WRITTEN PRELIMINARY Ph.D. EXAMINATION

Department of Applied Economics

University of Minnesota

January 24, 2014

MANAGERIAL, FINANCIAL, MARKETING

AND PRODUCTION ECONOMICS FIELD

Instructions:

- Write your code letter, not your name, and the page sequence on all sheets of paper and be sure to turn in these sheets at the end of the exam.

- Start each new question at the top of a new page. Please write legibly and on only one side of each page.

- This is a closed book exam. No notes, articles, books, or other sources may be used at the exam. You may not access the Internet for any reason while taking this exam. Accessing notes, articles, the internet, or other materials during the exam will result in a failing grade on the exam.

- The exam has two sections, and you are expected to answer four questions. Answer at least one question from each section.

When finished you should have answered four questions, with at least one question from each section and two questions from at most one section.

- You have four hours to complete this examination.
Section II Managerial Economics

1. The US food and agricultural industries are marked by vertical integration. For example, retailers own store brand dairy products, which are generally sold only in owner-retailer outlets. The organization of the production of store brand dairy products varies across retailers. Some retailers contract with large national dairy processors who also produce national brands, some others contract with regional dairy plants to produce only the store brands, still others own dairy plants and produce store brands for themselves.

a. Briefly describe the value chain for the production of a dairy product (e.g., fluid milk). What is a retailer’s make-or-buy decision?

b. Carefully explain the key factors that should be considered when a firm faces a make-or-buy decision? Which factors do you think are the most instrumental in explaining why retailers manage the production of their store brands in different ways?

c. One of your colleagues argues that by producing store brands, retailers reduce their procurement costs, and increase their profits. Carefully discuss the economic conditions under which this argument can be correct (or wrong).
American Crystal Sugar Cooperative is the largest sugar beet cooperative in the U.S. and has five plants in northwestern Minnesota and eastern South Dakota. Sugar beets are a fixed proportions technology in that each sugar beet has an approximately equal proportion of sugar (used in dry sugar ingredients) and byproducts which are used as animal feed. Like all sugar beet factories ever constructed in the world, the plants are built very close to the supply of sugar beets. Until recently, all of the world’s sugar beet factories were owned by public corporations. Sugar beet farmers organized their own associations which bargained with these sugar beet corporations on a contractual basis.

Sugar beets are 1) expensive to grow, 2) require much water and other inputs, 3) are intensive to cultivate, 4) perishable, and 5) cannot be stored for long periods of time. However, because of government programs, they are a high valued crop for farmers to grow. Sugar beet factories are expensive (a new state-of-the art plant would approach $500 million), require seasonal labor because sugar beets cannot be grown year-round, require skilled labor because the manufacturing process is intensive, and require a great deal of capital because the sugar refining process is capital intensive. Trucking the beets to the factory is expensive so growers want to have the plant build piling stations on land so they growers can truck beets a short distance and the plant can truck them to the factory as needed. However, this land is expensive and the return on investment is almost zero.

Sugar beet factory margins are small on a per volume basis but highly variable because they depend upon the quantity of sugar in the sugar beet which is highly dependent upon weather. Sugar yields are high uncertain. The sugar beet byproducts have lesser value but there is an inverse relationship in that greater sugar content means more value in sugar but less in byproducts and vice versa.

The sugar beet factories have no alternative use. In fact, more than 100 such factories litter the U.S. countryside because once they close, they never reopen. In a similar fashion, the sugar beet farmers’ equipment has no alternative use. Sugar beet harvesters are used for maybe three weeks a year but cost almost $1 million. In light of these facts, sugar beet firms and sugar beet farmers cannot use a market transaction (“the buy decision”) but must either vertically integrate or contract (“the make decisions”).

a. Drawing upon Nobel Laureate Ronald Coase, describe the theoretical nature of this relationship between assets and uncertainty.

b. Drawing upon Nobel Laureate Oliver Williamson, describe necessary elements of the ideal contract between the sugar beet farmer and sugar beet factory.

c. Since 2002, every U.S. sugar beet factory has been bought by U.S. sugar beet farmers and organized as cooperatives. That is, there is now 100% vertical integration in this industry. Why do you suppose this has happened?
3. The recent trade agreement between the EU and Canada has an important provision for geographic indications. The National Post, Canada’s most important business publication explains, “Among the details is an explanation of how the deal will affect 179 common food and beer names that are used by Canadian companies, but which the EU wanted protected because they are associated with specific geographic regions in the bloc. While a full list wasn’t provided, the report shows such terms as Black Forest ham, Valencia orange and Bavarian beer will continue to be able to be used by Canadian producers in French and English. But while Canadian companies using the names Feta, Asiago, Gorgonzola and Munster will also be able to continue using those distinctive terms, future producers will have to add words such as “like” or “imitation” to describe their new products. For example, the label would have to say something such as “Munster-like” or “Imitation Feta.” Dairy Farmers of Canada spokeswoman Therese Beaulieu described the arrangement as “unfair” and warned it will negatively affect Canadian cheese producers trying to enter the market. “We’ve always believed that these are common names,” she said. “It’s not a flavour, it’s not imitation. It’s the real thing that’s being made by our cheese makers.” But International Trade Minister Ed Fast said the protection of specific geographic terms for products was a key priority for the EU, and giving in on them meant Canada could make gains in other areas.

a. There are more than 6,000 geographic indications in the EU registry, up from less than 100 ten years ago. Consider Kraft Parmesan Cheese sold in a green cardboard container versus the wheel of cheese (called Parma Cheese and protected by EU law) produced in Parma, Italy. Is Parma cheese something unique to terroir?

b. Many agricultural economists have stated that geographic indications will be a major sticking point in any future US-EU trade deals. The U.S. trademark law states that ownership (and hence legal protection) of trademarks accrues to the individual or firm applying for the trademark whereas in the EU, ownership accrues to the supply chain. Discuss the supply chains used to supply Parma Cheese in Italy vs. the supply chains used in the U.S. to produce Kraft Parmesan Cheese. Where do the property rights exist in each supply chain?

c. Consider “Pisco Sour” that is labeled as a Peruvian mixed drink prepared with aguardiente (a local fermented grape juice), lime juice, and a sweetener. Aguardiente was used by the Spanish to license the fermented grape juice for tax purposes through the port of Pisco and Iquique (both located in Peru after Independeence from Spain in 1830s) and hence, the slang name for the drink became Pisco Sour. The grape is grown in Chile and Peru. The Chileans captured both ports from Peru in the War of the Pacific in the late 1880s but gave Pisco back to Peru and kept Iquique. Both countries now claim that the trademark Pisco Sour belongs to their respective country. The issue is now in court where the issue of the trademark is being debated. Discuss the property right associated with that trademark (“Pisco Sour named after the city of Psico, Peru”) and discuss the overall advantages and disadvantages of that trademark in creating a differentiated product.
Section III Production Economics

1. Suppose that you have time series data on aggregate agricultural production \( y \), the levels of land \( A \), labor \( L \) and chemicals \( F \), and input prices, \( w_i, i = 1,2,3 \), respectively. Your advisor asked you to model and estimate a cost function for this agricultural sector. Also, s/he thought you should perhaps work with a flexible functional form and asked you to specify a Translog cost function to characterize the cost minimizing behavior. The Translog cost function may be written as:

\[
\ln C(w, y) = \ln + \sum_{i}^{3} \beta_i \ln w_i \\
+ \beta_y \ln y + \frac{1}{2} \sum_{i}^{3} \sum_{j}^{3} \beta_{ij} \ln w_i \ln w_j + \sum_{i}^{3} \beta_{iy} \ln w_i \ln y + \frac{1}{2} \beta_{yy} (\ln y)^2
\]

where \( \ln \) denotes the natural logarithm of the variable.

a. Using Shephard’s lemma, derive the factor share equation for labor. If you were estimating the cost function within a system, which equations would constitute the system? What are the advantages of the system approach?

b. Would you impose any restrictions on the parameters of the cost function? If so, please carefully explain which restrictions you would impose, and why?

c. If you are imposing any restrictions on the parameters of the cost function, carefully explain how you could use econometric modeling techniques to test the restrictions.

d. One of your colleagues suggested that you should perhaps estimate

\[
\ln C = \ln C(w, E(y|\Omega)) \quad \text{where } E(y|\Omega) \text{ is the expected value of output based on the information } \Omega \text{ available to producers at the time they are making cost minimizing input decisions. What is the rationale behind this specification? What are the potential econometric problems if the model is simply estimated by ignoring the fact that expected output should be used in place of the actual output?}
2. Consider the directional output distance function given by

\[
\bar{D}_o(x_1, x_2, y_1, y_2; g) = x_1^{0.5} x_2^{0.5} - (y_1^2 + y_2^2)^{0.5}
\]  

(2.1)

Here, \(x_1\) and \(x_2\) represent the levels of inputs 1 and 2 used in production, while \(y_1\) and \(y_2\) are the levels of goods 1 and 2 produced. Let \(p_1\) and \(p_2\) represent the unit price of goods \(y_1\) and \(y_2\), respectively.

a. Given the production technology (2.1) above, derive the supply function for good 1 and the supply function for good 2.

b. What is the revenue function associated with this technology?

c. Is the revenue function you derived in part b of this problem homogeneous of degree one in output prices? Explain your answer.

d. Is the supply function of good 1 homogeneous of degree one in output prices? Explain your answer.

e. Assume the output prices were given by \(p_1 = 4\) and \(p_2 = 3\), and the input levels were \(x_1 = 1\) and \(x_2 = 9\). Then, what is the shadow value of an additional unit of \(x_1\)?
3. A subsistence household in India grows rice for consumption and income. Assume the household’s rice production technology is summarized by the production function

\[ y = 50x^{0.5}h^{0.25}z^{0.25} \]  

(3.1)

Here \( y \) represents rice yield in pounds, \( x \) represents the level of labor demanded in man-hours, \( h \) represents the level of water used in 1,000 cubic meters, and \( z \) represents cultivated area in acres. Both water and cultivated area are fixed for the household, and the household’s endowment of water is \( h = 100 \), while its endowment of land is \( z = 1 \). Furthermore, the wage rate is \( w = 25 \) rupee per unit of labor and the output price is \( p = 5 \) rupee per pound.

a. How many units of labor will maximize the rent to the household’s fixed factors?

b. How much would the household be willing to pay for an additional unit of water (i.e., what is the shadow value water)?

c. How much would the household be willing to pay for an additional unit of land?

d. Let household preferences be given by \( U = q_1^{0.4}q_2^{0.6} \), where \( q_1 \) is the amount of rice consumed and \( q_2 \) is an index of all other consumption goods. How much rice will the household purchase from, or sell to, the market? Explain how you arrived at your answer.

e. For this question, ignore all information you have regarding the factor and output price, and the level of endowments – the only information you have is equation (3.1), i.e., knowledge of the household’s production technology. If the household sold all its rice on the market and earned 100,000 rupee, explain how you would figure out how much income it earned.