

## ARE 251/ECON 270A PROBLEM SET 1

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Questions marked **(T,F,U)** should be answered “True,” “False,” or “Uncertain,” and your answer should be briefly justified. Note that points will be awarded based only on your reasoning, not on the answer itself, even if correct.

- (1) **(T,F,U)** If a village has a Pareto optimal allocation of resources, a policymaker can only hope to improve the equity of distribution, since she can't hope to increase efficiency.
- (2) **(T,F,U)** Consumption allocations in village economies are seldom Pareto optimal, because according to the first welfare theorem, only competitive equilibria are Pareto optimal.
- (3) **(T,F,U)** Credit markets may not be that important in developing countries since people may be able to fully insure themselves without credit.
- (4) **(T,F,U)** If there is insurance, then allocations will be Pareto optimal, so that all agents' consumptions will be equal.

The following questions require longer answers, and will account for most of your grade on the problem set. The quality of your argument matters more than whatever answer you may arrive at (that said, there *is* a correct answer).

- (5) Consider an environment in which the inhabitants' welfare depends on consumption of a bundle of goods  $x \in X \subset \mathbb{R}^l$ , and on individual characteristics  $z \in Z \subset \mathbb{R}^m$ . A person with characteristics  $z_i$  who consumes  $x_i$  is defined as “poor” if, for some nonpaternalistic function  $u : X \times Z \rightarrow \mathbb{R}$  it's the case that  $u(x_i, z_i) \leq \underline{U}$ .

Suppose that  $l = 2$  and  $m = 1$ , so that  $x$  can be written as a pair  $(x_1, x_2)$ , and  $z$  is a scalar. Further, suppose that

$$u(x, z) = \alpha_1 \log(x_1 - z) + \alpha_2 \log(x_2).$$

One interpretation is that  $x_1$  is food, with  $z$  the minimum quantity of food necessary to sustain life, and that  $x_2$  is “other goods.”

- a) Assume that  $x_2$  may be purchased at a constant price of 1, and that  $x_1$  can be exchanged on markets at a price  $p$ . Compute a poverty threshold which can be expressed in terms of income  $y$ .
  - b) How does this threshold vary with  $z$  and  $p$ ?
  - c) In words, describe the relationship between  $z$ ,  $\underline{U}$ , and the income poverty threshold.
  - d) What kind of data would you need to collect to determine poverty status in a spatially separated population?
- (6) Continuing to maintain the assumptions outlined in the previous problem, suppose now that people live for multiple periods, but die with constant probability  $\psi$  in any given period (and of course remain dead thereafter). People are of one of three types. Type A people receive a constant income  $y^*$  in every period. Type B people receive an income of  $y^*/2$  in odd periods, and an income of  $2y^*$  in even periods, while type C people receive income of  $y^*/2$  in even periods, and an income of  $2y^*$  in odd periods. All have identical values of

$z = 0$ , and the number of type B people is equal to the number of type C people in the population.

- a) If people simply consume their income in every period, then what can you say about poverty status for each of the three types?
- b) Devise an institution which would improve the welfare of all three types of people.
- c) If this institution were to be introduced, what then could you say about the poverty status of each type?
- d) What advice would you offer an economist who planned to collect cross-sectional data on income from this population in order to compute poverty status, if the data were to be collected before your institution was implemented? After?