14.03 Exam 1 Fall 1999 – Exam Number 2

DO NOT OPEN THIS EXAM UNTIL TIME IS ANNOUNCED!

There are 70 points on this exam and you have 80 minutes to complete it.

There are three parts to the exam. Please use a separate blue book for each part and don't forget to write your name on each blue book

Part I contains six TRUE-FALSE-UNCERTAIN AND WHY questions. You must defend your answers with one or two sentences or graphs. ***Answers without explanations will receive zero credit.*** **(5 points each, 30 points overall*)***

Part II contains two more detailed questions (10 points each, 20 points overall).

Part III contains one longer question (20 points).

If you have a question about the exam, please come to the front of the room to ask for clarification.

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Part I. 5 points each

True, False, or Uncertain AND WHY. You must explain your answer with one or two sentences and/or graphs. Answers without justification receive zero points.

1. Dr. Cyclone has recently discovered a way to clone consumers, and he practices his technique on Silicon dorm at MIT. Each original resident of Silicon dorm gets a clone with exactly the same income and preferences (presumably, the Dr. Cyclone expands the dormitory as well!). All (and only) residents of Silicon eat at the dining hall for dinner each night. We conclude that at every price, the price elasticity of demand for tuna casserole at Silicon dining hall will double after the cloning.

2. If the price of insurance is actuarially fair, risk averse consumers will always buy full insurance.

3. In the Rothschild-Stiglitz model, the pooling equilibrium is more likely to occur if the fraction of high risk people in the insurance market is relatively small.

4. We know by Shephard's lemma that if good A is a gross substitute for good B, then good B is a gross substitute for good A.

5. The Employers' Federation of Greater Texas is surprised to learn the results of the Tyler, Murnane, and Willet study indicating that the pure signaling value of the GED is approximately $1,500. They commission a new study to determine whether GED holders are on average more productive than non-GED holders. A finding that GED holders are on average more productive would contradict the Tyler, Murnane, and Willet results.

6. Suppose that a state government makes an unexpected announcement that it will publicly fund abortions for women who cannot afford them, effective immediately. Seven months later, we measure the change in the birth rate for teenage women in that state. A finding that the birth rate has *decreased* seven months after the announcement would be consistent with Kane and Staiger's analysis.

Part II: 10 points each.

1. Bill is a Von-Neumann Morgenstern expected utility maximizer with a well-behaved, continuously differentiable utility function (i.e., no kinks or inflection points). Bill is presented with the following choices:

A. $1,000 for sure

B. 50% chance of $800
50% chance of $1,500

C. $500 for sure

D. 50% chance of $400
50% chance of $900

Bill is indifferent between A and B and is also indifferent between C and D. (Note: this does not imply that he is indifferent between A and C or B and D.)

Part 1. Is Bill risk neutral, risk averse, risk loving, or can't you tell? Explain. (3 pts)

He is now faced with the following choice:

E. $750 for sure

F. 25% chance of $400
25% chance of $900
25% chance of $800
25% chance of $1,500

Part 2. Will Bill choose E or F, or is he indifferent between them, or is not possible to tell? (You must prove your answer) (7 pts)

2. The computer memory (RAM) industry is capacity constrained, meaning that its factories work at 100% capacity to meet existing demand (hence, supply is completely inelastic). Due to a natural disaster in Asia, half of the world's computer RAM production capacity is suddenly destroyed. Samsung, a Korean manufacturer that lost exactly ½ of its production capacity, calls a shareholder meeting to announce the news. A shareholder (and 14.03 graduate) says, 'I understand that Samsung's RAM output and world RAM output will fall by exactly ½, but how will this affect Samsung's RAM *revenue*?'"

Part 1. Draw a diagram that illustrates market supply and demand before and after the disaster. (Assume that only supply changes and demand is stable.) (2 points)

Part 2. A Samsung economist calculates that the world demand for RAM as a function of price is: $Q(P) = 10{,}000P^{-0.5}$. What is the price elasticity of demand for RAM? (4 points)

Part 3. Will Samsung's RAM revenue stay the same, increase, or decrease and by how much (in percentage terms) due to the disaster? (4 points)

Part III: Productivity in Lint Mills. (20 points)

1. In the town of Lint Mills, all citizens work in the weaving industry. Working at home, each citizen produces A feet of cloth per day where A is an individual's ability at weaving. A is distributed uniformly between 0 and 1 (hence, average ability is 0.5). Each person knows his ability at weaving and the distribution of abilities overall. Cloth sells for $1 per foot. Residents of Lint Mills work for 10 days in the weaving industry and then move to "the big city" where they get jobs at Internet startups. Hence, the town gets a new generation of citizens every 10 days.

   A weaving factory opens in town. Using assembly line technology, workers produce $1.75A$ feet of cloth per day. Managers of the factory can only observe *average* assembly line output (not individual output) which is equal to 1.75 times the *average* ability of factory workers. Managers offer a daily wage of W equal to average output at the factory. (Hence, for example, if workers with average ability 1.0 work at the factory, each worker is paid $1.75 at day's end.)

   Part 1. Draw a diagram that shows output at home as a function of A and output at the factory as a function of A. Draw a second diagram that shows average ability at the factory as a function of A_{max}, the ability of the most able worker at the factory. On the same diagram, show the factory wage as a function of A_{max}. (Hint: you are correct to assume that if a worker of ability A_{max} works at the factory, all workers of ability $A < A_{max}$ also work there). (4 points)

   Part 2. Given the wages offered by the factory, what is the average ability of workers who choose to work there? What is total output – both at home and in the factory – over 10 days? (4 points)

   Part 3. 10 days later, Lint Memorial School of Weaving opens. No education actually takes place at Lint Memorial. Instead, students sit in a classroom for two days and weave as they would *at home*. If a student has produced at least 1 foot of cloth in two days, he is given a Master Weaver (MW) degree. Otherwise, he gets nothing. Learning of this educational innovation, the factory announces that it will hire only people with an MW degree.

   On the assumption that everyone who is able to earn an MW degree does so, what is the daily wage that the factory offers for people with an MW degree? What is the 'participation constraint' for workers choosing between working at the factory and working at home? Show that this constraint is satisfied for workers who choose to work at the factory. (4 points)

   Part 4. What is total output – both at home and in the factory – over 10 days? (Do not count output while in school since this output is kept in the school's 'endowment.' Assume that everyone who goes to school does so during their first 2 days in town. Hence, they have 8 productive days left.) (4 points)

Part 5. An economist calculates total cloth output over 10 days (i.e., your calculation in Part 4). She compares this number to total cloth output *prior* to the opening of the school (your calculation in Part 2). "Just as I expected." she says, "The new school boosted productivity in town. This is further proof of the Human Capital model!"

Is her interpretation correct? If so, why? If not, how do you explain the observed productivity increase given that the school does not teach any skills? (4 points)