Assignment # 4
Due November 8 (beginning of class)

Problem 1 - Internal economies of scale and monopolistic competition

Lets assume that, in France and in Italy, bicycles are sold in the context of a monopolistic competition market structure. The total annual demand for bicycles in France is 500,000 units and in Italy 720,000 units. In both countries, firms have the same cost functions and face the same demand.

a. The cost function is given as

$$C = 10,000,000 + 100 \, Q$$

where $C$ is total cost, fixed cost is equal to 10,000,000 and marginal cost to 100 (constant).

i. Derive the average cost equation.  

$$AC = \frac{10,000,000}{Q} + 100$$

ii. When $Q = 100,000$  

calculate $AC = 200$

When $Q = 100,001$  

calculate $AC = 199.99$

When $Q = 1,000,000$  

calculate $AC = 110$

What happens to average cost when production expands? _____ it decreases _____

iii. How are such conditions in production called? (be specific)  

____________________ IRTS to firms ________________

OR __________________ Internal economies of scale ________________
b. The demand faced by each firm is described by the following equation:

\[ Q = S \left[ \frac{1}{n} - \frac{1}{2,000} (P - \bar{P}) \right] \]

where \( Q \) are the sales of the firm, \( P \) the price set by the firm and \( \bar{P} \) the average price of the competition. This relation is a typical form representing the demand faced by a firm in the monopolist competition setting: sales \( Q \) are positively related to total sales for the industry \( S \) and inversely related to the number of firms in the industry \( n \); \( 1/2,000 \) is the coefficient measuring the responsiveness of the firm’s sales to the price \( (P - \bar{P}) \).

i. Calculate the autarky equilibrium for France: number of firms, sales of each firm, average cost and industry price in equilibrium.

(show the four equations used to derive each one of these results below – see chapter pp5-8)

\[ n = \sqrt{\frac{S}{bF}} \quad Q = \frac{S}{n} \quad AC = \frac{F}{Q} + c \quad P = \frac{1}{bn} + c \]

with \( S_{Fr} = 500,000 \quad F = 10,000,000 \quad b = 1/2,000 \quad c = 100 \) (variable unit cost)

\[ n = 10 \quad Q = 50,000 \quad AC = 300 \quad P = 300 \]

ii. Calculate the autarky equilibrium for Italy: number of firms, sales of each firm, average cost and industry price in equilibrium.

\( S_{It} = 720,000 \) (the rest is same as above)

\[ n' = 12 \quad Q' = 60,000 \quad AC' = 266.67 \quad P' = 266.67 \]

c. Now assume that the two countries trade and form a large open market for bicycles.

i. Calculate the equilibrium for the open integrated market: number of firms, sales of each firm average cost and industry price in equilibrium.

\( S^W = S^{FR} + S^h = 500,000 + 720,000 = 1,220,000 \)

\[ n^T = 15 \quad (\text{round below}) \quad Q^T = 81,333.33 \quad AC^T = 222.95 \quad < \quad P^T = 233.33 \]
ii. Compare the original autarky price in each country to the new equilibrium price with trade and comment on the results (in a short and concise answer no longer than the space provided).

*World price < either autarky prices*

iii. Compare the number of varieties available in each country before and after the markets are opened and comment on your findings (in a short and concise answer no longer than the space provided).

*10 in France – 12 in Italy and 15 in the larger market (the original 12 varieties + 3 new varieties)*

d. Assume that the UK now integrates its bicycle market with France and Italy. In the UK, firms have the same cost functions and face the same demand as the Franco-Italian market. The UK annual demand for bicycle is 780,000.

i. Calculate the numbers of firms, the sales of each firm, average cost and industry price in equilibrium in the new enlarged market comprising France, Italy and the UK.

\[
S^W = S^{FR} + S^{IT} + S^{UK} = 500,000 + 720,000 + 780,000 = 2,000,000
\]

\[
\omega = \frac{500,000}{2,000,000} = 0.25
\]

\[
\omega = \frac{720,000}{2,000,000} = 0.36
\]

\[
\omega = \frac{780,000}{2,000,000} = 0.39
\]

\[
\omega = \frac{500,000 + 720,000 + 780,000}{2,000,000} = 0.63
\]

\[
\omega_N = \frac{n^T}{S^W} = \frac{200}{2,000,000} = 0.1
\]

\[
Q^T = 100,000
\]

\[
AC^T = 200
\]

\[
P^T = 200
\]

ii. In 1958, France and Italy were two of the six founding members of the European Common Market. The UK eventually joined the group in 1972 and now the membership has reached 15 countries with many more European countries waiting to be admitted in the now named European Union. Following the model above, the size of the average firm has increased allowing the exploitation of internal economies of scale thus creating substantial economic gains for the Europeans. However this has created a dilemma for the framers of the European Union constitution (incorporated in various treaties) which they addressed by also drafting a rigorous competition policy. Why is that? (answer in no more than 2 concisely written lines)

*Need for strict antitrust laws to curb the monopolistic power of firms expanding as a result of IRTS.*