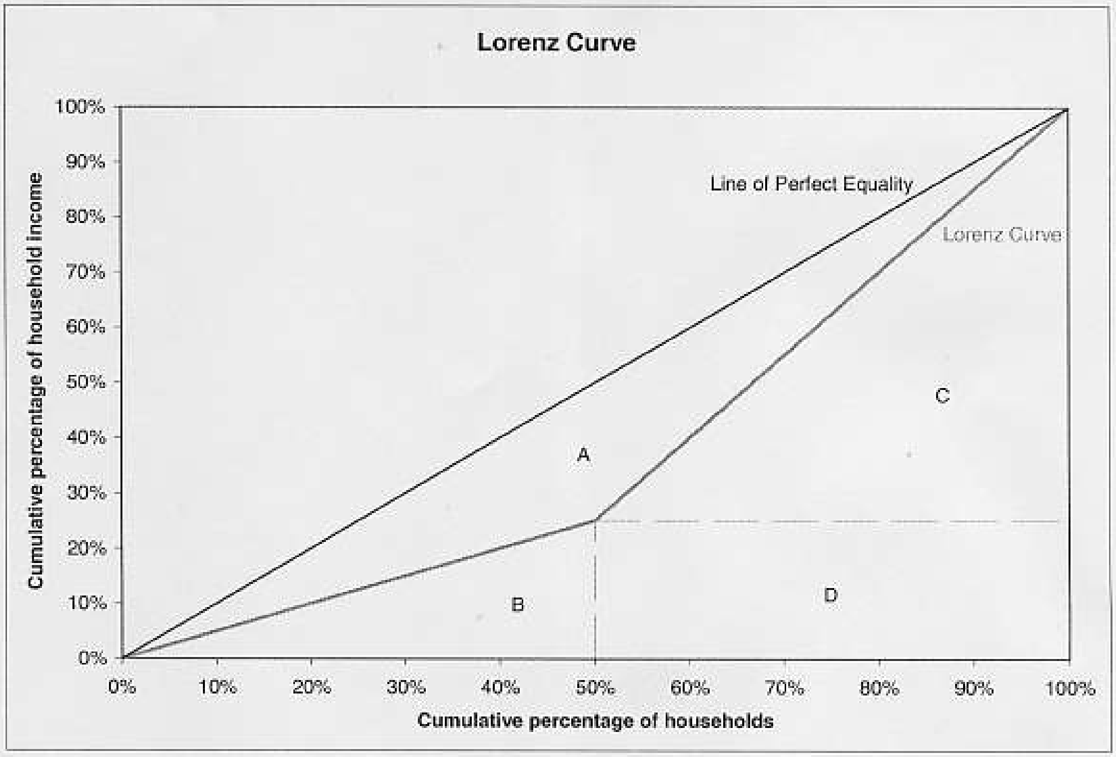
Chapter 13

Income Inequality

Solutions to Problems

1. (a) The Lorenz curve for the economy is drawn below. The data for the curve are as follows. Total wealth in the economy is (\$1)(5) + (\$3)(5) = \$20. The poorest 10% of the people own \$1/\$20 or 5% of the wealth. The poorest 20% own 10% and so forth until the poorest 50%. The poorest 60% own (\$1)(5) + (\$3)(1) = \$8 dollars. That is, 8/20 or 40% of the wealth. The poorest 70% own 55%; poorest 80% own 70%; poorest 90% own 85%; and finally the entire economy owns 100% of total wealth.



(b) The Gini is constructed by dividing the area between the line of perfect equality and the Lorenz curve by the entire area under the line of perfect equality. In our case,

$$GiniCoefficient = \frac{A}{A+B+C+D}$$

(c) To calculate the Gini, we must find the area of *A*, *B*, *C* and *D*. For the area of *B*, *C*, and *D*, we apply the area formula for triangles.

$$Area\ of\ B = (0.5)(0.25)(0.5) = 0.0625$$

$$Area\ of\ C = (0.5)(0.75)(0.5) = 0.1875$$

$$Area\ of\ D = (0.5)(0.25) = 0.125$$

In order to find the area of A, we first calculate the area under the line of perfect equality. This is simply a 1 by 1 right triangle implying that the area is 0.5. Following, we can subtract from this the area under the Lorenz Curve to find the area of A. Since the area under the Lorenz Curve is $B + C + D = 0.0625 + 0.1875 + 0.125 = 0.375$, we find the area of A to be,

$$Area\ of\ A = [Area\ Under\ Line\ of\ Perfect\ Equality] - [Area\ Under\ Lorenz\ Curve\ ]$$

$$= [\ A + B + C + D\ ] - [\ B + C + D\ ] = [0.5] - [0.375] = 0.125.$$

Now we substitute in these values into our equation from part (b).

$$GiniCoefficient = \frac{A}{A+B+C+D} = \frac{0.125}{0.5} = 0.25\,.$$

2. The perfection of "distance learning" serves to create a superstar effect for professors, thereby raising the level of inequality among professors. Because a single professor will be able to teach many students at any given time, only a few qualified professors will be needed, and those professors will earn a high wage.

3. Availability of student loans imply that at any given level of inequality, the accumulation of human capital will be higher. Additionally, at any level of inequality, student loans allow more to be allocated towards physical capital investment, raising physical capital accumulation. As a result, investment in factors will be greater insuring that the level of inequality required to maximize factor accumulation will be lower.

4. The relationship between a poor person's perception of economic mobility and that person's desire to see a high level of redistributive taxation is negatively correlated. If perceptions of mobility are low, a high level of redistributive taxation will be desired, and conversely, if perceptions of mobility are high, a low level of redistributive taxation will be desired. As a result, in a country with the same distribution of income as another, the country with low mobility would have a higher level of redistributive taxation relative the other country with high mobility.

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Problem 5

If the grandfather was in the bottom income quartile, the father had 33% chance of staying in the 1st quartile, 28% chance of moving to the 2nd, 22% chance of moving to the 3rd and 17% chance of moving to the 4th. [First row in Table 13.3].

For any quartile, there is a positive probability that the son ends up in the lowest quartile. [First column]

Then the probability that a man whose grandfather was in the bottom income quartile would also be in this quartile =

First row x First column =

$$0.33^2 + .28 \cdot .25 + .22 \cdot .22 + .17 \cdot .20 = 0.26$$

3. AN INCREASE IN CAPITAL AND INTERNATIONAL DEBTS

Fill in the missing values in the table below.

CA_t is notation for the current account balance. All other notations are in the text. The stock variable B_t^f is calculated at the end of the period using equation (17.4). The stock variable K_t is calculated as of the beginning of the period using equation (17.2). At the end of period 1 (the beginning of period 2) B_t^f is zero. K_t equals 300 at the beginning of period 2. The interest rate earned on foreign assets or paid on foreign debt is 10%.

a. What is the value of the depreciation rate δ? Why is the capital stock unchanged from year 4 to year 5?

b. What is the value of B_t^f at the end of period 2? Is there a current account deficit in period 2? Explain the source of the current account deficit in year 3. Calculate net foreign debts at the end of year 3.

c. There is a sharp fall in consumption in year 5. What is the effect of that drop in consumption in the current account? What is the effect of that drop in consumption in this country's net foreign debts at the end of year 5?

$$CA_t = B_{t+1}^f - B_t^f = rB_t^f + NX_t \quad (17.4)$$

$$K_{t+1} = K_t - \delta K_t + I_{t+1} \quad (17.2)$$

Since B_t^f is calculated at the end of the period (17.4) is in fact

$$CA_t = B_t^f - B_{t-1}^f = rB_{t-1}^f + NX_t$$

$NX_2 = X_2 - Q_2 = 0$

$CA_2 = B_2^f - B_1^f = 0 - 0 = 0$

$CA_3 = B_3^f - B_2^f = -5$

$NX_3 = CA_3 - rB_2^f = -5$

$X_3 = NX_3 + Q_3 = 20$

$K_3 = K_2 - \delta K_2 + I_2 = 300 - 30 + 30 = 300$

$NX_4 = X_4 - Q_4 = 21 - 20 = 1$

Year	Y_t	C_t	I_t	X_t	Q_t	CA_t	B_t^f	NX_t Trade Balance	K_t
2	100	70	30	20	20	0	0	0	300
3	100	65	40	20	25	-5	-5	-5	300
4	105	73	31	21	20	.5	-4.5	1	310
5	105	68	31	26	20	5.55	1.05	6	310

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$CA_4 = rB_3^f + NX_4 = 0.1 \times -5 + 1 = .5$

$B_4^f = CA_4 + B_3^f = .5 - 5 = -4.5$

$X_5 = Y_5 - C_5 - I_5 + Q_5 = 26$

$NX_5 = X_5 - Q_5 = 6$

$CA_5 = rB_4^f + NX_5 = 0.1(-4.5) + 6 = 5.55$

$B_5^f = CA_5 + B_4^f = 5.55 - 4.5 = 1.05$

a) We know that $K_{t+1} = K_t - \delta K_t + I_t$. With years 4 and 5 : $K_5 = K_4 - \delta K_4 + I_4$

$\Rightarrow 310 = 310 - \delta \cdot 310 + 31$

$\Rightarrow \delta \cdot 310 = 31$

$\Rightarrow \delta = 10\%$

Since investment equals depreciation, the capital stock remains unchanged between years 4 and 5.

b) $B_2^f = 0$ and there is no CA deficit. The CA deficit in year 3 comes from the raise in imports. $B_3^f = -5$

c) The fall in consumption results in a rise in net exports. This brings a positive and large CA. The country pays back its debts and the foreign depts are now positive.