

Chapter 9, IS-LM

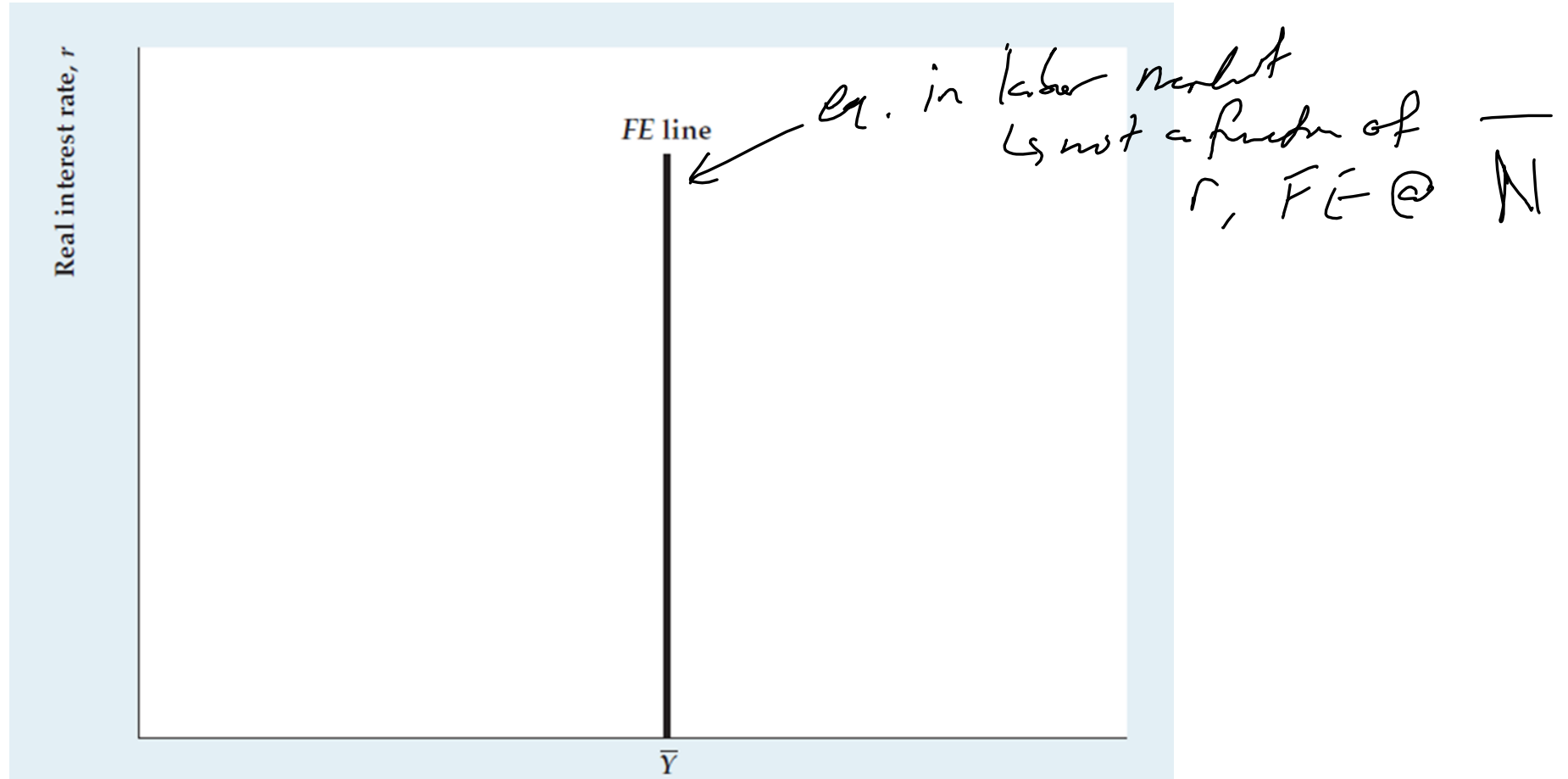
Topics

- The *FE* Line: Equilibrium in the Labor Market
- The *IS* Curve: Equilibrium in the Goods Market
- The LM Curve: Asset Market Equilibrium
- General Equilibrium in the Complete *IS–LM* Model
- Price Adjustment and the Attainment of General Equilibrium

Equilibrium in the Labor Market

- Labor market in Chapter 3 showed how equilibrium in the labor market leads to employment at its full-employment level (\bar{N}) and output at its full-employment level (\bar{Y})
- If we plot output against the real interest rate, we get a vertical line, since labor market equilibrium is unaffected by changes in the real interest rate

The FE line



The FE Line

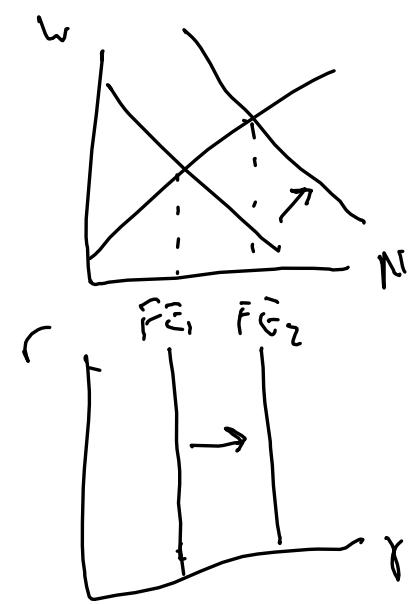
- Factors that shift the FE line
- The full employment level of output is determined by the full-employment level of employment. Factors that shift the FE line are the current levels of capital and productivity
- Summary Table 11 lists the factors that shift the full-employment line

Factors That Shift the Full-Employment (FE) Line

SUMMARY 11

Factors That Shift the Full-Employment (FE) Line

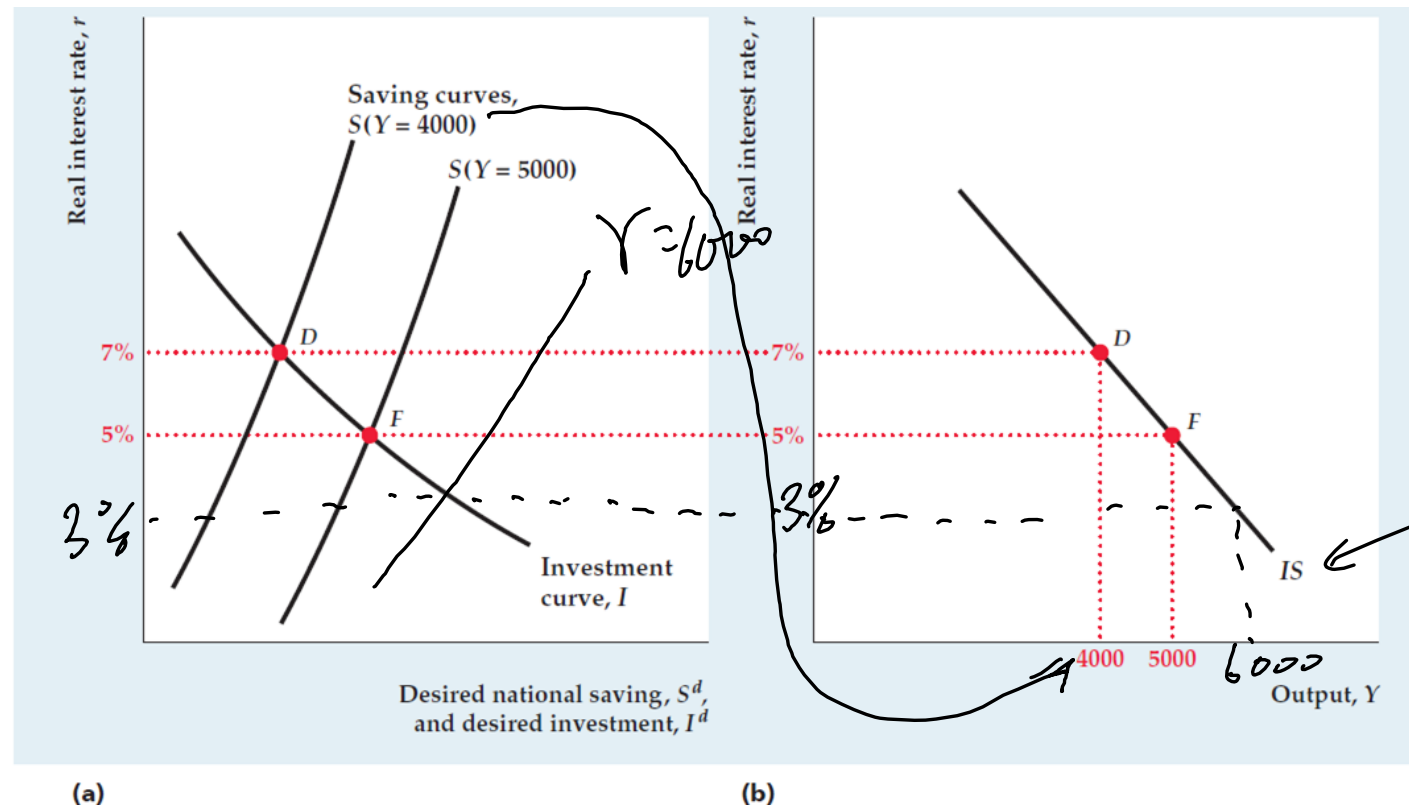
A(n)	Shifts the <i>FE</i> line	Reason
Beneficial supply shock	Right	<ol style="list-style-type: none"> 1. More output can be produced for the same amount of capital and labor. 2. If the <i>MPN</i> rises, labor demand increases and raises employment. <p>Full-employment output increases for both reasons.</p>
Increase in labor supply	Right	Equilibrium employment rises, raising full-employment output.
Increase in the capital stock	Right	<p>More output can be produced with the same amount of labor. In addition, increased capital may increase the <i>MPN</i>, which increases labor demand and equilibrium employment.</p>



The IS Curve: Equilibrium in the Goods Market

- The goods market clears when desired investment equals desired national saving
- Adjustments in the real interest rate bring about equilibrium
- For any level of output Y , the IS curve shows the real interest rate r for which the goods market is in equilibrium
- Derivation of the IS curve from the saving-investment diagram

Deriving the IS curve



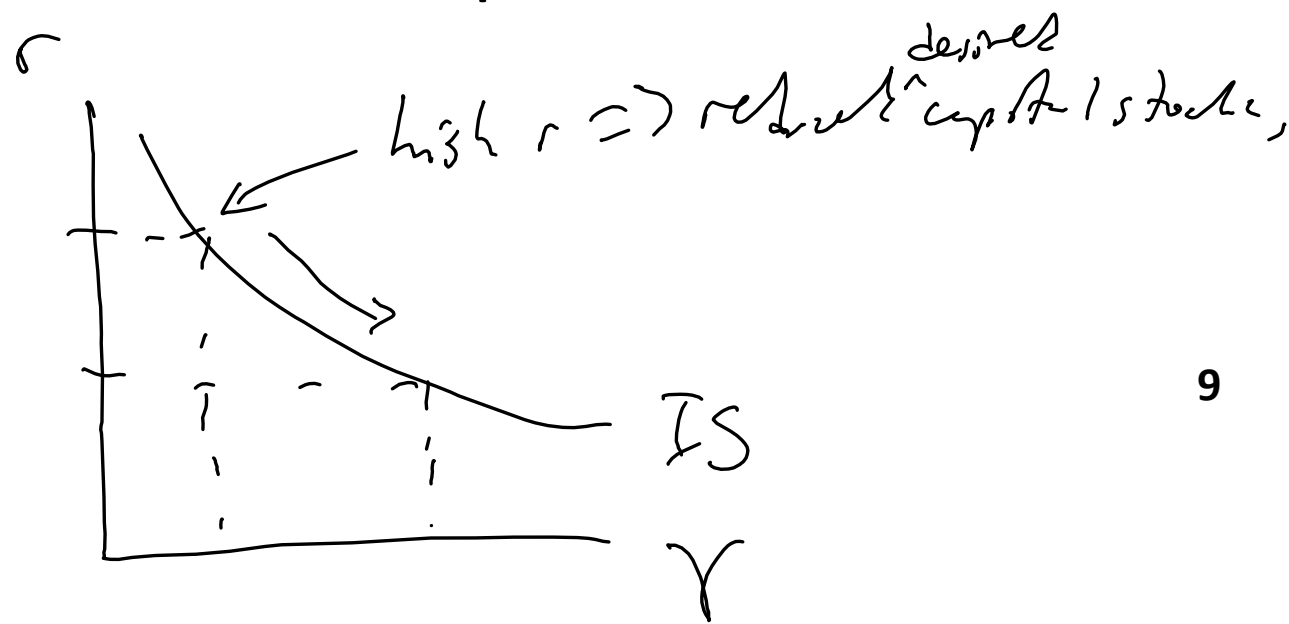
in the goods market, higher $r \Rightarrow$ lower Y

@ $Y = 4000$, equil. r in the goods market = 7%

@ $Y = 5000$, equil. r in the goods market = 5%

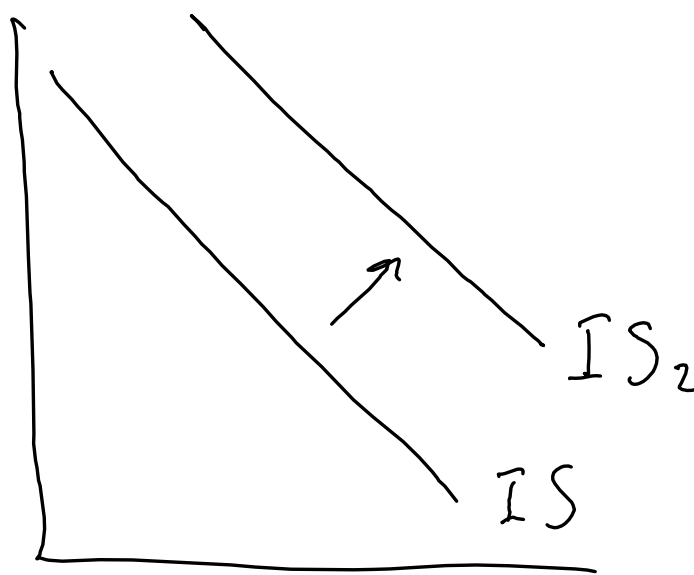
The IS Curve

- The saving curve slopes upward because a higher real interest rate increases saving
- An increase in output shifts the saving curve to the right, because people save more when their income is higher
- The investment curve slopes downward because a higher real interest rate reduces the desired capital stock, thus reducing investment

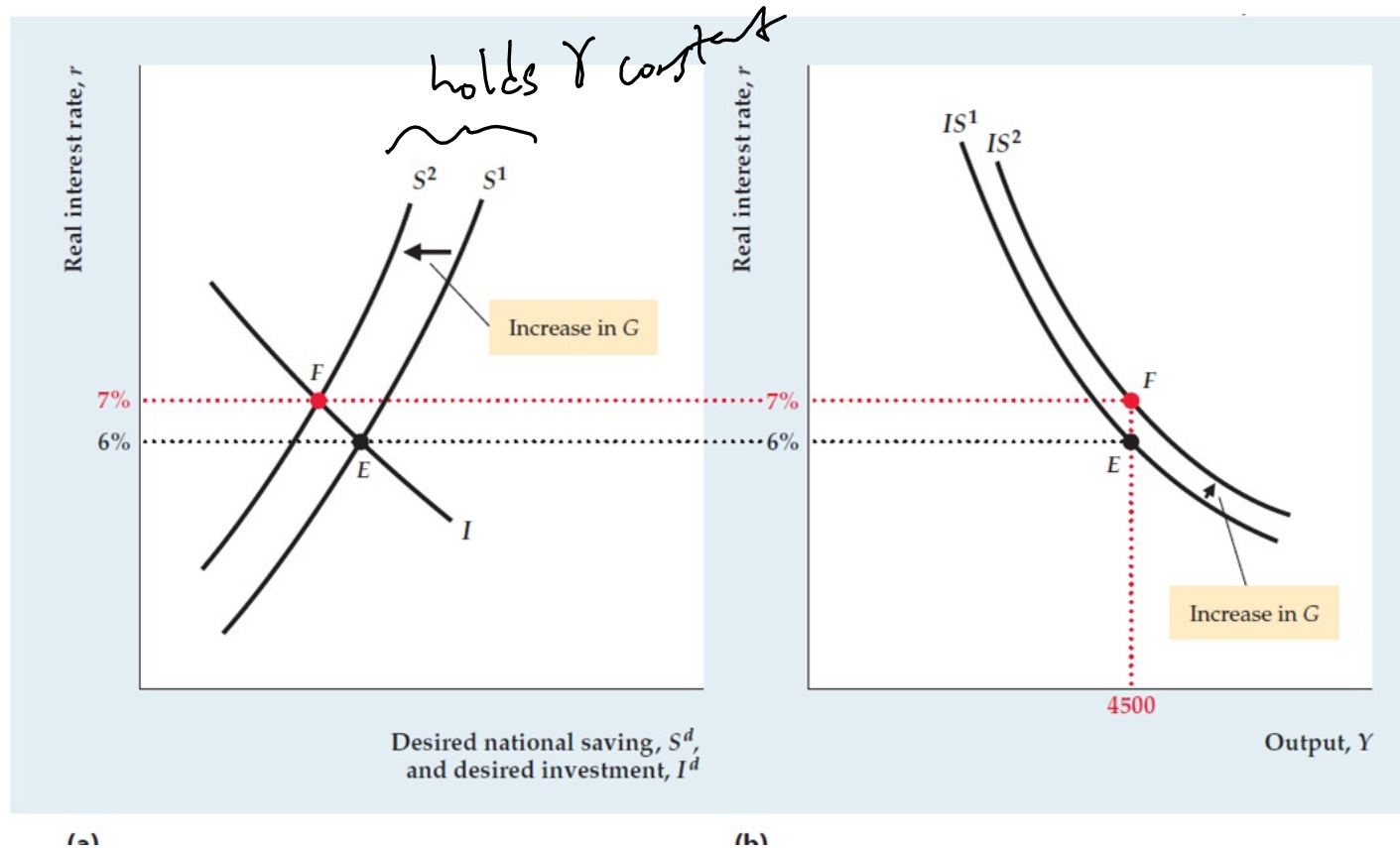


Factors that shift the IS curve

- Any change that reduces desired national saving relative to desired investment shifts the IS curve up and to the right
- Intuitively, imagine constant output, so a reduction in saving means more investment relative to saving; the interest rate must rise to reduce investment and increase saving
- A temporary increase in government spending reduces the savings rate since the government doesn't save



Effect on the IS curve of a temporary increase in government purchases



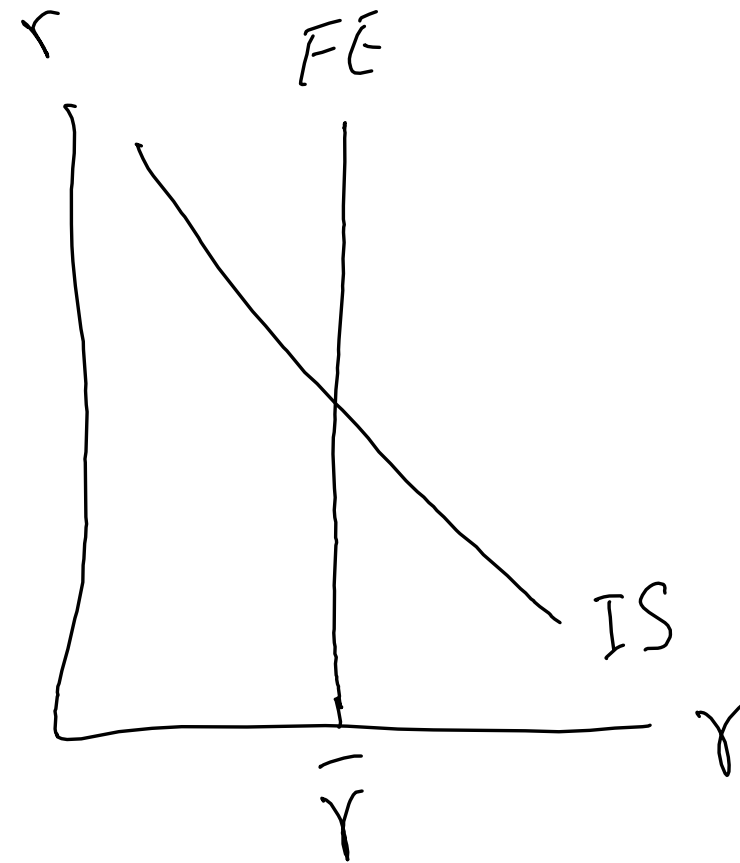
Factors That Shift the *IS* Curve

An increase in	Shifts the <i>IS</i> curve	Reason
Expected future output	Up and to the right	Desired saving falls (desired consumption rises), raising the real interest rate that clears the goods market.
Wealth	Up and to the right	Desired saving falls (desired consumption rises), raising the real interest rate that clears the goods market.

Government purchases, G	Up and to the right	Desired saving falls (demand for goods rises), raising the real interest rate that clears the goods market.
Taxes, T	No change or down and to the left	No change, if consumers take into account an offsetting future tax cut and do not change consumption (Ricardian equivalence); down and to the left, if consumers don't take into account a future tax cut and reduce desired consumption, increasing desired national saving and lowering the real interest rate that clears the goods market.

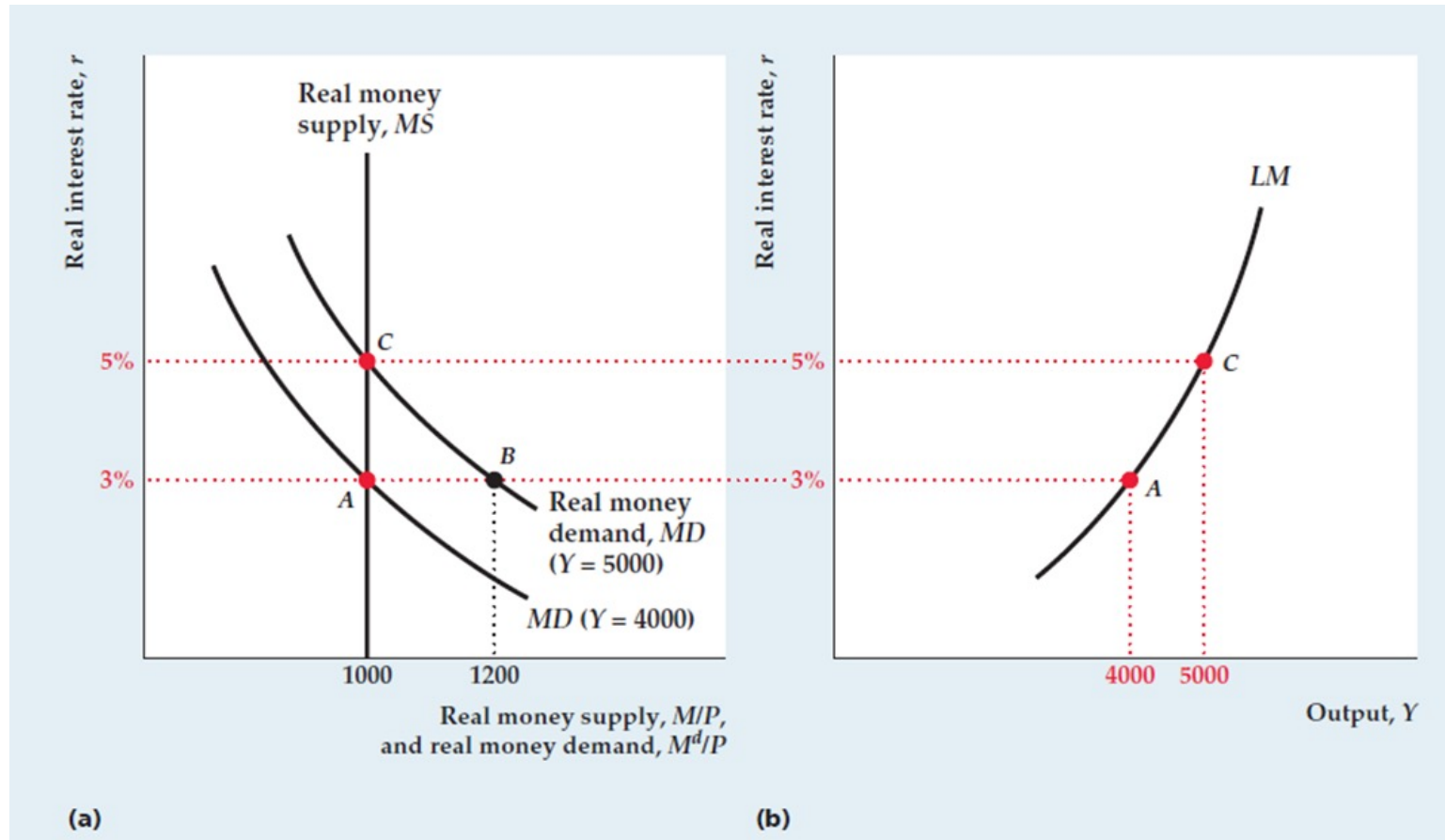
Expected future marginal product of capital, MPK^f	Up and to the right	Desired investment increases, raising the real interest rate that clears the goods market.
Effective tax rate on capital	Down and to the left	Desired investment falls, lowering the real interest rate that clears the goods market.

The LM Curve



The LM curve

↙ equilibrium in the money market

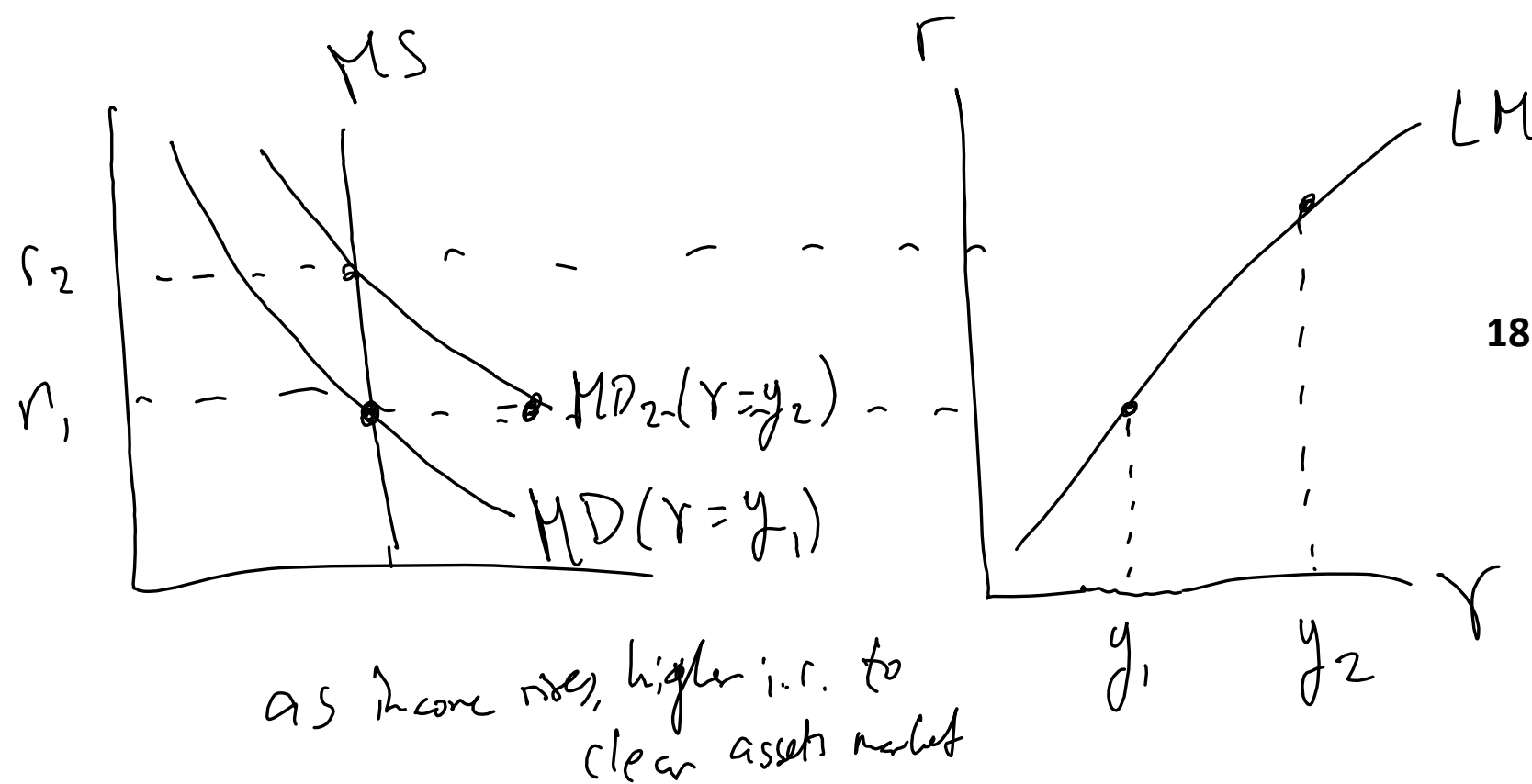


The LM Curve

- How is equilibrium restored?
 - Starting at equilibrium, suppose output rises, so real money demand curve shifts
 - The rise in people's demand for money makes them sell nonmonetary assets, so the price of those assets fall, and the real interest rate rises
 - As the interest rate rises, the demand for money declines until equilibrium is reached

The LM Curve

- The *LM* curve shows the combinations of the real interest rate and output that clear the asset market
 - For any given level of output, the *LM* curve shows the real interest rate necessary to equate real money demand and supply
 - Thus, the *LM* curve slopes upward from left to right



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Factors That Shift the LM Curve

SUMMARY 13

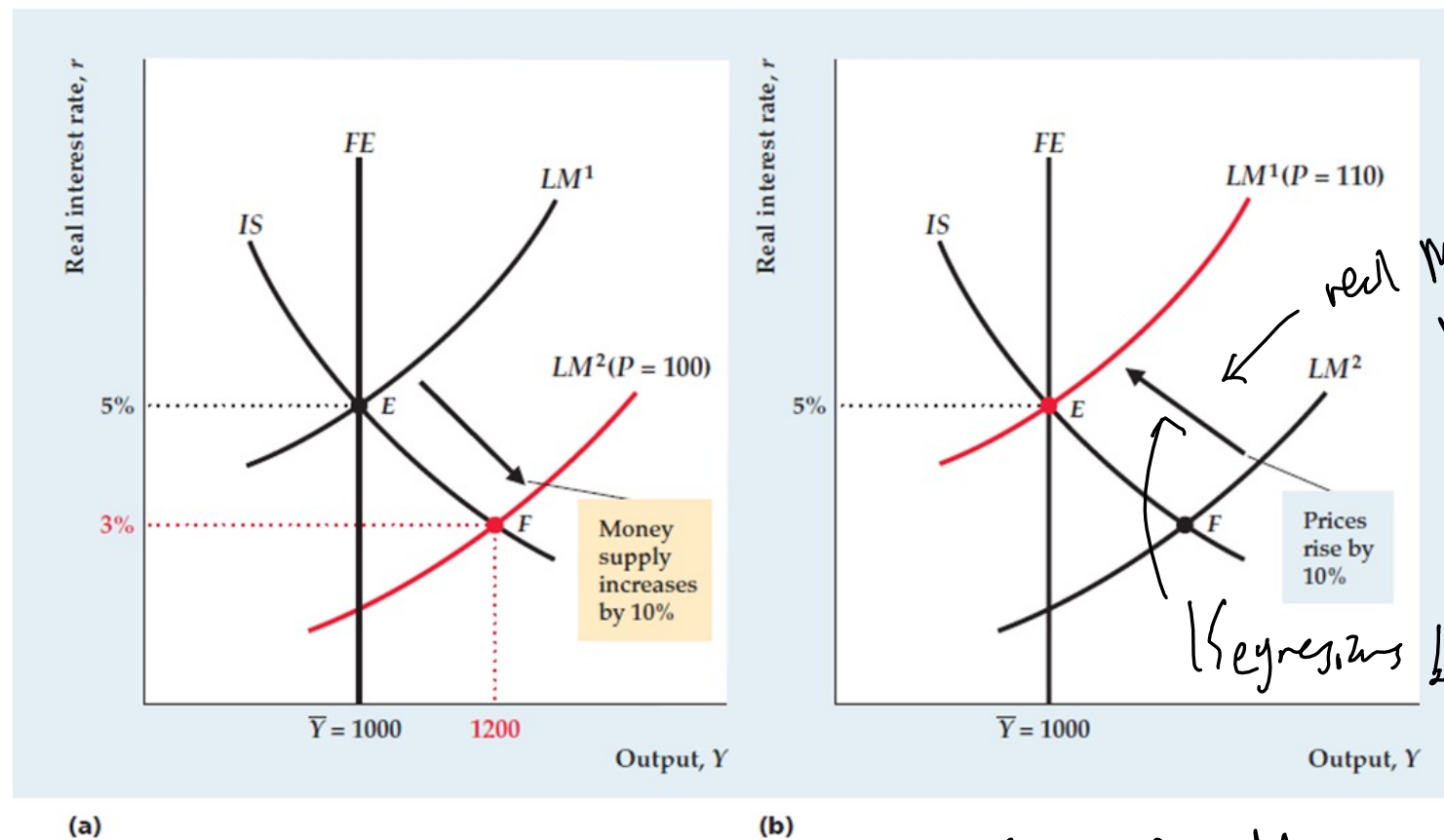
Factors That Shift the *LM* Curve

An increase in	Shifts the <i>LM</i> curve	Reason
Nominal money supply, M	Down and to the right	Real money supply increases, lowering the real interest rate that clears the asset market (equates money supplied and money demanded).
Price level, P	Up and to the left	Real money supply falls, raising the real interest rate that clears the asset market.
Expected inflation, π^e	Down and to the right	Demand for money falls, lowering the real interest rate that clears the asset market.
Nominal interest rate on money, i^m	Up and to the left	Demand for money increases, raising the real interest rate that clears the asset market.

In addition, for constant output, any factor that increases real money demand raises the real interest rate that clears the asset market and shifts the *LM* curve up and to the left. Other factors that increase real money demand (see Summary table 9, p. 259) include

- an increase in wealth;
- an increase in the risk of alternative assets relative to the risk of holding money;
- a decline in the liquidity of alternative assets; and
- a decline in the efficiency of payment technologies.

Effects of a monetary expansion

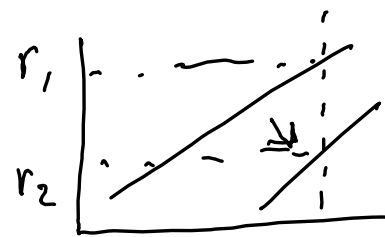
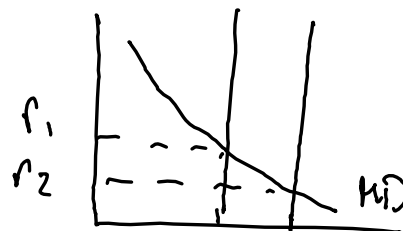


real money supply,
 $M/P \downarrow$, raising
 market clearing
 r for all Y

Regression between $P(t)$
 takes a long
 time

In LR, Money
 has no effect
 on real variables

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The effects of a monetary expansion

- The result is no change in employment, output, or the real interest rate
- The price level is higher by the same proportion as the increase in the money supply
- So all real variables (including the real wage) are unchanged, while nominal values (including the nominal wage) have risen proportionately with the change in the money supply

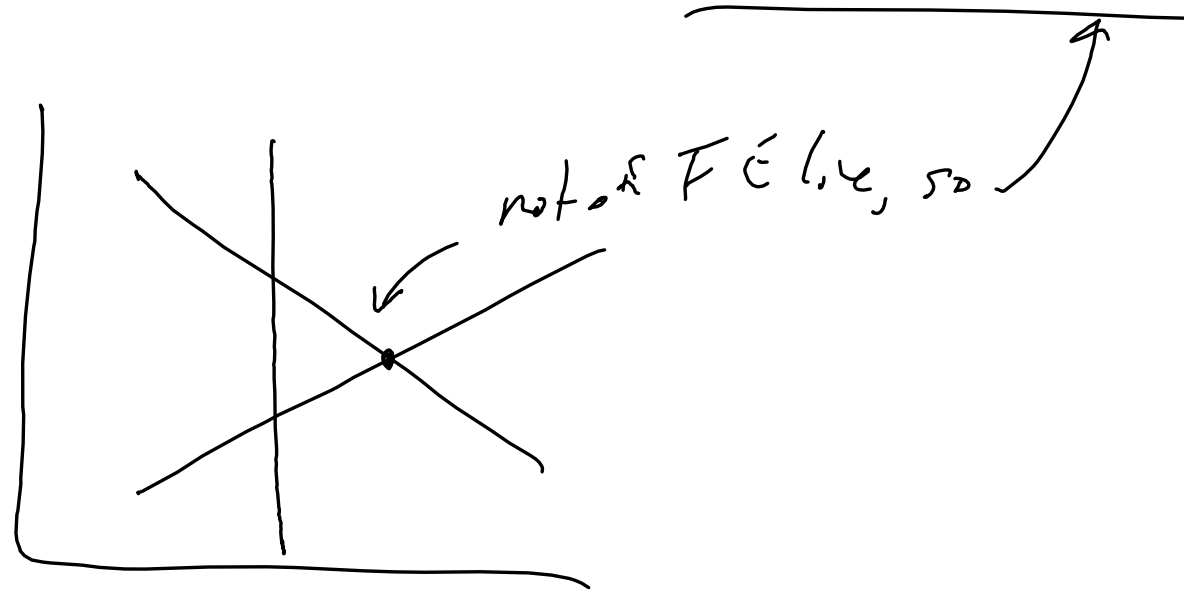
Classical versus Keynesian versions of the IS–LM model

Classical versus Keynesian versions of the IS–LM model

- There are two key questions in the debate between classical and Keynesian approaches
 - How rapidly does the economy reach general equilibrium?
 - What are the effects of monetary policy on the economy?
- Price adjustment and the self-correcting economy
 - The economy is brought into general equilibrium by adjustment of the price level
 - The speed at which this adjustment occurs is much debated

Classical versus Keynesian versions of the IS–LM model

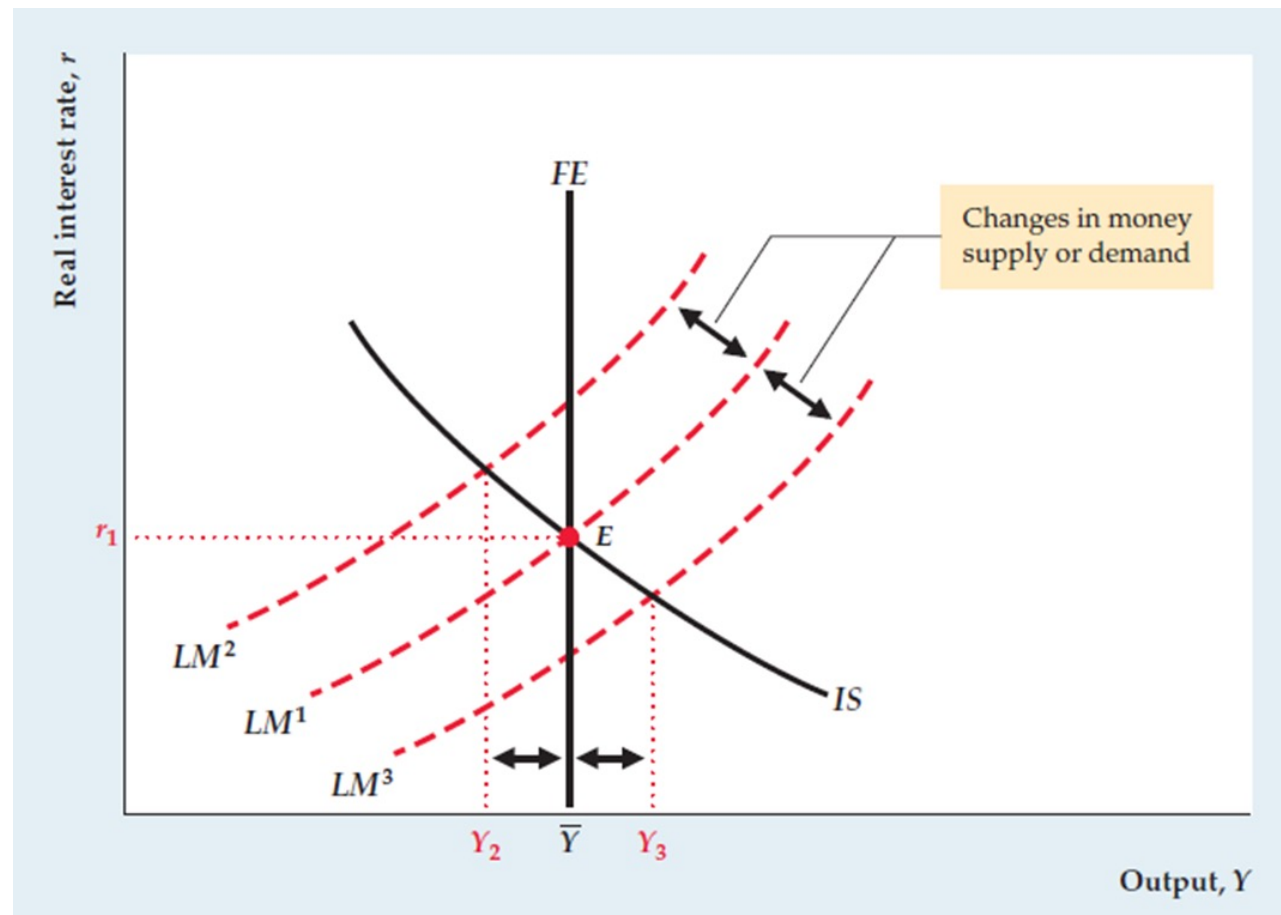
- Classical economists see rapid adjustment of the price level
 - So, the economy returns quickly to full employment after a shock
 - If firms change prices instead of output in response to a change in demand, the adjustment process is almost immediate *ie. expansion in MS does NOTHING by IS-LM*
- Keynesian economists see slow adjustment of the price level
 - It may be several years before prices and wages adjust fully
 - When not in general equilibrium, output is determined by aggregate demand at the intersection of the *IS* and *LM* curves, and the labor market is not in equilibrium



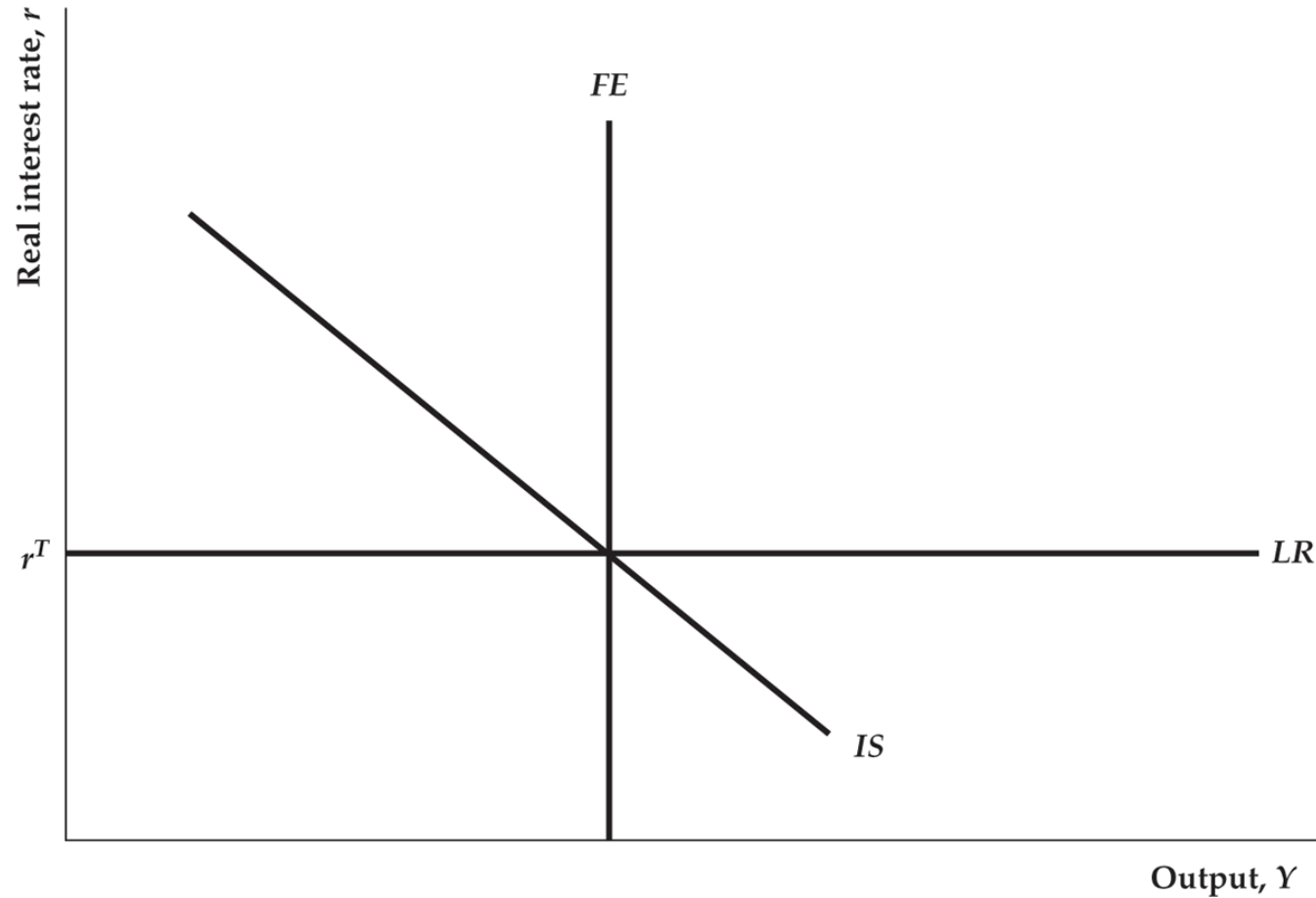
Targeting the federal funds rate

- The Fed uses intermediate targets to guide policy as a step between its tools or instruments (such as open-market purchases) and its goals or ultimate targets of price stability and stable economic growth
- Intermediate targets are variables the Fed can't directly control but can influence predictably, and they are related to the Fed's goals
- Most frequently used are monetary aggregates such as M1 and M2, and short-term interest rates, such as the fed funds rate
- The Fed cannot target both the money supply and the fed funds rate simultaneously
- Suppose both the money supply and the fed funds rate were above target, so the Fed needs to lower them
- Since a decrease in the money supply shifts the LM curve up, it will increase the fed funds rate
- In recent years the Fed has been targeting the fed funds rate

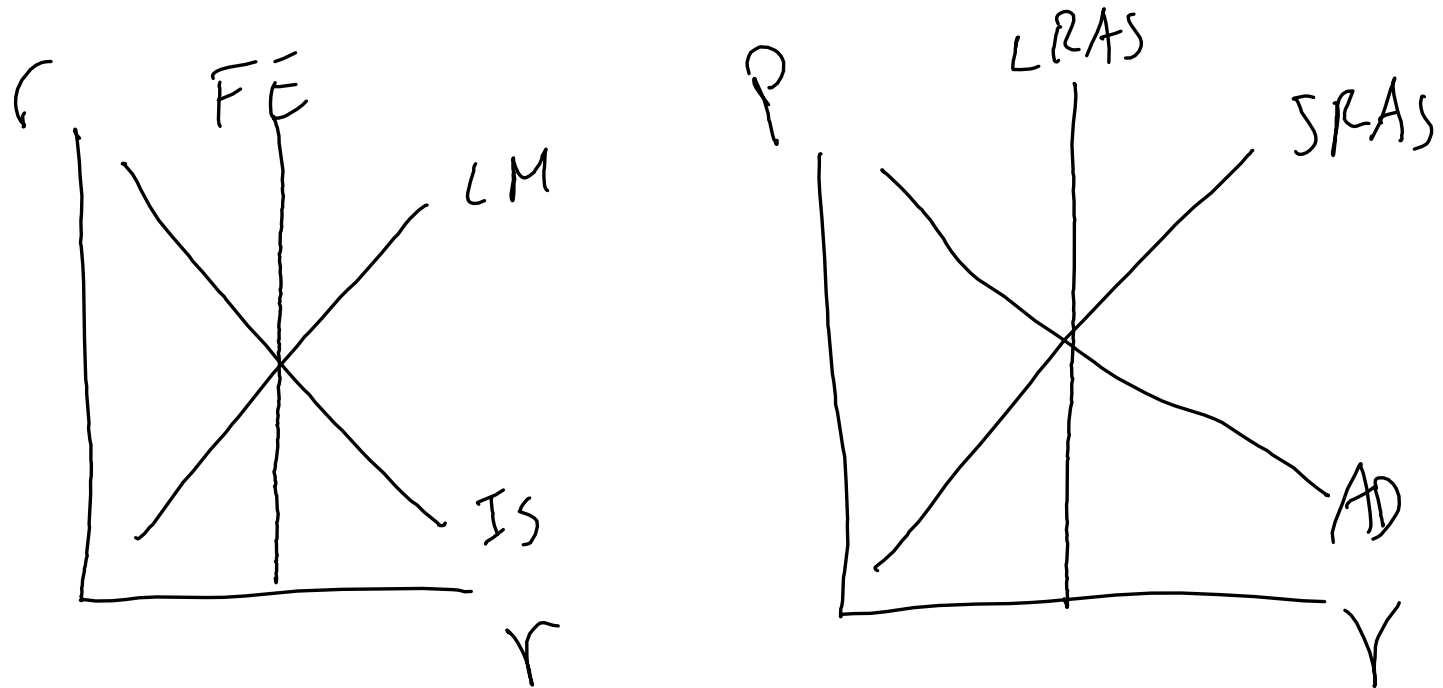
Targeting Money



Targeting an interest rate, the LR Curve



The AD-AS Model



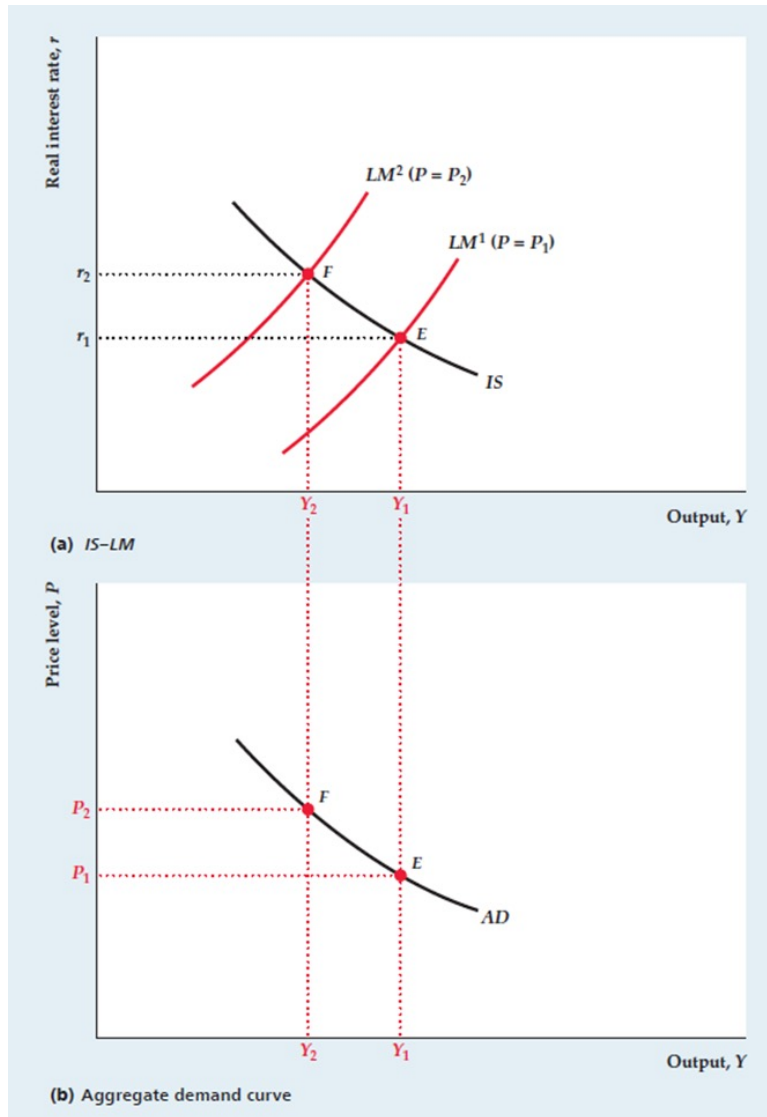
Aggregate Demand and Aggregate Supply

- IS–LM relates the real interest rate to output
- AD–AS relates the price level to output
- The AD-AS model is useful for long-run analysis; IS-LM useful for short-run analysis

The aggregate demand curve

- The *AD* curve shows the relationship between the quantity of goods demanded and the price level when the goods market and asset market are in equilibrium
- So the *AD* curve represents the price level and output level at which the *IS* and *LM* curves intersect (below)

Derivation of the aggregate demand curve



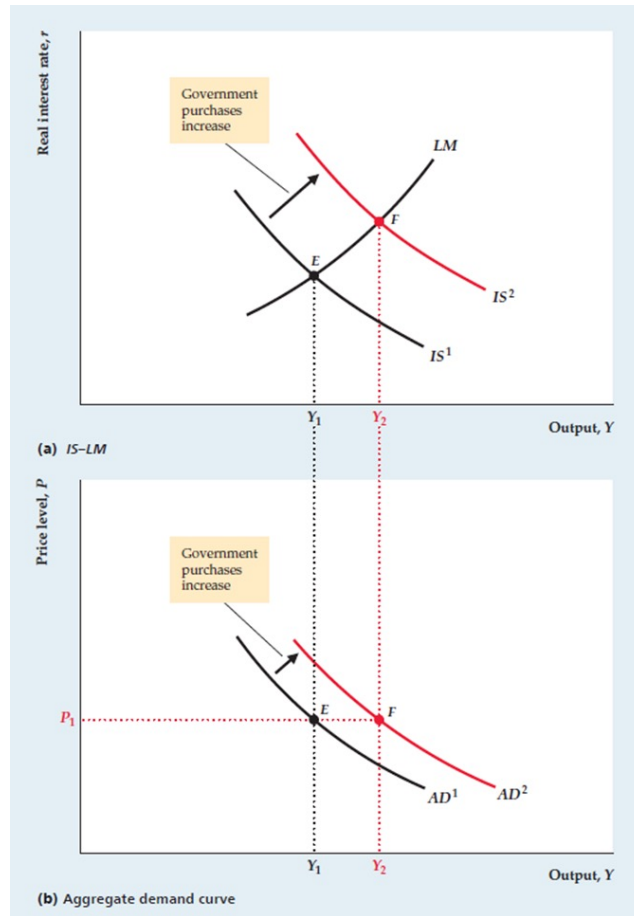
The aggregate demand curve

- The *AD* curve is unlike other demand curves, which relate the quantity demanded of a good to its relative price; the *AD* curve relates the total quantity of goods demanded to the general price level, not a relative price
- The *AD* curve slopes downward because a higher price level is associated with lower real money supply, shifting the *LM* curve up, raising the real interest rate, and decreasing output demanded

Factors that shift the AD curve

- Any factor that causes the intersection of the IS and LM curves to shift to the left causes the AD curve to shift down and to the left; any factor causing the IS–LM intersection to shift to the right causes the AD curve to shift up and to the right
- For example, a temporary increase in government purchases shifts the IS curve up and to the right, so it shifts the AD curve up and to the right as well (below)

The effect of an increase in government purchases on the aggregate demand curve



Factors that shift the AD curve

- Factors that shift the *IS* curve up and to the right and thus the *AD* curve up and to the right as well
 - Increases in future output, wealth, government purchases, or the expected future marginal productivity of capital
 - Decreases in taxes if Ricardian equivalence doesn't hold, or the effective tax rate on capital
- Factors that shift the *LM* curve down and to the right and thus the *AD* curve up and to the right as well
 - Increases in the nominal money supply or in expected inflation
 - Decreases in the nominal interest rate on money or the real demand for money

Factors That Shift the AD Curve

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Factors That Shift the *AD* Curve

For a constant price level, any factor that shifts the intersection of the *IS* and *LM* curves to the right increases aggregate output demanded and shifts the *AD* curve up and to the right.

Factors that shift the *IS* curve up and to the right, and thus shift the *AD* curve up and to the right (see Summary table 12, p. 319) include

- an increase in expected future output;
- an increase in wealth;
- an increase in government purchases, G ;
- a reduction in taxes, T (assuming no Ricardian equivalence so that consumers respond by raising desired consumption);
- an increase in the expected future MPK ; and
- a reduction in the effective tax rate on capital.

Factors that shift the *LM* curve down and to the right, and thus shift the *AD* curve up and to the right (see Summary table 13, p. 325) include

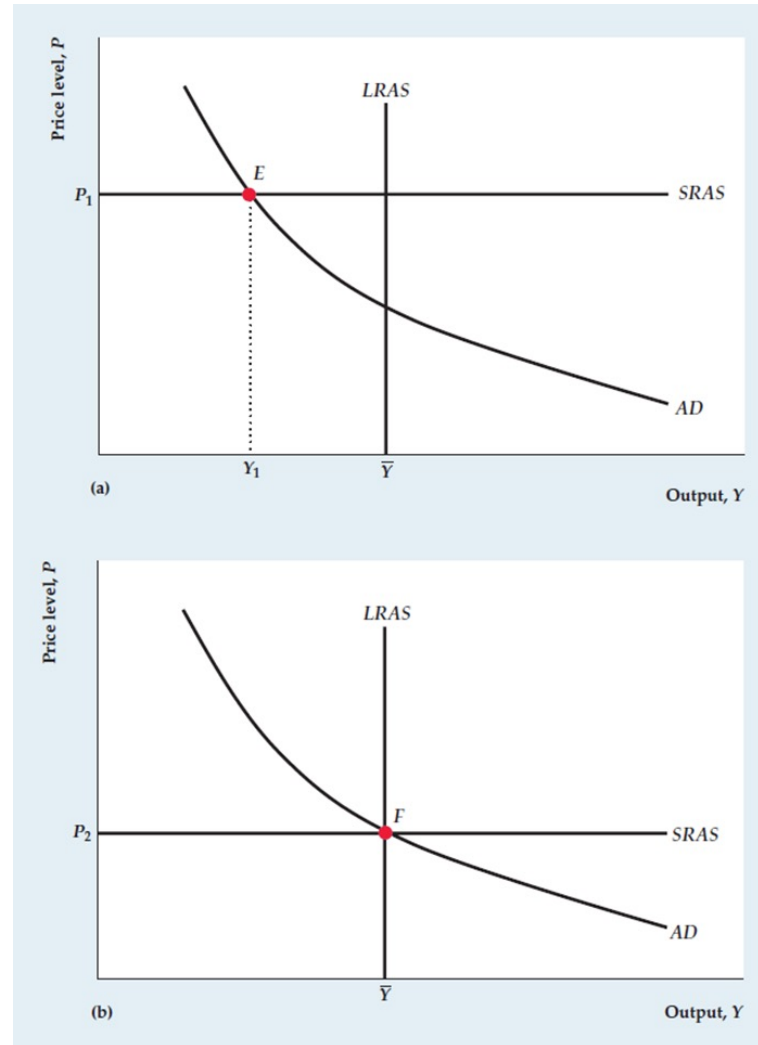
- an increase in the nominal money supply, M ;
- a rise in expected inflation, π^e ;
- a decrease in the nominal interest rate on money, i^m ; and
- any other change that reduces the real demand for money.

Equilibrium in the AD–AS model

Equilibrium in the AD–AS model

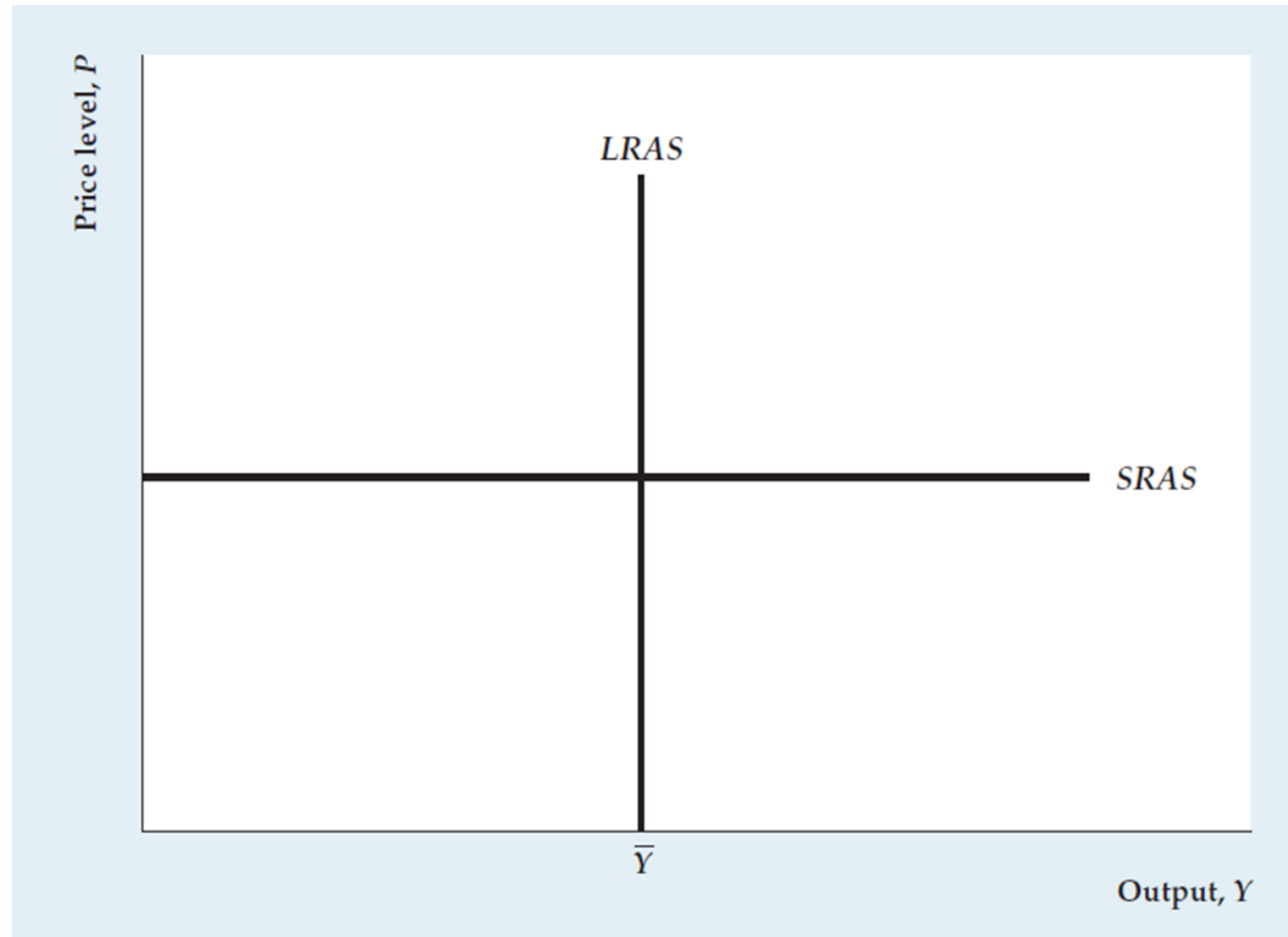
- Short-run equilibrium: *AD* intersects *SRAS*
- Long-run equilibrium: *AD* intersects *LRAS*

Equilibrium in the AD-AS model



The Aggregate Supply Curve

The short-run and long-run aggregate supply curves



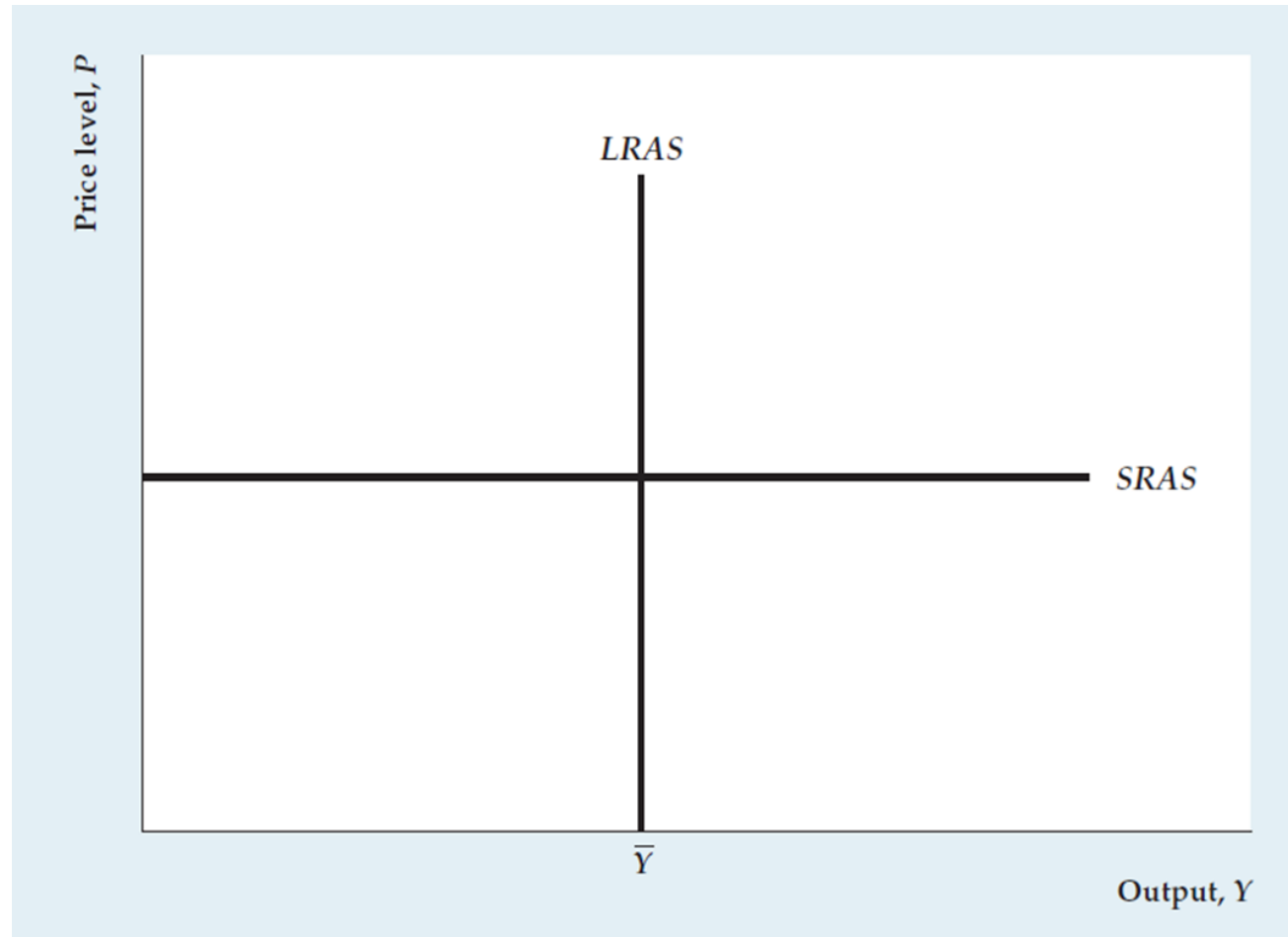
Factors that shift the aggregate supply curves

- The SRAS curve shifts whenever firms change their prices in the short run
 - Factors like increased costs of producing goods lead firms to increase prices, shifting SRAS up
 - Factors leading to reduced prices shift SRAS down
- Anything that increases full-employment output shifts the LRAS curve right; anything that decreases full-employment output shifts LRAS left
 - Examples include changes in the labor force or productivity changes that affect labor demand

The aggregate supply curve

- Full-employment output isn't affected by the price level, so the long-run aggregate supply curve (LRAS) is a vertical line
- Factors that shift the aggregate supply curves
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The short-run and long-run aggregate supply curves



Equilibrium in the AD–AS model

Equilibrium in the AD–AS model

- Short-run equilibrium: *AD* intersects *SRAS*
- Long-run equilibrium: *AD* intersects *LRAS*

Equilibrium in the AD-AS model

