Study Questions to Accompany International Energy Markets

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Chapter 7. Monopoly, Dominant Firm and OPEC

7.1. Suppose that MC = 12 and the demand price elasticity equals -1.8. The monopoly pricing result is $P = MC/(1-1/|\varepsilon_p|)$

7.1a. Using the above expression, what price should the monopolist charge?

7.1b. If MC increases to 14, compute the optimal price?

7.1c. If the demand elasticity doubles, compute the optimal price?

7.1d. What happens if the price elasticity becomes -0.5? Why does this equation imply that the monopolist must be operating in the elastic region of a linear demand curve? (i.e. Where "$\varepsilon_p < 1$ or $|\varepsilon_p| > 1$.)

7.2 The monopolists profit function is P(Q)Q-TC(Q). Where P(Q) is the inverse demand equation, Q is the monopolist's production, and TC(Q) is the monopolist's total cost function.

> **7.2a** Use general notation to compute first and second order conditions to maximize the monopolist's profit function.
>
> **7.2b** Give an economic interpretation for the f.o.c. the first and second order conditions.

7.3 Suppose a monopolist faces a demand function

$$Q = 200 - 1/4P.$$

Its total cost function is $100 + 40Q + Q^2$.

7.3a Write the monopolist's profit function along with first and second order conditions for a maximum. Solve for the optimal P and Q and monopoly profits.

7.3b. Show you get the same result if you solve the equation MR=MC.

7.3c. Write the profit function for 7.3b, if a unit tax of 2 is placed on the monopolist. Compute optimal P, Q, monopoly profits, and tax revenues.

7.3d Show you get the same optimal Q, if you solve the equation MR=MC+t or MR-t=MC.

7.2e On a diagram, show whether social welfare increases or decreases with the tax.

7.4 With an ad valorem tax, profits for the monopoly become:

$$\boldsymbol{\pi = (1 - t_a)P(Q)Q - TC(Q)}$$

First order conditions are:

$$\frac{\partial \pi}{\partial Q} = (1 - t_a)\left[P(Q) + \frac{\partial P}{\partial Q} Q\right] - \frac{\partial TC(Q)}{\partial Q} = (1 - t_a)MR - MC = 0$$

7.4a. Show the monopolist's optimal price and quantity on a graph.

7.4b. For Q = 200 – (1/4)P and TC(Q)= 100 40Q + Q^2, compute optimal P, Q, monopoly profits, and tax revenues.

7.4c. Does this policy get us to the socially optimal Q? Justify your answer with a graph.

7.5 The two other taxes mentioned in the text are a profit tax (t_π) and a lump sum tax of a fixed amount T. The after tax profit functions including these taxes are as follows:

$\pi = (1 - t_\pi)[P(Q)Q – TC(Q)]$

$\pi = P(Q)Q - TC - T$

7.5a. What would be the first order conditions ($d\pi/dQ$) for each of these functions? What are second order conditions?

7.5b. Explain intuitively why these taxes have no effect on output.

7.6 Many **countries** have antimonopoly laws as shown in table below. Find information for your assigned country Table.

Country	Law	When Passed	Basic Provisions and reference
United States	Sherman Antitrust	1890	Monopoly and restraint of trade are illegal. https://www.ourdocuments.gov/doc.php?flash=false&doc=51
Canada	Competition Act	1890 with latest revision 1986	A Federal Law to protect consumers, promote competition, and prohibit monopoly except for state regulated activities. http://www.acc.com/legalresources/publications/topten/canadian-competition-act.cfm, https://en.wikipedia.org/wiki/Competition_Act
Japan	Act on Prohibition of Private Monopolization and Maintenance of Fair Trade	1947	Prohibits mnopolistc practises and unfair trade activities https://www.jftc.go.jp/en/legislation_gls/amended_ama09/amended_ama15_01.html

7.7 Suppose OPEC is a two country multiplant monopolist with the countries marginal cost curves as follows.

$MC_1 = 1 + Q_1$

$MC_2 = 2 + 2Q_2$

7.7a Compute OPEC's profit maximizing price and quantity, if OPEC demand is P = 200 – 1/2Q?

7.7b Compute quantity and profits for each country within OPEC?

7.8 Suppose OPEC did not survive a low price atmosphere, and it broke up into two competitive companies.

7.8a Compute the market price and quantity.

7.8b Compute each countries quantity and profits.

7.9c Compute consumer surplus for the competitive solution.

7.9 Now suppose OPEC is a dominant firm facing world demand and fringe supply of:

$Q_w=50-0.5P_w$

$Q_f=-5.5+0.1P$.

7.9a Compute OPEC's demand curve and show it graphically. You do not need to get the graph perfectly to scale but label the values for P and Q at the kink and where functions cross the X or Y axes.

7.9b When would OPEC's demand curve not have a kink?

7.9c. If OPEC's marginal cost curve is -80+2Qo, compute OPEC's optimal price and quantity?

7.9d Compute OPEC's profits and the fringe's quantity and profits**.**

7.9e Compute consumer surplus for this market.

7.9f. Compare the solution for the dominant firm model to a competitive solution. Remember that in a competitive model MC would be the horizontal sum of OPEC plus the fringe and they would face total world demand. Compute Q_o, P, π_o, π_f and consumer surplus.

7.9g Compute Q_f and π_f. Did OPEC or the fringe gain more from OPEC acting as a dominant firm compared to a competitive market?

7.10 Suppose at optimal output $\varepsilon_w = -0.6, \varepsilon_f = 0.3, Q_w = 67.5, Q_o = 27.5, Q_f = 40$.

7.10a What is the price elasticity of demand for OPEC's oil?

7.10b Make world demand more elastic by subtracting 0.1 from it. Recompute OPEC's elasticity. What happens to the price elasticity of the demand for OPEC's oil as the world's demand gets more price elastic? Why?

7.10c. Make fringe supply elasticity more elastic by adding 0.15 to it. Recompute OPEC's elasticity. What happens to the price elasticity of demand for OPEC's oil as the fringe supply gets more price elastic? Why?

7.10d. Compute the price elasticity of demand for OPEC's oil, if world productions stays the same but the shares change as follows? Qo = 40, Qf=27.5. Did OPEC's share increase or decrease? Did OPEC's elasticity increase or decrease.

7.11 Suppose inverse export demand for OPEC is $P_x = 53 - 4Q_x$, marginal cost is $MC = 5+(Q_x+Q_d)$ and inverse domestic demand is $P_d = 20 – 10Q_d$. OPEC wants to maximize the benefits its gets from its oil reserves. Its benefits are revenues minus cost on the export market plus social welfare on the domestic market.

7.11a Compute how much OPEC will sell in the domestic and how much on the export market?

7.11b Compute the price and quantity on the domestic and export markets.

7.11c What are OPEC's total profits from selling on the domestic and export market?

For 5 points watch one of the Prize tapes you have not watched and make up and answer a question based on the tape.

7.12 Daniel Yergin has written a Pullitzer Prize winning book on the history of the oil industry. PBS has a nice eight part series based on the book now on youtube. Watch one episode of The Prize. For your chosen episode make up and answer one question. Your question and answer should be no more than 1/2 single spaced typed page. Your score will be based on the quality of the question and the answer. Questions that require a bit of thought or analysis will receive more points than questions that would require only memorization. (e.g. Questions requiring more thought include ones that compare, contrast. look for themes, give preferences and justify why, relate material in the episode to current events or other material in the course, etc.)

The Prize by Daniel Yergin. Each episode is approximately one hour long.

1: www.youtube.com/watch?v=Qspu35JG59Q

2: www.youtube.com/watch?v=ioazMpe1SHE

3: www.youtube.com/watch?v=y-yaMTYczMM

4: www.youtube.com/watch?v=PvkT3ByU5yg

5: www.youtube.com/watch?v=IIJxBrHcSUo

6: www.youtube.com/watch?v=BOMIY9yAbZw

7: www.youtube.com/watch?v=vgt1ZLDIy1M

8: www.youtube.com/watch?v=u4FdR3KMOZ8\\