14.771 / 2390B

Development Economics

Fall, 2002

Final Exam

Prof. Abhijit Banerjee
Prof. Esther Duflo
Prof. Michael Kremer

GENERAL INSTRUCTIONS

Do all three questions. All the questions carry equal weight. Do each question in a separate book and indicate the number of the question on the cover of the book. Write your name on each book.

Question 1

Part A: For each of these say whether it is true or false, using a brief intuitive argument or an example to justify the answer (you are free to answer this question by describing an environment where it is true or one where it is false).

i. Parental preferences do not matter for investment in education if capital markets are perfect.

ii. Raising the cost of capital makes the credit constraint tighter.

iii. If big farms are less productive than small farms, distributing land from the rich to the poor always raises overall productivity.

Part B: Consider the following resource allocation problem in a dysfunctional family. There are two goods, x, y. The family consists of a mother (M), a father (F) and a child (C). Let their consumption of good x be denoted by x_M, x_F, x_C and that of good y be denoted by y_M, y_F, y_C. Assume that the mother only cares about her own consumption and the child's happiness while the father cares about his own consumption and the child's happiness. The child only cares about her parent's happiness (and in particular gets no utility from consumption). Specifically let the mother's happiness be

$$V_M = U(x_M, y_M) + \beta_M V_C$$

where V_C is the happiness of the child. Likewise let

$$V_F = U(x_F, y_F) + \beta_F V_C$$

and finally

$$V_C = \alpha_F V_F + \alpha_M V_M.$$

Let the price of x be p_x and that of y be p_y. Let the mother's income be I_M and the father's be I_F. Also, to start with let the wife's bargaining power be λ and the child have no role in the decision making. The family therefore maximizes

$$V_F + \lambda V_M$$

with the budget constraint

$$p_x(x_M + x_F) + p_y(y_M + y_F) = I_M + I_F.$$

Write out the family's maximand in terms of $U(x_M, y_M)$ and $U(x_F, y_F)$.

Write down the first order conditions that characterize optimal family resource allocation.

What will happen to the optimal allocation if the mother gets richer, the father poorer and total income is unchanged?

Now suppose that the mother's bargaining power goes up, i.e., λ goes up? What happens to the optimal allocation?

Question 2.

Evaluating and understanding PROGRESA

[BE REALLY BRIEF in your answers: bullet points are OK!]

PROGRESA is a welfare program adopted in Mexico in 1997. The program is a cash transfer program, delivered through women only. Health grants are conditional on obtaining (free) preventive health care and nutrition supplements for everybody in the family and completing growth monitoring visits (for children). Education grants are targeted to families with children in secondary schools, and conditional on school attendance. The cash grants are important (the health grants can reach up to a third of average family income).

1) The program was started on a pilot basis in several communities in 1997. Imagine comparing a sample of grant recipients to a sample of non-grant recipients. Could you interpret these comparisons as the impact of the program? Why or why not?

2) Aware of these problems, the Mexican government started the program on an experimental basis. A group of communities was randomly selected to receive the program first. Data was collected on these communities and on a set of control communities, which were set to receive the program only later.

    a. Construct the estimator of the reduced form effect of being in a target village on the outcomes of interest (health or education).
    b. Construct the Wald estimator for the effect of the program on grant *recipients*, taking into account that not everybody took up the program.
    c. Could the Wald estimator be misleading even if the reduced form effect is unbiased? Explain why?

3) The program was shown by several authors to have a positive effect on health and education. Taking into account the features of the program, give four possible reasons why the program could have been effective. What additional experiments could be performed to distinguish between these different reasons?

4) Some authors have argued that individuals in the control communities knew that they were going to become beneficiaries of PROGRESA after 2 years.

    a. How could this affect the estimate of the effect of the program on education?
    b. Explain how this effect depends on the underlying model of why children are not attending school.
    c. Keeping in mind that households are eligible for the program only when their children are in secondary school, can you think of a way to assess the extent of this potential bias?
    d. Using the same fact and some additional assumption, propose a way to control for this potential bias.

1 Question 3.

2 Suppose that a new type of medicine has been introduced. Assume the following:

3

4 Medicines can either be low effectiveness or high effectiveness. Low effectiveness medicines

5 work in a given patient with probability α, and high effectiveness medicines work in a given

6 patient with probability β. The probability of getting well as a function of the effectiveness of the

7 medicine is given in the following table, where W = 1 if a given medicine works on a specific

8 patient, and zero otherwise; H = 1 if the medicine is "highly effective" and zero otherwise.

Likelihood/State-of-Nature	$Pr(W == 1\|H)$ works	$Pr(W == 0\|H)$ doesn't
H=1	β	$1-\beta$
H=0	α	$1-\alpha$

9

10 Suppose that the population starts out with a prior that there is a chance p that newly introduced

11 medicines are highly effective and a chance 1- p that newly introduced medicine are of low

12 effectiveness (i.e., $Pr(H = 1) = p$, $Pr(H = 0) = 1 - p$).

13

14 a.) Suppose that the particular medicine is in fact highly effective (i.e., H = 1). Suppose that

15   someone meets a friend who had a good experience with the medicine. What will be his

16   posterior belief about the medicine after being told about his or her friend's experience?

17

18 b.) Suppose that p=0. What is the posterior belief?

19

20 c.) The attached table is from a paper on use of deworming medicine in an area of Kenya where

21   it had recently been introduced. An earlier evaluation found that a deworming program

22   improved health and educational outcomes, not only among those who took the medicine, but

23   also among others, since it blocked worm transmission. The program was phased into 3

24   groups of schools over several years. Schools were randomly assigned to the groups. As of

25   2000, groups 1 and 2 had been offered treatment. In 2001 all 3 groups were offered treatment.

26   Households were queried about their social links (i.e., friends and relatives they talk to).

27   Table 6 examines how use of drug is affected by the number of links with children in groups

28   1 and 2 who are not in one's own school, controlling for the total number of social links with

29   children not in one's own school. Describe why this control is necessary to get at the causal

30   effect of information flow.

31

32   d.) Describe the set of prior and posterior beliefs in a model of information flow that would be

33   necessary to explain the negative coefficient on number of links in column 1 and column 5 in

34   Table 6 (attached). What assumptions about educated people's priors might be consistent

35   with the coefficient on the interaction term in Column 5?

36

37   e.) One finding from the earlier study was that treatment reduces disease transmissions. How

38   could Table 6, Column 1 be interpreted from this point of view in a model with no social

39   learning?

40

41   f.) Discuss the interpretation of Table 6, column 2 under the learning hypothesis. (Recall Group

42   2 had been treated in 2000, while Group 3 was offered treatment for the first time in 2001.

43   The group 2 indicator refers to the respondent being in group 2, not the link.) What could

44   explain the sign of the coefficient on the interaction between being a group 2 student and the

45   number of links to early treatment schools? Do you think this should be larger or smaller in

46   magnitude and why?

47

	Dependent variable: Child took deworming drugs in 2001				
	(1)	(2)	(3)	(4)	(5)
# Links with children in early treatment schools (Groups 1 and 2, not own school)	-0.032** (0.014)	-0.041** (0.017)			-0.004 (0.017)
# Links with children in early treatment schools * **Group 2 school indicator**		0.017 (0.029)			
Proportion links with children in early treatment schools			-0.099** (0.044)		
# Links with children in early treatment schools, with whom respondent speaks **at least twice/week**				-0.036** (0.015)	
# Links with children in early treatment schools, with whom respondent speaks **less than twice/week**				-0.023 (0.016)	
# Links with children in early treatment schools * **Respondent years of education**					-0.006* (0.003)
# Links with children in Group 1, 2, or 3 schools, not own school	0.014 (0.011)	0.014 (0.016)	-0.006 (0.008)	0.014 (0.011)	-0.011 (0.014)
# Links with children not in Group 1, 2, or 3 schools	-0.007 (0.007)	-0.008 (0.009)	-0.005 (0.007)	-0.007 (0.007)	-0.008 (0.010)
# Links, total	0.019*** (0.005)	0.029*** (0.007)	0.021*** (0.007)	0.018*** (0.005)	0.013* (0.008)
Respondent years of education	0.004 (0.003)	0.004 (0.003)	0.003 (0.004)	0.004 (0.003)	-0.014 (0.012)
Community group member	0.028 (0.025)	0.032 (0.026)	0.038 (0.029)	0.029 (0.026)	0.025 (0.025)
Total number of children	0.005 (0.006)	0.006 (0.006)	0.004 (0.007)	0.006 (0.006)	0.006 (0.006)
Iron roof at home	0.013 (0.027)	0.011 (0.027)	0.011 (0.032)	0.014 (0.027)	0.011 (0.028)
Distance home to school (km)	-0.018** (0.008)	-0.18** (0.008)	-0.014 (0.010)	-0.017** (0.008)	-0.018** (0.008)
Group 2 school indicator	0.02 (0.04)	0.22** (0.09)	0.01 (0.05)	0.02 (0.04)	0.02 (0.04)
Cost-sharing school indicator	-0.62*** (0.08)	-0.62*** (0.08)	-0.62*** (0.09)	-0.62*** (0.08)	-0.63*** (0.08)
Number of observations (parents)	1690	1690	1370	1690	1690
Mean of dependent variable	0.61	0.61	0.61	0.61	0.61

48   Notes for Table 6: Data from 2001 Parent Survey, 2001 Pupil Survey, 1999 and 2001 Parasitological
49   Surveys, and 1999 and 2001 administrative records. Marginal probit coefficient estimates are presented.
50   Robust standard errors in parentheses. Disturbance terms are clustered within schools. Significantly
51   different than zero at 99 (***), 95 (**), and 90 (*) percent confidence. Regression 2 also includes
52   interaction terms (# Social links with children in Group 1, 2, or 3 schools, not own school)*(Group 2) and
53   (# Social links with children not in Group 1, 2, or 3 schools)*(Group 2), and similarly in Regression 5 for
54   educational attainment. Regression 3 excludes parents for which (# Social links with children in Group 1,
55   2, or 3 schools, not own school) = 0, since the proportion of links to treatment schools is undefined in that
56   case. In Regression 4, we cannot reject the hypothesis that the coefficient estimates on (# Links with
57   children in early treatment schools, with whom respondent speaks at least twice/week) and on (# Links with
58   children in early treatment schools, with whom respondent speaks less than twice/week) are equal (p-
59   value=0.29).

Development Economics

MIT 14.771, Harvard Ec 2390B

Profs.: Mullainathan, Banerjee and Kremer

Fall 2001 Final Exam

Problem 1 (45 min)

Banerjee Questions

Consider a borrower who needs to invest $W + L = I$ in the high-yield technology, where W denotes his/her initial wealth and L his/her requested loan. The interest rate is r. Both the borrower and the lender are risk neutral. The source of capital market imperfection is ex post moral hazard and costly state verification. Namely, once the return $\sigma(W + L)$ is realized, the borrower can either repay immediately and get a net income equal to $\sigma(W + L) - rL$, or he/she can stall. Stalling revenues away from the lender has a cost to the borrower (who has to keep ahead of the lender), and let this cost be a fixed proportion τ of total revenues. Finally, whenever the borrower defaults on his/her repayment obligation, the lender may still invest effort into debt collection. Specifically, assume that a lender has a probability p of collecting her due repayment $r \cdot L$. Assume $(1-\tau)\sigma(W+L) > rL$ (so that if the borrower stalls but is caught, it still has enough resources to repay the lender). Also,

take r as exogenous throughout the question.

(1) Write down the borrower's incentive compatibility constraint for not defaulting. From this derive the credit limit the lender would impose on the

borrower if he did not want the borrower to default. How does the limit change when the interest rate goes up. Give intuition for this result.

(2) Next let p be chosen endogenously *after the default*. Specifically, assume that a lender who incurs a non monetary effort cost $L \cdot C(p)$ has probability p of collecting her due repayment $r \cdot L$. Derive an expression for the lender's maximand.

(3) Next, assume that $C(p) = -c \cdot \ln(1 - p)$. Derive explicitly the choice of p. How does it depend on r? Using this endogenously chosen value of p derive the expression for the credit limit. How does it depend on r? Explain your result.

(4a) Now assume that the lender is the borrower's uncle. This means that the lender puts a weight $\mu_B < 1$ on the borrower's net income in his maximization and the borrower puts a weight $\mu_L < 1$ on the lender's net income (NOTE THAT IT IS NET INCOME AND NOT UTILITY, WHICH WOULD REQUIRE TO ALSO TAKE ACCOUNT OF THE MONITORING COST). Assuming the lender still wants to prevent default. How does this change the credit limit?

Banerjee part of the exam ends.

Mullainathan part begins

Problem 1-Continued

(4b) Is this set-up a unitary or non-unitary model of the family?

Let us now suppose that you were interested in testing this model so you gathered data for a set of families where each member in the family. Each member was asked to list all the people they are currently borrowing from. For each of these lenders, they are then asked to state their credit limit (M),

the interest rate charged (r) and whether the lender is an uncle (U).

(5) Suppose you used the individual data to estimate the following OLS regression:

$$M = a + b * r$$

What criticisms would you make of this regression? Please be precise as possible with each criticism.

(6) Suppose now you were interested in testing the effect of "uncles". The basis of your test is that uncles care more about their nephews than their nieces. You therefore are interested in the differential credit limit that uncles give to males versus females. Let B be the dummy for male. You therefore estimate in OLS:

$$M = a + b * r + c * (B * U)$$

and test the sign of c to determine whether uncles give different limits to their nephews. Critique this regression as well.

(7) Suppose that these loans are being used to buy inputs for farm production and that you posessed data on farm productivity. Explain how you might use this information to test the uncle prediction of the above model. For the purposes of this question, put aside any identification concerns you may have.

Mullainathan part of the exam ends.

3

Problem 2: Cows and Contracting (45 min)

Suppose you are a risk neutral farmer and that you are the only person living in an isolated region. You are born with a certain amount of wealth and you derive utility from drinking milk, which costs one unit of your wealth per unit of milk. You are considering whether or not to introduce a high yield species of cows. These high yield cows are very productive, but there is a large chance they are not suited to the climate and will die before producing any milk. The cost of each cow is 1 and they are indivisible (so even if your wealth is 1.99 you can only buy one cow). They produce an output of milk worth 9/4 units of milk if they survive to a normal cow lifetime. For simplicity we assume that you can only buy cows out of your existing wealth and not by selling milk (for example, you drink all the milk produced because you live far from the market and it would go bad if you tried to sell it there. When you go buy milk at the market you actually drink it there).

While potentially very productive, the chance that the high yield species survives in your region is only 1/4. Given that one cow survives (dies) you know for sure that any other cow from the same species will also survive (die). While a single cow has negative expected return, it is possible to first buy one cow, see whether or not it dies and then decide whether to buy the other cows. For simplicity, we assume that the output is the same for both the cows you buy in the beginning and the ones you buy afterwards (for example you get to find out whether the cow survives while it is still very young and has not produced any milk).

4

(a)

i) What is the expected return from buying the first cow for a farmer with wealth $1 < w < 2$?

ii) What is the minimum wealth w, such that the farmer would find it optimal to experiment?

(b) Suppose another farmer just moved to your once isolated region. If she were to buy a high yield cow you would be able to see whether or not the cow survives without having to experiment yourself. Let your wealth be $w_{own} = 5/4$. Suppose the person moving in is richer than you, but not rich enough so that she would buy a cow on her own. What is the minimum wealth that your neighbor must have in order for her to experiment if:

i) You both have a very large disutility from cheating on each other, and can enforce any contract that involves transferring resources back and forth the two of you

ii) You cannot trust your neighbor to make any repayments to you. But if you were to subsidize her purchase of a high yield cow, you could make sure the money is actually spent on a cow (for example, you go buy the cow with her).

iii) You have no control of what your neighbor would do with any money you give her (i.e. if you give her money to use towards the purchase of a cow she could use it to buy milk and tell you that the cow died on the way home). You also don't trust her to make any repayments to you.

iv) Your neighbor's property has a fence around and you cannot see through it. As a result, the only way you can tell whether or not the cow survived is if she invites you to her property.

5

(c) Suppose both you and your neighbor have the necessary amount of wealth to find it privately optimal to experiment. Is there still scope for welfare improvements by talking to her? (Remember, you only derive utility from drinking milk so talking per se does not yield any utils).

(d) Suppose there are many isolated regions like the one in the questions above, each with 1/4 probability of the cows surviving and each with 2 farmers with different levels of wealth. Suppose an econometrician observes that in some areas all the farmers introduce the cows while in others none of the farmers introduce the high yield cows. Is this evidence for social learning? Explain.

(e) Suppose there are two types of people in these villages. Type A people who speak language A and type B people who speak language B. Only people of the same type can communicate. These people are randomly distributed in these regions. Other than speaking different languages, these people are identical. How could you make a test for social learning?

Development Economics
MIT 14.771 / Harvard 2390b

Final Exam

Dec 13, 2000

1:30 minutes

Please answer the THREE Questions in SEPARATE BOOKS. Write your name and question number on EACH book.

Good Luck!

Question 1: Prof. Abhijit Banerjee's section

1. Consider a cooperative made up of very large numbers of A's and B's in shares μ and $1 - \mu$. The cooperative maintains the local fishery. A's own boats and can extract up to X_A fish per day while B's just own a fishing net and can extract $X_B < X_A$ a day. There are two periods, 1 and 2. The stock of fish at the beginning of period 1 is S_1 per fisherman. The fish that are not fished out in period 1 reproduce so that the stock grows at rate g:

i. Check that if the A's fish $X_{A1} \leq X_A$ in period 1 and B's fish $X_{B1} \leq X_B$ in period 1, the stock per fisherman in period 2, $S_2 = (S_1 - \mu X_{A1} - (1 - \mu)X_{B1})(1 + g)$.

This rule only makes sense if $S_1 \geq \mu X_{A1} + (1 - \mu)X_{B1}$. If not, the fishermen are trying to fish too much. This is a free for all and fish are allocated in proportion to fishing effort, i.e., to A's in proportion to X_{A1} and to B's in proportion to X_{B1}. Also assume that $X_B < S_1$, so that there is never a free for all with only B's.

ii. The cooperative can either regulate fishing by setting a uniform bound $\overline{X}$ on every fisherman – that is the maximum they can fish in the period. Fishermen choose the amount they will fish to maximize their private utility, assuming that everyone else will do the same (and assuming that no individual has an effect on the stock of fish). Imagine that in period 2 it is known that there will be a free for all. Knowing this at the beginning of period 1, does the cooperative ever have the ex ante incentive to regulate fishing in period 1? (Assume that the cooperative maximizes $\mu(X_{A1} + X_{A2}) + \lambda(1 - \mu)(X_{B1} + X_{B2})$ where X_{A1} and X_{A2} are the amounts of fish that the A's get in equilibrium and X_{B1} and X_{B2} are the amount that the B's get. λ is the weight given to the utility of B's relative to A's.) Give conditions.

iii. How is the optimal regulation (or the absence of it) dependant on μ and λ?

iv. What testable implication does this theory generate? If you do not observe g, do you envisage problems in the testing of the theory?

1

Question 2: Prof. Esther Duflo's Section

Instruction: Do both questions, write short answers.

1 Social effects in girls education

You are interested in testing whether a family is more likely to send a girl to school when they see that a larger fraction of the other families in the village send theirs.

1. Suppose you run a regression of the probability for a girl to be enrolled in each family on the average enrollment of girls in the village. Can you interpret the coefficient as evidence of this social effect?

2. If you wanted to set up a randomized experiment to test this idea, how would you proceed?

2 Dowry, economic growth and health

Suppose that the higher mortality rate of girls is a consequence of the fact that their parents are not taking care of them on a day to day basis. The probability of death is lower when parents ensure that the girl stays healthy. Consider a context where parents pay a dowry when they their daughters are married. Suppose that women don't work: they raise children. The healthier they are, the healthier their children.

1. Suppose that a girl born in village (A) always get married in village (B). Suppose that technical change in agriculture (the green revolution) in a village raises the demand for healthy boys in that village (there is more work on the field).

   (a) What is the expected relationship between the technical change in village B and female child mortality in village A (controlling for technical change in village A)?

   (b) Based on the models seen in class, what relationship do you expect between technical change in village A and female child mortality in village A (controlling for family income and technical change in village B)?

2. Mark Rosenzweig and Andrew Foster took this model seriously. They used Indian data. They assumed that women get married in a circle of radius 83 kilometers around their village, but never in their village . They computed a measure of technical change in the village and in the marriage market, and they regressed the difference in mortality rates (boys' mortality rate-girls' mortality rate) on technical change in the village, technical change in the marriage market (and other control variables). In light of the previous questions, what coefficients do you expect for each of these two variables?

3. The results are provided in the attached table.

   (a) Do the results support the model?

   (b) Could there be alternative explanations for these results?

Table 3

Determinants of the Difference in Mortality Rates of Boys and Girls

(handwritten: Mortality of boy − Mortality of girls)

Technical change - village	-.000376
	(2.72)
Mean technical change - marriage market	.000492
	(2.80)
Proportion mothers literate - village	.164
	(2.10)
Proportion mothers literate - marriage market	-.558
	(0.40)
Proportion of fathers who completed primary school - village	.0571
	(0.91)
Proportion of fathers who completed primary school - marriage market	-.295
	(2.52)
Mean household wealth $(\times 10^{-6})$ - village	.356
	(0.34)
Mean household wealth $(\times 10^{-6})$ - marriage market	-.252
	(0.34)
Health center in village	.0193
	(0.56)
Proportion of population covered by health center in marriage market	-.0413
	(0.56)
N	432

[a]Absolute values of t-ratios in parentheses.

Question 3: Prof. Michael Kremer's Question

Consider a village where someone is afflicted with an illness X. X could be of two types: Non-Self-Limiting (NS), or Self-Limiting (SL). The villager does not observe the type of illness, but has a prior on the illness type, give by: Prob(Illness X is Self-Limiting) = θ. For example, the illness (X) might be a cold and cough. These symptoms (cold and cough) are consistent with either a common cold (Self-Limiting) or pneumonia (Non-Self-Limiting).

If an illness is Self-Limiting, it has a probability of 1 of being cured next period whether the villager undergoes any treatment or not. The cure probability for a Non-Self-Limiting illness however depends on the treatment that the villager takes. The probability of cure is 0 if the villager chooses NOT to go to any doctor (Option ϕ). The cure probability is 0.5 if the villager goes to an untrained doctor (Option B), and 1 if he goes to a trained doctor (Option A). This information can be summarized in the following table:

Table of Cure Probabilities

Illness	ϕ	B	A
Self-Limiting	1	1	1
Non-Self-Limiting	0	0.5	1

Utility of a villager is given by $U(C, H) = \ln(C) - H$ where C is consumption excluding health care costs, and H is positive if the villager is sick, and 0 otherwise. The budget constraint is that C plus the cost of health care expenditure must be less than Y. Trained doctors are more expensive than untrained doctors, and obviously there is no cost if no treatment is sought.

Patients are myopic and maximize per period utility, so they do not experiment to gain

information for the future. Assume also that patients do not communicate with each other.

After seeking treatment and observing whether the illness gets better, the villager updates beliefs on whether the illness is self-limiting, the illness may recur in later periods because the patient may be reinfected. After n periods in which the patient has been struck with the illness, denote a patient's beliefs that the Prob(Illness is Self-limiting) = 1- Prob(Illness is Non-self-limiting) = θ_n. The initial belief is θ_0.

(1) First, qualitatively characterize how the myopic treatment decisions of patients in the first period they have the illness will vary with income.

(2a) Following the first period in which they have the illness, what will be the beliefs about the illness of individuals who choose ϕ, depending on the actual nature of the illness?

(b) What will be the beliefs about the illness of individuals who choose A, depending on the actual nature of the illness?

(c) What will be the beliefs about the illness of individuals who choose B, depending on the actual nature of the illness?

(3) Suppose the disease is self-limiting. Consider someone who is struck by the disease twice and sees practitioner B both times. What is θ_2?

(4) Characterize the use of ϕ, B, and A for self-limiting illnesses by different income groups in the long run after many periods in which the illness has struck. Remember, the person is afflicted with the same

illness in every round.

So far we have assumed that the cure probabilities for the doctor (A or B) are known. Next assume that the cure probabilities are unknown, but that the cumulative distribution for A, the trained doctor, first-order-stochastically-dominates that for B, the untrained practitioner. In particular, assume that the Prob(B cures a non-self-limiting illness with prob .5) = 0.5 and the Prob(B cures a non-self-limiting illness with probability 1) = 0.5, but the Prob(A cures a non-self-limiting illness with prob .5) = 0.2 and the Prob(A cures a non-self-limiting illness with prob 1) = 0.8. Further, assume that $\theta = 1/4$, so that agents place a low probability on the illness being self-limited.

(5) Qualitatively discuss which treatment choice myopic patients will make in the first round, as a function of their income.

(6) Suppose a patient sees practitioner B and gets better. What is their updated probability that the illness is self-limiting?

(7a) What is their updated probability that they have found an untrained practitioner who cures this illness with probability 1?

(b)What treatment, if any, will they choose the next time they experience the same symptoms?

(8) Could people continue to see B for self-limiting illnesses in the long run after many periods in which the illness has struck?

14.771 Final Exam - Fall 1999

You must answer all three questions. **Each question must be written in a separate blue book.** If questions are not written in different blue books they will not be graded.

Question 1:

There is a landlord who has a plot of land which produces output levels X and 0 with probabilities e and $1-e$, where e is the effort chosen by the tenant who works the land and X is a characteristic of the tenant observable by the landlord but not to outside analysts. Assume that the landlord is risk-neutral but the tenant is risk-averse with declining absolute risk aversion represented in utility function $U(w+y)$ where y is the income the tenant receives from the landlord and w is the tenant's wealth. The tenant's outside option is m.

$$U(w+y) - C$$

I. Write down the condition that characterizes the optimal incentive scheme that the landlord would choose for the tenant assuming that e is unobservable.

II Graphically or otherwise analyze what happens to the contract as w and X go up.(feel free to assume a parametric form for $U()$). Your job is to identify the economic effects that are going on and not necessarily to provide a complete characterization.

III If this were the environment we were in and we wanted to estimate the effect of incentives on productivity, what are valid instruments (give the conditions for their validity). Are they reasonable?

Question 2:

You are asked by the government of Transylvania to evaluate the effects of a scholarship program on school attendance. The program covers the cost of education and gives a small stipend to beneficiaries. To be a beneficiary, a household needs to satisfy the following conditions:

- have at least a school aged child
- be eligible
- apply (this requires to be informed about the program, and to extend some effort)
- be selected by a committee of parents and teachers (who choose the best students among the eligible applicants, based on previous schooling grades)

Eligibility is decided by the government of Transylvania based upon a socio-economic index (SEI) which takes continuous values between 0 and 1 and is increasing with household wealth. Only those with socio-economic index below 0.25 are eligible. The government of Transylvania is fairly strict in enforcing this rule. You have access to a household survey with household level variables (including the SEI), child level variables (including attendance in school), and whether the household is a beneficiary.

1. What are the sources of bias when you regress school attendance of a child on a dummy variable for whether the child is a beneficiary?

2. Assume that households do not know the exact value of their SEI before they apply. Plot the probability of applying against the SEI.

3. Plot the probability of receiving the grant against the SEI. *[handwritten: plus but prior ... lesar ... applied]*

4. Plot school attendance against SEI in the three following cases:
      a. counterfactual in which this program does not exist
      b. this program exists, and the scholarship is effective in increasing attendance
      c. this program exists, but the scholarship is ineffective

5. Assume that you have access to a very large sample (so large that even if you restrict the sample to a fairly narrow range of SEI, you have many, many observations). How would you estimate the impact of the grant on attendance? (Provide a formula and an explanation)
      Notation:
      · · $y_i = 1$ if child ,i, attends school
      $p_i = 1$ the household of a child, i, is a beneficiary
      $s_i =$ SEI of the household of child, i
HINT= the formula is a ratio of differences

6. Assume that the grant is distributed through the children's mothers. Can your results generalize to any other scholarship program? Why?

Question 3:

Suppose people live along a circle, with neighbors to their right and left. There are two technologies, A and B. B is the new technology and is slightly superior. Initially, everyone uses A. People only have the opportunity to change technologies at random times that arrive according to a Poisson process. People also tend to imitate their neighbors. (Treat this as a reduced form – it could come from informational considerations, technological network effects, or just a taste for conformity.) Suppose the difference in utility between technologies is:
$$U(A) - U(B) = N_1(A) - N_1(B) - \theta,$$

[handwritten: $N_1 = 2$]

where $N_1(A)$ is the number of immediate neighbors (so each person has two N_1 neighbors), $N_1(B)$ is defined similarly, and θ is the absolute advantage of technology B. (Note that people are not forward looking.) People choose the utility maximizing technology when they have an opportunity to do so.

[handwritten: $N_1 = N_1(A) + N_1 B$]

    1.) Describe the behavior of the system as a function of θ. (Qualitative answers are fine throughout this question.)

    2.) To see how robust the conclusion in 1 is, suppose
$$U(A) - U(B) = N_1(A) - N_1(B) - \theta + \varepsilon,$$
    where ε is uniformly distributed between $-\sigma$ and σ, where $\sigma > 1$.
    How does this stochastic element change the long-run proportion of people using technologies A and B? How does the impact of ε on the long-run proportion of people

using technology B depend on θ?

3.) How does the proportion of people using the new technology depend on σ in the long-run and in the short-run?

4.) Suppose that

$$U(A) - U(B) = \frac{N_d(A) - N_d(B)}{d} - \theta + \frac{\varepsilon}{d},$$

where N_d is the number of neighbors within a distance d. Suppose that technology B has just been introduced and you are an extension agent, or a company selling B, and that you can bribe people to use B, but you have a limited budget. You know which people have opportunities to change technology each moment, and you know who has adopted B so far. Qualitatively describe your strategy in promoting use of B.