Study Questions to Accompany International Energy Markets

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Chapter 8. Transaction Costs and U.S. Natural Gas Markets

8.1 In the United States, natural gas volumes are typically some multiple of cubic feet (cf). (e.g. 1,000 cf = Mcf, a million (10^6) cubic feet (MMcf), a billion (10^9) cubic feet (bcf) and a trillion (10^{12}) cubic feet (tcf). While natural gas energy units are in British Thermal Unit (BTU) (e.g. 1,000 BTU = MBTU, a million (10^6) BTU (MMBTU), and a quadrillion (10^{14}) BTU is called a quad). In standard international units (SI), the volume measure is cubic meters (m^3) and the energy content is kilojoules (kJ) joules or sometimes kilowatt hours kWh)

8.1a Convert Russian gas production from cubic feet to cubic meters if Russian gas production in 1997 = 20168 billions of cubic feet.

8.1b Convert Russian gas energy content from BTU/cu ft to Kcal/ cu mt with 1012 BTU/cu ft

8.1c Suppose a new gas province is found in a frontier area (i.e. a province where no previous discoveries have been made). If reserves were announced to be 40 billion m3 does this appear to be a big or small discovery? Why or why not? You can assume that the gas would be depleted at the rate of 10% per year to answer part c.

8.2 Transaction cost economics suggests that market governance is influenced by the costs (both direct and opportunity cost) of exchanging goods or of making transactions.

8.2a Give examples of 4 types of transaction costs.

8.2b What are the four types of governance discussed in the book.

8.2c What is quasi rent and how is it different from total rent?

8.2d How does quasi rent impact production decisions?

8.2e Suppose the price of natural of gas is $5 per Mcf, average fixed cost is $2.00 per Mcf, and average variable cost is $0.50. How much is quasi rent and rent.

8.2f Do you think quasi rents are low or high relative to variable costs in the natural gas pipeline industry? How does the difference between quasi rent and total rent in natural gas transport impact on transaction governance structure?

8.3 Many markets such as that for US natural gas can be described by what is known as transaction cost economics. This theory states that several factors influence the development of certain market structures based on the varying types of costs in each transaction. What are transaction costs? What is the main premise of transaction costs. What are the four main market structures or types of governance? Compare and contrast the four market structures, with specific emphasis on the three "institutional factors" that influence each one.

8.4 (contributed by Toru Muta) Go to the U.S. EIA International Energy Database (http://www.eia.gov/countries/data.cfm)

8.4a For the latest year available, find the country with the largest gross natural gas production. Indicate the country, year, and production. How much of its gas was flared?

8.4b Convert the gross production in 8.41a from cubic feet into cubic meters. (Recall that 1 m^3=35.3 ft^3).

8.4c Find the heat content of this countries natural gas in the data base and its energy content from BTU/ft^3 to Kcal/m^3. (Recall that 1 Kcal =3.966 BTU).

8.4d What country flares the most natural gas? How much? What country re-injects the most natural gas? How much?

8.4e Go to their glossary (http://www.eia.gov/tools/glossary/) and find out the difference between gross production, dry production, and marketed production.

8.5 Economies of scale, economies of scope and transaction costs influence firm behavior. Define each of these concepts and discuss what influence they are likely to have on market behavior. Be sure to include some discussion of market governance and transaction cost economics.

8.6 The U.S. natural gas industry has adapted to whatever regulatory framework existed. Briefly discuss how the United States' natural gas market has evolved from the early 1800's to now? Focus specifically on regulatory measures, which have helped to shape the industry.

8.8 Briefly describe (and where pertinent give reasons for) the following:

8.8a Regionality of natural gas markets

8.8b Different types of natural gas

8.8c world regions that are

i) (roughly) self-sufficient,

ii) net importers and

iii) net exporters in natural gas

8.8d the difficulties in comparing US natural gas data with data from other areas

8.9 Why would privately regulated monopolistic pipeline companies purchase gas from producers and sell gas to distributors under extremely long term contracts? Name the various provisions contained within these long term contracts.

8.10 Suppose the quantity of natural gas demanded in the United States is follows:

$$Q_d = 40 - 1.5P$$

The marginal cost of conventional natural gas production:

$$MC_{NG} = 1 + Q_{NG}$$

Let coal bed methane (CBM) have roughly twice the production costs of conventional natural gas with a marginal cost of coal bed methane production of:

$$MC_{CBM} = 1 + 2Q_{CBM}$$

8.10a If the market is competitive what is the equilibrium price and quantity in the market?

8.10b How much production is attributed to conventional natural gas?

8.10c How much production is attributed to Coal Bed Methane?