Ph.D. Core Examination

PRICE THEORY (MICROECONOMICS)

Friday, July 13, 2012

WRITE in **black ink** and write only on **one side** of each page.

DO NOT WRITE in the margins.

Be sure the "random number" stamped on your paper is the correct number (the number you were given by the department office). Be sure to put your **random number** in the upper left hand corner of **every page** you write on.

On the **first page** of your examination write:

- the name of the examination
- the date of the examination

Put the **page number** in the upper right hand corner of **every page** of your examination.

When you have completed your examination, write the **total number** of pages on the **back** of the last page.

Put your examination in the envelope to be turned in.

Results of the examination will be posted by your random number outside the Office of Graduate Student Affairs and sent to you by letter.

TIME: THREE HOURS

1. **You must answer ALL questions and justify ALL answers.**
2. **The exam is out of 180 points. Part I is worth a total of 90 points. Each of Parts II, III, and IV are worth 30 points.**

Note: The envelope you will be given will contain a colored writing pad to be used for notes and a white writing pad with your random number to be used for writing your final answers.

I. BASIC PRICE THEORY QUESTIONS (90 points)

Answer each of the following nine questions as TRUE, FALSE, or UNCERTAIN, and justify your answer. Each question is worth 10 points. Your grade will depend entirely on your justification.

1. Suppose some persons donate blood out of altruistic reasons and others donate blood because they are paid to do so. An exogenous increase in the price paid for blood would increase the total amount of donated blood by less than the increase in the amount donated by those paid to do so.
2. Suppose equilibrium in a marriage market with an equal number of men and women and monogamy. Men and women differ only in education, and there is positive assortative matching. Then the private gain to a male from increasing his education exceeds the social gain because the gain in the marriage market to the male from getting more education is partly at the expense of other males in the marriage market since he would move ahead in the education ranking of males.
3. Firms in a competitive industry may like having a union of all its workers precisely because the union raises the wages that firms have to pay workers.
4. Suppose there are ℓ identical leaders (L) and f identical followers (F) consuming a fashion good X, where $\ell < f$. If given the price of X, the demand for X by the L's falls when the consumption of X by the F's rises, but the demand by the F's rises when the consumption of X by the L's rises, then demand for X by L's would fall when the price of X fell.
5. Assume cars last 10 years and that the quality of the services provided by cars declines with age. Technological changes that make the service flow decline more slowly but do not change the cost of making new cars will make consumers of old cars (primarily the poor) better off.
6. Improvements in the quality of life (that raise the utility of each life year) will raise the willingness to pay for life extension (i.e. the value of a life year).
7. The marginal cost of producing a product is lower in the long run than in the short run since there are more options for how to produce that marginal unit in the long run.
8. A monopolist would be willing to pay its customers to restrict their purchases of substitute products and consumers would be willing to accept such payments.
9. Local governments may be willing to subsidize capital investment in manufacturing as a means of raising local labor demand even when labor and capital are gross substitutes for the manufacturing industry as a whole.

II. GENERAL EQUILIBRIUM AND CHOICE THEORY(30 points)

(a) (10 points) Consider the exchange economy $\mathcal{E} = (u_i, \mathrm{e}^i)_{i \in I}$. Suppose that each u_i is strictly increasing and strictly quasiconcave. Further, suppose that the u_i are such that for any endowment vectors $\hat{\mathbf{e}}^i \in \mathbb{R}^n_+$, $i \in I$, the exchange economy $(u_i, \hat{\mathbf{e}}^i)_{i \in I}$ possesses a Walrasian equilibrium. Prove that for any Pareto efficient allocation $\bar{\mathbf{x}}$ in $\mathcal{E}$, there are lump sum income transfers, T^i, $i \in I$, summing to zero such that $\bar{\mathbf{x}}$ is a Walrasian equilibrium allocation for $\mathcal{E}$ when those lump sum transfers are imposed.

(b) (10 points)

(i) (5 points) State Arrow's theorem (you need **not** define the terms used in the statement of the theorem).

(ii) (5 points) Show that Arrow's conditions **can** all be satisfied when there are just two alternatives. (Hint: You may assume an odd number of individuals if this is helpful.)

(c) (10 points) Suppose that $u : \mathbb{R}_+ \to \mathbb{R}$ is a consumer's von Neumann-Morgenstern utility function over wealth. Suppose also that u is twice differentiable and that $u' > 0$. Prove that if this consumer's preferences over wealth gambles are independent of her initial wealth, then she must display constant absolute risk aversion, i.e., the ratio $u''(w)/u'(w)$ must be independent of w. (Hint: Consider, for any $w_0 > 0$, the two vNM utility functions $u(w + w_0)$ and $u(w)$ over wealth, w. How are they related?)

III. GAME-THEORY (30 points)

Players 1 and 2 must independently decide whether to grab or yield. Each player i privately knows his or her payoff t_i from yielding, which we may call the player's type.
Their payoffs (u_1,u_2) depend on their actions and their types as follows:

	2 grabs	2 yields
1 grabs	-2, -2	8, t_2
1 yields	t_1, 8	t_1, t_2

(a) (18 points) Suppose first that $t_1=0$, but t_2 could be either 0 or 1, each with probability 1/2. That is, $t_1=0$ is common knowledge, but only player 2 knows t_2, and player 1 believes that t_2 is equally likely to be 0 or 1.
Find a Bayesian equilibrium in which both grabbing and yielding have positive probability for player 1. (Be sure to describe each player's equilibrium strategy completely.)

(b) (12 points) Now suppose that t_1 and t_2 are independent random variables, each drawn from a Uniform distribution on the interval from 0 to 1. When they decide whether to grab or yield, each player i knows only his own type t_i.
Find a Bayesian equilibrium in which, for each player, some types would grab but other types would yield. (*Hint:* you may use the symmetry between the two players in this equilibrium.)

IV. INFORMATION ECONOMICS (30 points)

All consumers are ex-ante identical. Each has the same initial wealth, $w_0 = 16$ dollars, and each has the same von Neumann-Morgenstern utility function, $\ln \frac{w}{2+\varepsilon}$, over wealth w and wellness effort ε. A consumer can exert high wellness effort $\varepsilon = 1$, or can exert no wellness effort $\varepsilon = 0$. Exerting high effort implies a low probability, $\pi = 1/4$, of illness, whereas exerting no effort implies a high probability, $\pi = 3/4$, of illness. There is only one illness and the treatment cost, which must be incurred if the illness is contracted, is $c = 15$ dollars.

(a) (5 points) Show that, without any form of insurance, each consumer will choose to exert high wellness effort. What is each consumer's expected utility?

(b) (10 points) Suppose the government wishes to improve the situation by providing universal coverage. Under the plan, each consumer pays a lump sum tax of T and receives free health care if they become ill. How much effort does each consumer exert now? What is the minimum value of T that is required so that the government's budget balances in expectation? What is each consumer's expected utility under this budget-balanced plan?

(c) (15 points) Instead of a government health insurance program, suppose that two insurance companies, each interested in maximizing expected profits, simultaneously offer menus of policies (a policy is a benefit-price pair (B, p)) to consumers, and then consumers choose any one policy from any one insurance company so as to maximize their expected utility. Assume that a subgame perfect equilibrium exists in this game. Assume that the two insurance companies earn zero expected profits in equilibrium. What policy do consumers purchase in equilibrium? Are consumers fully insured? How much wellness effort do they exert? What is their expected utility now? Can a government program that breaks even in expectation provide an ex-ante Pareto improvement over this market outcome? (If you run short of time, provide the relevant maximization problems without solving them.)