Econ 434 Professor Ickes

Fall 2004

Homework Assignment #1

These are brief answers. In some places there is some extra discussion about a point I thought was interesting.

1. *Consider the economy of Macronesia (which is small despite its name). Here people have access to world capital markets but under current circumstances they choose neither to borrow or lend. In a two-period diagram draw production opportunities and indifference curves for Macronesia, and draw the world interest rate. Label the consumption point as A.*

   brief answer the production possibilities curve and the indifference curve are tangent to each other and the budget line with the slope $1 + \hat{r}$ where $\hat{r}$ is the world interest rate (see figure 1):

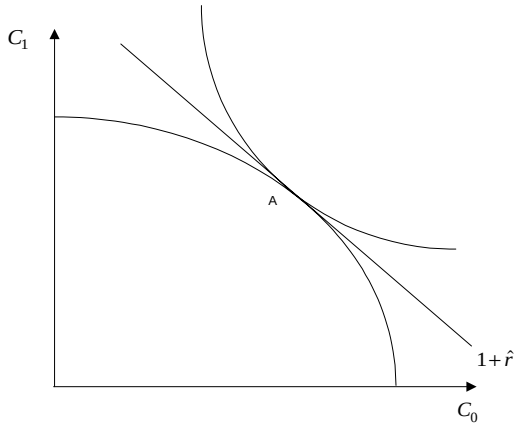

Figure 1:

2. (a) *Imagine that a great innovation is discovered which will greatly increase future income in Macronesia. How does the production opportunities set shift? What would happen to consumption if Macronesia did not have access to world capital markets? Label this consumption point B.*

   brief answer Slope becomes steeper as there are more opportunities for future production. If there were no access to world capital markets then consumption would shift towards the future; hence, present consumption would likely decrease (see figure 2)

   (b) *What happens to the autarky rate of interest in Macronesia? Explain.*

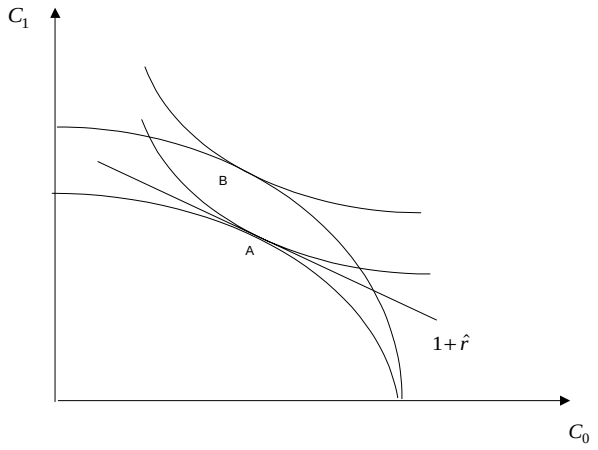

Figure 2:

brief answer The autarky rate rises, as the interest rate where there is no desire for trade in future goods requires a higher rate to reflect the higher production opportunities.

(c) *If Macronesia has access to the world capital markets what happens to production and consumption? Explain. Label the new consumption point C.*

brief answer Macronesia will produce where $1 + \hat{r}$ is tangent to the production line. This will involve more future production. It will then borrow against this to finance current consumption. Current consumption will be higher than in part (b), see figure 3:

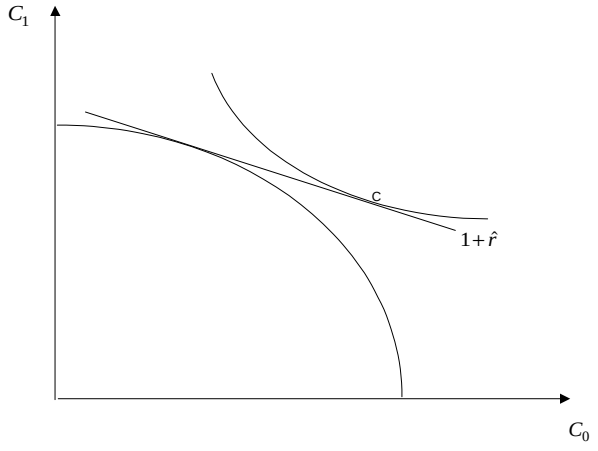

Figure 3:

(d) *Suppose Macronesia was a large economy. What would happen to the world interest rate given this discovery*?

brief answer The world interest rate would rise, because Macronesia is now dissaving.

This causes an excess world demand for current consumption, so the price of current consumption must rise.

2. *Use the two-country model of savings and investment to examine the impact on the world interest rate of an improvement in future productivity. Suppose that productivity is expected to increase in the home country in the future. What will happen to interest rates, savings and investment today? Explain.*

   brief answer Investment in the home country will increase at every interest rate if future productivity is higher. What about savings? Home savings will decline if people believe they are richer – which they are if they can produce more with the same inputs over their lifetimes. So current savings falls in the home country. This means that the current account balance in the home country deteriorates. Equilibrium requires that the current account balance for the rest of the world improve. The only way for the current account balance to improve in the rest of the world is for the world interest rate to increase. The key point is that $CA_t + CA_t^* = 0$ (where the asterisk is the rest of the world). If $\Delta CA_t < 0$ we need $\Delta CA_t^* > 0$. Another way to think of this is that the productivity change has increased the autarky rate of interest in the home country. So the world interest rate will have to rise to balance out world savings and investment. It is easy to draw the picture.

3. *Use the dynamic model to examine the impact of recovery from a war. Suppose that an industrialized country loses half of its capital stock in a war (but not its know-how). Examine what happens to the capital labor ratio if the economy is closed. Compare this to the case of an open economy. In which case is the recovery faster? Why?*

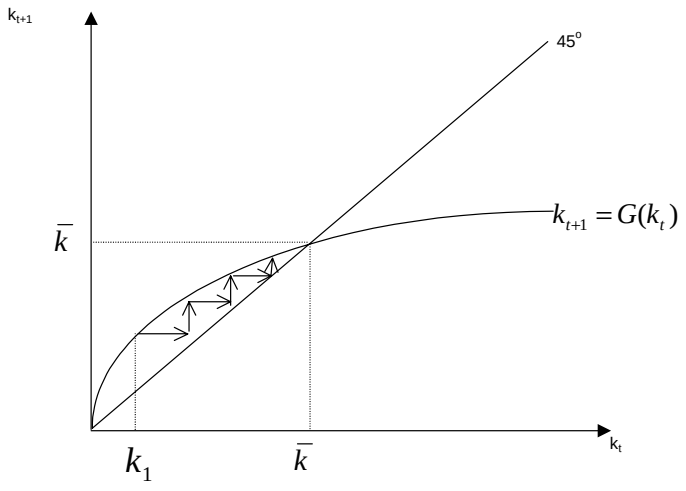

Figure 4: Recovery from War in a Closed Economy

The war causes the capital-labor ratio to fall from its steady state level ($\overline{k}$) in figure 4 to k_1. If the economy is closed then recovery depends on domestic savings alone. The adjustment is as in the figure.4.If world capital markets were available then the country

could rely on savings from abroad. Note that at k_1 the rate of return to capital will be much higher than at the steady state (because the war has made capital scarce). Foreign savers will prefer to earn these higher rates. So the capital stock will rise much faster. To see this, assume that initially both countries were identical, and that the common steady state was $\overline{k}$. In the closed economy case we know that the war-torn country moves to k_1. If the economy is open, however, we move to some world capital labor ratio, k_w, where $k_1 < k_w < \overline{k}$, as in figure 5. Notice that the world k must fall after the war because the country was not small. At k_w both countries have the same capital-labor ratio and the same rate of return on capital. Consumption by the elderly, however, is somewhat lower in the recovering economy because some of its capital is owned by foreigners. To repatriate those assets plus interest, the war-torn country will then have to run a current account surplus. After that, both countries will move along the arrow path to the steady state, with no further foreign investment or capital ownership. The key point, then, is that recovery is faster in the open economy because the world capital market aids the war-torn economy's ability to accumulate capital. Of course, this is exactly what happened to Japan after WW2. In the postwar years it ran trade deficits as it relied on foreign-owned capital to recover. By the 1970's Japan started to run trade surpluses to pay back the capital, then it reverted to balanced trade.

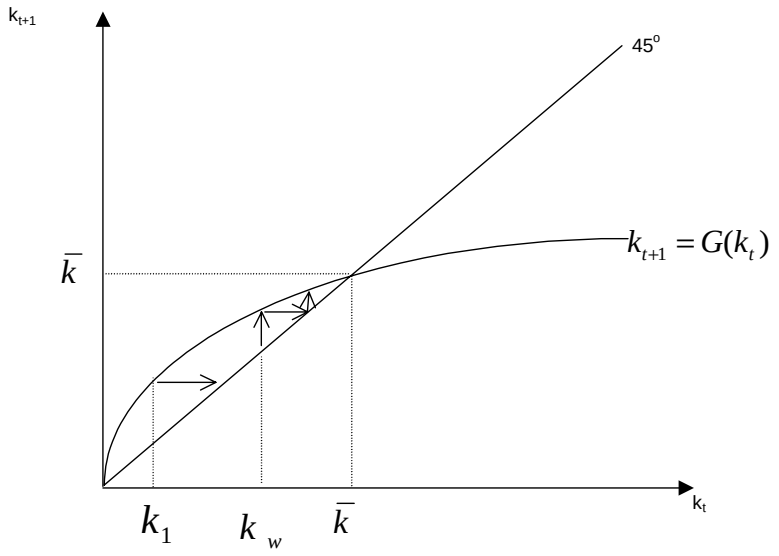

Figure 5: Adjustment After War in the Open Economy

brief answer 2. *Consider the dynamic model of the current account balance. Now suppose that we add a government in each country that taxes workers by an amount t (t^* for the foreign country). Then the total amount taxed in a generation (in the home country) is $f = Nt$. The tax revenue is wasted by the government – it has no productive result. We want to analyze how this alters capital accumulation.*

(a) *What happens to the volume of assets accumulated by young workers in each country?*

brief answer The total amount of assets accumulated by domestic young workers goes down. Before, this was $Na_{t+1} = N(1-\alpha)w_t$, which is just savings per-worker multiplied by the number of workers, N. Now it is $Na_{t+1} = N(1-\alpha)w_t - f$. In the foreign country we have $N^*a^*_{t+1} = N^*(1-\alpha)w^*_t - f^*$.

(b) *How does the equation for the world capital labor ratio change? What happens to the steady state world capital-labor ratio?*

brief answer Recall that the equation for the world capital-labor ratio before was $k_{t+1} = (1-\overline{\alpha})(1-\beta)A_t k_t^{\beta}$. Now we must subtract the amount that is taxed in both countries. What is this amount? It is just the weighted average of taxation in each country, with the weights depending on population. That is, $\overline{f} = \frac{Nf+N^*f^*}{N+N^*}$. Hence, the equation for the world capital-labor ratio is now $k_{t+1} = (1-\overline{\alpha})(1-\beta)A_t k_t^{\beta} - \overline{f}$.

(c) *Suppose that f rises but f^* falls by an equal amount. Show that if the home country is larger than the foreign country that the steady-state value of k falls.*

brief answer Since $\Delta f = -\Delta f^*$ by assumption, the numerator of $\overline{f}$ changes by $\Delta f(N - N^*)$. Since $N > N^*$ the numerator rises. Hence $\overline{f}$ rises. What this means is that the impact of fiscal policy on the world capital-labor ratio depends on the size of the country. If a country is small then its fiscal policy will have no effect on k, and hence, it will have no effect on the rate of interest. This is not true for a large country; in that case changes in f will affect $\overline{f}$ and thus k.

Note Added Later Notice that the answer above is a bit odd. The reason is that in the question I defined f as Nt, but in parts (b) and (c) I treated f as taxes paid per worker. To make things clear, change the question definition to make f the amount taken from *each* worker. Then in part (a) the expression for assets will be $Na_{t+1} = N(1-\alpha)w_t - Nf$, and likewise for the foreign country. Nothing in parts (b) and (c) need to be changed.