

Solution Key: Homework 1

Economics 101 - Chapters 1-3

- 1) a) I and GDP rise.
b) G and GDP rise.
c) C and GDP rise.
d) No effect on GDP or any sub-category. This is an intermediate good.
e) I rises, NX falls an equal amount, so there is no change in GDP.
f) I (inventory investment, to be precise) and GDP rise.

2) 2014 nominal GDP = $(40 \times 150) + (7 \times 300) + (600 \times 0) = 8100$ \$ (2014 dollars)

$$2014 \text{ real GDP} = (30 \times 150) + (6 \times 300) + (200 \times 0) = 6300 \text{ $ (2013 dollars)}$$

$$\text{GDP deflator} = \text{nominal GDP} / \text{real GDP} = 8100 / 6300 = 1.3$$

$$\text{CPI} = \frac{(40 \times 100) + (7 \times 200) + (600 \times 30)}{(30 \times 100) + (6 \times 200) + (200 \times 30)} = 2.3$$

The CPI here suggests prices have risen more, because it gives greater weight to flights to Cancun, even though none was bought in 2014. This illustrates how the CPI can overstate inflation because of substitution bias. The GDP deflator may be a better measure here of cost of living, since trips to Cancun are not part of the consumption bundle, and rises in its price do not affect the consumer. (However, it potentially could be argued that the GDP deflator underestimates the impact of the rise in living costs. People might have wanted to buy trips to Cancun, but the dramatic rise in price forced them to forfeit this, and thereby lowered their welfare.)

- 3) a) $(W/P) = MPL = F_L(K, L) = 6K^{1/3}L^{-1/3} = 6(K/L)^{1/3} = 6(100/100)^{1/3} = 6$
 $(R/P) = MPK = F_K(K, L) = 3K^{-2/3}L^{2/3} = 3(L/K)^{2/3} = 3(100/100)^{2/3} = 3$
b) total payments to labor = $(W/P) \times L = 6 \times 100 = 600$
total payments to capital = $(R/P) \times K = 3 \times 100 = 300$
c) $Y = 9K^{1/3}L^{2/3} = 9(100)^{1/3}(100)^{2/3} = 900$.
(payments to labor) + (payments for capital) = $600 + 300 = 900 = Y$
d) labor share = $600/900 = 2/3$. This is the exponent on L in the production function.
capital share = $300/900 = 1/3$. This is the exponent on K in the production function.
e) According to the equation for the real wage above $\{(W/P) = MPL = 6(K/L)^{1/3}\}$, a rise in L lowers the workers' marginal product because they are crowded around the machines. This will lower the real wage and make workers unhappy. But according to the equation above $\{(R/P) = 3(L/K)^{2/3}\}$, the real rental rate will rise with more labor, making owners of capital happy.

- 4) a) equilibrium condition: $Y = C + I + G$

$$\begin{aligned}
 8000 &= 600 + .6(8000-3000) + 2000 - 6000r + 3000 \\
 -600 &= -6000r \quad \text{so} \quad r = .10 \\
 C &= 600 + .6(8000-3000) = \underline{3600} \quad \text{and} \quad I = 2000 - 6000(0.10) = \underline{1400}
 \end{aligned}$$

b) Taxes fall by $0.1 \times 3000 = 300$, from 3000 to 2700

$$\begin{aligned}
 Y = C + I + G \text{ means } 8000 &= 600 + .6(8000-2700) + 2000 - 6000r + 3000 \\
 -780 &= -6000r \quad \text{so} \quad r = .13 \\
 C &= 600 + .6(8000-2700) = \underline{3780} \quad \text{and} \quad I = 2000 - 6000(0.13) = \underline{1220}.
 \end{aligned}$$

The tax cut raises disposable income, which leads people to consume 180 extra units. Because there is a limited supply of goods, the interest rate rises and crowds out investment by 180 units.

c) Investment is negatively affected by the interest rate because it implies a greater cost for borrowing the funds to carry out an investment project. Consumption might be affected in the same way, because some consumption purchases, such as cars, usually require people to borrow funds. If consumption is negatively affected by a rise in the interest rate, the tax cut will not raise consumption as much as the case above. As the rise in disposable income raises consumption, the resulting rise in the interest rate will partly counteract the rise in consumption. As a result, investment should be crowded out by less.

d) For the example with consumption function: $C = 600 + .6(Y-T) - 3000r$

Equilibrium before the tax cut: $Y = C + I + G$

$$\begin{aligned}
 8000 &= 600 + .6(8000-3000) - 3000r + 2000 - 6000r + 3000 \\
 -600 &= -9000r \quad \text{so} \quad r = .0667 \\
 I &= 2000 - 6000(0.067) = \underline{1600}
 \end{aligned}$$

Equilibrium after the tax cut: $Y = C + I + G$

$$\begin{aligned}
 8000 &= 600 + .6(8000-2700) - 3000r + 2000 - 6000r + 3000 \\
 -780 &= -9000r \quad \text{so} \quad r = .0867 \\
 I &= 2000 - 6000(0.0867) = \underline{1480}
 \end{aligned}$$

So the interest rate rises less and investment now is only crowded out by 120.
