

THE MEDIUM RUN

Exercise 1 - The labor market

In country A the wage and price equations are respectively:

$$W = P F(u, z)$$

$$P = (1 + \mu) W$$

- After having graphically represented the equilibrium, show the effects of an increase in minimum wages on the equilibrium values of u and W/P . Provide an economic intuition for your answer.
- Suppose that

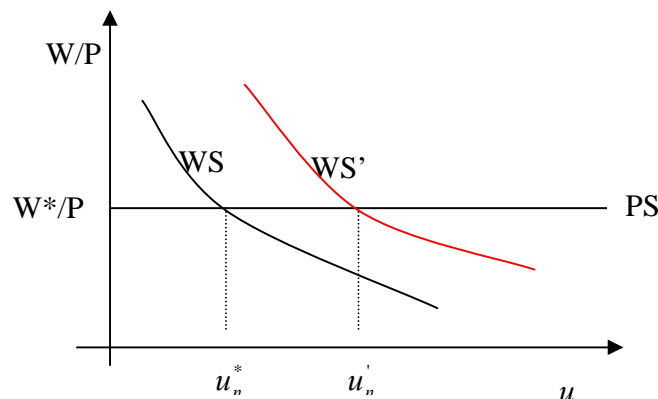
$$F = 0.5 z - 5u, \quad z = 2 \text{ and } \mu = 1.$$
 Compute the initial equilibrium level of u and W/P .
- Following an increase in industrial concentration μ increased by 50%. Suppose that the government wants to maintain the unemployment level fixed. Compute the value of z that will allow this objective to be attained and graphically represent the new equilibrium, showing the movements of the curves. How could the government intervene to vary z ?

a) Solving the system of equations generated by the wage setting and the price setting equations we obtain:

$$\begin{cases} \frac{W}{P} = F(u, z) \\ \frac{W}{P} = \frac{1}{1 + \mu} \end{cases} \Rightarrow \frac{W}{P} = F(u, z) = \frac{1}{1 + \mu}$$

Under this condition the real wage that emerges from price setting and wage setting is the same, and the unemployment rate is equal to the natural rate of unemployment. An increase in the minimum wage causes an increase in the initial real wage before negotiation leading to an increase in the reservation wage of each worker, for every level of unemployment. The wage setting curve $W = PF(u, z')$ shifts upwards. In equilibrium the real wage stays constant (the mark-up μ has not changed), but the natural rate of unemployment is higher. If the minimum wage increases the reservation wage increases, there will be less workers willing to work for every level of the real wage.

b) Substituting the values, in the following system we obtain:

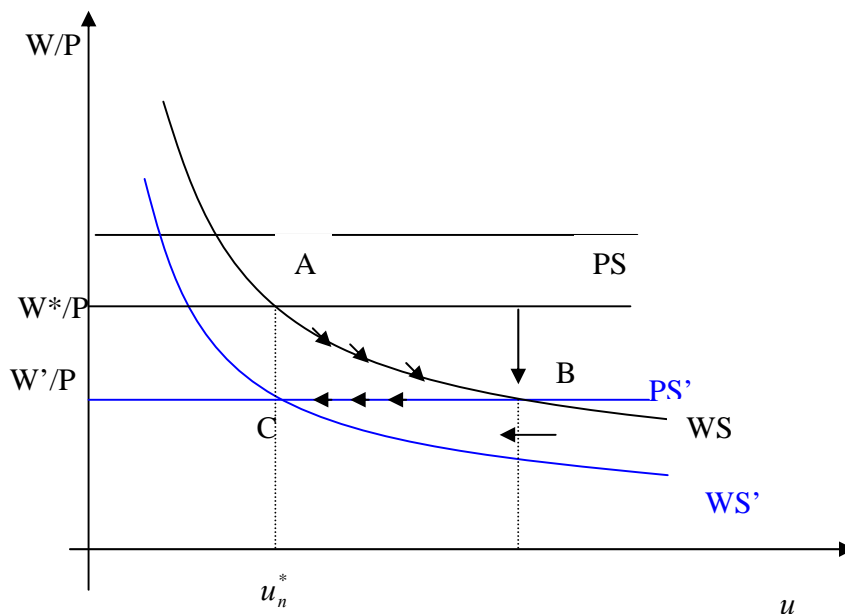


$$\begin{cases} \frac{W}{P} = F(u, z) \\ \frac{W}{P} = \frac{1}{1+\mu} \end{cases} \Rightarrow \begin{cases} \frac{W}{P} = F(u, z) = 0.5 \times 2 - 5u \\ \frac{W}{P} = \frac{1}{2} = 0.5 \end{cases} \Rightarrow \begin{cases} u^* = \frac{(1-0.5)}{5} = 0.1 \\ \frac{W^*}{P} = 0.5 \end{cases}$$

c) We set the new value of μ ($\mu' = 1.5$) and solve for W/P and z and imposing that the unemployment rate stays fixed at 10%

$$\begin{cases} \frac{W}{P} = \frac{1}{1+\mu} \\ \frac{W}{P} = F(u, z) \end{cases} = \begin{cases} \frac{W}{P} = \frac{1}{2.5} = 0.4 \\ \frac{W}{P} = F(u, z) = 0.5 \times z - 5 \times 0.1 \end{cases} = \begin{cases} \frac{W'}{P} = 0.5 \\ z' = \frac{(0.4 + 0.5)}{0.5} = 1.8 \end{cases}$$

Graphically we obtain:



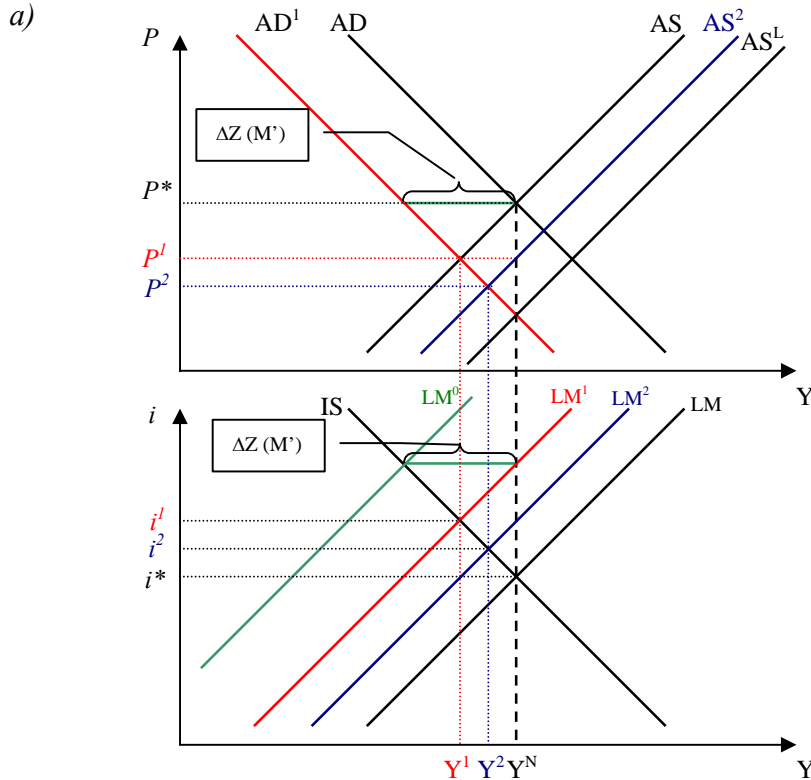
To reduce z the government can, for example, reduce the unemployment subsidies, decrease minimum wages or facilitate firing.

Exercise 2 - Monetary policy in the AS-AD model

A closed economy characterized by flexible prices is at its medium-run equilibrium.

- Provide a detailed description of the short-term and long-term effects on output, prices and the interest rate of a reduction in the money supply (use the IS-LM and AS-AD framework).

b) How would your answer to point a) change if we suppose investment is insensitive to the interest rate?



In the short term a reduction in money supply:

$M^s \downarrow \Rightarrow \frac{M^s}{P} \downarrow \Rightarrow$ since $\frac{M^s}{P} < M^d$, the LM curve shifts upwards $\Rightarrow i \uparrow \Rightarrow I \downarrow \Rightarrow Z$ (aggregate demand) $\downarrow \Rightarrow Y \downarrow$.

In the AS-AD model such a variation leads the AD curve to shift to the left (for every price, equal to ΔZ as a consequence of $M^s \downarrow$):

$Z \downarrow \Rightarrow Y \downarrow \Rightarrow u \uparrow \Rightarrow$ the bargaining power of the workers decreases $\Rightarrow w \downarrow \Rightarrow$ by the price setting equation $\Rightarrow P \downarrow$.

The decrease in P leads to $\frac{M^s}{P} \uparrow \Rightarrow$ the LM curve shifts partially rightwards (LM^1).

In the Short Run, the new equilibrium is characterized by production below the natural level, lower prices and higher interest rates (curve IS- LM^1 , AS- AD^1).

In the Medium Run adjustment begins to take place:

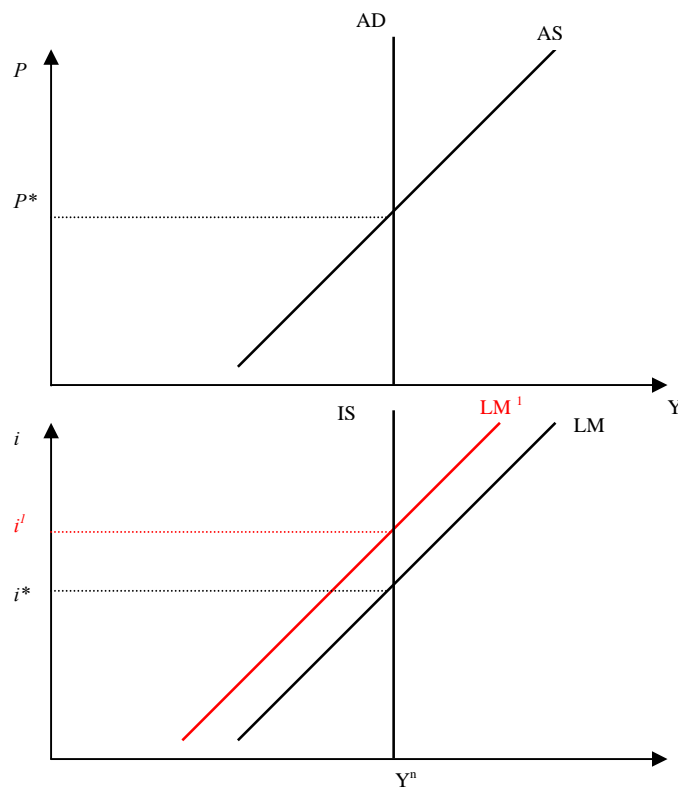
$P^e \downarrow$ (since $P^1 < P^*$) \Rightarrow the AS curve $\left[P = P^e (1 + \mu) F \left(1 - \frac{Y}{L}, z \right) \right] \downarrow$ (by definition always going through the point $(P^e, Y_n) \Rightarrow P \downarrow \Rightarrow Y \uparrow$.

In the IS-LM model:

$P \downarrow \Rightarrow \frac{M^s}{P} \uparrow \Rightarrow$ the LM curve shifts rightwards $\Rightarrow i \downarrow \Rightarrow I \uparrow \Rightarrow Z \uparrow \Rightarrow Y \uparrow$.

This adjustment continues until $Y=Y_n$. In the medium run the economy will return to the natural level of output, at the same level of interest rates, but with a lower level of prices.
Monetary policy is neutral in the medium run: having an impact only on prices but not on real variables like output, investment or consumption.

b) If investment does not react to variations in the interest rate, the IS curve becomes a vertical line. This implies that by construction the AD curve is also vertical ($\Delta P \Rightarrow \Delta M/P \Rightarrow \Delta i$ but this has no impact on I and therefore on Z and Y). In this case monetary policy has no effects on output even in the short run. The only short and medium run variation will be a rise in the interest rate.



Exercise 3 – The model AS-AD and the price expectations

Consider an economy in the medium run equilibrium.

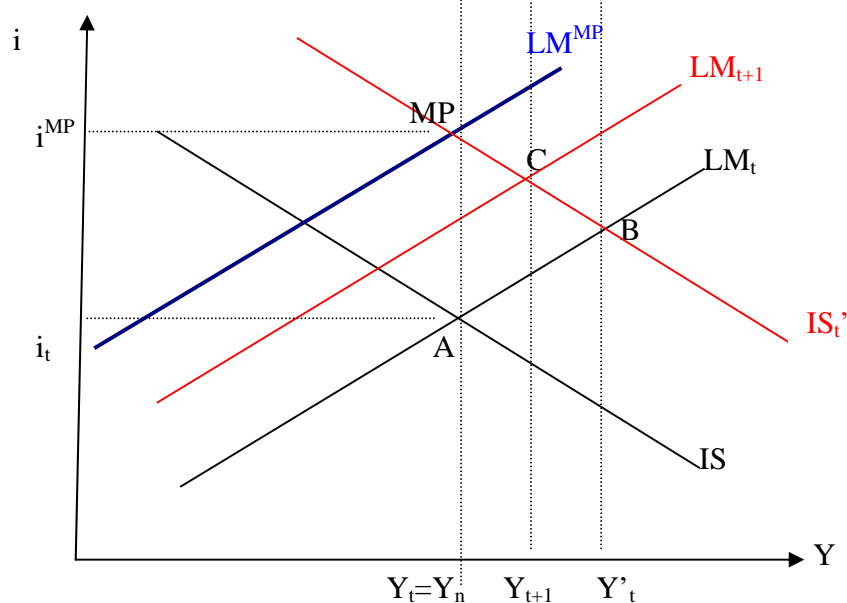
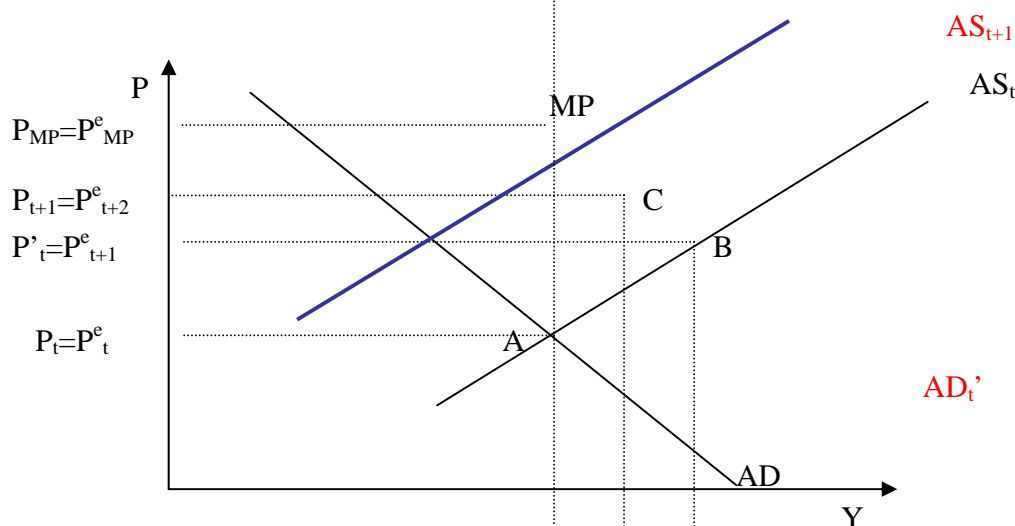
- Describe the short run and medium run effects on prices and the interest rate of an increase in the marginal propensity to consume. Describe graphically and explain.
- Describe the short run and medium run adjustment of AS-AD and IS-LM models after an increase in the marginal propensity to consume under the hypothesis that price expectations are $P^e = P^{-2}$ (i.e. the expected price is equal to the price two periods earlier).

a) $\uparrow c_1 \Rightarrow \uparrow Z \Rightarrow \uparrow Y$, IS curve shifts upward and its slope changes

$\uparrow M^D$, ma se M^S è costante $\uparrow i$

The increase in production, at a given price level shifts the AD curve upward. The increase in production leads to an increase in employment and thus to a reduction in the unemployment rate. Wages and prices increase as well.

As prices increase real money stock decreases and an increase in the interest rate is needed to restore the equilibrium in the money market. LM curve shifts upward.



In the short run the economy moves from point A to point B.

- $\uparrow Y : Y' > Y_n$,
- $\uparrow P$;
- $\uparrow i$.

b) $P^e = P_{t-2}$, The adjustment process will be slower. So if the shock occurred in period 1, during period 2 the AS curve doesn't change, since workers do not revise their price expectations. In period 3 workers revise upward their expectations: $P^e = P_1 > P_{t-1}$.

AS-AD:

The increase in the expected price level implies that in the next period, the aggregate supply curve shifts up. The new AS curve (AS'') goes through (Y_n, P_1) . As long as equilibrium output exceeds the natural level of output, the expected price level increases, shifting the AS curve upward (every 2 periods!!!). The adjustment process stops when output returns to its natural level. Then the expected level of prices will be equal to the actual price level and therefore the AS curve will not change anymore.

IS-LM:

The increase in price level leads to a decrease in the real money stock; interest rate increases and output decreases. The LM curve shifts upward. Also here the adjustment process stops when output returns to its natural level and the expected level of prices is equal to the actual price level.

Exercise 4 - The IS-LM and AS-AD models

The introduction of the monetary union in Europe has produced an increase in competition between firms.

- a) Describe graphically the consequences of the monetary union on the labour market equilibrium.
 - b) Using the IS-LM and AS-AD framework, analyze the effects on output, prices, and the interest rate, distinguishing between short-term and long-term effects.
- a) An increase in competition between firms translates into a reduction of μ (the mark-up on costs).

$$WS: \quad \frac{W}{P^e} = F(u, z) \quad \text{In MR eqm, } P^e = P$$

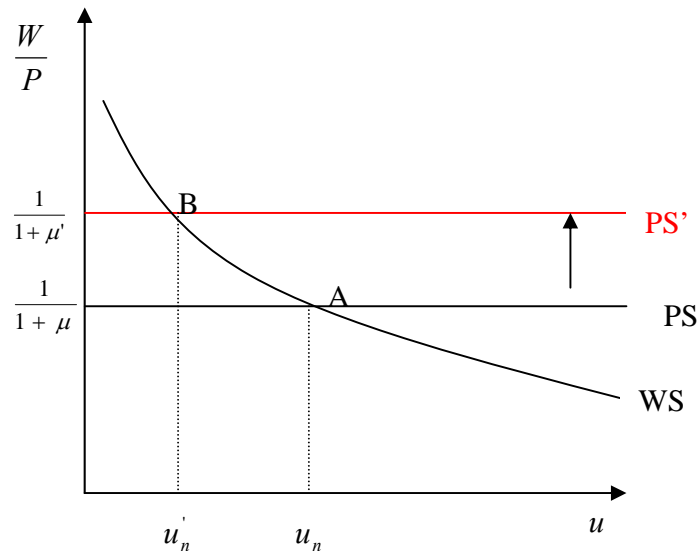
$$PS: \quad \frac{W}{P} = \frac{1}{1 + \mu}$$

$$\downarrow \mu \Rightarrow \downarrow P \Rightarrow \uparrow \frac{W}{P}$$

as a consequence the PS curve shifts upwards to PS' .

The increase in real wages leads to a reduction of the natural rate of unemployment because now a greater number of people is willing to work at the increased real wage. The labour market equilibrium shifts from A to B.

Graphically:



b) Since: $Y = N$, if $\downarrow u_n \Rightarrow \uparrow N_n \Rightarrow \uparrow Y_n$, in other words the reduction in the natural rate of unemployment translates into an increase in production.

In the short run:

The reduction of μ causes a reduction in prices for every level of production, leading to a shift to the right of the AS curve in AS' , that by definition passes through (Y'_n, P_0) . In the new short term equilibrium, A' is characterized by a lower price level and by a greater level of output with respect to the starting point, but still inferior with respect to the new natural level of output.

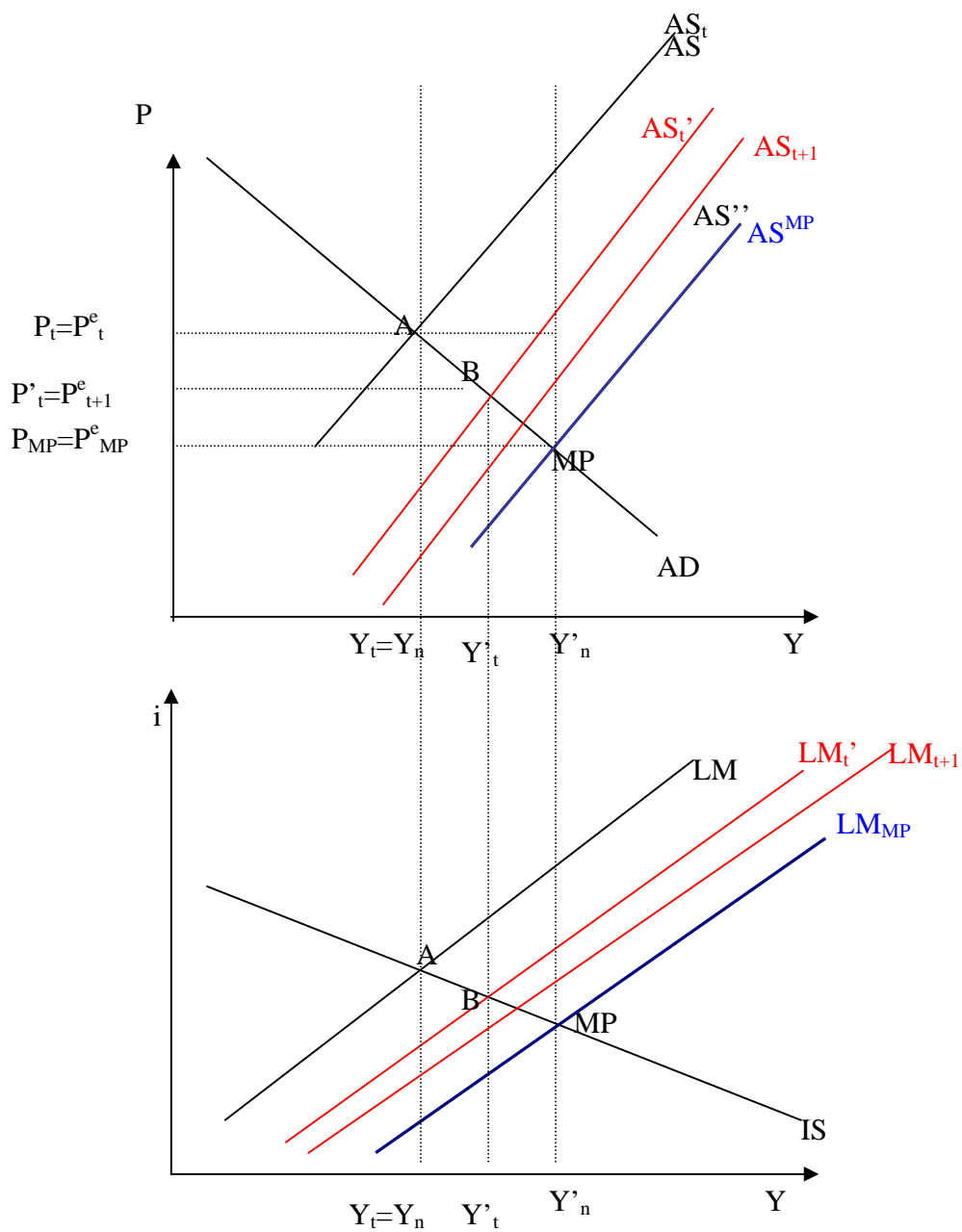
The reduction in prices leads to an increase in the real money balances with a consequent rightward shift of the LM curve in LM' . The reduction of μ could also influence the position of the AD curve, both through the impact on investment (a reduction of the mark-up reduces the profit margins therefore possibly decreasing firm incentives to invest) and through its effects on consumption (a lower level of prices leads to an increase in the real income of consumers). Here we assume that the different effects cancel out and that the AD curve does not move.

In the medium run:

In the period following the shock, the workers will revise downwards their expectations on prices:

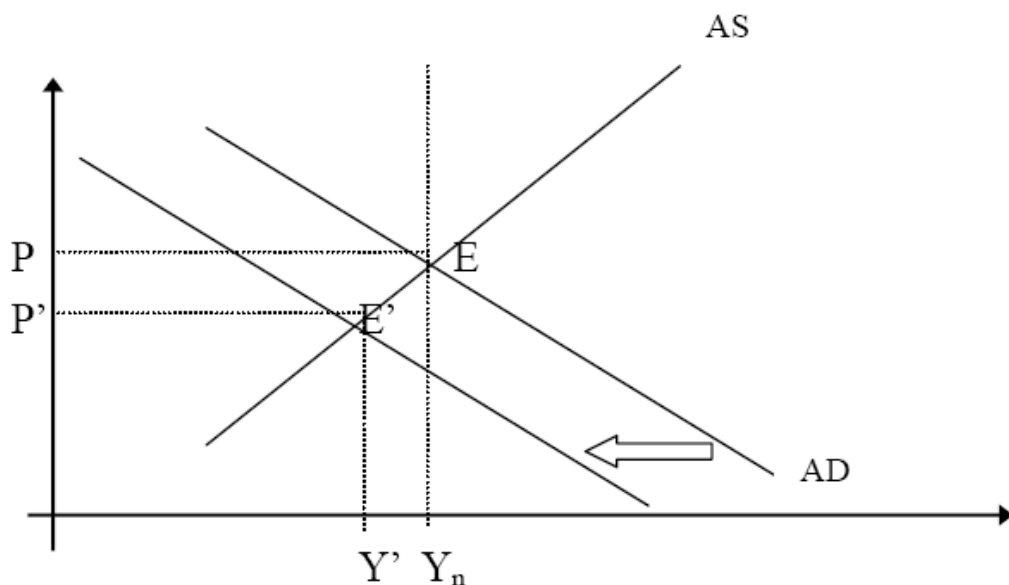
$$P^e = P_1 < P_0, \quad P^e = P_0 > P_1, \text{ so } P^e \text{ falls}$$

The revision of expectations on prices implies a downward shift of the AS' curve that moves to AS'' . As long as the output level is below the new natural level (Y'_n), prices will continue to decline and output will continue to grow. The AS curve will continue to shift downwards, and so will the LM. When output finally reaches its natural level, the economy will be back in medium-run equilibrium (point B).



Exercise 5 – Past Exam, October 2008, Q6

- a) Consider a decrease of stock prices in the United States that reduces the wealth of consumers. Use the AS-AD model to show the effect in the short run. Assume the economy is initially at the natural level of output.
- b) Show the transition from the short run equilibrium level in point a) to the natural level of output. Explain in detail and, in particular, motivate the price dynamics.
- a) *The lower level of wealth reduces the permanent income and hence the level of consumption. This provokes a reduction of the aggregate demand and the AD curve moves to the left. In the short run, the equilibrium moves from E to E'. The level of production decreases from Y_n to Y' and the level of price decrease from P to P' .*



- b) *Since the production is now under its natural level ($Y' < Y_n$), the unemployment rate is above its natural level and wages tend to decrease. The AS curve moves to the right: prices decrease and the production come back to its natural level- The final situation shows unemployment only as a temporary phenomenon with deflation.*

