

Professor Debraj Ray  
19 West 4th Street, Room 608  
email: [debraj.ray@nyu.edu](mailto:debraj.ray@nyu.edu), homepage: <https://debrajray.com/>  
Webpage for course: <https://pages.nyu.edu/debraj/Courses/23UGDev/index.html>

ECON-UA 323

## Sample Examination 2

NO CALCULATORS, IPADS, LAPTOPS, ETC., ALLOWED. PUT THEM AWAY, PLEASE.

*Points 65. Time 75 minutes. The first question carries 30 points; the second 17 points, and the third 15 points. 3 points are reserved for extra credit, presentation and clarity. **You'll have to grade yourself on it all, including the last!***

**Guide for Time Allocation:** *The questions in (1) should take no more than 5 minutes each to answer; total 30 minutes. Questions (2) and (3) should take you no more than 15 minutes each. This schedule will allow you to finish the exam in 60 minutes. If you are stuck with a question, move on to the next one and plan to come back later. Keep your answers brief and to the point.*

**(1) (30 points, 6 points per part, 5 parts)** Are the following statements true, false, or uncertain? In each case, back up your answer with a brief, but precise explanation.

(a) The Kuznets ratio, given by then income share of the richest 20% divided by the income share of the poorest 40%, is a measure of inequality that fails the Dalton transfer principle.

(b) If the Lorenz curve of two situations do not cross, the Gini coefficient and the coefficient of variation cannot disagree.

(c) Consider the regression  $Y = A + bX + \epsilon$ , which suffers from endogeneity problems. If a fully exogenous variable  $I$  strongly influences  $Y$  independently of  $X$ , then  $I$  is a good instrument for  $X$ .

(d) An omitted variable  $Z$  biases the estimate of  $b$  in the regression  $Y = A + bX + \epsilon$ , because its omission makes  $X$  correlated with the error term  $\epsilon$ .

(e) In the Acemoglu-Johnson-Robinson study of institutions and per-capita, the presence of malaria is a threat to the exclusion restriction for the instrument they use.

**(2) (17 points)** We are going to study the *inequality of wealth* in the land of Equitania. Suppose that starting from some initial, unequal distribution of strictly positive wealths, everyone saves 20% of their wealth, earns a rate of interest of 10% on that savings, and then earns an income  $y$ , which adds to their wealth.

(a) [3 points] For a person with wealth  $W_t$  at date  $t$  and income  $y_{t+1}$  at date  $t+1$ , show that new wealth is given by

$$W_{t+1} = \frac{11}{50}W_t + y_{t+1}.$$

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(b) [4 points] Show that if a person's income  $y_{t+1}$  is proportional to her wealth  $W_t$  in the previous period; i.e., if  $y_{t+1} = \lambda W_t$  for some  $\lambda > 0$ , then any Lorenz-consistent inequality measure defined on the wealth distribution must remain the same over time.

(c) [5 points] Suppose that a house in Equitania costs some amount  $H > 0$ , and assume that at some date  $t$ , everyone has enough wealth to buy one, and *must do so to live in Equitania*. Prove that net financial wealth (not counting the house) must be more unequal than gross wealth (counting house ownership).

(d) [5 points] Now assume that  $y$  is the same for everyone. Using the variables  $(y, H)$  along with the numbers you already have for  $s$  and  $r$ , describe the conditions under which *everyone* can ultimately afford to buy a house in Equitania, no matter what her (positive) starting wealth  $W_0$  might be.

**(3) (15 points)** In the land of TwoSkill, there are just two skills. You can become an unskilled worker at no cost, earning a wage of  $w_u$ , or you can become a skilled worker by paying an education cost of  $E$ , and then you receive  $w_s$ . These wages are exogenous as far as you are concerned, but are determined endogenously by macroeconomic conditions. That is, there is a production function that produces output as follows:

$$Y = 2\sqrt{US},$$

where  $U$  is the amount of unskilled labor in the economy and  $S$  is the amount of skilled labor. Normalize the price of output to 1. It is a competitive economy and each factor is paid its marginal product.

(a) [5 points] If  $U$  and  $S$  are the supplies of skilled and unskilled labor, show that

$$w_u = \sqrt{S/U} \text{ and } w_s = \sqrt{U/S}.$$

(b) [5 points] Assume that the population mass of people is  $N$  (that is,  $S + U = N$ ), and that everyone can pay the education cost  $E$  out of their own pocket. Let  $s$  be the *share* of skilled labor in the economy. Without necessarily solving explicitly for  $s$  (though you can attempt it), find a formula that connects  $s$  to  $E$ , and show that  $s$  is declining as  $E$  goes up. Explain this result intuitively.

(c) [5 points] Now suppose that a fraction  $d$  of the population (that is,  $dN$  people) are denied access to education; that is, they cannot afford pay for  $E$  while the others can. Describe fully the allocation of labor to skilled and unskilled, as well as the relative wages of skilled to unskilled labor,  $w_s/w_u$  as  $d$  varies all the way from 0 to 1.