Econ 102 Week 10 Discussion Handout

1. Rule of 70

Review:

The rule of 70 provides a simple way to calculate the approximate number of years it takes for the level of a variable growing at a constant rate to double. The rule states that the approximate number of years n for a variable growing at the constant rate of R percent, to double is

$$n = 70/R$$

Exercise:

Suppose you invest $10,000 in a bond in 2013 that earns 14% interest per year steadily. The target of this investment is to reach $80,000 before 2030 for education of your kids.

a) How many years will it take to double your money? How about quadruple it? Will you realize the target?

It takes 5 years to be double and 10 year to be quadrupled. Yes, you will realize you target in 2028.

	2013	2018	2023	2028
Value of bond	*10,000*	*20,000*	*40,000*	*80,000*

b) Suppose the financial market suffers from a crisis such that the interest rate decreases to 5% in 2018. How many year do you need to realize the target if the interest rate stays at 5% from 2018 onwards?

You need 33 years to realize the target.

	2013	2018	2032	2046
Value of bond	*10,000*	*20,000*	*40,000*	*80,000*

2. Long Run Economics Growth

Review:

What cause economic growth? Three main factors: physical capital (machines, equipment), human capital (worker skill, education), and technological progress (technology).

Labor Productivity:

Labor Productivity = $\dfrac{Y_t}{L_t}$ = slope of the ray drawn from origin to the aggregate production

function

Aggregate production function ($A_t \, technology \, , K_t \, physical \, capital \, , L_t \, Labor$):

$$Y_t = f(A_t, K_t, L_t)$$

Diminishing marginal returns to capital (labor), given technology and labor (capital) fixed:

As more units of labor are hired, while capital and technology level fixed, output will increase but at a diminishing rate.

Marginal returns to labor= the slope of a tangent line on the production function which decreases as the labor input increases fixing capital and technology level. This is because capital and technology level are fixed, so each unit of labor gets less and less resources as more labors share the fixed amount of resources.

Exercises:

Ex1. In country A both the aggregate labor supply and the aggregate labor demand increase. What happens to (1) aggregate production, (2) labor productivity and (3) equilibrium wage rate?

(1) aggregate production increases

(2) labor productivity deceases

(3) equilibrium wage rate is undetermined

Ex2. In 1999 country X experienced an improvement in its technology. At the same time 2000 lawyers that were employed in country X migrated to country Y. Given this information and holding everything else constant, what the effect of these changes on the aggregate economy in country X will be? i.e. How will labor productivity and aggregate production be influenced?

Labor productivity will increase in country X due to an improvement of technology and a decrease in number of workers.

Change in aggregate production is undetermined due to opposing effect of technology improvement and migration of workers in A.

Ex.3 The market supply and demand for labor are represented by the following equations:

Labor supply (in millions) = w – 10

Labor demand (in millions) = 40 – w

Where w is the real wage.

Aggregate production function: $Y = \sqrt{K*L}$

If the level of capital is $ 15 million, what is the labor productivity of the average workers?

Equilibrium labor is given by labor market clearing: w – 10 = 40 – w, i.e. w = 25, L = 15

$Y = \sqrt{K*L} = \sqrt{15*15} = 15$

Labor productivity= Y/L = 15/15 =1

Ex.4 Consider a labor market and an aggregate production function. After the government institutes a new policy we observe that the real wage increases and labor productivity decreases. You are told the policy change shifted only one of the labor market curves: which curve shifts?

Demand curve shifts to the right since productivity decrease implies an increase in equilibrium units of labor.

3. Past exam questions:

(Spring 2013 12:05, #4) Suppose Y is output, K is capital, L is labor, and A is the level of technology in an economy and we can express the relationship between output and K, L, and A with the following aggregate production function:
   $Y = A(K^{.5})(L^{.5})$
   Given this production function, what will happen to the level of output, Y, if K, L and A are all doubled?

   a) Y will double
   b) Y will more than double
   Answer: b

(Spring 2013 12:05, #24) Suppose that an economy is initially hiring 100 units of labor while the level of capital and technology available in this economy is fixed. Holding everything else constant, if the economy moves to employ a larger amount of labor then:

   a) Labor productivity will rise.
   b) Capital productivity will rise.
   c) The marginal product of labor will stay the same.
   d) Both answers (a) and (c) are correct.
   Answer: b

(Spring 2013 12:05, #25) Suppose that the labor market in an economy is described by the following two equations where L is the quantity of labor and W is the wage rate.

Demand for Labor: L = 1000 − 100W

Supply of Labor: L = 200W − 800

Furthermore, suppose that the aggregate production function for this economy is given by the following equation:

$$Y = 20(K^{(1/2)})(L^{(1/2)})$$

Assume that capital, K, is fixed in this economy and equal to 400 units. When the labor market is in equilibrium, what is the value of labor productivity?

    a) One unit of output per 20 units of labor.
    b) Twenty units of output per unit of labor.
    c) 8000 units of output per unit of labor.
    d) Two hundred units of output per unit of labor.
Answer: b