

ECON 3010 Intermediate Macroeconomic Theory Solutions to Homework #2

#1. Ten *Sapling* multiple-choice questions. You have unlimited attempts to complete the assignment and they are due at midnight on the date above.

The written questions below are due at the beginning of class and should be typed.

#2. Chapter 3. Problems and Applications #2.

Solution.

a) To find the amount of output produced, substitute the given values for labor and land into the production function:

$$Y = 100^{0.5}100^{0.5} = 100.$$

b) According to the text, the formulas for the marginal product of labor and the marginal product of capital (land) are:

$$MPL = (1 - \alpha)AK^{\alpha}L^{-\alpha},$$

$$MPK = \alpha AK^{\alpha-1}L^{1-\alpha}.$$

In this problem, α is 0.5 and A is 1. Substitute in the given values for labor and land to find the marginal product of labor 0.5 and the marginal product of capital (land) 0.5.

$$MPL = (1 - 0.5)100^{0.5}100^{-0.5} = 0.5,$$

$$MPK = (0.5)100^{-0.5}100^{0.5} = 0.5.$$

We know that the real wage equals the marginal product of labor and the real rental price of land equals the marginal product of capital (land).

c) Labor's share in the output is given by the marginal product of labor times the quantity of labor, or 50.

d) The new level of output is 70.71.

e) The new wage is 0.71. The new rental price of land is 0.35.

f) Labor now receives 35.5, but still receives half of output.

#3. Chapter 3. Problems and Applications #7 parts (a) – (c).

Solution.

a) The production function is $Y = K^{0.33}L^{0.33}H^{0.33}$. The marginal product of labor is

$$MPL = \frac{\partial Y}{\partial L} = 0.33K^{0.33}L^{-0.67}H^{0.33} = 0.33\frac{Y}{L}.$$

An increase in H will increase the MPL.

b) The marginal product of human capital is

$$MPH = \frac{\partial Y}{\partial H} = 0.33K^{0.33}L^{0.33}H^{-0.67} = 0.33\frac{Y}{H}.$$

An increase in H will decrease the MPH.

c) The income share paid to labor (L) is

$$\frac{MPL \times L}{Y} = 0.33.$$

The income share paid to human capital (H) is

$$\frac{MPH \times H}{Y} = 0.33.$$

In the national income accounts, workers would appear to receive two-thirds of national income because human capital is embodied within workers. Skilled workers with high degrees of human capital would receive more income than unskilled workers. However, the total income share to workers would be two-thirds of GDP.

#4. Chapter 3. Problems and Applications #10.

Solution.

a) Private saving is the amount of disposable income, $Y - T$, that is not consumed:

$$\begin{aligned} S^{private} &= Y - T - C \\ &= 8,000 - 2,000 - \left[1,000 + \left(\frac{2}{3}\right)(8,000 - 2,000)\right] = 1,000. \end{aligned}$$

Public saving is the amount of taxes the government has left over after it makes its purchases:

$$\begin{aligned}S^{public} &= T - G \\ &= 2,000 - 2,500 \\ &= -500.\end{aligned}$$

Total saving is the sum of private saving and public saving:

$$\begin{aligned}S &= S^{private} + S^{public} \\ &= 1,000 - 500 \\ &= 500.\end{aligned}$$

b) The equilibrium interest rate is the value of r that clears the market for loanable funds. We already know that national saving is 500, so we just need to set it equal to investment:

$$\begin{aligned}S &= I \\ 500 &= 1,200 - 100r\end{aligned}$$

Solving this equation for r , we find:

$$r = 7\%.$$

[*Note: In class I may use examples where r is defined as a fraction, here it is defined as a percentage. Either way is fine. If it's not stated upfront, you can usually tell by the size of the number.*]

c) When the government increases its spending. Private saving remains the same as before (notice that G does not appear in $S^{private}$ above) while government saving decreases. Putting the new G into the equations above:

$$\begin{aligned}S^{private} &= 1,000 \\ S^{public} &= 2,000 - 2,000 \\ &= 0\end{aligned}$$

Thus,

$$\begin{aligned}S &= S^{private} + S^{public} \\ &= 1,000 + 0 \\ &= 1,000.\end{aligned}$$

d) Once again the equilibrium interest rate clears the market for loanable funds:

$$\begin{aligned}S &= I \\ 1,000 &= 1,200 - 100r\end{aligned}$$

Solving this equation for r , we find that, $r = 2\%$.