ECON 110, Prof. Hogendorn

Problem Set 8

1. *Botswana.* In his book *Globalization and its Discontents,* pg. 38, Joseph Stiglitz criticized the IMF's policy toward Botswana in 1981. He uses this as one example of a larger critique of the so-called "Washington Consensus" policy toward developing nations. This problem uses approximately accurate data to analyze the situation.

   First, let's normalize Botswana's working population to $\mathcal{L} = 100$. Let Botswana have an economy-wide production function

   $$Y = f(L) = 117.5L^{1/2}$$

   and assume the firms represented by this function are owned by the workers. Set the price of Y equal to 1, and note that with the given production function, GDP at full employment is 1,175 million US dollars.

   (a) Find the equilibrium real wage in Botswana's labor market and graph the labor market. Graph the production function.

   (b) Now let's examine the capital market in 1980. Private Botswanans were saving 5% of GDP (assume perfectly inelastic with respect to the real interest rate). The government was spending 33% of GDP and collecting taxes of 34% of GDP. Firms' investment demand function was $I = 728 - 3520r$. Graph the domestic capital market and show the equilibrium real interest rate.

   (c) Actually, Botswana's real interest rate in 1980 was 10%, lower than what you found above. This was because Botswana could

borrow in the world capital market. Redraw your capital market graph to show this lower real interest rate. How much investment took place in Botswana? How large were foreign capital inflows?

(d) Recall that total income from wages plus dividends has to equal consumption plus savings plus taxes. Find this for Botswana in 1980. Then recall that total output has to equal consumption plus investment plus government plus net exports. Find this for Botswana in 1980. Note: you just found consumption; investment and government were given in part (b) and (c); net exports is the residual that makes total income equal to total output.

(e) Botswana faced two negative shocks in 1981 due to drought and problems in the diamond industry. We'll model this by saying that the production function changed for the worse to $Y = f(L) = 103.8L^{1/2}$. Show the new real wage.

(f) The IMF advised Botswana to cut government spending, but it did not. Stiglitz agreed with Botswana's decision not to cut government spending. There are lots of reasons, but let's focus on just one: suppose some government spending is for healthcare, and that this spending creates a positive externality because it reduces disease throughout the population. Draw a graph of the healthcare market, and show that the private market would provide less than the socially optimal amount of healthcare.

2. *GrowingChina.* This problem discusses the Malthusian trap that has worried China for centuries and that the country now seems to have escaped. Let there be $\mathcal{L} = 1000$ Chinese workers who inelastically supply labor and who spend all of their income on rice. These workers own the Chinese rice firms which have aggregate production function $Y = f(L, K) = A(hL)^{2/3}K^{1/3}$. (Aggregate

meaning we treat all the firms as if there were just 1.) Let $A = 3.33$, $h = 1, p = 1$ and let $K = 729$. Note that the Chinese capital stock is constant until part (d) of this problem.

(a) Find the equilibrium real wage and graph the labor market.

(b) Verify that there is also equilibrium in the rice market and graph the production function. What is output per worker $(Y/\mathcal{L})$?

(c) Suppose that over several years, the Chinese workforce rises to 1,728 workers. If nothing else changes, what is the new general equilibrium (the new wage and the new output per worker)? Why don't these new workers produce enough to keep the output per worker at least as high as before?

(d) Consider the following changes to the production function: an increase in A, an increase in K, and an increase h. How would each of these help China escape the Malthusian trap? What is the name for each of these sources of growth?

3. *AIG.* AIG is the world's largest insurance company, and it got into deep financial trouble in the 2008 financial crisis. As of September 30, 2008, AIG's simplified balance sheet looked approximately like this (all figures in billions):

Assets	Liabilities
$400 financial securities	$913 general liabilites
	$38 government loan
$622 other assets	$71 net worth
$1022	$1022

(a) By late fall 2008, things had gotten worse. It turned out that $50 of the other assets are distressed, and could no longer

be counted as assets. Rewrite the balance sheet, and find the new net worth.

(b) Things got worse still. There was been a decline of 10% in the financial securities. Also, AIG had a new liability of $35 in credit default swaps. Again rewrite the balance sheet and show the net worth.

(c) Finally, the government announced a bailout plan. One thing the government did was buy the $50 in distressed assets at their full face value by giving AIG $50 in cash. Show how this changed the balance sheet.

(d) The other terms of the government plan were to lend AIG $60 (a new liability). AIG took this cash and paid off the credit default swap liability. Separately, the government bought $40 in shares in the company (again, giving AIG cash). How does this change the balance sheet?

4. *Sticky.* Let the economy-wide labor demand curve be $L(w) = 1000 - 20w$. Let economy-wide labor supply be $\mathcal{L} = 800$.

(a) Draw the labor market and show the equilibrium wage.

(b) Let firms reduce hiring, shifting labor demand to $L^r(w) = 800 - 20w$. If the labor market clears, show what happens to wages and employment.

(c) Now suppose that wages are completely sticky and do not adjust. Show what happens to wages and employment.

(d) If the Ministry of Labor of this economy did a telephone survey to find the unemployment rate, which would be the most realistic unemployment rate under the conditions of part (c): 30%, 25%, or 20%? Explain.

Review Problems only, not to turn in:

5. *OldGermansSave.* As in OldGermans, there are 243 German workers who inelastically supply labor, but now they save 100 beers (in total) for the future and spend the rest of their income on beer consumption. These workers own the German beer firms which have aggregate production function $f(L) = \frac{54}{4}L^{4/5}$. The German beer firms have aggregate investment demand of $I = 1200/r$, where r is the real interest rate.

  (a) Find the equilibrium real wage in the labor market and graph the labor market. Verify that there is also equilibrium in the beer market and graph the production function. (This just repeats OldGermans parts (a) and (b)).

  (b) Graph the capital market. What is the equilibrium real interest rate?

  (c) What happens if Germans become more pessimistic and start saving 110 beers?

  (d) Go back to just 100 beers saved. What happens if the German government levies taxes of 60 beers but German Chancellor Angela Merkel drinks 80 beers?

6. *Fear-goods.* This problem shows how in the neoclassical long-run macro model, widespread fear across an economy will not cause a recession! This is an important and comforting insight for the long run, but on the other hand, in the long run we are all dead...

  Suppose the production function for the one representative firm in the economy is $Y = f(L) = 20L^{4/5}$. There are $\mathcal{L} = 40$ workers who inelastically supply labor.

  (a) Show that the labor demand curve is $L(w) = (16/w)^5$, graph the labor market, and show the equilibrium real wage.

(b) Verify the national income accounts identity, i.e. that income from wages and dividends(which equals consumption) equals output (all of which is also consumption).

(c) Now suppose that people in this country hear about the financial crisis. Everyone becomes very fearful of the future. The firm shifts down its labor demand curve to $L(w) = (8/w)^5$ – even though this is not profit maximizing because the production function remains unchanged. Assuming the labor market still clears, what happens to the wage, income from wages, income from dividends, and output?

7. *LittleT.* A bank has deposits of $50 million, loans of $52 million, and complies with a 10% reserve requirement. Assuming this bank is properly run, write its T-account.

8. *SW25.2* Down Home Savings Bank has the following assets and liabilities: $6 million in government bonds and reserves, $40 million in deposits, $36 million in outstanding loans. Draw up the balance sheet for the bank. What is its net worth?

9. *SW25.3* While gardening in his backyard, Bob finds a jar containing $100,000 in cash. He deposits the money in his bank, where the reserve requirement is 5%. Show the relevant changes on the bank's balance sheet. How much will the money supply eventually increase due to Bob's deposit? How would your answer be different if Bob only deposited $95,000, keeping $5,000 in cash to himself?

10. *OldGermansMoney.* Suppose that Germany output is $Y = 4374$ beers now, and will fall to $Y = 3713$ beers in the future due to population decline. If the European Central Bank (which acts as Germany's central bank plus the other countries that use the Euro) does not change the money supply over the years and velocity does

not change, will there be deflation or inflation in Germany? Show what happens on a graph of P as a function of M and also mathematically.

Answers to Review Problems:

5. *OldGermansSave_a.*

(a) We can find labor demand using $pMP_L = w$, so,

$$1 \cdot \frac{4 \cdot 54}{5 \cdot 4} L^{-1/5} = w \Rightarrow L^d = \left(\frac{54}{5w}\right)^5$$

Setting $L^d = L^s = 243$ gives an equilibrium real wage of $w = 3.6$.

The total costs of the firm are $wL = 3.6 \cdot 243 = 874.8$. The total revenues are $py = 1 \cdot f(243) = 1093.5$. Thus the profits, paid as dividends, are 218.7. The firm's output is 1093.5.

Workers earn total wages of $wL = 874.8$ and total dividends of 218.7. Their total consumption of beer is thus $1093.5 - 100 = 993.5$, and the remaining 100 beers are saved, so there is equilibrium.
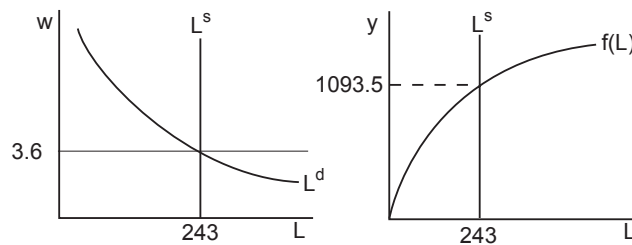
(b) The equilibrium real interest rate is found by setting

$$I = S \Rightarrow \frac{1200}{r} = 100 \Rightarrow r = 12\%$$

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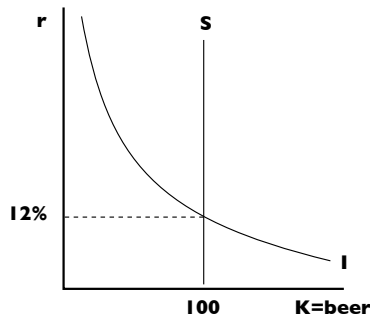
(c) The higher savings reduces the real interest rate:

$$I = S \Rightarrow \frac{1200}{r} = 110 \Rightarrow r = 10.9\%$$

(d) Consumption of beers falls to $1093.5 - 100 - 60 = 933.5$. Private savings stays the same at 100. Government spending is 80, so $T - G = -20$, i.e. the government runs a deficit. National saving is then $100 - 20 = 80$. The real interest rate rises to
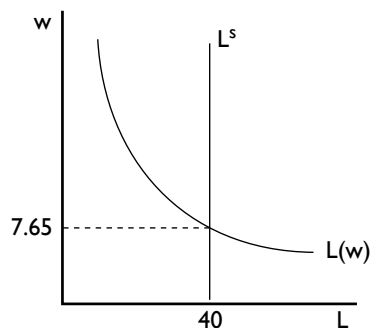
$$I = S \Rightarrow \frac{1200}{r} = 80 \Rightarrow r = 15\%$$

Note that the government deficit fully crowds out private investment, which falls from 100 to 80.

6. *Fear-goods_a.*

(a) Firms maximize profits by setting the marginal product of labor equal to the wage:

$$f'(L) = w \Rightarrow \frac{4}{5}20L^{-1/5} = w \Rightarrow L^{-1/5} = \frac{w}{16} \Rightarrow L(w) = \left(\frac{16}{w}\right)^5$$

(b) Since the labor market clears, employment is 40, and output is $Y = f(40) = 382.5$.

Income is equal to wages plus dividends. Wages are $w\mathcal{L} = 7.65 \cdot 40 = 306$. To find dividends, we need to find the profits of the firm:

$$\Pi = pq - wL = 1 \cdot 382.5 - 306 = 76.5$$

So total income is $306 + 76.5 = 382.5$ which does indeed equal output.

(c) The labor market now equilibrates off the new, irrational labor demand curve, so

$$\left(\frac{8}{w}\right)^5 = 40 \Rightarrow w = 3.83$$

Not surprising, workers' wages fall because the firms' collective fear has essentially the same effect as if they all colluded to reduce wages. But since this is a neoclassical model, the labor market does still clear, and all 40 workers are still employed. That means that output is still $Y = f(40) = 382.5$.

It remains to be seen if there is really income to pay for this output. Total wages are now only $3.83 \cdot 40 = 153.2$. But firm profits now rise (due to the lower labor costs) to $1 \cdot 382.5 - 153.2 = 229.3$. Therefore, dividends go up a lot, and total income is still $153.2 + 229.3 = 382.5$, exactly enough to equal output.

7. *LitteT_a.* The T-account is:

8. *SW25.2_a* The balance sheet is:

9. *SW25.3_a.* We know that the amount of currency is unchanged; Bob has less currency but the bank has more in vault cash (note that when the money was underground, it was still in the money

Assets	Liabilities
$52 million loans	$50 million deposits
$5 million reserves	$7 million net worth
$57 million	$57 million

Assets	Liabilities
$6 million bonds and reserves	$40 million deposits
$36 million loans	$2 million net worth
$42 million	$42 million

supply; that is, it was still currency outstanding – it was just underground.) To find deposits, we can use the fact that required reserves must be 5% of deposits. When Bob deposits his $100,000, the bank makes an entry on the liability side of its balance sheet representing the deposit. There must be a matching entry of $100,000 on the asset side. This entry is made in the bank's reserves. At this point, the bank is holding excess reserves since there was an entry of $100,000 but the bank is only required to hold 5% of Bob's deposit, or $5,000. The bank can lend out the rest. When banks lend they create further deposits, and we can determine the total change in deposits after the money multiplier goes to work within the banking system. Use the formula new reserves/0.05 = total increase in money supply, thus $\frac{\$100,000}{0.05} = \$2,000,000$.

If Bob only deposits $95,000, then the original change in reserves is $95,000 not $100,000. From the above formula $\frac{\$95,000}{0.05} = \$1,900,000$. But if Bob spends the $5,000 in cash, then the person or firm he gives it to may put it in their bank account, and then the money multiplier will start to work anyway.

10. *OldGermansMoney_a.* The quantity equation says that $MV = PY$. Here, M and V do not change, so the old value $PY = 1 \cdot 4374$ has

to equal the new value $P' \cdot 3713$. This is true for $P' = 1.18$. We can graph this by showing money demand and supply: