Midterm Exam II: Answer Sheet

1. (20%) The government of a country operating with a flexible exchange rate and perfect capital mobility imposes a tariff on imports, distributing the tariff revenues back to the public in the form of tax rebate. What happens to the equilibrium levels of output, the rate of interest, the trade balance, and the nominal exchange rate? Show your answer graphically.

   Answer A tariff on imports leads to a rise in the autonomous trade balance, $\overline{T}$. This causes the IS curve to shift to the right. The rebate on tax revenues means that incomes are unchanged from the tariff, insuring that the IS curve does shift right. This causes $i > i^*$. Because of perfect capital mobility this causes a capital inflow and pushes up the value of the currency. Hence, the exchange rate depreciates, causing the real exchange rate to depreciate. This causes the IS curve to shift back to where it started. Equilibrium output is unchanged, as is the rate of interest. The trade balance is also the same in equilibrium: the favorable effect of $\Delta\overline{T}$ is offset by the effects of the fall in q. The nominal exchange rate is lower. This is evident from the rightward shift of the YY curve.

2. (25%) Consider a small open economy under fixed exchange rates and imperfect capital mobility. Suppose that foreign income (Y^*) increases. Trace the effects on the domestic economy. Suppose that the monetary authorities engage in sterilized intervention to offset the effects of the rise in Y^*.

   Answer If there is no sterilization the rise in Y^* causes the IS curve to shift to the right. The increase in interest rates causes a capital inflow and an increase in the monetary base. So the LM curve also shifts right. Output and interest rates rise, due to imperfect capital mobility. If the inflow is sterilized, on the other hand, the LM curve does not shift to the right. The increase in income due to the monetary expansion is prevented.

   (a) Carefully explain how the process of sterilization works.

   Answer The capital inflow causes an excess demand for dollars. To keep the exchange rate fixed the Central Bank must sell dollars and purchase foreign exchange. So international reserves increase. To sterilize, the Central Bank must change the stock of domestic securities (DS) to maintain unchanged the stock of high-powered money (H). That is, $\Delta H = \Delta IR + \Delta DS = 0$. Suppose that at the same time the Fed purchases foreign exchange it also sells domestic securities; that is, it engages in an open market operation. The latter transaction will decrease the money stock, and total central bank assets will be unaffected. This action is called *sterilization* because the domestic economy is insulated from the foreign reserve transaction. Thus, if the Central Bank is purchasing foreign exchange, so that reserves are increasing, it must simultaneously sell domestic securities; i.e., $\Delta IR = -\Delta DS$.

   (b) What is the purpose of sterilization? Why would it be advantageous?

Answer The purpose of sterilization is to insulate the domestic money stock from external developments. In this case, it is to prevent the money supply from further increasing income in response to the rise in foreign income. Notice that if sterilized intervention is feasible the Central Bank may actually shift the LM curve to the left to offset the rightward shift in IS. Because this causes an even larger increase in domestic interest rates it will require even greater sterilization to prevent the rightward shift of LM.

(c) Explain how country size, the degree of capital mobility, and financial development effect the ability of a central bank to engage in sterilized intervention.

Answer Notice that to persist in sterilized intervention requires large stocks of both foreign reserves and domestic securities. The reason for the former (that of a "deficit" country) is obvious. But consider the case of a surplus country. It is accumulating reserves. Presumably it can do this forever. But to sterilize such a flow it must be selling domestic securities. But this requires that the Central Bank have a very large stock of debt to sell. This condition is unlikely to be satisfied in most economies. This is easier for large countries than small countries. Larger economies tend to be smaller, so inflows will not be as large relative to the economy and the supply of domestic securities. Also, the more developed the financial market the smaller the effect of changes in Central Bank holdings of DS on the economy. Greater capital mobility makes sterilization more difficult because it makes capital flows more sensitive to interest rate differentials. As capital mobility increases the size of the flows becomes too large for the Central Bank to offset.

3. (25%) Consider a small open economy under flexible exchange rates. Suppose that there is a monetary expansion. Carefully explain (using figures wherever possible) what happens to income, the current account, and the rate of interest under the following conditions:

(a) Zero capital mobility;

(b) Perfect capital mobility;

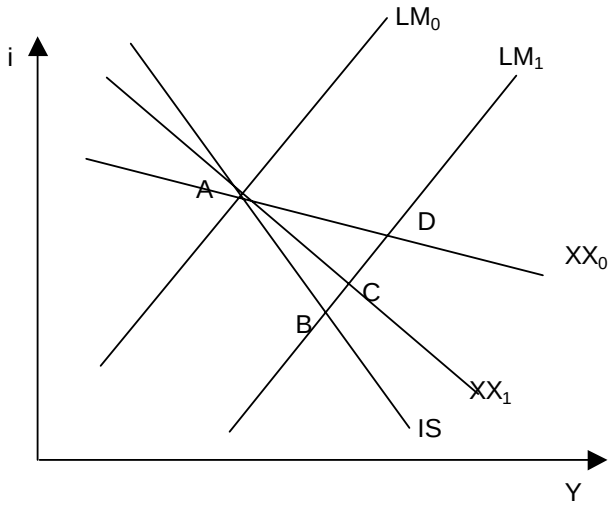
(c) Imperfect capital mobility

Answer Notice that in all three cases the monetary expansion shifts the LM curve to the right. It is simplest to start with *perfect capital mobility*. In this case, the BB curve is horizontal. The capital outflow that results from the monetary expansion causes the exchange rate to appreciate, improving competitiveness and shifting the IS curve to the right. Notice that in the new equilibrium income has rise to the level where the LM curve intersects the BB curve; i.e., at i^*.

Now suppose that there is *zero capital mobility*. As explained in the lecture note, it is difficult to use the BB curve now because changes in the exchange rate shift the BB curve as well. Hence, we use the XX curve, which gives combinations of income and the rate of interest that satisfy both the goods market equilibrium and external balance conditions. In the figure (below) the monetary expansion shifts the LM curve to the right. At point B the external balance condition is not satisfied; we are below the XX curve. The depreciation of the currency at that point causes the IS curve to shift to the right, and we end up at point C. Notice that even

with zero capital mobility the currency depreciates at point B. The reason is that higher income worsens the trade balance. But there is a flexible exchange rate so the currency must depreciate due to the excess supply of domestic currency. In order to satisfy the expression for external balance $B = \overline{T} - mY + \phi q = 0$, the exchange rate must appreciate to offset the rise in income. This moves us from point B to point C.

If there is *imperfect capital mobility*, the depreciation of the currency is larger. This follows because at point B there will be a capital outflow; we now have an external imbalance due to the negative interest differential in addition to the trade balance. So the appreciation in the exchange rate is greater, and we end up at point D. Notice that as capital mobility increases the XX curve will be flatter. In the limit it is horizontal at i^*; monetary policy has its greatest impact.



Monetary expansion with imperfect capital mobility

4. (30%) Explain what is meant by the term "optimum currency area." Carefully explain the role of the following factors in the decision whether or not to join a common currency area:

Answer An *optimum currency area* is a group of countries for which it is optimal to have a fixed exchange rate or a common currency. Hence, it is a group of countries for which the gains from entering a currency union exceed the costs. The costs of a currency union derive from giving up an independent currency. Hence, one way to think about a currency area is to consider when the gains from exchange rate flexibility will be large or small.

(a) common versus idiosyncratic shocks

Answer One reason to have a national currency is to be able to respond differentially to shocks to the economy. If all the shocks to an economy were common to a group of countries, they would not need independent monetary policy. But this need not be the case. Consider a country that is divided into two regions, North and South. Suppose that some shock occurs that shifts demand away from North's goods and towards South's goods. This would cause an expansion in the South and contraction

in the North. To adjust to this shock relative prices (wages) must fall in the North and rise in the South. If wages are relatively inflexible, this may result in costly adjustment. Now if these regions had their own currencies then a depreciation of North's currency against South could offset the effect on q and thus on incomes in the two countries. Another way to analyze this issue is to consider how entry into a monetary union will affect business cycles. Clearly, it will raise trade linkages. Business cycle patterns will differ after entry. The question is how? Certainly the common monetary policy will change the incidence of monetary shocks. This should detract from idiosyncracy. What about trade? There are two possibilities. Closer trade ties could lead to more specialization and *inter*-industry trade. If shocks are primarily supply driven then this could lead to more idiosyncratic cycles. Closer trade ties could lead to more *intra*-industry trade. Moreover, if demand shocks are more important than supply, business cycles could become more highly correlated. While theoretically ambiguous, empirical evidence seems to support the latter view. Frankel and Rose studied the effects of integration on business cycles in 20 industrialized countries over 30 years. They found that greater bilateral trade intensity was associated with higher cross-country correlation in business cycle activity. Greater integration led to more highly synchronized cycles.

(b) labor mobility

Answer Suppose that exchange-rate flexibility is not available because a country has joined a currency union. Then if factor mobility is high, labor can move from North to South. This will reduce unemployment in the North, and alleviate shortages in the South. So high factor mobility can substitute for exchange rate flexibility. This is Robert Mundell's original criteria for thinking about optimum currency areas. Think about shocks to the US that relatively hit the Northeast more than the Southwest. The adjustment to these shocks occurred through labor moving from the rust belt to the sunbelt. But if labor mobility is low then this avenue of adjustment may be precluded. Hence, one conclusion from the theory of optimum currency areas is that high labor market flexibility is an important consideration for a monetary union. Interstate labor mobility is quite high in the US, but it is much lower in Europe.

(c) the share of non-traded goods in total output

Answer Ron McKinnon has argued that factor mobility may not be necessary nor sufficient condition for a successful union. Exchange rate flexibility is beneficial if it can affect the real exchange rate. If PPP holds, then there is no benefit to exchange rate flexibility. It will not change relative prices, so it is of no help in responding to idiosyncratic shocks. The key point is that exchange rate flexibility can only affect relative prices if the non-traded goods sector in an economy is large. Suppose that an economy is small and open. Then most goods are traded. Hence, any exchange rate shock is immediately translated into wages and prices. So under these circumstances the exchange rate is not an effective tool for altering relative prices. This suggests that a key criterion may also be the share of output in non-traded goods. If this is low, even an economy with low factor mobility may benefit from a monetary union; at least the cost of eliminating exchange rate flexibility is low.

(d) a system of fiscal re-distribution

Answer Another criteria for a currency union is the existence of a system of redistributive fiscal transfers. Idiosyncratic shocks can be offset by fiscal transfers. If North suffers an adverse shock a fiscal transfer from the South can offset this effect. For example, in the US when income in a region falls by one dollar, disposable income falls by 70 cents. The difference is due to Federal government transfers. This cushions the shock across the regions when there are disparate shocks. In theory Europe could do even better, because countries will retain independent fiscal authorities, and so can run deficits and surpluses. But in practice, the mechanisms that are in place are nowhere near as large as in the US.

(e) the desire to import monetary discipline

Answer A final economic argument for participating in a common currency – one that was crucial to the push for the EMU – area is that the union may impose a degree of monetary discipline that a government desires but cannot itself commit to. The union is viewed as an enabling mechanism, whereby "weak" central bankers unable to credibility commit to low inflation are able to borrow credibility from the independent central banking authority. Suppose that Italy's Central Bank is unable to commit to a low inflation rate. Weak credibility means that expected inflation is high in Italy, so the cost of disinflating is quite high. Germany has a reputation for low inflation, and actual and expected inflation are low in Germany. If Italy joins with Germany, then the former may "import" the monetary discipline of the latter. Italians will expect lower inflation which will make it easier to cut actual inflation. This argument is especially strong when higher Italian inflation does not lead to higher average output. Then Italy is able to get lower inflation and no increase in unemployment.