ECON 110, Professor Hogendorn

Problem Set 10 Answers

1. *GrowthIsGood2.*

   (a) TFP growth just changes the coefficient of the production
   function, so the new function is

   $$Y = g(L) = (1.04)67L^{4/5} = 70L^{4/5}$$

   In the graph, the new function is just shifted a bit higher than
   the old one.

   (b) We can find labor demand quickly by using the profit-maximizing
   condition $pMP_L = w$. For the original production function
   this is
   $$1 \cdot \frac{4}{5}67L^{-1/5} = w \Rightarrow L^D = \left(\frac{4}{5}\frac{67}{w}\right)^5$$
   The new labor demand curve is then $L^{D'} = \left(\frac{4}{5}\frac{70}{w}\right)^5$.

   (c) Initially the labor market cleared at $L^D = L^S$, i.e. $\left(\frac{4}{5}\frac{67}{w}\right)^5 = 243$.
   This implies an equilibrium wage of \$17.90. Since the wages
   are sticky, they remain at that level even after labor demand
   shifts right. And since thre are only $L^P = 243$ workers, the
   marginal product of labor must rise. The workers are under-
   paid relative to their marginal product.

   (d) Full employment output has risen. It was $f(L) = 67(L^P)^{4/5}$,
   and now it's $g(L) = 70(L^P)^{4/5}$.
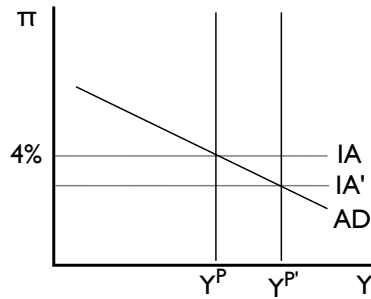
(e) There *is* a condition where GDP is below the potential level of output, which looks just like a recession diagram, but in this scenario there is no point in time where GDP actually declines. There is downward pressure on prices which will increase the quantity of aggregate demand to match the new higher level of output.

2. *Recession_a.*

(a) The representative firm in this market will set $pMP_L = w$, or $\frac{1}{4}L^{-3/4} = w$. Thus $L^D = (4w)^{-4/3}$. Setting labor demand equal to labor supply gives an equilibrium real wage of 0.00025.
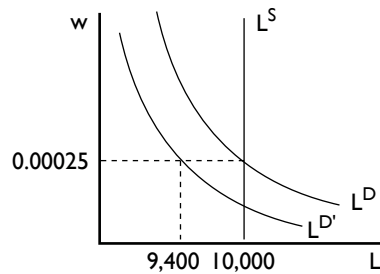

(b) This is not surprising, because even when the labor market "clears" there is still frictional unemployment (people between jobs) and structural unemployment (people whose skills do not match available jobs). In this case, 4% is the natural rate of unemployment that occurs from these imperfections in the labor market.

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(c) The shift in demand does nothing to change the wage, so it only reduces the quantity employed. Since there was 4% natural rate of unemployment even when 10,000 were employed, a total of 10% unemployment implies there must now be 6% cyclical unemployment, or 9400.

(d) In this problem we know the production function, so we can directly calculate the full employment level of output: $Y^P = f(L^P) = 10,000^{1/4} = 10$. This allows us to use Okun's Law backwards from the normal way to find the level of output during the recession:

$$\frac{10 - Y}{10} \approx 2(10\% - 4\%) \Rightarrow 10 - Y = 120\% \Rightarrow Y = 10 - 1.2 = 8.8$$

Thus, the AD/IA diagram would look like this:
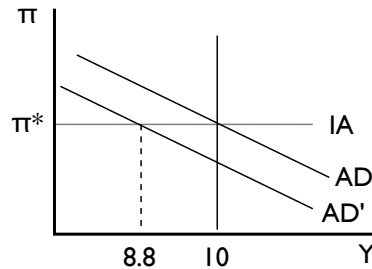
(e) If the capital market clears, an increase in the government deficit will crowd out investment by reducing the amount of capital available. If, on the other hand, the capital market is stuck out of equilibrium, then there is a gap between savings and investment anyway and there will not be reduction in investment.

Case (i)   Case (ii)
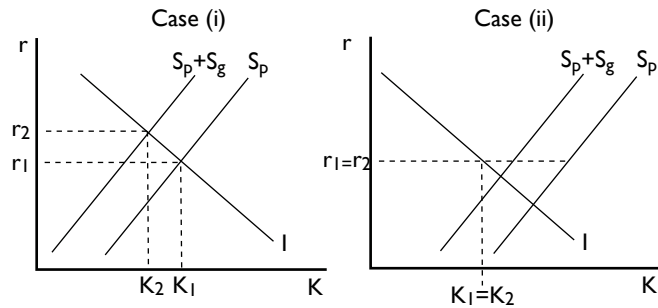
(f) Since the government did not raise taxes, this change will stimulate aggregate demand. The AD curve shifts right, increasing the output of the economy and helping to alleviate the recession.
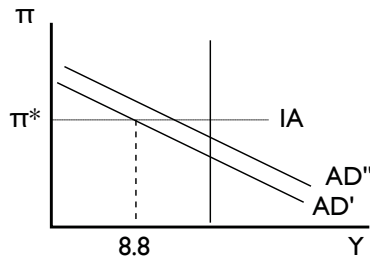
3. *TaxCut.*

(a) The firm maximizes profits by setting $MP_L = w$, or

$$\frac{1}{3}18L^{-2/3} = w$$

$$L^{-2/3} = \frac{w}{6}$$

$$L(w) = \left(\frac{6}{w}\right)^{2/3}$$

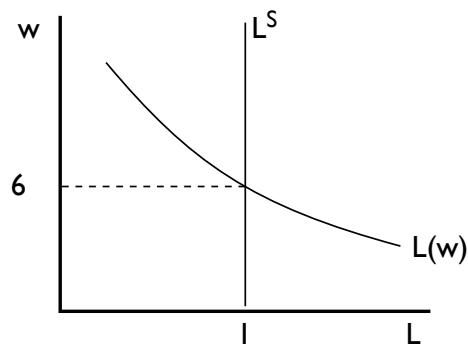$L(w)$ is the labor demand curve. Setting labor demand equal

to labor supply gives the equilibrium real wage

$$L(w) = L^S$$
$$\left(\frac{6}{w}\right)^{2/3} = 1$$
$$w^* = 6$$

The labor market diagram looks like this:

(b) The firms hires L^*1 worker at wage $w^* = 6$, hence $w^*L^* = 6$. The firm produces $Y^* = f(L^*) = 18$, so after paying out the wages its profits are $\Pi^* = 12$. Thus total national income is

$$NI^* = w^*L^* + \Pi^* = 6 + 12 = 18$$

(c) Government saving is $S_G = T - G = 2.5 - 3.2 = -0.7$. National saving is $S = S_P + S_G = 3.3 - 0.7 = 2.7$. Private investment demand evaluated at the world real interest rate is $I(0.04) = 8 - 110(0.04) = 3.6$. A graph of this capital market is
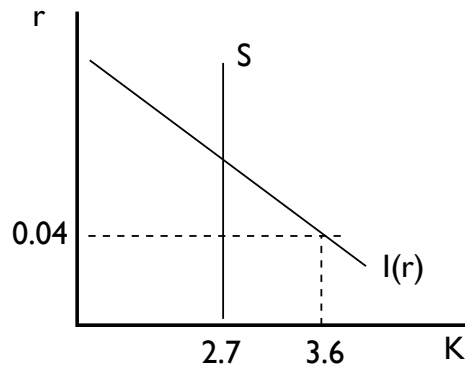
The NCF into the United States is $3.6 - 2.7 = 0.9$ which is also the US trade deficit $-NX$.

(d) Suppose the tax cut is equal to about 0.12, and that the world real interest rate remains unchanged. Also assume that all of the tax cut goes to an increase in consumption C, and that the IA curve is flat at 2.5%. Show the effects of the tax cut in the capital market and in an AD/IA diagram.

Since the tax cut is not accompanied by any spending cut, S_G and thus S shift left by 0.12. If all of this goes into consumption, then AD shifts right by 0.12. The economy moves (further) into a boom, the NCF gets bigger, and the trade deficit also gets bigger.
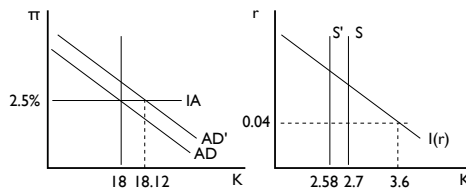
(e) The strongest argument for bad policy is that the economy is above full employment and this will put upward pressure on wages and prices, causes inflation. The IA line will shift upward, and output will decline in a movement along the AD curve. The country will end up with the same output as before, but with higher inflation and more government debt.

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The strongest argument for good policy is that the tax cut will make the economy more efficient and perhaps spur capital deepening or total factory productivity. All of these would increase the potential level of output to the right, and the new level of output would become the new long-run equilibrium.

(f) We know that national income is 18 before the tax cut, and we know that $NI = C + S_P + T$. Since we know $S_P = 3.3$ and $T = 2.5$, we can find that $18 = C + 3.3 + 2.5$ which means C must equal 12.2. After the tax cut, the C is assumed to rise by the full amount of the tax cut, so the new C must be 12.32.

Alternatively, you could find that GDP was 18 before the tax cut, I was 3.6, G was 3.2, and we know that NCF was 0.9 so NX is -0.9. Then since $Y + C + I + G + NX$, we have $18 = C + 3.6 + 3.2 - 0.9$ so C is 12.1. (Slight rounding difference.)