

## OPTIONAL PROBLEM SET SOLUTIONS

### Chapter 15: The Labor Market (Petya)

#### *Short Problem*

If the labor market is not competitive and the unions play an important role in wage-bargaining, then marginal cost is not necessarily equal to the wage:  $MC = W / (dY/dN) = W / a * N^{(a-1)}$ . Therefore, the PS-curve becomes  $P = (1 + \mu) * W / a * N^{(a-1)} \Rightarrow (1 + \mu) = a * N^{(a-1)} / (W/P)$ , i.e. the sign of the markup would depend on whether the marginal product of labor  $a * N^{(a-1)}$  is smaller or larger than the real wage  $W/P$ . The markup could be negative if the marginal product is less than the real wage. This could occur if the firms are forced by the unions to keep their workers in bad times. This is more likely to occur if the unions are strong.

If the unions become less important in the economy, then the WS-curve would shift to the left. The PS-curve would shift down as well (here, I assume that the markup was negative initially and decreased in absolute value). The new equilibrium would give us a lower natural rate of unemployment.

### Chapter 16: General Equilibrium (John)

#### *Short Problem*

### Chapter 17: The Phillips Curve (Adam)

T/F: Because the Phillips Curve is the same as an upward-sloping short-run Aggregate Supply curve, the breakdown in the relationship between the unemployment rate and inflation in the 1970s now indicates that the short-run Aggregate Supply is now vertical.

FALSE. The breakdown in the Phillips Curve in the 1970s was due to a change in the way agents formed expectations. The original curve is described by  $\Pi^e = 0$  which is an upward-sloping SRAS curve which does not shift in response to demand shocks. This method of forming expectations was reasonable as long as average inflation was zero. Persistent positive inflation forced agents to change their formation of expectations in a manner best captured by  $\Pi_t^e = \Pi_{t-1}$ . The SRAS curve is still upward-sloping, but now shifts with a one-period lag in response to demand shocks.

T/F: If all wages were fully indexed to inflation then the unemployment rate would always be equal to the natural rate of unemployment.

TRUE. Differences between actual and natural rates of unemployment are driven by differences between the actual and expected price level. If nominal wages are fully indexed to inflation, there are never any surprises in prices, and

unemployment and output are always at their actual levels. Fluctuations in output and employment are thus only driven by shocks from the supply-side of the economy, while demand shocks are neutral, even in the short-run.

## **Chapter 18: Disinflation (Adam)**

T/F: In the long-run, inflation is always and everywhere a monetary phenomenon.

UNCERTAIN. In the sense that all other shocks either from the supply or demand side only have temporary consequences for the price level, it is TRUE that higher nominal money growth leads to higher inflation. On the other hand, for a fixed level of nominal money growth, changes in the growth rate of labor productivity or the labor force also affect the rate of inflation through the growth rate of output.

T/F: A central bank with credibility can reduce inflation without any increase in unemployment in the short-run.

FALSE. If there are pre-existing and/or staggered wage contracts, there are important constraints on the speed at which disinflation can occur without any increase in unemployment.

T/F: The proper policy rule for a central bank engineering a disinflation of 10 percent over five years is to simply reduce nominal money growth by 2 percent each year.

FALSE. The proper policy rule for nominal money growth is first a sharp reduction to raise the unemployment rate above the natural rate (to start the disinflation through the modified Phillips curve). The next period the central bank should increase money growth the next period in order to keep the unemployment rate constant over the course of the disinflation. Nominal money growth is slowly reduced until disinflation is completed. At that point, a one-period increase in nominal money growth will reduce unemployment to its natural rate and the economy achieves the long-run at the target rate of inflation.

### ***Short Problem***

An decrease in  $\alpha$  captures an increase in the proportion of long-term unemployed as the sensitivity of wage demands by workers to the unemployment rate is reduced as these long-term unemployed have no effect on workers' bargaining power.

The sacrifice ratio of the economy is the point-year excess unemployment required to reduce inflation by one percent, and is simply  $1/\alpha$  from the modified Phillips curve. An increase in the proportion of long-term unemployed implies that the sacrifice ratio is increasing, and thus the amount of excess unemployment required to achieve disinflation is increasing.

Although not mentioned in the question, NAIRU also increases.

In addition, the reduction in  $\alpha$  implies that for a given deviation between the actual and natural rate of unemployment, inflation responds more slowly than with the higher fraction of long-run unemployed. This economy is thus characterized by a much flatter SRAS curve and thus will have more volatile employment and less volatile prices than previously.

## Chapter 19 – Inflation, Interest Rates, and Exchange Rates (Jacob)

T/F In the long run the rate of inflation is determined only by the rate of money growth.

FALSE.  $\pi = g_m - g_y$ . Thus the long run rate of inflation depends on the difference between the rate of money growth and the rate of growth of output.

### Long Question

$$\text{a. } \varepsilon = \frac{E P^*}{P} = \frac{(E P_T^*)^\alpha (E P_N^*)^{1-\alpha}}{P_T^\alpha P_N^{1-\alpha}} \quad \text{but } E P_T^* = P_T \Rightarrow \varepsilon = \frac{(E P_N^*)^{1-\alpha}}{P_N^{1-\alpha}}$$

$$\text{b. Using the result in (a) and } P_N = a_N w, P_N^* = a_N^* w^* \text{ we get: } \varepsilon = \left( \frac{E a_N^* w^*}{a_N w} \right)^{1-\alpha}$$

A rise in Home's wages is a real appreciation of its exchange rate. The rise in Home's nominal wage however may be the result of very different reasons: it may reflect higher productivity, but it may also reflect higher domestic demand due to government spending. Both are illustrated below.

c.  $H$  does a nominal devaluation  $\Rightarrow E \uparrow$ . By  $E P_T^* = P_T$ ,  $P_T \uparrow$  but since the ratio  $E P_T^* / P_T$  is always 1 (by our assumption), this channel does not affect the real exchange rate. However  $E \uparrow$  but  $w$  is fixed in the short run so  $P_N$  does not change  $\Rightarrow (E P_N^* / P_N) \uparrow \Rightarrow$  we get a real depreciation. Therefore when wages cannot adjust immediately, a nominal devaluation gives a real depreciation in the short run.

In the long run wages adjust: So from  $P_T = a_T w$  we know that  $P_T \uparrow \Rightarrow w \uparrow$ . But  $w$  is the same in both sectors ( $T$  and  $N$ ) so from  $P_N = a_N w$  it follows that  $w \uparrow \Rightarrow P_N \uparrow$ . So in the long run  $P_N$  rises by the same proportion as  $E$  did. Therefore in the long run there is no change in the real exchange rate. The conclusion is that a nominal devaluation can create a real depreciation in the short run (when wages and at least some prices are sticky). Thus it can improve the trade balance (and employment) in the short run. However in the long run a nominal devaluation has no real effect. It only results in higher values of all the nominal variables ( $E$ ,  $P$ , and  $w$ ).

d. A fiscal expansion in  $H$ :  $H$ 's demand for all goods rises. But since  $E$  is unchanged (fixed exchange rate) and  $P_T^*$  is given, then  $P_T$  does not change. However the increased

demand raises  $P_N$  so by  $P_N = a_N w$  wages go up. Furthermore the rise in  $P_N$  implies a real appreciation. This means a deterioration of the trade balance since a lower real exchange rate reduces exports and increases imports. Thus government spending partially crowds out exports through its effect on the real exchange rate. This reduces the effectiveness of fiscal policy in increasing output.

e.  $H$  becomes more efficient in producing  $T \Rightarrow a_T \downarrow$ . But  $P_T$  does not change because  $E$ ,  $P_T^*$  are fixed. So by  $P_T = a_T w$  wages at Home ( $w$ ) must go up. But this implies that  $P_N$  rises as well. We therefore have a real appreciation. Countries that have long run growth e.g. a long run improvement in their productivity also experience a real appreciation of their currency. Japan's post war experience is a case in point. Thus, a long run appreciation *may* (though not necessarily) be an indication of a country's success. As a country gets relatively richer and more productive its currency becomes more valuable.

## Chapter 20 – Unemployment (Pablo)

T/F: Hysteresis is only bad news; it means that unemployment in Europe is bound to stay permanently high.

FALSE. Hysteresis works by making current unemployment depend on the whole history of unemployment. Therefore, it just says that it might be difficult to actually reduce the unemployment rate, but not that it's permanently at a higher level.

T/F: The European governments that face high unemployment simply don't get it: it would be just a matter to reduce unemployment benefits and the problem would go away.

UNCERTAIN. Actually unemployment benefits and other labor market legislation have been relaxed in the past few years. However, because of other factors (hysteresis) it just happens that these measures do not have a large significant effect on unemployment

T/F: More long-term unemployment implies a steeper Aggregate Supply curve in the short-run.

FALSE: More long-term unemployment for sure implies a higher natural rate of unemployment, and therefore a lower natural rate of output. What the question implies though is that for a given increase in output in the short-run, the effect on unemployment will be larger, and therefore wage pressures will be larger and the AS curve will be steeper. But is this reasonable? It can be argued that for a given increase in output, part of that increase in employment will fall in short-term unemployed and another (possibly smaller) part in long-term unemployed. Therefore, the effect on wages will possibly be smaller, as the relevant unemployment rate for wage-setters is the short-term unemployment rate. Therefore the AS might actually be flatter. In the extreme case in which the effect is only on short-term unemployed, the slope should be the same.

## Chapter 21 – Inflation (Jacob)

T/F Inflation tax is always equal to seignorage.

FALSE. Inflation tax =  $\pi(M/P)$ . Seignorage =  $(\Delta M/M)(M/P)$ . So the inflation tax equals seignorage only when the rate of inflation equals the rate of money growth. When money growth is constant this must eventually be true, but it might not hold in the short run.

T/F The government can increase its seignorage by lowering the rate of money growth.

UNCERTAIN. This depends on where we are on the Laffer curve. If we are at a point to the right of maximum seignorage this is true: a lower rate of money growth will increase the real balances enough so as to increase seignorage. If the rate of money growth is lower than that which maximizes seignorage then reducing this rate will result in a lower seignorage.

T/F Inflation means higher prices so people want to hold more money.

FALSE. Indeed a higher price level increases the demand for nominal balances. However, inflation (an ongoing process of a rise in prices) is a tax on holding money: it reduces the value of your money holdings. Therefore you want to hold less money, so as to reduce the losses.

## Chapters 22-24 – Economic Growth (Alejandro)