Problem Set #5 Answer Key

Economics 305: Macroeconomic Theory

Spring 2007

1 Chapter 9, Problem #1

There are two effects of an increase in the depreciation rate. First, given the marginal product of capital in period two, $MP_{K'}$, the net marginal product of capital, $MP_{K'} - d$, will decrease when the depreciation rate increases. For any given real interest rate, this effect lowers the firm's preferred level of K', and shifts the investment demand curve out.

The second effect can be seen by rearranging the equation $K' = (1-d)K + I$ to $I = K' - K + dK$. Given the initial capital stock, K, more investment will be required to achieve a given second-period capital stock if the depreciation rate is higher. Therefore, when d increases, the investment demand curve shifts in. The two effects work in opposite directions, and so, given the real rate of interest, investment may either rise or fall with an increase in the depreciation rate.

2 Chapter 9, Problem #3

For the first policy, the output subsidy, there will be no direct effect on investment. That is, a subsidy of t for each unit of output produced in the current period affects neither the marginal cost of investment nor the marginal benefit from investment for the firm. However, there will be an indirect effect: by raising the marginal benefit from current production, the subsidy will increase the firm's current labour demand. Given the consumer's labour supply curve, this will push the output supply curve out. Interest rates will fall, and so investment will increase.

If there is an investment tax credit, that is, a subsidy of s per unit invested in the current period, then the marginal cost of investment is $1 - s$ instead of 1. The firm's optimal investment rule is now to invest to the point where $MP_{K'} - d = r - s(1+r)$. Therefore, the investment tax credit will increase investment, shifting the optimal investment schedule to the right.

Both policies would tend to increase investment. I would suspect the second policy would have a larger effect - direct effects are usually stronger than indirect effects - but it is not clear which way it would go.

3 Chapter 9, Problem #6

First we consider direct effects. A future increase in government spending generates a negative income effect for the consumer. Therefore, current-period consumption declines and current-period labour supply increases. The increase in current-period labour supply shifts the output supply curve out. The decrease in current-period consumption shifts the output demand curve in. The anticipated increase in government spending has no direct effect on the firm.

The results are summarized in Figure 1. The equilibrium interest rate unambiguously declines, so investment unambiguously increases. What happens to the equilibrium level of employment and output depends on the relative strength of the different effects: labour supply goes up because of the negative shock to the consumer's lifetime income, but down because interest rates have gone down.

Figure 1 is drawn to assume the first of these effects dominates. The equilibrium level of output probably increases from Y^* to Y^{**}, in which case the level of employment rises from N^* to N^{**}. If, overall, employment and output increase, then it must be the case that the real wage falls. The overall effect on consumption is also unclear: the income effect tends to lower consumption, while the decline in the real interest rate tends to increase consumption.

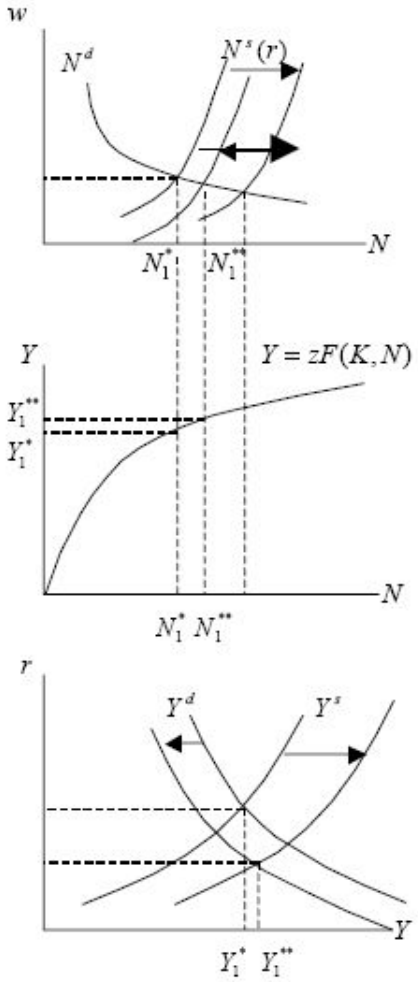

Figure 1:

4 Chapter 9, Problem #7

Labour supply shifts to the right, so output supply also shifts out. Consumption demand also increases, so the output demand curve must also shift out. Output must increase; the real interest rate may rise or fall. In light of the increase in output, equilibrium employment must increase. A higher level of employment, in the absence of a shift in the labour demand curve, implies that the real wage rate must also fall. The effecgt on investment depends on what has happened to the real interest rate: investment rises if the real interest rate declines, and falls if the real interest rate increases. Because output has increased, consumption will rise as long as investment remains the same or declines. Consumption falls only in the case of a decline in the rate of interest of sufficient size to increase investment by more than the increase in output.

a) To summarize: $Y \uparrow, N \uparrow, w \downarrow$. r, I, C are ambiguous, but most likely C increases.

b) Clearly, there are many potential correct answers to this question.

One example that has been investigated by economists and others interested in economic history and development economics: at low levels of nutrition, it may be infeasible for the consumer to work very much (a very high $MRS_{ell,C}$). In this case, an increase in nutrition would make the consumer more willing (and able) to work more and consume more. One could also imagine some change in the technology of using leisure that is more goods intensive. In this case, the value of leisure is low without a lot of consumption goods.