Economics 102 - Spring 2010
Homework #4
(Due Wednesday, April 7th in lecture)

Directions: The homework will be collected in a box before the lecture. Please place your name, TA name and section number on top of the homework (legibly). Make sure you write your name as it appears on your ID so that you can receive the correct grade. Please remember the section number for the section **you are registered in,** because you will need that number when you submit exams and homework. Late homework will not be accepted so make plans ahead of time. Good luck!

Problem 1.

Consider the following labor market for some economy: labor demand is given by $w = 170 - 3L$ whereas supply of labor is characterized by the equation $w = 30 + L$. In this setting w and L are the nominal wage rate per week and the number of hours worked per week, respectively.
   (a) Suppose we have full employment, what is the equilibrium level of L and w?
   (b) Assume that the aggregate production function is $Y = 5K^{0.5}L^{0.5}$ where K is physical capital. Additionally suppose this economy possesses an endowment of capital, $K_0 = 100$, and furthermore assume this economy always produces at full capacity. What is the full employment output for this economy? (Y is real GDP, K is capital, and L is labor.)
   (c) What is the labor productivity if the economy produces the full employment level of output?
   (d) Suppose now, that the government implements a minimum wage rate of $70 per week.
      (d.1) Given this information, what is the number of unemployed in this economy?
      (d.2) Given this information, what is the new level of output for this economy and the new level of labor productivity?
      (d.3) From your answers in parts (d.1 and d.2), discuss whether or not the government minimum wage policy makes workers better off or not?
   (e) Go back to the initial situation (no minimum wage imposed by the government). Suppose the amount of available physical capital increases to K=125. Suppose there is no change in labor demand and labor supply. Given this change in capital, what is the full employment level of output and what is labor productivity? How does an increase in the capital stock affect output and labor productivity?

Answers:

   a- To find equilibrium values of L and w, we proceed as we did before when we dealt with markets for goods and/or services. That is, we equate supply and demand equations and solve for each variable.
   $30 + L = 170 - 3L$

Thus, L = 35.

Then plugging this number in some of the equations, for example into the demand equation, we have $w = 170 - 3(35)$ and then $w = 65$

b- This can be easily found plugging the result of point (a) into the aggregate production function.

$$Y = 5(100)^{0.5}(35)^{0.5}$$

$$Y = 295.8$$

c- The ratio Y/L can be compute from points (a) and (b). Labor Productivity = 8.45

d.1- Given the new wage level of 70, we have to plug this number into the demand equation and into the supply equation. Then, calculate the difference between them to obtain the unemployment level.

$$70 = 170 - 3L^d \quad \blacklozenge L^d \quad 33.33$$

$$70 = 30 + L^s \quad \blacklozenge L^s \quad 40$$

Unemployment = 6.67

d.2- Y = 288.7; labor productivity = 8.66

d.3- This is an interpretation question. The main facts to analyse here are: a minimum wage above the equilibrium level generates unemployment. Moreover, among this group of people we can find workers that were already working before the policy took place and after that they were fired because firms do not demand their work any more. Only the portion of employed persons who could maintain/preserve their jobs are better off (because they enjoy a better salary). However, there is an additional group of people that was tempted by the higher wage rate and wish to get a job but cannot find it. As a result, we can assert that there is a loss in society's welfare.

e. Y = 330.7; labor productivity = 9.45

Problem 2.

For each of the following situations use a graph of both the labor market and a graph of the aggregate production function to analyze the situation (these vertically stacked graphs were presented in class). Provide a clear explanation and be sure to identify the effects on the level of employment, the wage rate, the output level and the level of labor productivity.

(a) The average education level has increased. Assume that this change does not alter either the labor demand or the labor supply curves.

(b) The level of capital in the economy changes while the demand and supply of labor is unaffected.

(c) An immigration wave takes place (i.e. the labor force increases).

Answers:

a- Education causes the production function curve to shift upward. There is no change in the level of employment and the wage rate, and output and labor productivity increase.

b- A change in capital will shift the aggregate production function upwards. Since the labor market is unchanged the equilibrium level of employment and the equilibrium wage rate are unaffected, but the level of output increases as does labor productivity.

c- Labor supply shifts to the right. We move along the aggregate production function. The wage rate decreases, the level of employment increases, the level of output increases, and labor productivity decreases.

Problem 3.

Complete the following table. The production function is given by $Y = 10K^{0.5}L^{0.5}$ where capital is fixed at the level $K=100$. *APL* stands for *average productivity of labor* while *MPL* stands for *marginal productivity of labor* ($\Delta Y / \Delta L$).

Table 1

Output	Capital	Labor		
Y	K	L	APL	MPL
	100	0	-	-
100.0	100	1		100.0
141.4	100	2	70.7	41.4
	100	3		
	100	4		
	100	5		

Answer:

Output	Capital	Labor		
Y	K	L	APL	MPL
0	100	0	-	-
100.0	100	1	100.0	100.0
141.4	100	2	70.7	41.4
173.2	100	3	57.7	31.8
200.0	100	4	50.0	26.8
223.6	100	5	44.7	23.6

Problem 4.

Consider the following economy:

The business sector has an investment function: r = 25 – I/2000
The household sector has a saving function: r = - (1/2) + S_P /4000

Also, by definition, we have the following equations:

$$Y = C + I + G + X - IM$$
$$S_P = Y - C - T + TR$$
$$S_G = T - TR - G$$
$$KI = IM - X$$

where

C = Consumption	S_P = Private Saving
I = Investment	S_G = Government Saving
G = Government spending	T = Tax
X = Export	TR = Government Transfers
IM = Import	KI = Capital Inflow

r = real interest rate in percentage tem.

Answer the following questions.

(a) Write an equation for National Saving (NS), and indicate all the components in NS. (Note: National Saving equals the sum of private saving and government saving).

(b) In equilibrium, we know that investment equals national saving plus capital inflows. Using the equations above, provide a proof about the identity.

(c) Consider a country whose economy is a closed economy. Furthermore, assume initially that government saving in this economy is zero. Use the information above to find (1) the equilibrium interest rate, (2) the equilibrium level of investment, (3) the equilibrium level of private saving and (4) the equilibrium level of national saving.

(d) Suppose in this closed economy the government decides to increase its spending so that it will have a budget deficit of 12,000 (i.e., S_G = - 12,000). Find (1) the equilibrium interest rate, (2) the equilibrium level of investment, (3) the equilibrium level of private saving and (4) the equilibrium level of national saving.

(e) How does the government's decision to increase its government spending affect the equilibrium level of investment, the equilibrium level of private saving, and the real interest rate?

(f) Suppose this country continues to have a budget deficit of 12,000. Suppose the government decides to trade with other countries and its capital inflows are equal to $6000 (i.e., KI = 6,000). Find (1) the equilibrium interest rate, (2) the equilibrium level of investment, (3) the equilibrium level of private saving and (4) the equilibrium level of national saving.

(g) How does this capital inflow affect the equilibrium level of investment, the equilibrium level of private saving, and the real interest rate in this open economy?

Answers:

a- NS = S_P + S_G = (Y – C – T + TR) + (T – TR - G) = Y – C – G.
That is, National Saving = Output (GDP) - Consumption – Government Spending.

b- From Y = C + I + G + (X - IM), we have
I = Y – C – G + (IM - X)
From (a), we obtain I = S_P + S_G + KI = NS + KI.
That is, Invesment = National Saving + Cash Inflow.

c- From (b), we know I = S_P + S_G + KI.
By assumption, we know KI = S_G = 0
Thus in equilibrium, I = S_P
Rearranging the investment function and saving function gives
I = 50,000 – 2,000*r
S_P = 2,000 + 4,000*r
Set I = S_P
50,000 – 2,000*r = 2,000 + 4,000*r.
We obtain r* = 8.
Substitute back into the investment function and saving function. We obtain
I* = 34,000 and S_P * = 34,000.

d- From (b) we know I = S_P + S_G + KI. Given S_G = -12,000, KI = 0, we know that in equilibrium
I - S_G = S_P.
Similar to (c), using the investment function and saving function and the above identity, we obtain
50,000 – 2,000*r + 12,000 = 2,000 + 4,000*r.
That is, r* = 10.
Substitute back into the investment function and saving function, we obtain
I* = 30,000 and S_P *= 42,000.

e- Increase in government spending increases in the demand for loanable funds. Real interest rate will increase from 8% to 10%. Equilibrium level of private saving increases from 34,000 to 42,000. Equilibrium level of investment decreases from 34,000 to 30,000.

f- From (b) we know I = S_P + S_G + KI. Given S_G = - 12,000, KI = 6,000.
Similar to (c), using the investment function and saving function and the above identity, we obtain
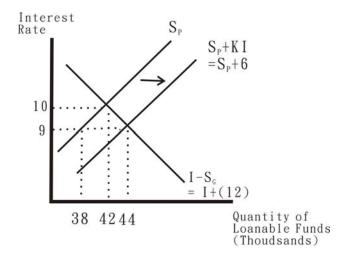50,000 – 2,000*r +12000= 2,000 + 4,000*r + 6,000.
That is, r*=9.
Substitute back into the investment function and saving function, we obtain

I* = 32,000 and S_P* = 38,000.

g- Capital inflows cause the supply curve to shift rightward. The equilibrium interest rate will decrease from 10% to 9%. The equilibrium level of private saving will decrease from 42,000 to 38,000. The equilibrium investment will increase from 30,000 to 32,000.

Interest
Rate

S_P

S_P+KI
$=S_P+6$

10

9

$I-S_G$
$= I+(12)$

38 42 44
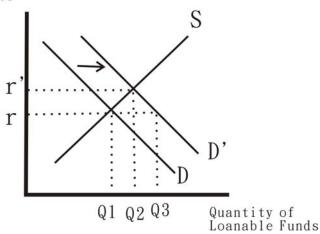
Quantity of
Loanable Funds
(Thoudsands)

Problem 5.

Use the market for loanable funds to answer the following questions:

(a) Suppose that the government wants to reduce the size of its surplus to zero by increasing its spending. Use a graph of the loanable funds market to explain what happens to private savings, equilibrium level of investment, and equilibrium interest rate.

(b) Assume the budget balance is zero. Suppose that at any given interest rate, consumers decide to save less. Use a graph of the loanable funds market to explain what happens to the equilibrium level of investment and equilibrium interest rate.

(c) Assume the budget balance is zero. Suppose that at any given interest rate, businesses become very pessimistic about the future profitability of investment. Use a graph of the loanable funds market to explain what happens to private savings and the equilibrium interest rate.

(d) Suppose the equilibrium level of investment is exactly equal to the depreciation of the economy's capital each year. Holding everything else constant, the government decides to decrease its level of spending. Suppose this decrease in government spending has no effect on the equilibrium level of employment. What is the effect of this decrease in government spending on output and capital productivity (output per unit of capital)?
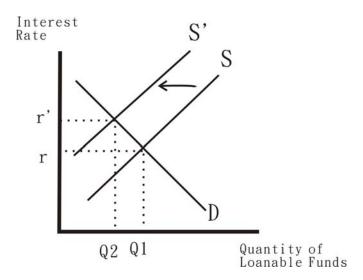
Answers:

a- If the government wants to reduce the size of its surplus to zero by increasing its spending, there will be an increase in the demand for loanable funds from D to D', which equals to the amount of decrease in the size of the surplus. In the following figure, the amount Q3-Q1 represents the amount by which the government increases its spending.
In response to this, equilibrium interest rate increases from r to r'. Equilibrium level of investment decreases from Q3 to Q2. Private savings increase from Q1 to Q2.
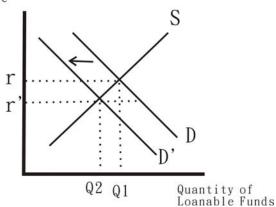

b- If the consumer decides to save less, there will be a decrease in the supply of loanable funds. In the following figure, this is represented by the leftward shift of the supply curve from S to S'.
In response to this, equilibrium interest rate increases from r to r'. Equilibrium level of investment decreases from Q1 to Q2.

c- Lower investment spending at any given interest rate leads to a decrease in the demand for loanable funds. In the following figure, the decrease in demand for loanable funds shifts the demand curve from D to D'.
In response to this, equilibrium interest rate decreases from r to r'. Private savings decrease from Q1 to Q2.

Interest
rate

d- Government's decision on decreasing the level of spending will shift the demand curve for loanable funds to the left, which leads to a lower interest rate. If the interest rate decreases, businesses will increase investment spending. This tells us the equilibrium level of investment will increase.
Since the equilibrium level of investment increases, the depreciation in capital will be smaller than the new equilibrium level of investment during the current period. As a result, the level of capital in the next period will increase relative to the current period. Holding everything else constant, output will increase and capital productivity will decrease.