LECTURE NOTES

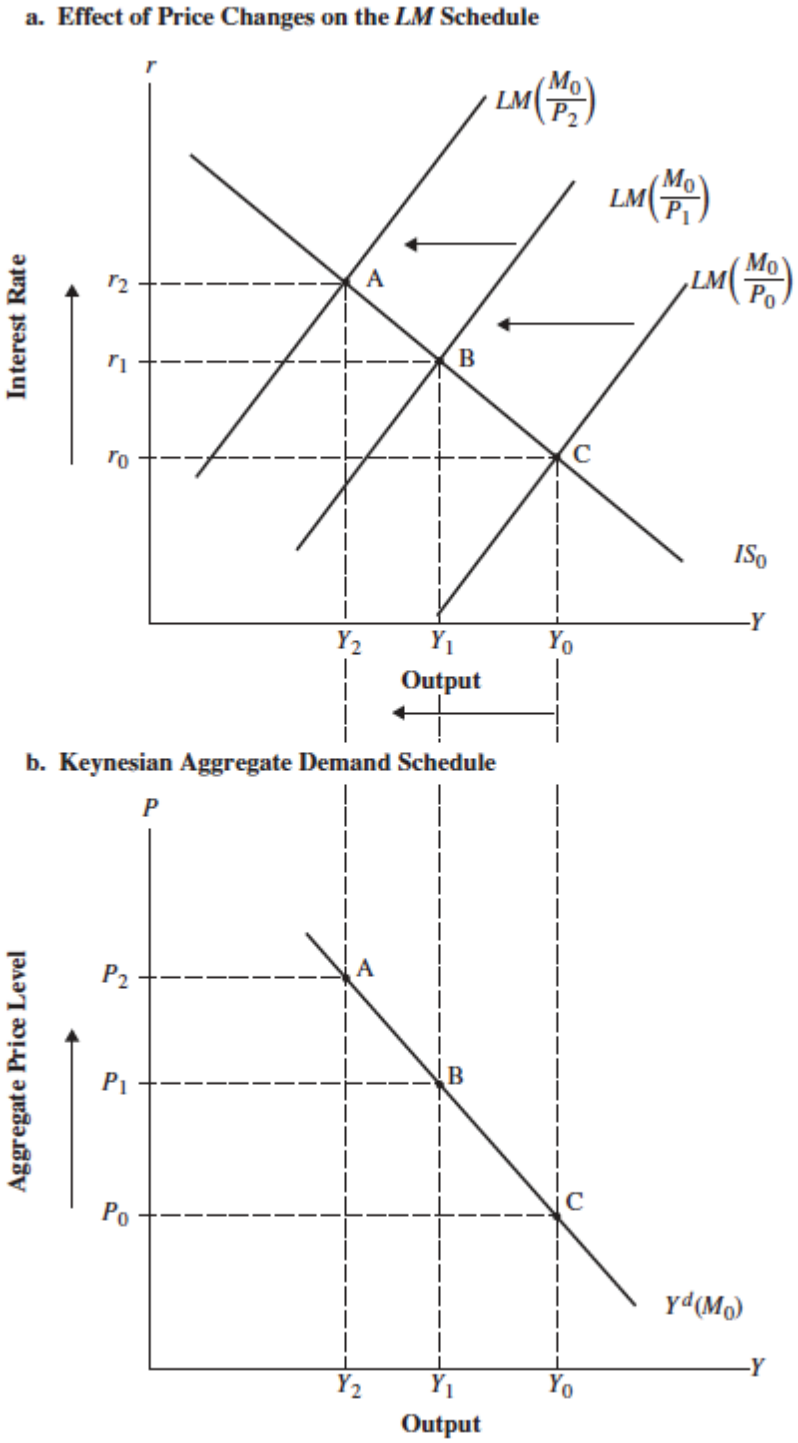
Chapter 8: The Keynesian System (IV): Aggregate Supply (AS) and Demand (AD)

- In the simple Keynesian model the interest rate and the price level (P) is assumed to be fixed
- In the IS-LM model *P* is assumed to be fixed
- The AD-AS model includes flexibility of *P*
- Different assumptions in the supply yield produce a different result than the Classical model
- All that follows is for the short-run Keynesian model (more on this on the next two chapters)
    - *But this long run is a misleading guide to current affairs. In the long run we are all dead* –John M. Keynes

1. The Keynesian Aggregate Demand Schedule

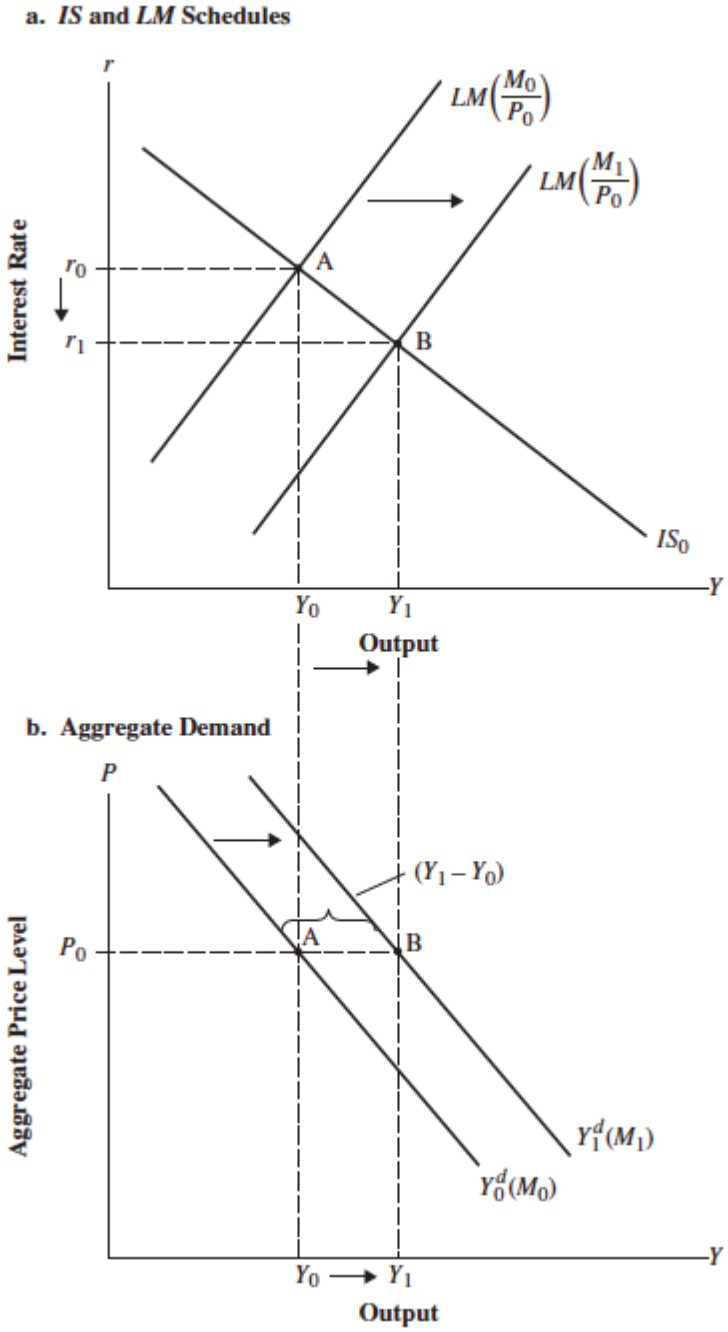
- The IS-LM model implicitly assumes that whatever the level of demand, output will react accordingly at the given price level (P). Namely, the model assumes a horizontal AS schedule
- This assumption might be considered plausible when there is a significant output gap (like the case of the Great Depression when these ideas were being developed)
    - For the same reason, marginal product of labor (MPN) does not fall substantially. Unemployment is significantly above the natural rate of unemployment
    - This assumption is lifted in a more general case than the IS-LM
- Aggregate Demand: Output (Y) demanded at each price level (P)
- If $P_1 > P_0$, then $\frac{M_0^S}{P_1} < \frac{M_0^S}{P_0}$, therefore the demand of nominal money has to increase to keep the demand for real money $\left[\frac{M}{P}\right]$ (purchasing power) at the same level. The increase in the demand of nominal money shifts the LM to the left. This produces an inverse relationship between *P* and *Y* (Figure 8-2)
- Different is an increase in the amount of money supply. In this case the LM schedule also shifts, but it also shifts AD (Figure 8-3)

FIGURE 8-2 Construction of the Aggregate Demand Schedule



At successively higher price levels, P_0, P_1, P_2, the *LM* schedule in part *a* is shifted farther to the left. This shift results in successively lower levels of aggregate demand Y_0, Y_1, Y_2. These combinations of price and aggregate demand are plotted to give the negatively sloped aggregate demand schedule in part *b*.

FIGURE 8-3 Effect on Aggregate Demand of an Increase in the Money Supply

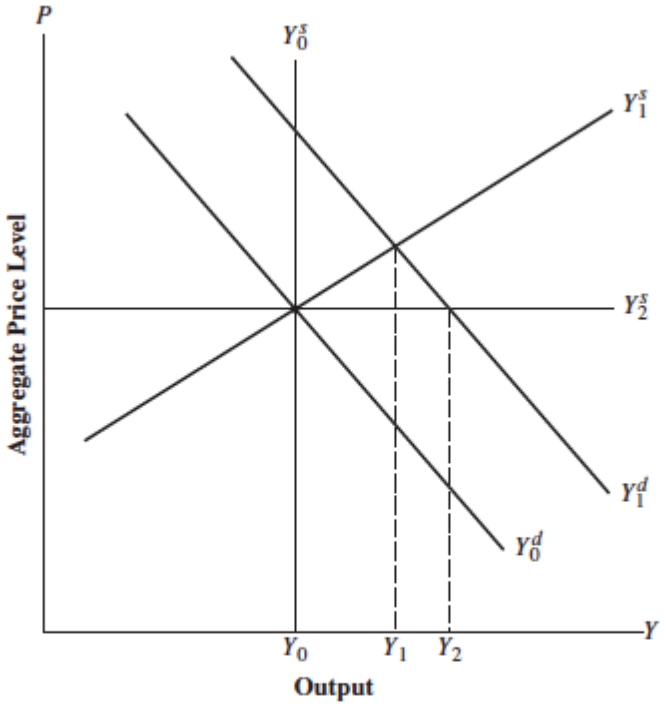


An increase in the money supply shifts the *LM* schedule in part *a* to the right, from $LM(M_0/P_0)$ to $LM(M_1/P_0)$, and shifts the aggregate demand schedule to the right, from Y^d_0 to Y^d_1, in part *b*.

2. The Keynesian Aggregate Demand Schedule Combined with the Classical Theory of Aggregate Supply

- Assume a positive shock to AD (shifts to the right)
    - If AS is horizontal -> largest effect on output
    - If AS is vertical -> null effect on output (Classical model)
    - If AS has a positive slope -> *some* effect on *Y*
    - The assumptions on the supply side define on which system are we working: Classical or Keynesian (Figure 8-4)
- Remember: AS comes from the output level assuming equilibrium in the labor market
    - To support a different policy prescription than the classics, then the Keynesian system needs to have different assumptions on the supply side
    - More specifically, there are different assumptions about how the labor market works because this is the market that defines the level of output <u>with a given</u> production function

FIGURE 8-4 Role of Aggregate Supply in Determining the Output Response to a Policy Shock

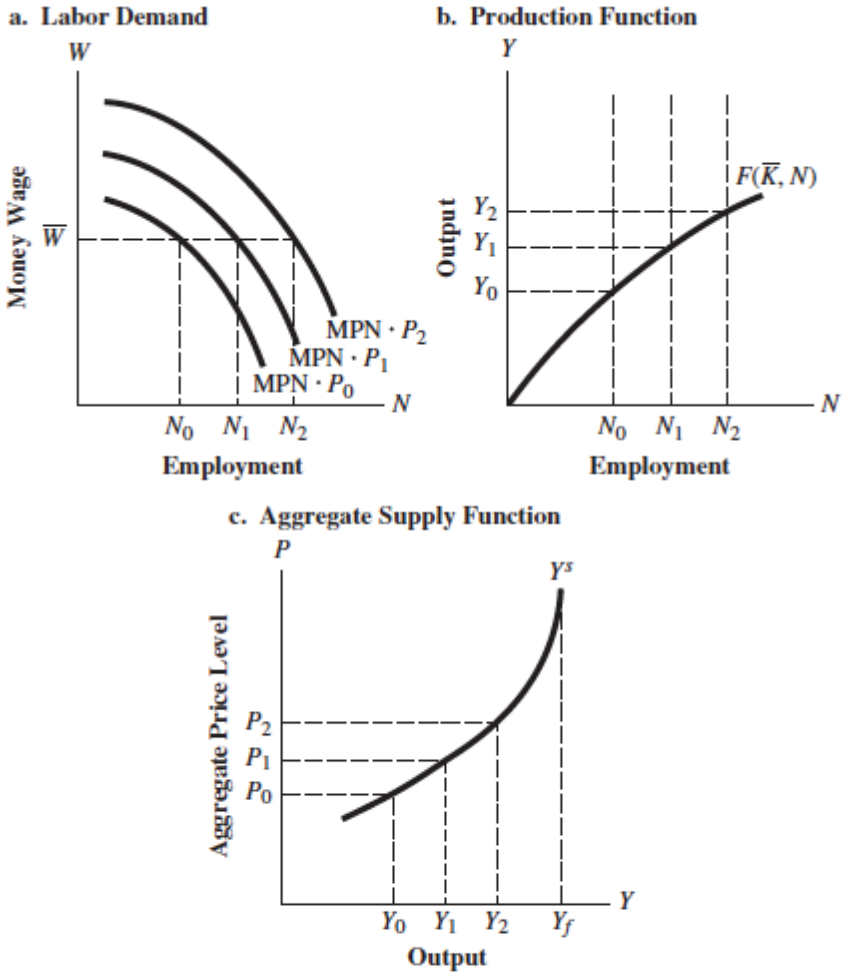


An increase in government spending shifts the aggregate demand schedule from Y^d_0 to Y^d_1. If the aggregate supply schedule is horizontal (Y^s_2), output increases from Y_0 to Y_2. If the aggregate supply schedule slopes upward (Y^s_1), output increases only to Y_1. If the supply schedule is vertical (Y^s_0), output is unchanged at Y_0.

3. A Contractual View of the Labor Market

- Wage rigidity or stickiness
    - Wages (W) move slower than *P*
    - Be careful: Stickiness does not mean what *W* does not move, it means that it moves slower than *P* (but it moves…)
    - Then: $\frac{W}{P}$ it's not constant
- Sources of wage rigidity
    - Workers care about nominal wages
        - Workers care about wage differentials (i.e. workers versus managers)
        - Because *P* affects all wages in the same proportion, it is enough (and simpler) to look at nominal *W*
        - This is why (1) the labor market is resistant to a decrease in nominal wages (even if real wages remain the same) and why (2) there is less resistance to a decrease of real wages because *P* increases when the nominal wages do not change
    - Institutional effects
        - Wages are set by contracts that last 2 or 3 years. Therefore, wages take time to adjust for unexpected shocks and movements in *P*. This effect is stronger in unionized sectors
    - Implicit agreement between employer and employee that nominal wages will not fall
        - Therefore, adjustment is done through shorter workweeks or layoffs
    - Because of these three reasons, in the presence of a crisis (a fall in AD) the market is unable to restore full employment. AD has to be stimulated with fiscal policy (G)
    - More precision: Wages are sticky downwards, not necessarily upwards
- A Flexible Price-Fixed Money Wage Model
    - If labor supply is larger than labor demand, then firms can increase labor at the fixed nominal wage rate. The binding constrain is demand, not supply
    - Then, an increase in *P* reduce the real wage, then firms can hire more workers without putting pressure on *W* (so that real wages do not rise) and therefore output increases
    - As full employment is reached ("bottleneck effects") nominal wages start to increase, firms do not want to hire extra workers, supply becomes more vertical (Figure 8-6)

FIGURE 8-6 The Keynesian Aggregate Supply Schedule When the Money Wage Is Fixed

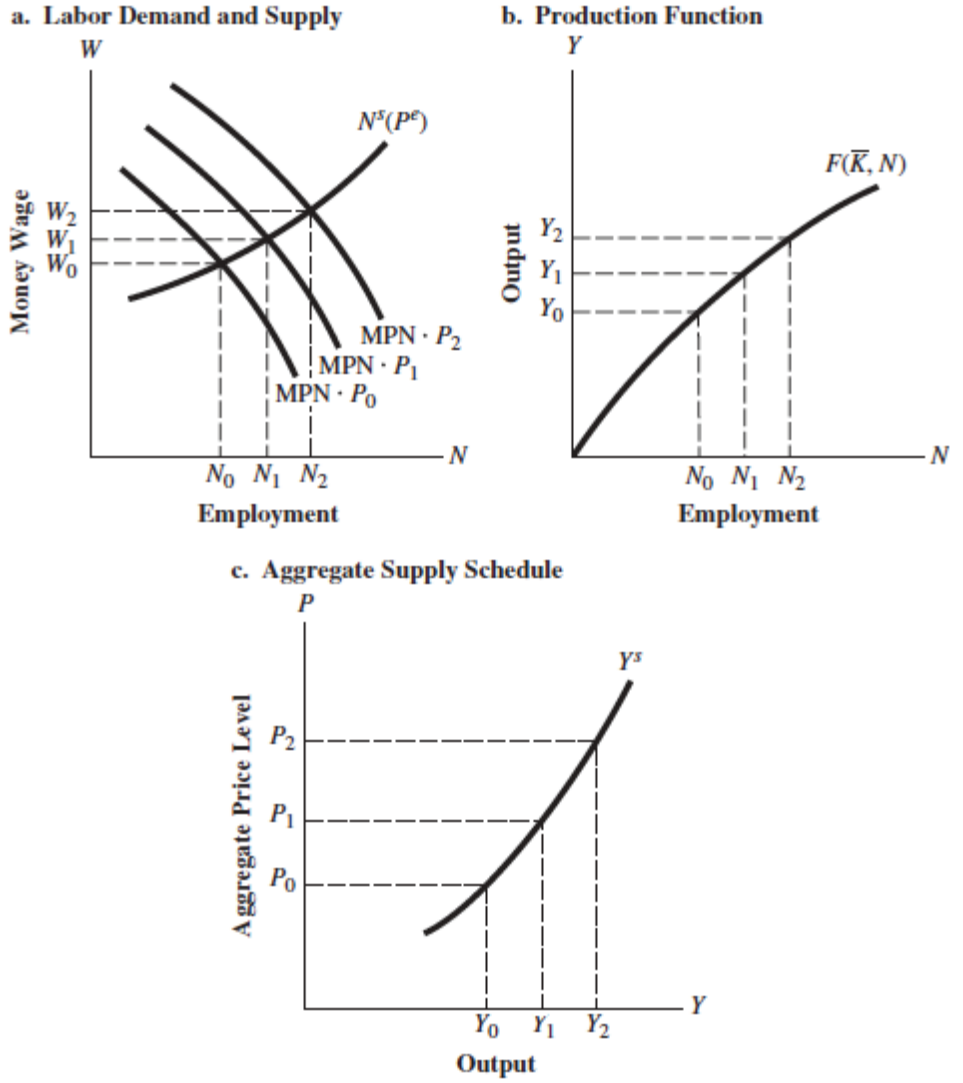


Part *a* shows the levels of employment N_0, N_1, N_2 for three successively higher price levels, P_0, P_1, P_2. Part *b* shows the levels of output, Y_0, Y_1, Y_2, that will be produced at these three levels of employment. In part *c*, we put together the information in *a* and *b* to show output supplied at each of the three price levels. Notice that at higher price levels, employment, and hence output supplied, increase; *the aggregate supply curve* (Y^s)*is upward-sloping*.

4. Labor Supply and Variability in the Money Wage

- Classical theory assumes workers think in terms of real wages (W/P)
- Keynesian theory assumes workers think in terms of nominal wages (W). But:
    - Because work contracts in fixed in nominal terms for a given period of time (i.e. 2 years), then labor supply works with the expected price level (P^e) not with the actual price level (P)
    - Therefore, unexpected changes in *P* will affect labor supply because (by definition) these changes are not included in P^e
    - Example, if you think that inflation will be 2%, and you see your nominal wage increase 5%, you assume the real wage is increasing 3% until you realize that inflation was not actually 2%, but 5%
    - Therefore: *Even if* nominal wage were perfectly flexible, AS would still not be vertical
- Classical model labor supply: $N^s = h\left(\frac{W}{P}\right)$
- Keynesian model labor supply: $N^s = h\left(\frac{W}{P^e}\right)$
- How are price expectations formed?
    - Mostly on the past behavior of the price level
    - $P_t^e = a_1 P_{t-1} + a_2 P_{t-2} + \cdots + a_n P_{t-n}$, where a_i are the weights assigned to each past price level
    - Why not use more information to produce a P^e? Because the cost of gathering and processing such information is higher than the accuracy gained in the prediction
    - Note:
        - (1) P^e is essentially a *backward looking* process
        - (2) P^e is a "linear projection" of past information
        - (3) Therefore P^e adjusts slowly to changes in *P*
        - (3) Therefore, P^e can be assumed to constant and because of this monetary policy can easily "surprise" (be unexpected) the market. Then monetary policy has a positive effect on employment and output
- The Keynesian Aggregate Supply Schedule with a Variable Money Wage
    - Labor demand still depends on *P* $(not\ P^e)$ because firms know at what price they are going to sell their goods
    - Assume the price level increases from $P_0\ to\ P_1\ to\ P_2$ (Figure 8-9)
        - (1) <u>Labor demand</u> increases (shift to the right)
        - (2) Nominal wages increase
        - (3) Workers interpret W/P is increasing because they think in terms of P^e not in terms of actual *P*
        - (4) <u>Quantity</u> of labor supply increases (no shift!)
        - (5) With a higher rate of employment, output increases

FIGURE 8-9 The Keynesian Aggregate Supply Schedule When the Money Wage Is Variable

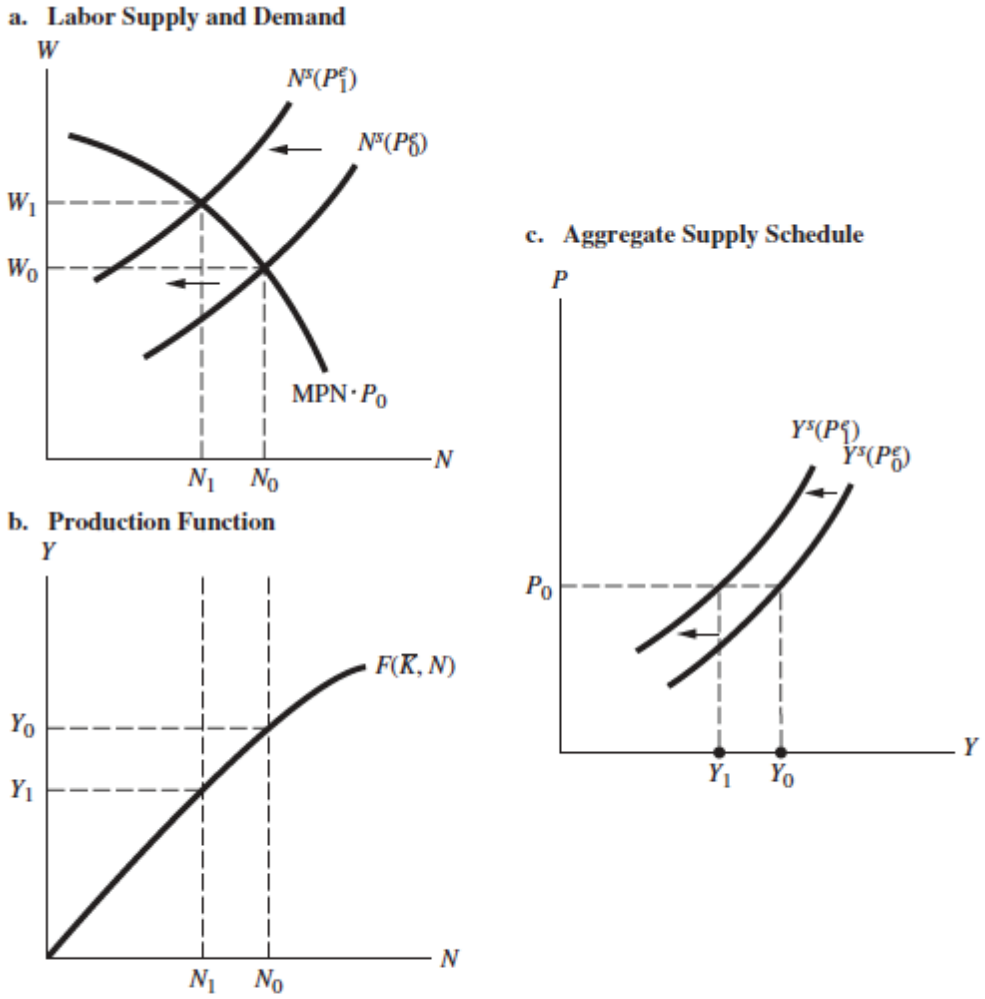


Part *a* shows equilibrium levels of employment N_0, N_1, N_2, corresponding to successively higher values of the price level, P_0, P_1, P_2. Part *b* gives the level of output, Y_0, Y_1, Y_2, that will be produced at each of these employment levels. Part *c* combines the information in parts *a* and *b* to show the relationship between the price level and output supplied. At higher values of the price level, output supplied increases; as in the fixed-wage case, *the aggregate supply curve* (Y^s) *is upward-sloping*.

5. The Effects of Shifts in the Aggregate Supply Schedule

- Remember, because price (and output) can change because either demand or supply shifts, supply shocks are also needed to explain observed economic effects (think of the oil market during the 1970s)
- What shifts Aggregate Supply? Think of what determines the level of output
    - (1) a positive shock to labor demand
    - (2) a positive shock to labor supply
    - (3) a positive shock in the production function
- Example: Assume an increase in the expected price level (Figure 8-12)
    - (1) Labor supply shifts to the left
    - (2) Nominal wage increases
    - (3) Employment falls
    - (4) Output falls
    - (5) Price level rises

FIGURE 8-12 Shift in the Aggregate Supply Schedule with an Increase in the Expected Price Level

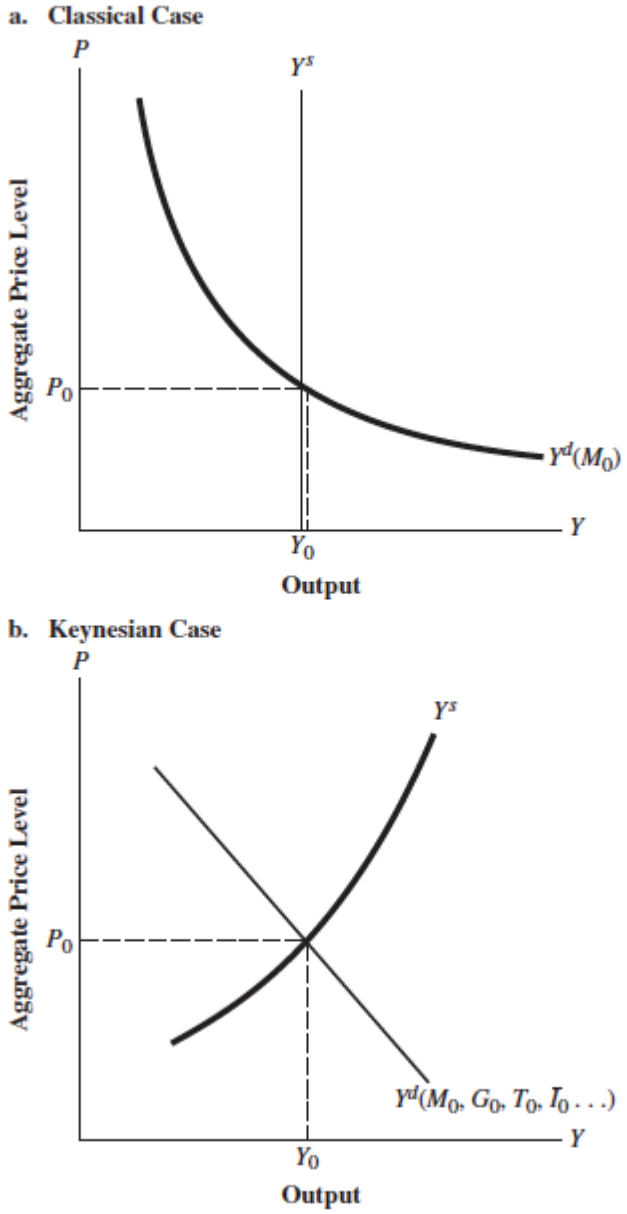


An increase in the expected price level shifts the labor supply schedule to the left from $N^s(P^e_0)$ to $N^s(P^e_1)$ in part *a*. At a given price level, P_0, employment declines from N_0 to N_1, and output falls from Y_0 to Y_1 (part *b*). This decline in output for a given price level is reflected in a shift to the left in the aggregate supply schedule from $Y^s(P^e_0)$ to $Y^s(P^e_1)$ in part *c*.

6. Conclusion: Keynes vs the Classics

- Aggregate Demand
    - Classical AD:
        - Explicit theory of AD: MV = PY
        - Increase in demand by one sector of the economy (G) cancel out with other sectors because of perfect Ricardian Equivalence and interest rate equilibrating the loanable fund market
    - Keynesian AD:
        - It looks the same, but it does not depend only on M, it also depends on other variables like G because MV = PY = C + G + I + NX. But because changes in demand of one sector are not perfectly offset by changes in other sectors, AD does not depend only on M
- Aggregate Supply
    - Classical AS:
        - Vertical because labor demand and labor supply depend on real wages and because W is not sticky
        - Because of this, output and employment depends on supply, not demand
    - Keynesian AS:
        - Upward slopping in the short-run because of (1) nominal wage stickiness and because (2) labor supply depends on a backward estimation of expected price level
        - Output and employment depend on both, AD and AS
- Policy Conclusions
    - Classical model
        - Stresses the self-adjusting ("invisible hand") property of markets
        - Laissez-Faire: Let the free market work to achieve equilibrium
    - Keynesian model
        - Because of AD instability, and because AD also determines output and employment, the market is unstable
        - Well-designed fiscal and monetary policy can cancel-out AD instabilities

FIGURE 8-15 Classical and Keynesian Aggregate Supply and Demand Schedules



The classical aggregate supply schedule is vertical, whereas the Keynesian aggregate supply schedule slopes upward to the right. The classical aggregate demand schedule depends only on the level of the money supply (M_0); in the Keynesian system, aggregate demand depends also on fiscal variables (G_0, T_0), autonomous investment (I_0), and other variables.