Economics 102

Spring 2008

Answers to Homework #3

Due March 31, 2008

On your homework please include at the top of the first page your name, TA name, and the section number for the discussion section you attend. All homeworks should be legible and neat: do a professional looking job!
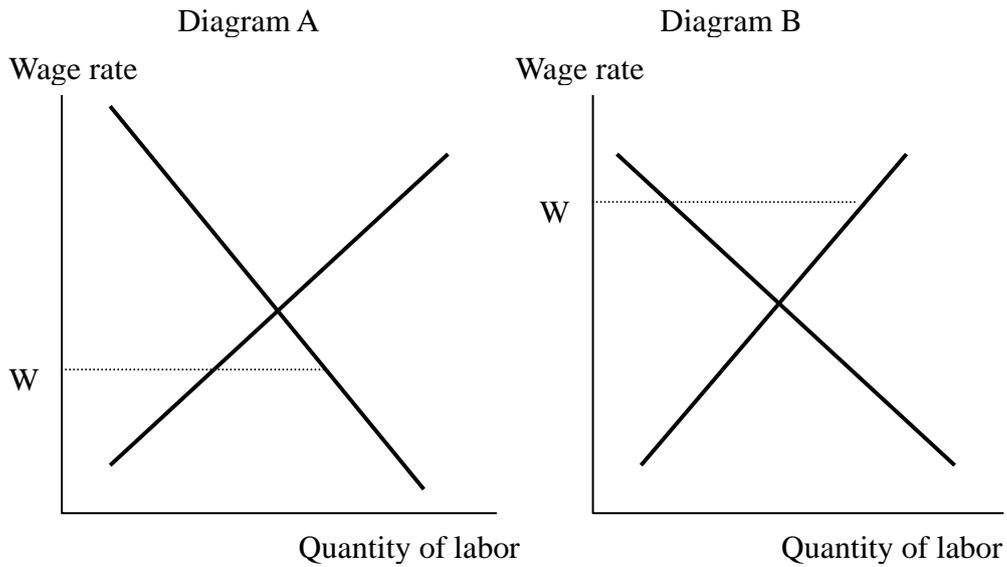
Question 1. Unemployment. In 2007, there were 2,500,000 adults in China. 1,800,000 of the adults were employed; 500,000 were unemployed; 100,000 were discouraged workers; and 100,000 were not working or seeking jobs in 2007. Among the unemployed, 390,000 were engaged in job search, and 100,000 were in the labor markets where the number of people seeking jobs is more than the number of jobs available.

a. What are the labor force and unemployment rates in 2007?

Labor force = Employed + Unemployed = 1,800,000 + 500,000 = 2,300,000.
Unemployment rate = (Unemployed/Labor force) 100% = (500,000/2,300,000)100% = 21.74%

b. What is the frictional, structural, and cyclical unemployment in 2007? What is the natural rate of unemployment in 2007?

Frictional unemployment = 390,000
Structural unemployment = 100,000
Natural unemployment = Frictional unemployment + Structural unemployment = 490,000
Cyclical unemployment = Actual unemployment – Natural unemployment = 10,000
Natural rate of unemployment = (Natural unemployment / Labor force) 100% = 21.30%

	Diagram A		Diagram B

Diagram A

Wage rate

W

Quantity of labor

Diagram B

Wage rate

W

Quantity of labor

c. Which of the following diagrams is more appropriate to describe labor markets where the number of people seeking jobs is more than the number of job available? Explain your answer.

Diagram B is more appropriate to describe labor markets with positive structural unemployment. When the prevailing wage rate is higher than the equilibrium wage rate, the number of jobs available (the quantity demanded of labor)is smaller than the number of people seeking jobs (the quantity supplied of labor).

Question 2. CPI and inflation. In a country, the price index is based upon a market basket consisting of 3 units of rice, 2 units of vegetable, and 1 unit of meat. The prices of these three items in 2005, 2006, and 2007 are presented in the following table.

Year	Price per unit of rice	Price per unit of vegetable	Price per unit of meat
2005	$0.5	$2	$3
2006	$0.6	$1.5	$2.8
2007	$0.65	$2	$2.5

a. Use year 2005 as the base year to calculate the price indices for the three years.

Year	Cost of Market Basket	Price index
2005	3($0.5) + (2)($2) + 1($3) = $8.5	(8.5/8.5)100 = 100
2006	3($0.6) + (2)($1.5) + 1($2.8) = $7.6	(7.6/8.5)100 = 89.41
2007	3($0.65) + (2)($2) + 1($2.5) = $8.45	(8.45/8.5)100 = 99.41

b. What was the inflation rate from 2005 to 2006 and the inflation rate from 2006 to 2007?

Inflation rate from 2005 to 2006 = -10.59
Inflation rate from 2006 to 2007 = 11.18

c. If we use 2006 as the base year, will the inflation rates that you calculated in b change?

The inflation derived by CPI does not depend on the choice of base year. The inflation rate form year t-1 to t is equal to

$$Inflation\ rate_t = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \times 100.$$

By definition of the CPI,

$$Inflation\ rate_t = \frac{\dfrac{Cost\ of\ market\ basket_t}{Cost\ of\ market\ basket_{base\ year}} - \dfrac{Cost\ of\ market\ basket_{t-1}}{Cost\ of\ market\ basket_{base\ year}}}{\dfrac{Cost\ of\ market\ basket_{t-1}}{Cost\ of\ market\ basket_{base\ year}}} \times 100.$$

Since the cost of market basket in the base year can be cancelled out,

$$Inflation\ rate_t = \frac{Cost\ of\ market\ basket_t - Cost\ of\ market\ basket_{t-1}}{Cost\ of\ market\ basket_{t-1}} \times 100.$$

That is, the choice of base year does not affect the inflation rates.

**Question 3. Growth.** Suppose the aggregate production function of an economy is

$$Y/L = \sqrt{K/L},$$

where Y is the real GDP, K is the quantity of physical capital, and L is the number of labor employed. Note this production function measures output per worker, Y/L, and not just output, Y. K/L is the capital to labor ratio.

a. Fill in the following table and plot the aggregate production function in a graph. Measure K/L on the horizontal axis and Y/L on the vertical axis.

K/L	0	1	4	9	16	25	36	49	64	81
Y/L	0	1	2	3	4	5	6	7	8	9

Aggregate Productin Function
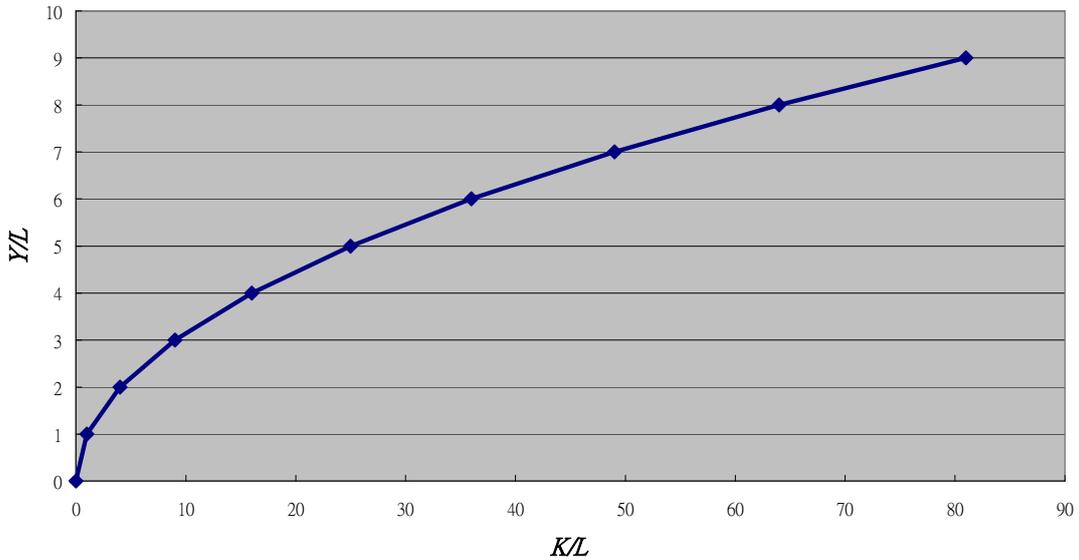
b. Does this aggregate production function exhibit diminishing returns to physical capital?

The aggregate production function exhibits diminishing returns to physical capital. At the point where $K/L = 1$, we need to increase K/L by three units to increase Y/L by 1; at $K/L = 4$, we need to increase K/L by five units to increase Y/L by 1; at $K/L = 9$, we need to increase K/L by seven units to increase Y/L by 1.

c. Suppose there is an increase in the total factor productivity, which of the following functions would represent such an increase?
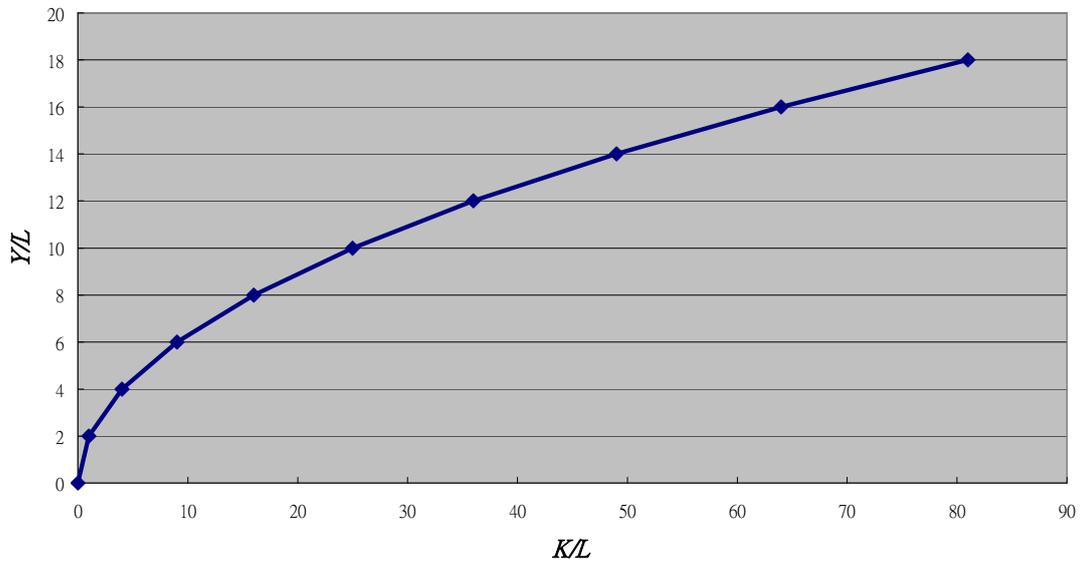
$$Y / L = 2\sqrt{K / L}$$

$$Y / L = \frac{1}{2}\sqrt{K / L}$$

Use the function that you choose to fill in the following table and plot the aggregate production function in a graph. Does the new aggregate production function exhibit diminishing returns to physical capital?

K/L	0	1	4	9	16	25	36	49	64	81
Y/L	0	2	4	6	8	10	12	14	16	18

Aggregate Production Function

The new aggregate production function exhibits diminishing returns to physical capital also. The reasoning is similar to the reasoning in b. At point where $K/L = 1$, we need to increase K/L by three units to increase Y/L by 2; at $K/L = 4$, we need to increase K/L by five units to increase Y/L by 2; at $K/L = 9$, we need to increase K/L by seven units to increase Y/L by 2.