Development Economics
Problem Set #1 Due Wednesday, Oct 3, 2007

1. Education and growth.

   Consider Azariadis-Drazen model of endogenous growth with human capital accumulation. Assume $f(k) = 2\sqrt{k}$, $u(c_1, c_2) = c_1^2 c_2$, $h(\tau, x) = 1 + 10\tau$ if $x > 10$, and $h(\tau, x) = 1 + \tau x$ if $x < 10$. For all values of initial levels of physical and human capital characterize the dynamics of the economy (find steady states, determine their stability, discuss the properties of growth paths in terms of human and physical capital per capita, per capita income and consumption etc).

2. Industrialization and the Big Push.

   In a Murphy-Shleifer-Vishny world, there are L workers. There is a continuum of sectors normalized to 1. Each sector chooses whether to use modern or traditional technology. Modern production of q units of good takes $F + q$ workers, while traditional production of q units of good takes $2q$ workers. Workers would only accept working in a modern firm if paid 25% more than in a traditional firm. Find conditions on the size of economy L under which there exist: (i) only a no-modernization equilibrium; (ii) only a modernization equilibrium; (iii) both.

3. Policy impact evaluation.

   Consider a policy experiment (i.e., a remedial class in development economics). The outcome of interest is Y_i (i.e., knowledge of development economics). The true effect of the policy on individuals is heterogenous: $Y_i|_{T=1} - Y_i|_{T=0} = p + \varepsilon_i$, where p is a constant $> 0, \varepsilon_i \sim N(0; \sigma^2)$, and T is the treatment. Both p and ε_i are unobserved.

   (a) Suppose policy is applied to those individuals who showed up ($S_i = 1$ if i showed up and =0 if i did not show up). Note that $cov(S_i; \varepsilon_i) = \mu \neq 0$.Calculate the probability limit of the OLS estimator of a in regression $Y_i = aS_i + \epsilon_i$. Is that a good estimator of the average treatment effect (ATE)? What is the bias?

   (b) Suppose now policy is randomized: only individuals, who have an attribute $Z_i = 1$ are treated. $Z_i = 1$ with probability 1/2 and $Z_i = 0$ with probability 1/2. Suppose there is a perfect compliance.

How one would estimate the ATE? Calculate the probability limit of the proposed estimator.

(c) Suppose now that compliance is imperfect (some of those who were intended to be treated, i.e., those with $Z_i = 1$ did not show up). Thus, the actual treatment was T_i. $cov(T_i; Z_i) > 0$, $cov(\varepsilon_i; T_i) = \nu \neq 0$.What is the probability limit of the OLS estimator of b in regression $Y_i = bZ_i + \epsilon_i$? How would you estimate the ATE? Calculate the probability limit of the proposed estimator.