

## Homework Assignment #4: Energy Economics 399

Due: Wednesday, February 25

1.
  - a. What is the difference (conceptually) between the short run price and income elasticities of the demand for gasoline and the long run price and income elasticities of the demand for gasoline?
  - b. Why are measured long-run elasticities larger than measured short-run elasticities?
  - c. List three measures the government could take that would allow the elasticity of gasoline to more rapidly shift from its short-run level to its long-run level.
  
2.
  - a. In the time period immediately prior to the beginning of the Iraq War, what was the approximate price of crude oil per barrel and what was the approximately daily world production of oil. Cite your source as well as the specific month or year of your data.
  
  - b. Assume that the short-run world demand ( $Q_d$ ) for oil can be characterized by the following demand curve and that the short-run supply ( $Q_s$ ) of oil from other suppliers is perfectly inelastic:  
$$Q_D = 85 - .3P \qquad Q_S = 76$$
What is the equilibrium price and quantity of oil?
  
  - c. What is the price elasticity of demand and the price elasticity of supply of oil at a price of \$30.
  
  - d. Now suppose the Iraq War takes 3.0 million barrels per day of Iraqi supplies off of the market. What is the new equilibrium price and quantity of oil?
  
  - e. Now assume instead that there is some short run supply response that can be characterized by the short-run supply function (prior to the Iraq War):  $Q_S = 70 + .2P$   
What is the price elasticity of supply at a price of \$30? What is the equilibrium price and quantity (prior to the Iraq War)?
  
  - f. Now again suppose the Iraq War takes 3.0 million barrels per day of Iraqi supplies off of the market. What is the new equilibrium price and quantity of oil?
  
3. If oil and natural gas are close substitutes discuss the effect of a negative shock to world oil supplies as in question 1 on field prices, import prices, quantities, and market clearing conditions for natural gas sold in the U.S. under the following conditions:
  - a. Field prices for natural gas produced in the U.S. and prices for imported gas are unregulated. Pipelines pass through the cost of the gas they purchase in the field in the prices they charge to local distribution companies.
  - b. The field price of natural gas produced in the U.S. is subject to a price ceiling equal to the pre-shock domestic price of natural gas while imported gas prices are unregulated. Pipelines are required to charge the average prices they pay for domestic and imported gas to local distribution companies.
  - c. The pipeline network in the U.S. was operating at full capacity prior to the supply shock.

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4. a. Suppose the world oil market is characterized by a demand of  $Q_D = 85 - .3P$  and a supply that is controlled by two groups, each with a supply equal to  $35 + .1P$  for a total market supply of  $70 + .2P$ . What is the equilibrium price and the quantity and total revenue for each group?
- b. Now suppose that one of the groups (the cartel) intentionally lowers their supply to 20 units while the other group maintains their previous supply function. What is the new equilibrium price and the quantity and total revenue for each group?
- c. Suppose the world oil market is characterized by a more elastic demand of  $Q_D = 97 - .7P$  and a supply that is controlled by two groups, each with a supply equal to  $35 + .1P$  for a total market supply of  $70 + .2P$ . What is the equilibrium price and the quantity and total revenue for each group?
- d. Now suppose that one of the groups (the cartel) intentionally lowers their supply to 20 units while the other group maintains their previous supply function. What is the new equilibrium price and the quantity and total revenue for each group?
- e. Comparing your answers in parts a. and b. to your answers in parts c. and d., why is it the case that cartels are much less effective in the long-run as they are in the short-run?
- f. Suppose again the world oil market is characterized by a demand of  $Q_D = 85 - .3P$  and a supply that is controlled by two groups of unequal size: a cartel with supply equal to  $21 + .06P$  and the rest of the market with supply equal to  $49 + .14P$  for a total market supply of  $70 + .2P$ . What is the equilibrium price and the quantity and total revenue for each group?
- g. Now suppose that the cartel intentionally lowers their supply to 12 units while the other group maintains their previous supply function. What is the new equilibrium price and the quantity and total revenue for each group?
- h. Comparing your answers in parts a. and b. to your answers in parts f. and g., why is it the case that antitrust regulators worry far less about cartels forming in among the bar and restaurant industry than in the airline industry?
- i. For the case where the world oil market is characterized by a demand of  $Q_D = 85 - .3P$  and a supply that is controlled by two groups, each with a supply equal to  $35 + .1P$  for a total market supply of  $70 + .2P$ , what is the optimal reduction in oil supply if one of the groups forms a cartel (assuming the goal of the cartel is to maximize oil revenue.)
5. Find price and consumption data for gasoline for the U.S. in January or February of 2008 as well as June or July of the same year. Calculate the short-run price elasticity of demand of gasoline in the U.S. based on your numbers. Comment on the difficulties of obtaining accurate measures of elasticity.