14.771 / 2390B

Development Economics

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Final Exam

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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 (Duflo)

1. Show (diagramatically) why, in the Dasgupta and Ray model, a land reform could simultaneously increase output and increase involuntary unemployment.

2. PROGRESA is a means-tested social program providing grant to poor families in Mexico, if their children regularly attend school.[1] The money is always handed out to women. A family gets about 100 pesos per month if a child is enrolled in primary school, and 200 if the child is enrolled in secondary school (this is simplified for the purpose of the exam). In 2000, the overall budget of PROGRESA was 9 billion pesos (US$ 950 million), of which 4 billion (44%) was for educational transfers (Coady, 2000). These transfers benefit approximately 1.6 million children in primary school and 800,000 in secondary school. The primary school grants account for 55% of the overall education budget.

   Before being fully launched PROGRESA was evaluated in the context of a randomized evaluation. In comparison communities, enrollment rate was about 97% in primary schools, but only 67% of the children attended secondary school. In treatment community, 98% of children attend primary school, and 75% attend secondary school.

   (a) Calculate the cost per year to get one additional child to attend primary school, and to get one additional child to attend secondary school.

   (b) Some observers have suggested that these results suggest that the program should be modified to drop subsidies conditional to primary school attendance. What do you think ?

3. The attached tables are taken from a paper by Chris Udry and Markus Goldstein "Gender, Power, and Agricultural Investment in Ghana". All the plots in this sample are cultivated with the same crop, namely maize/cassava intercrop.

   (a) Comment column 1 and 2 of table 2. How would Udry first interpret these results? (ignore the other columns for now).

   (b) Now turn to columns 3 and 4 (suppose the only inputs beside land are labor and seeds). Would Udry be troubled by these results? Why or why not?

   (c) Regular fallowing is the main way that land can be re-generated. Fallowing means leaving the plot unused for some time, to leave time to the soil to generate new nutrients. So the main

[1] There is also a component of the program that delivers grants to families if they obtain regular health check up and get food supplements for their families, but we won't focus on that for now

investment on this plot is to leave it fallow for a period of time. It is more likely that someone will grab the land when it is fallowed then when it is in use.

i. Look at tables 6 and 4. What accounts for the gender differences in profit and yields?

ii. Look at table 6. Note that office holders are people in positions of power in the village. What other variables makes it more or less likely that the land is not fallowed very often ? Provide an interpretation for these coefficients.

iii. Suppose that women's claim to their land is weaker than men's. Are the results in table 2 and 6 are compatible with the collective model (or indeed with the unitary model) ? Explain.

Table 2: Base results

	1 profit x1000 cedis/hectare	2 yield x1000 cedis/hectare	3 labor cost x1000 cedis/hectare	4 seed cost x1000 cedis/hectare
gender: 1=woman	-1,043.43	-1,497.18	-262.71	-91.22
	[472.73]	[561.54]	[276.17]	[125.70]
hectare decile=2	446.64	-775.44	-1,313.13	-244.97
	[576.66]	[684.99]	[336.89]	[184.37]
hectare decile=3	1,039.18	-793.74	-1,734.12	-238.22
	[595.48]	[707.34]	[347.88]	[182.15]
hectare decile=4	1,135.09	-331.22	-1,556.35	-169.9
	[597.12]	[709.30]	[348.84]	[165.58]
hectare decile=5	656.62	-1,188.55	-1,721.02	-345.87
	[588.40]	[698.94]	[343.75]	[168.38]
hectare decile=6	810.67	-1,083.07	-1,821.08	-209.65
	[586.80]	[697.03]	[342.81]	[159.66]
hectare decile=7	875.33	-1,369.88	-2,079.89	-277.51
	[590.16]	[701.03]	[344.78]	[170.48]
hectare decile=8	438.97	-1,816.14	-2,074.95	-232.3
	[599.90]	[712.60]	[350.47]	[182.80]
hectare decile=9	249.13	-2,733.71	-2,783.99	-298.64
	[638.96]	[759.00]	[373.29]	[178.01]
hectare decile=10	-315.67	-2,847.31	-2,278.36	-587.54
	[700.07]	[831.59]	[408.99]	[190.82]
soil type=loam	-174.76	-249.94	-105.46	-7.57
	[400.06]	[475.21]	[233.72]	[103.42]
soil type=clay	-511.77	-101.82	329.79	108.4
	[467.71]	[555.58]	[273.24]	[117.99]
ph	-259.79	-118.68	200.78	-102.67
	[249.19]	[296.00]	[145.58]	[59.12]
organic matter	-15.94	19.09	73.05	-46.63
	[151.08]	[179.46]	[88.26]	[37.65]
topo: midslope	299.14	96.63	-295.81	499.03
	[1,595.93]	[1,895.74]	[932.35]	[600.76]
topo: bottom (level)	663.23	358.48	-228.79	279.67
	[1,584.04]	[1,881.62]	[925.41]	[593.65]
topo: steep slope	2.73	460.28	282.27	389.05
	[1,625.75]	[1,931.16]	[949.77]	[609.07]
Constant	1,209.25	3,234.46	1,253.24	949.85
	[2,186.75]	[2,597.55]	[1,277.51]	[702.08]
Observations	614	614	614	336
R-squared	0.81	0.52	0.9	0.89

all regressions include household-year fixed effects
standard errors in brackets
hectare decile=1, soil type=sand, topo=uppermost (level) excluded

Table 4: Profits and fallow duration

	1	2	3	4	5	6
		OLS	IV	first stage	IV	first stage
	profit x1000 cedis/hect	profit x1000 cedis/hect	profit x1000 cedis/hect	fallow duration (years)	profit x1000 cedis/hect	fallow duration (years)
fallow duration (years)	163.12	238.37	421.41		314.07	
	[47.88]	98.19	[225.67]		[182.00]	
fallow duration (years) squared		-4.30				
		4.90				
gender: 1=woman	-356.19	-370.24	19.28	-0.58	143.06	-0.43
	[397.00]	397.43	[537.24]	[0.67]	[426.13]	[0.54]
1 if first of family in town				-0.44		0.29
				[0.66]		[0.64]
years family/resp lived in village				-0.01		0.01
				[0.01]		[0.01]
1 if resp holds trad. office				3.91		1.95
				[1.11]		[0.80]
number of wives of father				0.39		0.52
				[0.35]		[0.23]
number of father's children				-0.08		-0.02
				[0.07]		[0.05]
parity of mom in father's wives				-0.44		-0.42
				[0.41]		[0.36]
1 if fostered as child				0.86		0.35
				[0.74]		[0.61]
size of inherited land				-0.29		-0.52
				[0.63]		[0.57]
1 if mother had any education				-0.87		0.96
				[1.17]		[1.05]
1 if father had any education				-0.13		-0.98
				[0.80]		[0.63]
Observations	760	760	755	755	700	700
Fixed Effects	household-year	household-year	household-year	household-year	household year and spatial	household year and spatial
F-test of instruments				F(10,415)=2.10		F(10,381)=2.49

standard errors consistent with arbitrary spatial correlation in brackets
plot controls and constant included in every regression

Table 6: Fallowing and Source of Land

	1		2		3	
	Last Fallow Duration (years)		Last Fallow Duration (years)		Last Fallow Duration (years)	
	Parameter Estimate	Standard Error	Parameter Estimate	Standard Error	Parameter Estimate	Standard Error
Female	-0.52	0.27	-0.67	0.28	-0.87	0.30
Direct Effect:						
Land from Spouse	-1.95	0.37	-2.04	0.35	-1.83	0.39
Land from Spouse's Family	-0.15	0.29	0.16	0.26	-0.21	0.28
Land from Resident Non-Relation	-0.96	0.25	-0.64	0.25	-0.81	0.21
Land from Non-Resident Non-Relation	-0.62	0.34	-0.59	0.37	-0.28	0.32
Office Holder times:						
Land from Spouse	4.43	0.94				
Land from Spouse's Family	3.73	0.56				
Land from Resident Non-Relation	5.64	1.12				
Land from Non-Resident Non-Relation	3.70	0.68				
Land from Family	2.26	0.49				
Family Office Holder times:						
Land from Spouse			4.42	1.13		
Land from Resident Non-Relation			5.27	1.36		
Land from Non-Resident Non-Relation			4.02	1.12		
Land from Family			2.92	1.20		
Village Office Holder times:						
Land from Spouse					2.98	0.67
Land from Resident Non-Relation					5.29	1.77
Land from Family					1.41	0.65
observations	422		422		422	

Omitted Category: Direct Effect of Family Land
All specifications include: full set of plot characteristics, full set of family background variables.
Household and spatial fixed effects

Question 2 (Kremer)

Consider the Ellison-Fudenberg model, with two technologies f and g. Assume that in a particular period $u(g)-u(f)=\theta+\varepsilon$ where θ is the average benefit of technology g, which could be negative, and ε is uniformly distributed on $-\sigma,\sigma$.

1.) Suppose at time 0 a fraction x_0 of the population uses technology g. Suppose that every period, a fraction α of the population switches to whatever technology was best last period. Solve for the expected fraction of the population using technology g at time 1 and in the long-run.

2.) Suppose people put weight m on the fraction the population using technology g. People who can make a choice use the following rule: choose g if $u(g)-u(f)\geq m(1-2x)$. Describe the behavior of the system for various values of m. Derive the m leading to long-run optimal technology choice, denoted m*.

3.) Suppose people choose m*. Suppose a brand new technology is introduced by a single firm. Qualitatively describe the expected path of adoption of the technology. Draw a graph outlining how the number of new adopters would typically change over time (# adopters on y-axis, time on x-axis).

4.) Suppose that effort is required to produce new technologies, and that inventors are rewarded with patents that eventually expire. Charging more for the technology reduces the chance people will adopt. Assume people weight popularity at m*. Qualitatively describe the optimal path of prices for the inventor. For low patent lengths, does the inventor prefer higher or lower popularity weights?

5.) Keep the same setup as in part 1, but assume that the opportunities to switch come up only every n periods, and that people who have the opportunity to switch do so if and only if the other technology was better on average over the previous n periods. For n=2, solve for the expected fraction of the population using technology g at time 2 and in the long-run.

Question 3 (Banerjee)

Imagine that there is a farm that requires both labor and management inputs and the same person cannot put in both. Therefore there will be a laborer and a manager working on the farm. Call their inputs e_l and e_m respectively, and assume that these are not contractible. Let the production function take the form: When e_l and e_m are the two inputs, the output will be 1 with probability $ce_l + e_m$ and zero with probability $1 - ce_l - e_m$. Assume that the cost of effort is given by $\frac{1}{2}e_l^2$ for the laborer and $\frac{1}{2}e_m^2$ for the manager. Assume that both the manager and the laborer are risk neutral. Assume first that both the worker and the manager have no outside wealth. Therefore in the state where output is zero both will end up with zero while when output is 1, one of them will get h $(0 \leq h \leq 1)$ and the other will get $1 - h$. The choice of the optimal contract is therefore just a choice of what h should be.

a) Solve for the contract that maximizes the manager's utility, assuming that the laborer has an outside option of m How do these effort levels compare with the first best levels (the levels that would obtain if effort on both sides were contractible)

b) What happens to output when m goes up? Give intuition for your result.

c) Now allow both the manager and the laborer to have lots of outside wealth. Let there be a third party (a capitalist) who comes and makes them an offer of the following form: I will pay you h_l and h_m if output is one and b_l and b_m if output is zero. Since the workers have their own money, it is not necessary that b_l and b_m are non-negative (they can pay out of pocket). Since the capitalist also has money, $h_l + h_m$ can be greater than zero. Argue formally or informally that it should be possible to reach the first best in this environment. Would this possible if the laborer and the manager were both rich but there was no third party? Once again, an informal answer is more than acceptable, as long as it is correct.