Intra Industry Trade

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Intra-industry Trade (IIT):

Trade between similar countries in similar products.

Sources of IIT:

- Market imperfection
- IRS
- Product differentiation

Types of Intra-industry Trade

Intra-Industry Trade (IIT)

IIT in Identical Commodities

- Border Trade
- Strategic Trade

(e.g., Brander, 1981, Spencer, Krugman)

IIT in Differentiated Products

Horizontal Differentiation

- Love of Variety approach (by Krugman, 1979 Based on Dixit-Stiglitz utility function
- Characteristic approach (by Helpman based on Lancester's utlity function)

Vertical Differentiation

Trade in Quality differentiated goods (Helpman, E. Bond)

IIT in identical product: *Border Trade*

- **Assumptions:**

i. Transport cost increases with distance.

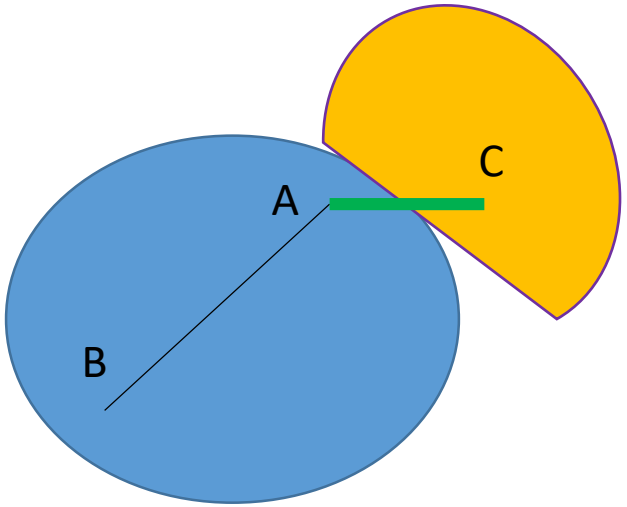
ii. Free trade between countries.

- **Conditions:**

i. Common border

ii. Geographically large countries

- **Example**: Trade between US & Canada



IIT in Horizontally Differentiated products: Characteristic Approach

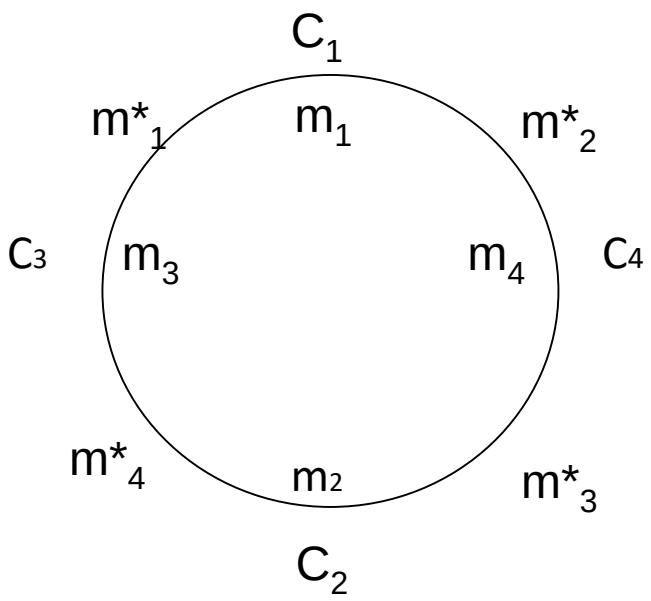
- Developed by Helpman (1980) based on Lancaster (1979).

- **Feature of Characteristic Approach:**
- Heterogeneous consumers (in terms of taste/preference).
- IRS
- Product differentiation

- Goods are viewed as bundle of characteristics.
- Every individual has a notion of ideal package.
- If you get your “ideal” you are lucky, otherwise go for the next best alternative.
- Under autarky, number of variety available may be < number of ideal packages.

Circular City and Distribution of Preferences

Consumers are uniformly distributed among the circumference of the unit circle. Each point represents a consumer. In HC 4 varieties are produced- m_1, m_2, m_3, m_4.



Consider identical FC producing 4 models- m_{1*}, m_{2*}, m_{3*}, m_{4*}.

The models are different but there is no price difference.

- *Gains from trade* occurs

In each country the availability of ideal package increases.

There will be some takers of the 4 Home varieties in both HC and FC.

There will be some takers of the 4 Foreign varieties in both HC and FC.

IIT in horizontally differentiated products

- *Love for Variety Approach, Monopolistic Competition and IIT, Krugman, 1979*
- IRS (implication: each variety is produced by only one firm)
- Product differentiation (horizontal)
- Identical consumers (unlike *Characteristic approach*)

Preference

- Variety per se doesn't matter. Hence, different varieties enter the utility function symmetrically.

- Dixit-Stiglitz preference function

(1) $U = v(c_1) + v(c_2) + v(c_3) + \ldots\ldots + v(c_n)$, $v'(c_i) > 0$, $v''(c_i) < 0$

Assumptions regarding demand function

Define price elasticity of demand: $\varepsilon_i = -\frac{v\prime(c_i)}{v\prime\prime(c_i)c_i}$

FOC: MU/P=λ

$$\frac{\delta U}{\delta C_i} = v'(c_i) = \lambda P_i$$

$$v''(c_i) = \lambda \frac{\delta P_i}{\delta C_i}$$

Define price elasticity of demand: $\varepsilon_i = -\frac{P_i}{c_i}\frac{\delta C_i}{\delta P_i}$

$$\frac{\delta \varepsilon_i}{\delta c_i} < 0$$

2. Assumption: downward sloping linear demand curve

Assumptions regarding Production function

Labour is the only factor of production.

3. Production function: $l_i = \alpha + \beta x_i$

where x_i is the total output of *i*-th variety,
l_i is the amount of labour required to produce x_i unit of i-th variety;
α Is the fixed labour cost, β is the fixed labour cost.

Equilibrium under autarchy for each variety: $x_i = c_i L$

Identical consumers each of them consume c_i

$\sum_i l_i = L$ where L = number of workers as well as the total number of consumers in the Home country

Hence n=L/l

Assumptions of Monopolistic competition

4. Given IRS each variety will be produced by a single firm. Therefore, each firm has monopoly power over its own brand. (Assmpn of monopoly in monopolistic competition)

Hence **number of firm = number of variety = n**

5. Varieties are close substitutes. Hence monopoly power is not exerted much. Due to **free entry and exit, at the LR eqm**, **profits=0.**

(Assmpn of perfect competition in monopolistic competition)

Equilibrium conditions

Under monopolistic competition: MR=MC

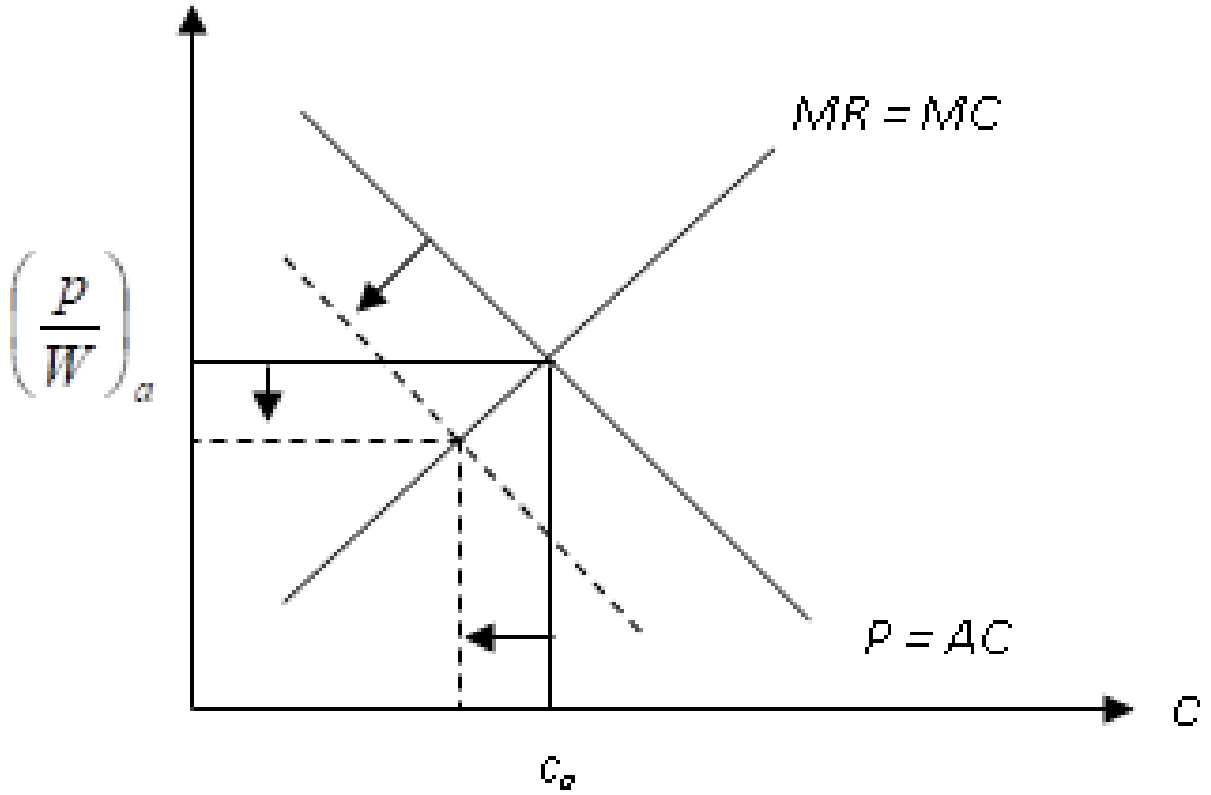
$$\beta W = p_i\left(1-\frac{1}{\varepsilon_i}\right)$$

$$\Rightarrow \frac{p_i}{W} = \frac{\varepsilon_i}{\varepsilon_i - 1}\beta \quad \text{.....Condition (A)}$$

Free entry of firms => P=AC=> $p_i = \left(\frac{\alpha}{x_i} + \beta\right)W$

$$\Rightarrow \frac{p_i}{W} = \left(\frac{\alpha}{x} + \beta\right) \quad \text{.....Condition (B)}$$

Two endogenous variables c and w/p to be solved from 2 eqns.



Effect of Trade on Real Wage and Consumption

Equilibrium conditions

- MR=MC is positively sloped: As c rises, elasticity of dd falls (for a linear demand function). Denominator of (A) falls. So RHS rises, (P/W) should increase to maintain equality.

- P=AC is downward sloping. As C rises, xrises, (1/x) falls, RHS falls, (P/W) should increase to maintain equality.

- **Number of varieties produced under autarchy in Home country is:**

$$n_a = \frac{L}{l} = \frac{L}{\alpha + \beta x_a}$$

Post Trade

- Given the type of the utility function and identical consumers, opening up of trade implies increase in the number of consumer for each producer (equivalent to growth in labour force).

- Suppose FC produces n* no of varieties.

- Due to IRS, all n and n* varieties are distinctly different.

- As L increases (when trade opens up), dd increases, output per variety (in both HC and FC) increases. Hence P=AC shifts down but MR=MC remains unchanged.

Gains from trade:

1. **Increase in real wage**: Labour being the only factor of production implies real income gain.

(a) P falls: Larger integrated market allows each firm to expand their production and thus lower AC. With free entry P=AC, price of each variety thus falls.

(b) Money wage increases: Increase in output requires more labour, which given the labour supply, raises the money wage in each country.

since price falls and nominal wage increases, real wage goes up implying real income gain.

2. **Increase in number of variety**: Though consumption per variety falls, this loss is offset by increase in number of varities available in each country.

Increase in number of variety

$$\hat{x} = \hat{L} + \hat{c} < \hat{L}$$

Now n = L/βx

$\Rightarrow \quad \hat{n} = \hat{L} - \hat{x} > 0$

Since $\hat{x} = \hat{L} + \hat{c}$ As L increases, C falls, x increases but < the increase in L.

Hence $\hat{n} > 0$

FPE in Krugman's done for variety (1979)

- Technology, taste : identical
- Total dd in HC : D = p(n+n*)LC
  where RHS = expenditure of HC after Trade
- Expenditure of FC after Trade D* = p(n+n*)L*C
- Import share of HC in D = $\frac{pn^*LC}{p(n+n^*)LC} = \frac{n^*}{n+n^*}$

$n^* = \frac{L^*}{l}$ and $n + n^* = \frac{L^*}{l} + \frac{L}{l} = \frac{L^*+L}{l}$

Value of Import by HC (M) = $wL\left(\frac{L^*}{L+L^*}\right)$

Value of import by FC (M*) = $w^*L^*\left(\frac{L}{L+L^*}\right)$

Trade balance condition : M = M*

⇒ $w = w^*$

⇒ FPE

Limitation of the Model

- Pattern of trade is indeterminate.

We don’t know in the post-trade situation which varieties are exported by which countries in the Love-of-Variety and Characteristic approach. Hence implementation of trade policy becomes difficult.

Distinction between Love-of-Variety and Characteristic Approach

- *Love-of-variety* is applicable for non-durable goods which the consumers can buy a lot whereas *Characteristic approach* is more suited for durable goods.

- In *Love-of-variety* consumer preference is homogeneous whereas in *Characteristic approach* the notion of ideal variety differs across consumers implying that consumers preference is heterogenous.

IIT in identical product: Reciprocal dumping *(Brander, 1981)*

- ***The source or basis of trade*** *here is the* ***market imperfection****.*

- Homogenous product
- CRS
- Monopoly under autarky

- Let demand and cost conditions are identical in the two countries:
- Pa=Pa*=Pm
- Hence autarkic profits of the two countries are equal (to monopoly profit).

- Autarkic price of HF (Home Firm)> MC. Hence FF (Foreign Firm) can enter the Home market and charge a price < Pm.
- Similarly, HF can invade Foreign market.

- Hence **post-trade duopoly**. (Assume Cournot competition, that is, simultaneous move output competition)
- Pm>Pd>c (Note. Pd>c for all non-Bertrand equilibrium)

Market Structure

- Domestic monopoly under autarky.
- Post-trade Cournot competition

- Note the result will hold even if we assume oligopoly under autarky. In that case when trade opens up market structure will still be oligopoly with increased number of firms.

Two important assumptions

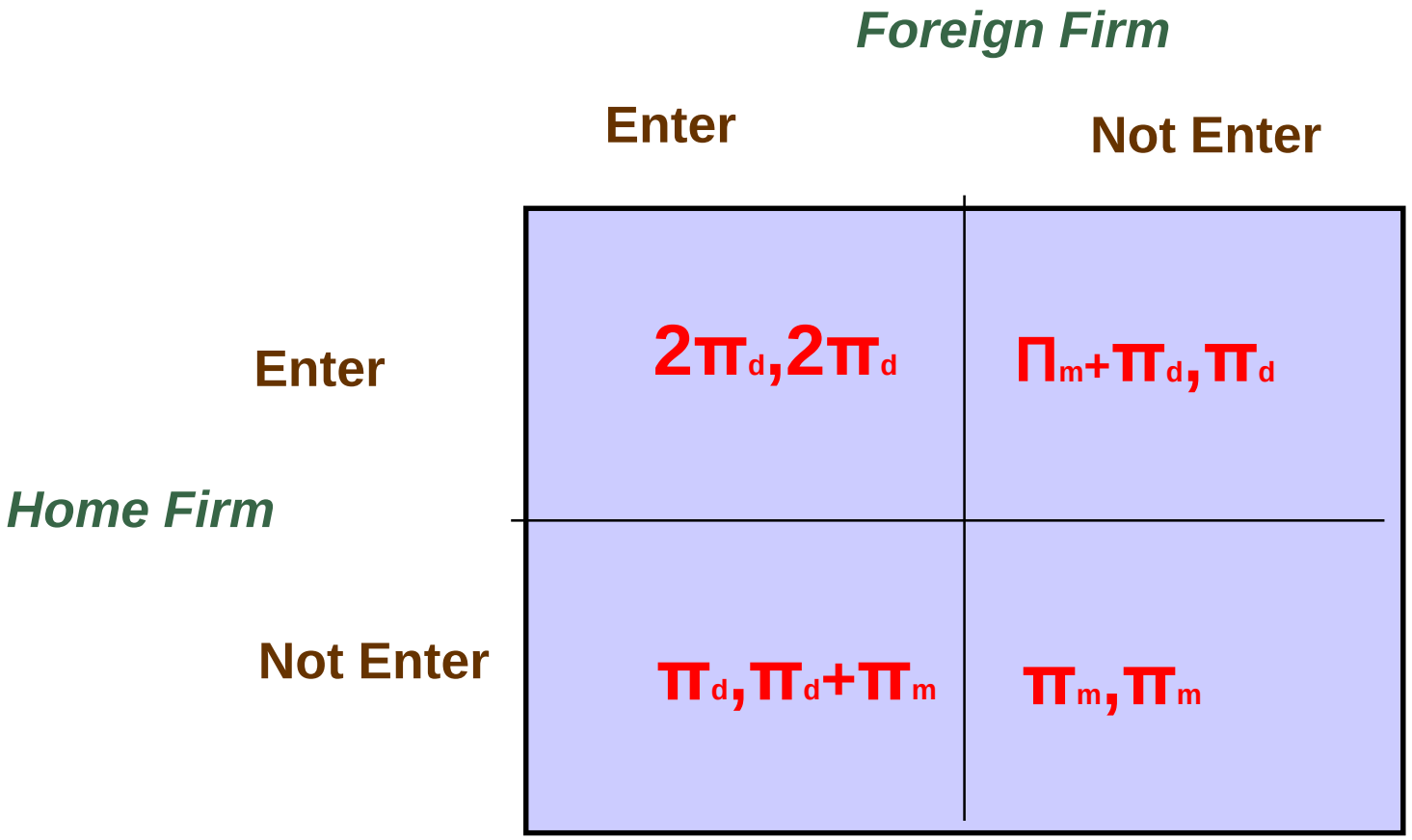
- ***Market symmetry:*** Identical technology and identical local demand conditions imply same pre-trade relative prices ruling out the scope for arbitrage.

- ***Market segmentation:*** Because of constant marginal cost of production output decision in one market does not depend on output decisions in other markets.

Since MC doesn't depend on output volumes of exports as well as domestic sales are to be decided by the firm. Hence the two decisions of how much a firm will be selling domestically and how much in abroad are independent of each other.

(Note that with increasing or decreasing MC, the property of market segmentation will not hold)

Pay-off matrix



Nash Equilibrium: (Enter, Enter) for any $\pi_d > 0$

Remarks.

- Basis of trade here is **market imperfection**. If we assume perfect competition so that P=MC in both the countries, then there would not have been any incentive of evasion.

- Here we assume fixed cost=0, MC= constant. Hence production technology exhibits **CRS**. So economies of scale is not the basis of trade in strategic trade theory.

- This is called ***cross-hauling or reciprocal dumping***. Since autarkic prices are > MC Each country can dump (charge a lower price) its product on the foreign market.

Model

- Demand functions:

$P_h=f(X_h)$ where $X_h=x_h+x_h^*$

$P_f=f(X_f)$ where $X_f=x_f+x_f^*$

- Cost function: $C=cX= Cx_h +Cx_f$

- Profit of Home and Foreign firms :

$\Pi=[P_h - c] X_h +[P_f -c] X_f$

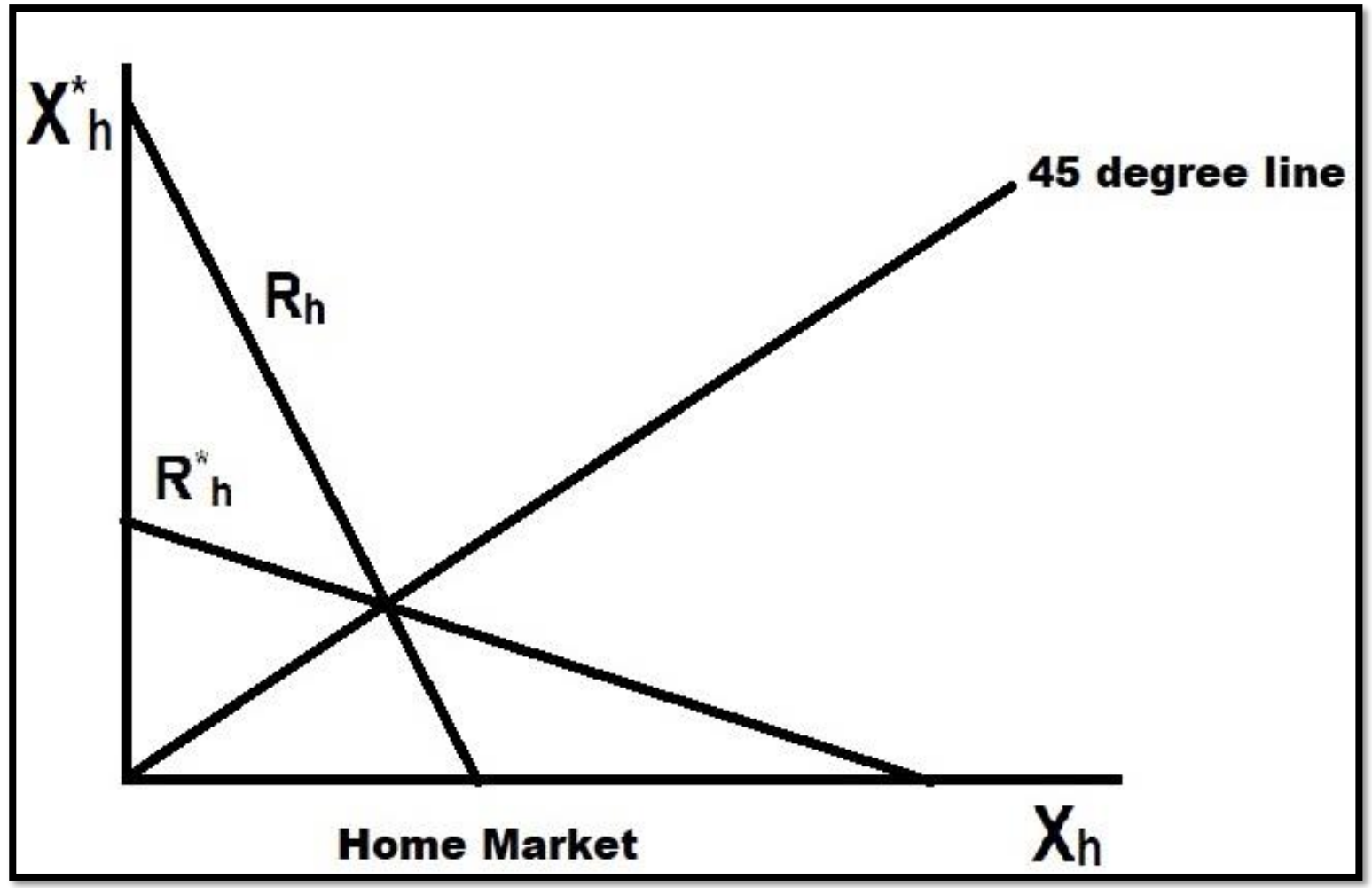
$\Pi^*=[P_h - c] X_h^* +[P_f -c] X_f^*$

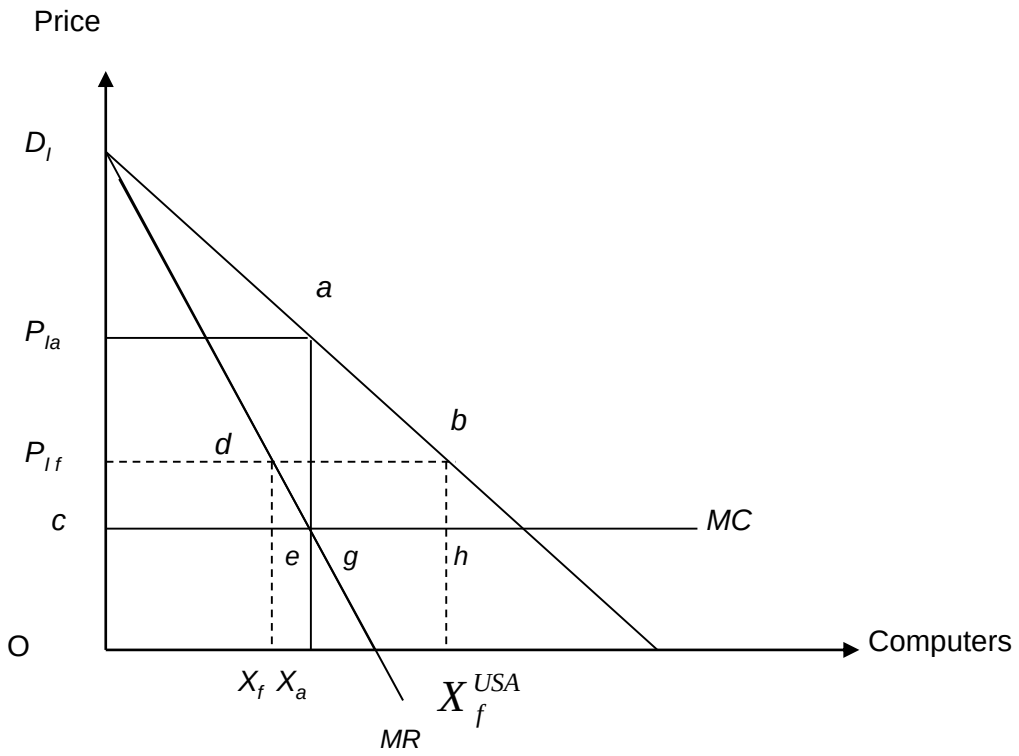
First order conditions:

$$\left\{ \begin{array}{ll} \dfrac{\partial \pi}{\partial x_h} = 0 & \dfrac{\partial \pi^*}{\partial x_h^*} = 0 \\ \dfrac{\partial \pi}{\partial x_f} = 0 & \dfrac{\partial \pi^*}{\partial x_f^*} = 0 \end{array} \right\}$$

These will be independent pairs.

So $\dfrac{\partial \pi}{\partial x_h} = 0$ are $\dfrac{\partial \pi^*}{\partial x_h^*} = 0$ related through demand. X_h doesn't depend on X_f. X_f doesn't depend on X_h.

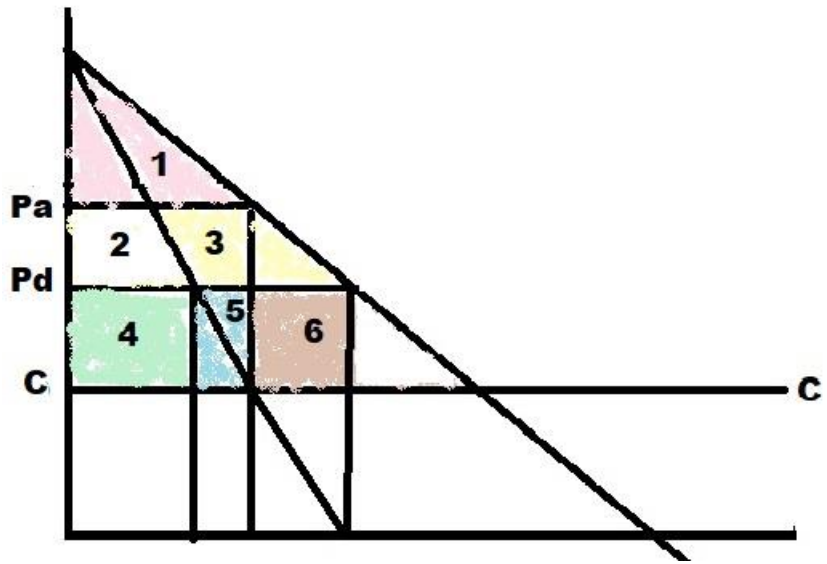

X^*_h
45 degree line
R_h
R^*_h
Home Market
X_h



Domestic Market, Reciprocal Dumping and IIT

Gains from Trade: Welfare Analysis

- **CS increases from the area aD_lP_{la} to $bD_{la}P_{lf}$ as Price falls by the pro-competitive effect of trade.**
- **Profit of domestic firm changes from $aP_{la}cg$ to $dP_{lf}ce$ from local sales and $dehb$ from exports.**
- **Area $dP_{lf}ce$ measures the profit for the foreign firm from selling in its domestic market.**
- **Net increase in total surplus for both countries. CS and profit increases.**



$W_a = CS_a + \pi_a$

$= \text{area } (1+2+4+5)$

$W_T = CS_T + \pi_T$

$= \text{areas } (1+2+3) + \text{areas } (4+5+6)$

Therefore,

GFT = areas (3+6)

Distinction between Strategic Trade Model with Love-of-Variety and Characteristic Approach

- Love-of-variety and Characteristic approach assume *IRS* but Strategic trade model has *CRS.*

- Love-of-variety and Characteristic approach deal with *differentiated product* whereas Strategic trade model has *homogenous product.*

Assignment

- Brander (1981) model with transport cost.