Study Questions to Accompany International Energy Markets

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Chapter 9. Monopsony - Japan and the Asia Pacific LNG Market

9.1 You may encounter three measurements of temperature.

- the old English measure degrees Fahrenheit F (°F) used in the U. S.,
- the International System of Units (SI) degrees Kelvin (°K), or
- degrees Celsius (°C), which are the same size as °K and is the popular measure in countries on the metric system

9.1a What is the temperature of LNG in degrees Fahrenheit? Degrees Celsius? Kelvin? What equation converts degrees Celsius to degrees Fahrenheit?

9.1b How many cubic feet are there per ton of LNG? How many cubic meters of natural gas are there per tonne of LNG?

9.1c Other cargoes more typically are measured in deadweight tonnes (DWT), which is the number of metric tons a ship can carry including cargo, bunkers, crew, and provisions. DWT tonnes are a bit larger than the cargo space. How many deadweight tons would a 135,000 cubic meter LNG tanker carry? (Ignore non cargo capacity for this computations unless you can find a value for it.)

9.1d How many miles in a nautical mile? How many kilometers?

9.1e Suppose you have a 4 million metric tonne per year project that will deliver LNG 3000 nautical miles away. If you have ships that carry 135,000 cubic meters and travel at 20 knots, loading and unloading each takes 12 hours, how many ships would you require for your project? You may assume that ships do not have any downtime. (This would be roughly the distance from Australia to Japan. The distance from the Middle East to Japan would be about 7000 nautical miles.)

9.1f If LNG cost $4.31/ MMBTUs, what would be the per barrel oil price on an energy equivalent basis for a barrel of oil that has 5,800,000 BTUs/barrel and an Mcf of gas that has 1,026,000 BTUs?

9.2 Assume in the model that the price of electricity increases to $0.12. Since Japan has some of the most efficient power plants in the world, redo the example in the text beginning at equation 9.1 assuming the efficiency of a combined cycle power plant using LNG is 50%.

$\pi = P_e E(L) - P_L(L)$

$L = -20 + 100P_L$.

9.2a How much LNG would Japan import, if it were a monopsonist? What would be the price paid? What would be the total cost of imports?

9.2b What would happen if Japan switched to combined cycle gas turbines raising gas efficiency to 50%?

9.2c. How much would Japan gain by being a monopsonist instead of a competitor?

9.2d Explain how combined cycle gas turbines work. Why are they more efficient?

9.3 Now suppose we have a downward sloping marginal revenue product curve as in Figure 9.2 in the text. Let $MRP_L = 103.8 - 0.215L$.

9.3a Now how much LNG would Japan consume and what price would they pay?

9.3b What is producer and consumer surplus and social losses?

9.4 Suppose that Japan lost its monopsony power in **9.3.**

9.4a Graphically show the new solution.

9.4b How much LNG would Japan import? What would be the price paid? What would be the total cost of imports?

9.4c Is monopsony power greater or weaker when supply is more elastic? Justify your answer with a diagram.

9.5 Redo the example in 9.4 assuming that Japan is a perfectly discriminating monopsonist.

9.6 Diagrammatically compare this case to the case where Japan is a monopsonist on the input but a competitor on the output market. Does Japan buy more or less LNG in this case? Is the price of LNG higher or lower?

9.7 Consumer and producer surplus change as market structure changes.

9.7a Show diagrammatically what are consumer and producer surplus in Figure 9.1.

9.7b Show diagrammatically what are consumer and producer surplus in Figure 9.4.

9.7c What happened to the surplus as market power shifts from producer to consumer?

9.7d Compare social welfare in cases a and b to the competitive solution.

9.7e Use the marginal revenue and marginal costs from above (MRP = 103.8 - 0.215489L and MC = 0.2 + 0.01L) and solve for PL and L when OLEC faces a competitive market in Japan.

9.8 Suppose we have a bilateral monopoly. The monopolist has a cost curve $MC = 2 + 4Q$, and the monopsonist has an inverse demand curve $P = 50 - 4Q$. They are negotiating the price for 4 units of the product.

9.8a What is the monopolist's reservation price for 4 units?

9.8b What is the monopsonists reservation price for 4 units?