PC3: Imperfect Competition

Exercise #1. Gains of trade under imperfect competition

In country 'A', there are N apple orchards indexed by $i \in \{1..N\}$, each producing a given variety of apple: Golden Delicious, Granny Smith, etc. Each farmer is a monopoly producer on its market segment, and it is small enough to take as given the average price of apples. The perceived demand Y_i and cost function C_i of farmer i are:

(1) $$Y_i = \overline{Y}\left[\frac{1}{N} - b(P_i - \overline{P})\right] \qquad b > 0$$

(2) $$C_i = f + cY_i \qquad f, c > 0$$

where $\overline{Y}$ is the (exogenous) total demand for apples, P_i is the selling price set by farmer i and $\overline{P}$ is the average price across market segments.

In the short run, the number of orchards is fixed.

1. Comment the model's assumptions. Plot the cost curve of the representative orchard as a function of the number of farms, N.

2. Invert the demand function and compute the marginal revenue, then the first-order condition of profit maximization. Where does the equilibrium price lie on the preceding figure?

In the long run, the number of orchards is endogenous due to free entry on the market.

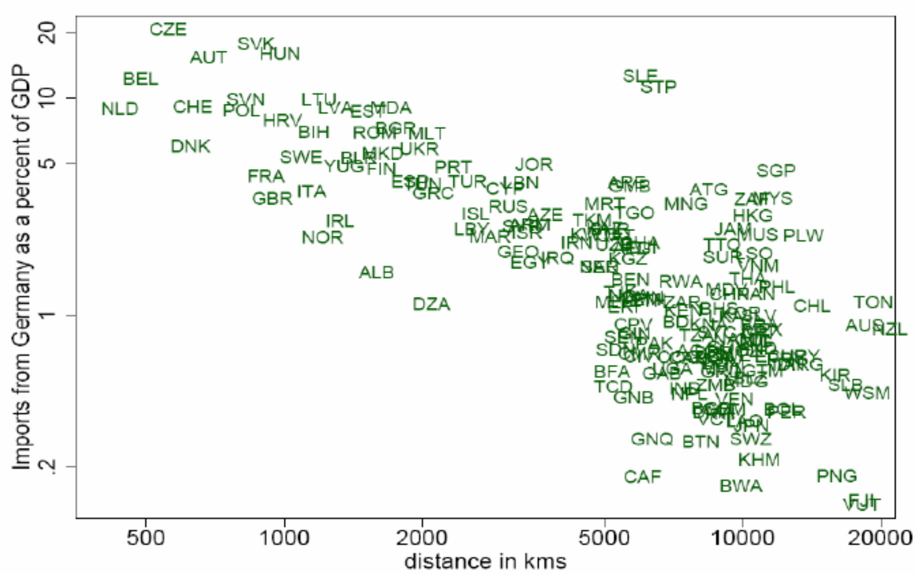
3. What is the number of farms and the long-term equilibrium price? What is the individual production of each farm? Explain its relation with $\overline{Y}$ and f.

Country 'A' strikes a free-trade deal with country 'B' which is identical to country 'A' (same total demand for apples, same technology).

4. What is the total number $\mathcal{N}$ of farms in the short run? In the long run? What if before opening the market to foreign trade, governments in each country decide to compensate fully the revenue losses of farmers?

Exercise #2. The gravity model

We seek to build a micro-founded model which could explain the following empirical pattern:



Source: Mayer (2008).

We proceed as follows. The nominal revenue of a given country j is Y_j. Country j consumes N_i varieties of goods imported from each of its partner countries i, with $i \in \{1..C\}$. The price of variety $k \in \{1..Ni\}$ imported by country j from country i is written p_{ij}^k. The utility function of the representative consumer of country j writes:

$$U_j = \left[\sum_{i=1}^{C} \sum_{k=1}^{N_i} \left(c_{ij}^k \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \qquad \text{with } \sigma > 1$$

All varieties k shipped by country i to country j are sold the same price: $\forall k,\ p_{ij}^k = p_{ij}$. Quantities sold are therefore identical as well: $\forall k, c_{ij}^k = c_{ij}$. The utility function can be simplified as:

$$U_j = \left[\sum_{i=1}^{C} N_i \left(c_{ij} \right)^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}$$

Finally, we define the *price index* of country j as: $P_j = \left[\sum_{i=1}^{C} N_i \left(p_{ij} \right)^{1-\sigma} \right]^{\frac{1}{1-\sigma}}$

1. Write the budget constraint of country j. Show that the utility-maximizing consumption of each variety c_{ij} under the budget constraint writes:

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

Hint: form the Lagrangian and show that the first-order condition writes $c_{ij}^{-1/\sigma} = \lambda p_{ij} U_j^{-1/\sigma}$. *From this expression, calculate* $N_i\, p_{ij}\, c_{ij}$ *and add up over i.*

2. We suppose that proportional transport costs τ_{ij} apply to the importing country:

$$p_{ij} = (1 + \tau_{ij}) p_i$$

where p_i is the price at departure from exporting country *i* (the so-called 'free-on-board' or 'FOB' price) and p_{ij} is the price at arrival in country *j* ('cost, insurance and freight' or 'CIF' price). How do transport costs impact on exports from *i* to *j*?

3. Infer from the last question the equation explaining aggregate trade between *i* and *j*.

4. Based on the following pooled regression, assess the effect, for trade of goods and services, of sharing a common currency.

	(1)	(2)	(3)	(4)	(5)	(6)
ln Pop, i	0.978^a	0.893^a	0.290^a			
	(0.006)	(0.009)	(0.046)			
ln Pop, j	0.837^a	0.835^a	0.962^a			
	(0.006)	(0.008)	(0.040)			
ln GDP/Pop, i	1.118^a	0.921^a	0.732^a			
	(0.007)	(0.010)	(0.015)			
ln GDP/Pop, j	0.945^a	0.702^a	0.634^a			
	(0.007)	(0.010)	(0.015)			
ln Dist (avg)	-1.035^a	-1.197^a				
	(0.014)	(0.015)				
Shared Language	0.506^a	0.522^a				
	(0.034)	(0.038)				
Shared Legal Origins	0.313^a	0.160^a				
	(0.026)	(0.029)				
Colonial History	1.560^a	2.605^a				
	(0.380)	(0.206)				
RTA	0.958^a	0.593^a	0.521^a	0.400^a	0.411^a	0.317^a
	(0.044)	(0.026)	(0.027)	(0.029)	(0.034)	(0.033)
Both GATT	0.125^a	0.155^a	0.159^a	0.244^a	0.368^a	0.206^a
	(0.020)	(0.016)	(0.017)	(0.038)	(0.041)	(0.042)
Currency union	0.688^a	0.483^a	0.486^a	0.499^a	0.469^a	0.309^a
	(0.091)	(0.064)	(0.068)	(0.047)	(0.056)	(0.089)
Tetrads:				GBR,FRA	USA,DEU	CHE,CAN
Fixed Effects:	None	Dyads(RE)	Dyads	Tetrads	Tetrads	Tetrads
# Obs.	618233	618233	618233	655531	651603	633190
RMSE	2.165	1.480	1.473	1.677	1.722	1.832

Source : Head, Mayer and Ries (2008).

Notes:

- The first three columns portray results where exporter and importer population and per-capita GDP proxy for exporter-specific and importer-specific effects. In the ensuing three columns, these effects are eliminated by creating tetradic trade flows. This requires choosing reference countries. To investigate the robustness of the method, we employ three country pairs—Great Britain-France, the United States-Germany, and Switzerland-Canada—as the reference countries and report estimates for all three. All specifications include year dummies that are not reported in the table;
- 'RTA' signals the existence of a regional trade agreement;
- Standard errors in parentheses with [a], [b] and [c] respectively denoting significance at the 1%, 5% and 10% levels. Standard errors are corrected to take into account correlation of errors within dyads in columns

(1) to (3). Columns (4) to (6) use three-way clustering by dyad, i-year, and j-year using Cameron et al. (2006) method.