Lecture 17

Strategic Trade Policy

1. Definition??? Trade policy with increasing returns and imperfect competition

   Domestic distortion "Profit shifting"

2. Cournot competition - production subsidy

   One firm in each country (Brander and Spencer)
   Firm numbers fixed, but > 1. (Eaton and Grossman)
   Add domestic consumption (Horstmann and Markusen, Markusen and Venables)
   Free entry (Venables, Horstmann and Markusen)
   Foreign ownership (Dick, Janeba)

3. Bertrand competition (Eaton and Grossman)

5. Import protection as export promotion (Krugman)

6. Voluntary export restraints, facilitating collusion
(Harris, Krishna)

7. Monopolistic competition (Venables, Flam and Helpman)

8. Complementarity of domestic and imported intermediate inputs
(Markusen)

9. Segmented versus integrated markets
(Markusen and Venables, Smith and Venables)

Strategic Trade Policy

1. Environment: imperfectly competitive firms with increasing returns to scale.

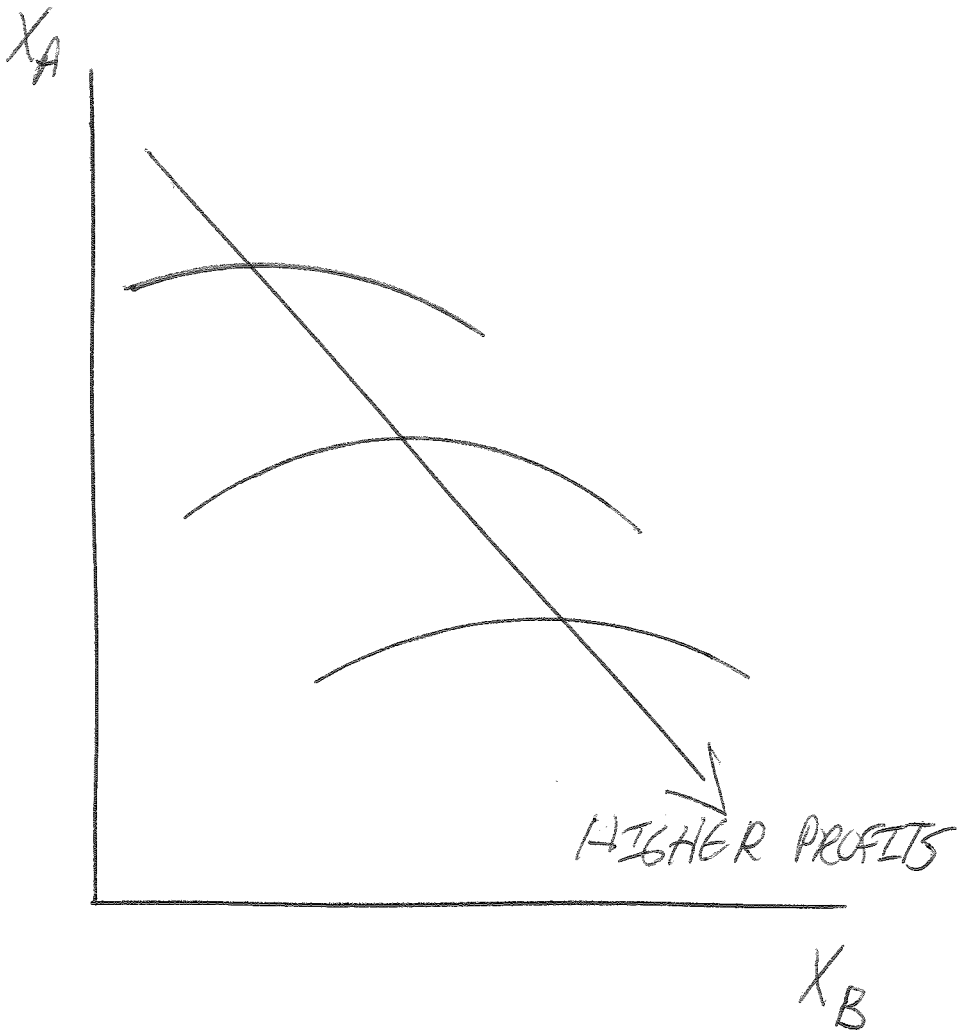
There are really two issues here. First, goods are priced above marginal cost, so there is a gain at the marginal from more production. Second, there are positive profits earned in the industry. So there is a distributional issue over these profits. We would like our domestic firm to have a larger share of these profits.

3. Simplest model: three countries. US, EU, and ROW. US and EU each have one firm (e.g., Boeing and Airbus). Assume that all output is sold to ROW.

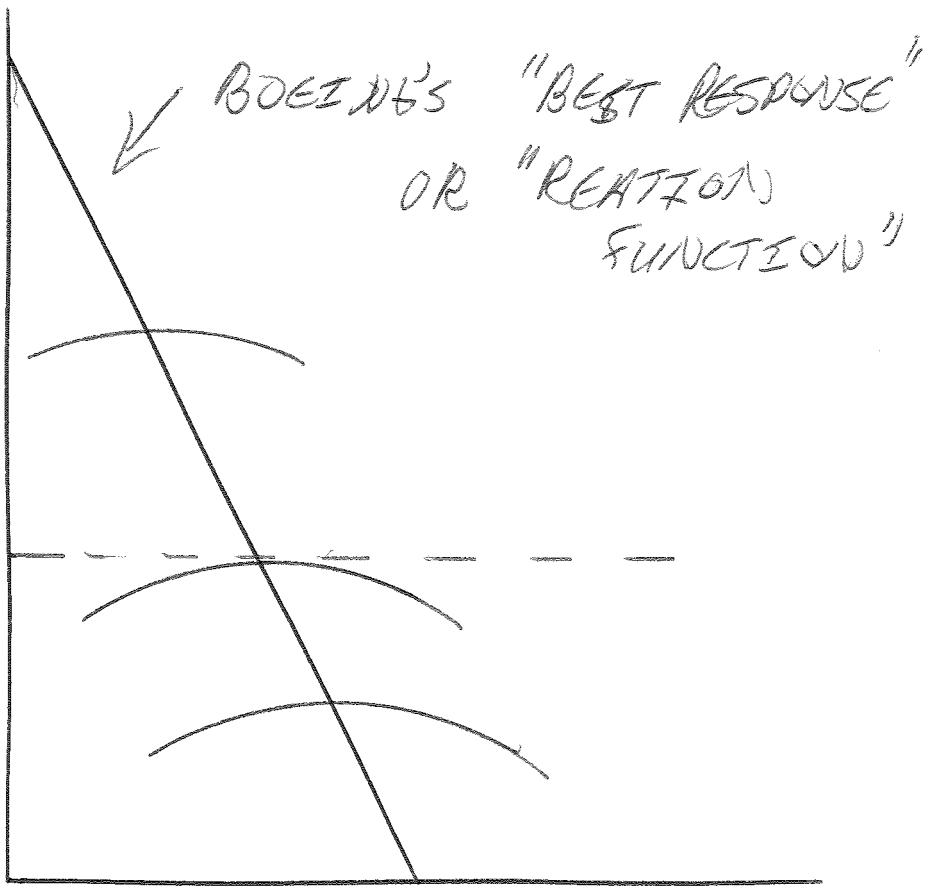
4. This last assumption is made in order to make domestic welfare in the US and EU equivalent to each firm's profits. That is, the governments' strategic objectives are to help maximize the profits of the domestic firm.

5. Consider first a Cournot game, in which the two firms pick quantities, each firm making a best response to their rival firm.

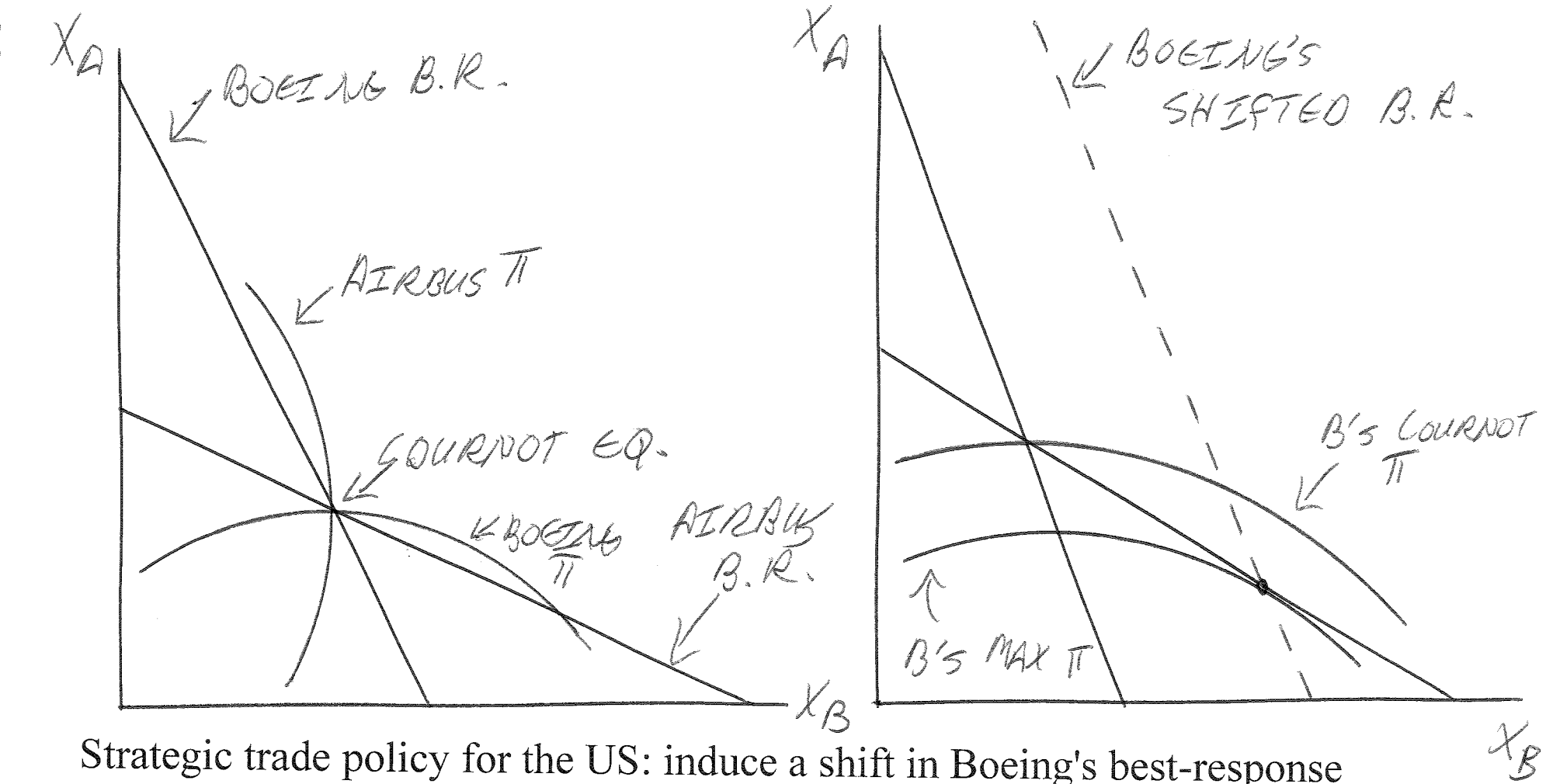
Iso-profit curves



Best-response (or reaction) functions.



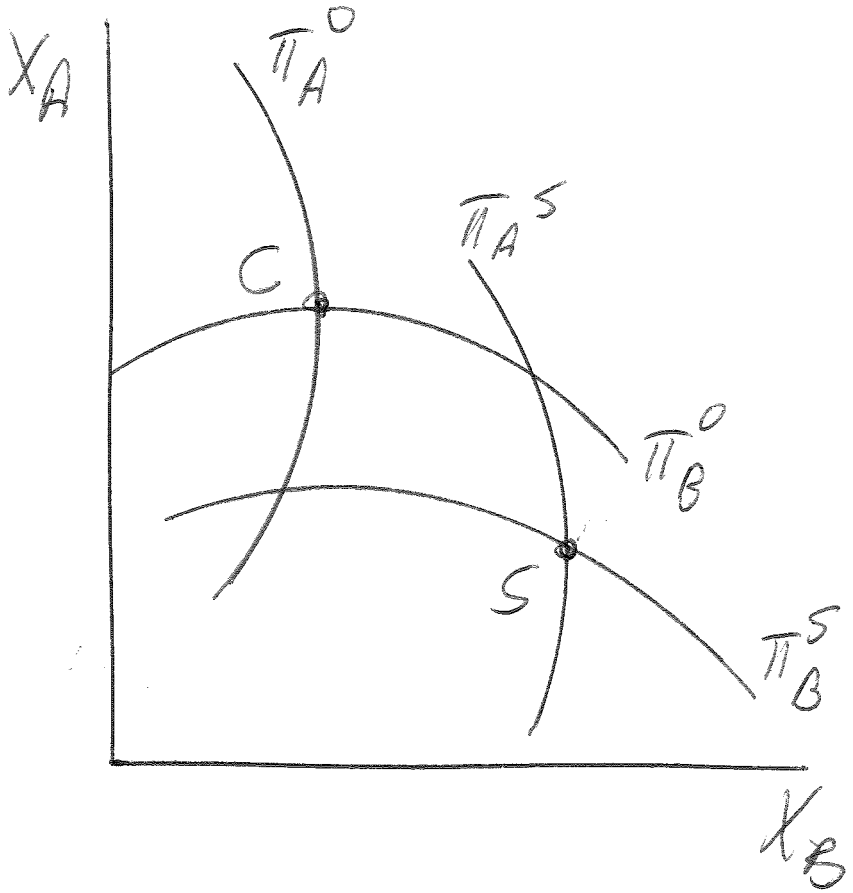
Cournot equilibrium and profit levels

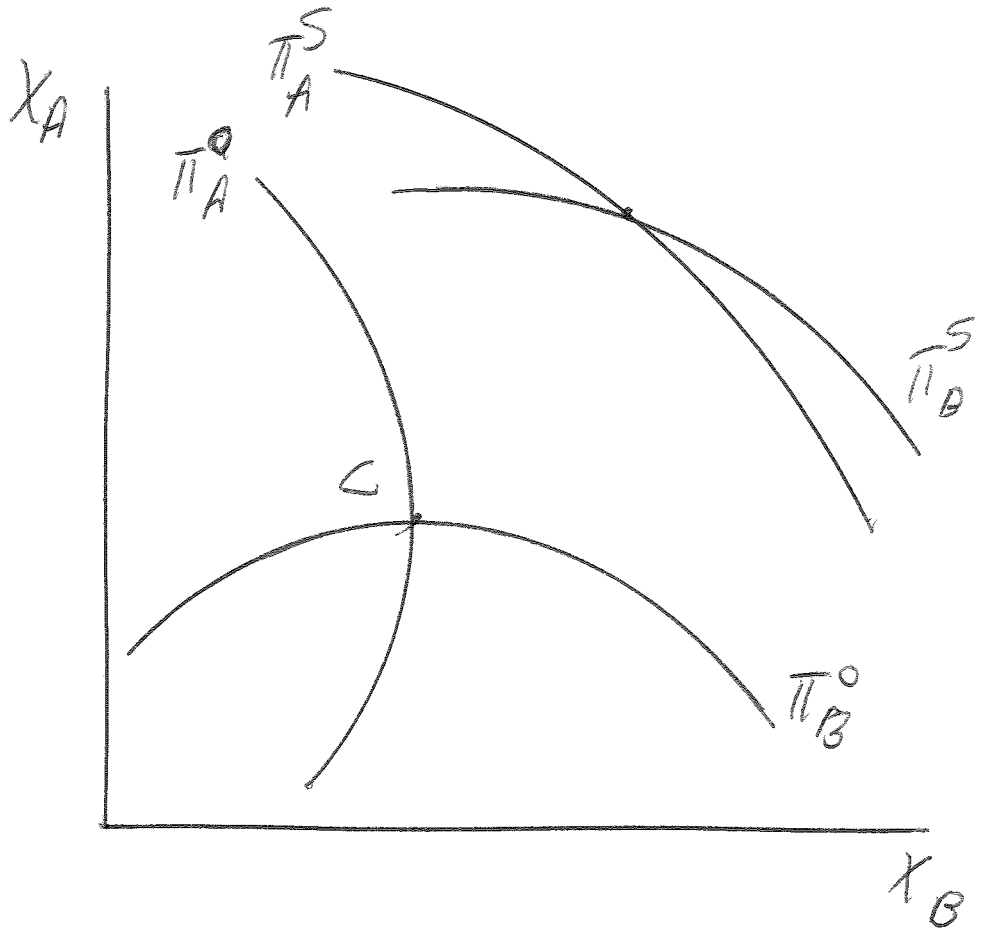


Strategic trade policy for the US: induce a shift in Boeing's best-response function so that Boeing makes the highest possible profits subject to being on the Airbus best-response function.

What type of policy does this? We want Boeing to produce more output at each level of Airbus' output. This can be done via a production subsidy.

Strategic trade policy = US subsidizes the output of the US firm. Airbus is worse off. This is known as a <u>profit shifting</u> argument: profits in the world aircraft market are shifted from Airbus to Boeing. But, if both countries subsidize, both lose





Firm i's profits

(1) $$\Pi_i = pX_{ii} - c_iX_i + sX_i = [\alpha - \beta(X_i + X_j)]X_i - c_iX_i + sX_i$$

(2) $$\frac{d\Pi_i}{dX_i} = \alpha - 2\beta X_i - \beta X_j - c + s = 0$$

(3) $$\frac{d\Pi_j}{dX_j} = \alpha - 2\beta X_j - \beta X_i - c = 0$$

Reaction functions

(4) $$X_i = \frac{\alpha - c + s}{2\beta} - \frac{1}{2}X_j \qquad X_j = \frac{\alpha - c}{2\beta} - \frac{1}{2}X_i$$

Equilibrium outputs

(5) $$X_i = \frac{\alpha - c + 2s}{3\beta} \qquad X_j = \frac{\alpha - c - s}{3\beta}$$

(6) $$\Pi_i = \left[\alpha - 2\beta\frac{\alpha - c + s/2}{3\beta} - c + s\right]\frac{\alpha - c + 2s}{3\beta} = \beta X_i^2$$

(7) $$\Pi_j = \beta X_j^2$$

Optimal subsidy: home firm's profits minus subsidy cost

(8) $$\max \Pi_i \equiv \beta X_i(s)^2 - sX_i(s)$$

(9) $$\frac{d\Pi_i}{ds} = 2\beta X_i\frac{dX_i}{ds} - s\frac{dX_i}{ds} - X_i = 0 \qquad \frac{dX_i}{ds} = \frac{2}{3\beta}$$

(10) $$s = \frac{\alpha - c}{4}$$

Cournot with n firms in each country

(11) $$R_{xj} = (\alpha - \beta(n_x X_i) - \beta(n_y Y_i))X_j$$

(12) $$MR_{xj} = \alpha - \beta(n_x + 1)X_i - \beta(n_y Y_i) = MC_{xj}$$

Consider just a symmetric case with $n_x = n_y$,

(13) $$X_i = \frac{\alpha - c + 2s}{(2n + 1)\beta} \qquad \frac{d\Pi_j}{ds} = \frac{2}{(2n + 1)\beta}$$

(14) $$n\Pi_j = n\beta X_j^2$$

Exercise: What is the optimal s as a function of n? What is the level of n at which the subsidy turns to a tax?

Intuition: with more than one domestic firm, the domestic firms are engaging in wasteful competition among themselves. This calls for an export tax to restrain wasteful domestic competition. This will work in the opposite direct to the profit

shifting motive, which calls for an export tax.

Add domestic consumption

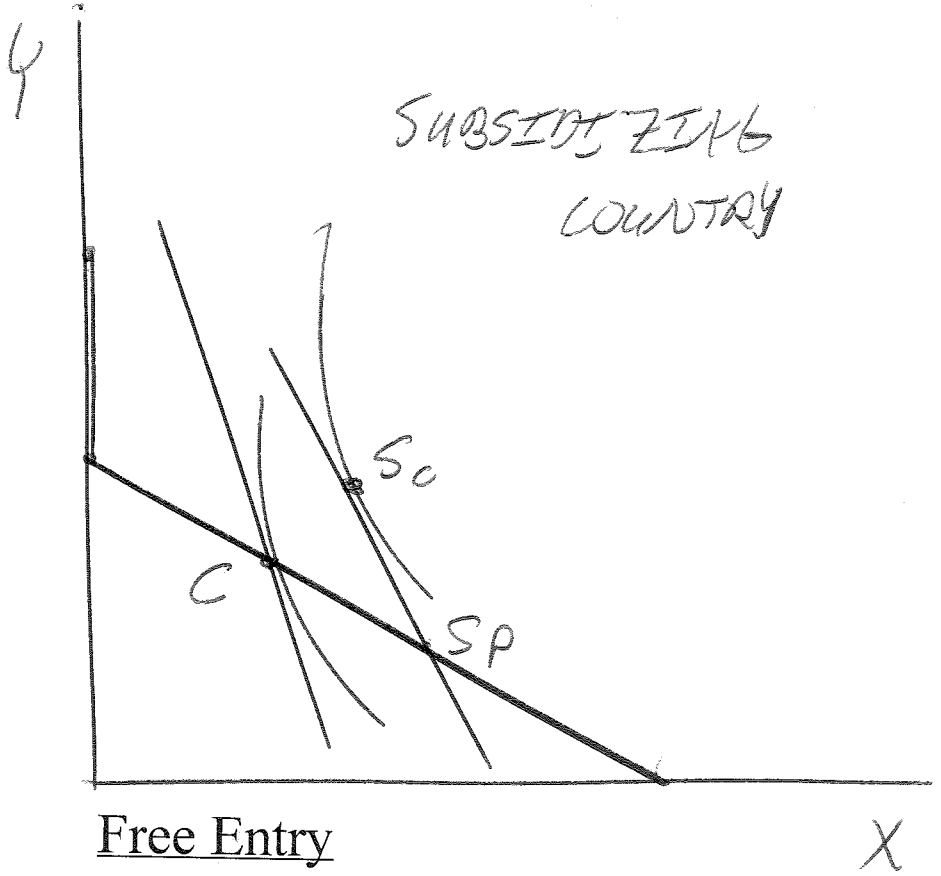
Return to one firm in each country. Adding domestic consumption can reinforce the result, because the X good is sold for a price greater than marginal cost.

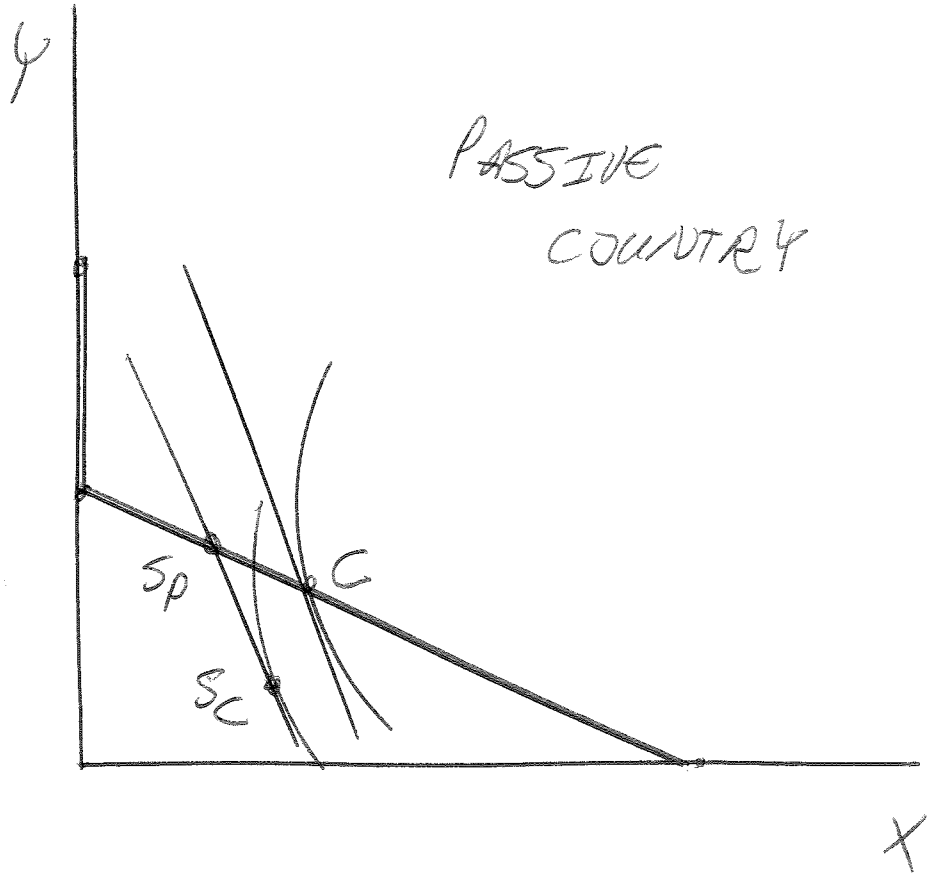
Recall for our earlier analysis that this is the welfare expression for country i, subtracting off the value of the subsidy. The first term is consumer surplus.

$$(15) \qquad U_i = (\beta/2)(X_{ii} + X_{ji})^2 + \beta X_{ii}^2 + \beta X_{ij}^2 - s(X_{ii} + X_{ij})$$

$$(16) \qquad X_{ii} = X_{ij} = \frac{\alpha - c + 2s}{3\beta} \qquad X_{ji} = \frac{\alpha - c - s}{3\beta}$$

In addition to the profit shifting motive, a subsidy increased domestic consumption and consumer surplus. A small subsidy must increase welfare.





Free Entry

$$(17) \qquad p_i = \alpha - \beta\left[\sum_i X_i\right] - \beta\left[\sum_i Y_i\right]$$

$$(18) \qquad \Pi_i = p_i X_i = \left[\alpha - \beta\left[\sum_j X_j + \sum_j Y_j\right]\right] X_i - cX_i$$

Marginal revenue minus marginal cost for firm i is given by:

$$(19) \qquad MR - MC = \alpha - 2\beta X_i - \beta \sum_{j \neq i} X_j - \beta \sum_{j} Y_j - c = 0$$

Now impose symmetry. X will denote the output of a representative firm, and n the number of firms. All firms that are active in equilibrium will produce the same amount.

$$(20) \qquad MR - MC = \alpha - 2\beta(n_x + 1)X - \beta n_y Y - c = 0$$

The zero profit condition is that the profits of the representative firm are exactly zero.

$$(21) \qquad \alpha X - \beta n_x X^2 - \beta n_y YX - cX - F = 0$$

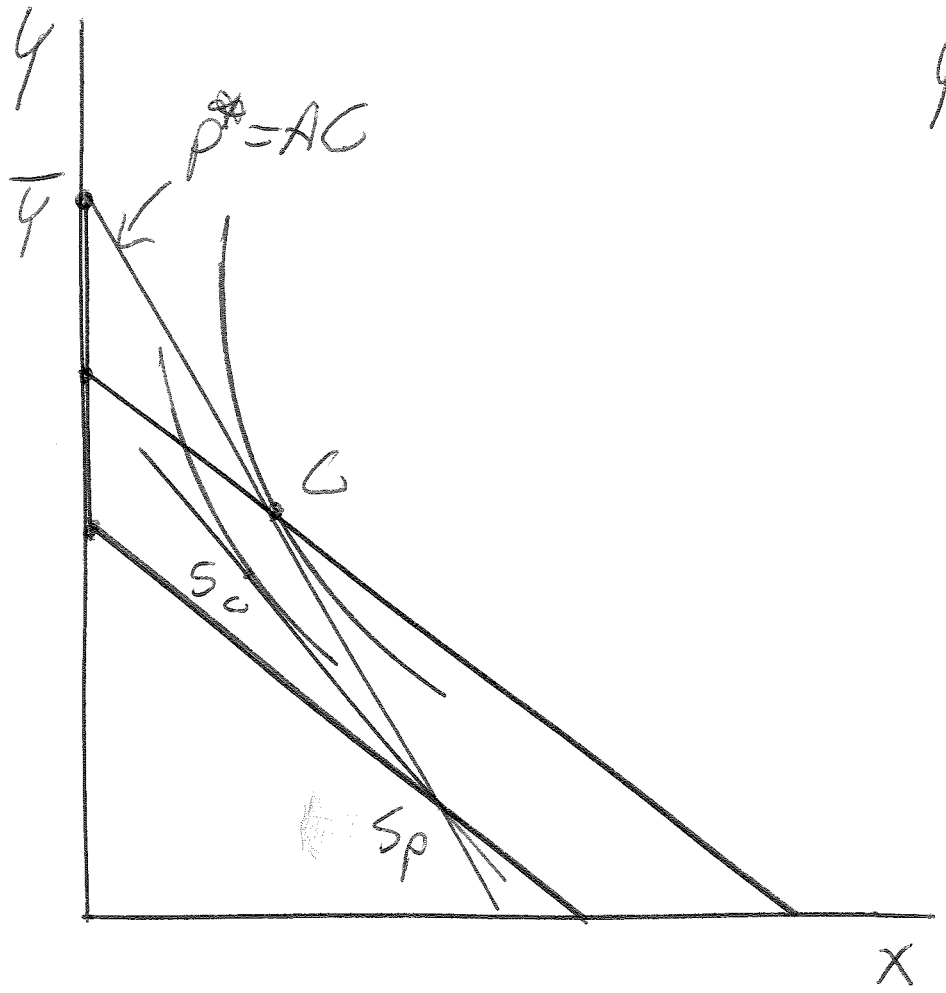
Multiple *MR* - *MC* through by X. Solve the two equations for X

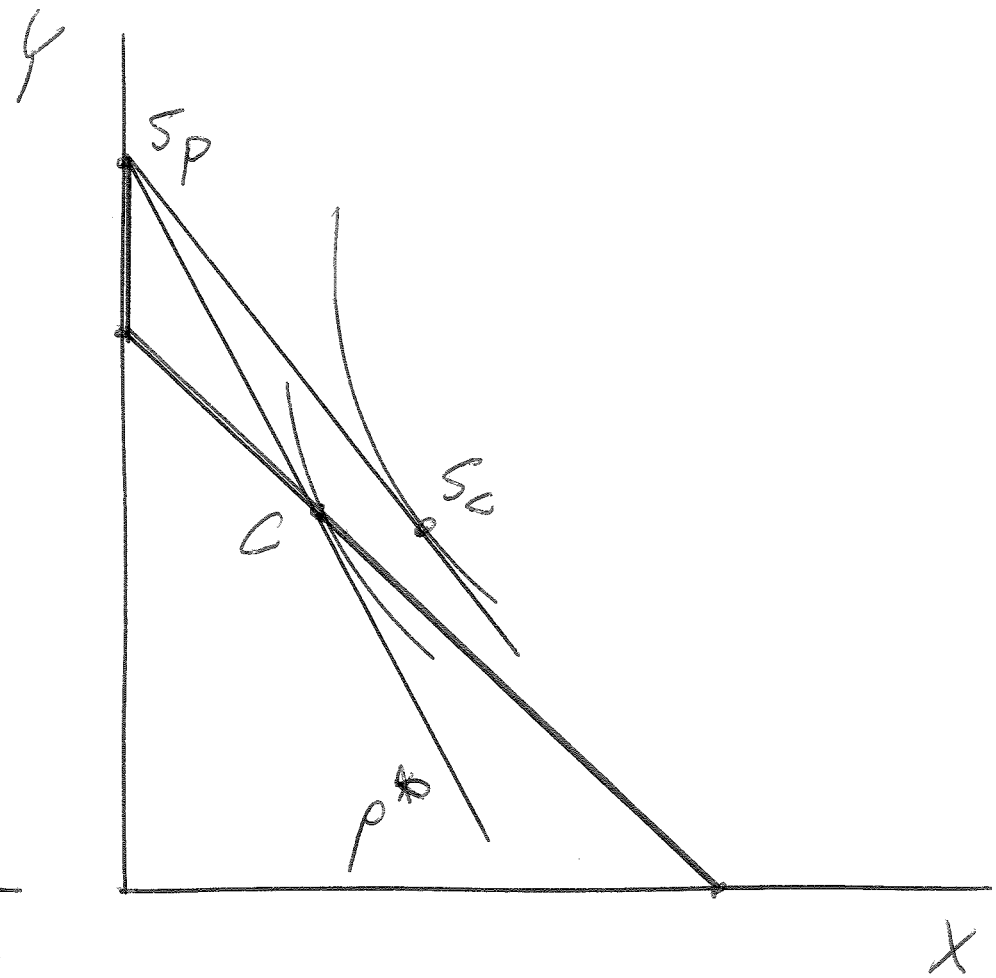
(22) $X = \left[\frac{F}{\beta}\right]^{1/2}$ and similarly for Y $Y = \left[\frac{F}{\beta}\right]^{1/2}$

The important thing to note is that these quantities do not depend on marginal costs. Thus a small specific subsidy to X does not change output per X firm or change average cost.

But the price of X must fall, because the price is less than average cost, which is equal to p +s. But if the X firms are breaking even with the subsidy, the Y firms (whose optimal output and average cost is the same) cannot make profits and are forced out of the market.

In country i, there are more firms each producing at the old scale of production and country j is force out of the Y industry. Here is the correct diagram, which indicates that country i is worse off and country j is better off, similar to a competitive model.


y
$\bar{y}$
$p^* = AC$
C
S_C
S_P
x


y
S_P
S_C
C
p^*
x

Foreign Ownership

Go back to the basic Brander-Spencer model with firms serving a third country.

Let γ be the share of profits that are domestically owned.

$$(23) \qquad X_i = \frac{\alpha - c + 2s}{3\beta} \qquad \Pi_i = \beta X_i^2$$

$$(24) \qquad Max\,\Pi_i = \gamma\beta\left[\frac{\alpha - c + 2s}{3\beta}\right]^2 - s\left[\frac{\alpha - c + 2s}{3\beta}\right]$$

I get the optimal value of s as

$$(25) \qquad s* = \left[\frac{4\gamma - 3}{3 - 2\gamma}\right]\frac{(\alpha - c)}{4} < \frac{(\alpha - c)}{4} \qquad for \qquad \gamma < 1$$

$$(26) \qquad s* < 0 \qquad for \quad \gamma < 3/4$$

Summary

There is an argument for a subsidy in the Brander-Spencer model
This argument is strengthened with domestic consumption.

BUT

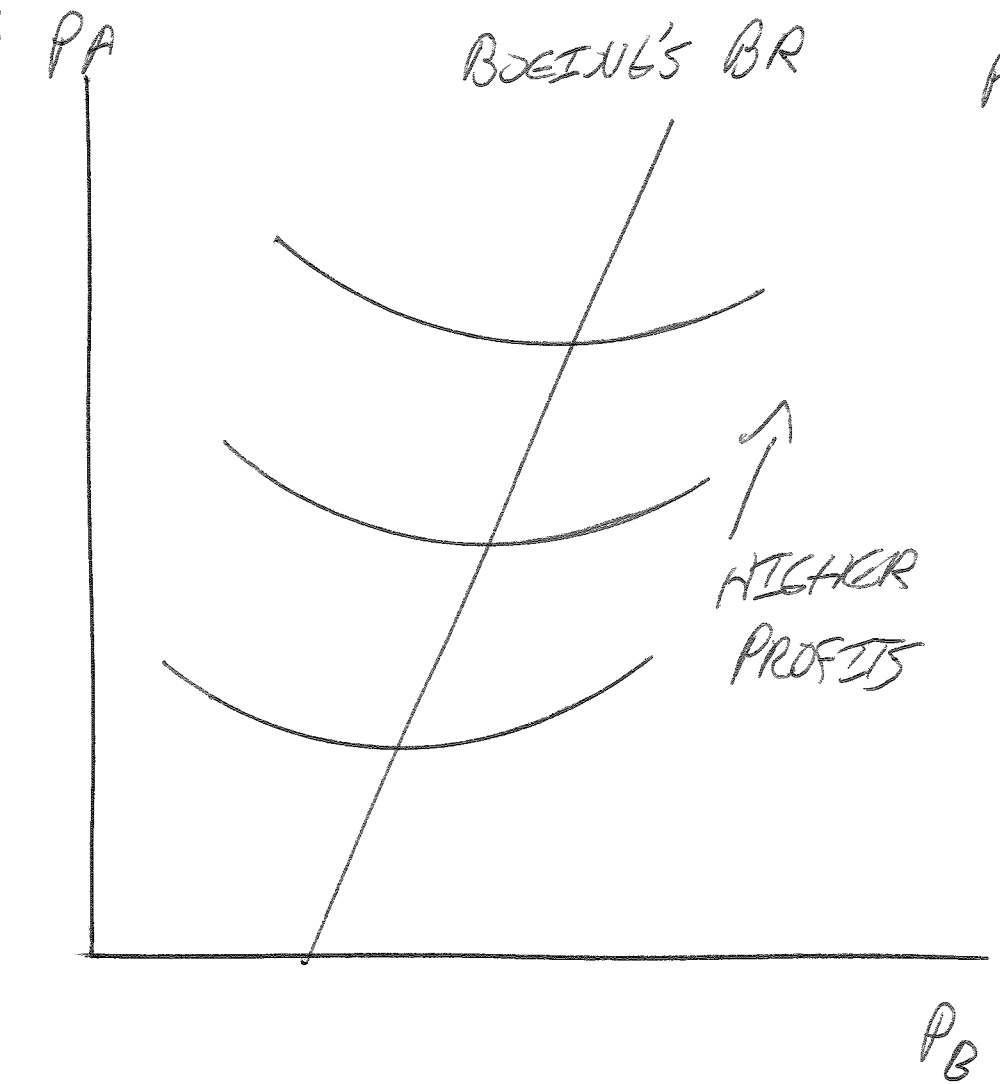
The argument is weakened with more than one firm
The argument is destroyed with free entry
The argument is weakened with foreign ownership

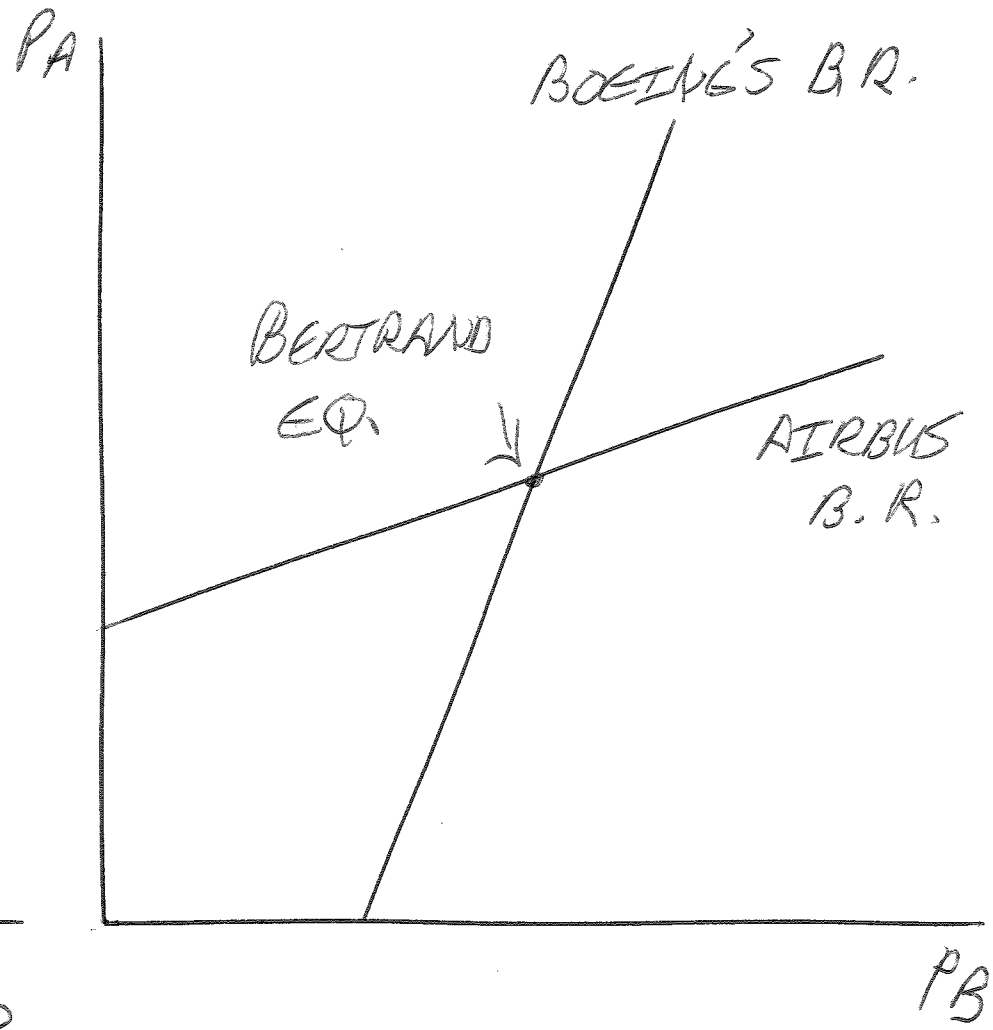
Bertrand Competition

Difficulty is that if we change the assumptions a bit, we change the results.

Suppose that firms chose prices instead of quantities. Firms make a best response price choice against their rivals price choice. This is known as Bertrand competition. Requires goods being imperfect substitutes.

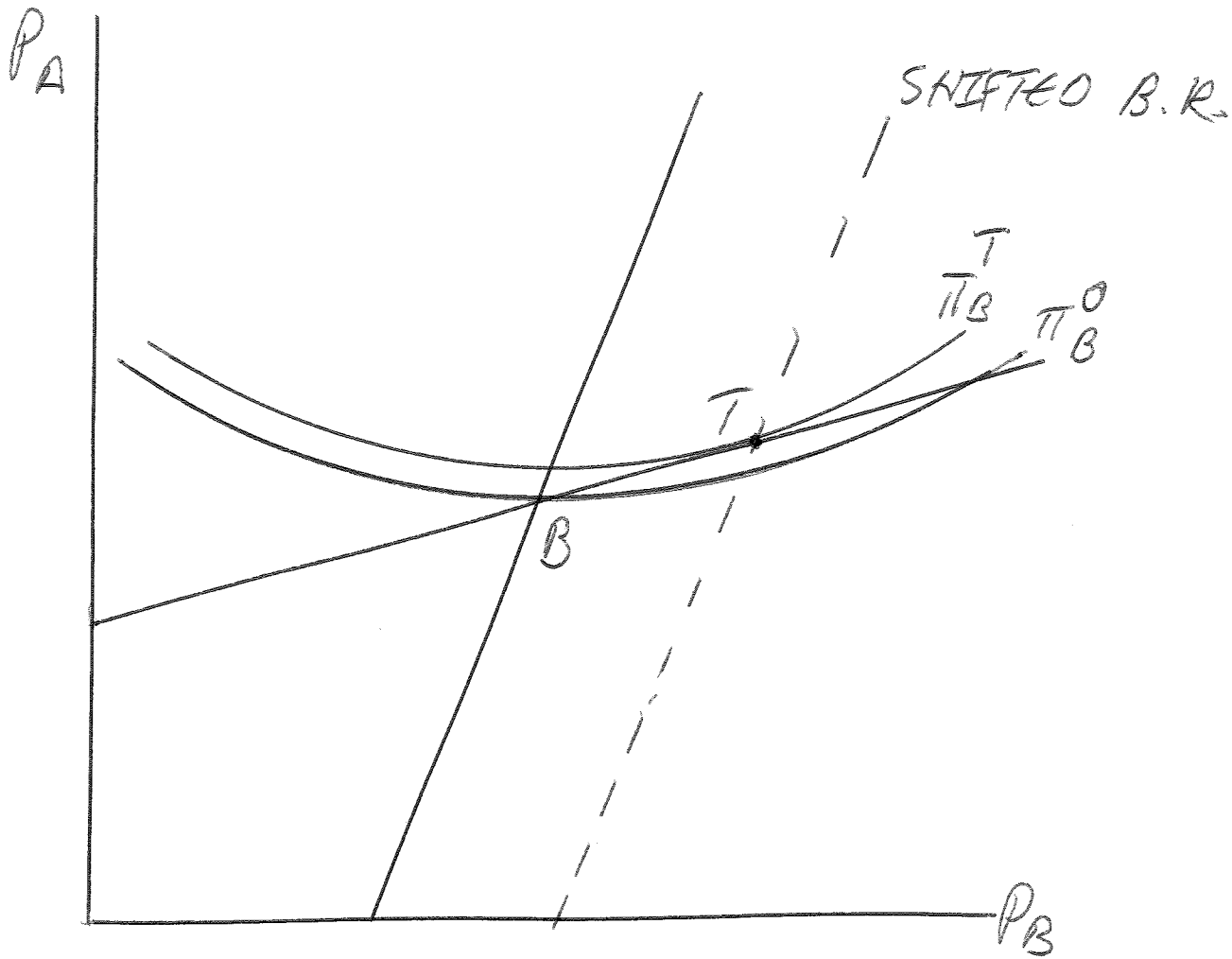
Strategic trade policy consists of the US government shifting out Boeing's reaction function so that it can capture the highest profits possible subject to being on Airbus' best-response function.


P_A
BOEING'S BR
HIGHER PROFITS
P_B


P_A
BOEING'S B.R.
BERTRAND EQ.
AIRBUS B.R.
P_B

The US government should now adopt a policy that shifts Boeing's reaction curve out so that it goes through the point T.

What policy does this? We want Boeing to charge a higher price for each level of Airbus' price. The policy to do this is a <u>tax</u> not a subsidy.



The underlying reason for this result is that Bertrand competition is inherently much more competitive than Cournot competition. In Bertrand, both firms are competing "too much", and the government wants to restrain that competition.

We also then reverse the earlier result, Airbus is helped by the tax, and the third-country purchasers are hurt. Let

(27) $X_i = \alpha - \beta p_i - \gamma p_j \qquad X_j = \alpha - \beta p_j - \gamma p_i$

If $p_i = a - bX_i - cX_j \qquad b > c$

Then $\alpha = \dfrac{ab - ac}{b^2 - c^2} \qquad \beta = \dfrac{b}{b^2 - c^2} \qquad \gamma = \dfrac{c}{b^2 - c^2}$

(28) $\Pi_i = p_i X_i - mX_i = (p_i - m)(\alpha - \beta p_i - \gamma p_j)$

(29) $\dfrac{d\Pi_i}{dp_i} = \alpha - \beta p_i + \gamma p_j - \beta(p_i - m) = 0$

Best response or reaction functions, symmetric case

$$(30)\qquad p_i = \frac{\alpha + \beta m}{2\beta} + \frac{\gamma}{2\beta} p_j$$

$$p_j = \frac{\alpha + \beta m}{2\beta} + \frac{\gamma}{2\beta} p_i$$

If you then solve for the output levels and compare them to the Cournot levels with imperfect substitutes, you get Bertrand behavior is inherently more competitive.

$$(31)\qquad X_b = \frac{a - m}{2b + c - c^2/b} > X_c = \frac{a - m}{2b + c}$$

Change the domestic firm's marginal cost to (m + t). Use the reaction functions to get

$$(32)\qquad dp_i = \frac{1}{2} dt + \frac{\gamma}{2\beta} dp_j \qquad dp_j = \frac{\gamma}{2\beta} dp_i$$

(33) $$dp_i = \frac{1}{2}dt + \left[\frac{\gamma}{2\beta}\right]^2 dp_i$$ Goods are "strategic complements"

(34) $$0 < \frac{dp_h}{dt} = \frac{1}{2(1 - (\gamma/2\beta)^2)} < 1$$

National objective function (no domestic sales)

(35)

$$Max\ \Pi_i + tX_i = (p_i - (m + t))(\alpha - \beta p_i - \gamma p_j) + t(\alpha - \beta p_i - \gamma p_j)$$

$$= (p_i - m)(\alpha - \beta p_i - \gamma p_j)$$

Consider the first-order condition and evaluate it at t = 0 initially

(36)

$$\frac{d(\Pi_i + tX_i)}{dt} = \left[\alpha - \beta p_i + \gamma p_j - \beta(p_i - m)\right]\frac{dp_i}{dt} + \gamma(p_i - m)\frac{dp_j}{dt}$$

$$= \gamma(p_i - m)\frac{dp_j}{dt} > 0$$

The term in square brackets is the FOC at t = 0, and therefore zero. This is an application of the envelop theorem.

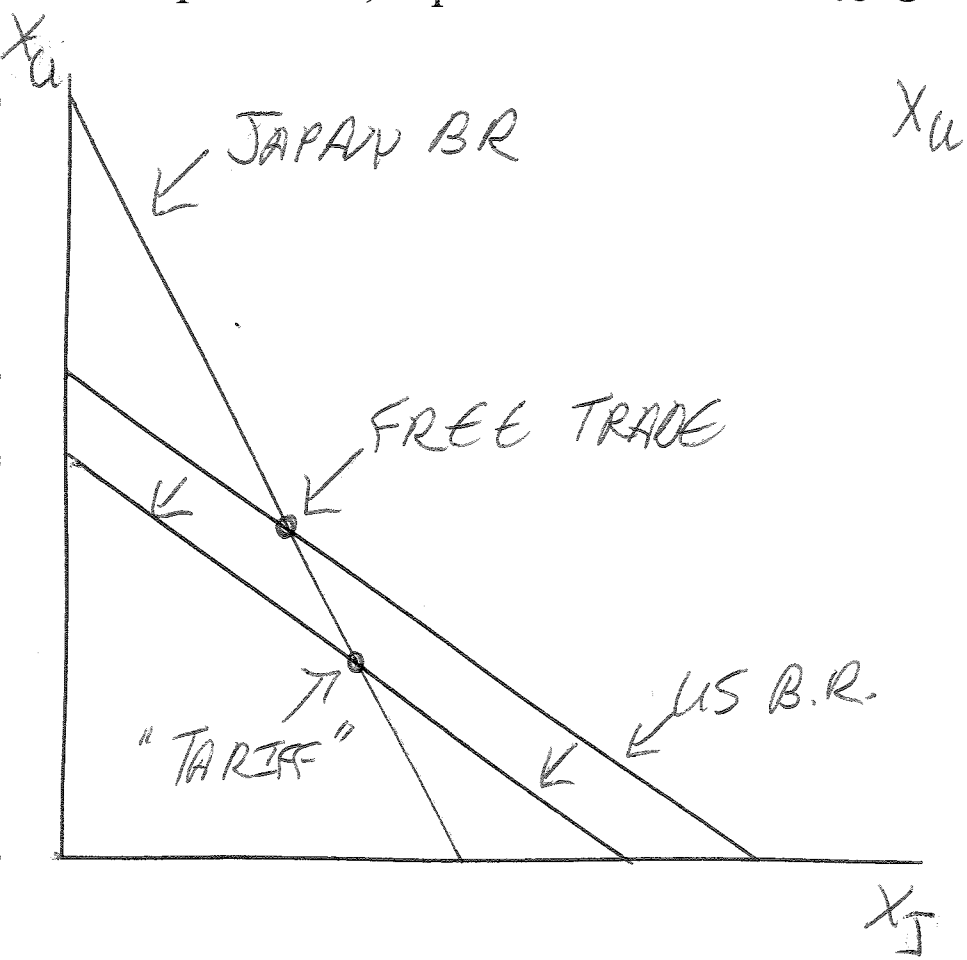
Thus we know that a small tax improves welfare.

If you went back and took the FOC at t > 0, the term in square brackets would be negative (= - β t) and increasingly negative as t increases. The optimal tax would set the whole expression to zero.

Import protection as export promotion (relevant to some of the case studies in Tyson). Protecting the home market spills over to a competitive advantage in the foreign market.

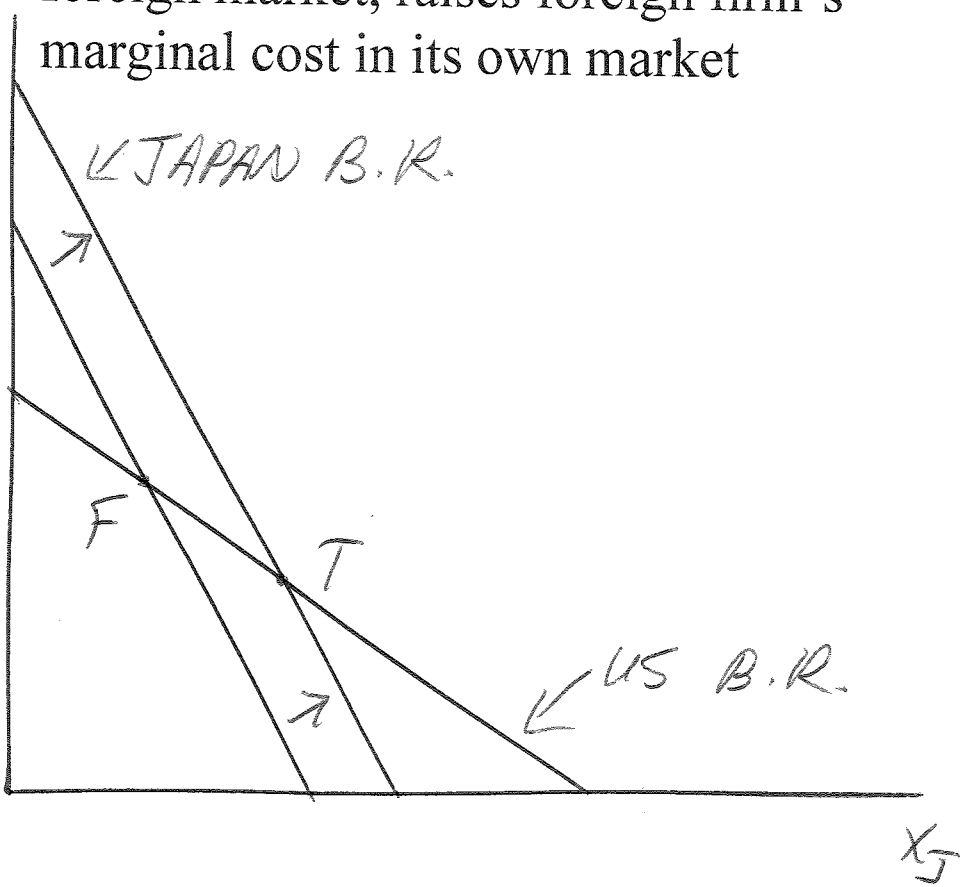
Home Market (JAPAN)

home protection shifts foreign best response in, equilibrium from F to C



Foreign Market (US)

increased market share in home market lowers home firm marginal cost in foreign market, raises foreign firm's marginal cost in its own market



VERs as "facilitating practices".

Certain trade restrictions may facilitate implicit collusion between home and foreign firms. The best example is a VER, which can restraint competition in the Bertrand (price strategies) case.

1. Consider a quota at the free trade level of imports in a Bertrand model. Quota would not be binding in a competitive model.

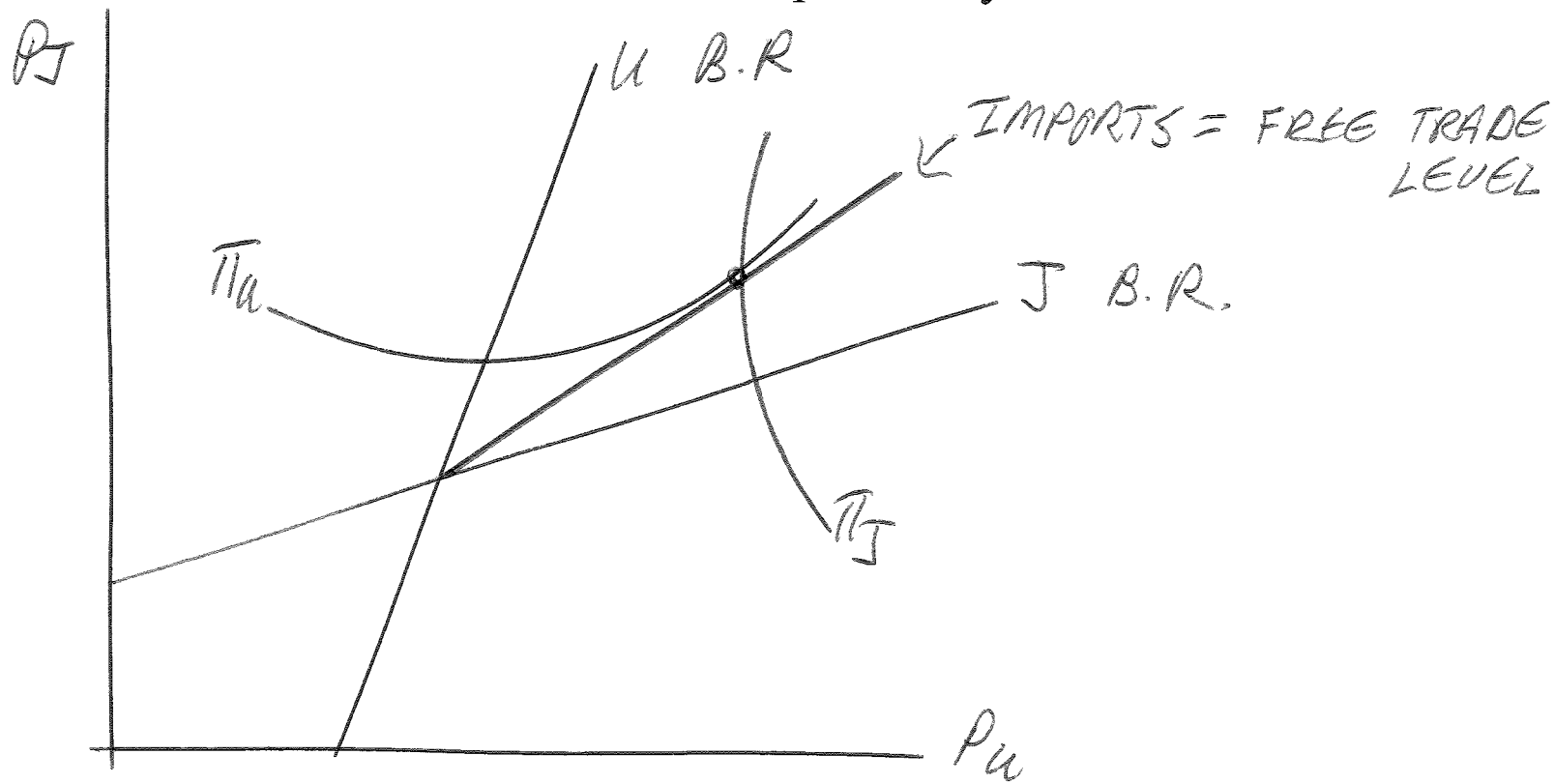
2. In the duopoly case, Harris argues that this turns the domestic firm into a natural price leader.

3. Home firm knows that if it raises its price, the foreign firm's sales must increase at a constant foreign price. Foreign firm will be in violation of the VER.

4. Foreign firm will have to raise its price in response to the increased price of the domestic firm. This anticipated response means that it is optimal for the domestic firm to deviate from the Bertrand equilibrium.

5. In the final equilibrium with the VER, the prices of both goods are higher and the profits of <u>both</u> firms are higher.

6. The effect of the VER at the free trade level is to facilitate collusion, even though the firms are behaving non-cooperatively.



Heavy line is the set of prices consistent with the free trade level of imports. The home firm can now pick the point on the constant-imports locus that maximizes its profits. But the foreign firm also has higher profits

Trade Policy with Large-Group Monopolistic Competition

Let q be the price index for the "composite X sector good", and p the price of an individual variety

The utility value of output of the sector is given by

(37) $$q\left[\sum_i X_i^{\beta}\right]^{1/\beta}$$

Price for individual varieties are the marginal valuations of one more unit of an individual variety

(38) $$p = (q/\beta)(nX^{\beta})^{1/\beta - 1}\beta X^{\beta - 1} = qn^{1/\beta - 1}$$

The private value of entering is thus

(39) $$pX = qn^{1/\beta - 1}X$$

But expansion of the sector occurs through new entry. The social value of a new variety is:

$$(40) \qquad \frac{dq(nX^{\beta})^{1/\beta}}{dn} = (q/\beta)(nX^{\beta})^{1/\beta - 1}X^{\beta} = (q/\beta)n^{1/\beta - 1}X$$

The difference between the social and private value of entering is thus positive and equal to

$$(41) \qquad q(1/\beta - 1)n^{1/\beta - 1}X \equiv \alpha pX = > 0 \qquad \alpha = (1/\beta - 1)$$

Suppose that there is a small tariff placed on imports into country i. Country i welfare changes by:

$$(42) \qquad dU_i = \left[\alpha p_i X_{ii} dn_i + \alpha p_j X_{ji} dn_j\right] + \left[n_i X_{ii} dp_i + n_j X_{ji} dp_j\right]$$

The first term in square brackets is a variety effect due to $\alpha > 0$. The second is s terms-of-trade effect. This second effect is assumed to be positive for the usual monopoly power in trade argument.

Assume free trade initially and that $p_i = p_j$ and $X_{ii} = X_{ji}$.

Flam and Helpman have a model in which the country is small in imports but large in exports. A small tariff raises the number of domestic varieties without lowering the number of foreign varieties and so the country is better off. Essentially, the tariff is like correcting a domestic distortion.

Venables has a model in which there are trade costs initially. Because there is an elasticity of substitution greater than one between varieties, consumers spend more on the cheaper domestic varieties

$$p_i X_{ii} > p_j X_{ji}$$

Thus if a tariff can substitute one domestic variety for one foreign variety, then the first term in square brackets in dU is positive and the tariff improves welfare.

Markusen (1990) explicitly considers a two-sector model and identifies an implicit assumption, which is that the differentiated goods are better substitutes for one another than for the other sector's output.

But what if the opposite is true and they are "complements" (thinking of differentiated intermediate goods).

He shows that although a tariff induces expenditure switching from foreign to domestic varieties, the total number of varieties may fall (due to a switch from X to Y goods) so that the first bracketed term in dU is negative.

This could outweigh a favorable terms of trade effect so that the tariff is welfare worsening.

Segmented versus integrated markets

Venables and Smith
Markusen and Venables
Ganslandt

X, X^* home firm's sales at home, in foreign country

Y, Y^* foreign firm's sales in home country, foreign country

Home tariff against Y

1. Segmented markets

Cournot conjecture: Y is fixed, home and foreign market prices can vary independently.

Home tariff shifts market share to domestic firm, increasing the profits of the domestic firm and improving the terms of trade. No effect in foreign market (with constant marginal costs).

2. Integrated markets

Cournot conjecture: $(Y + Y^*)$ is fixed, but will be arbitraged between markets so that price of Y is the same in both markets. Similarly with X, price must be the same in both markets.

Home country tariff shifts market share to domestic firm. etc., but the net price to the Y producer in from exports is now less than in the foreign country, so Y supply is shifted to foreign market ($dY < 0$, $dY^* > 0$). This raises prices to home country consumers and reduces prices to foreign consumers.

Home X producers also face lower demand in the foreign country as Y is shifted to domestic supply. Home firm may gain more from the tariff in its own market but suffers offsetting losses in the foreign market. Because of the greater loss of consumer surplus with integrated markets, the "optimal" tariff is lower with market integration.

With integrated markets, there is a "spillover" from the market in which the policy is enacted to the other market. In many cases such as this one, that spillover effect weakens the favorable effect of any policy.

Free trade for producers, not for consumers.

This is essentially just the segmented markets model. Producers favor free trade for themselves only, not for consumers

Strategic Trade Policy - Summary Points

1. With increasing returns to scale and imperfect competition, market equilibria are not efficient. It would be beneficial to stimulate the output of domestic firms to improve technical efficiency and shift a larger share of oligopoly profits to the domestic firm.

2. There is an argument for a subsidy in the Brander-Spencer model
   This argument is <u>strengthened</u> with domestic consumption.
   BUT
   The argument is <u>weakened</u> with more than one firm
   The argument is <u>destroyed</u> with free entry
   The argument is <u>weakened</u> with foreign ownership
   The argument is <u>destroyed</u> with Bertrand competition

3. In large-group monopolistic competition there is an initial distortion due to the fact that the social value of an additional variety is greater than the private value, thus too few are produced.

If foreign and domestic varieties are general-equilibrium substitutes, then a tariff is (unilaterally) optimal.

If foreign and domestic varieties are general-equilibrium complements, then a subsidy may in fact be optimal.

4. Other subtleties considered included links between domestic protection and exporting success, segmented versus integrated markets, and the use of trade policies to facilitate collusion between domestic and foreign firms for their mutual benefit.