p, P) + tpd(p, P)$
  - **FOC for optimal** t:

$$\frac{dw}{dt} = \underbrace{\pi_p}_{0} \frac{dp}{dt} + \pi_P \frac{dP}{dt} + \underbrace{\pi_t + pd}_{0} + t(d + pd_1)\frac{dp}{dt} = 0$$

$$\Rightarrow \quad t^o = -\frac{(p - c')d_2}{d + pd_1} \frac{dP}{dp}$$

- **Under Bertrand competition in differentiated goods,** $t^o > 0$**, i.e., optimal policy is an export tax.**
  - **Under product differentiation,** $(p - c')d_2 > 0$.
  - **From the home firm's FOC,** $d + pd_1 < 0$.
  - $dP/dp = -\Pi_{Pp}/\Pi_{PP}$**: slope of the foreign firm's reaction curve**