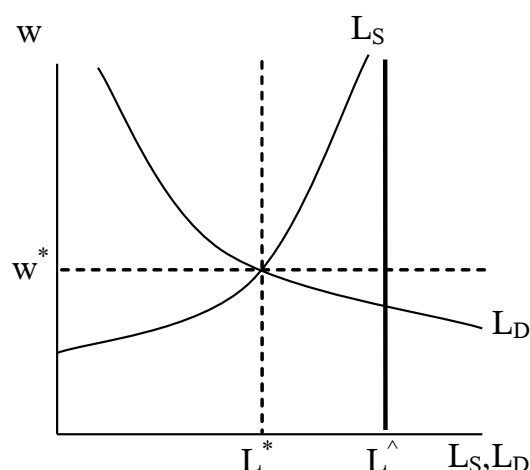


## Topic 4: Introduction to Labour Market, Aggregate Supply and AD-AS model

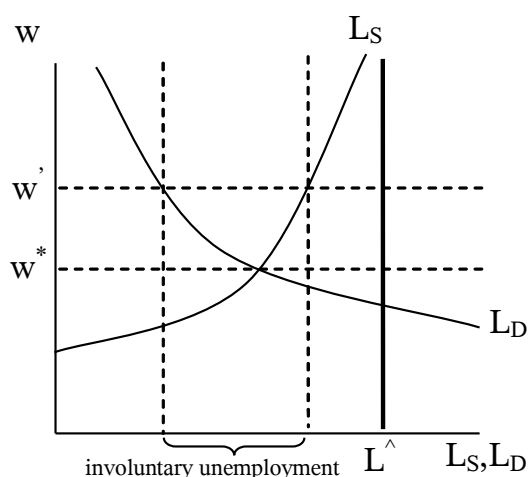
1. In order to model the labour market at a microeconomic level, we simplify greatly by assuming that all jobs are the same in terms of disutility of work effort, hours worked, benefits and any other factors that cannot be captured in the real wage. We can then put the number of workers in the labour force ( $L$ ) along the x-axis and real wages ( $w=W/P$ , where  $W$  is the nominal wage and  $P$  is the price level) along the y-axis. Each worker will have a reservation wage, which is the minimum real wage required to make them want to take a job rather than remain unemployed. This will differ from worker to worker depending on their individual characteristics (e.g. personal preferences, size of family, etc.) As real wages rise, more and more workers will want to enter the labour market. This generates the upward sloping *labour supply curve* ( $L_S$ ). Firms are assumed to be perfectly competitive, which means that they sell the goods they produce at marginal cost. This means that the amount they are able to pay each additional worker whilst still breaking even (i.e. making 0 economic profits) will be equal to the *marginal revenue product of labour* ( $MRPL$ ), which is the same as the marginal product of labour (the derivative of the production function with respect to labour) multiplied by the nominal price at which firms' output is sold. If we let  $L$  be labour supply,  $K$  be capital and  $F(L,K)$  be the firm's output then  $MRPL=P(\partial F/\partial L)$ . We assume that  $F$  exhibits constant returns to scale, and thus that, holding capital fixed at  $K^*$ , that  $\partial F/\partial L$  and therefore  $MRPL$  are decreasing as  $L$  increases. With a given real wage, firms will hire workers up to the point where  $MRPL=W$  or  $\partial F/\partial L=w$ . The higher the wage, the less labour will be hired. This generates the downward sloping labour demand curve ( $L_D$ ).

(a) Using classical assumptions, the labour market clears where the  $L_S$  and  $L_D$  curves meet at  $L^*$ . The equilibrium real wage is  $w^*$ . The total number of workers is shown as  $L^\wedge$ . Unemployment is equal to  $L^\wedge - L^*$ . All unemployment is voluntary in the sense that none of the unemployed workers want to work at the current market wage. The following diagram illustrates the labour market equilibrium:

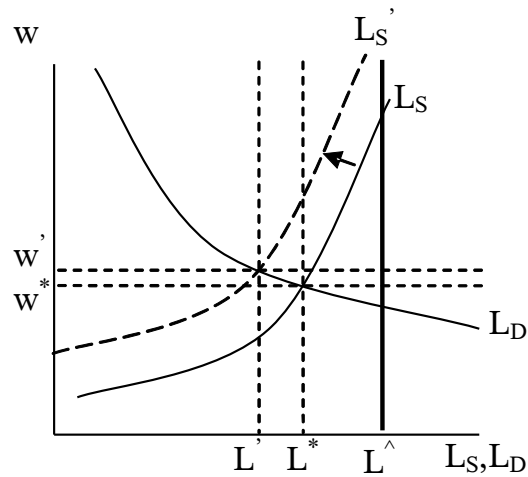


(b) When wages are sticky, we are referring to a situation where the price level has changed, but nominal wages have remained unchanged. For this to occur there must be some kind of **nominal rigidity** in the economy. This could be for a number of reasons. It could be because bargaining between firms and workers only occurs periodically, so that wages have not yet been renegotiated to take into account the altered price level. (Note that this explanation requires that we move away from the classical model, where each worker “negotiates” individually with their employer, so that the market clears instantly, to a model with trade unions or other kinds of bargaining institutions.) It could be because the unionized workers who have kept their jobs at the higher real wage are unwilling to accept a nominal wage cut. (Note that this explanation requires that firms for some reason cannot fire these workers and hire those willing to work for less, as would occur in the classical model.)

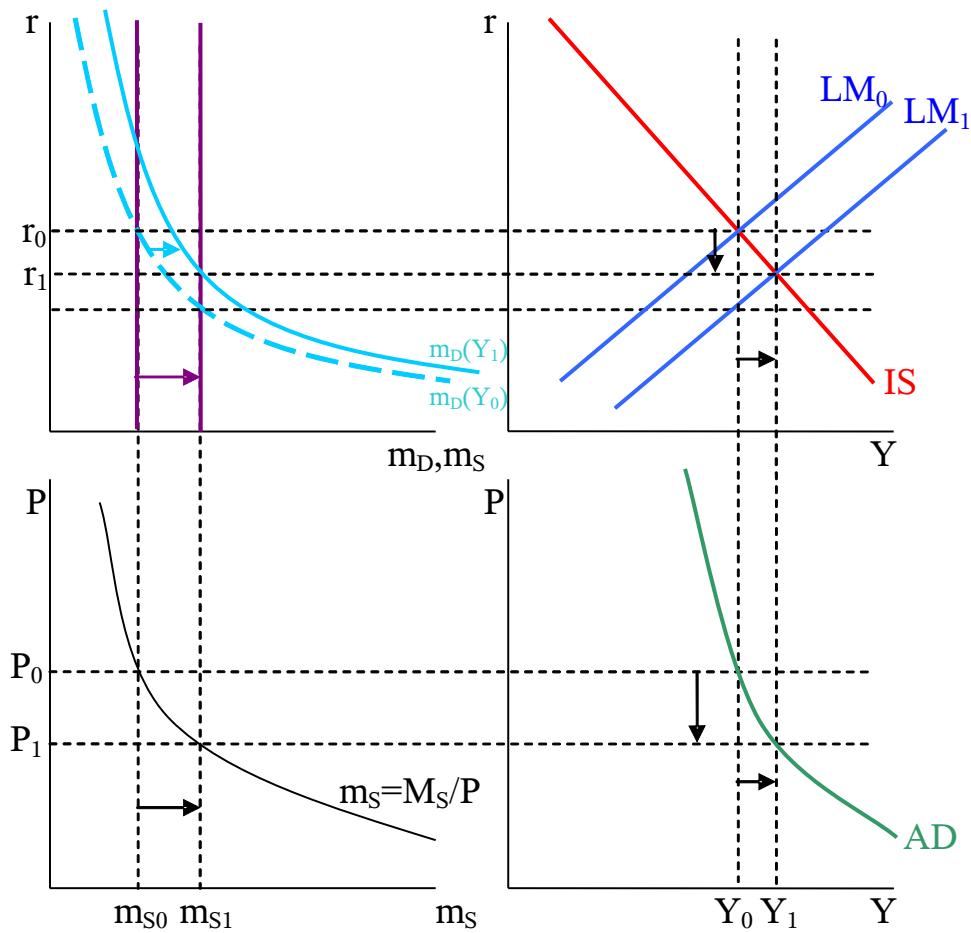
The diagram below illustrates a situation where the price level has dropped, but nominal wages have remained stuck at their original level. This has resulted in a rise in the real wage above the market clearing wage to  $w'$ . Only those workers who the firm is willing to hire (i.e. up to the  $L_D$  curve) will be employed. There will now be involuntary unemployment as shown on the diagram. Note that the involuntary unemployment is *more* than the shortfall between the new level of employment and the equilibrium level  $L^*$ , because the real wage is higher, so even more people want to work than in the market clearing equilibrium, even though less are employed.



(c) An alternative to sticky wages in explaining why employment can deviate from the equilibrium level is a model where workers can misperceive the price level. For simplicity, we assume that firms know the actual price level, whereas workers have more limited information and so base their decisions on previously formed expectations. Suppose that there is surprise disinflation so that nominal wages drop, but so do prices so that real wages remain constant. If workers do not realize that the price level has also dropped, they will think that their real wages have dropped. This will have the same effect as if the  $L_S$  curve were shifted upwards (to  $L_S'$  in the diagram below). Since the labour demand curve remains fixed, this will result in a higher real wage and a lower level of employment than in the classical case. The additional unemployment here probably should not be classified as involuntary because all those workers who are willing to work at the market wage are able to do so. However, when they realize that the price level has dropped they will in retrospect realize that they have made a mistake, and should have been willing to work at a lower nominal wage.



2. The AD curve is plotted in  $(Y, P)$  space where  $Y$  is output and  $P$  is the nominal price level. It represents all those points where both the goods market and the money market are in equilibrium for a given price level, nominal money supply and fixed position of the IS curve. The AD curve is thus derived from the IS-LM framework. This is done in the diagram below assuming that there is a fixed nominal money supply equal to  $M_S$ . When the price level drops from  $P_0$  to  $P_1$ , this causes an increase in the real money supply. This in turn causes a rightward shift in the LM curve. This causes an increase in output and a decrease in the interest rate. The increase in output also shifts the money demand curve outwards.

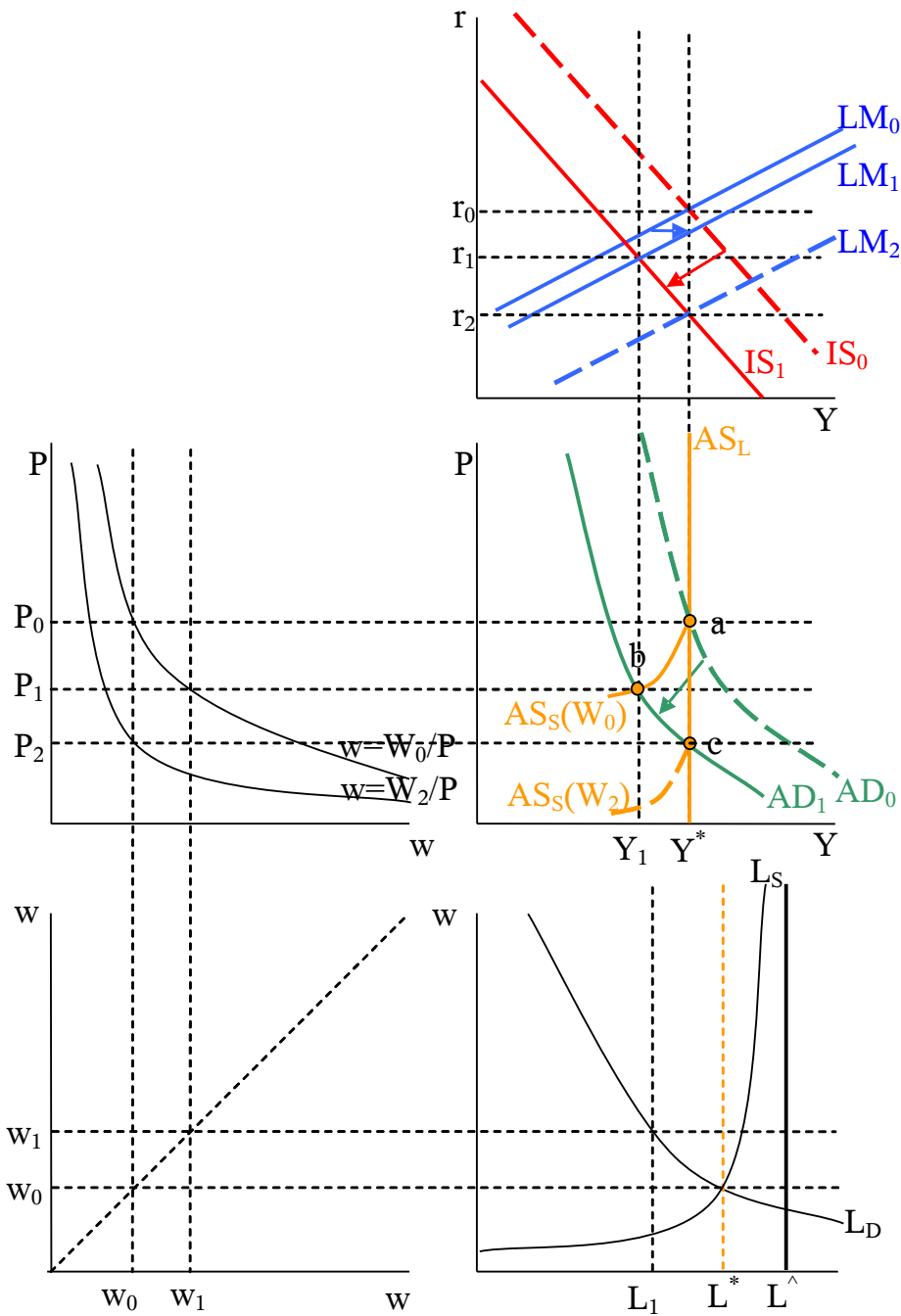


The AD curve is shifted by a number of factors. Firstly, any change in the position of the IS curve (via a change in the multiplier or autonomous expenditure) will shift the AD curve. Secondly, any change in the nominal money supply will shift the AD curve. Thirdly, any change any of the other variables (aside from output) which enter into the money demand function will shift the AD curve.

3. (a) The diagram overleaf illustrates the effect of a decline in autonomous investment. The IS curve shifts to the left from  $IS_0$  to  $IS_1$ . This causes the AD curve to also shift to the left. The short run AS curve  $AS_S$  is upward sloping because wages are sticky downwards in the short run. When the nominal price level reduces, the nominal wage level remains stuck, and so the real wage increases. (We assume for simplicity that nominal wages are sticky downwards but not sticky upwards, i.e. that firms have no problem raising nominal wages to a new market clearing level, only reducing them.) This leads to the employment level falling below the market clearing level  $L^*$ , and thus to output falling below the economy's capacity level  $Y^*$  (which corresponds to the level of output produced when the labour market is in equilibrium, i.e. when there is no involuntary unemployment). The new lower employment level  $L_1$  leads to a lower output level  $Y_1$ . The fall in the price level also causes the LM curve to shift outwards from  $LM_0$  to  $LM_1$  because the real money supply increases. The interest rate falls from  $r_0$  to  $r_1$ , illustrating the fact that some but not all of the reduction in autonomous investment demand is compensated for by a lower interest rate. The new short run equilibrium of the economy therefore results in a recession as the economy moves from point a to point b, where there is involuntary unemployment.

In the long run, however, the forces which lead to labour market equilibrium will win out (e.g. workers with jobs will be unable to prevent those who are willing to work for less from doing so indefinitely) and the economy will end up back on the  $AS_L$  curve, this time at the intersection with the new AD curve. As the nominal wage  $W$  is reduced from  $W_0$  to  $W_2$ , the  $AS_S$  curve will shift downwards until the economy eventually ends up at long run equilibrium at point c. The LM curve will in the long run have shifted to  $LM_2$ , where the reduction in the price level has been sufficient to lead to a lowering of interest rates to  $r_2$ , sufficient to compensate for the initial decline in autonomous investment.

Assuming this model of the relationship between the supply side and the demand side of the economy is correct, then there is a role for monetary or fiscal policy to reduce or eliminate the damage done to the economy by the recession in the short term. If an investment subsidy were used to stimulate aggregate demand, the IS curve could be shifted back out to  $IS_0$ , thus re-establishing the original IS-LM and AS-AD equilibrium. It would, however, be difficult to target fiscal policy so precisely at investment expenditure. There would also be a deterioration in the government budget position. Perhaps more promisingly, an immediate increase in the nominal money supply could shift the LM curve directly to  $LM_2$ , without the need to wait for nominal wages and prices to drop. This would shift the AD curve back to  $AD_0$ , its original position. There would then be no short run recession and aggregate demand management policies would have immediately restored macroeconomic equilibrium.



(b) A rise in the price of oil will result in a reduction in the optimal capital input  $K$  (because machinery is now more expensive to operate) and thus a reduction in the marginal product of labour. This will cause a leftward shift in the long run and short run aggregate supply curves. Assuming the nominal money supply remains unchanged, and (for simplicity and clarity) that the oil price shock has no effect on the demand side components entering into the IS curve, the position of the AD curve will remain unchanged. Assuming that nominal wages are only sticky downwards, the short run result of the supply side shock will be an immediate increase in nominal wages and the price level to point b. This is also a stable long run equilibrium. The increased price level has reduced the real money supply, and interest rates have increased from  $r_0$  to  $r_1$ . This means the investment component of aggregate demand that has been reduced. The consumption component has also reduced (because

$C=C_0+mY$  in the Keynesian multiplier model) but government expenditure has remained unchanged.

The supply side shock produces a recession which looks similar to that of a demand side shock, the major difference being that it is accompanied by inflation, not deflation. Suppose the government treated the supply side shock like a demand side shock and attempted to stimulate the economy using fiscal or monetary policy to shift the AD curve (e.g. to  $AD'$ ). Under the assumption that wages are only sticky downwards, this would simply cause even more inflation, taking the economy to point c. We conclude that aggregate demand stimulation is not the correct response to a supply side shock, certainly if not accompanied by other policies to increase the output capacity of the economy.

