WRITTEN PRELIMINARY Ph.D. EXAMINATION

Department of Applied Economics

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June 18, 2012

PRODUCTION, MANAGERIAL, and MARKETING ECONOMICS

Instructions:

• IDENTIFY YOURSELF BY CODE LETTER, not name, on all pages.

• Start each question at the top of a new page.

This Exam has three sections, and you are expected to answer four questions

• Answer AT LEAST ONE question from each section

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

  o You have four hours to complete this examination.

• This is a closed book exam. No notes, articles, books or other sources may be used.
Section A – Production Economics

This section contains two questions: Question I and Question II.

Answer at least one question from this section.

Question I

A subsistence farmer uses land, family labor and fertilizer to produce maize. The maize technology is given by the Cobb-Douglas function: \( y = \Psi l^{\alpha_1} z^{\alpha_2} k^{\alpha_3} \). Here, \( y \) is maize output, \( l \) is family labor, \( z \) is land and \( k \) is fertilizer, where land and labor are fixed endowments. Denote the fertilizer price by \( r \) and the maize price by \( p \).

a. Assuming there are no land and labor markets, derive the household’s value-added function.

b. Assuming \( \Psi = 50, \alpha_1 = 0.25, \alpha_2 = 0.25 \) and \( \alpha_3 = 0.5 \), what is the parameterized expression for the value-added function (i.e., what do you get after substituting the values into the expression derived in part (a) of this problem)?

Use the answer to part (b) to answer the remaining questions in this problem.

c. If \( p = 1, r = 1, l = 4, \) and \( z = 1 \):

   How much fertilizer will the household purchase and how much output will it produce?
   How much income (rent) will the household earn?
   How much would the household be willing to pay for an additional unit of labor?

d. If \( p = 2, r = 2, l = 4, \) and \( z = 1 \):

   How much income (rent) would the household earn?
Question II

You have farm level data on farm units in ten villages in Tamil Nadu, India, with 50 observations from each village. For each farm, the major inputs were fertilizer, fuel, labor, land, seed, and irrigation water. You have price and input level data for each of the input categories. The major outputs were rice and chickpeas. You have price and output level data for each of the outputs. Assume markets exist for each output, and for all inputs except irrigation water. In each village, farmers get an allocation of surface water to irrigate their crops. In five of the villages, farmers also have access to well water – the well and surface water is free. You have been asked to search for evidence that farmer income is constrained by water scarcity.

a. Give a brief description of how you would conduct such a study using Nerlovian indicators (or any other appropriate distance function measures). Your discussion should include at least the following points: (i) your representation of the underlying technology and its properties regarding returns to scale and disposability, (ii) the restrictions you would place on the technology and what the restrictions mean, and (iii) a definition of the efficiency measure/indicator.

b. Give an abstract, two-dimensional graphical representation of the efficiency measure you discussed in part (a) of this question. In other words, if you used a distance function approach, show on the graph an efficient and inefficient firm. For your graph, be sure to specify the technology’s properties regarding returns-to-scale and input or output disposability.

c. Describe a procedure for decomposing the efficiency measure into a technical efficiency component, a water efficiency component, and an allocative efficiency component.
Section B – Managerial Economics

This section contains two questions: Question III and Question IV.

Answer at least one question from this section.

Question III

Frito-Lay, which manufactures potato chips, is a large user of cooking oils. In order to produce a potato chip with no transfats, it requires oil made from sunflower, corn, and canola. All of these three oils are produced throughout the world and widely traded in world commodity markets. The price of each of these three oils (“oilseeds”) fluctuates as supply and demand changes.

Management at Frito-Lay is contemplating vertically integrating into oilseed production. It makes the following statement. “Manufacturing potato chips is very utilization-sensitive because a plant that operates at full capacity can produce potato chips at a much lower cost per unit than a plant that operates at less than full capacity. Owning our own sources of oilseed production insulates us from short-run supply-demand imbalances and therefore will provide us a competitive advantage over other potato chip manufacturers.”

Explain why this argument is true or false.
Question IV

It has been said that more business managers have learned and understood economics from Dr. Michael Porter of the Harvard Business School than any other economics professor in the world. Professor Porter’s five forces model is used to teach economics to MBA students and upper-level undergraduate business students. The National Food and Agribusiness Management Education Commission found that faculty working in agribusiness, economists and managers, ranked this as one of ‘absolutes’ in any agribusiness economics and management course taught at the graduate level in departments of agricultural economics.

Briefly discuss the five forces model and compare it to the assumptions of perfect competition. Then choose an industry in the food economy and apply the five forces model to it.
Section C – Marketing Economics

This section contains two questions: Question V and Question VI.

Answer at least one question from this section.

Question V: (Answer both Part 1 and Part 2)

Part 1: You are to investigate the retail-farm price relationship in a specific food industry. The general philosophy you take is that the observed price relationship is, in part, an outcome of the optimizing behavior of the processors who produce the food item using farm and nonfarm inputs. Assuming perfect competition, set up a model in the line of Gardner to demonstrate how you would analyze the effect of a farm shock on the retail-farm price spread.

Part 2: Now you are to investigate the retail-farm price relationship using time series data. You are concerned about the issues of nonstationarity and co-integration. Further, you are intrigued by the possibility of asymmetrical price responses facing shocks. Finally, you suspect that there may have been structural breaks (with unknown break dates) in the vertical price relationship in question.

a. Discuss why it is important to test for unit roots and co-integrations in price analysis using time series data, and how you would proceed with the tests.

b. Discuss the various reasons underlying price asymmetry and the various procedures for testing price asymmetry.

c. Discuss how you would entertain structural breaks (and estimate break dates) in the vertical price relationship.


Question VI

Consider the case of Country T in which tomatoes are produced all year round by many small growers who take their input and output prices as given. The farm tomatoes are then processed into one single output, tomato sauce, via a quasi-fixed proportions technology wherein substitution between farm tomatoes and processing inputs (e.g., labor, energy, and capital) is not possible, but substitution among processing inputs is allowed. The processed products are sold in the domestic and international markets.

Since there are only few tomato processors in Country T, it is suspected that those processors may possess market power in the procurement of farm tomatoes and/or in the domestic sale of tomato sauce. However, the processors are assumed to take the output price in the export market as given.

The government in Country T is considering a policy encouraging the adoption by tomato growers of a mechanical harvesting technology, with the goal of benefiting the growers. However, concerns have been raised that a significant portion of the technology adoption benefit may actually go to the limited number of tomato processors because of the oligopsonistic and/or oligopolistic nature of the domestic industry.

a. Present a conceptual model that can be used as a foundation for the investigation of the oligopsonistic/oligopolistic power of the processors. Discuss the theoretical insights therein.

b. Present the empirical specification and the hypotheses to be tested. Discuss the estimation procedure and the data need.

c. Explain how you would use the estimated model to analyze the distributional effect of the technology adoption.

d. Discuss and graphically illustrate how you would proceed with the measurement of welfare implications of the technology adoption.