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Spring 2018   Professor David Romer

LECTURE 24

INFLATION AND THE RETURN OF OUTPUT TO POTENTIAL

April 19, 2018

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LECTURE 24
Inflation Adjustment and the Return to Full Employment

April 19, 2018

Announcement

- We have handed out Problem Set 6.

  - It is due at the start of lecture on Thursday, April 26th.

  - Problem set work session next Monday, April 23rd, 6:00–8:00 p.m., in 648 Evans.

I. OVERVIEW

Key Idea #1: Inflation doesn't change in the short run, but over time, it responds to the difference between actual and potential output.

In the absence of other shocks:

- When $Y > Y^*$, inflation rises.

- When $Y < Y^*$, inflation falls.

- When $Y = Y^*$, inflation holds steady.

Key Idea #2: Monetary policy responds to inflation.

- When inflation rises, the Fed raises nominal and real interest rates.

- When inflation falls, the Fed lowers nominal and real interest rates.

- When inflation is steady, the Fed holds nominal and real interest rates steady.

The Fed's Reaction Function
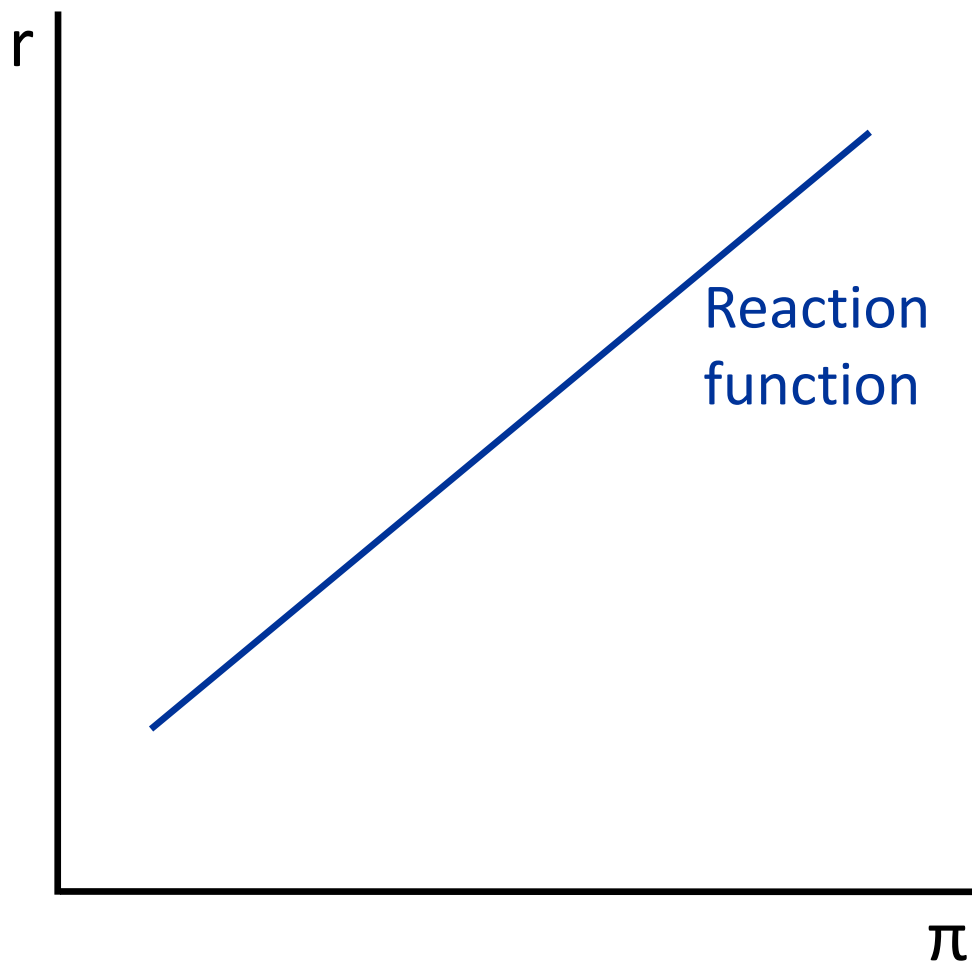
Key Idea #3: The Fed's response to inflation feeds back to the economy.

- Changes in r change planned aggregate expenditure (the PAE line).

- The shifts of the PAE line change output.

Key Idea #4: The economy is in long-run equilibrium when output is equal to potential.

- If Y is not equal to Y*, inflation is changing, and so r is changing, and so Y is changing: the economy is not in long-run equilibrium.

- If Y is equal to Y*, inflation is steady, and so r is steady, and so Y is steady: the economy is in long-run equilibrium.

Key Idea #5: The r in the long-run equilibrium we have just described is the same as the r* from our long-run saving and investment diagram.

# II. HOW OUTPUT RETURNS TO POTENTIAL

The Fed's response to inflation feeds back to the economy: An initial situation
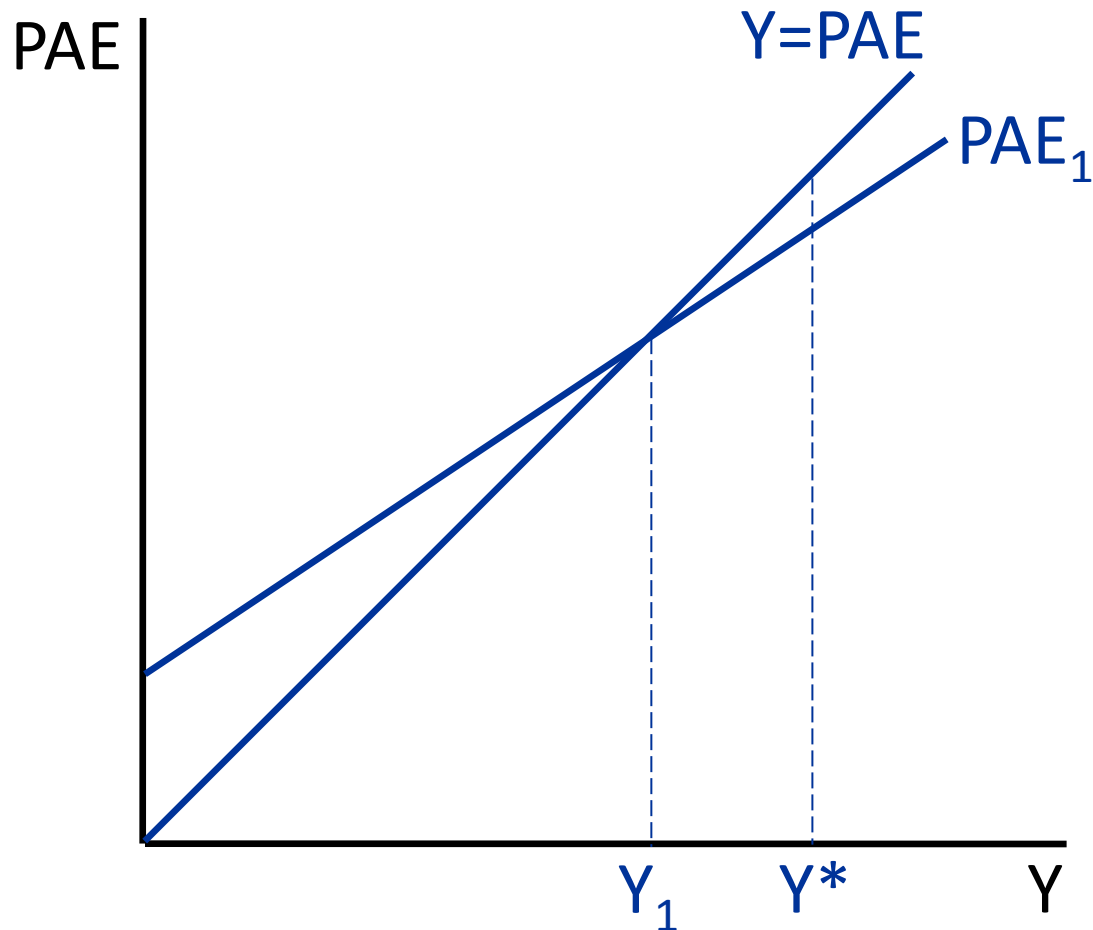
What Happens over Time?

- If Y_1 is not equal to Y*, after a while inflation starts to change.

- In our example, Y_1 < Y*, so inflation falls.

- As inflation falls, the Fed, following its reaction function, lowers r.

- The reductions in r increase C at a given Y and increase I^p, and so shift the PAE line up and raise Y.

Moving toward Y*
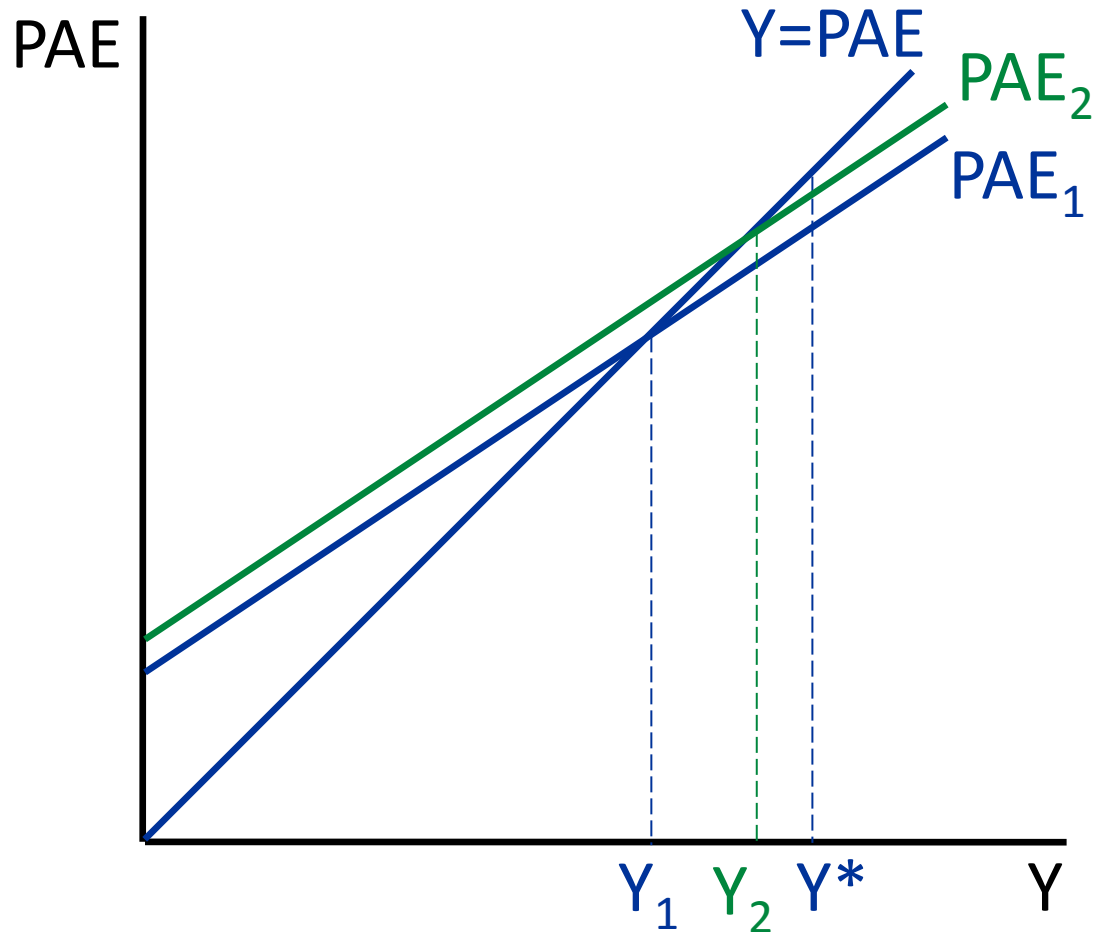
As the Fed lowers r as inflation falls, the PAE line shifts up.

Key Idea #3: The Fed's response to inflation feeds back to the economy.

- Changes in r change planned aggregate expenditure (the PAE line).

- The shifts of the PAE line change output.

Reaching Long-Run Equilibrium

- As long as $Y \neq Y^*$, inflation continues to change, so the Fed continues to change r, and so Y continues to change: the economy is not in long-run equilibrium.

- In our example, $Y < Y^*$, so inflation continues to fall, so the Fed continues to lower r, so the PAE continues to shift up, so Y continues to rise.

- The process continues until $Y = Y^*$. That is when the economy is in long-run equilibrium.

- Note: For simplicity, we ignore the fact the Y^* is growing during this process.

Reaching Long-Run Equilibrium
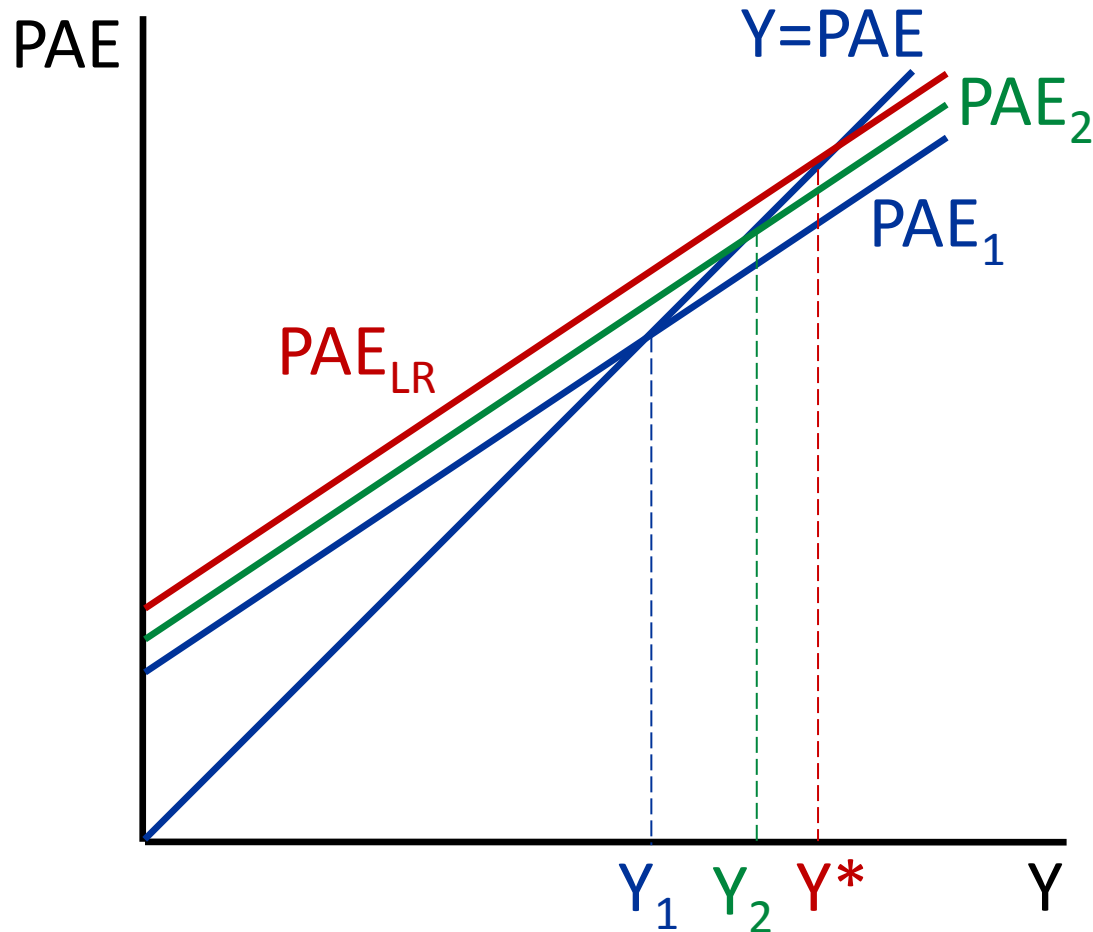
The economy is in long-run equilibrium when the PAE line intersects the 45 degree line at Y=Y*.

Long-Run Equilibrium

- When Y = Y*, there is no force acting to change inflation, and so π, r, the PAE line, and Y all stay the same—until some shock hits the economy.

- Notice that in the adjustment process, the PAE line moves (because of movements in inflation changing the Fed's choice of the real interest rate) until it crosses the 45 degree line at Y*.

Key Idea #4: The economy is in long-run equilibrium when output is equal to potential.

- If Y is not equal to Y*, inflation is changing, and so r is changing, and so Y is changing: the economy is not in long-run equilibrium.

- If Y is equal to Y*, inflation is steady, and so r is steady, and so Y is steady: the economy is in long-run equilibrium.

The Timing of the Return to Potential

- The short run (little noticeable change in inflation): perhaps 6 months to a year.

- The time it takes to get essentially all the way back to potential:

  - Usually 3–5 years.

  - But, sometimes substantially longer.

S, I, and r in Long-Run Equilibrium – Overview

- The real interest rate at the long-run equilibrium we have just described is the same as r* from our long-run saving and investment diagram. (This is Key Idea #5.)

- Implication: The long-run saving and investment diagram is (still) the right tool to use to understand how saving, investment, and the real interest rate behave in the long run.

Saving, Investment, and the Real Interest Rate in Long-Run Equilibrium
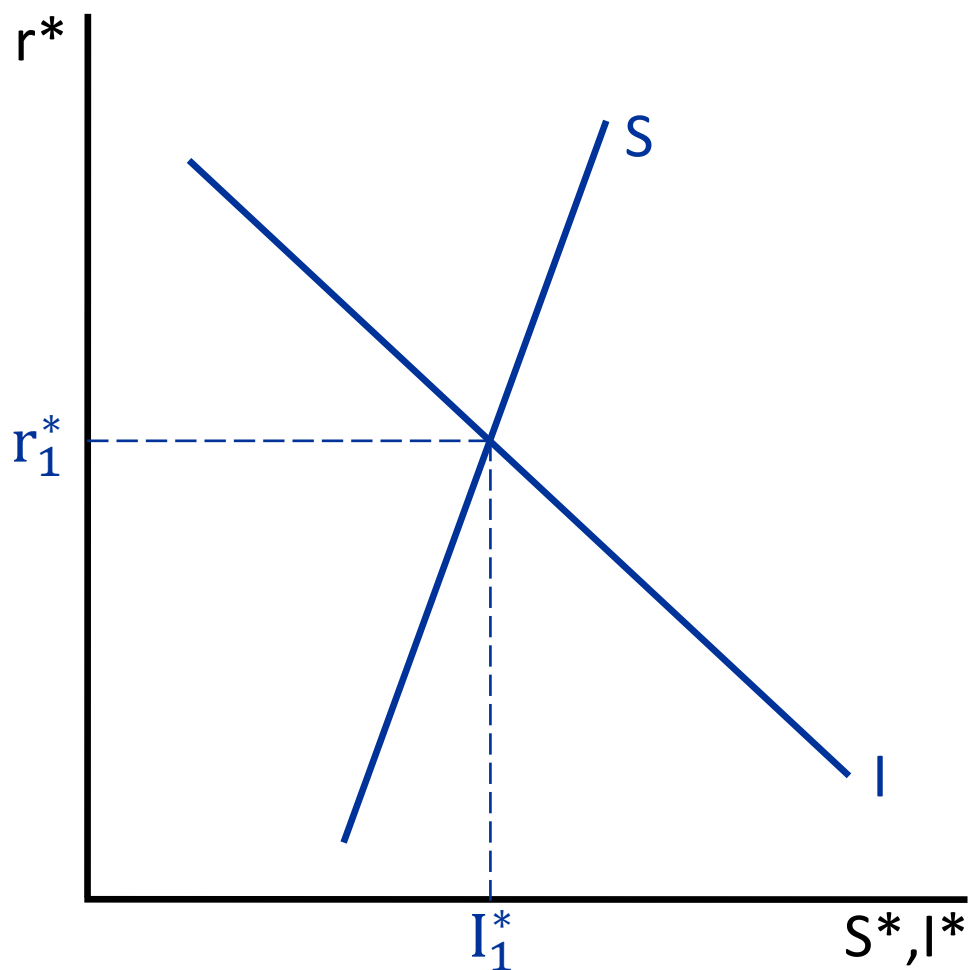
S, I, and r in Long-Run Equilibrium – Details

- Recall: **The economy's normal real interest rate, r*, is the real interest rate at which Y* − C* − G = I*,** where C* is consumption when Y = Y* and I* is normal investment.

- In the long-run equilibrium we've just described (where PAE crosses the 45 degree line at Y = Y*), Y* = C* + I* + G, or Y* − C* − G = I*. C* and I* depend on r. Thus, **the r at that long-run equilibrium is the real interest rate at which Y* − C* − G = I*.**

- Conclusion: The real interest rate at the long-run equilibrium we have just described is the same as r* from our long-run saving and investment diagram.

Key Idea #5: The r in the long-run equilibrium we have just described is the same as the r* from our long-run saving and investment diagram.

Additional Implications

- Implication #1: The Fed has no choice about the real interest rate in the long run.

    - It must be the real interest rate where S* = I*.

- Implication #2: When the Fed chooses its reaction function, it is (implicitly or explicitly) choosing what inflation will be in the long run.

The Long-Run Inflation Rate Implied by the Reaction Function
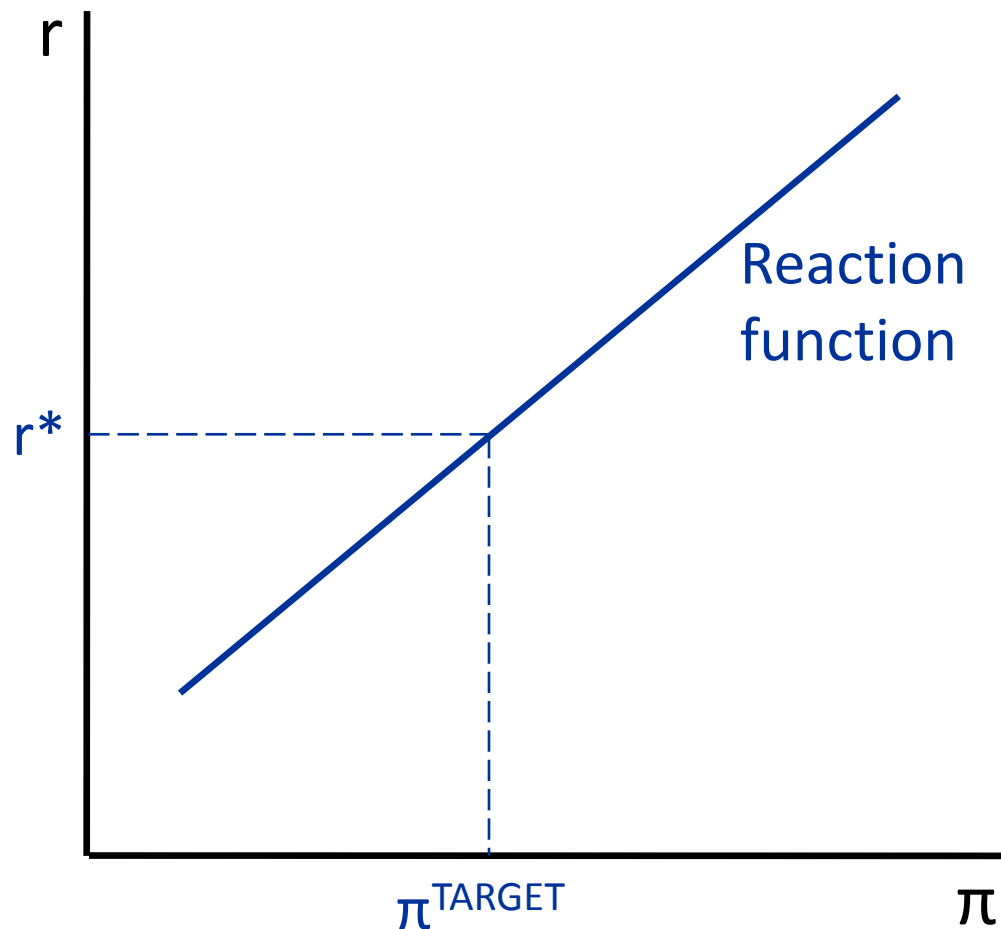
A Key Message of All This

- In the long run, ouptut is equal to its normal or potential level.

III. Application #1: An Increase in Government Purchases

The Experiment

- The economy starts in long-run equilibrium.

- There is then a permanent increase in government purchases, G.

- As always when we change G (unless we explicitly say otherwise), we are holding T fixed.

The Short Run
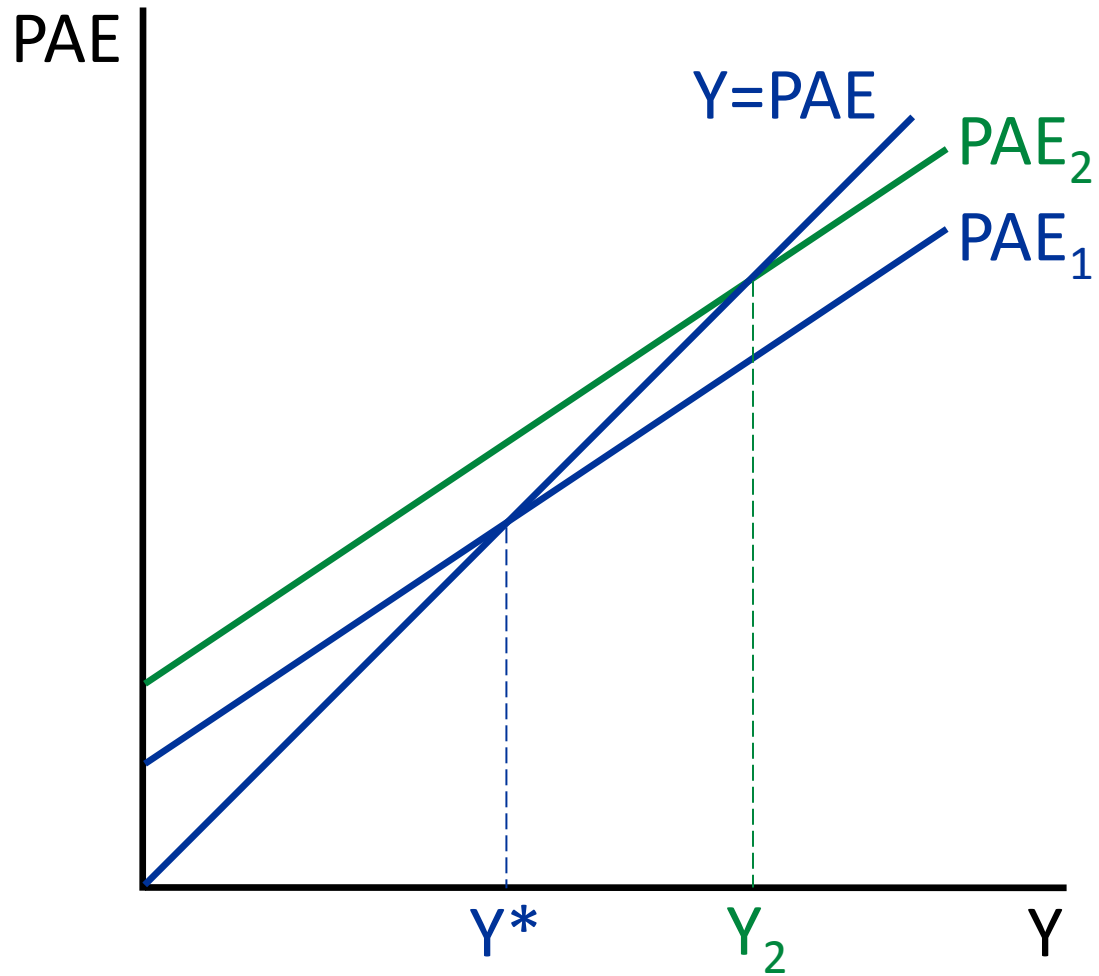
The Short-Run Effects

- The PAE line shifts up.

- Y rises (by more than the amount of the upward shift in PAE, because of the multiplier).

- Inflation does not change (nominal rigidity).

- So r does not change.

Returning to Potential Output

- Y > Y*, so after a while inflation starts to rise.

- As inflation rises, the Fed, following its reaction function, raises r.

- The increases in r shift the PAE line down and lower Y.
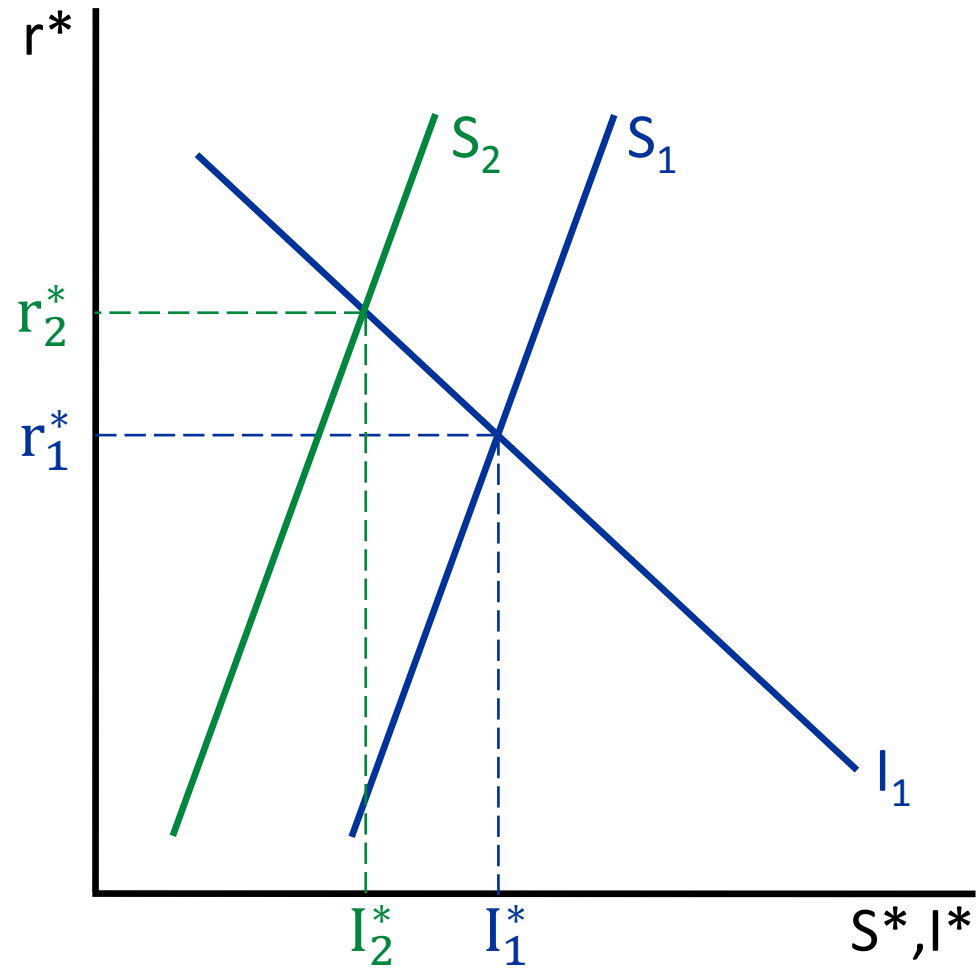
- The process continues until we are back at Y*.

Returning to Potential Output
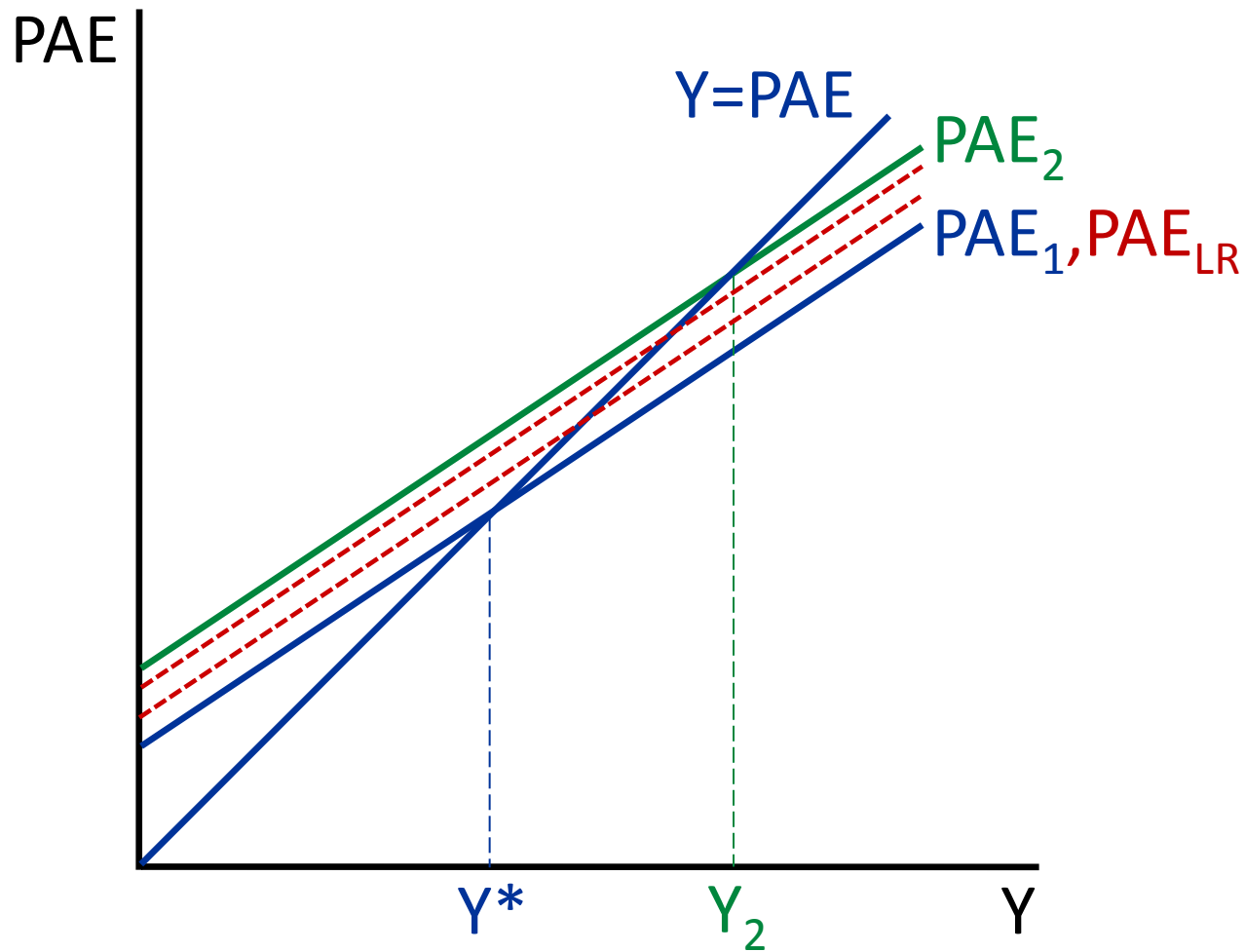
The Long-Run Effects

- Y is back at Y*.

- What about r, I, and C in the long run?

S, I, and r in the Long Run

The tax cut raises r and lowers I in the long run.

The Long-Run Effects

- Y is back at Y*.

- What about r, I, and C in the long run?

- The long-run saving and investment diagram shows that r is higher in the long run.

- Since I and C are both decreasing functions of r, they are both lower in the long run.

- So: The increase in government purchases has changed the composition of output.

# Another Way to See the Long-Run Effect on r (and Hence on I and C)

- Y is back at Y*.

- The Fed raised r in response to the increase in inflation.

- Thus, r is higher in the long run.

- Since I and C are both decreasing functions of r, they are both lower in the long run.

- This approach gives the same answer as the long-run saving and investment diagram—but the long-run saving and investment diagram is easier.

IV. APPLICATION #2: THE FED REDUCES INFLATION

The Experiment

- The economy starts in long-run equilibrium.

- There is then a permanent upward shift of the reaction function—at a given rate of inflation, the Fed sets a higher real interest rate than before.
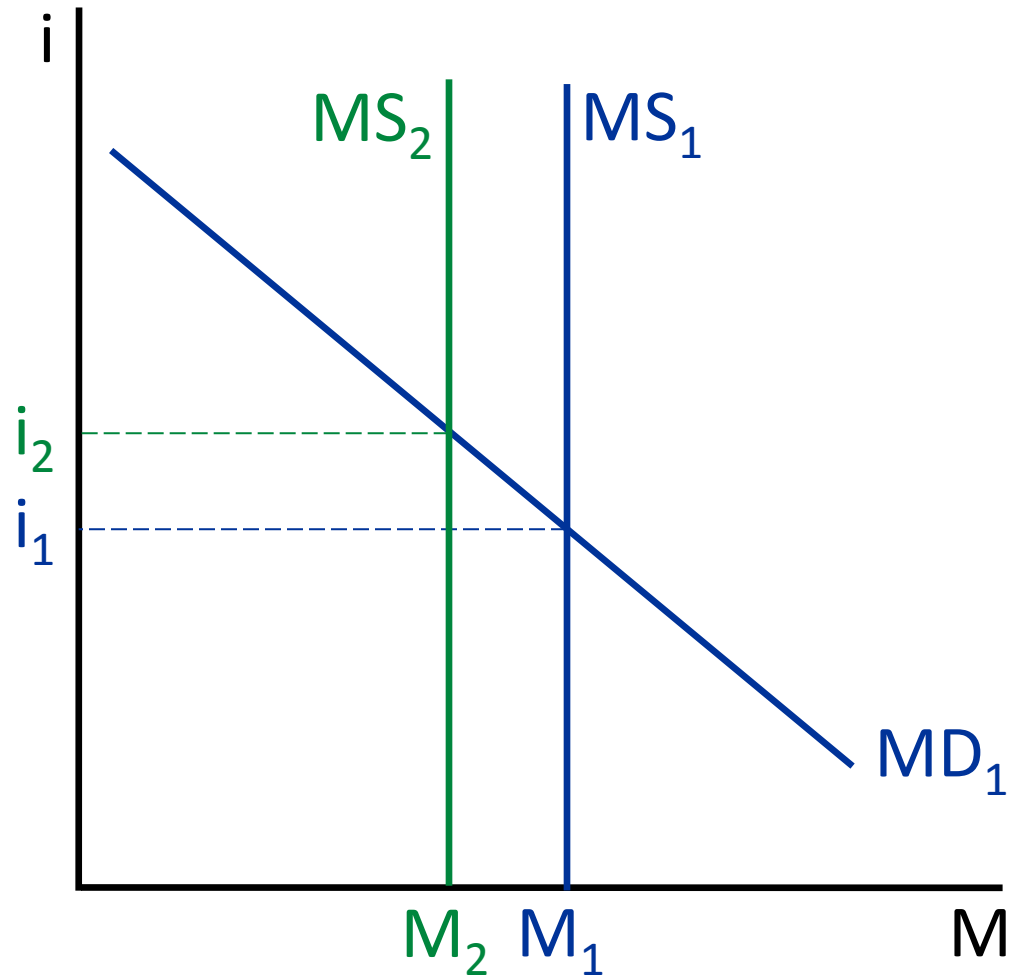
An Upward Shift of the Reaction Function
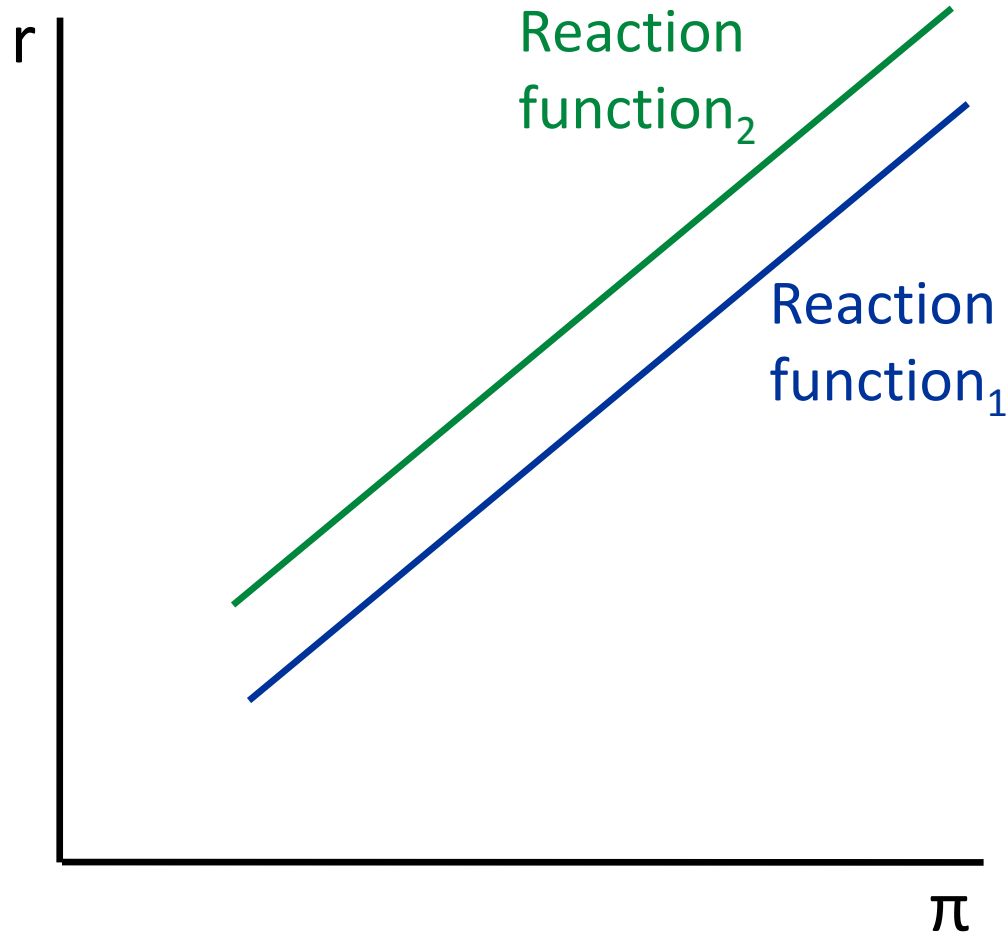
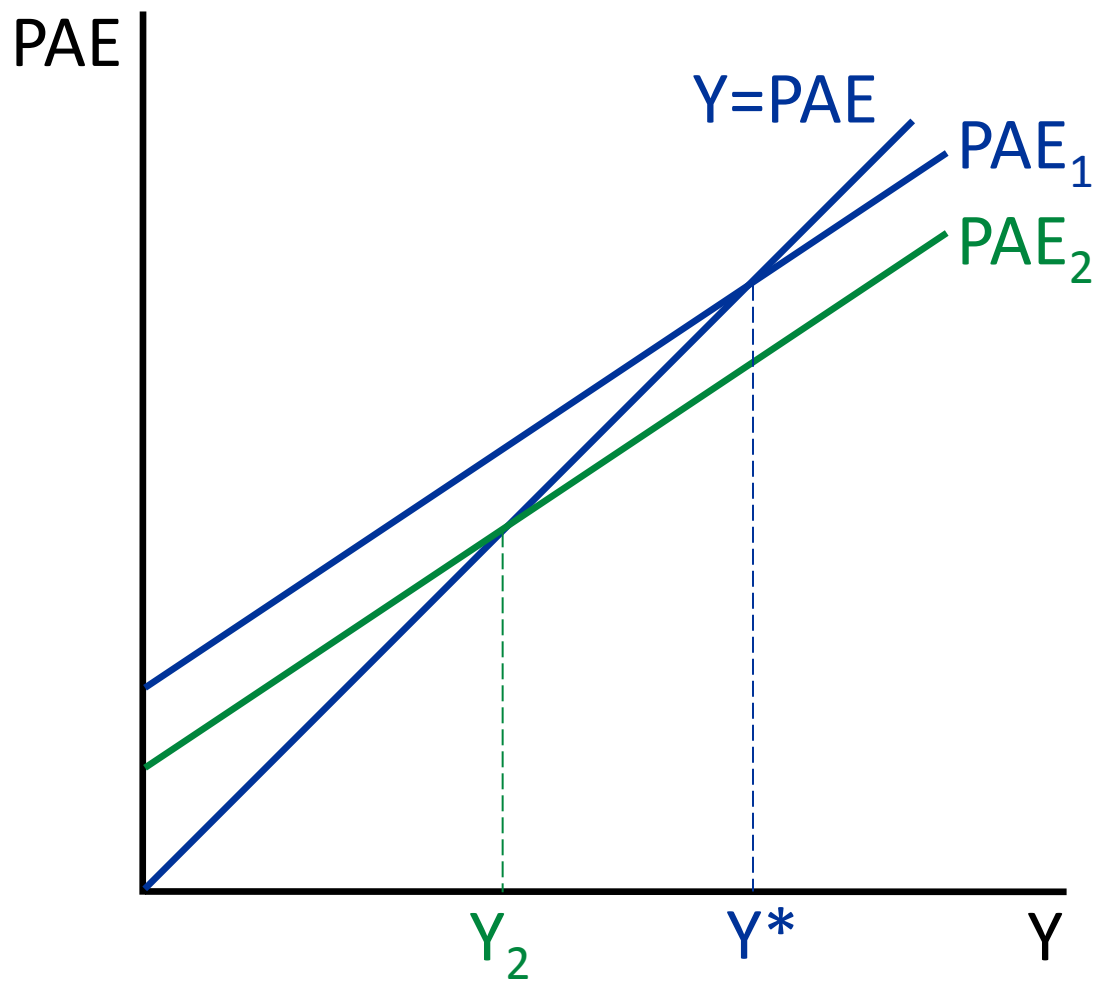# The Short-Run Effects on Inflation and the Real Interest Rate

- Inflation does not change (nominal rigidity).

- r does change (because of the shift of the reaction function).

How the Fed Increases the Real Interest Rate

The Fed sells bonds and, in doing so, reduces the money supply.

The Short Run

The Short-Run Effects

- Inflation does not change (nominal rigidity).

- r does change (because of the shift of the reaction function).

- The PAE line shifts down.

- Y falls (by more than the amount of the downward shift in PAE, because of the multiplier).

Returning to Potential Output

- $Y < Y^*$, so after a while inflation starts to fall.

- As inflation falls, the Fed, following its reaction function, lowers r.

- The decreases in r shift the PAE line up and raise Y.

- The process continues until we are back at Y^*.

Returning to Potential Output
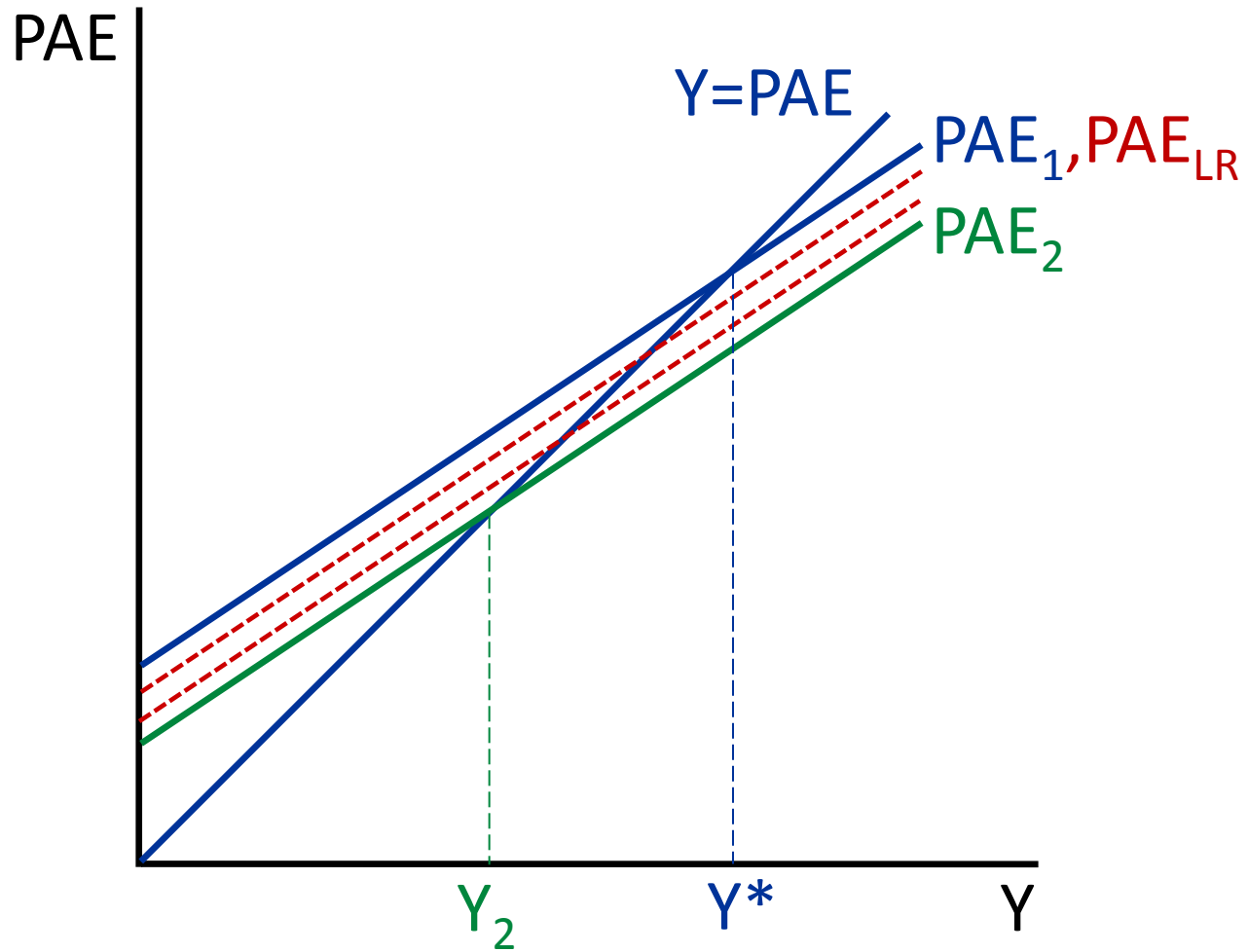
The Long-Run Effect on Inflation

- Y is back at Y*.

- Inflation was falling the whole time Y was below Y*, and there was never a period when Y was above Y*.

- Thus, inflation is lower in the long run.

The Long-Run Effect on the Real Interest Rate

- Y is back at Y*.

- r rose sharply when the Fed adopted its new reaction function, then fell gradually. So the overall effect isn't immediately obvious.

- But: Recall that the best way to analyze the long-run behavior of r is to use the long-run saving and investment diagram.
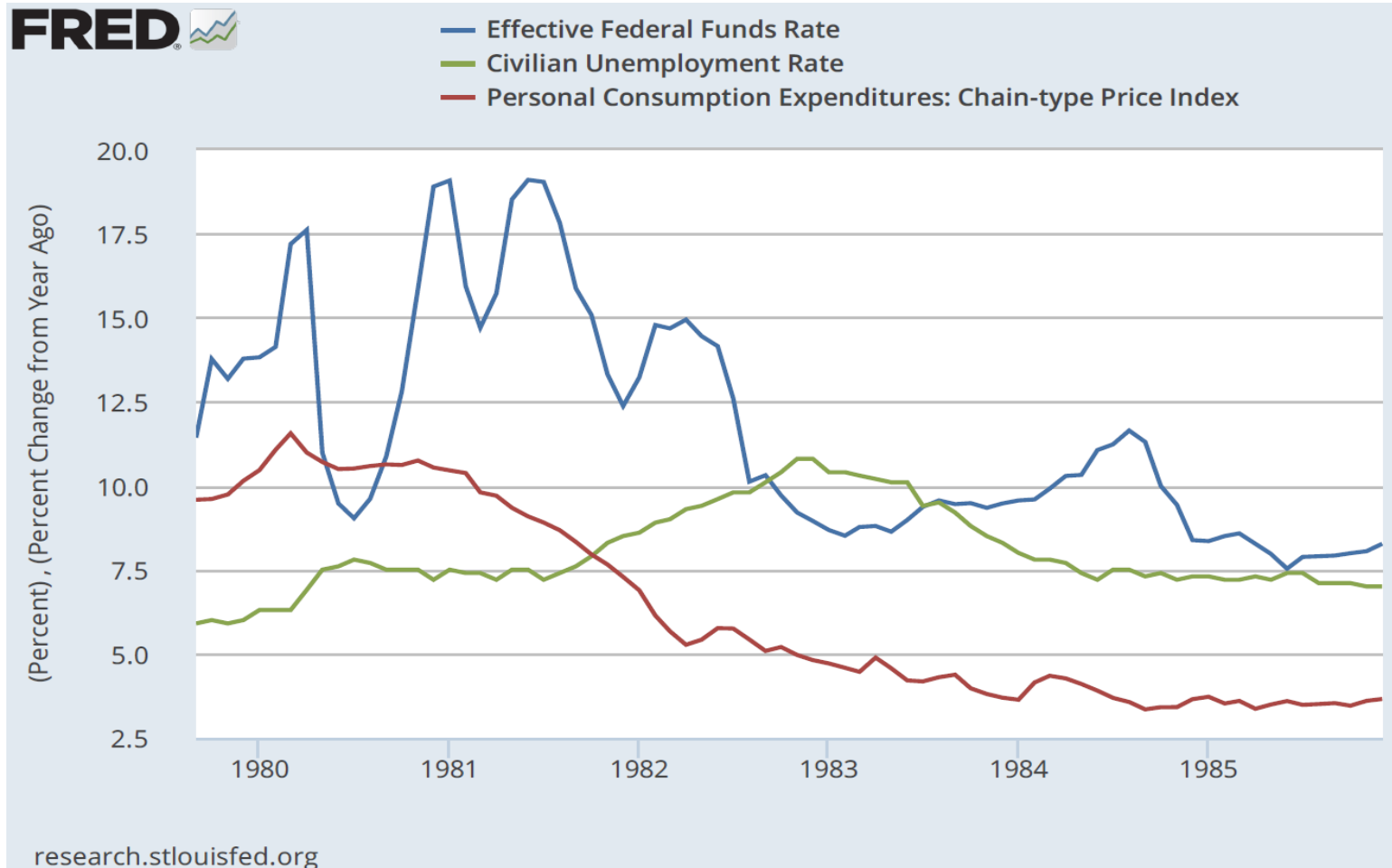
S, I, and r in the Long Run
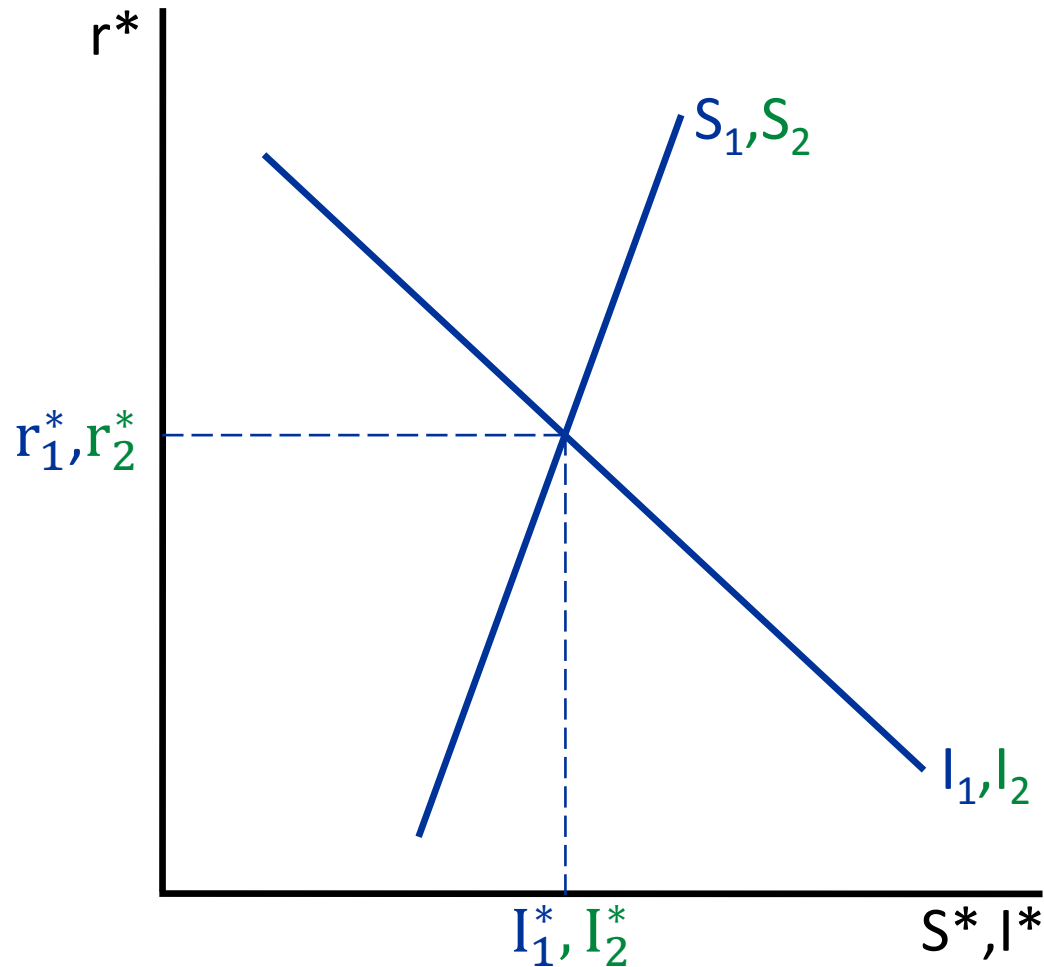
Monetary policy does not affect long-run saving supply or long-run investment demand. Thus, r, C, and I are all unchanged in the long run.

Using the reaction function to see the long-run change in inflation (equivalently, to see the change in the Fed's inflation target)
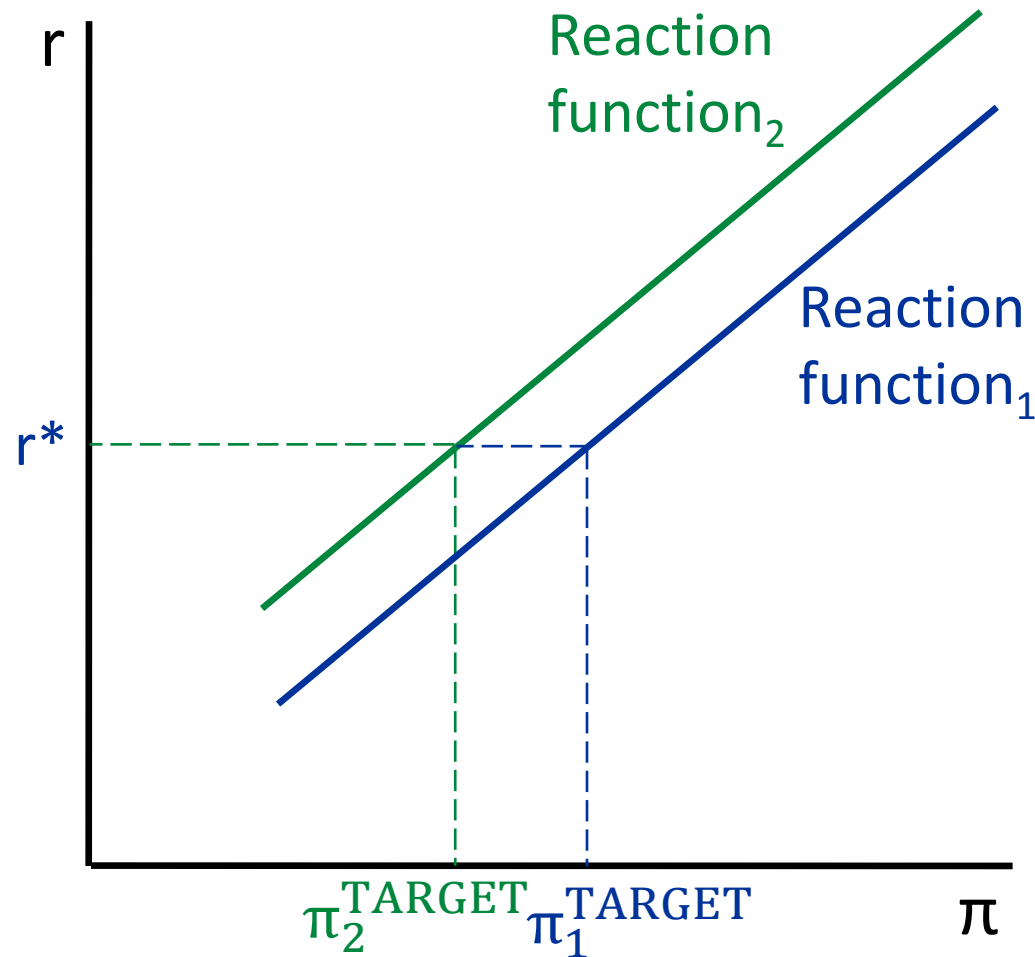
The nominal interest rate, unemployment, and inflation, Sept. 1979–Dec. 1985

Source: FRED.

V. APPLICATION #3: DOES THE FED WANT GROWTH?

A Simple Perspective on the Fed's Views

"The essential point … is that the Fed does not want faster growth. …

"Representative Steve Pearce, a New Mexico Republican, asked Ms. Yellen rather incredulously at a congressional hearing in February whether the Fed would really try to offset faster growth by raising rates more quickly. Ms. Yellen's response was carefully couched, but it amounted to 'yes'."

Source: *New York Times*, March 12, 2017.

How Will the Fed Respond to Growth in Different Scenarios?

- Case 1: Y is initially less than Y*, and Y grows (from things like tax cuts and improvements in confidence shifting the PAE curve).

- Case 2: Y is initially equal to Y*, and Y grows (from things like tax cuts and improvements in confidence shifting the PAE curve).

- Case 3: Y is initially equal to Y*, and Y and Y* grow together (for example, tax cuts and improvements in confidence shift PAE, and other policy changes raise Y*).

Case 1

- The economy starts with Y < Y*.

- Policy changes and increases in confidence shift the PAE curve up.

- Let's assume that the upward shift isn't large enough to bring Y immediately all the way to Y*.
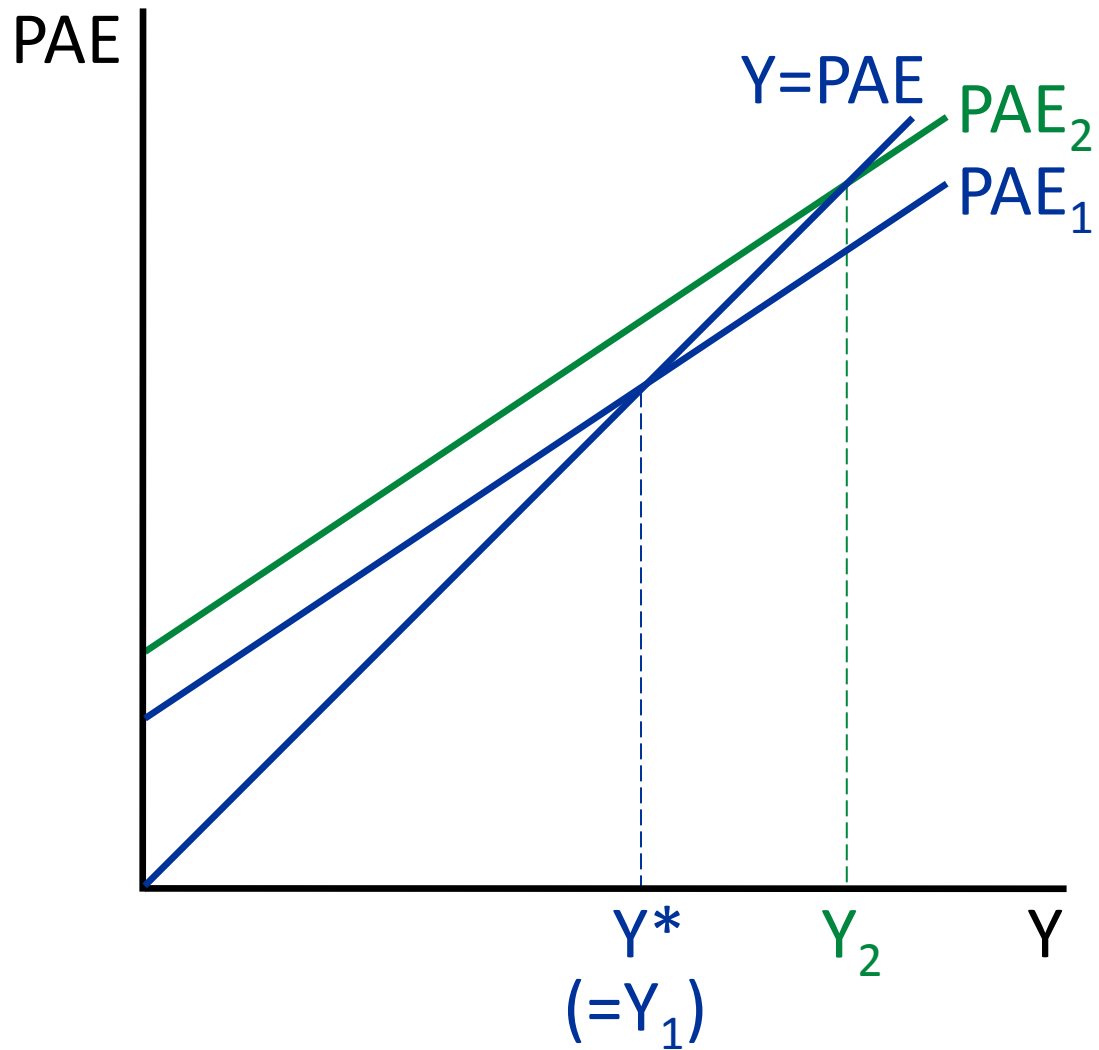
Case 1
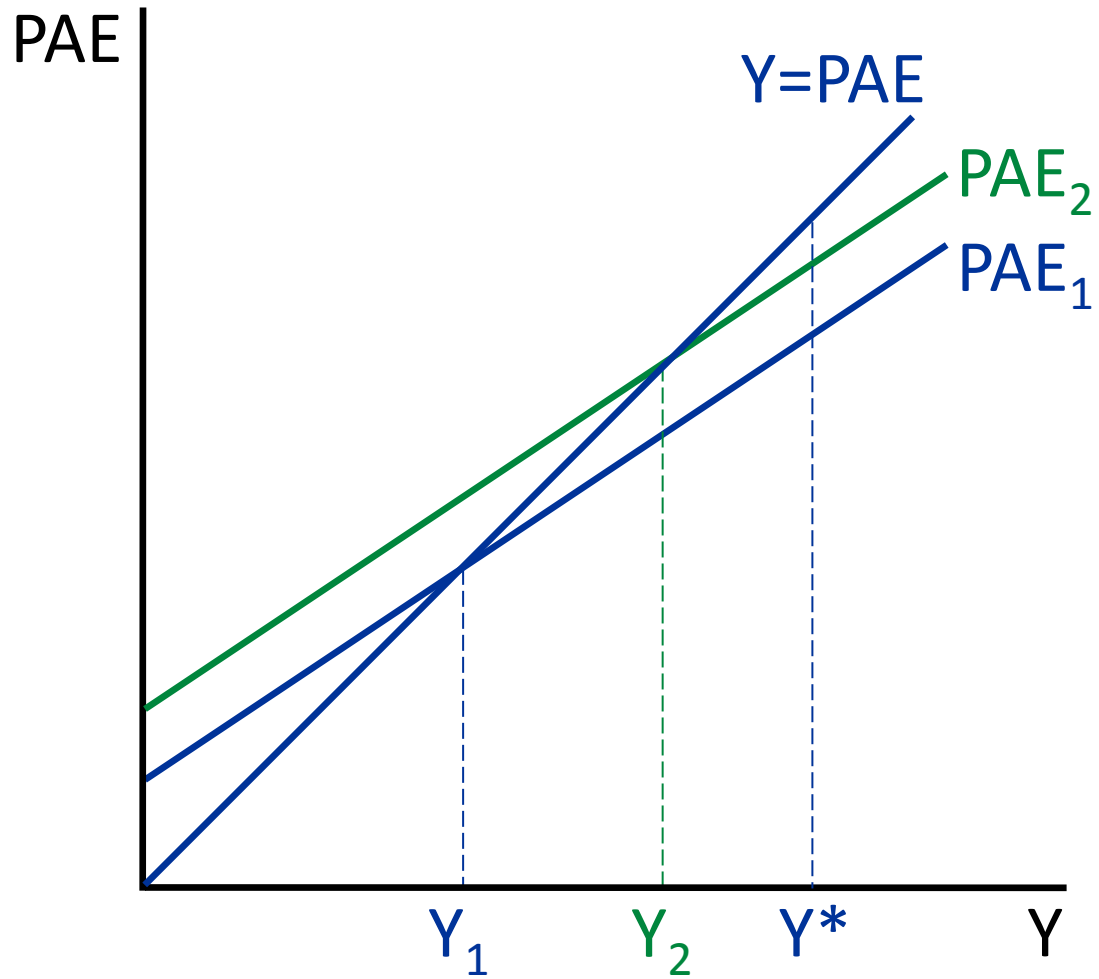
Will the Fed Counteract This Growth?

- Even after the upward shift of the PAE line, Y is still less than Y*.

- So inflation will gradually fall.

- As inflation falls, the Fed will lower r.

- This will shift the PAE line up further.

- In short: No.

Case 2

- The economy starts with Y = Y*.

- Policy changes and increases in confidence shift the PAE curve up.

Case 2

Will the Fed Counteract This Growth?

- After the upward shift of the PAE line, Y is greater than Y*.

- So although inflation will not change immediately , after a while it will start to rise.

- As inflation rises, the Fed will raise r.

- This will shift the PAE line gradually back down.

- The process ends when Y is back at Y*.

- In short: Yes.

Case 3

- The economy starts with Y = Y*.

- Y and Y* grow together: there are policy changes that shift the PAE curve up **and** that raise Y*.

Case 3
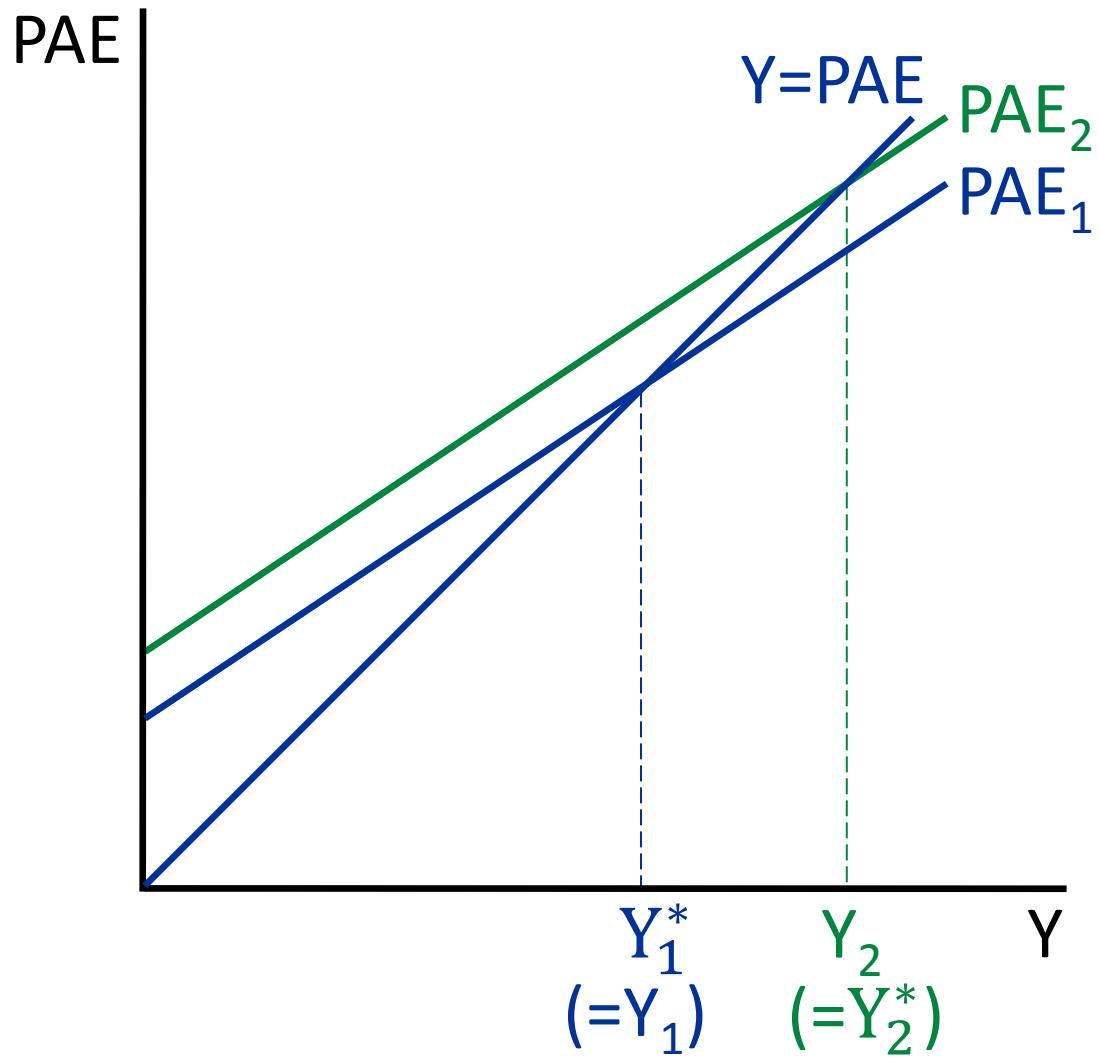
Will the Fed Counteract This Growth?

- After the changes, Y is equal to the new Y*.

- So there will be no tendency for inflation to change.

- With inflation not changing, the Fed will not change r.

- So the PAE line will not shift further, and so Y will not change further.

- In short: No.

A More Nuanced Perspective on the Fed's Views

"Fed officials … see the [current] pace of job growth as unsustainable. … There are already growing signs of a tighter labor market."

"[Ms. Yellen] said the Fed was fine with faster growth so long as it reflected an improvement in economic fundamentals. On the other hand, she said, the Fed would try to offset faster growth 'if we think that it is demand-based and threatens our inflation objective'."

Source: *New York Times*, March 12, 2017.