Written Exam for the M.Sc. in Economics summer 2011

Advanced Development Economics: Micro Aspects

Final Exam/Master's Course

Suggested Answers

1 June 2011

(3-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by "eksamen på dansk" in brackets, you must write your exam paper in Danish.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students' self-service system.

Question 1: Poverty

(a) Please explain how we can think of total expenditure per person as a measure of well-being.

Using a fixed price-vector (p0) and basic utility theory we can define the money metric utility, which is simply the utility level expressed in, say, dollar (the cost function is expressing the total cost of obtaining a given level of utility at the reference prices). We don't know the cost function, but if the reference prices are not too far from the true prices then total expenditure deflated by a Paasche index is an approximate measure of utility, which is the economic measure well-being.

(b) Please explain how we can derive an absolute poverty line which is related to total expenditure. Relate the national absolute poverty line to the global poverty line used in Chen and Ravallion (2010).

The absolute poverty line used in most recent studies is based on the cost of basic needs (CBN). The CBN line consists of a food-expenditure component and a non-food expenditure component.

a. Pick a nutritional requirement for good health (say, 2100 cal/day) and estimate the cost of consuming this energy requirement, using a food consumption bundle that reflects the habits of households near the nutritional requirement. This is the food poverty line z^f
b. Add a non-food component, z^{nf} (based on the expenditure of the reference group)
c. The overall poverty line is the sum $z = z^f + z^{nf}$

The story of the global poverty line:

The PPP numbers for a wide range of countries makes comparisons of the Household surveys possible. But the national poverty lines do not collapse to a single line when using the PPP-Dollar. Researchers have studied how poverty lines varied with mean consumption when both were converted to PPP-Dollar. They found that national poverty lines have a positive economic gradient above some critical level. The student should be able to discuss (based on the lecture notes only since Ravallion and Chen is cursory reading only) the discussion of the 5 difference poverty lines that we now have:

a. $1.00 a day, which is very close to India's national poverty line.
b. **$1.25** is the average poverty line for the 15 poorest countries in the sample.
c. $1.45, by updating the 1993 $1.08 line for inflation in the US.
d. $2.00 is the median poverty line amongst the developing countries as a whole and also approximately the line obtained by updating the $1.45 line at 1993 PPP for inflation in the US.
e. $ 2.50 is the median poverty line for all developing countries – excluding the 15 poorest countries.

(c) Please define the three first FGT poverty-indexes (the headcount index, the poverty gap index and the poverty severity index) and explain the information we get from each of the three indexes. Use the table below (poverty in Vietnam 2004) to explain the poverty measures.

Region	Headcount (%)	Gap (%)	Severity (%)
Vietnam	19.5	4.7	1.7
North West	*58.6*	*19.1*	*8.0*
Northern Mountains	*35.4*	*9.5*	*3.5*
Central Highland	33.1	10.6	4.5
North Central Coast	31.9	8.1	2.9
North East	*29.4*	*7.0*	*2.4*
South Central Coast	19.0	5.1	2.1
Mekong River Delta	15.9	3.0	0.9
Red River Delta	12.1	2.1	0.6
South East	5.4	1.2	0.4

Let,
x_j be per capita consumption for individual j
z be the poverty line,
N be the population
N_p be the number of people below the poverty line

The Headcount index, P_0, is computed as

$$P_0 = \frac{N_p}{N} = \frac{1}{N}\sum_{i=1}^{N} 1[x_i < z], \quad \text{where } 1[\bullet] \text{ is the indicator function}$$

Pros: Easy to construct and easy to understand.
Cons: The measure ignores the degree of poverty. The measure does not change if the poor becomes poorer. In particular the measure violates the transfer principle.

The Poverty gap Index is computed as

$$P_1 = \frac{1}{N}\sum_{i=1}^{N}\left(1 - \frac{x_i}{z_i}\right) 1[x_i < z], \quad \text{where } 1[\bullet] \text{ is the indicator function}$$

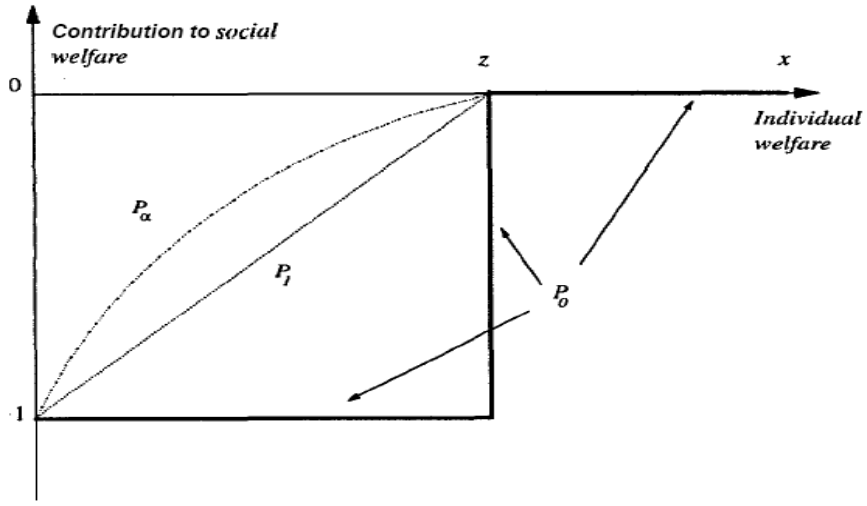
Pros: Has an interpretation as the average extent to which individuals fall below the poverty line. Further can be used to compute the minimum cost of eradicating poverty (NP1z). The measure respects the transfer principle
Cons: The measure does not take account of inequality amongst the poor.

The poverty severity index is computed as

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{N}\left(1-\frac{x_i}{z_i}\right)^2 1[x_i < z], \text{ where } 1[\bullet] \text{ is the indicator function}$$

Pros: Takes account of inequality amongst the poor. The measure respects the transfer principle.
Cons: The measure is hard to interpret.

Overall relationship



Question 2: Health and Nutrition

Field et al (2009) examine the effects on child schooling of an intensive and repeated distribution of iodine supplements. They look for evidence of improvements in cognitive ability attributable to the intervention by assessing whether children who benefited from supplements in utero exhibit higher rates of grade progression 10 to 14 years later.

(a) Describe the way iodine deficiencies (iDD) can affect human capital accumulation and labor productivity? Include in the description the link between IDD and gender inequality.

Ecological conditions related to health environment (malaria transmission rates has a direct effect on economic growth). Iodine is one of the most important for human growth and development (the only micronutrient known to have significant, irreversible effects on brain development). If dietary iodine is a key determinant of cognitive capacity, its deficiency could have important consequences for human capital accumulation and labor productivity. An estimated 1 billion people are at risk of iodine deficiency disorders (IDD) worldwide. IDD may therefore account for a significant fraction of unexplained variation in cross-country growth rates. (Africa has particularly low concentrations of iodine in soil and ground water). What is the influence of iodine deficiency on rates of learning disability. GENDER: If girls are more susceptible to IDD in utero, geography may contribute directly to gender disparities in schooling outcomes.

(b) Based on the table below describe the main results obtained? Remember to comment on the gender dimension.

Field et al (2009) examine the effects on child schooling of an intensive and repeated distribution of iodine supplements. Look for evidence of improvements in cognitive ability attributable to the intervention by assessing whether children who benefited from supplements **in utero** exhibit higher rates of grade progression 10 to 14 years later. Compare children likely to benefit from the program in utero to slightly older and younger cohorts within the district. Result: Reducing fetal IDD has significant benefits for children's cognitive capacity.

Estimation Strategy:

Outcome: Years of completed schooling.

Problem: The program favored needier areas.

Solution: Rely only on the within-district comparisons for estimating treatment effects.

EQUATION: Fixed effects specification

$$grade_{id} = \alpha + \beta_1(T_{id}) + \beta_2(\mathbf{A}_i) + \beta_3(\mathbf{X}_{id}) + \mu_d + \varepsilon_{id}.$$

T(i) = child i in district d protected from IDD

A = birth year dummies

X = household and child-level control variables

Table results: Children likely to be protected from iodine deficiency during their first trimester in utero attain an average of 0.35 years of education above older and younger children in their district who were not. When district-level coverage rates are incorporated into the estimates, the implied effect of supplementation rises to 0.56 years. Estimated effects are substantially larger for girls (Micronutrient deficiencies important in explaining gender differences in schooling attainment).

(c) What are the two confounding issues of the approach chosen? And are they likely to be valid?

1. Treatment may have influenced early fetal outcomes through channels other than iodine availability (For example through interaction with health care workers or offer of alternative health inputs at the time of IOC).
2. The timing of distribution rounds was driven by irregular declines in the quality of district prenatal health services. In this case, children in utero during program gaps may have experienced other deficiencies in fetal health inputs, relative to those born immediately before or after, which could lead to permanently poorer health—and possibly schooling— among children who did not benefit from IOC that is independent of reductions in IDD.

   HOWEVER: the duration of IOC coverage makes such stories difficult to construct.

TABLE 3—GRADE ATTAINMENT AND IOC SUPPLEMENTATION IN UTERO (*PART I*)

				Binary treatment indicator		
	All (1)	Girls (2)	Boys (3)	All (4)	Girls (5)	Boys (6)
Pr(IOC in utero)	0.347	0.594	0.190	0.246	0.429	0.134
	[0.148]**	[0.170]***	[0.160]	[0.114]**	[0.135]***	[0.136]
Pr(IOC in utero) × district coverage rate						
$\Pr(\text{IOC in utero})_{3\le t<5}$	0.033	0.208	−0.095	0.106	0.223	−0.017
	[0.159]	[0.296]	[0.210]	[0.122]	[0.199]	[0.147]
$\Pr(\text{IOC in utero})_{3\le t<5}$	−0.055	−0.283	0.080	−0.056	−0.313	0.121
× young mom	[0.161]	[0.354]	[0.200]	[0.081]	[0.180]*	[0.112]
Age 11	0.377	0.310	0.360	0.437	0.362	0.412
	[0.115]***	[0.137]**	[0.132]***	[0.126]***	[0.154]**	[0.147]***
Age 12	1.129	1.113	1.115	1.187	1.146	1.170
	[0.125]***	[0.162]***	[0.137]***	[0.130]***	[0.176]***	[0.154]***
Age 13	1.914	2.062	1.735	1.958	2.079	1.778
	[0.143]***	[0.172]***	[0.160]***	[0.148]***	[0.193]***	[0.191]***
Fixed effects	District	District	District	District	District	District
Observations	1,395	678	717	1,395	678	717

Question 3: Land Markets and Property Rights

(a) Describe whether there is a rationale for sharecropping in a full information setting under constant returns to scale?

The standard rationale for sharecropping used to be purely in terms of risk sharing. BUT with constant returns to scale (CRS) sharecropping yields no extra risk-sharing benefits over a suitable mix of fixed-rent tenancy and wage labor contracts. To see this, let $F(A,e,\theta)$ be the production function. θ is random, A is leased land and e is labor effort. Let α be the share of output going to the fixed-rent tenant; $1-\alpha$ goes to the landlord. Suppose that the landlord gives a fraction a of the land on fixed rent and cultivates the rest with wage labor. Moreover, suppose that the peasant allocates a fraction α of his effort e to fixed-rent tenancy and a fraction $1-\alpha$ to working on a wage contract. Finally, let W be the wage rate and R the land rental rate.

The peasant's income is: $Y = W(1-\alpha)e + F(\alpha A,\alpha e,\theta) - R\alpha A \gtreqless \alpha F(A,e,\theta)$ as $W(1-\alpha)e \gtreqless R\alpha A$

$\alpha F(A,e,\theta)$ = sharecropping income to peasant.

The landlord's income is: $\pi = R\alpha A + F[(1-\alpha)A,(1-\alpha)e,\theta] - W(1-\alpha)e \gtreqless (1-\alpha)F(A,e,\theta)$ as $R\alpha A \gtreqless$

$W(1-\alpha)e$

$(1-\alpha)F(A,e,\theta)$ = sharecropping income to the landlord

Note that CRS implies that $F(\lambda A,\lambda e,\theta) = \lambda F(A,e,\theta)$. Now if $W(1-\alpha)e > R\alpha A$ peasant will reject sharecropping; vice versa if $R\alpha A > W(1-\alpha)e$. Only if $W(1-\alpha)e = R\alpha A$ will sharecropping survive.

BUT $W(1-\alpha)e = R\alpha A$ implies that $Y = F(\alpha A,\alpha e,\theta) = \alpha F(A,e,\theta)$ and $\pi = F[(1-\alpha)A,(1-\alpha)e,\theta] = (1-\alpha)F(A,e,\theta)$ where $\alpha F(A,e,\theta)$ and $(1-\alpha)F(A,e,\theta)$ are the random incomes going to the peasant and the landlord, respectively, under sharecropping. Hence, there is no additional risk-sharing advantage under sharecropping in this case. In sum, sharecropping has nothing

going for it under CRS and full information. Hence, we have to add other imperfections, i.e. information imperfections, in order to be able to rationalize sharecropping.

(b) Consider a risk-neutral landlord and risk-averse tenant (one-period principle-agent model), where the work effort of the tenant is not observable. Discuss how this may change the conclusion in (a).

Let the tenant have utility function $U(Y)-e$, where Y is income and $e \in [0,e]$ is work effort, which is

NOT observed by the landlord. The tenant has outside option $\underline{U}>0$. Let output be given by $\theta F(e)$, where $E\theta = 1$, $F'>0$, $F''<0$, and assume that θ has distribution function G with support $[\underline{\theta},\bar{\theta}]$. The income accruing to the tenant is determined by the contract. For a pure fixed-rent contract we have $Y = \theta F(e) - R$, implying that the tenant buys a lottery with price R and expected payoff $\theta F(e)$. Note that this means that the tenant bears all the risk. For a pure share contract we have $Y = \alpha\theta F(e)$, implying that the tenant buys a share of a lottery with utility price $-e$ and expected payoff $\alpha\theta F(e)$. In the general case, with the two previous contracts as special cases, we obtain $Y = \alpha\theta F(e) +$

S, where the side payment $S \gtreqless 0$.

The landlord maximizes his expected profits $(1-\alpha)\theta F(e) - S$ subject to (i) the tenants participation constraint (PC) given by $E(U(\alpha\theta F(e) + S) - e) \geq \underline{U}$ and (ii) the tenants incentive compatibility constraint (ICC) given by $E(U'(\alpha\theta F(e) + S)\alpha\theta F'(e)) - 1 = 0$. The PC simply says that the tenant must earn more from taking the contract than from opting for his outside option. The ICC says that any contract that induces effort e must be incentive compatible, i.e. earn the tenant a higher income

than any other effort $e \in [0,e]$.

The landlord can drive the tenant down to her reservation utility level. FOC can be shown to be $\alpha = 1 - ((F+S_{\alpha})/(F'e_{\alpha}))$. S_{α} is negative and less than F in magnitude with risk aversion. If e_{α} is positive, then α is less than unity, thus ruling out the pure fixed rent case under risk aversion.

(c) Consider a multi-period principal-agent setting, where the landlord can use the threat of eviction when output is low. Discuss how eviction threats may affect tenant incentives to invest in land.

The multi-period setting adds interesting extra dimensions of the incentive effects under tenancy. Threat of eviction may be effective in this setting since the tenant earns some rent over and above her reservation income, which she would lose if evicted. Eviction threats reduce the bargaining power of the tenant, and investment may be discouraged because the tenant now expects to get a lower share of additional output generated by the investment.

However, Bardhan and Udry (1999) mention two ways in which eviction threats may have positive effects on the incentives to invest. First, investments today raises the chances of doing well tomorrow and hence of retaining the job the day after tomorrow. Second, if eviction threats raise current effort, then is raises the change of the tenant being around in the next period, and this effect too is good for investments. Answers could also refer to Banerjee-Gertler-Ghatak (2002).