

PC5: Location Choice

Exercise #1. Horizontal foreign direct investment

The model¹

Consider a country j where consumers have a CES utility function over differentiated varieties of the same product, each variety being produced in a different country ($i = 1$ to C). The demand for each variety i is given by:

$$c_{ij} = \left(\frac{p_{ij}}{P_j} \right)^{-\sigma} \frac{Y_j}{P_j}$$

where p_{ij} is the price of product i in country j , Y_j is the exogenous nominal income of country j , $\sigma > 1$ is the elasticity of substitution across varieties and P_j is the price index:

$$P_j = \left[\sum_{i=1}^C p_{ij}^{1-\sigma} \right]^{\frac{1}{1-\sigma}}$$

C is assumed to be large enough for each individual price p_{ij} to have a negligible impact on the price index P_j . The production function of the exporter is given by:

$$L_i = \beta y_i$$

where L_i denotes labor input, y_i is the production for export and $1/\beta$ is labor productivity. We assume that plant-specific costs are already covered by home sales of the product. The unit cost of labor is w_i .

As in PC3, international transportation involves a proportional, ‘iceberg-type’ cost $T_{ij} > 1$, meaning that the production shipped by country i to country j is:

$$y_i = c_{ij} T_{ij}$$

The corresponding CIF price for country i 's consumer is:

$$p_{ij} = p_i T_{ij}$$

where p_i is the producer's FOB price.

1. A producer located in country i is considering exporting to country j . Show that maximization of his profit on exports (π_i) given the demand function yields the following pricing policy:

$$p_i = \frac{\sigma}{\sigma - 1} \beta w_i$$

Express the corresponding profit π_i as a function of this optimal price. Comment.

2. Rather than exporting to country j , the firm can instead establish a subsidiary in country j and sell locally. In this case, it faces a production cost $L_j = \alpha + \beta y_j$ where α is the plant-specific fixed cost

¹ Adapted from Feenstra (2004), pp. 386-390.

paid abroad, and y_j is the production carried out in country j . There are no transport costs when producing in country j and selling locally, so with the price p_j , the quantity sold is:

$$c_{ij} = \left(\frac{p_j}{P_j} \right)^{-\sigma} \frac{Y_j}{P_j}$$

Derive the new optimal price p_j of the foreign subsidiary and the corresponding profit. Comment. What happens under perfect competition?

3. For which values of T_{ij} will exporters of country i switch to local production in country j ? For which values of T_{ji} will exporters of country j switch to local production in country i ? It will be assumed that $w_i = w_j = w$.

4. For which values of T_{ij} T_{ji} will a multinational operate in both countries? When are horizontal multinationals more likely to materialize? Denoting $Y = Y_i + Y_j$ and defining s_i (resp. s_j) as the share of country i (resp. country j) in total income Y , show that horizontal multinational are more likely if countries are of similar sizes

5. Comment the following table:

Conditional logit estimation of investments abroad and in France by French multinationals (1992-2002)

Model :	Dependent Variable: Chosen Country						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln market access	0.44 ^a (0.02)	0.36 ^a (0.03)	0.37 ^a (0.03)	0.34 ^a (0.03)	0.35 ^a (0.03)	0.36 ^a (0.03)	0.35 ^a (0.03)
ln distance	-0.44 ^a (0.07)	-0.26 ^a (0.08)	-0.26 ^a (0.08)	-0.27 ^a (0.09)	-0.27 ^a (0.09)	-0.23 ^a (0.08)	-0.27 ^a (0.09)
common language	0.05 (0.07)	-0.27 ^a (0.08)	-0.23 ^a (0.08)	-0.19 ^b (0.09)	-0.17 ^c (0.09)	-0.21 ^a (0.08)	-0.18 ^c (0.09)
ex colony	0.19 (0.12)	0.38 ^a (0.12)	0.36 ^a (0.12)	0.21 (0.14)	0.21 (0.14)	0.35 ^a (0.12)	0.21 (0.14)
ln GDP per capita	-0.28 ^a (0.03)	-0.27 ^a (0.03)	-0.27 ^a (0.03)	-0.24 ^a (0.04)	-0.25 ^a (0.04)	-0.26 ^a (0.03)	-0.24 ^a (0.04)
France	2.37 ^a (0.07)	2.20 ^a (0.08)	0.97 ^a (0.09)	3.97 ^a (0.29)	4.47 ^a (0.17)	5.16 ^a (0.39)	1.32 ^a (0.10)
ln (# of same ind. firms -1)	0.88 ^a (0.01)	0.87 ^a (0.01)	0.85 ^a (0.02)	0.87 ^a (0.02)	0.82 ^a (0.02)	0.82 ^a (0.02)	0.87 ^a (0.02)
ln (supply access -1)		0.14 ^a (0.01)	0.12 ^a (0.01)	0.10 ^a (0.02)	0.10 ^a (0.02)	0.12 ^a (0.01)	0.10 ^a (0.02)
ln (financial network -1)			0.86 ^a (0.03)	0.79 ^a (0.03)	0.82 ^a (0.03)	1.70 ^a (0.08)	0.79 ^a (0.03)
France × ln productivity				-0.49 ^a (0.05)			
France × ln employment					-0.58 ^a (0.03)		
France × ln financial network						-0.86 ^a (0.08)	
France × ln advertising							-1.53 ^a (0.29)
Region fixed effects	yes	yes	yes	yes	yes	yes	yes
Investments × countries	1266123	1183772	1183772	1131094	1138197	1183772	1136625
Investments	14966	14960	14960	14294	14384	14960	14364
French Investments	12321	12321	12321	12238	12321	12321	12306
Pseudo R ²	0.784	0.783	0.796	0.830	0.834	0.797	0.830

Note: Standard errors in parentheses with ^a, ^b and ^c respectively denoting significance at the 1%, 5% and 10% levels.

Source: Mayer, Méjean and Nefussi (2007).

Exercise #2. Foreign direct investment: proximity or concentration?

An aircraft producer considers locating its assembly lines in France, in Germany, or in both countries. The assumptions are the following:

- France is the main market: French demand is 40 planes whereas it is only 5 planes in Germany. However Germany has a lower production cost of 6 million euros per plane instead of 7 million euros per plane in France;
 - Planes are sold the same price in both countries, *i.e.* 10 million euros;
 - A fixed cost of 30 million euros per location is incurred by the firm;
 - There is a trade cost of t per plane sold abroad and zero when selling locally.
1. What is the total profit when an assembly line is established in each country to cover the country's local market?
 2. What is total profit if all production is located in France? In Germany?
 3. If Germany and France were not in a custom union, a tariff $t = 6$ million euros per plane would be incurred. What would the best strategy? Comment.
 4. Being both members of the European Union, Germany and France do not impose tariffs vis-à-vis each other, so that trade cost t boils down to transportation costs worth 2 million euros per plane. What is the best strategy? Comment.
 5. Due to tariff cuts and improvements in transport infrastructures, trade costs fall to $t = 1$ million euros per plane. What is the best strategy? Comment.