# Aggregate Supply and Inflation

Spring 2026
Econ 256, College of the Holy Cross
Prof. Josh Abel

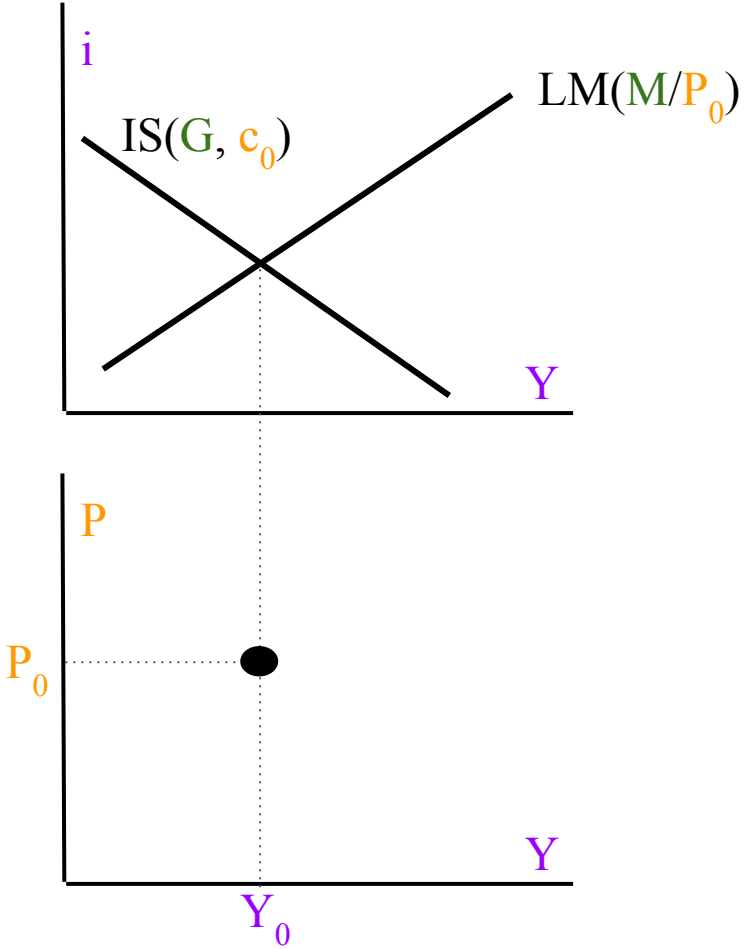
Chapters 16, 18, Bryan (2013)

# AS-AD

# Prices

- Other than a few ad hoc points, the last slide deck assumed prices were fixed
  - Assumed Supply Curve was flat and static
- To now let prices adjust, we will need a model of Supply
  - Prices will continue to be sticky, but not completely stuck – they will adjust but slowly, so we still don't have the perfect market clearing assumed in most micro models
- One way of saying this is that we will now make price endogenous (P) rather than exogenous (P)
- But before we think about Supply, let's think about how Aggregate Demand depends on price

# Deriving the Aggregate Demand Curve



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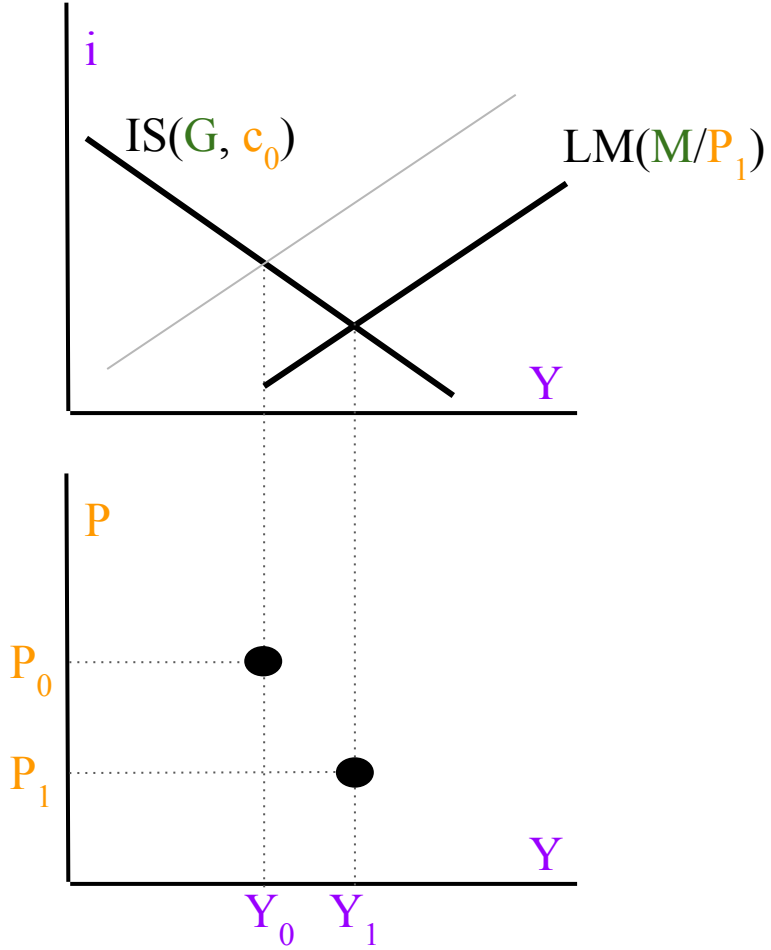

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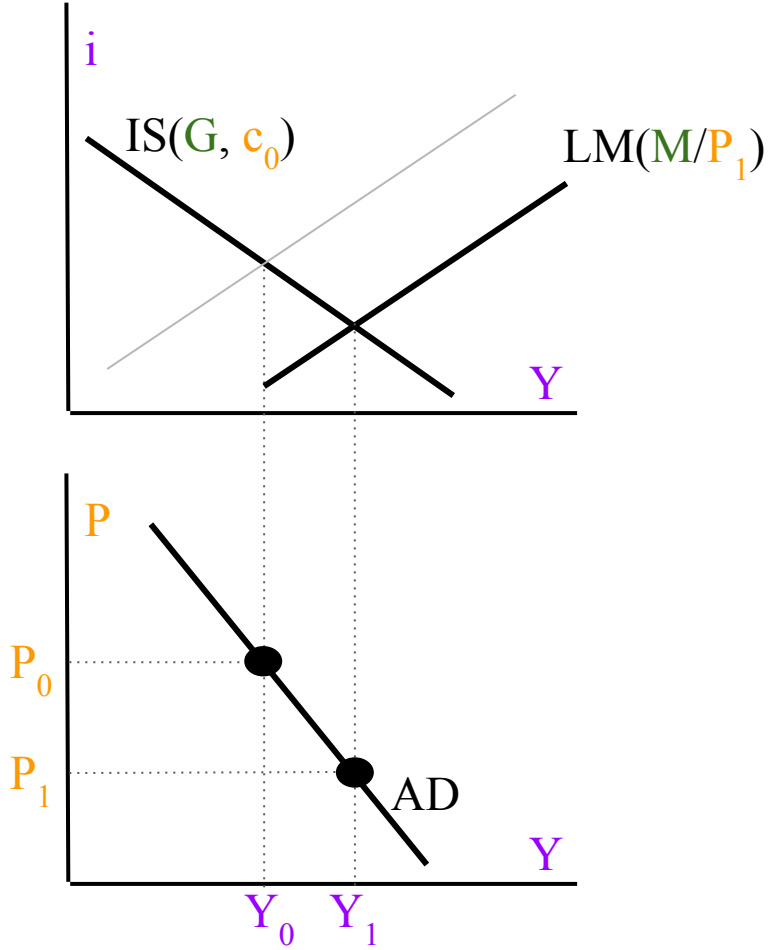


# Firm Pricing Decisions

- We will now consider firms' price-setting behavior to derive an Aggregate Supply Curve to "close" the model
- To get incomplete price adjustment, we will assume there are two types of firms
  1. Flexible firms that get to adjust their prices as output changes (share 1-s)
  2. Firms whose prices are fixed (share s)

For firms who adjust, we will assume they set prices such that:

$$p_{flex} = P^e \cdot (Y/Y_{pot})^{\gamma}$$

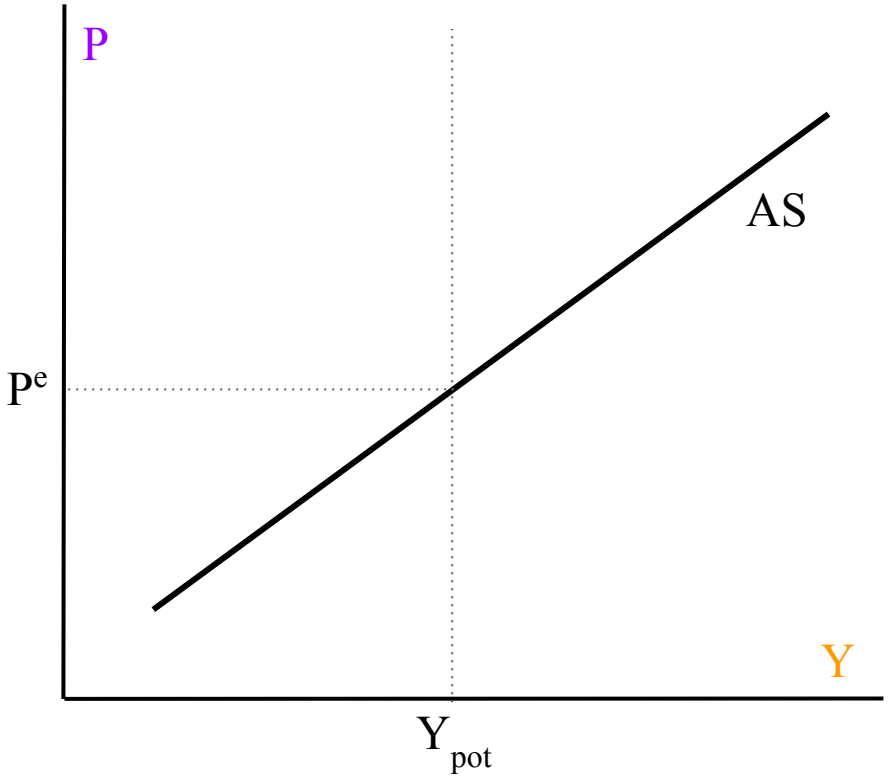
- The price set by an <u>individual firm</u> (notice lower case "p") with flexible prices depends on...
  1. its expectation (notice the "e") of the <u>aggregate</u> price level (notice the upper case "P")
  2. output (Y) relative to its potential ($Y_{pot}$) – when output is high, costs are higher and so they charge higher prices
     - We will be clearer about what "potential output" is later
     - $\gamma$ moderates how responsive price is to output (i.e. elasticity)

For firms who cannot adjust, we will assume they set prices such that they are equal to the average when output is at its potential:

$$p_{fixed} = P^e$$

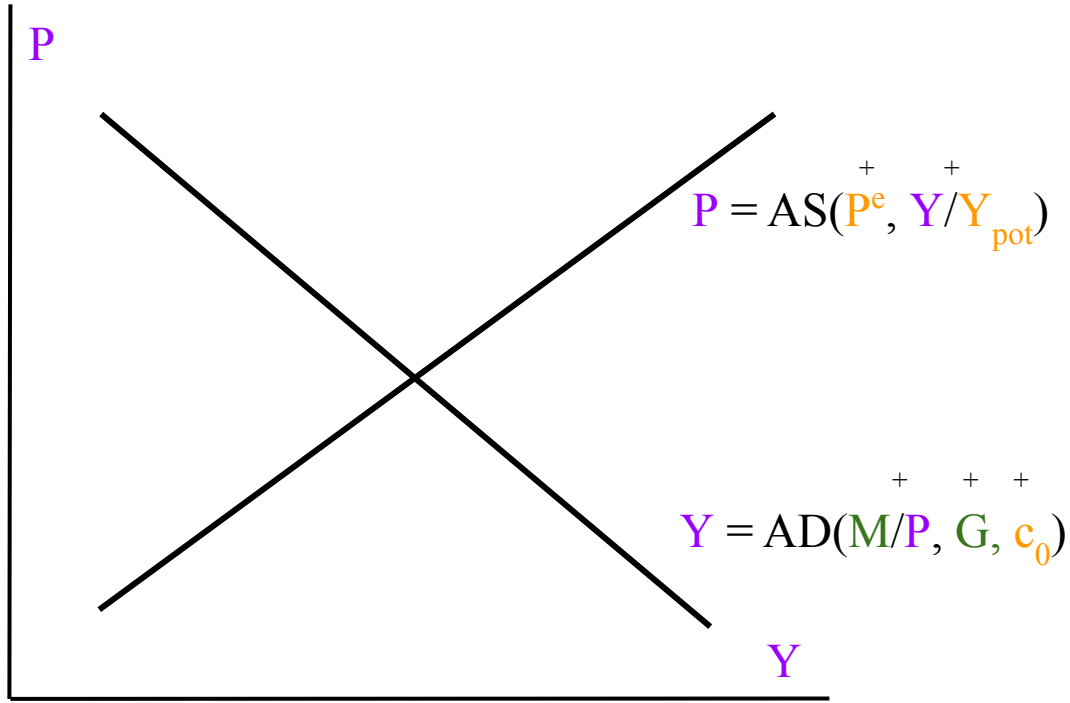
# The Aggregate Supply Curve

$$P = s \cdot p_{fixed} + (1-s) \cdot p_{flex} = s \cdot P^e + (1-s) \cdot P^e \cdot (Y/Y_{pot})^{\gamma} = P^e \cdot (s + (1-s) \cdot (Y/Y_{pot})^{\gamma})$$

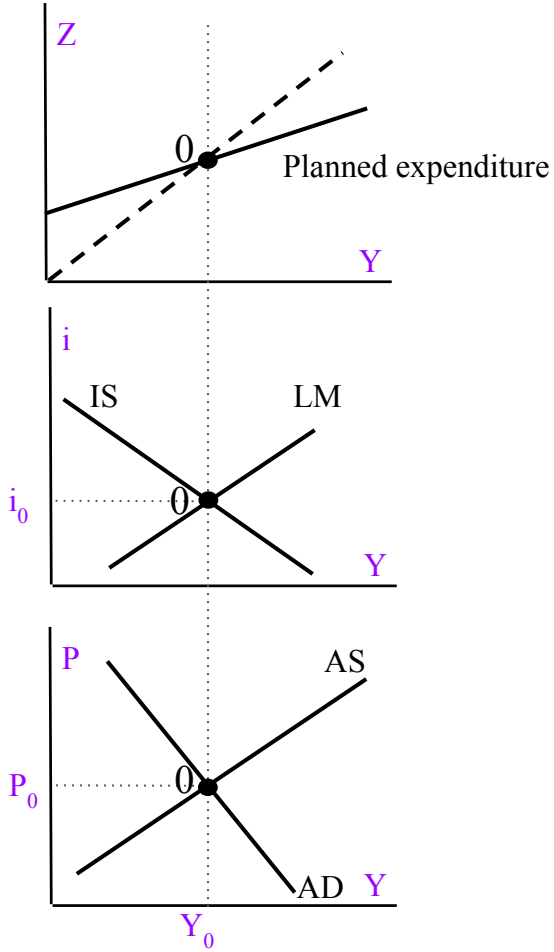


# AS-AD

("+" means the function is an increasing function of the argument.)



# AS-AD vs. IS-LM vs. Keynesian Cross




$P = P_0$ and $i = i_0$ are exogenous/constant

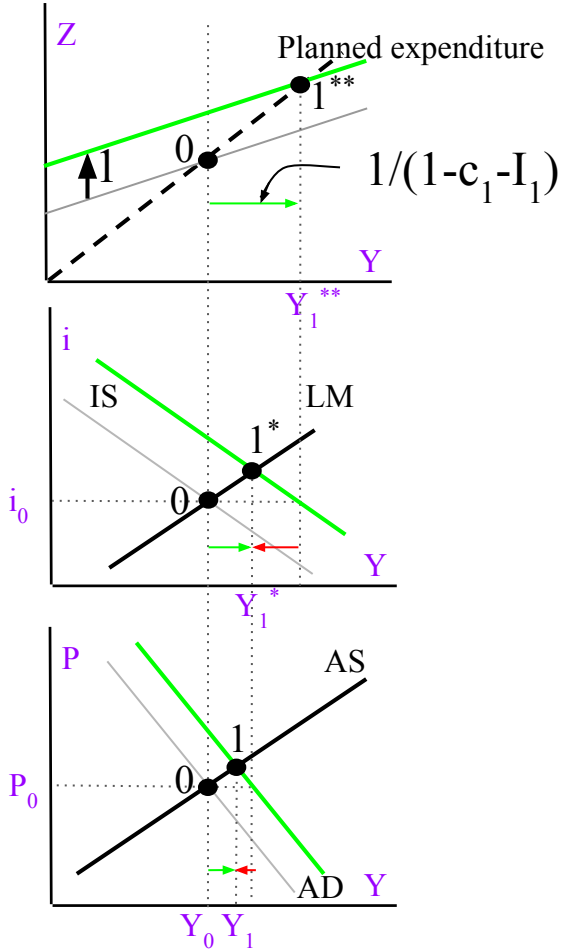
$P = P_0$ is constant, $i$ is endogenous

$P$ and $i$ are endogenous

# AS-AD vs. IS-LM vs. Keynesian Cross

Increasing G by 1:

- Increases output by $1/(1-c_1-I_1)$ if P and i are held constant
- But some of that increase gets crowded out by the rise in i
- And some of what remains gets further eliminated by the rise in P

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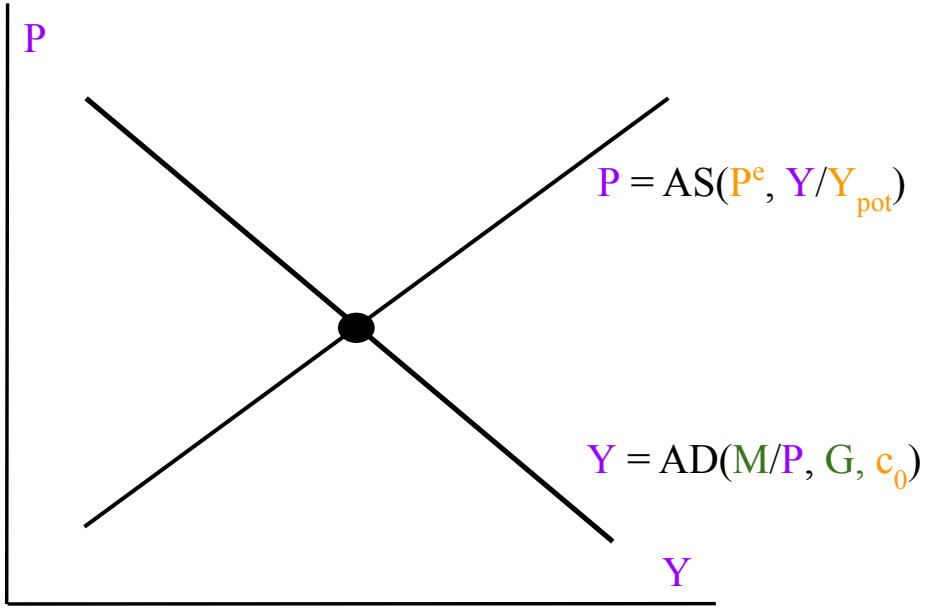

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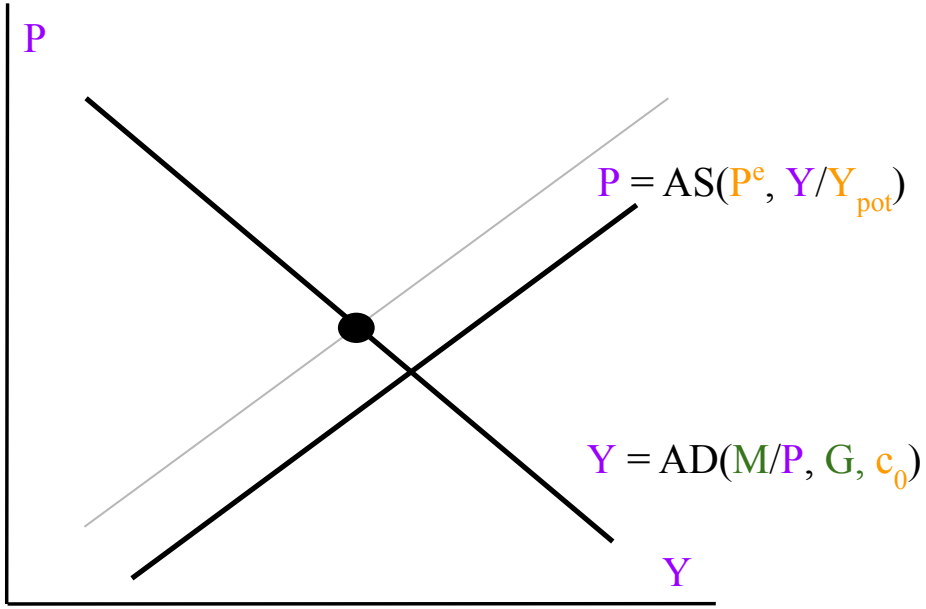

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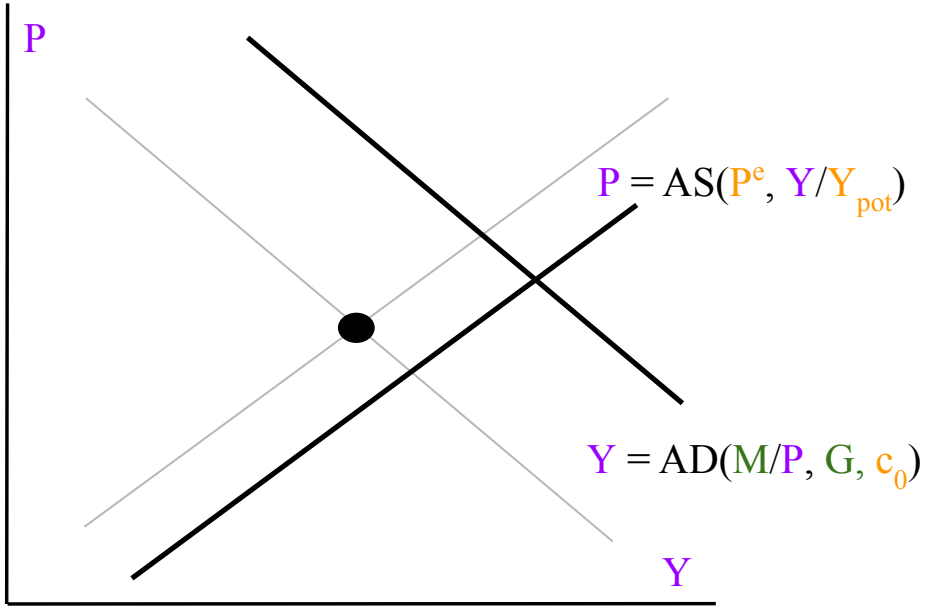

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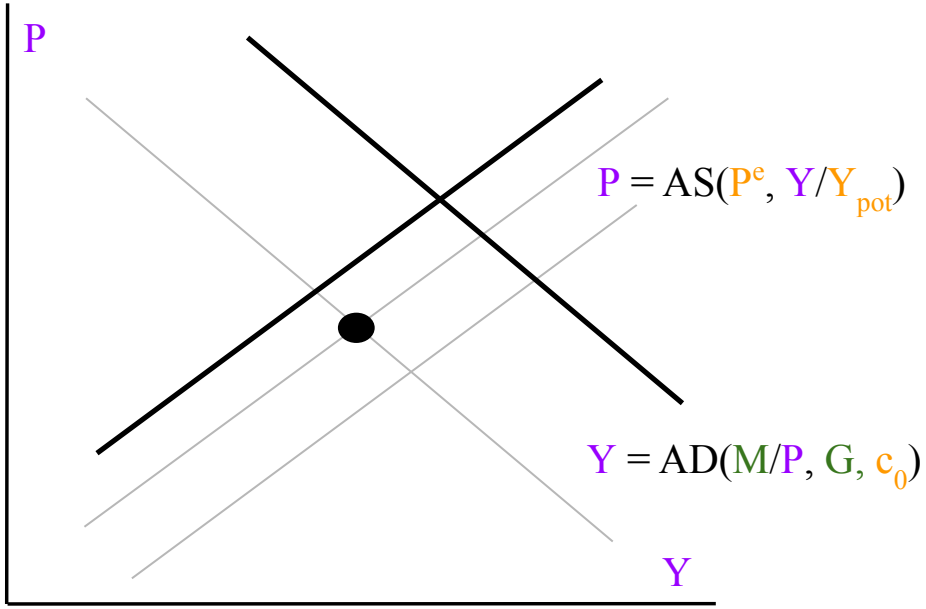

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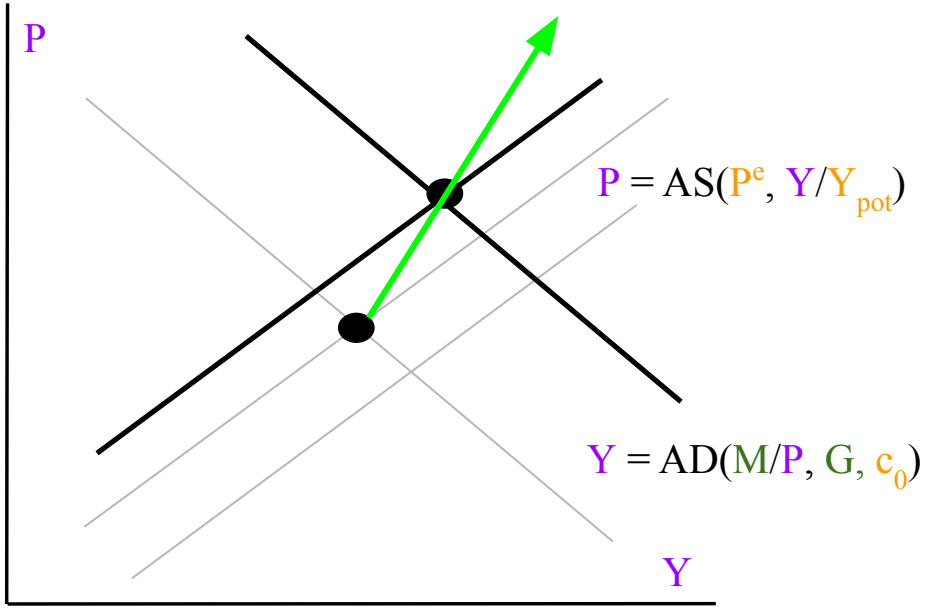
  - Etc.
- The economy drifts to the northeast



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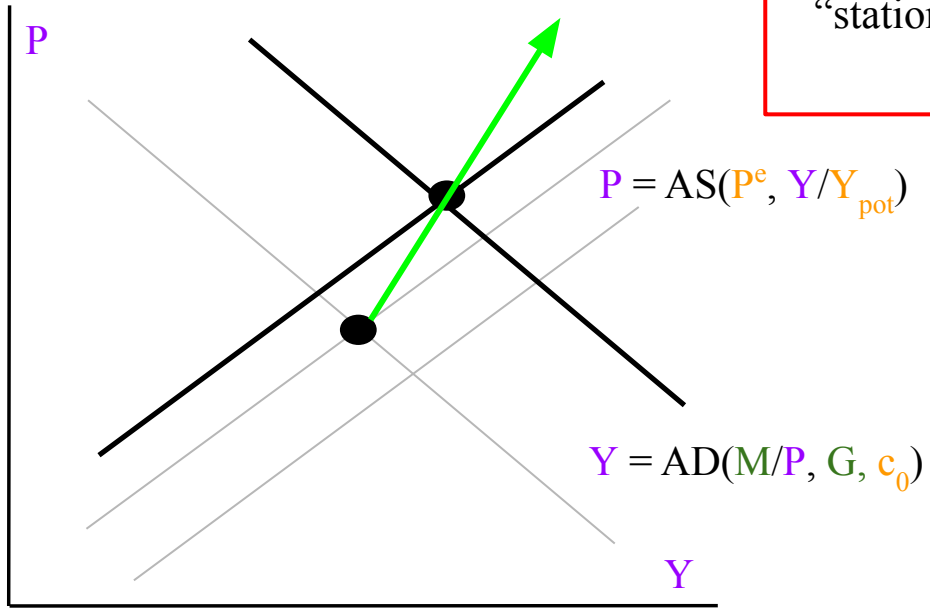
To study business cycles, we want to isolate "cyclical movements," i.e. deviations of Y from $Y_{pot}$, and get rid of long-run trends. So we need to put the model in terms of "stationary," i.e. trendless, variables.



# PC-NAD: Setup

# New Axes

- Instead of the price level, we will now focus on the growth rate of prices, i.e. inflation:

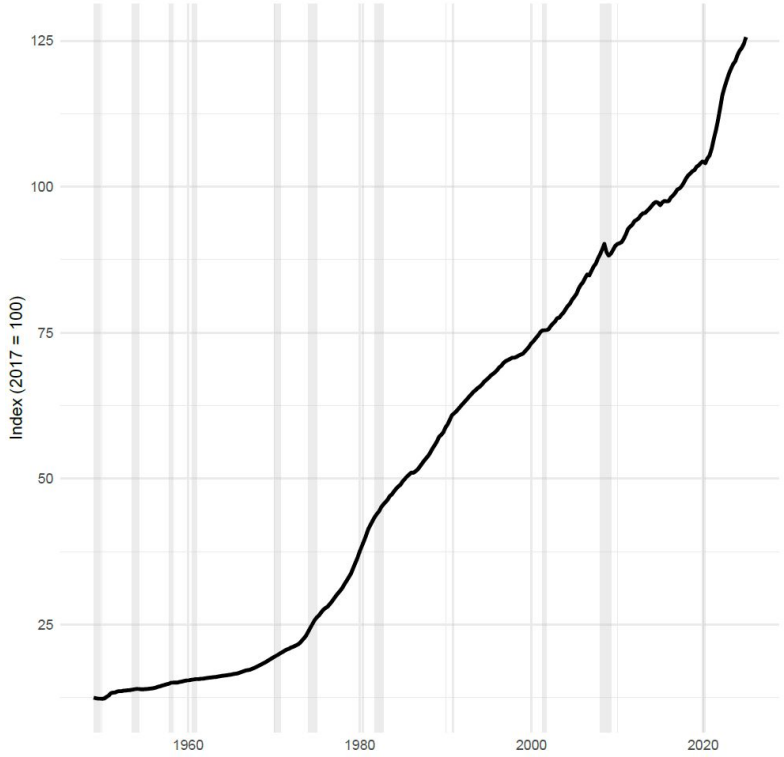
$$\pi_t = P_t/P_{t-1} - 1$$

$$\pi_t \cong \ln(1 + \pi_t) = \ln(P_t/P_{t-1}) = \ln(P_t) - \ln(P_{t-1})$$

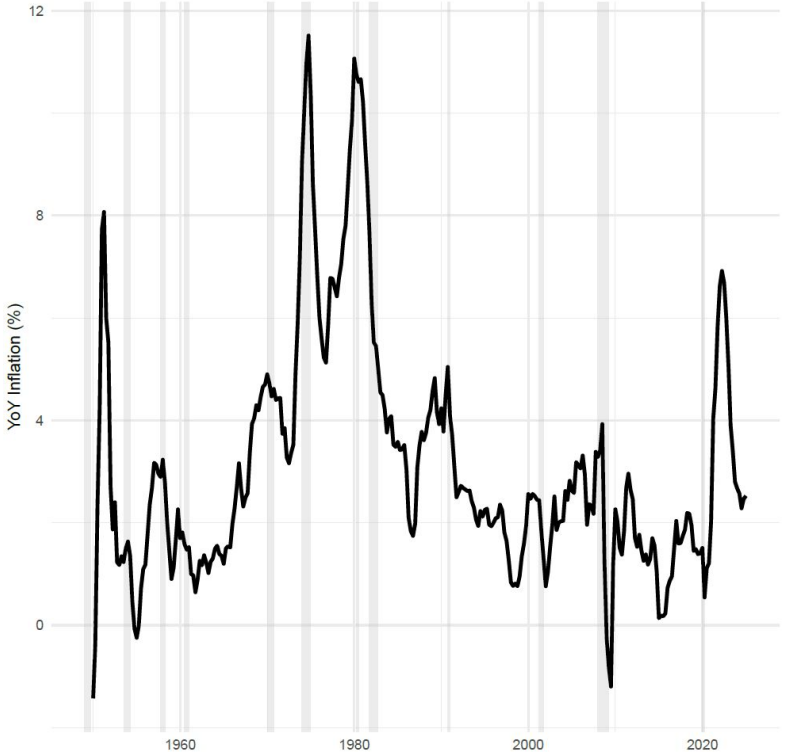
- Instead of output, we will focus on the unemployment rate
  - Because unemployment is a share bounded between 0 and 1, it will not have a trend
  - **BEWARE**: now our "output" measure is flipped
    - Low u is good, high is bad; this is the opposite of Y (low Y bad, high Y good)
    - This is conceptually obvious, but if you're not careful you can really screw up the analysis just based on this silly issue!

# Inflation is stationary, the price level is not

## Price Level




## Inflation




Source: Federal Reserve Economic Database

# Unemployment Rate

$$u = \frac{\text{Unemployed}}{\text{Labor force}} = \frac{\text{Not employed and looking for work}}{\text{Employed} + (\text{Not employed and looking for work})}$$

- Makes sense to exclude people who don't want to work (i.e. focus on labor force)
- But sometimes the composition of the labor force is important to acknowledge

1. "Discouraged workers"
   - Sometimes people stop looking for work, but they'd like a job! So, u is artificially low.

2. Secular trends can affect the business cycle
   - E.g. The plateau of women's entry to the labor force in the 1990s led to the appearance of "jobless recoveries"

- Alternatives to the unemployment rate:

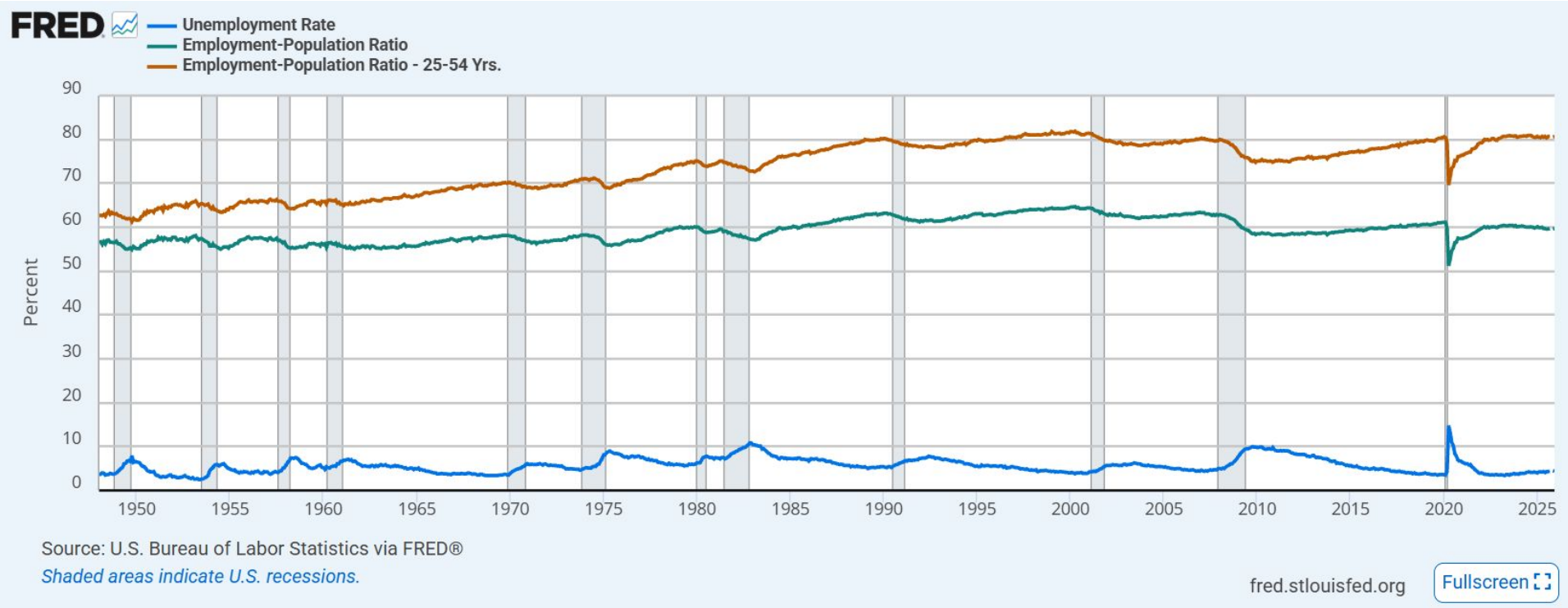
1. Employment-to-population ratio (E/P)
2. Prime-age E/P

# The Unemployment Rate

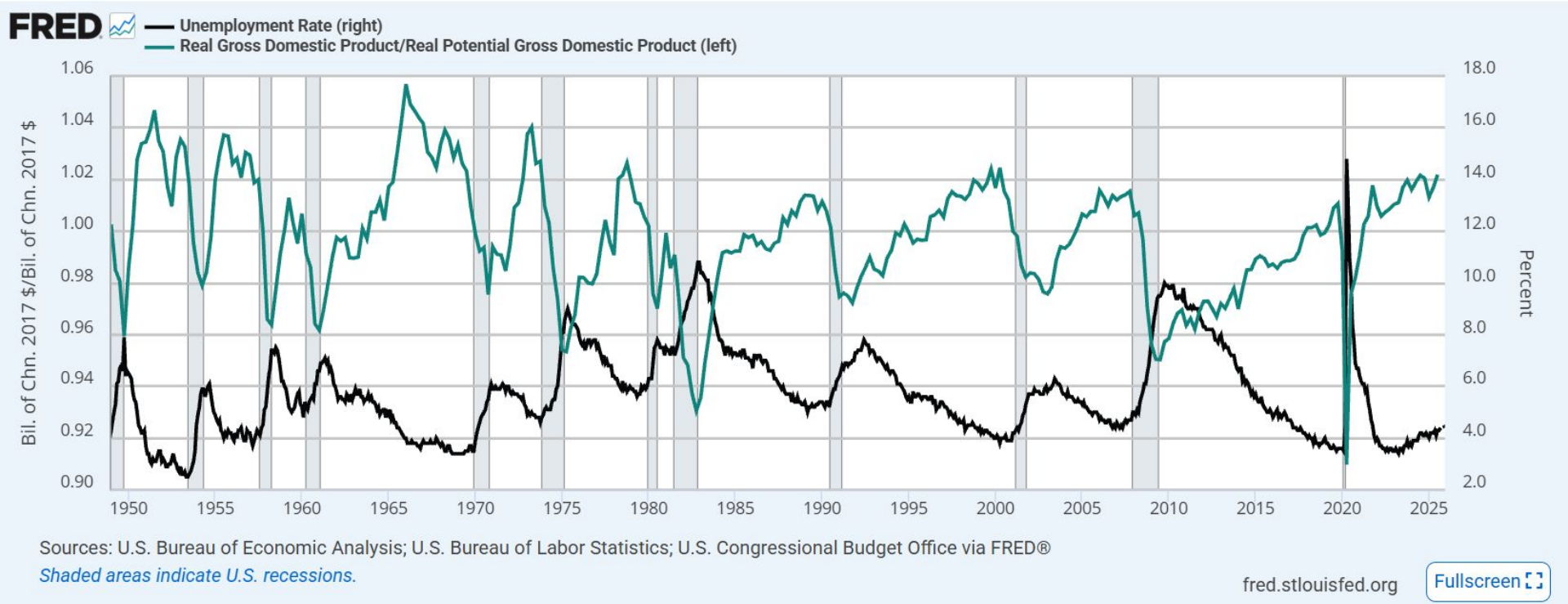
# Common Labor Market Measures

There's no perfect cyclical labor market measure:

- u has issues with discouraged workers
- E/P has issues with aging of population (e.g. upward bump from late 1970s through 2000s from Boomers)
- Prime-age E/P had a serious trend for decades as women entered the labor force in far greater numbers



# Unemployment and the output gap are highly (negatively) correlated



# From the Aggregate Supply Curve to the Phillips Curve

$$\text{AS: } P_t = P_t^e \cdot (s + (1-s) \cdot (Y_t / Y_{pot,t})^{\gamma})$$

$$\text{Take logs: } \ln(P_t) = \ln(P_t^e) + \ln(s + (1-s) \cdot (Y_t / Y_{pot,t})^{\gamma})$$

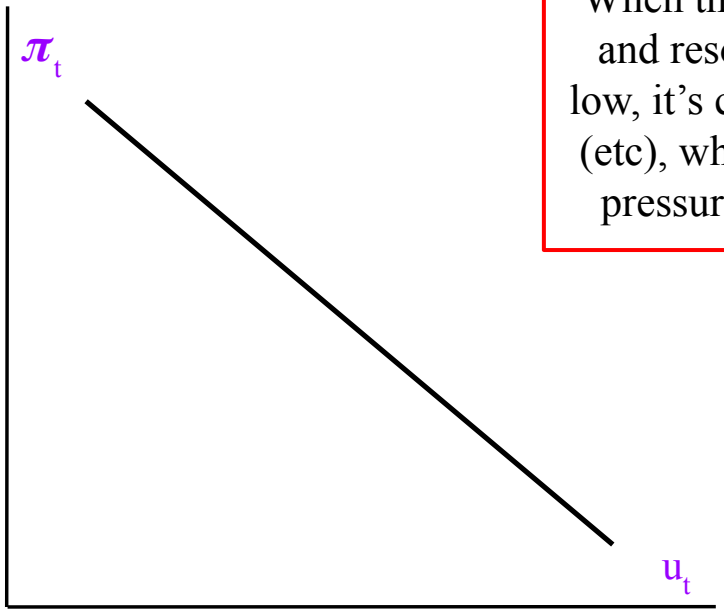
$$\text{Subtract last period's price level: } \ln(P_t) - \ln(P_{t-1}) = \ln(P_t^e) - \ln(P_{t-1}) + \ln(s + (1-s) \cdot (Y_t / Y_{pot,t})^{\gamma})$$

$$\text{Apply definition of inflation: } \pi_t = \pi_t^e + \ln(s + (1-s) \cdot (Y_t / Y_{pot,t})^{\gamma})$$

$$\text{Linear approximation: } \pi_t = \alpha + \pi_t^e + \phi \cdot (Y_t / Y_{pot,t})$$

$$\text{Replace output gap with unemployment: } \pi_t = \alpha + \pi_t^e - \beta \cdot u_t$$

# The Phillips Curve in Theory




When the economy is weak and resource utilization is low, it's cheaper to hire labor (etc), which puts downward pressure on price growth.

(And remember, x-axis is flipped: right is bad, left is good!)

# From Aggregate Demand to Normalized Aggregate Demand

$$AD: Y_t = AD(M_t/P_t, G_t, c_{0,t}) \quad (+, +, +)$$

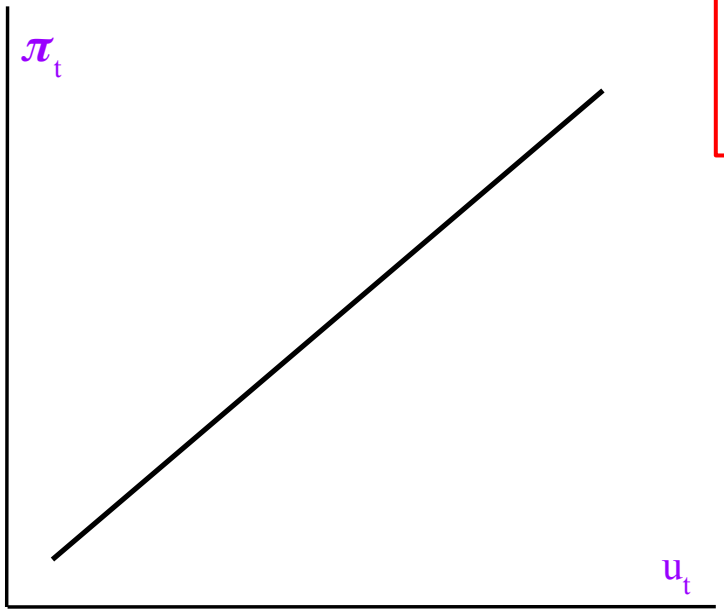
$$\text{Normalize by } Y_{pot,t}: Y_t/Y_{pot,t} = NAD_y(M_t/P_t/Y_{pot,t}, G_t/Y_{pot,t}, c_{0,t}/Y_{pot,t}) \quad (+, +, +)$$

$$\text{Define } m_t = M_t/Y_{pot,t}: Y_t/Y_{pot,t} = NAD_y(m_t/P_t, G_t/Y_{pot,t}, c_{0,t}/Y_{pot,t}) \quad (+, +, +)$$

$$\text{Substitute in inflation: } Y_t/Y_{pot,t} = NAD_y(m_t/(P_{t-1}\cdot(1+\pi_t)), G_t/Y_{pot,t}, c_{0,t}/Y_{pot,t}) \quad (+, +, +)$$

$$\text{Replace output gap with unemployment: } u_t = NAD(m_t/(P_{t-1}\cdot(1+\pi_t)), G_t/Y_{pot,t}, c_{0,t}/Y_{pot,t}) \quad (-, -, -)$$

# The Normalized AD Curve in Theory




When inflation is high, the real money stock is low, suppressing demand and leading to low resource utilization.

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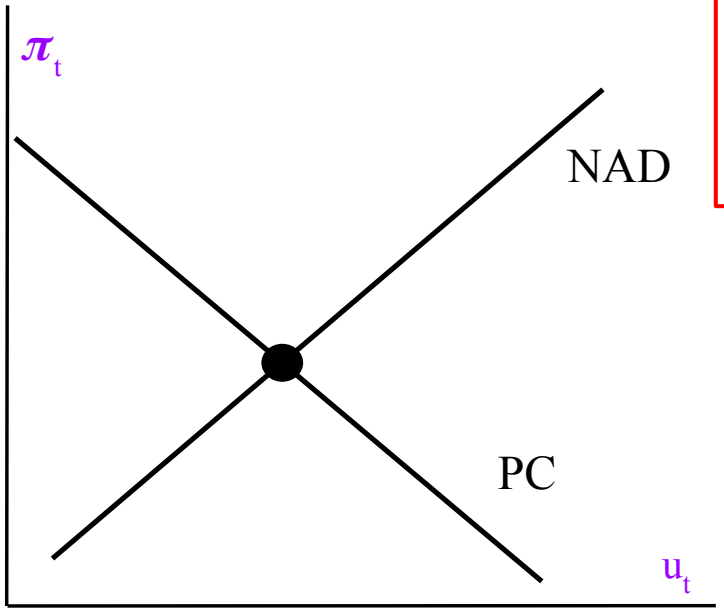
# PC-NAD Model

PC slopes down: when the economy is weak and resource utilization is low, it's cheaper to hire labor (etc), which puts downward pressure on price growth.




NAD slopes up: when inflation is high, the real money stock is low, suppressing demand and leading to low resource utilization.

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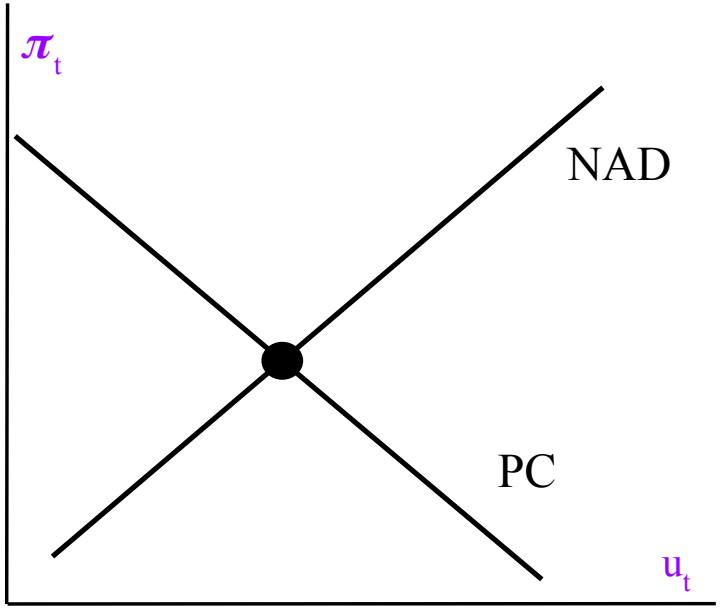
# Understanding Business Cycles with Price Adjustment

# Policy in the PC-NAD Model

Consider how changes in M impact the economy (G will do the same)



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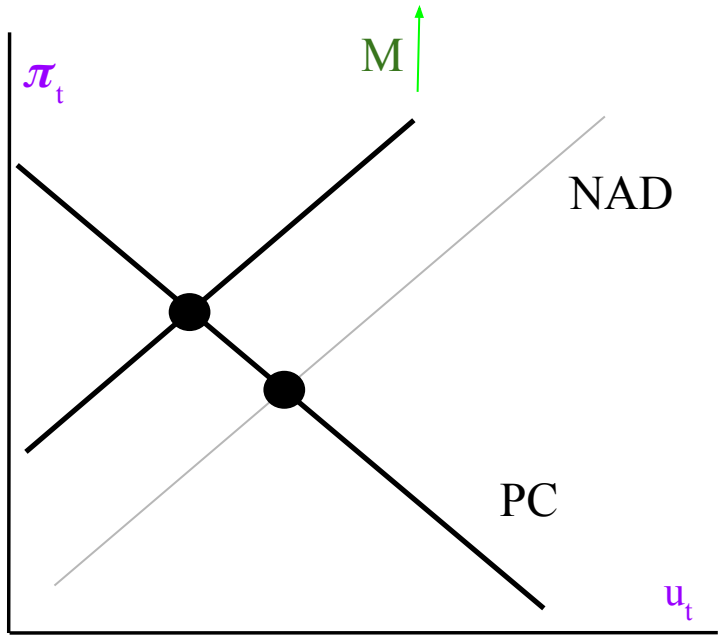

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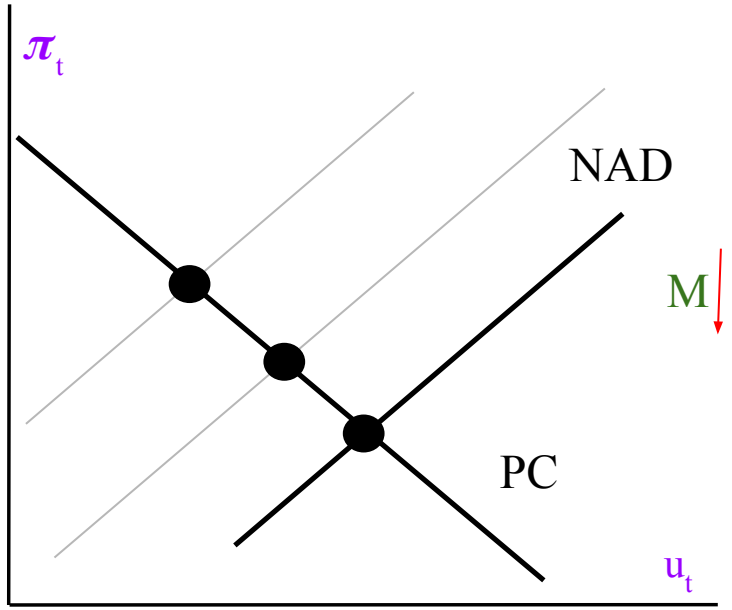

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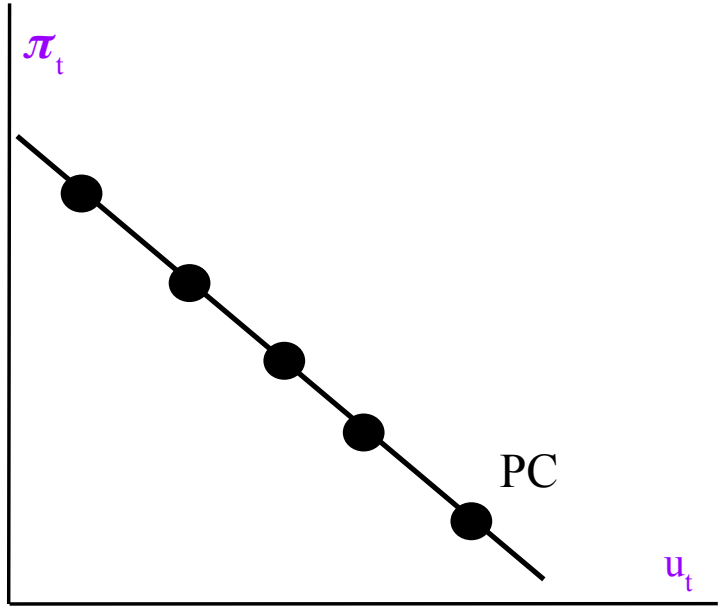

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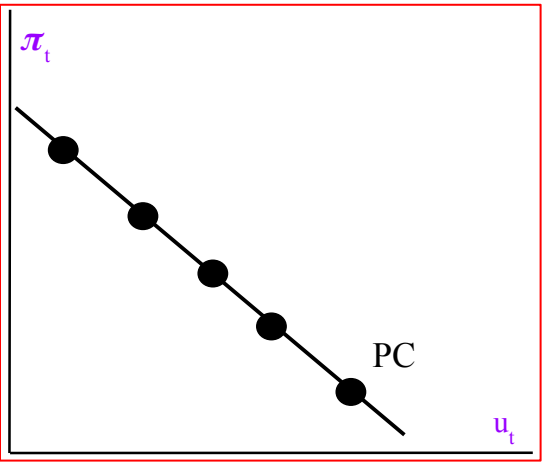
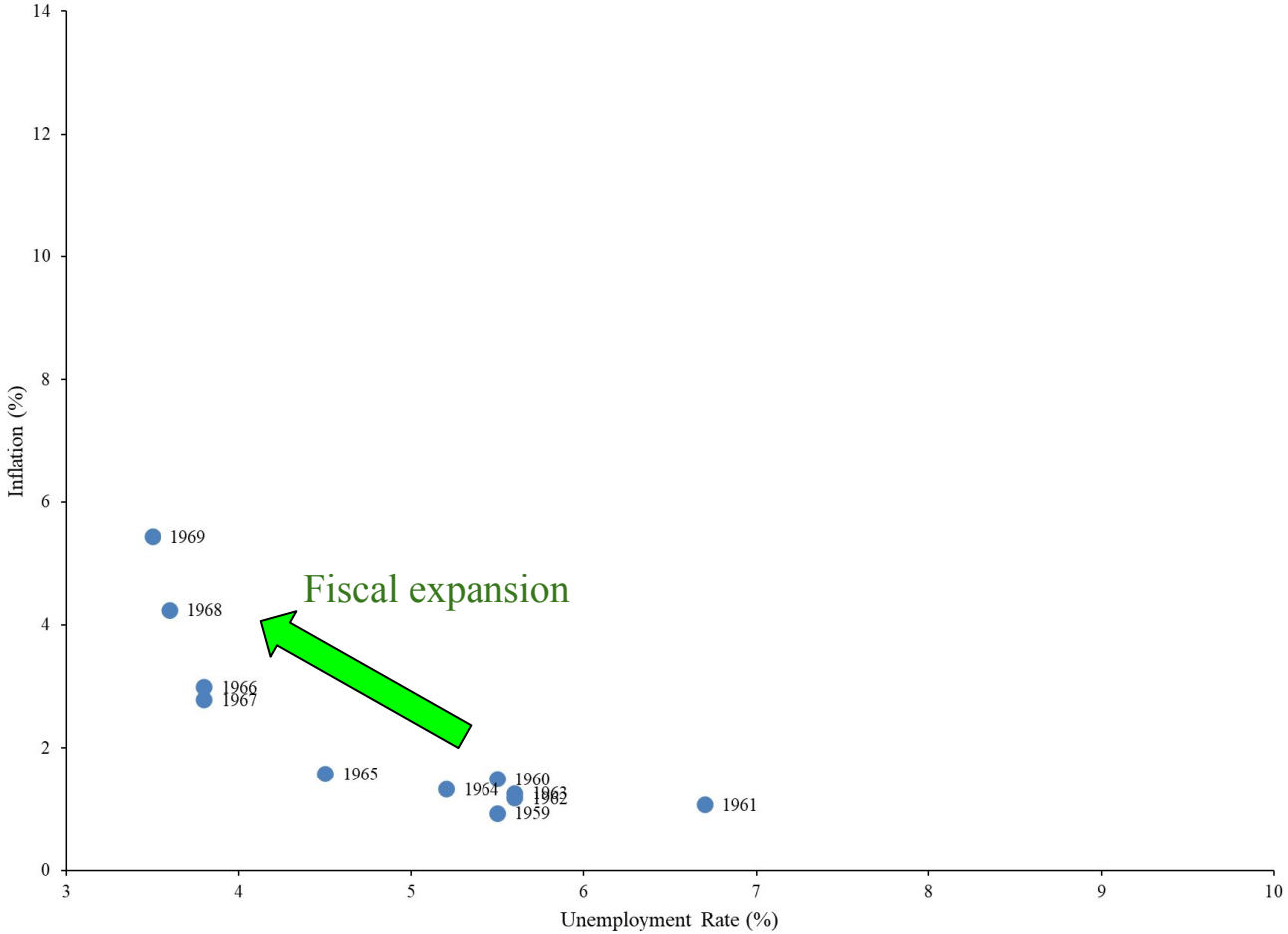
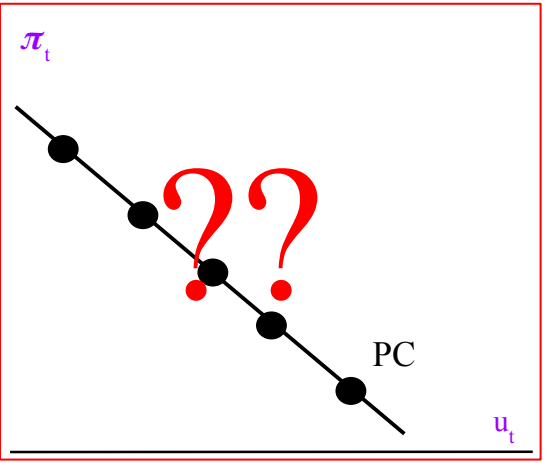
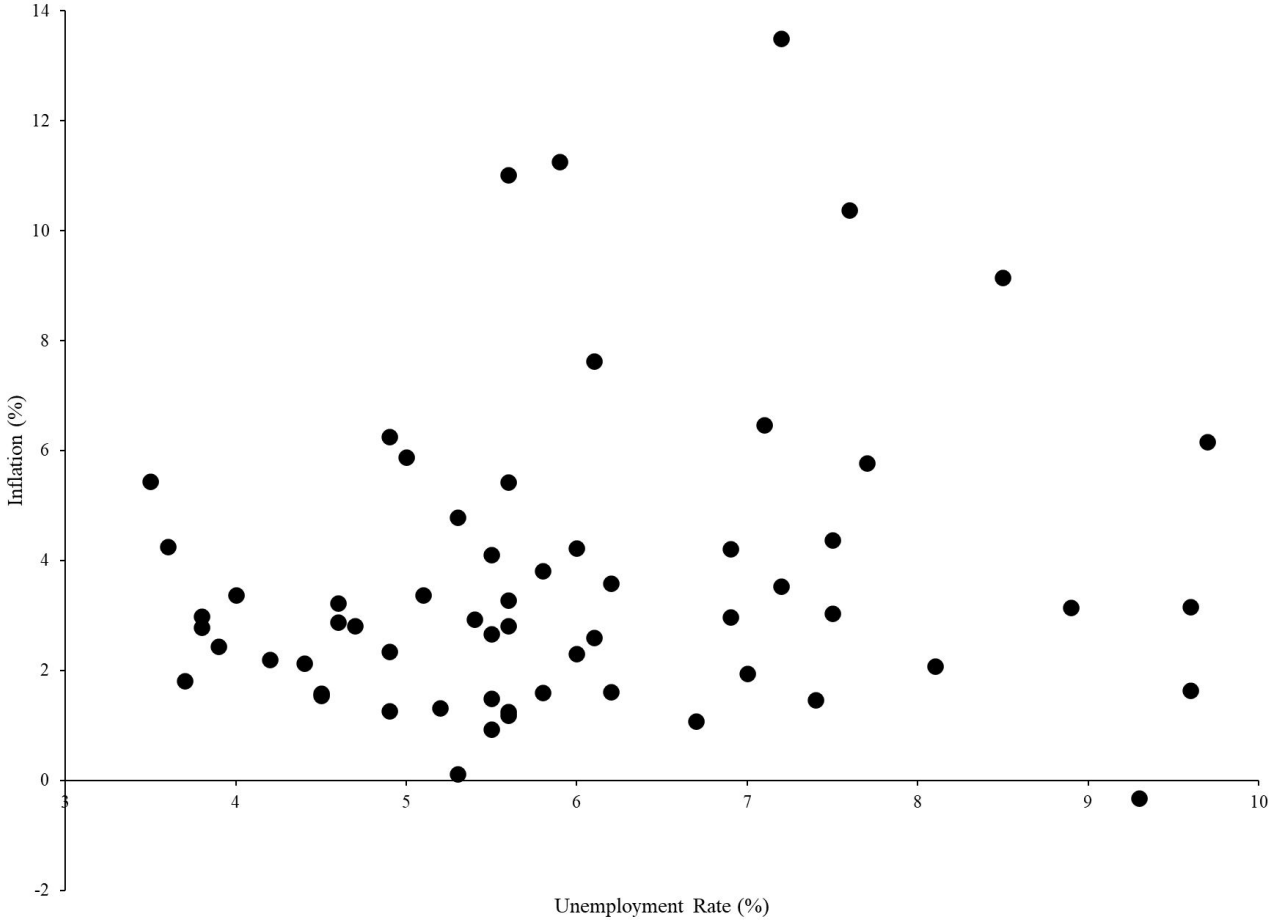


# The data validates the model – or does it?

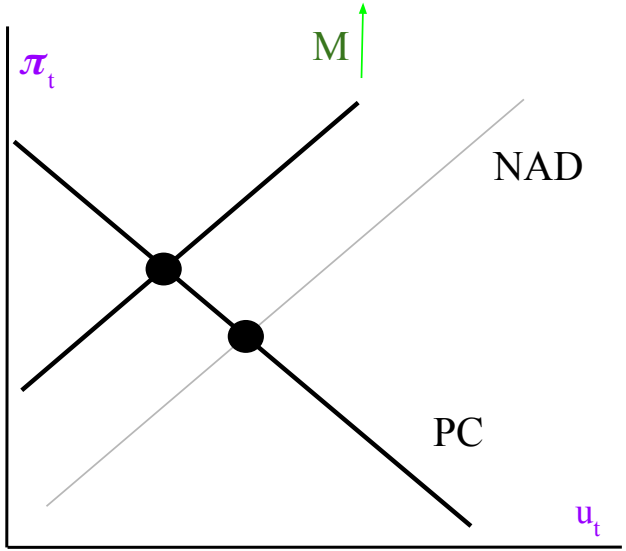


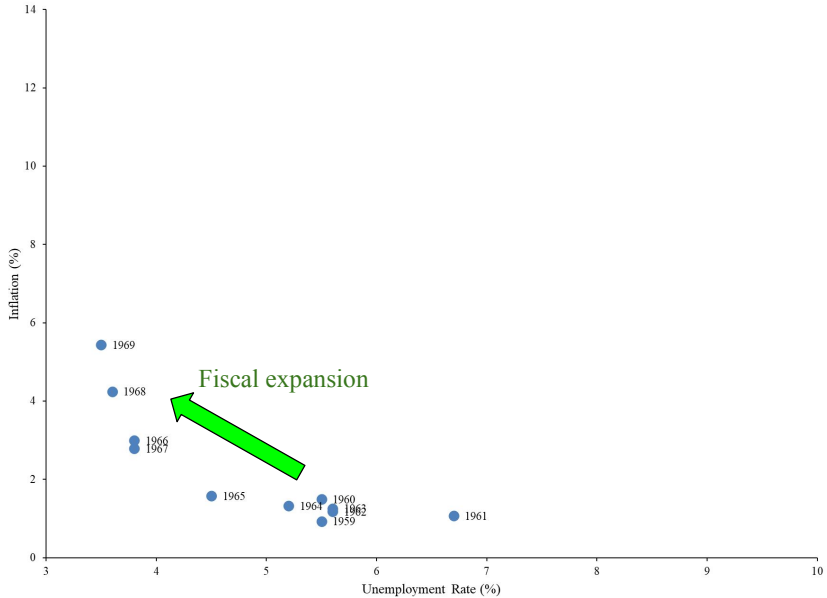



# Friedman and Phelps on Inflation Expectations

$$\pi_t = \alpha + \pi_t^e - \beta \cdot u_t$$

- In his 1968 Presidential Address to the American Economic Association, Milton Friedman predicted that the clean downward relationship between u and $\pi$ – known as the Phillips Curve – would soon break down.
- Why? So far, we have left $\pi^e$ fixed, and this was not something economists at the time thought much about.
  - But if $\pi$ is persistently high (perhaps because policy is focused on getting u to be very low), people will start to expect that high inflation



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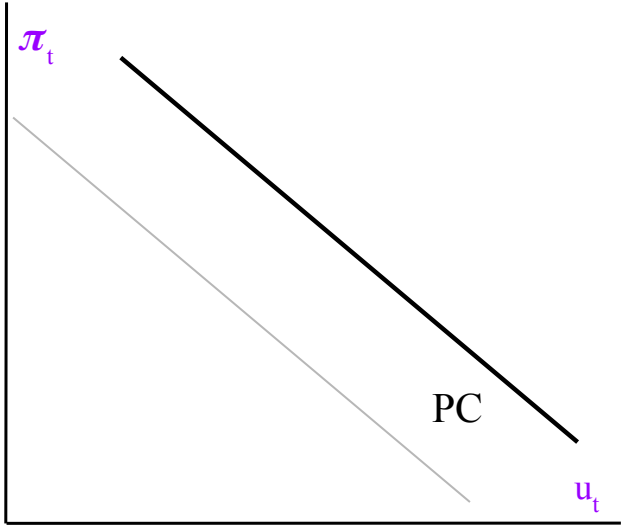
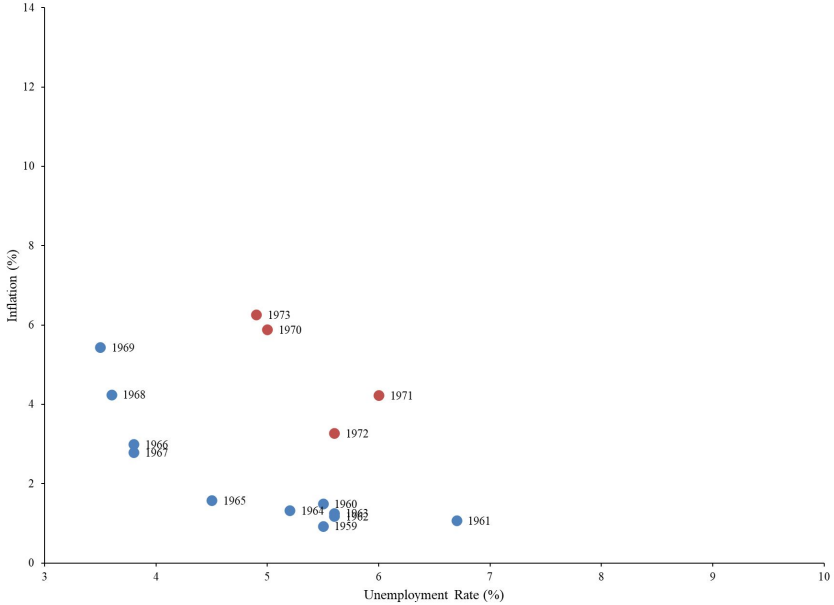
  - But if $\pi$ is persistently high (perhaps because policy is focused on getting u to be very low), people will start to expect that high inflation
- That would cause the Phillips Curve to shift up



# Adaptive Expectations

$$\pi_t = \alpha + \pi_t^e - \beta \cdot u_t$$

- This episode brought expectations – of inflation, in particular – center stage in macroeconomic theory.
- Given their importance, we will know turn $\pi^e$ from exogenous to endogenous
- For the most part, we will assume "adaptive expectations":

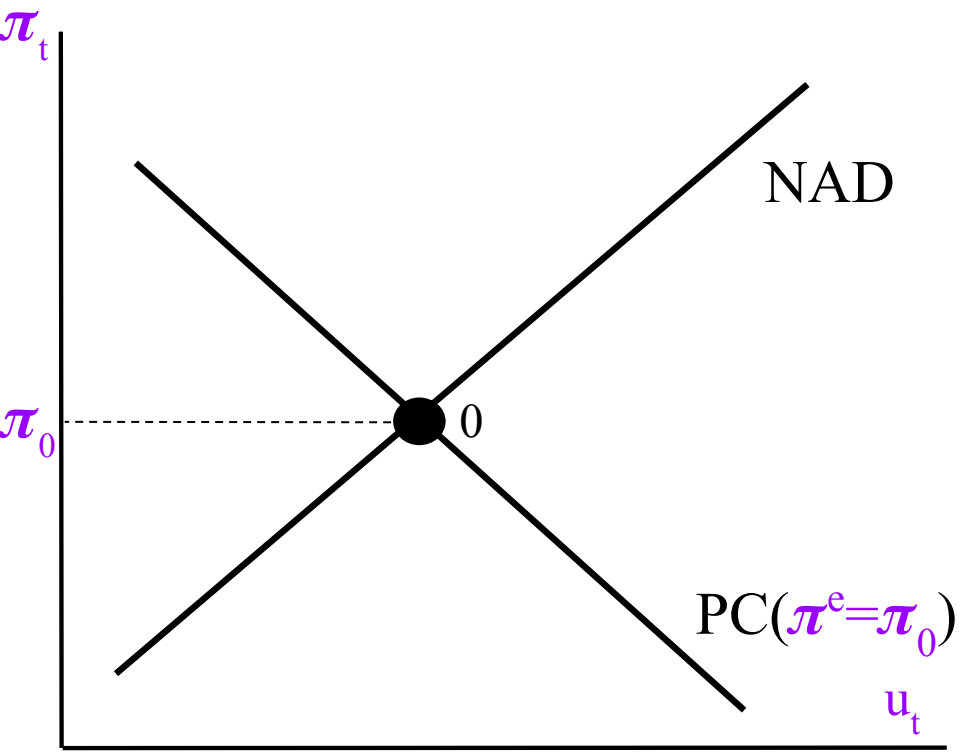
$$\pi_t^e = \pi_{t-1}$$

  - People expect inflation this period to be whatever it was last period
    - Note that $\pi_{t-1}$ is exogenous as of period t, since it is set in stone – nothing can change the past

- Key implication: if inflation rises by $\Delta$, the Phillips Curve shifts up by $\Delta$

# Policy in the PC-NAD Model with Adaptive Expectations

- The model is now dynamic, as one period affects the next via $\pi_t^e$
- Let's now trace out the impact of a 1-time, permanent surge in m



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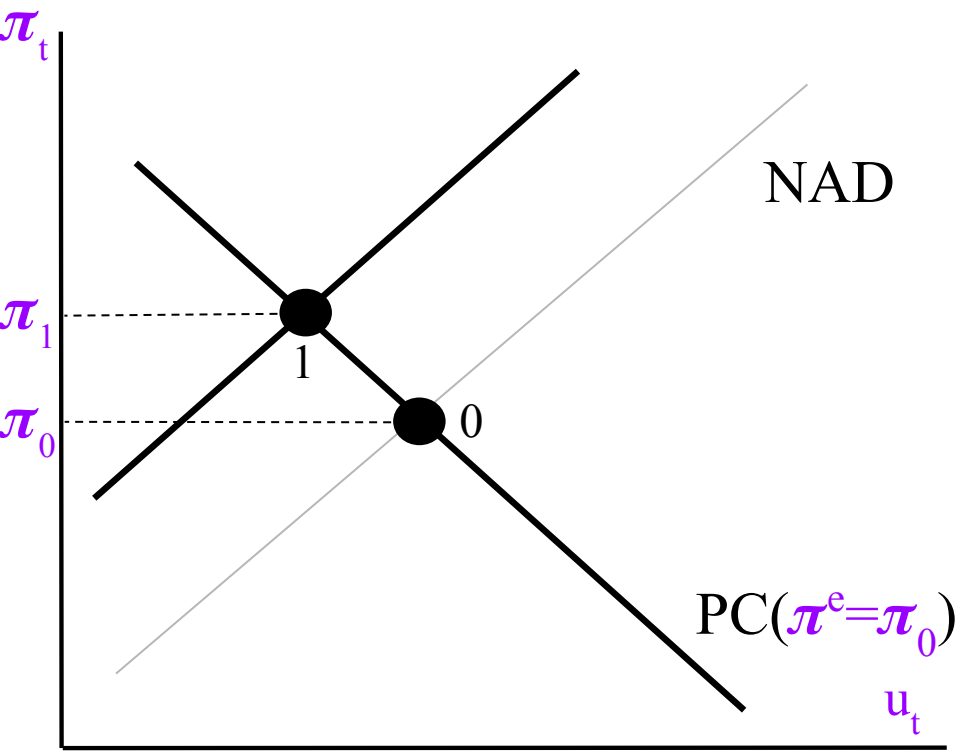

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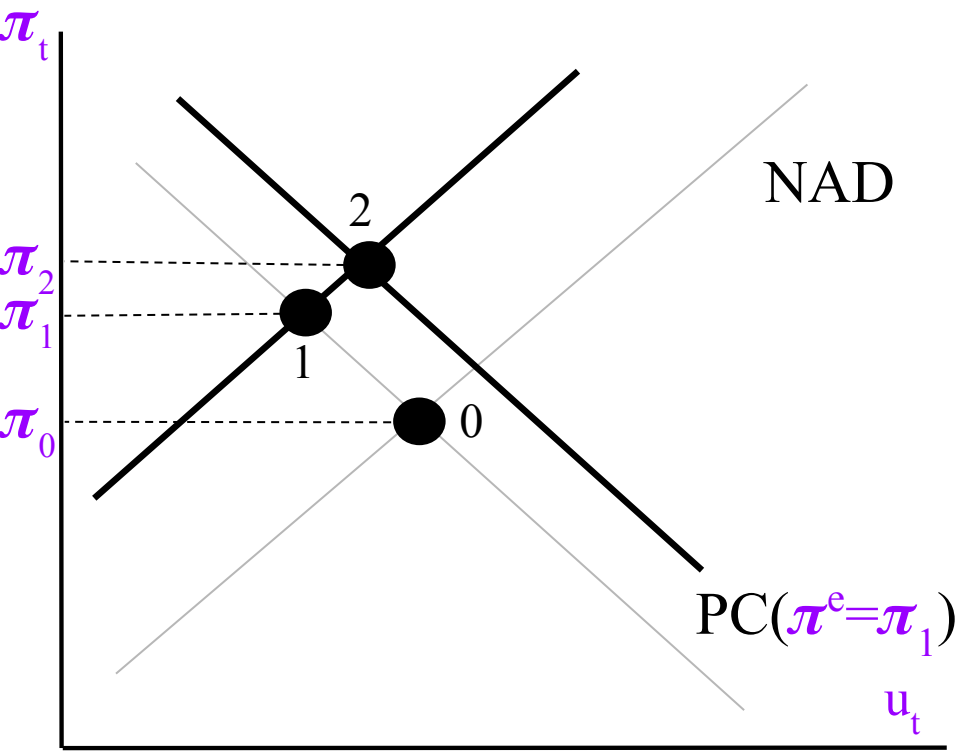

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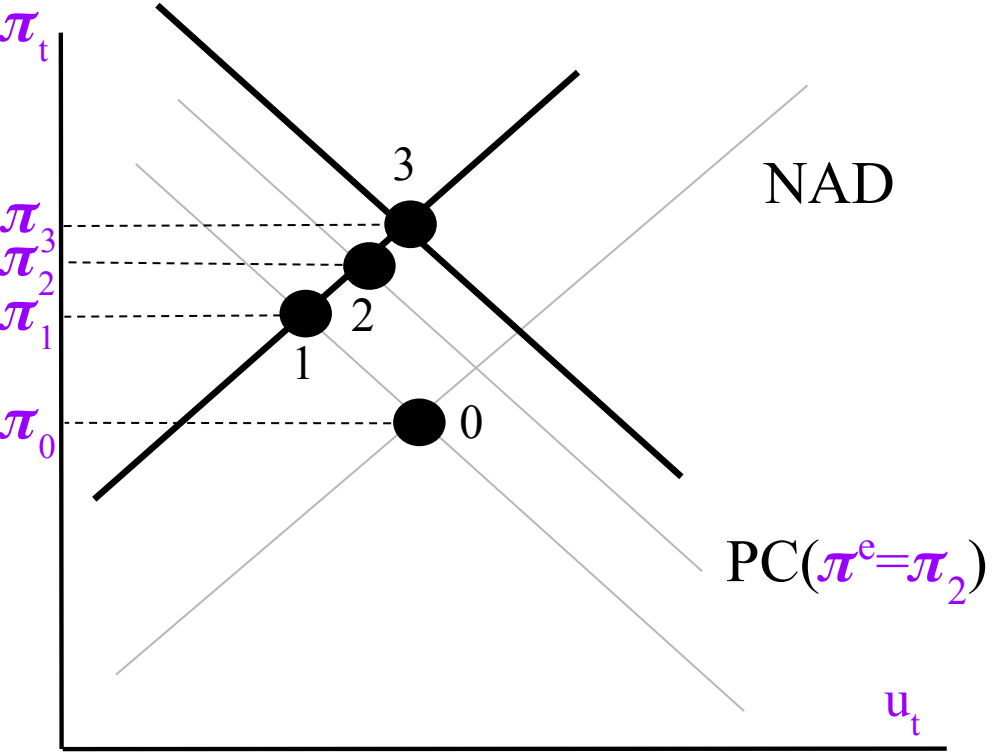

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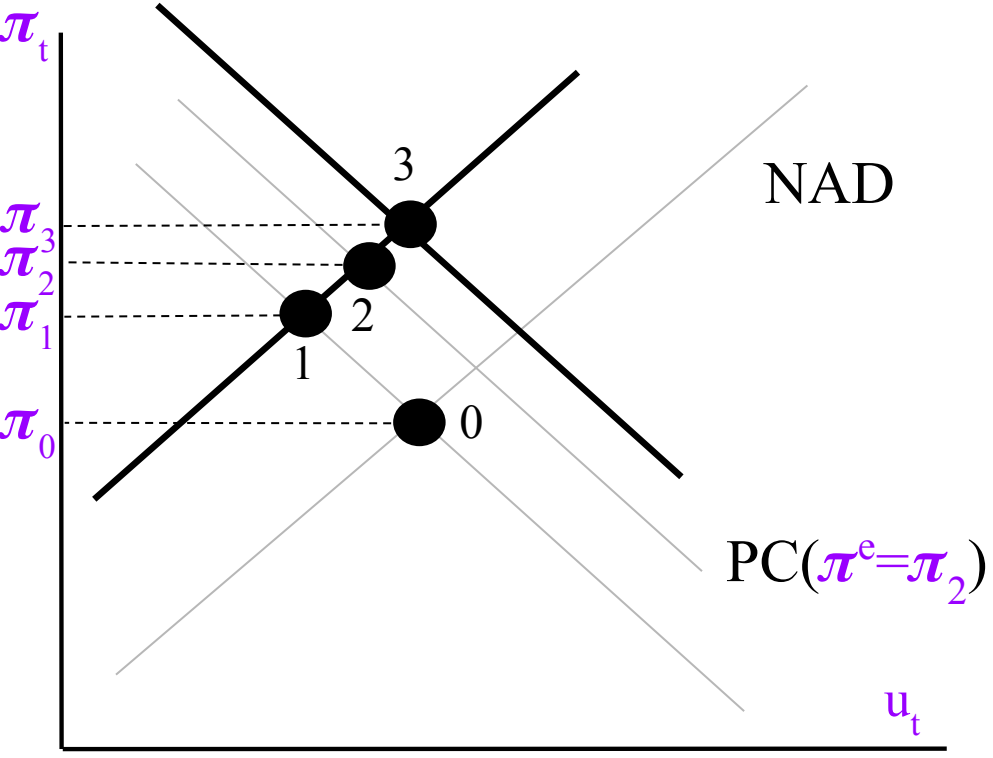
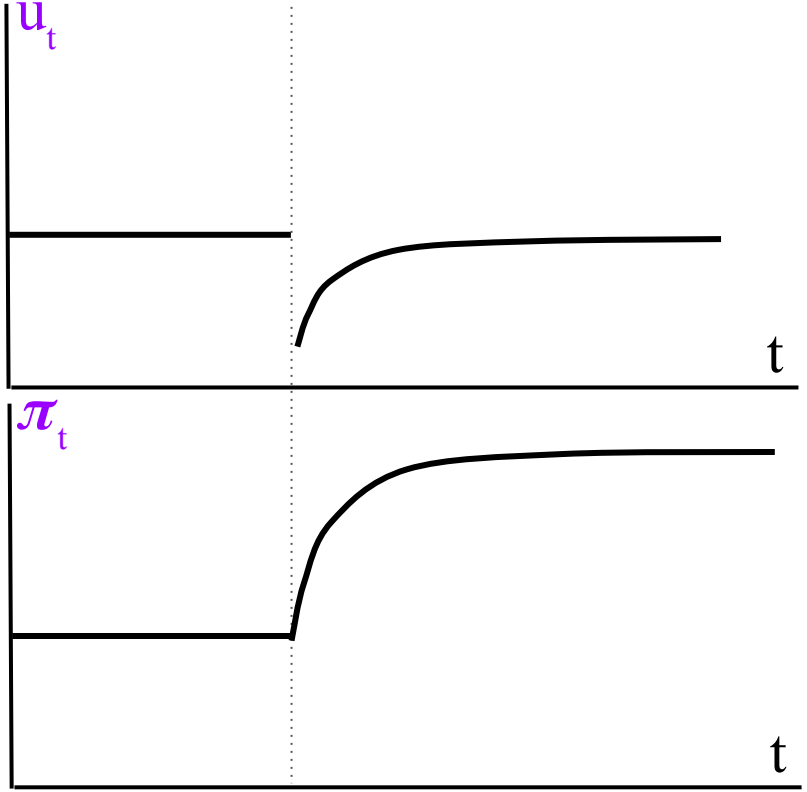


# The Natural Rate of Unemployment ($u_N$)

$$\pi_t = \alpha + \pi_t^e - \beta \cdot u_t$$

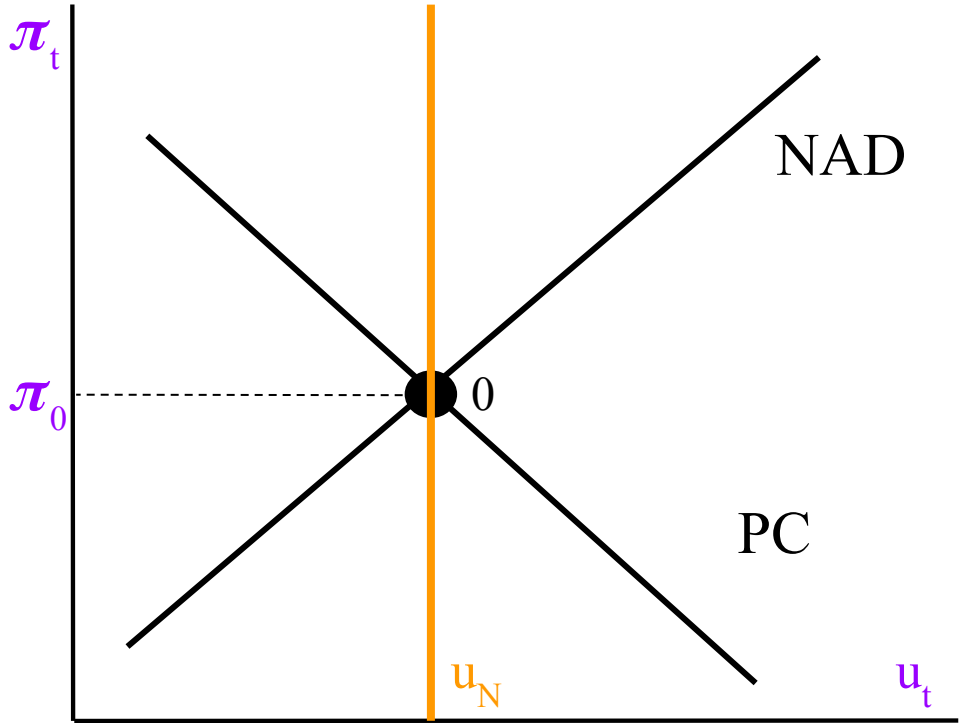
- In the model and the data, u seems to be anchored to some base level, even if it can deviate from it for awhile
- We will call this $u_N$, most often referred to as the <u>the natural rate of unemployment</u>
- 2 interpretations of $u_N$:
  1. Long-run level of unemployment reached after the effects of a shock have worn off
  2. The level of unemployment achieved if people correctly predict inflation ($\pi_t^e = \pi_t$)
     - Story: nominal prices get set based on $\pi_t^e$
       - ➢ If we print extra m and drive up $\pi_t > \pi_t^e$, those nominal prices will feel cheap, which spurs spending, leading to firms bidding up the price of labor and driving down u
         - Of course, then next period people will come to expect that higher level of inflation
       - ➢ If we don't print enough m and $\pi_t < \pi_t^e$, the prices feel very high and the reverse happens
       - ➢ So $u_N$ is the level of unemployment associated with a normal level of capacity utilization
         - Don't have to compete vigorously to hire workers
         - Don't have workers desperate for jobs
         - $Y_{pot}$ is the level of output associated with $u_N$
- Common to rewrite the Phillips Curve as:

$$\pi_t = \pi_t^e - \beta \cdot (u_t - u_N)$$

# The PC Pinning Rule

PC with adaptive expectations: $\pi_t = \pi_{t-1} - \beta \cdot (u_t - u_N)$

- Each period's PC should intersect $u_N$ at last period's level of $\pi$



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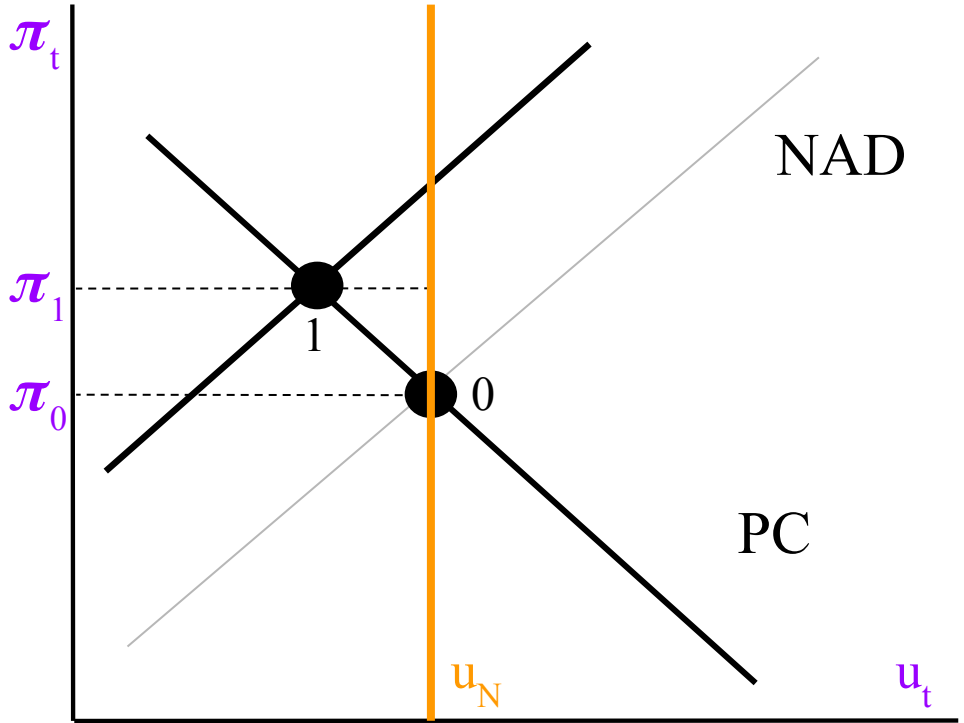

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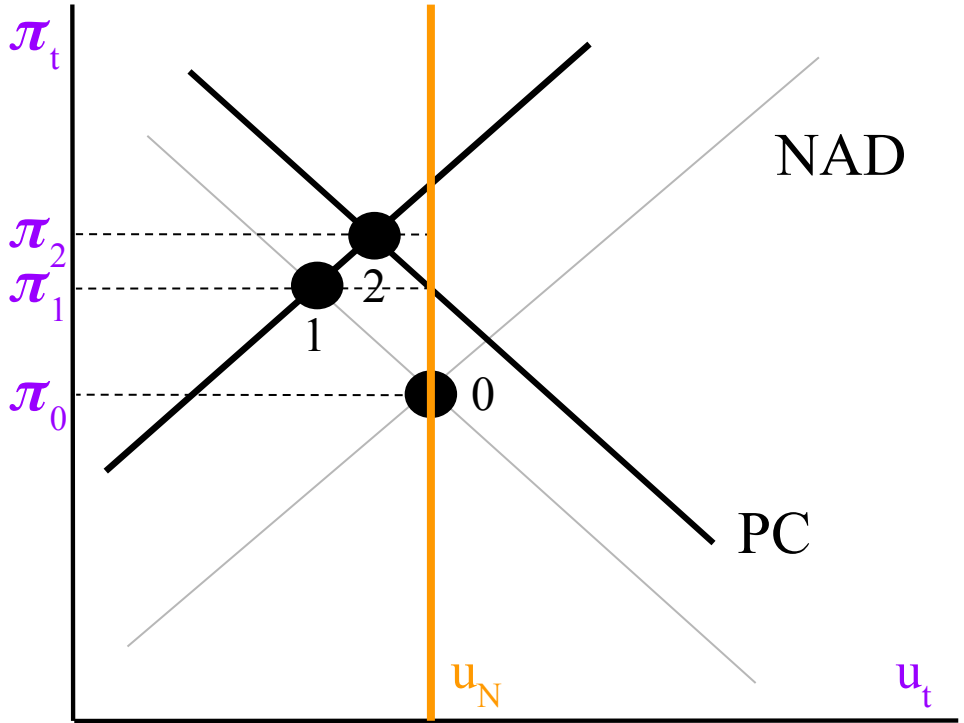

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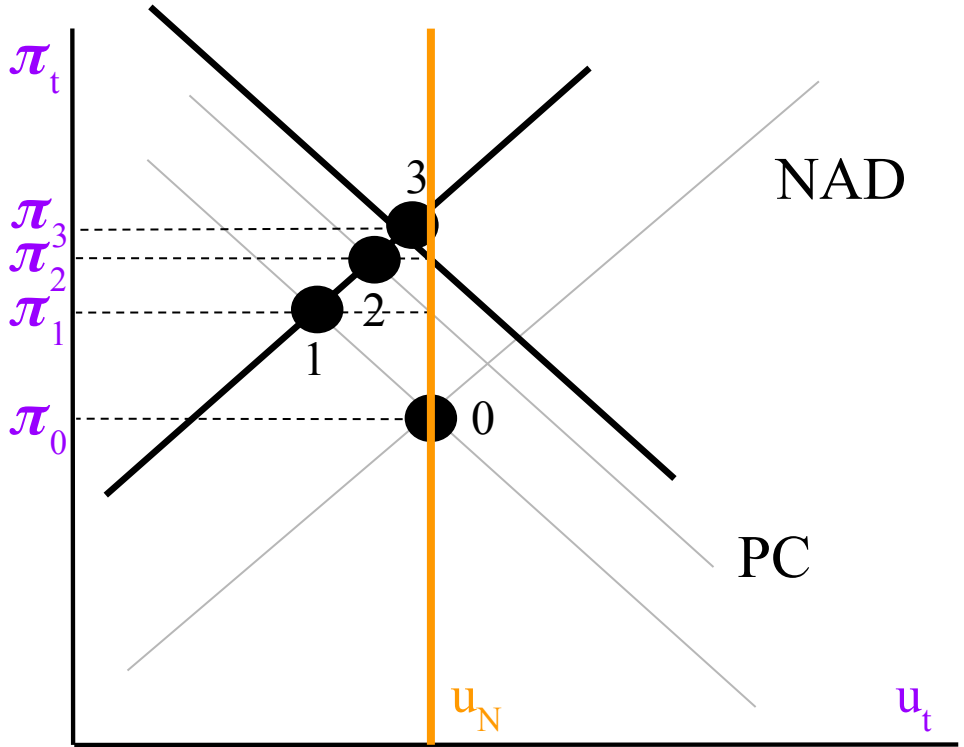
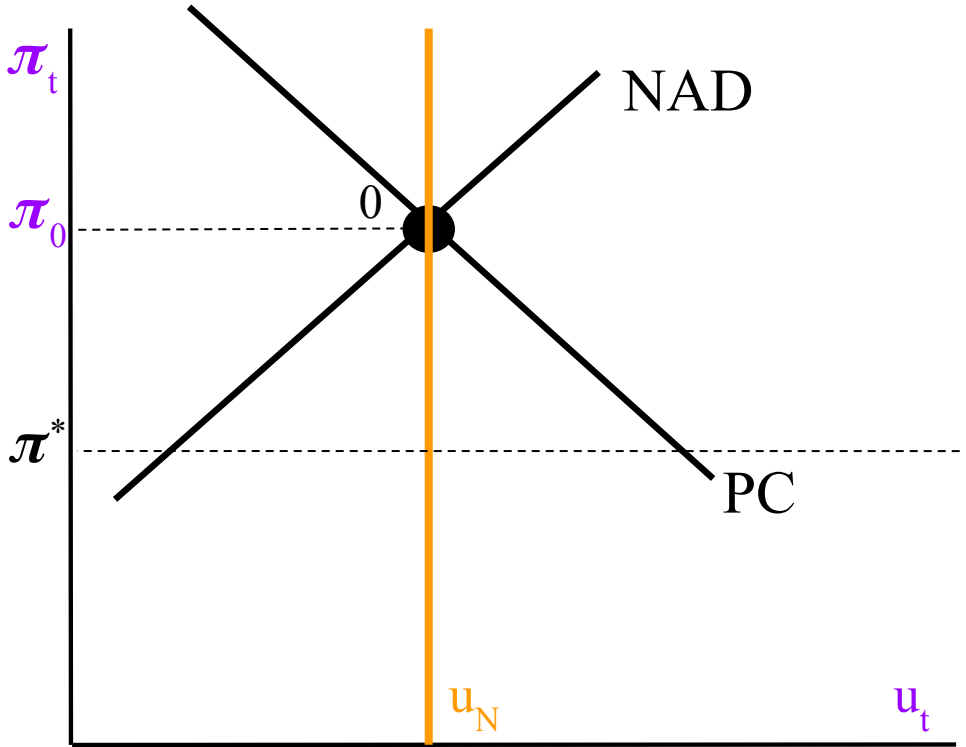


# Long-Run Neutrality of Monetary Policy

- The "natural rate hypothesis" brings back the classical dichotomy in the long run
  - Printing money can have short term impacts on output because of sticky prices…
  - …but prices are not stuck forever, and eventually inflation will eat away at spending power and bring output back to where it started
  - Known as the "neoclassical synthesis" – bridges are models of totally fixed and totally flexible prices
- Notice the horrible tradeoff created by this! A temporary decrease in unemployment requires either:
  1. Permanently higher inflation
  2. A recession (see next slide)

# Lowering Inflation when Expectations are Adaptive

- Suppose $u = u_N$ but you think $\pi = \pi_0$ is too high – you want it at $\pi^*$. What can you do?



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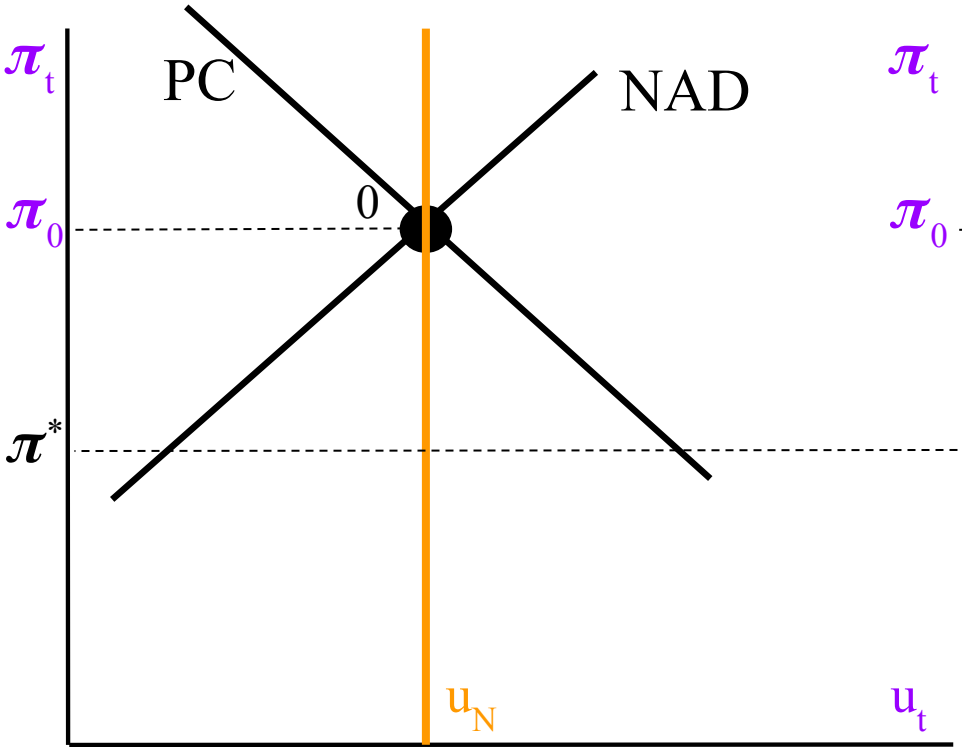
Short, deep recession

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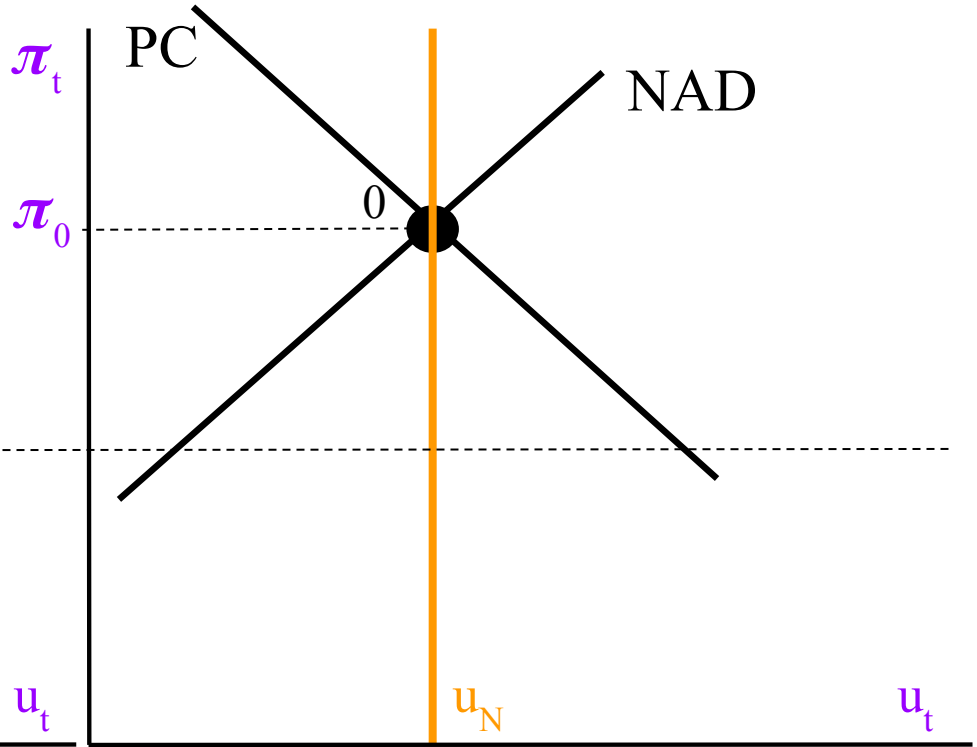

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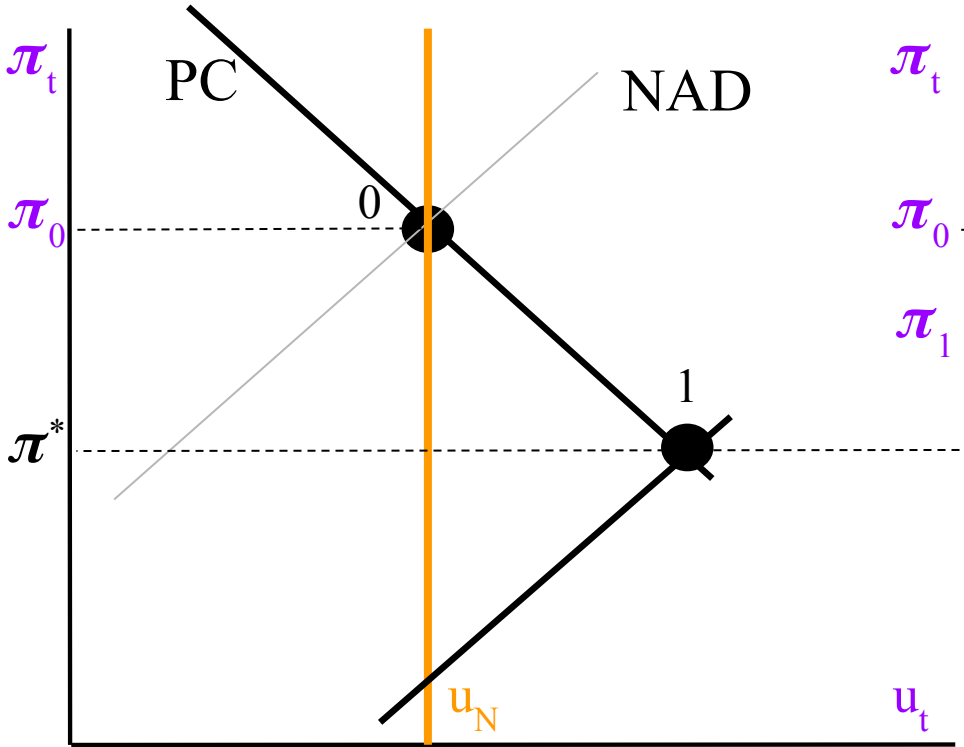


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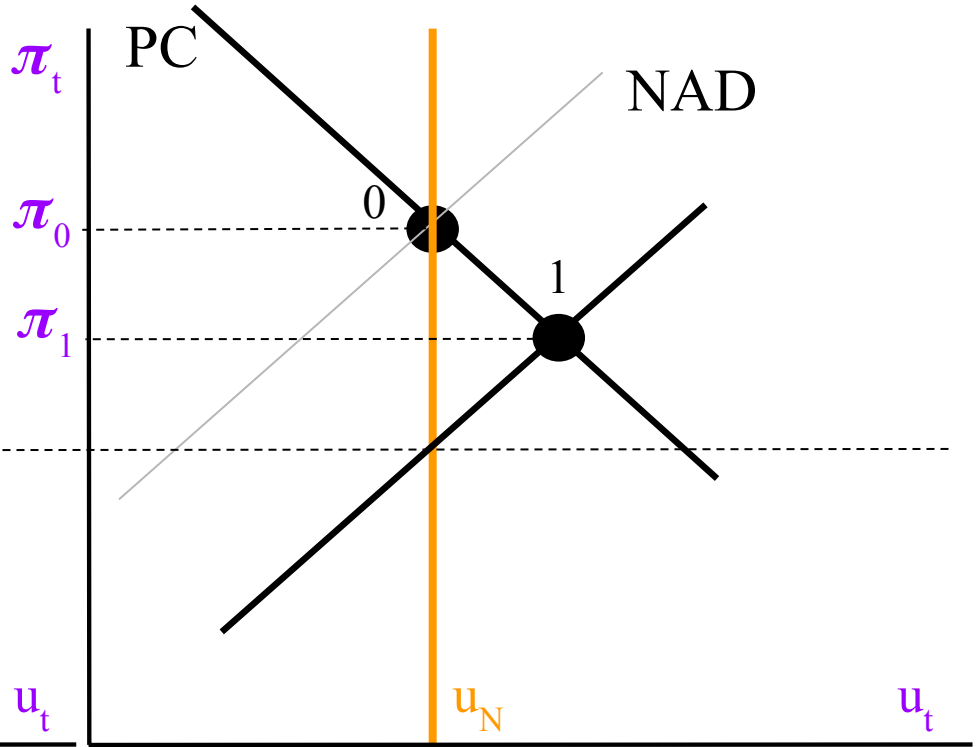

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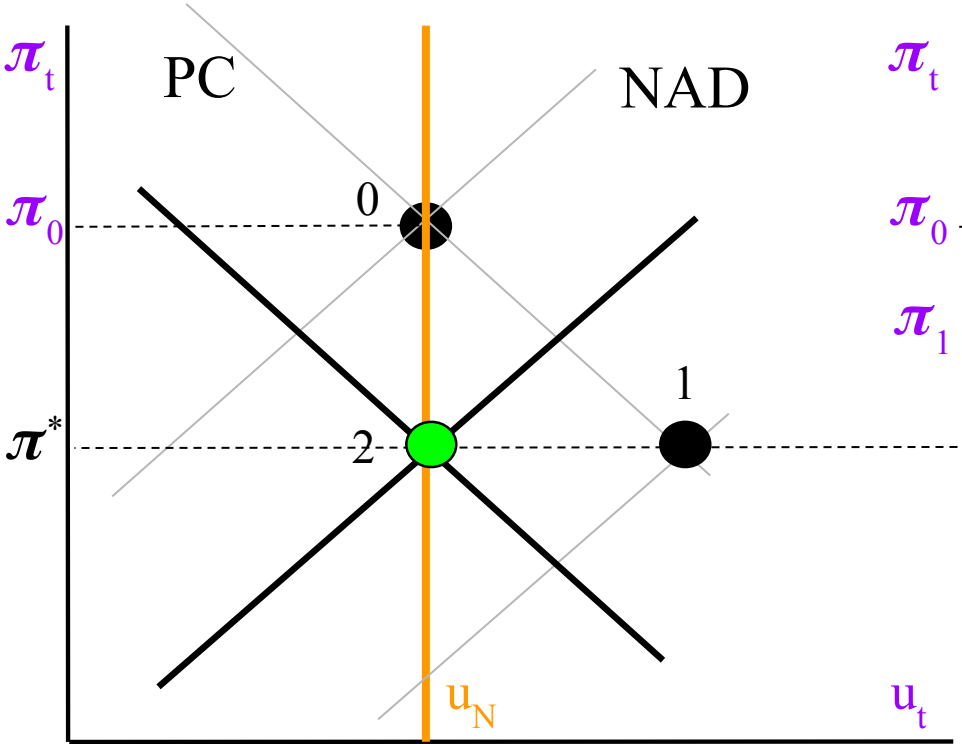


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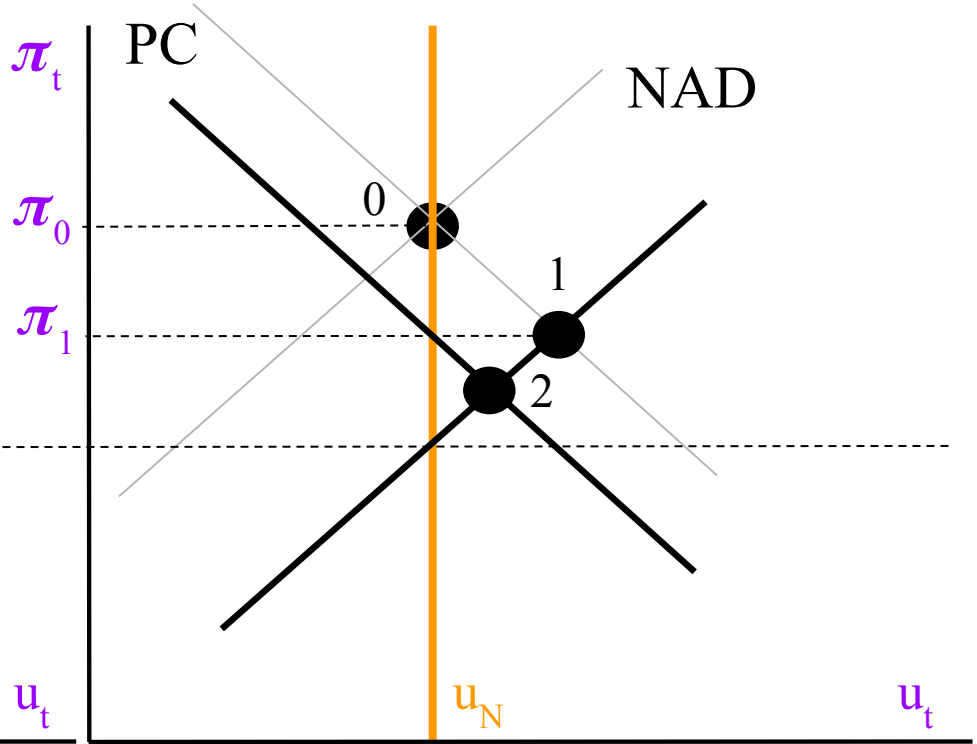

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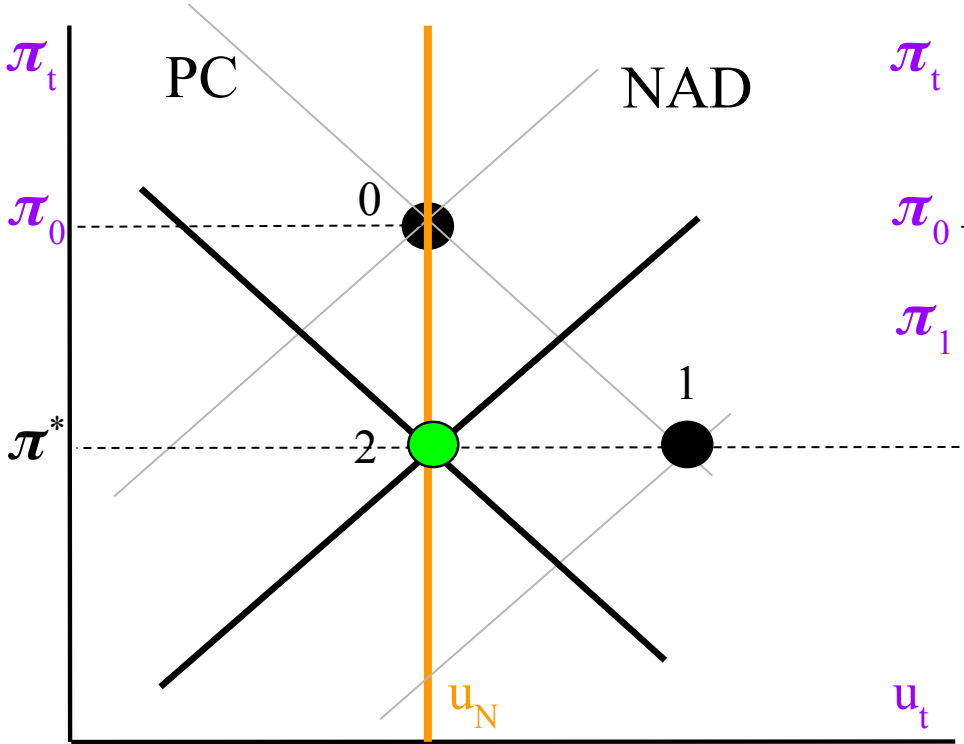


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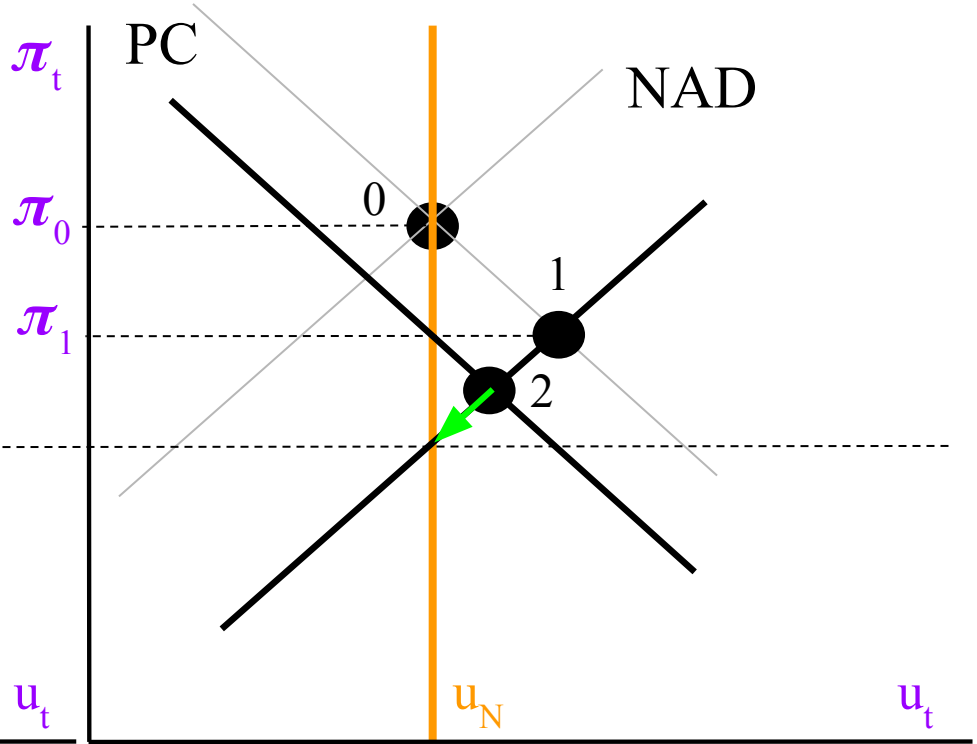

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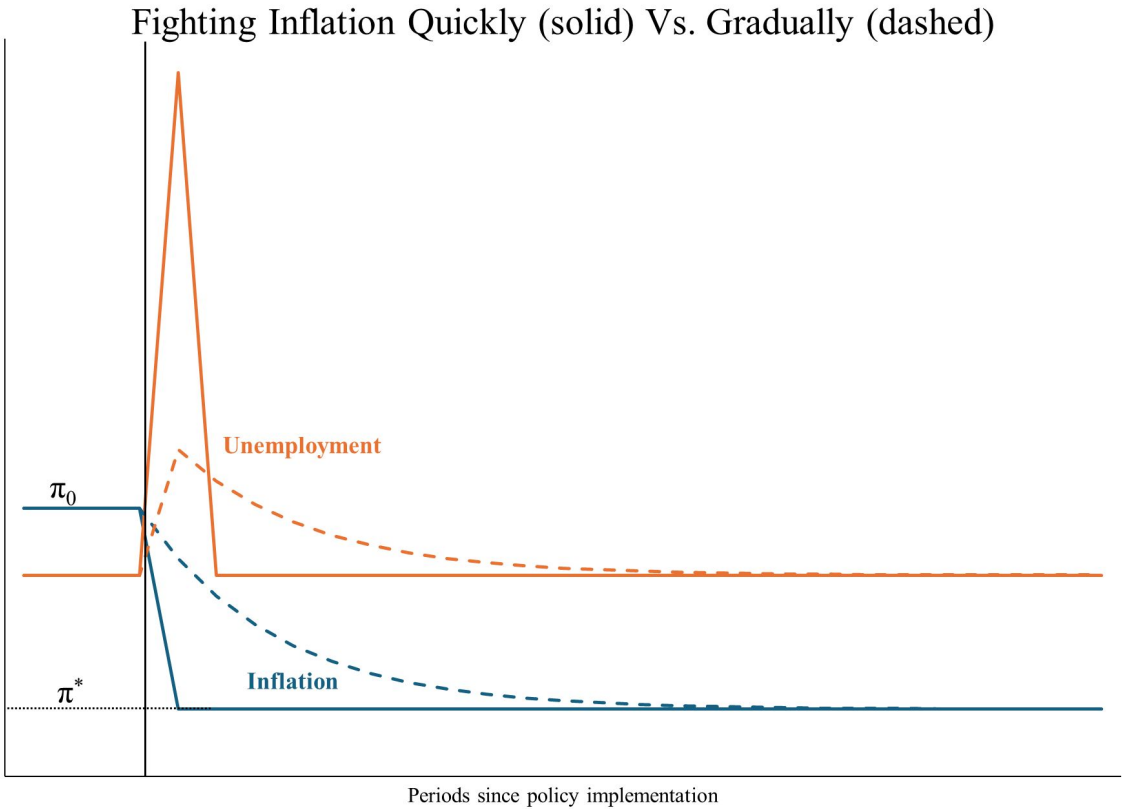

# The Sacrifice Ratio

$$\boldsymbol{\pi}_t = \boldsymbol{\pi}_{t-1} - \boldsymbol{\beta}\cdot(u_t - u_N)$$

- Lowering inflation requires elevated unemployment.
- The “sacrifice ratio” measures how much unemployment you must endure to get $\boldsymbol{\pi}$ down by 1pp (0.01)
- With a linear Phillips Curve and adaptive expectations, the sacrifice ratio is $1/\boldsymbol{\beta}$
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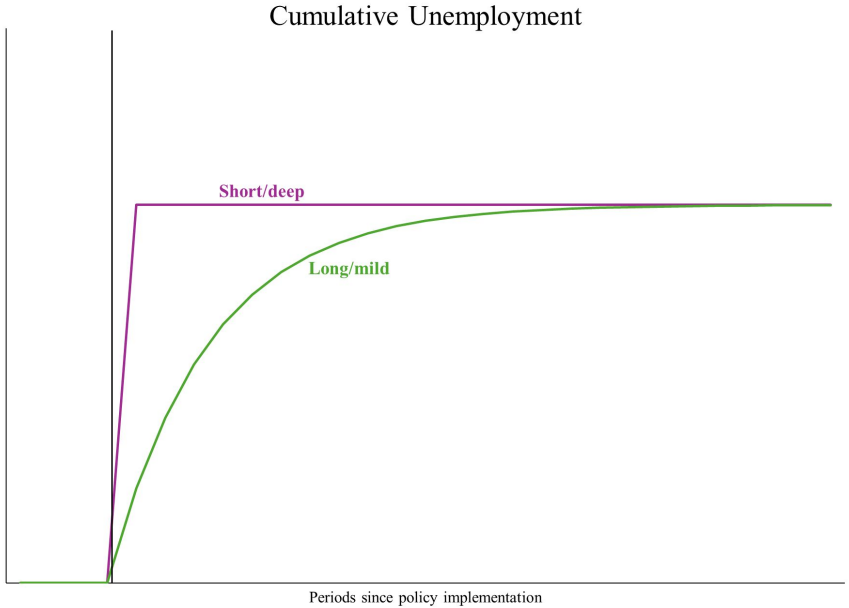

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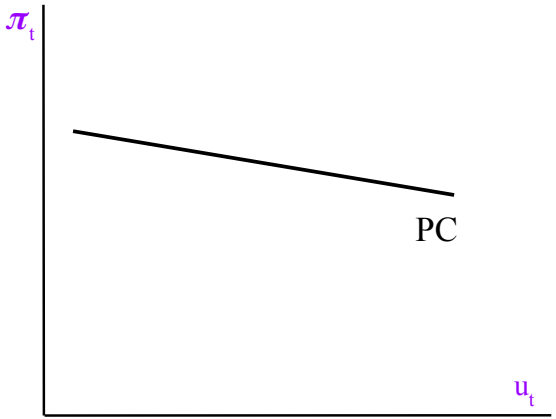
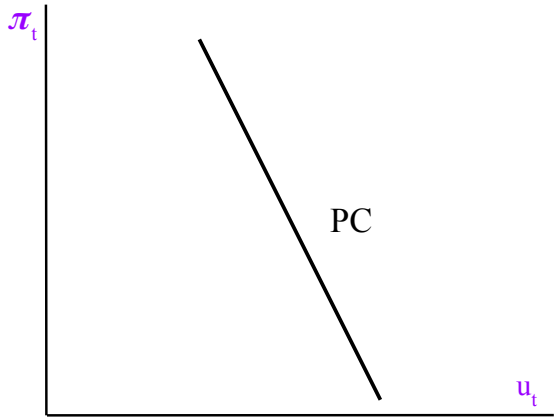
- 2 things to notice:
  1. It does not matter whether you take the short/deep approach or the long/mild approach – the cumulative amount on unemployment above $u_N$ is the same
  2. Flat Phillips Curve means inflation is not very sensitive to the state of the economy
     - Hard to generate inflation, but once you have it, it will be difficult to get rid of
     - Rough consensus is $\beta = 0.4$: reducing $\pi$ by 1pp requires 2.5pp of extra u. More on this later…



# Taylor Rules

- Interest rate policy can be thought of as balancing u and $\pi$, as summarized by the "Taylor Rule:"

$$r_t = r_N + \kappa_\pi \cdot (\pi_t - \pi^*) - \kappa_u \cdot (u_t - u_N)$$

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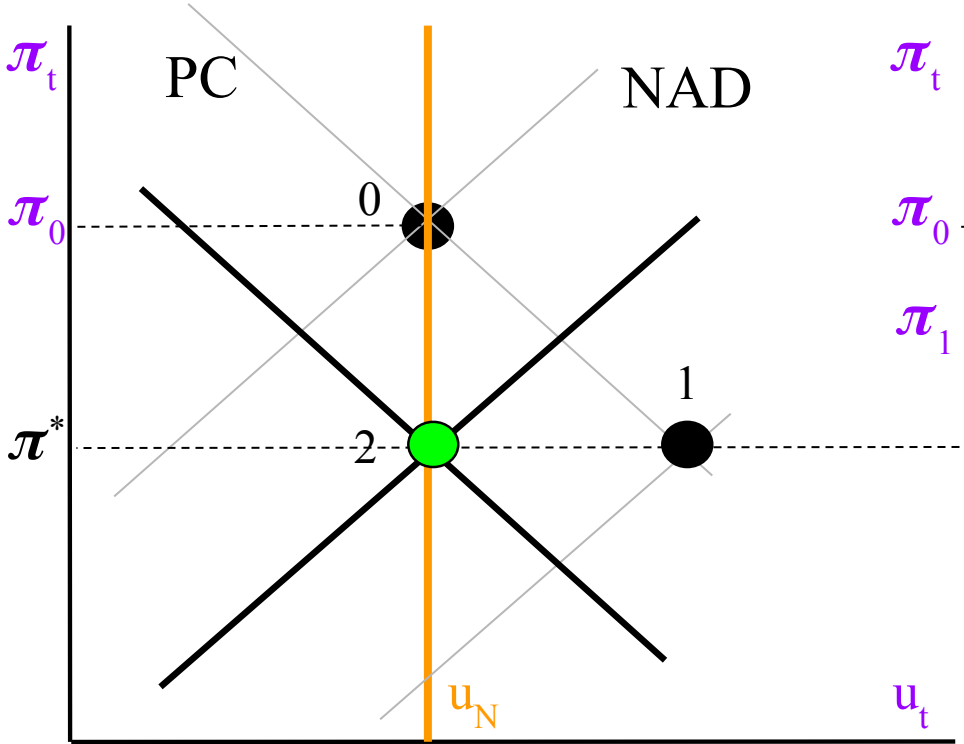


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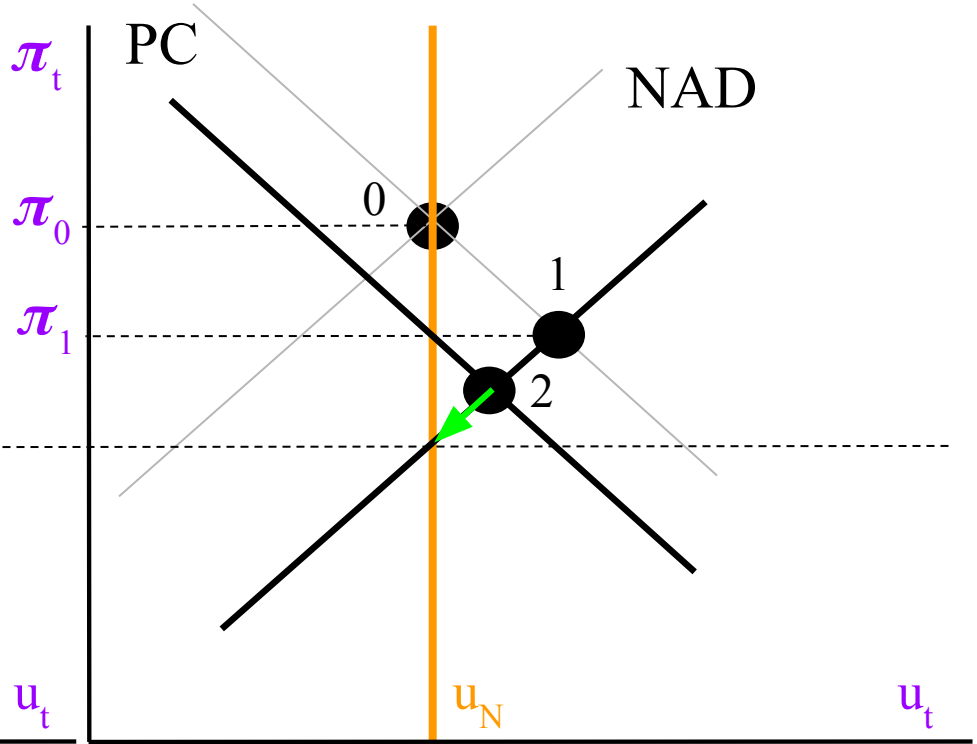

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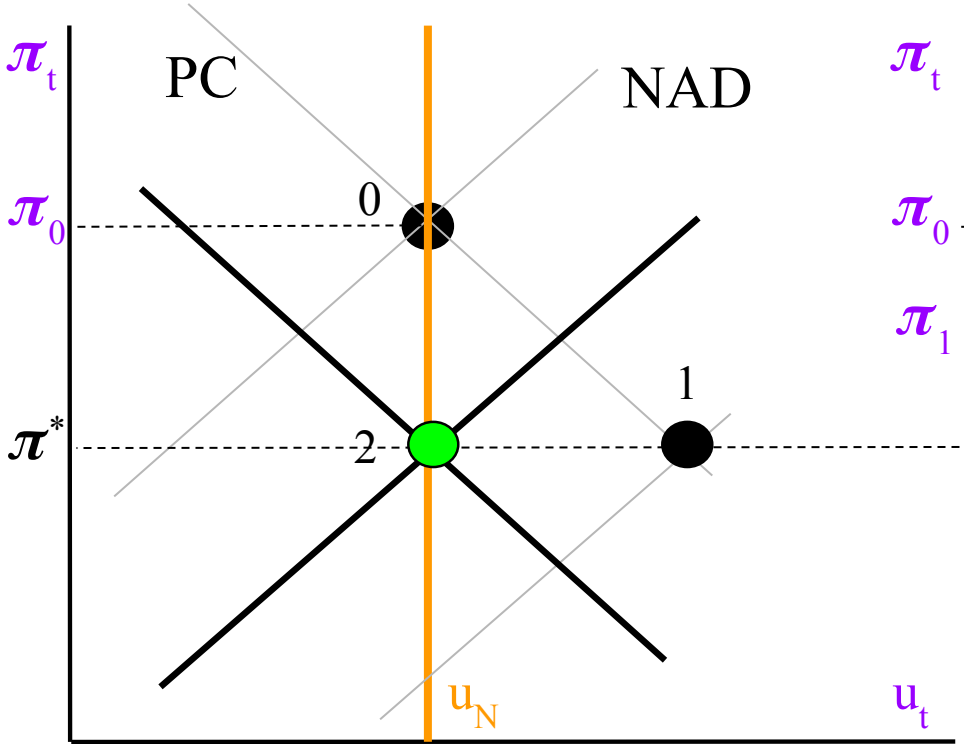
Approach if $\kappa_\pi > \kappa_u$

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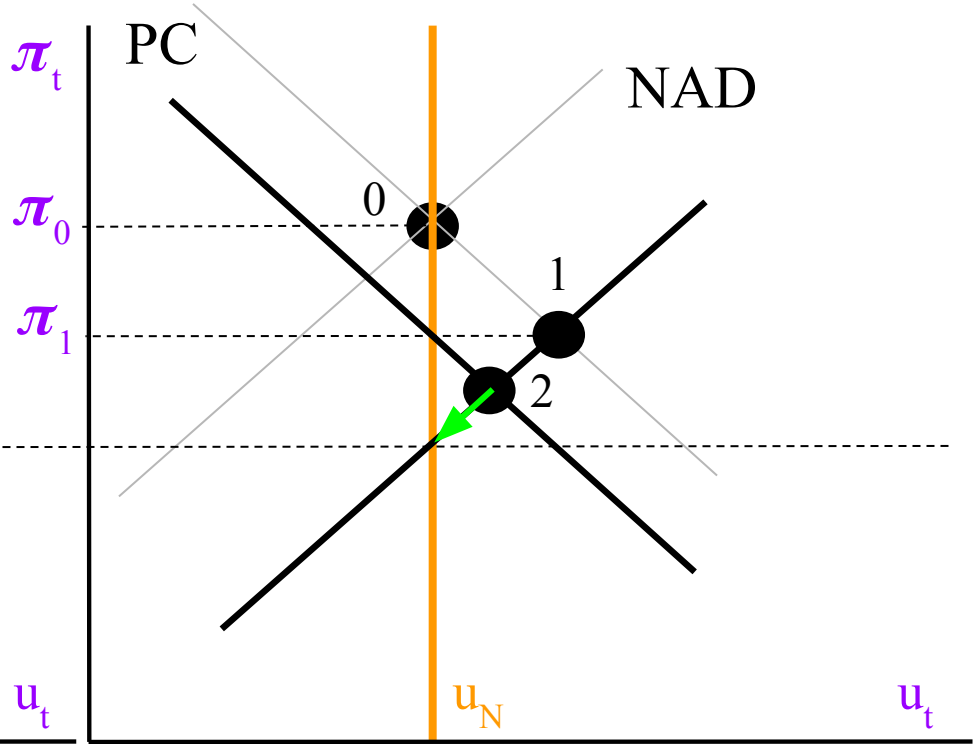
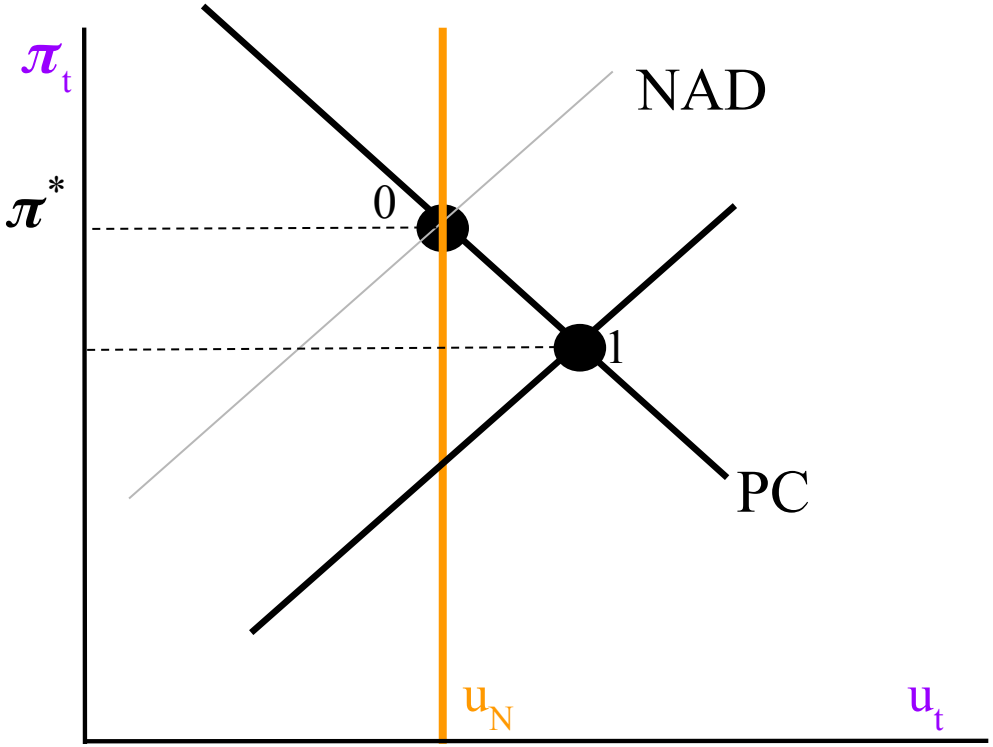


# Given these mechanics, we can now turn to how to deal with shocks

- So far, we've been seeing the impact of policy <u>when we start in a steady state</u>
  1. Expansionary policy can work for a bit but is eventually neutralized by higher inflation
     - Temporary boom requires permanent inflation
       - Lesson: we probably shouldn't strive to have $u < u_N$
  2. Lowering inflation requires a recession
     - This is really the same point as #1, but it's motivated around inflation rather than unemployment
       - Lesson: we shouldn't try to drive down inflation forever. Much of the world has adopted a target of $\boldsymbol{\pi}^* = 2\%$
- We will now think about how to deal with recessions that are caused by economic shocks, not policy
  - It turns out, the proper response depends a lot on the type of shock

# Demand shocks are easy to deal with in theory

- Suppose a decline in $c_0$ pushed you from 0 to 1, i.e. into a recession. What should you do?



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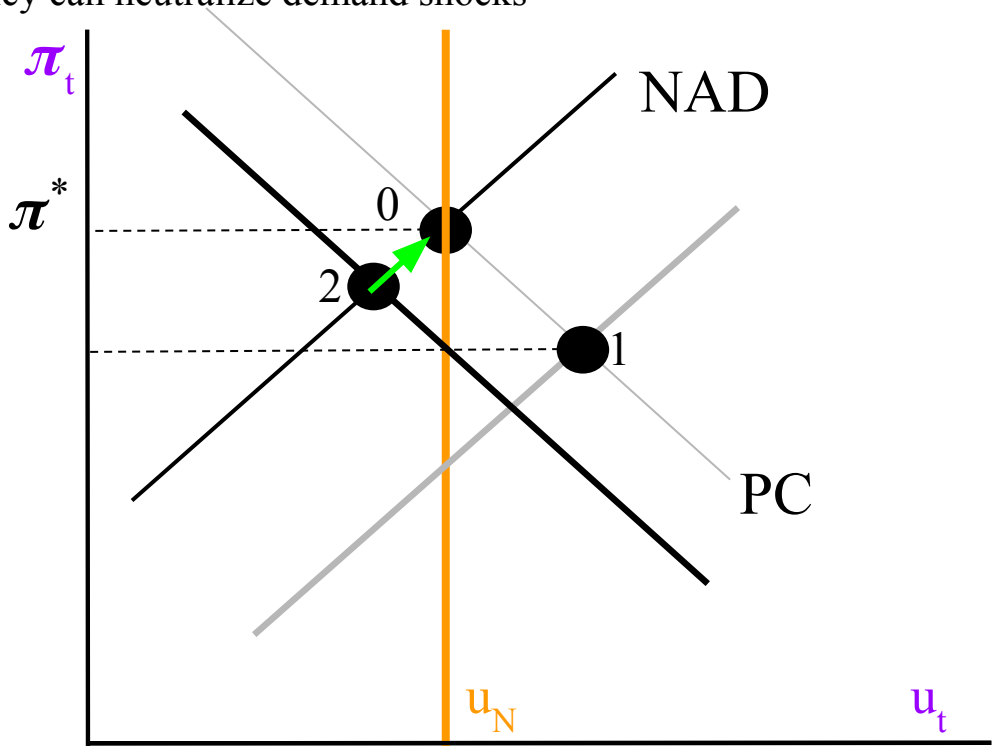
- Expansionary policy: increase M or G
  - This is the same as in IS-LM, because IS-LM was all about Demand anyway!
  - In theory, policy can neutralize demand shocks

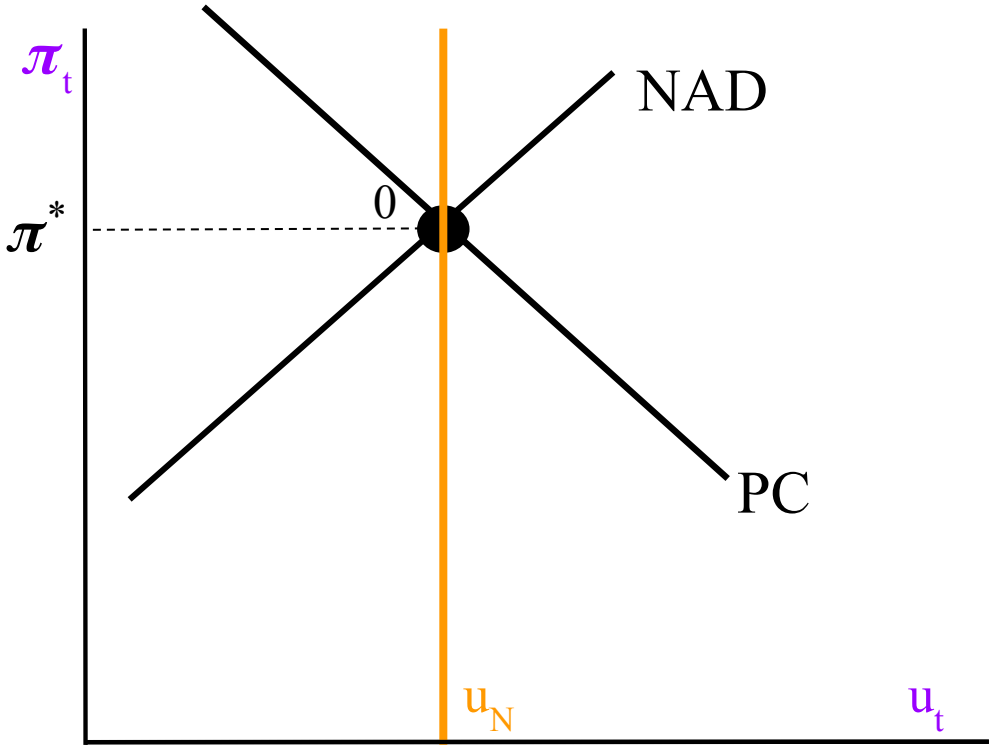


# Supply Shocks

- Shocks to production technology or inputs affect the supply side of the economy.
- 3 famous ones that we'll talk about:
  1. Oil – US's access to oil was hampered in 1970s (negative)
  2. COVID – working was a lot less appealing and more cumbersome during global pandemic (negative)
  3. IT revolution – productivity growth increased as computers and internet took hold in the 1990s (positive)
- In our model, the supply side of the economy is captured by $Y_{pot}$, or in our current formulation $u_N$
  - A negative supply shock shifts $u_N$ to the right, a positive one shifts it to the left
  - We'll also think about temporary vs permanent shocks

# A Permanent Negative Supply Shock

- Consider a long-term decline in TFP growth, which lowers economic potential



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  - Negative supply shocks cause "stagflation"
    - Economic stagnation, high inflation
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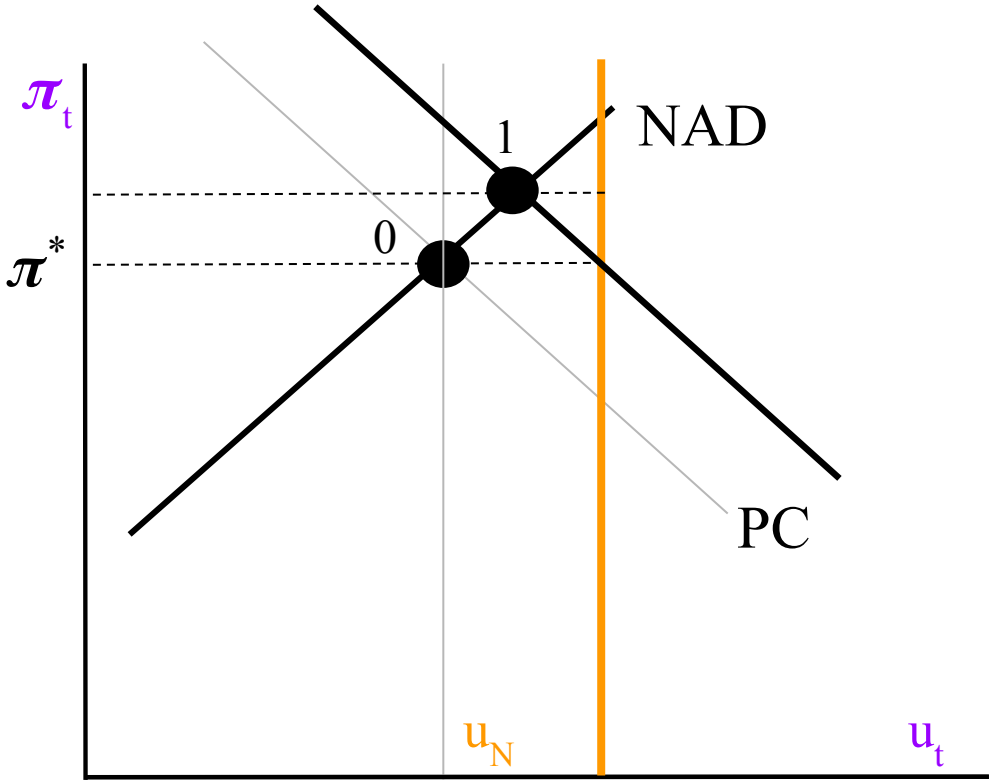

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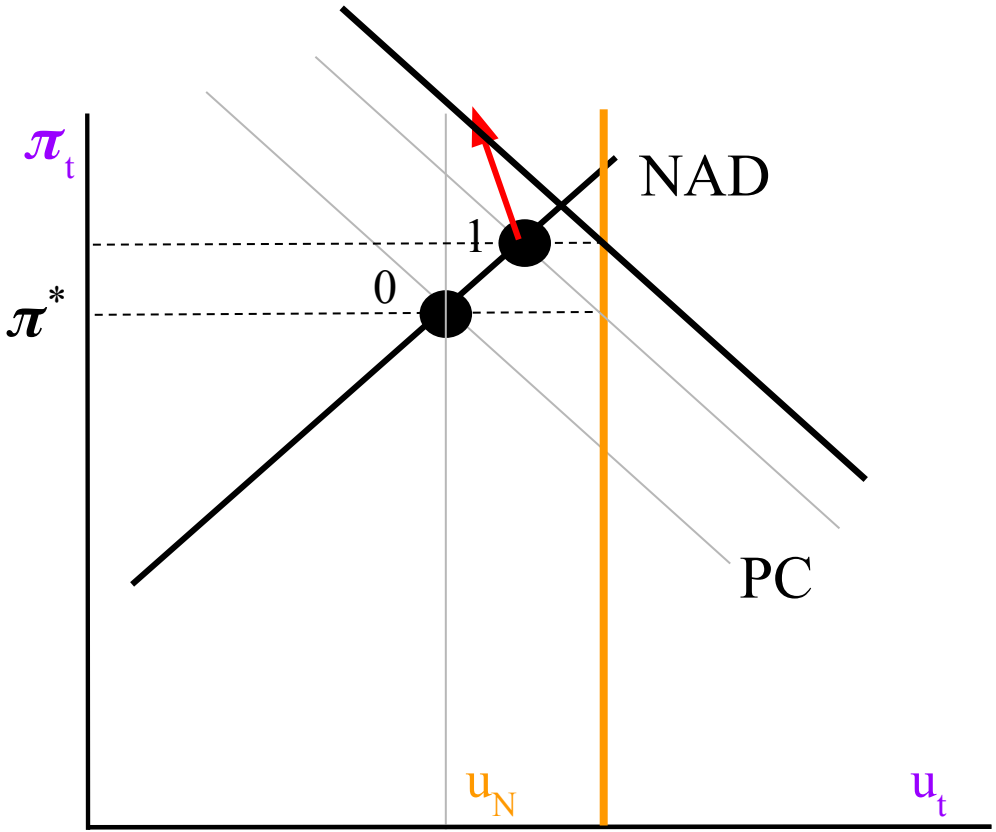


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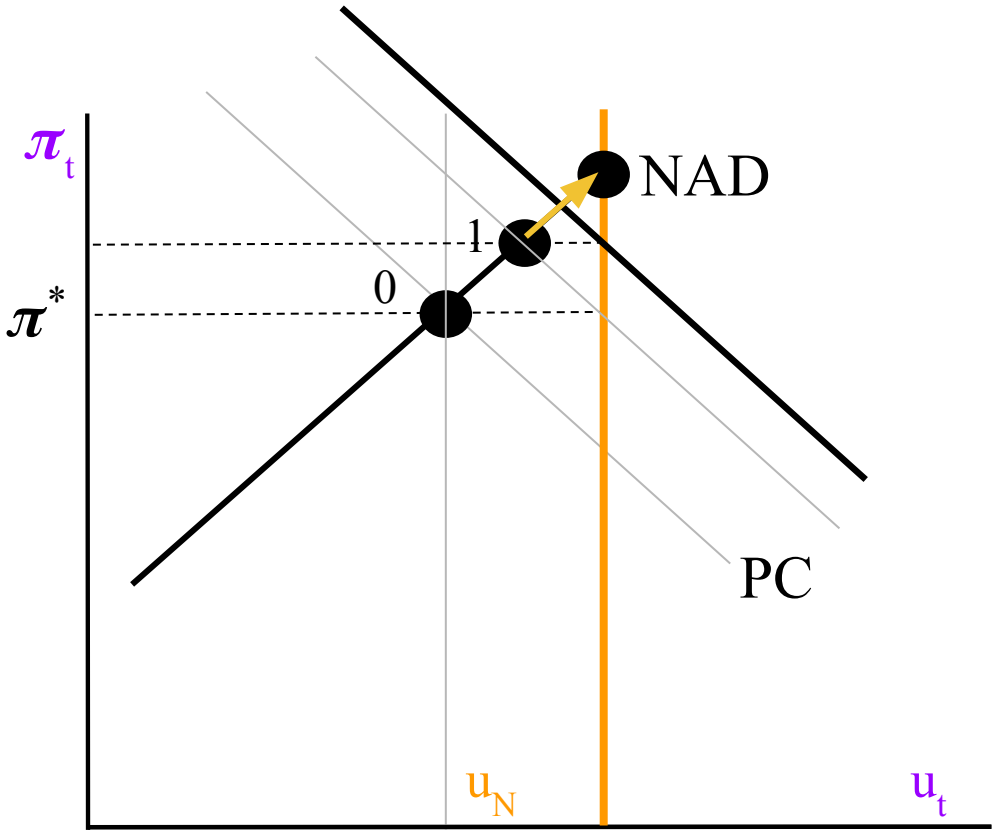


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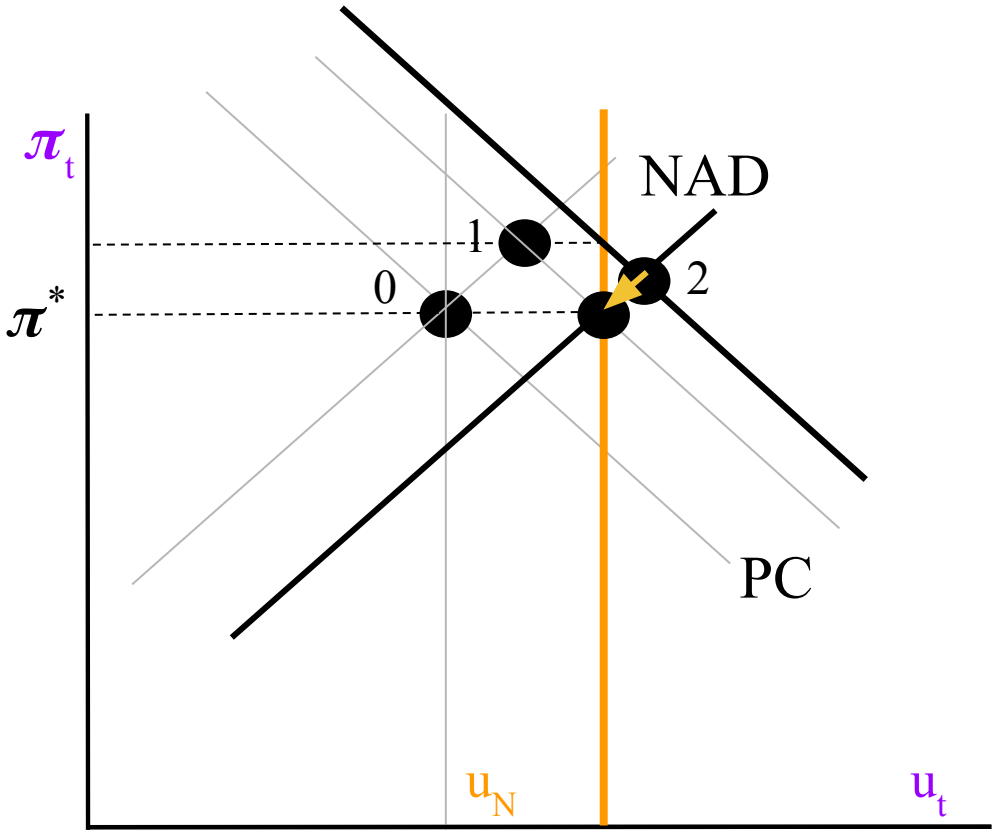
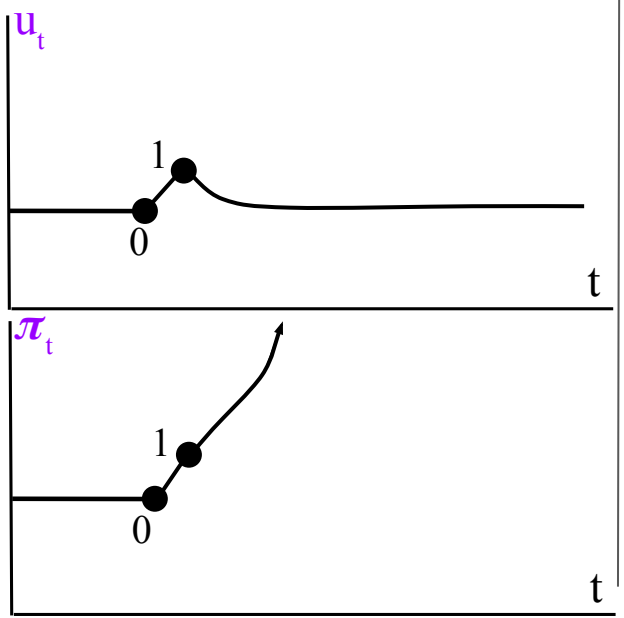


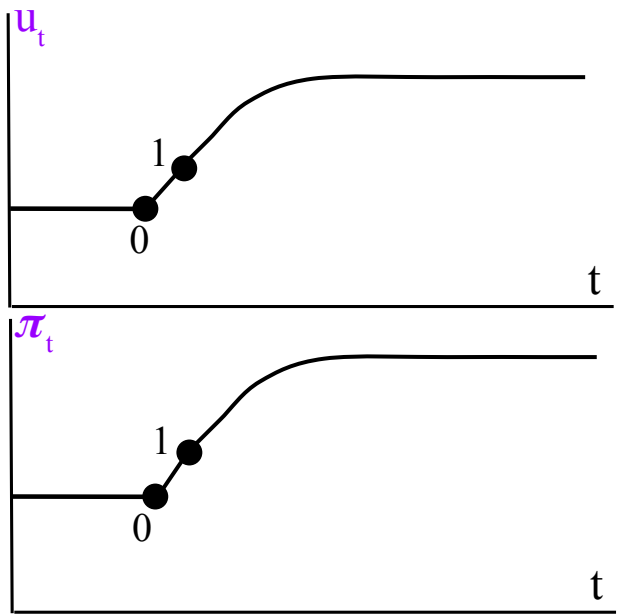

- Negative supply shocks cause "stagflation"
  - Economic stagnation, high inflation
- Feels like a recession, but it's actually a bizarro boom ($u_2 < u_N$)
- Policy is really stuck here
  1. Keeping u low isn't really an option
     - This would lead to hyperinflation
  2. Inaction will see u drift up and $\pi$ find a new permanent level above $\pi^*$
  3. If you're serious about $\pi^*$, you actually have to lean into the "recession"
     - i.e. eliminate the bizarro boom
     - You could do this more or less gradually, but one way or another you need to accept even higher u than than the new $u_N$ if you want to get inflation back to $\pi^*$

# A Permanent Negative Supply Shock: Recap

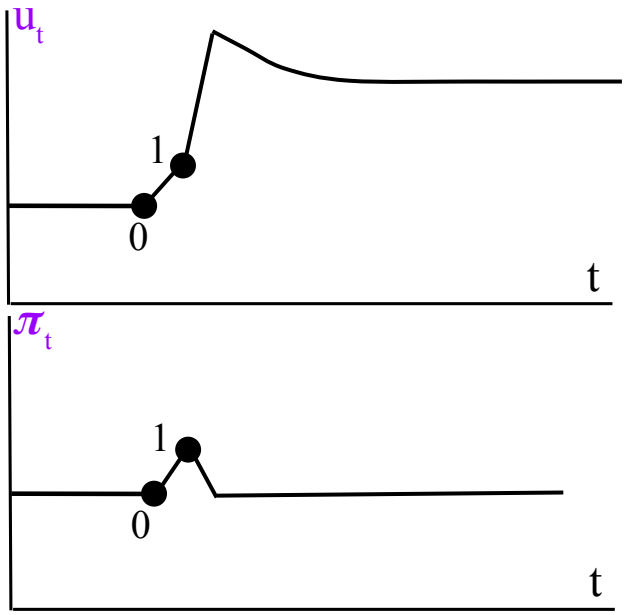
1. Keep u low




2. Inaction

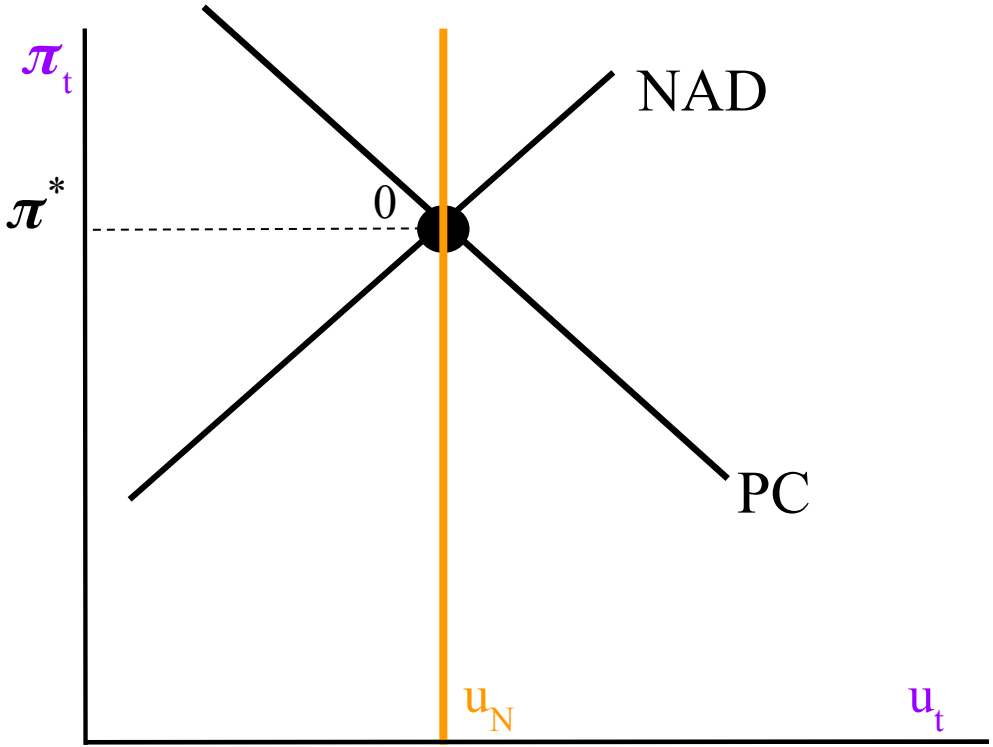



3. Get $\pi$ down



# A Temporary Negative Supply Shock

- Consider a temporary (one-period) reduction in access to foreign oil, which lowers economic potential



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  - Stagflation in period 1
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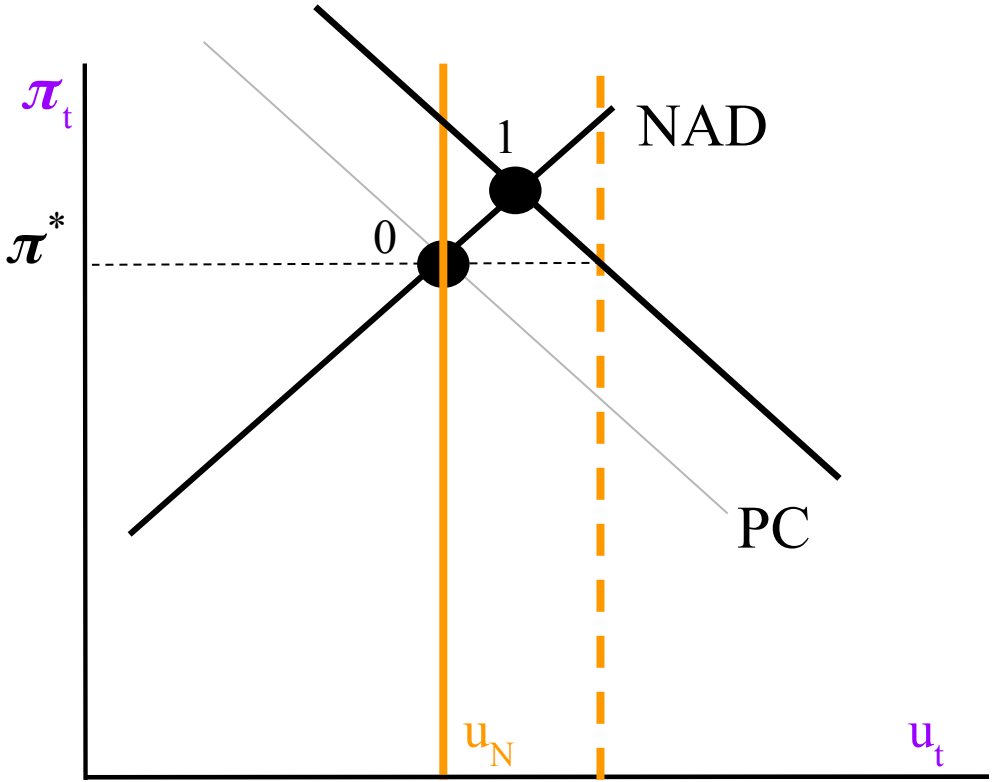

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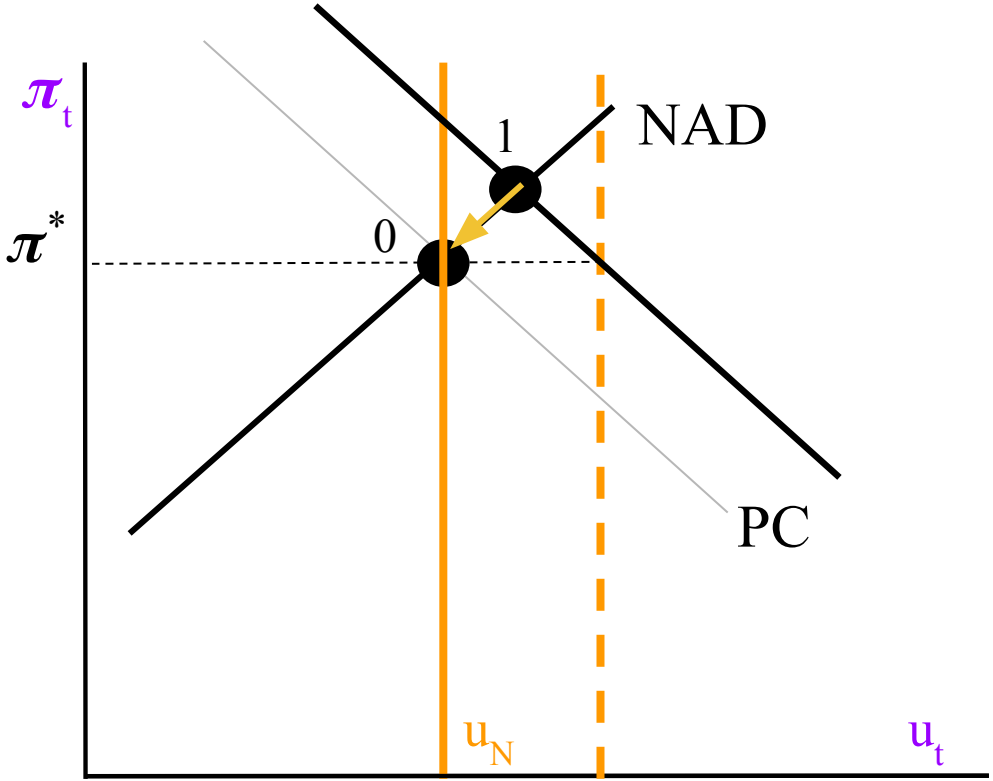
  - Stagflation in period 1
  - Policy options:
    1. Inaction: eventually the recession will grind down inflation expectations



# A Temporary Negative Supply Shock

- Consider a temporary (one-period) reduction in access to foreign oil, which lowers economic potential
  - Stagflation in period 1
  - Policy options:
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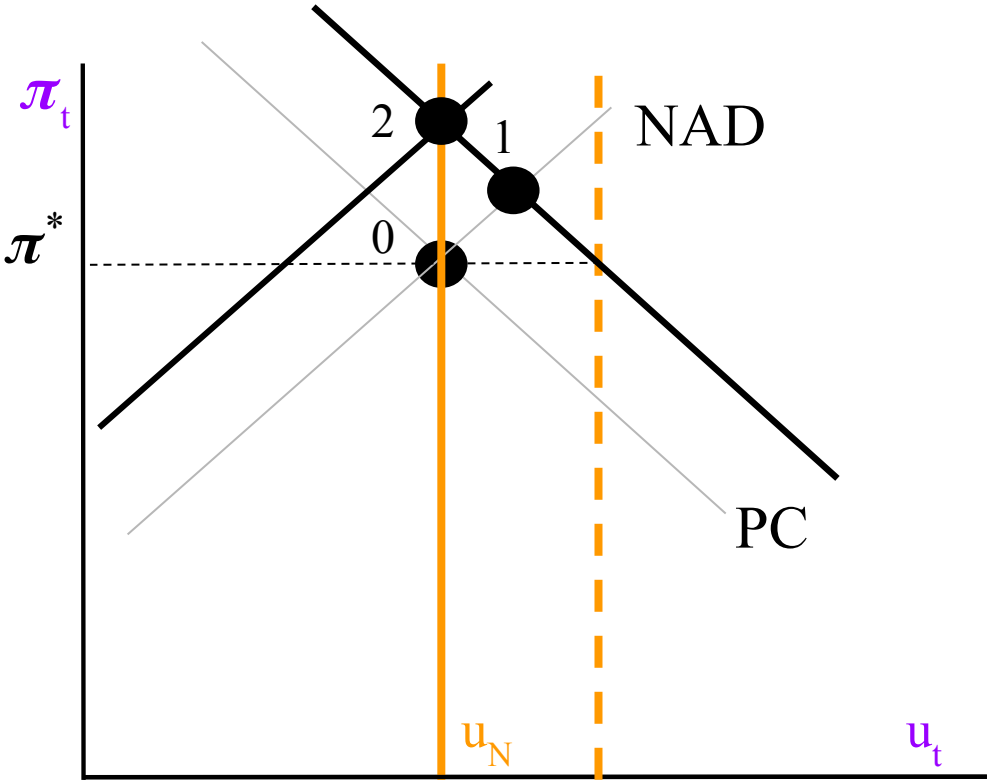
    2. Lowering unemployment quickly is still hard: it won't lead to hyperinflation, but it will lead to permanently high inflation



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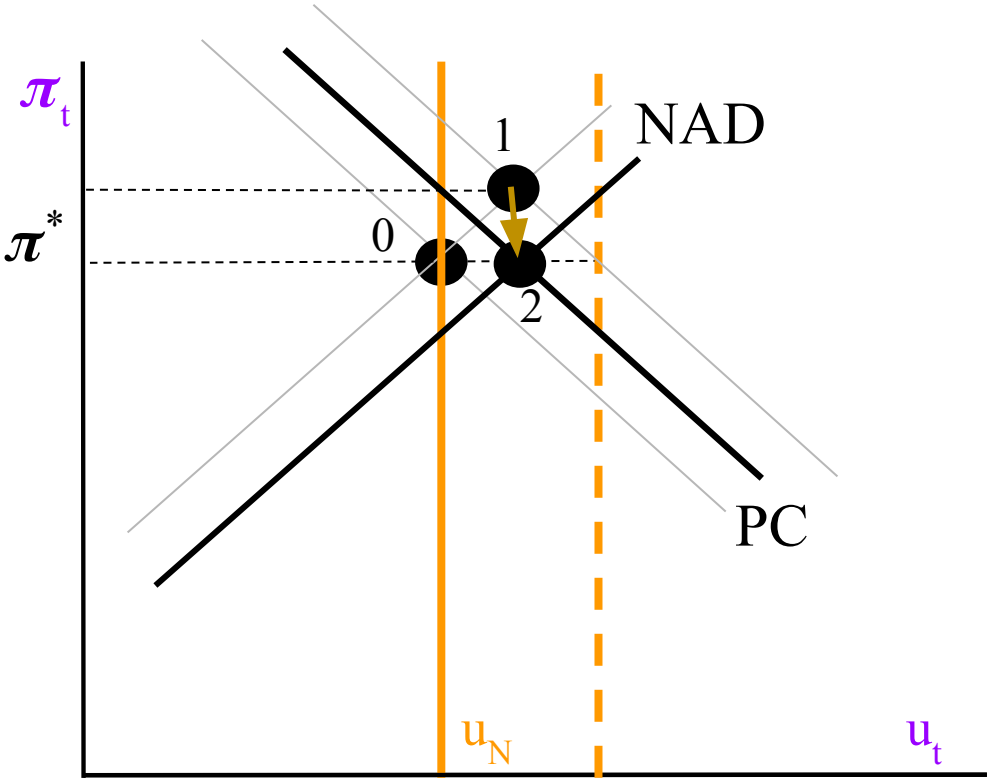

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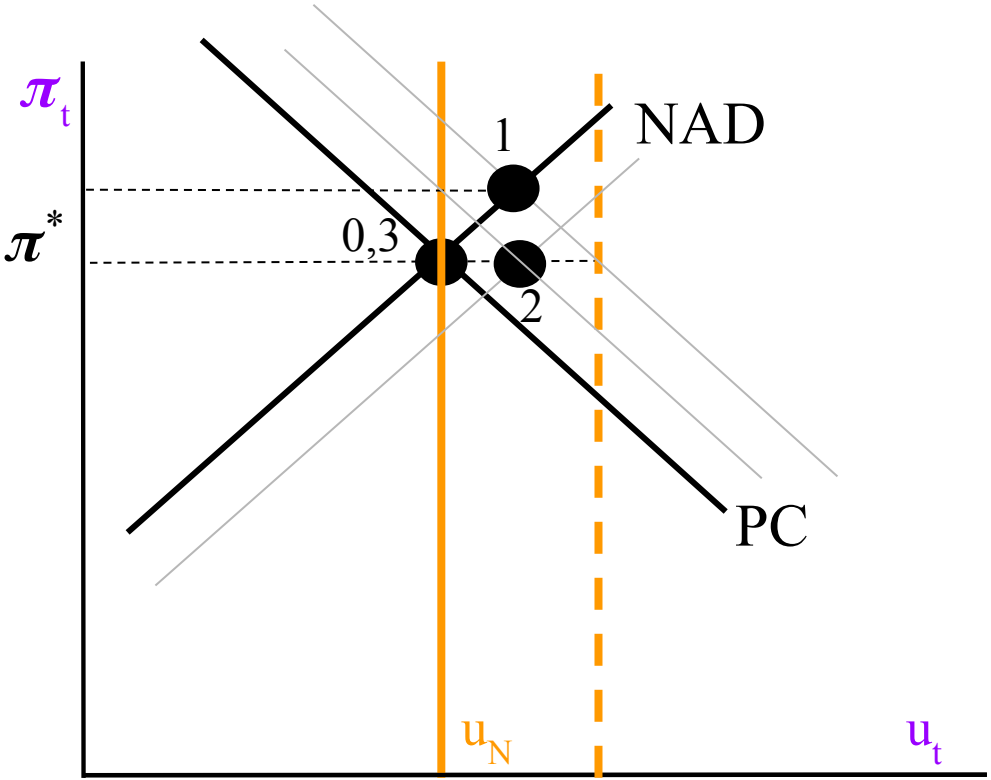
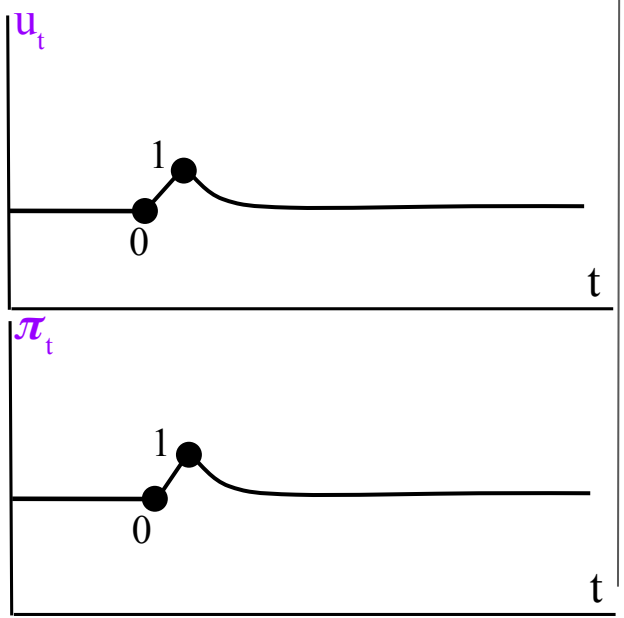
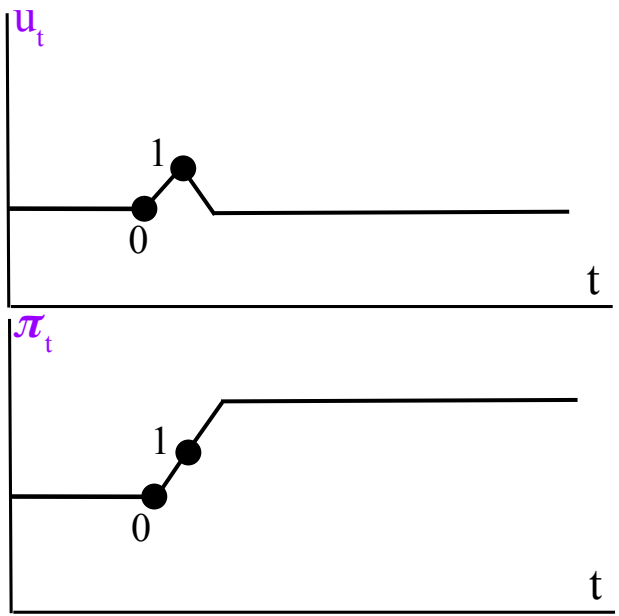


# A Temporary Negative Supply Shock: Recap

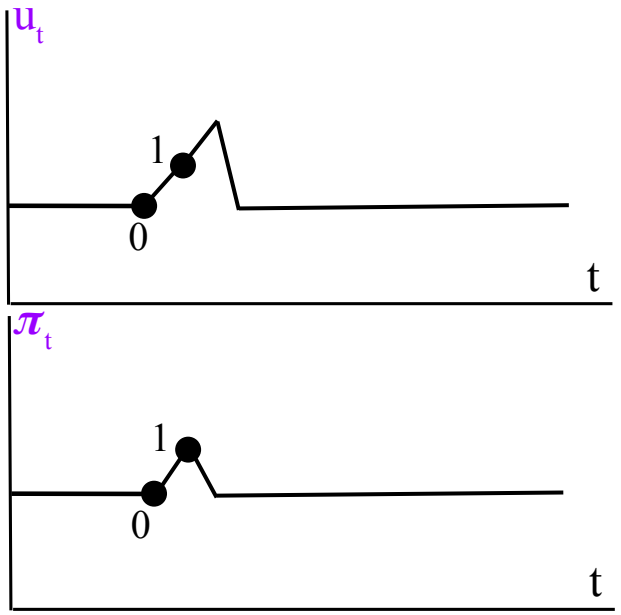
1. Inaction




2. Lower u quickly

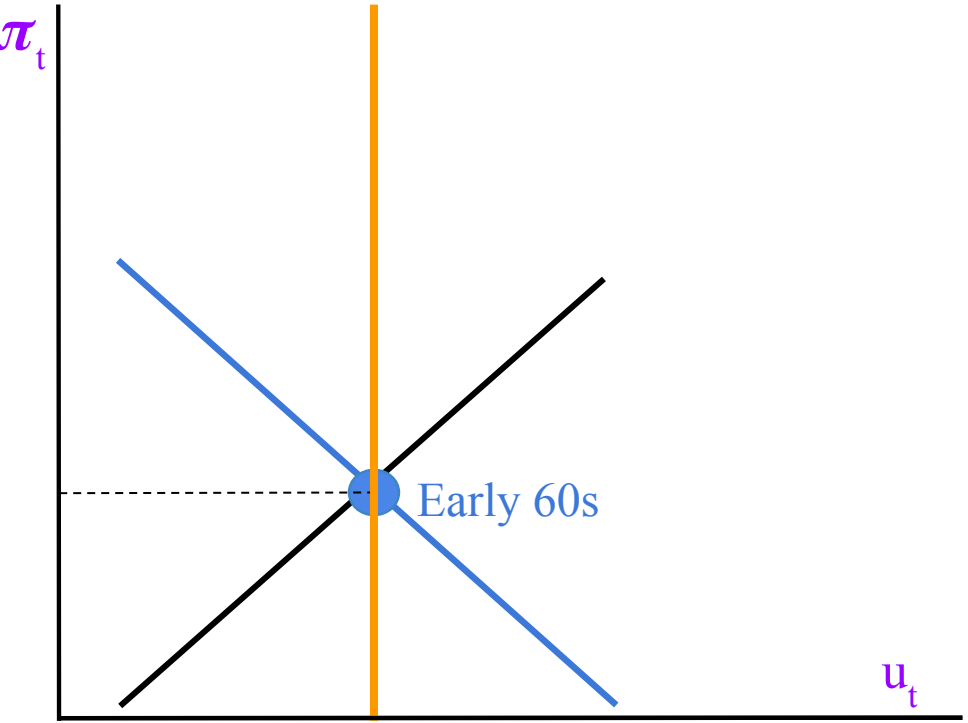



3. Get $\pi$ back to $\pi^*$



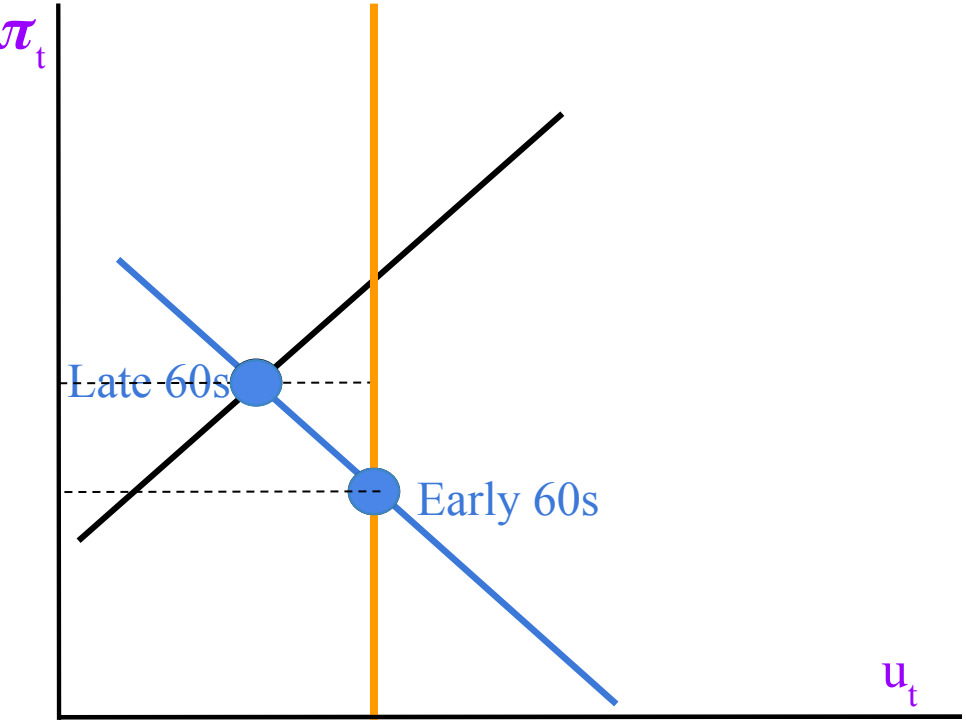
# Returning to Friedman, Phelps, and the 1970s Stagflation

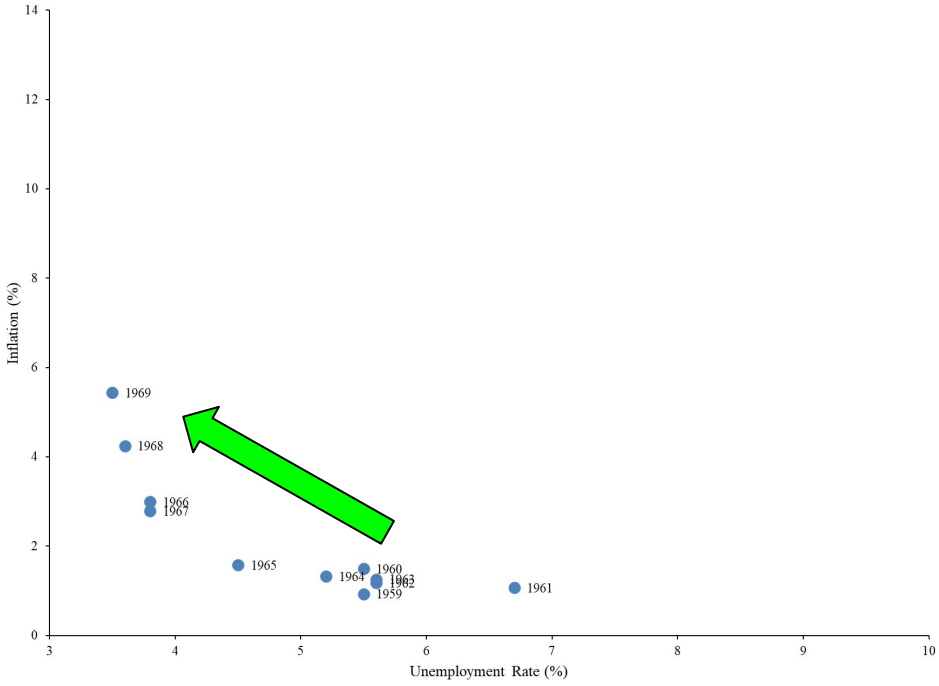
Early 1960s: Baseline



# Returning to Friedman, Phelps, and the 1970s Stagflation

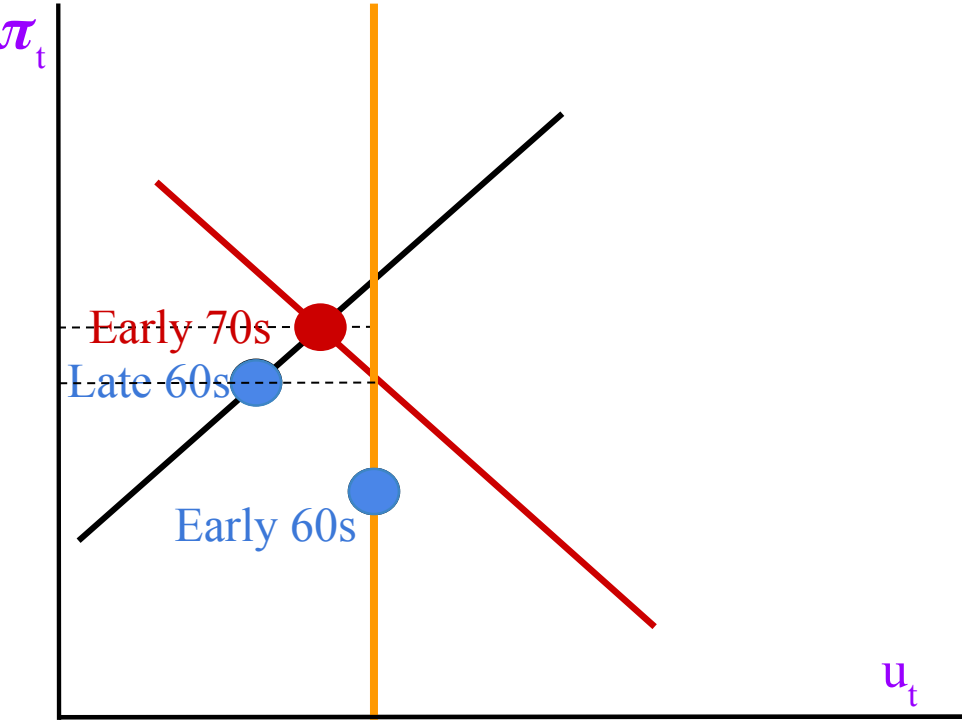
Late 1960s: Expansionary fiscal policy shifts NAD up

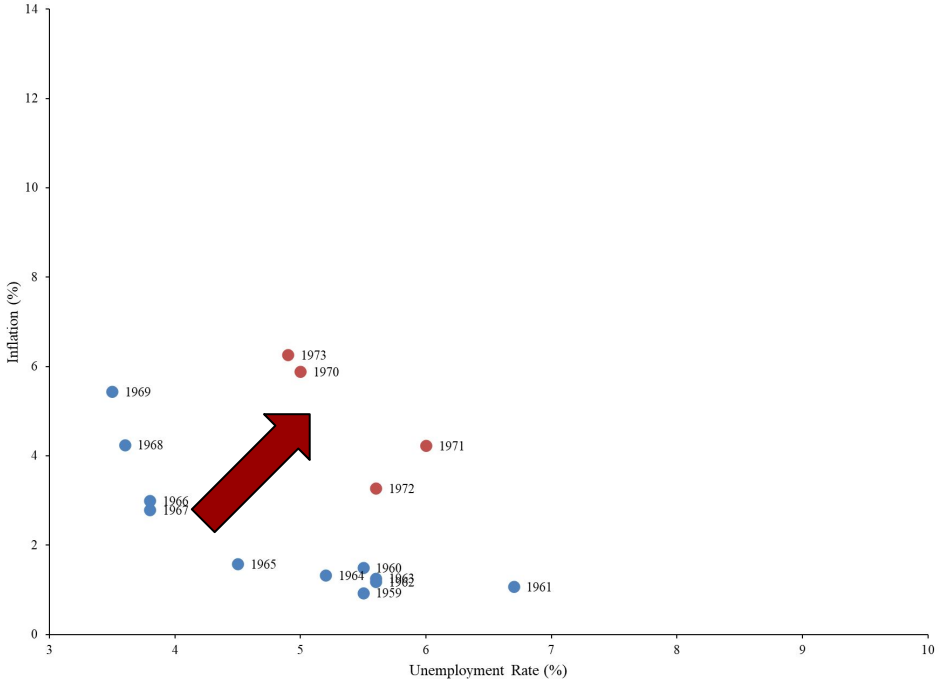


# Returning to Friedman, Phelps, and the 1970s Stagflation

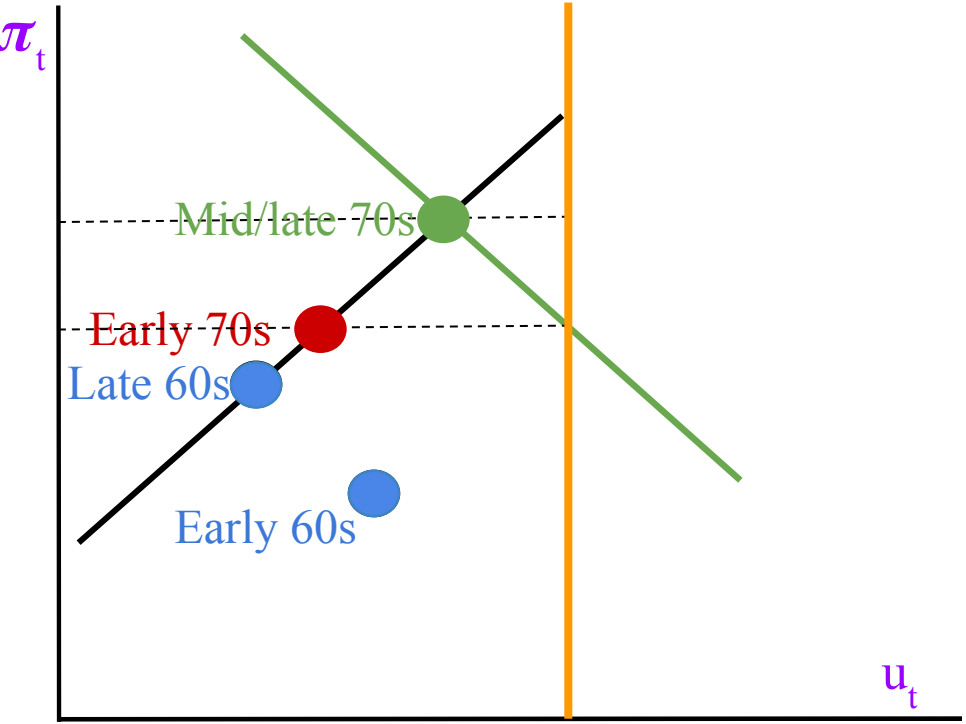
Early 1970s: Rising inflation expectations shift PC up

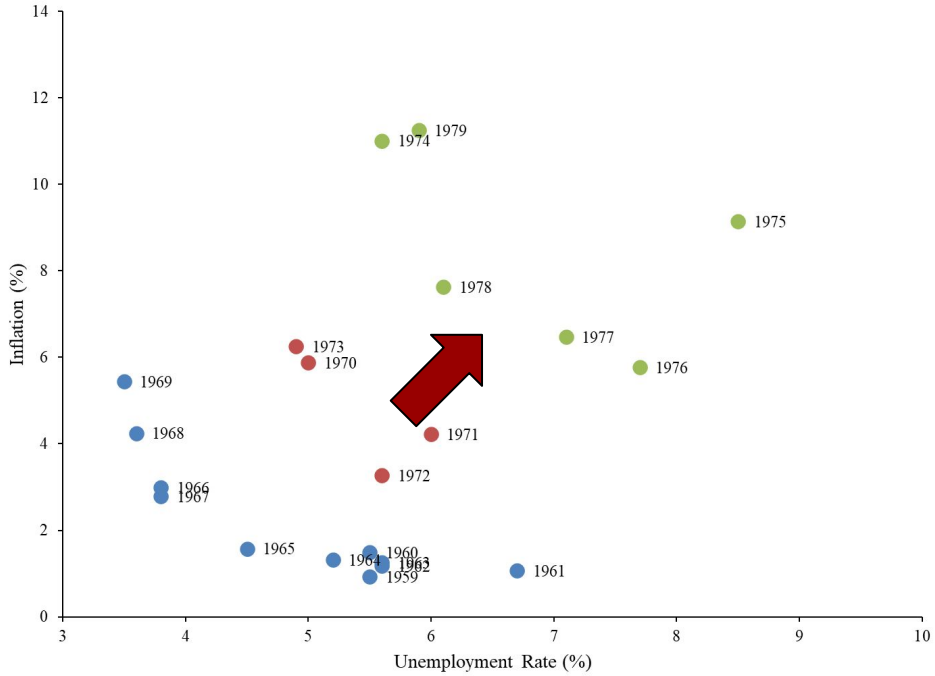


# Returning to Friedman, Phelps, and the 1970s Stagflation

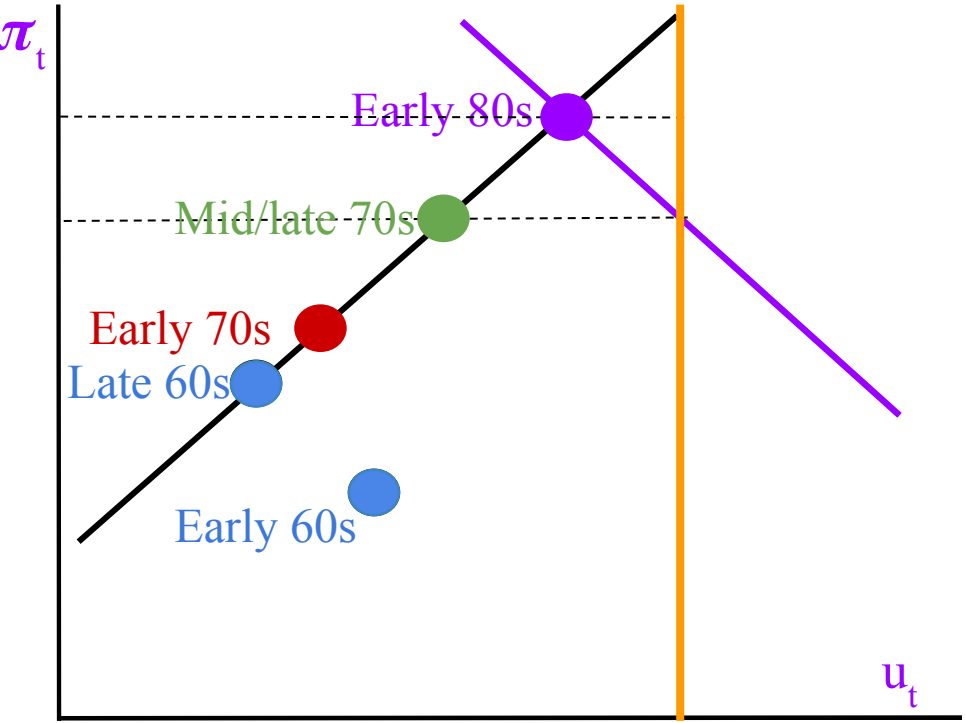
Mid/late 1970s: Oil shock increases $u_N$ and policy tries to keep u low. Inflation expectations keep rising.

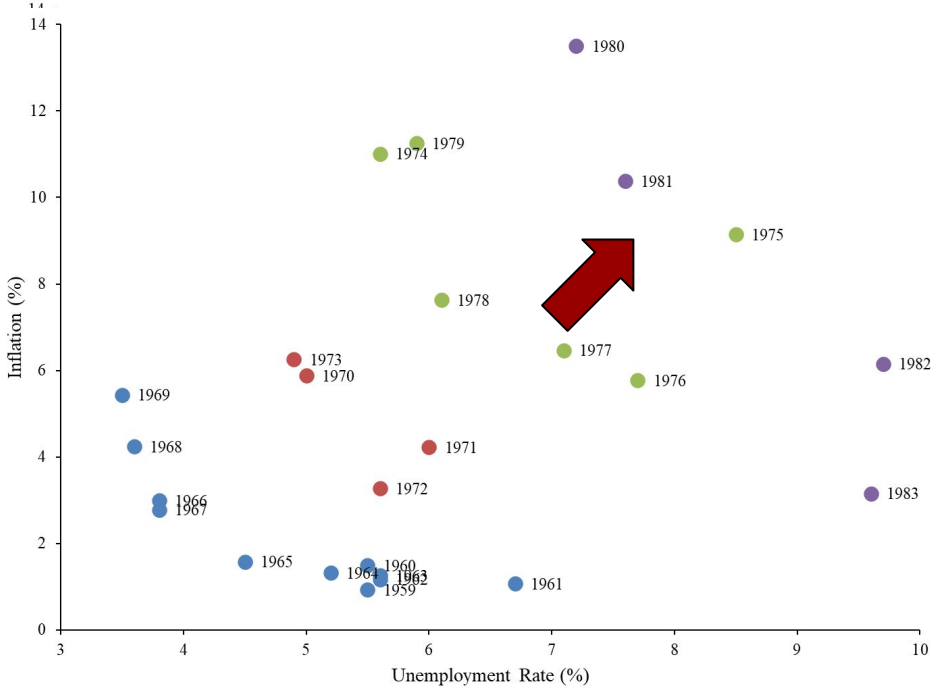


# Returning to Friedman, Phelps, and the 1970s Stagflation

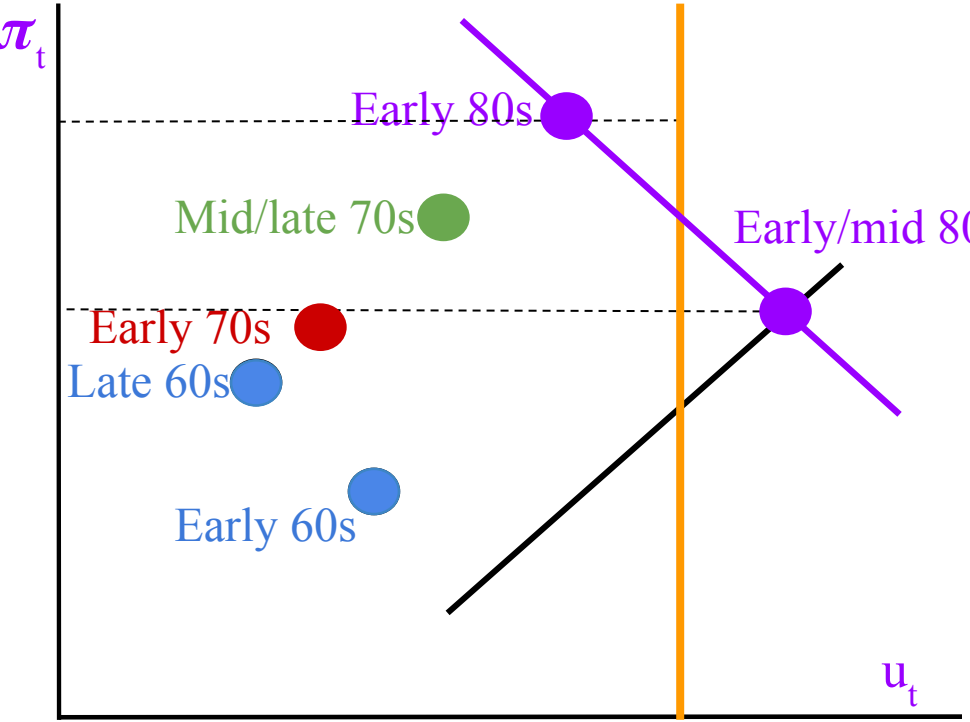
Early 1980s: Another oil shock, inflation expectations keep rising.

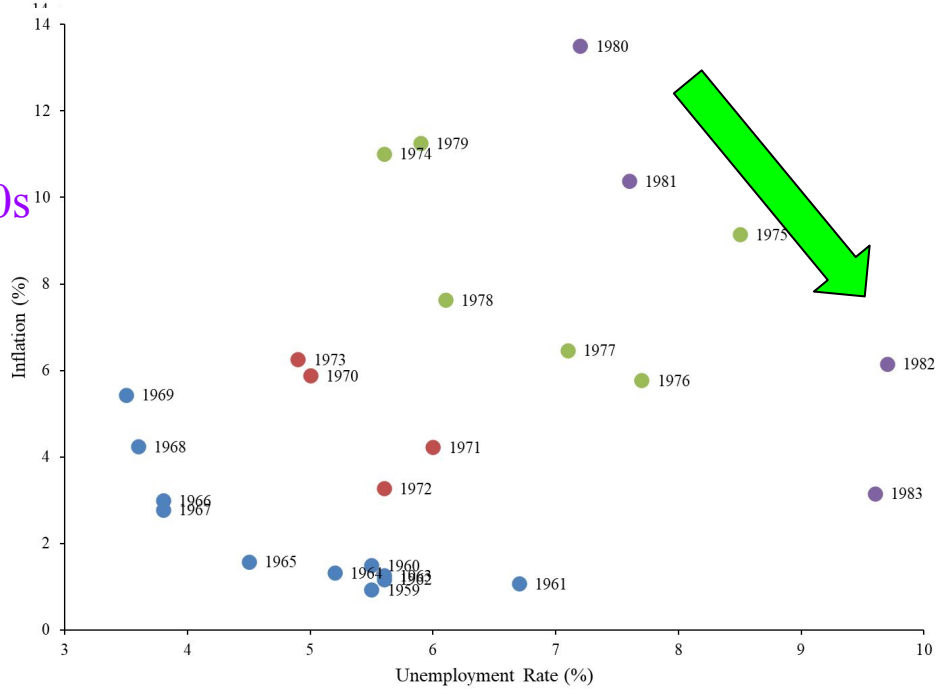


# Returning to Friedman, Phelps, and the 1970s Stagflation

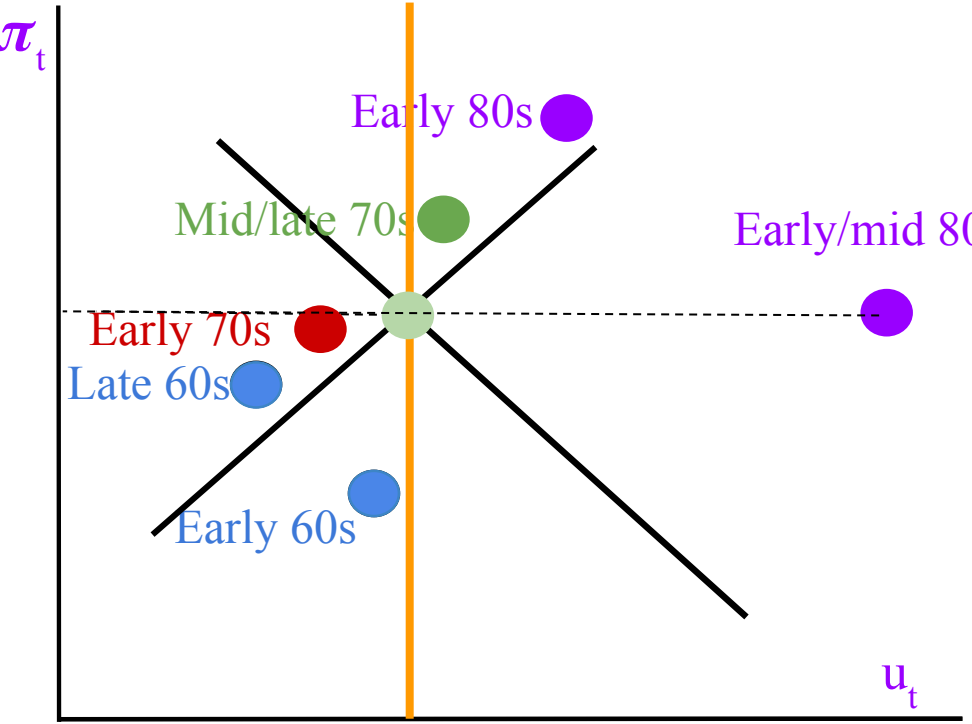
Early/mid 1980s: Fed brings interest rates to historic high ("Volcker Disinflation").

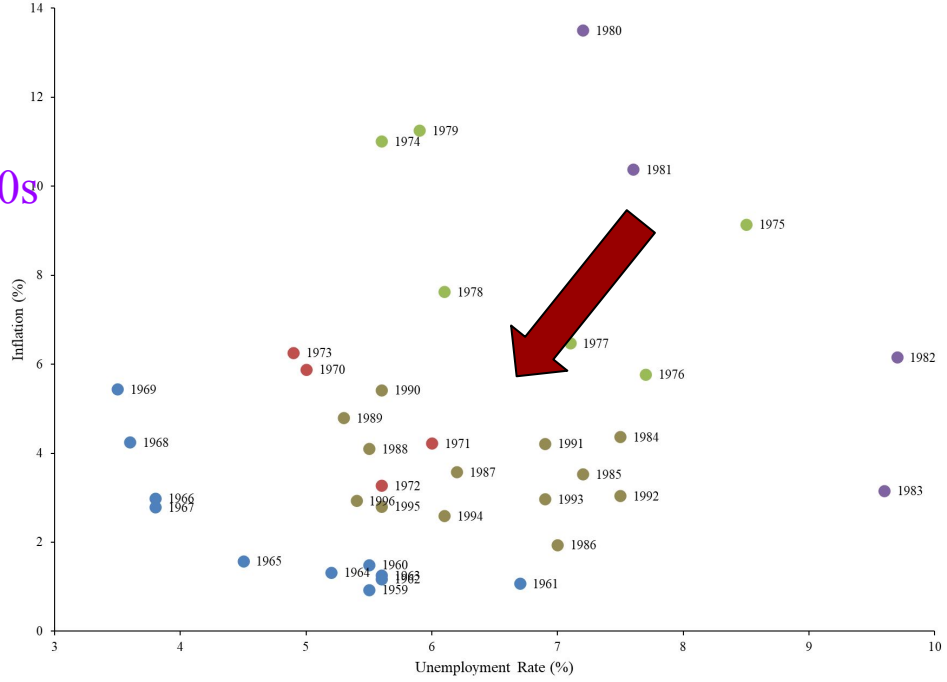


# Returning to Friedman, Phelps, and the 1970s Stagflation

Mid/late 1980s and early 1990s: Oil shocks dissipate, inflation expectations decline, policy moderates.



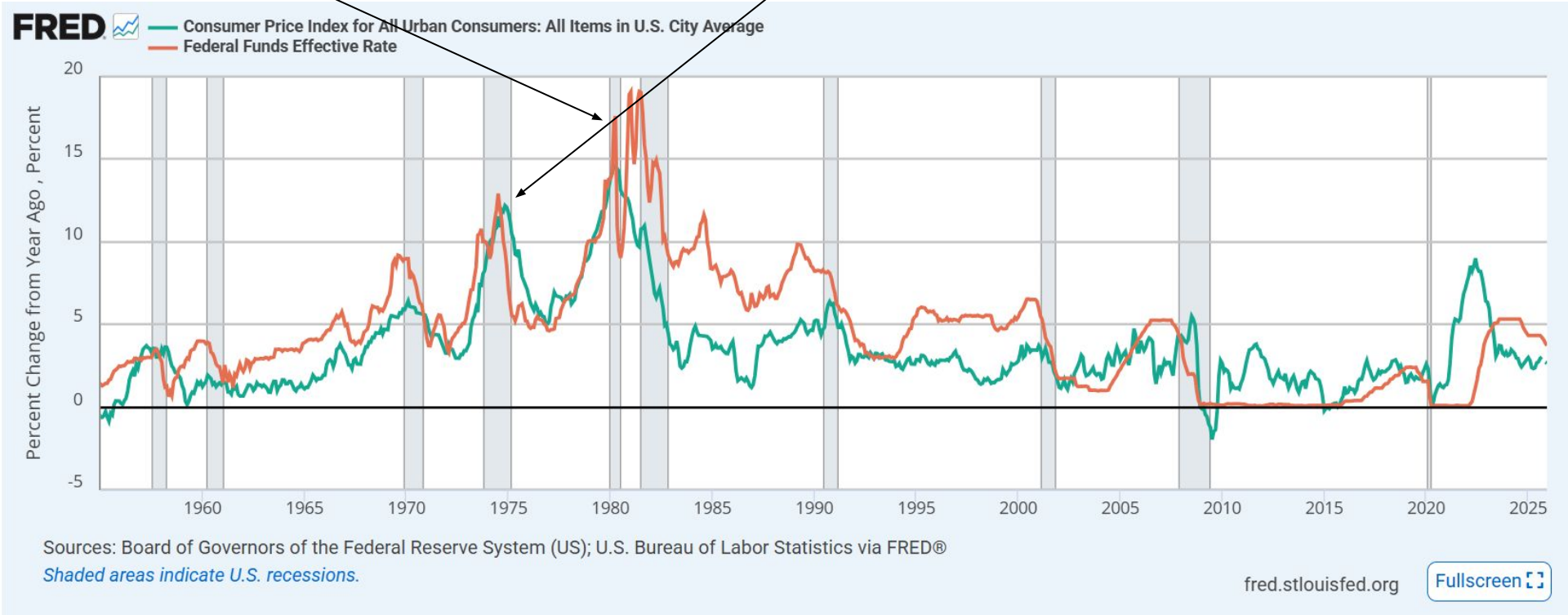



# Stagflation

The episode was unique in having high inflation during recessions/downturns (stagflation).

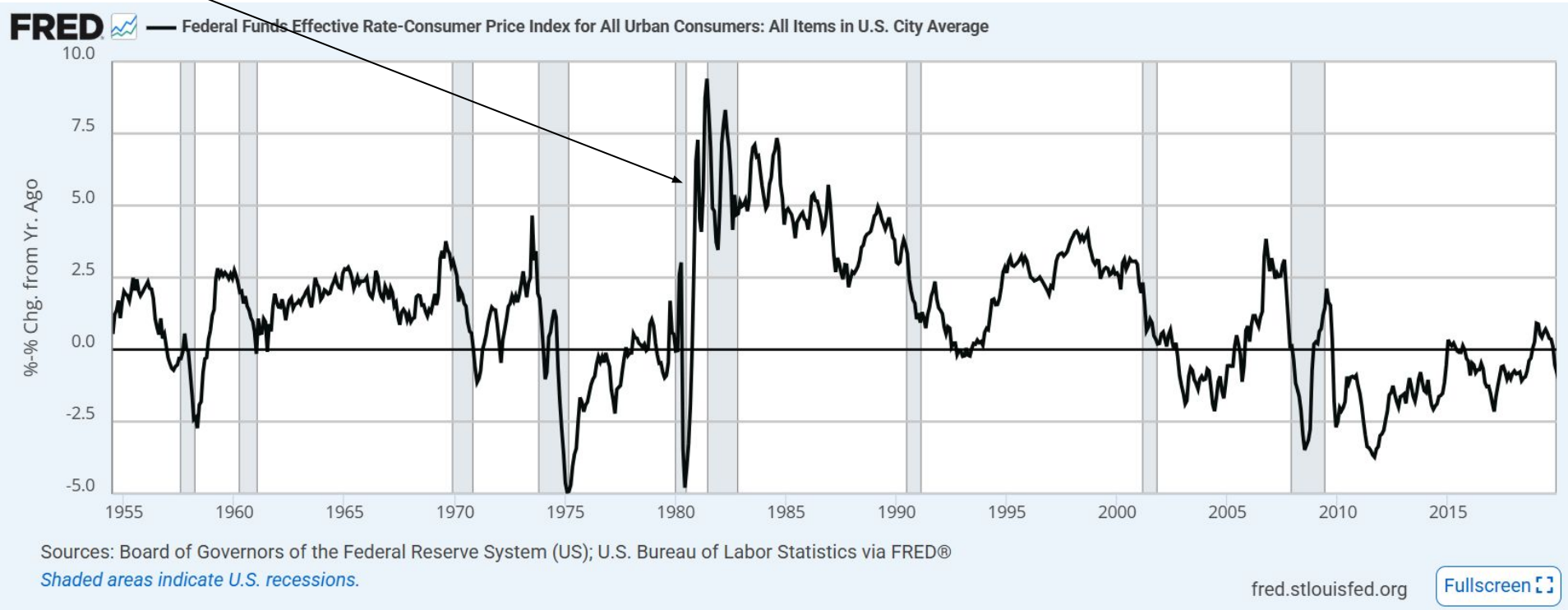
# Fighting Stagflation

- Volcker's was not the first attempt at tough policy. It had been tried but been given up too quickly.



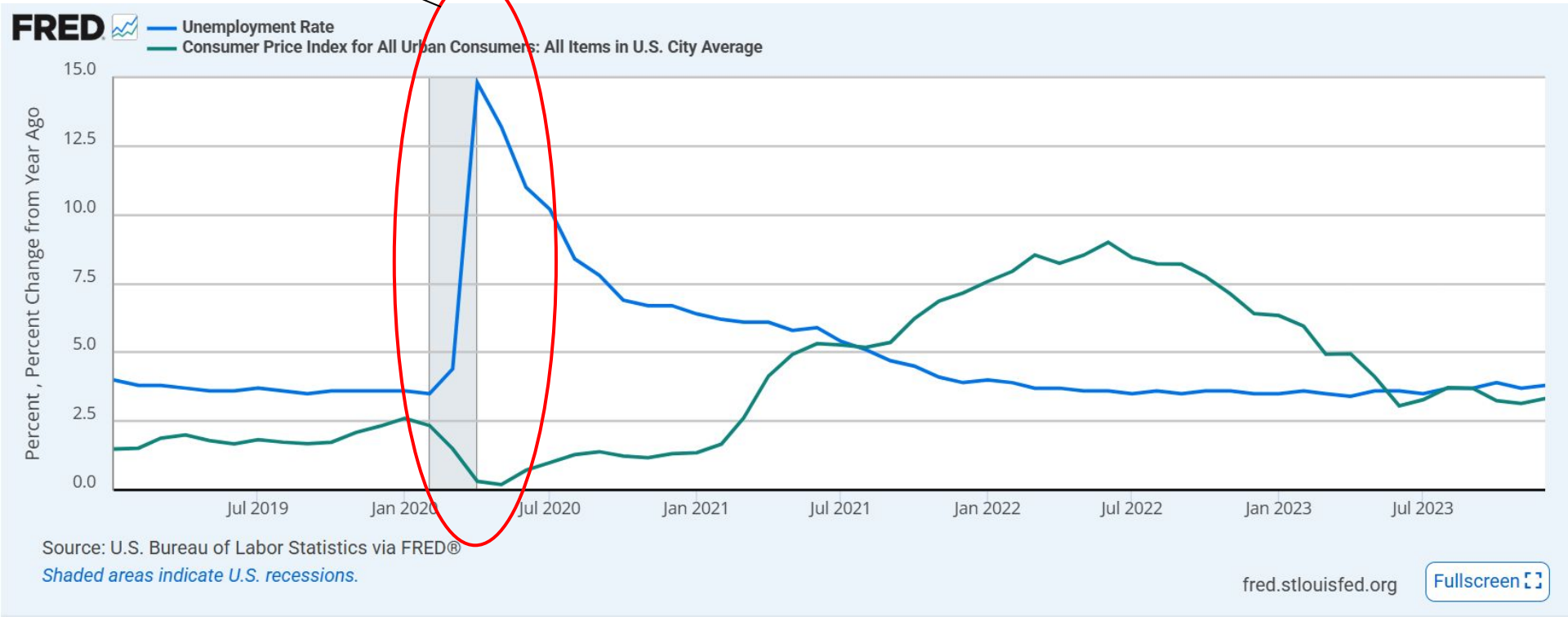
# Fighting Stagflation

- Volcker's was not the first attempt at tough policy. It had been tried but been given up too quickly.
- Remember, when inflation is rising, you <u>really</u> need to crank up the nominal interest rate in order to get the real interest rate up – that's what's required to shift NAD Curve down



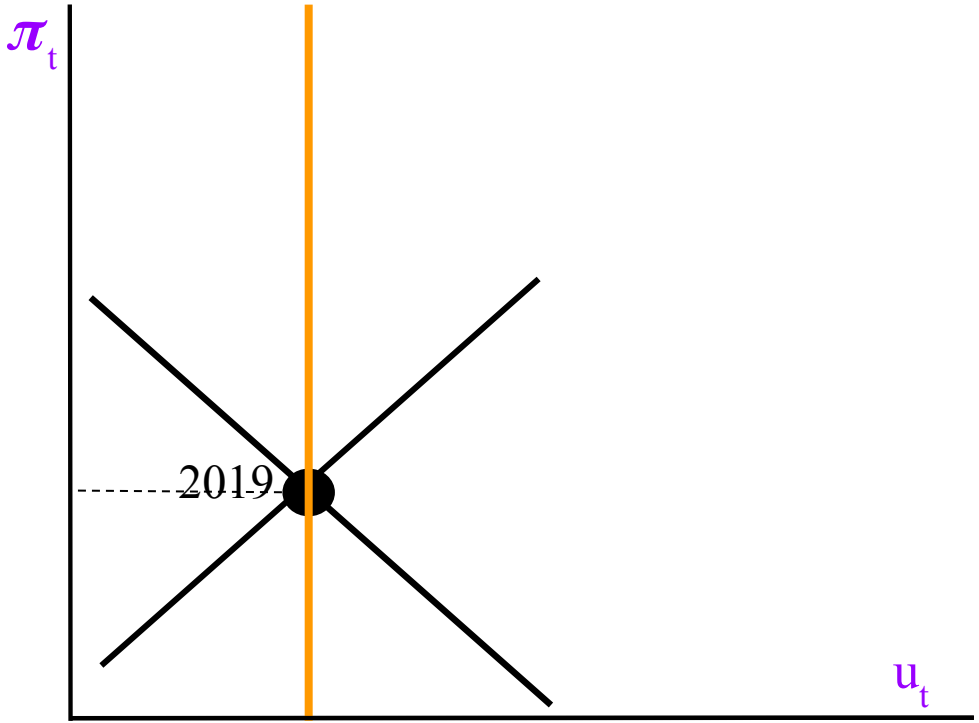
# COVID

1) Looks like a demand shock, predominantly (though we know there's also a supply shock)



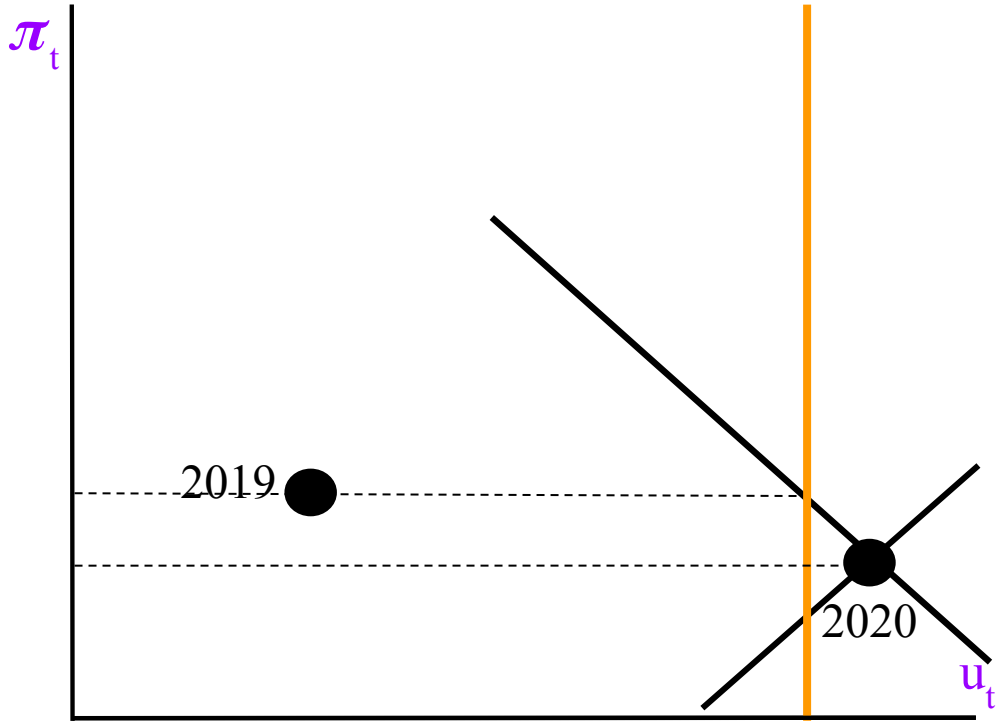
# Modeling the COVID Episode

2019: Baseline



# Modeling the COVID Episode

2020: Pandemic is a massive negative shock to both supply and demand



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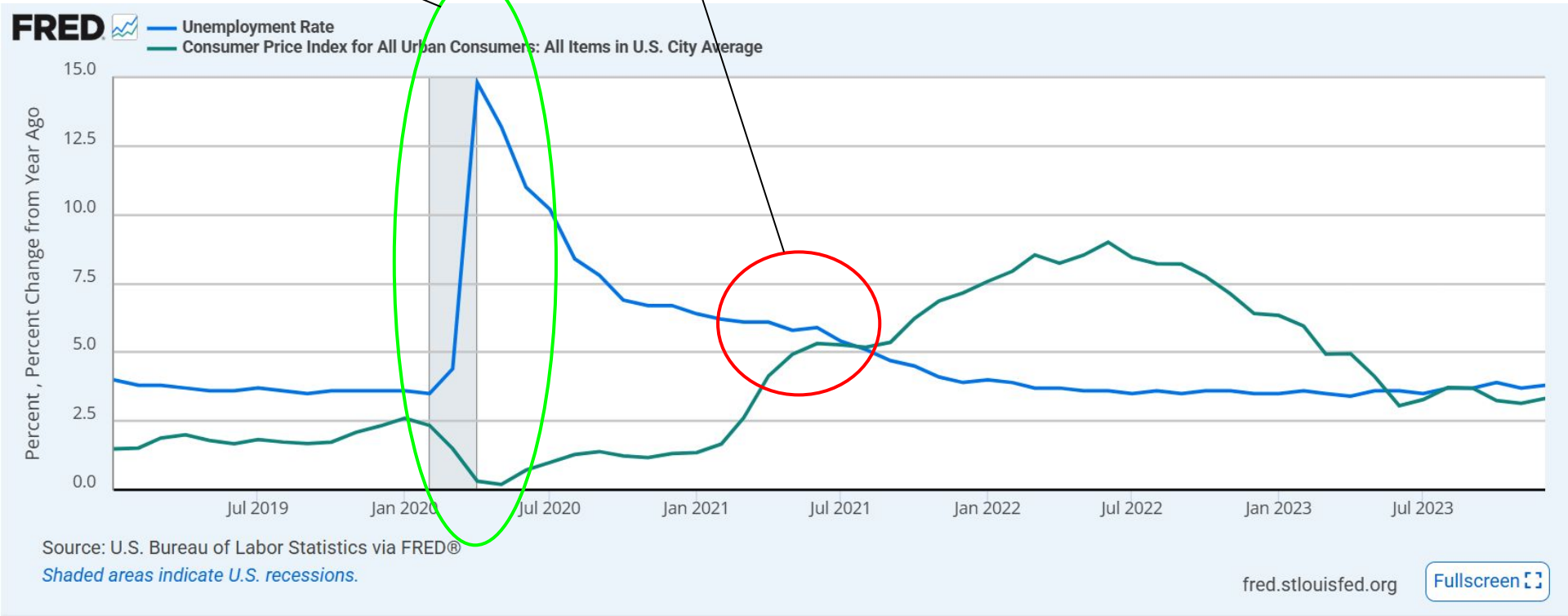
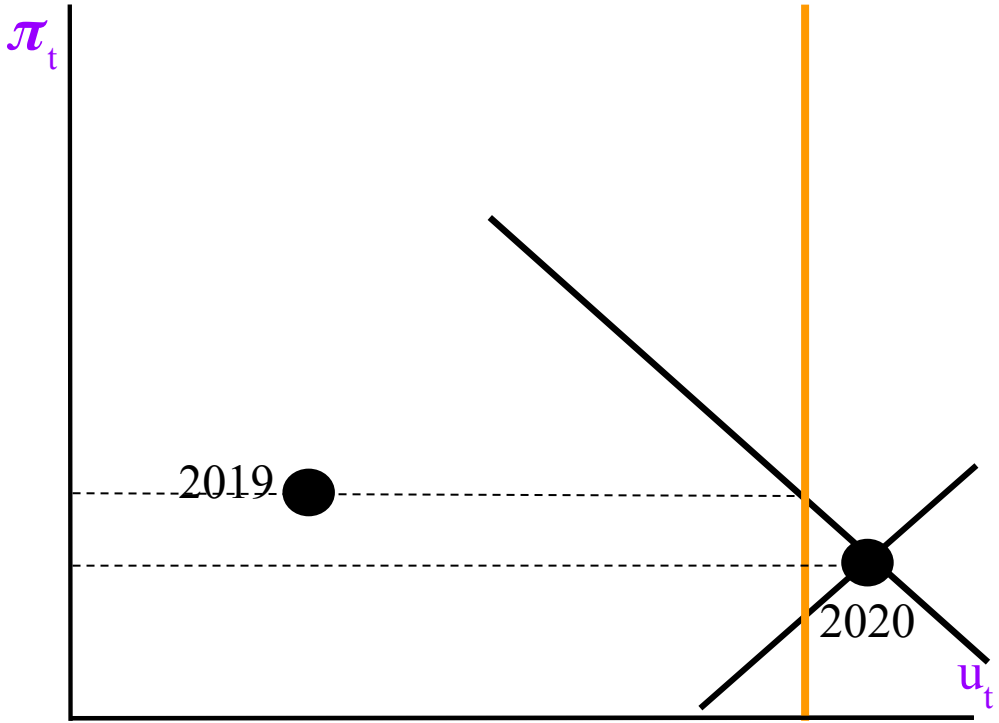
1) Looks like a demand shock, predominantly (though we know there's also a supply shock)

2) Starting to look like stagflation (relative to old $u_N$)

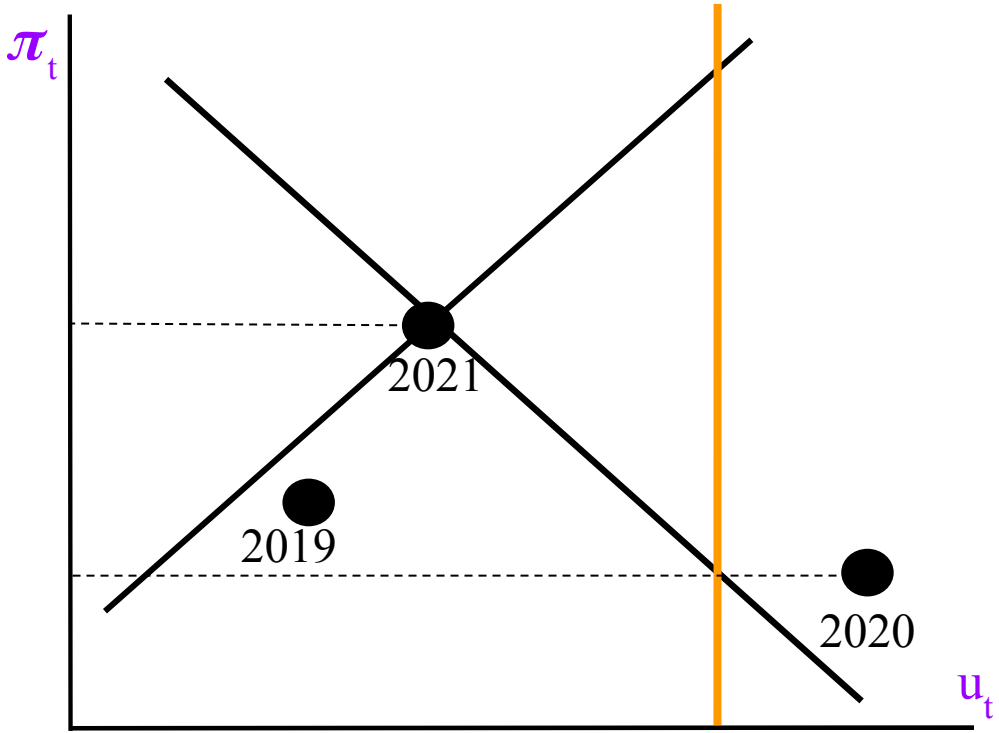


# Modeling the COVID Episode



# Modeling the COVID Episode

2021: Policy and vaccine provide massive positive demand shock. Supply shock starts to wear off, but still major disruptions (e.g. supply chains)



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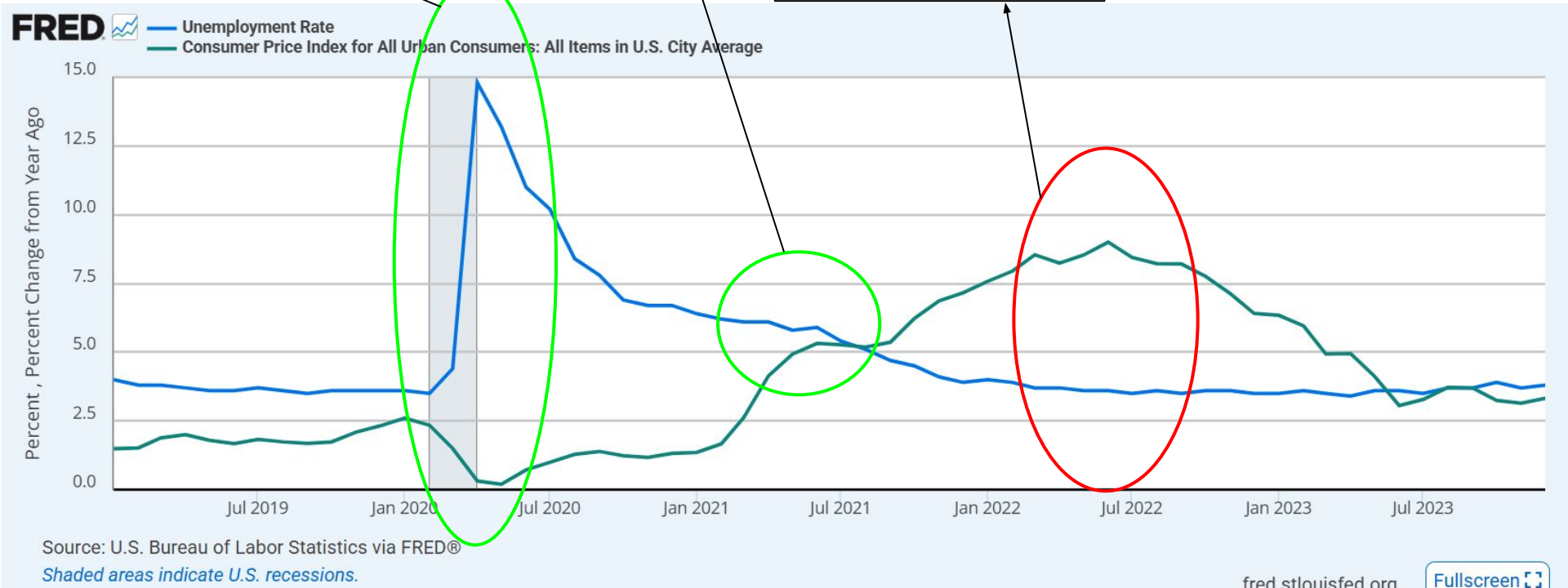
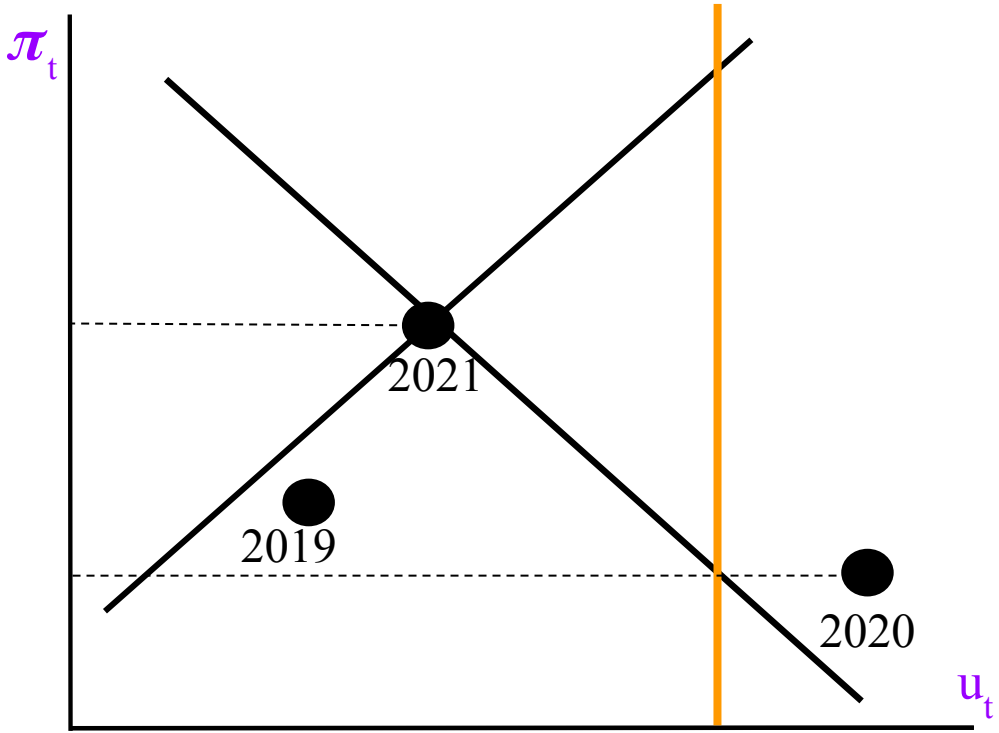
3) Looks like we chose to let $\pi$ soar to keep u falling

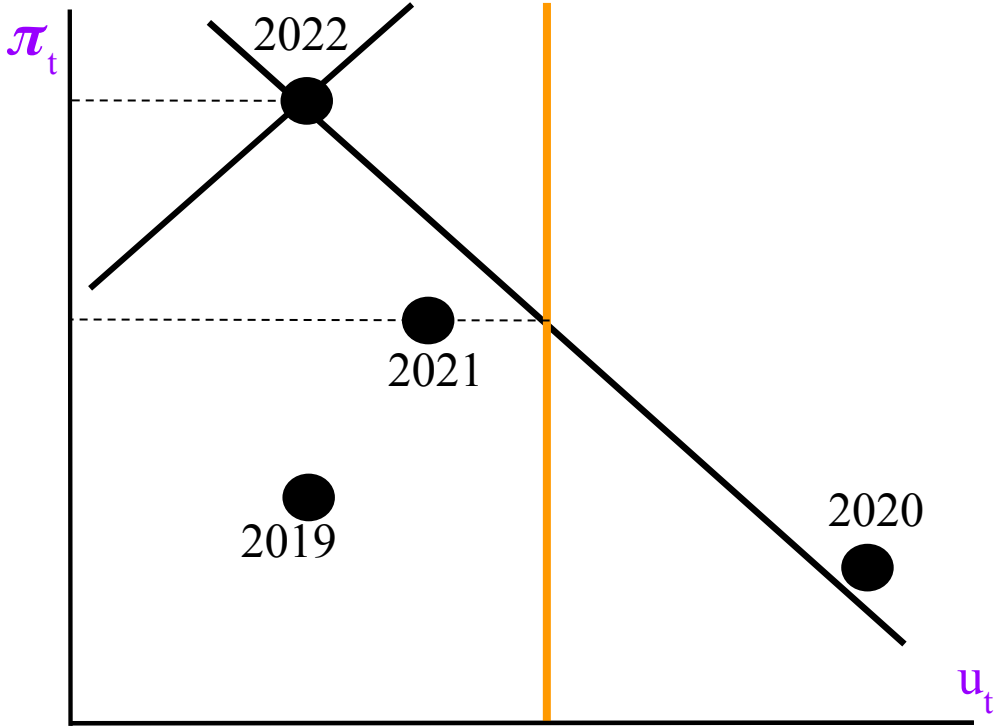


# Modeling the COVID Episode



# Modeling the COVID Episode

2022: Supply shock continues to ease but is still present, while massive spending by government and private sector continue to juice demand.



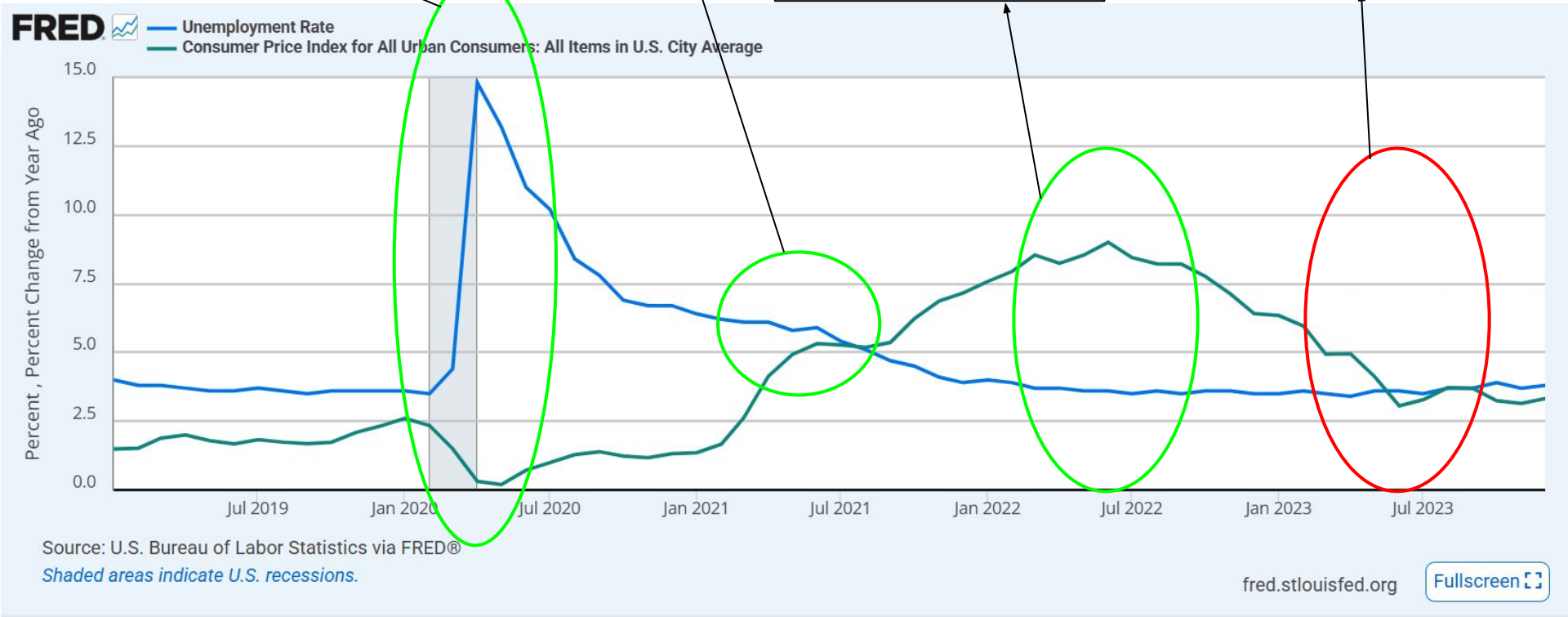
# COVID

1) Looks like a demand shock, predominantly (though we know there's also a supply shock)

2) Starting to look like stagflation (relative to old $u_N$)

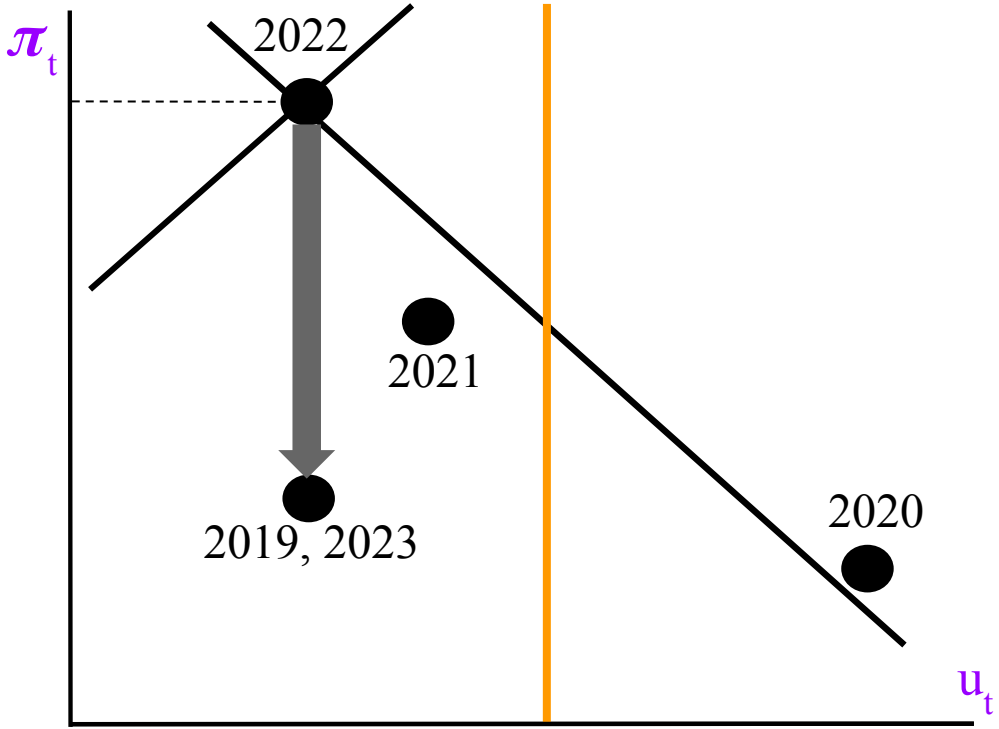
3) Looks like we chose to let $\pi$ soar to keep u falling

4) Huh?! $\pi$ falls without u rising – immaculate disinflation!



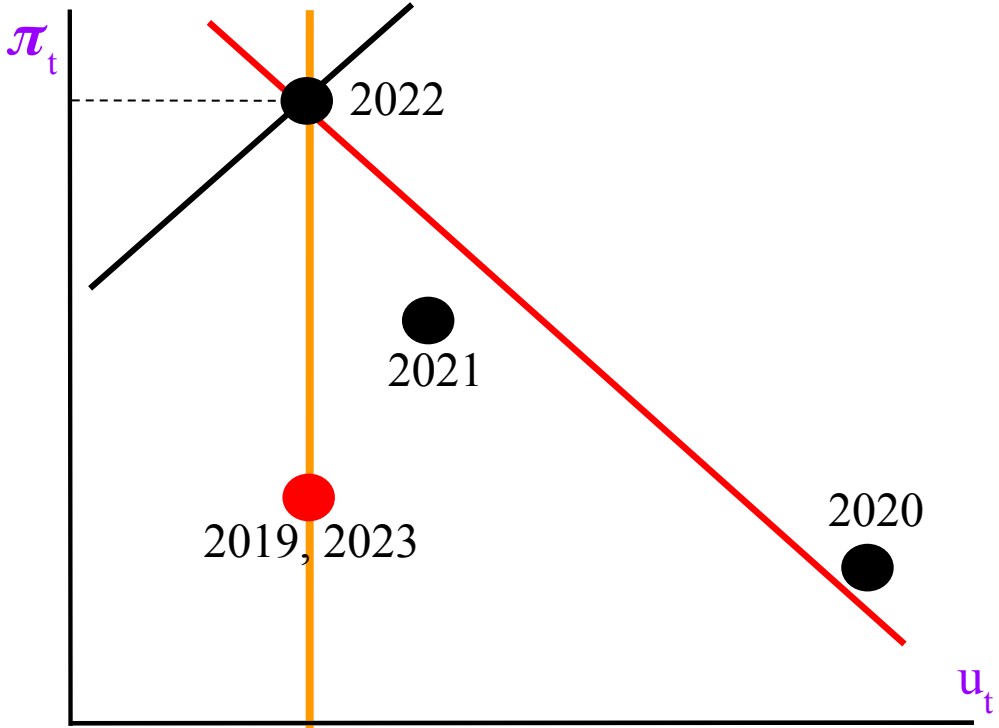
# Modeling the COVID Episode

2023: It's very hard to get the model to rationalize such a large drop in $\pi$ without an increase in u



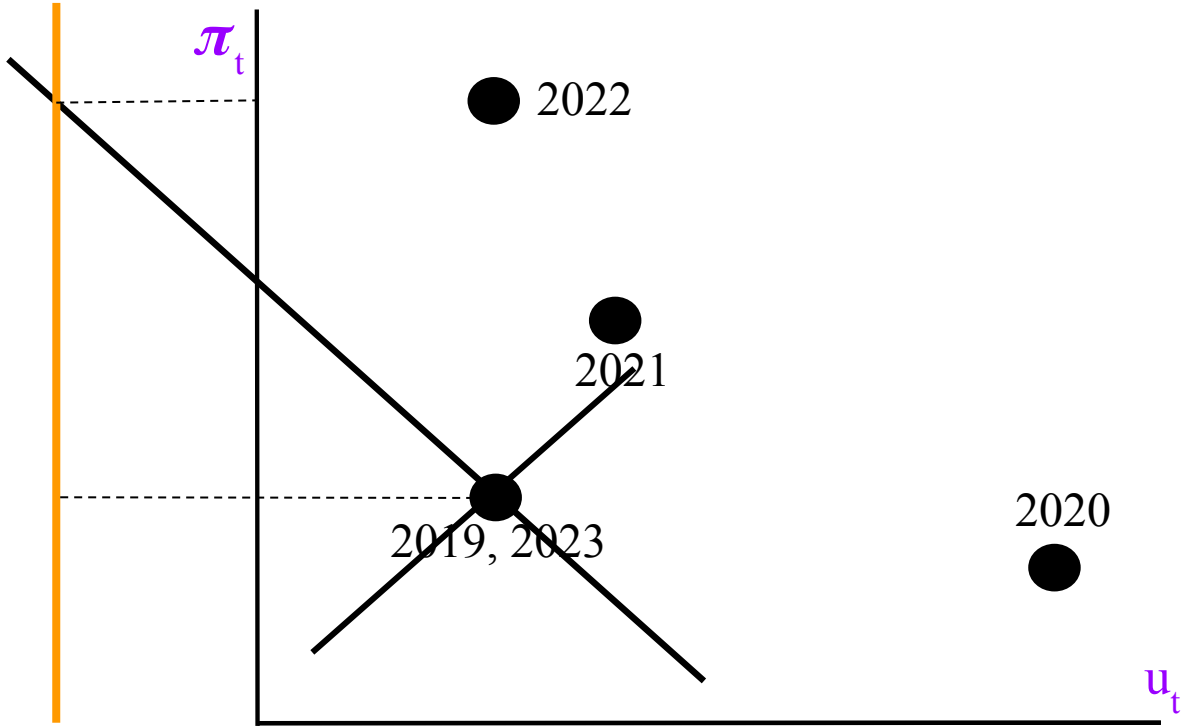
# Modeling the COVID Episode

2023: Even assuming the supply shock is over and $u_N$ is back where it started, this shouldn't happen!



# Modeling the COVID Episode

2023: A massive positive supply shock could do it, but we have no reason to think that happened.
Plus, if that were the case, why did $\pi$ not keep falling?



# Anchored Expectations

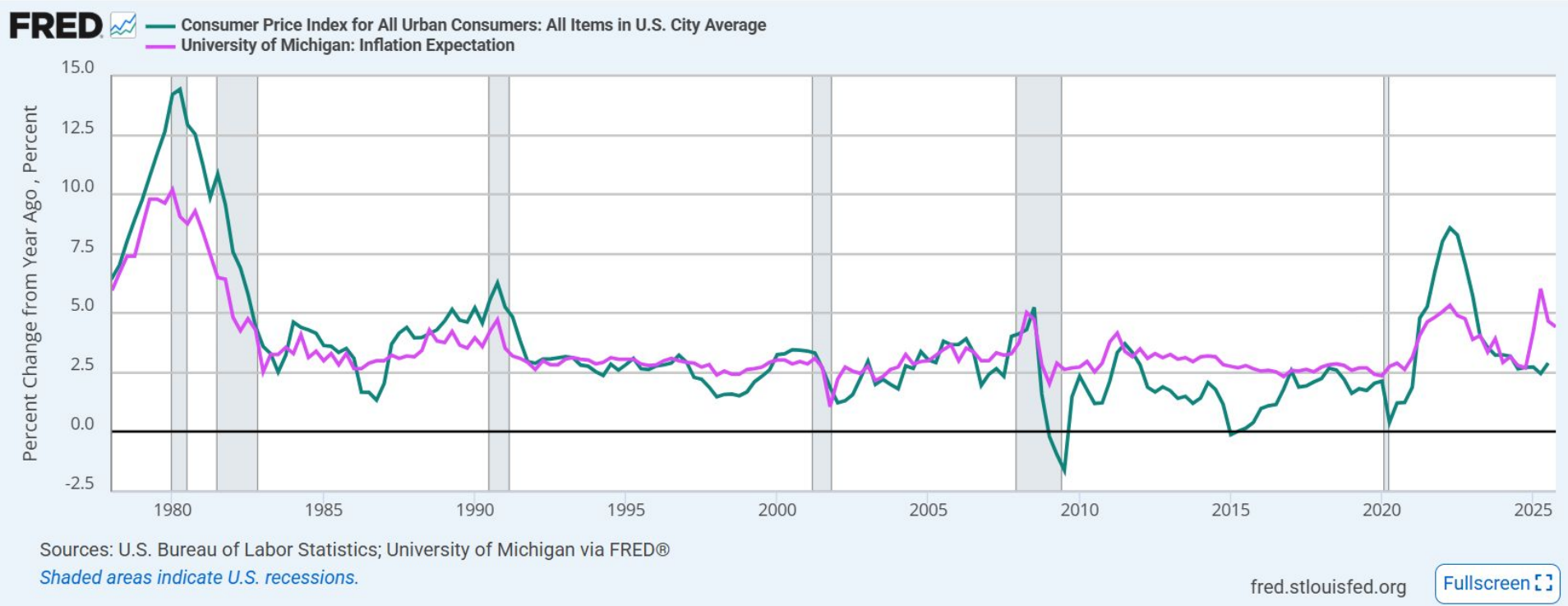
- It is the assumption of adaptive expectations ($\pi_t^e = \pi_{t-1}$) that makes our model effectively incapable of matching the immaculate disinflation.
  - Barring an implausible positive supply shock, lowering $\pi_t^e$ requires high u.
- However, there is strong evidence that for roughly 30 years (1990-2020), $\pi_t^e$ was "anchored" at 2%. Why?
  1. Because the Fed had stated that that was its goal
  2. Volcker had shown that the Fed was willing to put the economy through great pain to achieve the goal
  3. For 30 years, the Fed had indeed essentially hit that target
     - Even during the 1990s boom and the Great Recession, $\pi$ moved remarkably little
- Note that anchored expectations are partially self-fulfilling
  - If $\pi^e$ stays anchored at 2%, that keeps the Phillips Curve in place (except for changes in $u_N$)
  - Keeping the Phillips Curve in place avoids inflationary spirals, making it easier to keep $\pi$ at 2%!
  - For this reason, some economists think central banks should only target $\pi$
    - New Zealand's central bank actually uses this policy, known as "Inflation Targeting"

General Phillips Curve: $\pi_t = \pi_t^e - \beta \cdot (u_t - u_N)$

Adaptive Phillips Curve: $\pi_t = \pi_{t-1} - \beta \cdot (u_t - u_N)$

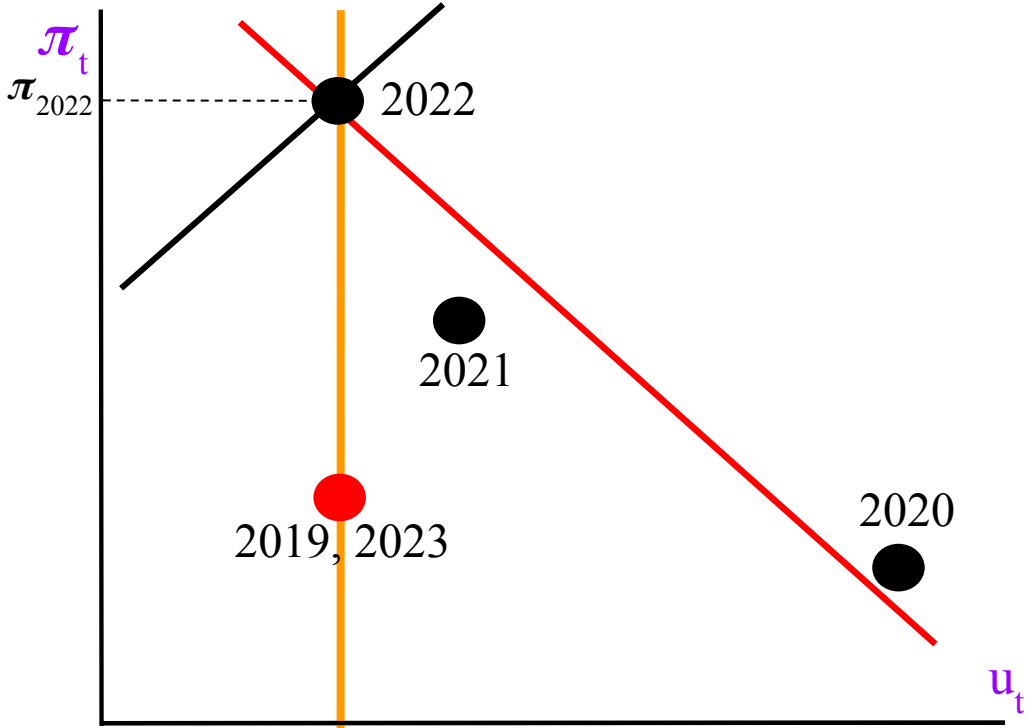
Anchored Phillips Curve: $\pi_t = \pi^* - \beta \cdot (u_t - u_N)$

# Inflation expectations have long been well-anchored



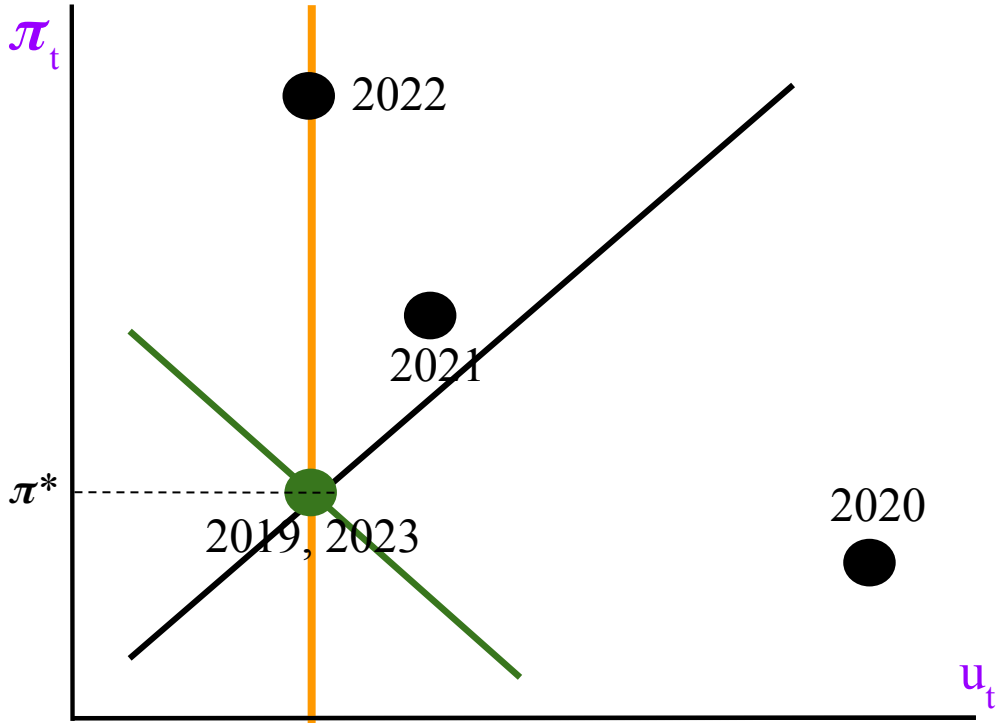
# Modeling the COVID Episode

Adaptive expectations cannot explain the move from 2022 to 2023: the PC pinning rule requires $u_N$ to be associated with $\pi_{2022}$ (7-8%)



# Modeling the COVID Episode

Anchored expectations can:
the PC pinning rule requires $u_N$ to be associated with $\pi^*$ (2%)

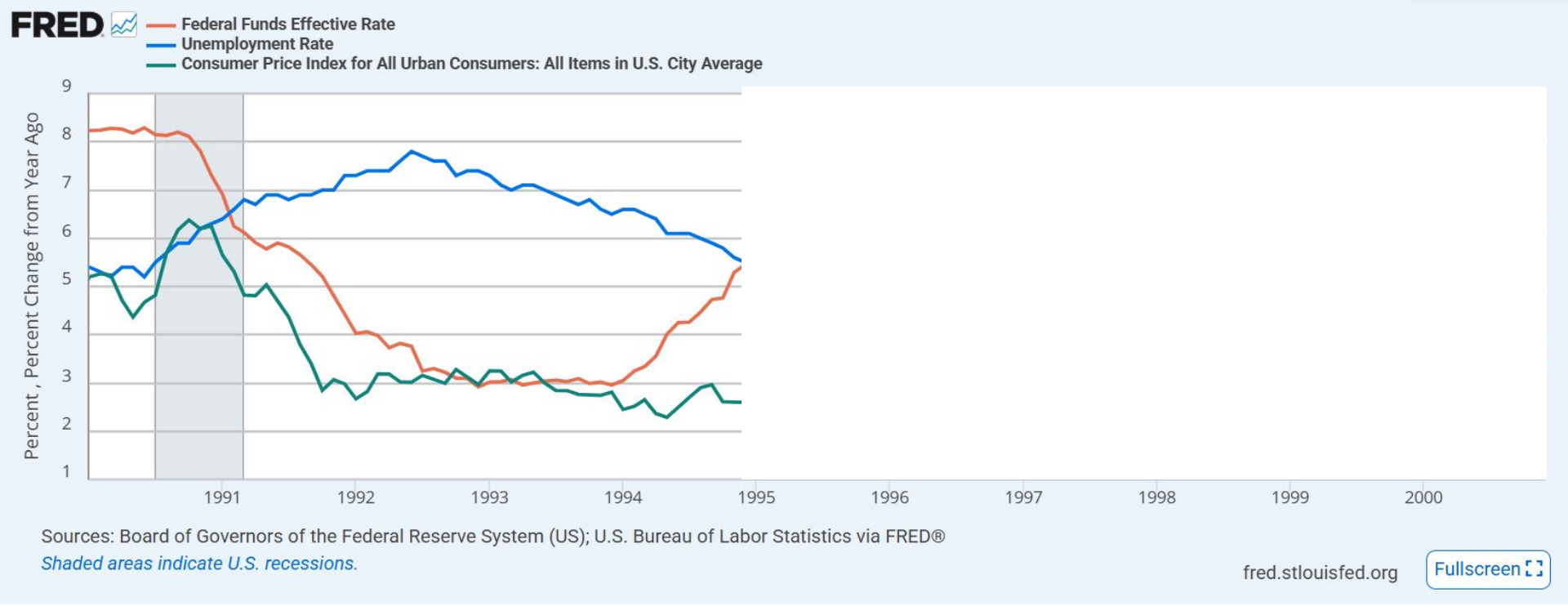


# So, what happened?

- Adaptive expectations works pretty well <u>until the immaculate disinflation</u>
  - Survey data showed that $\pi_t^e$ does move around with $\pi_t$ (though not as strongly)
  - The $\pi$-and-u patterns can basically be rationalized
- This is the model most macro policymakers have in their head (for good reason). For that reason, people were shocked that $\pi$ came down so much and so fast in 2023-2024 without a recession
- Pure anchored expectations is too extreme
  - The survey data showed that while $\pi_t^e$ was pretty steady, it does move around when $\pi_t$ itself moves
  - But undoubtedly the economy got a HUGE lifeline from the fact that people were very willing to believe that $\pi_t$ would be back at 2% soon.
- Volcker (1980s) had to generate a huge recession to convince people inflation would fall
- Powell (2020s) basically just had to snap his fingers
  - That's the key to the last step…PC falling down the $u_N$ line

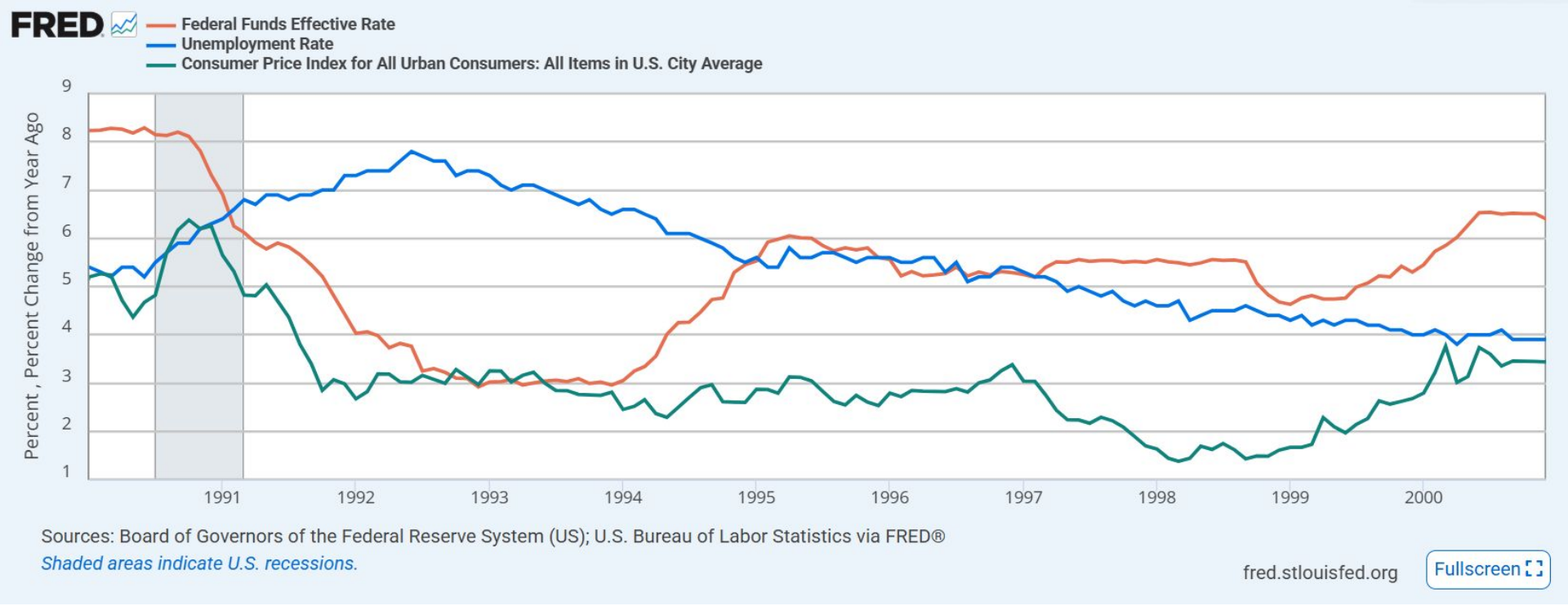
# Monetary Policy in the 1990s

- In the mid-1990s, inflation was stable around $\pi^*$ and unemployment was falling close to 5%, the long-run level many associated with $u_N$
- Given the previous episode, many called on the the Fed to continue raising interest rates to prevent "over-heating" (i.e. rising inflation). Instead, Alan Greenspan decided to stabilize interest rates.

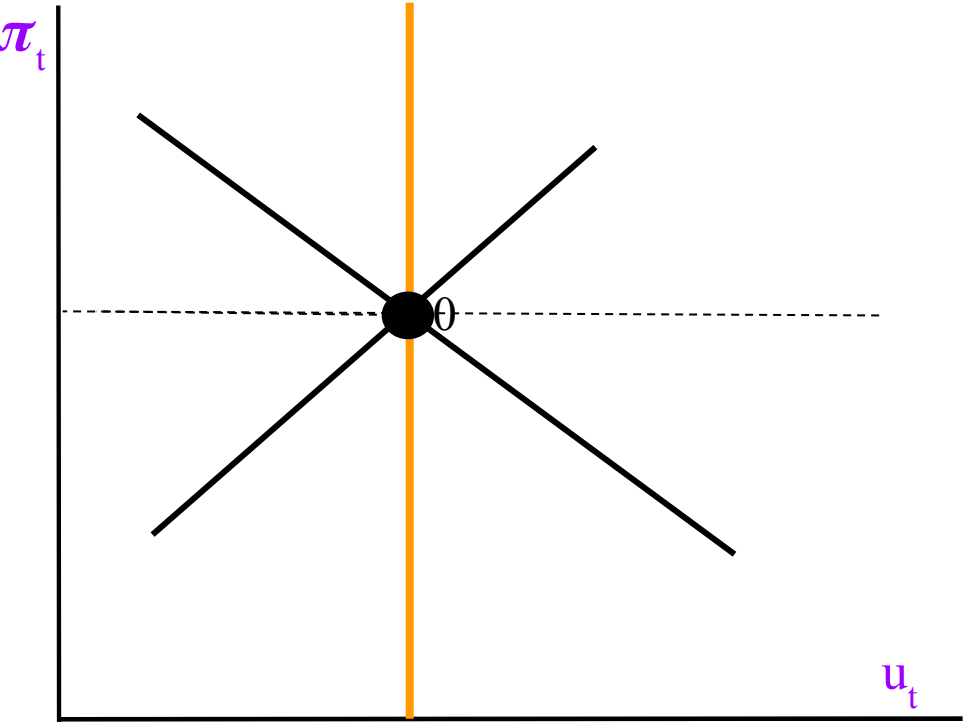


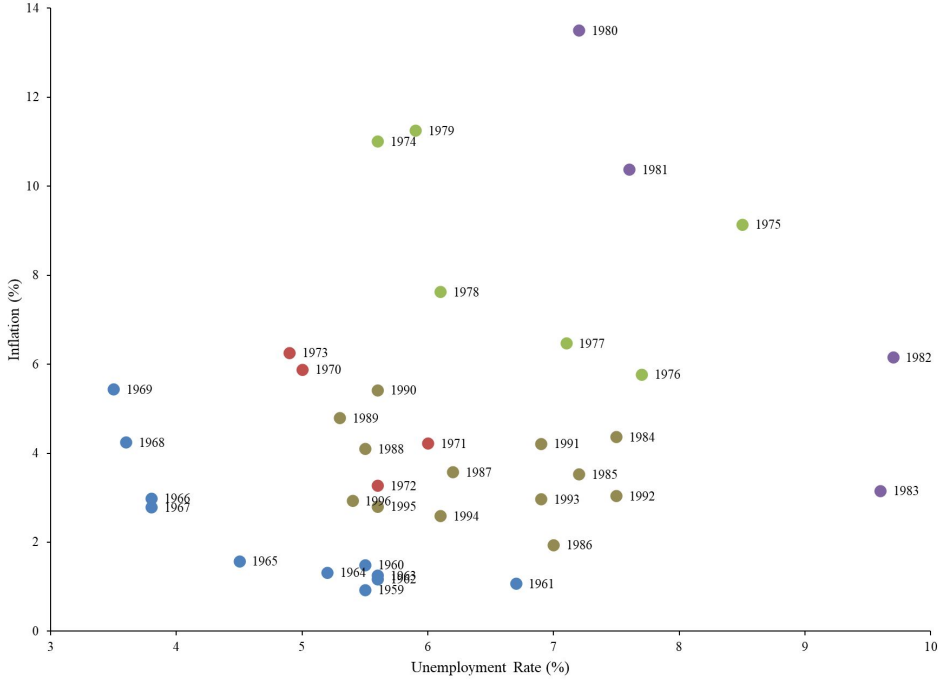
# Greenspan Becomes “The Maestro”

- Remarkably, u fell all the way to 4%, and inflation did not rise
  - In fact, it fell!
- The cause? IT revolution as a positive supply shock



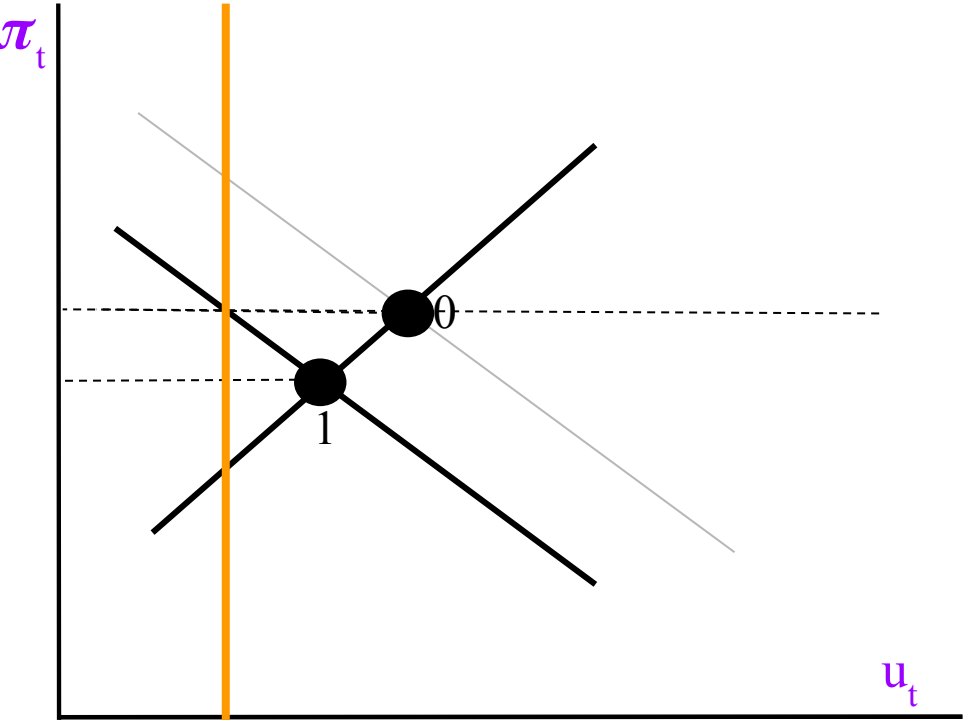
# The Phillips Curve Shifts in Again

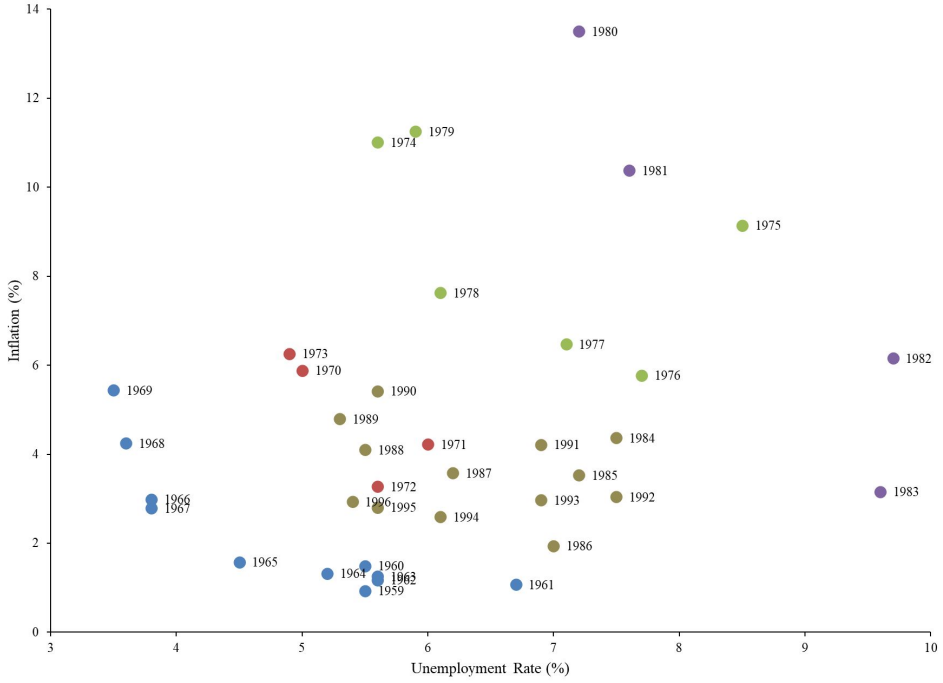


# The Phillips Curve Shifts in Again

When a positive supply shock occurs, stabilizing inflation requires <u>expansionary</u> policy



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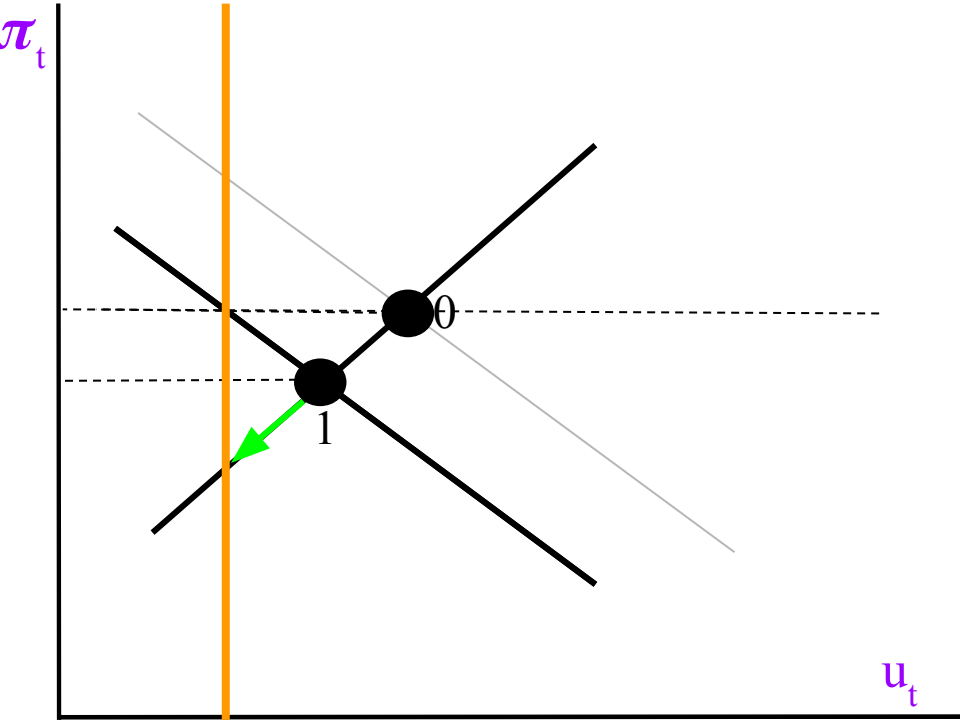
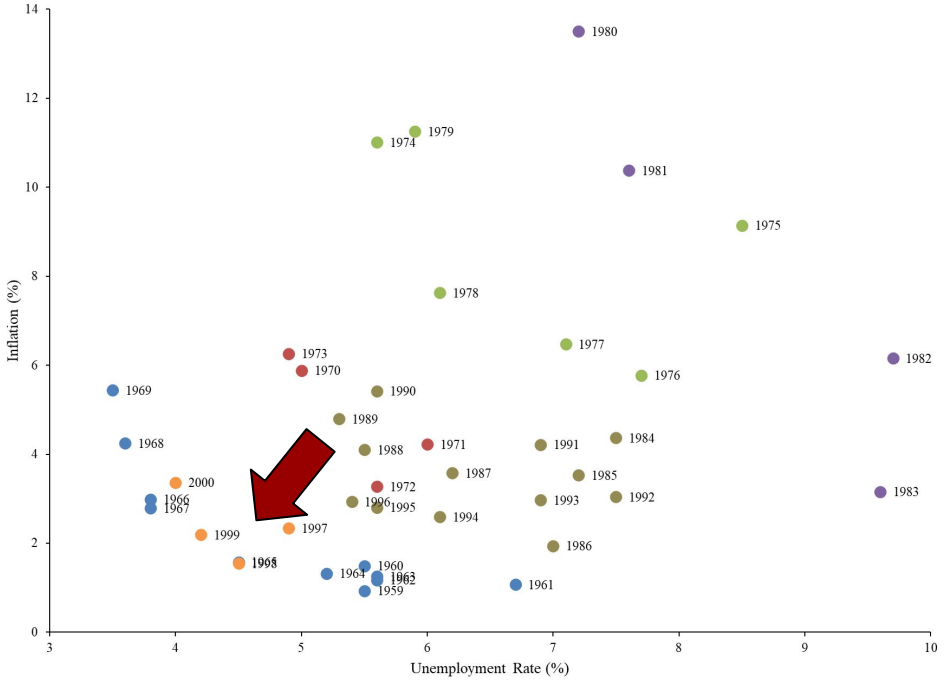
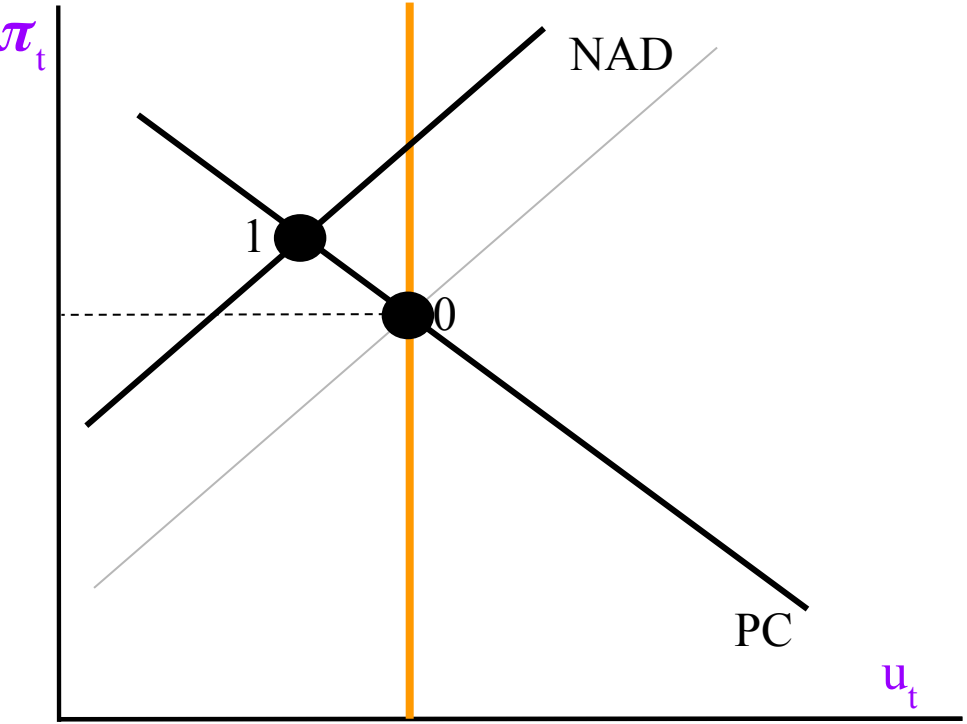
When a positive supply shock occurs, stabilizing inflation requires <u>expansionary</u> policy



# Central Bank Independence

- Politicians typically think 1 election ahead, i.e. < 2 years
- As a result, they are very tempted to push up NAD, creating a boom
  - "Get the votes now, we'll deal with the consequences later."
  - Infamously, Richard Nixon did this aggressively prior to the 1972 election



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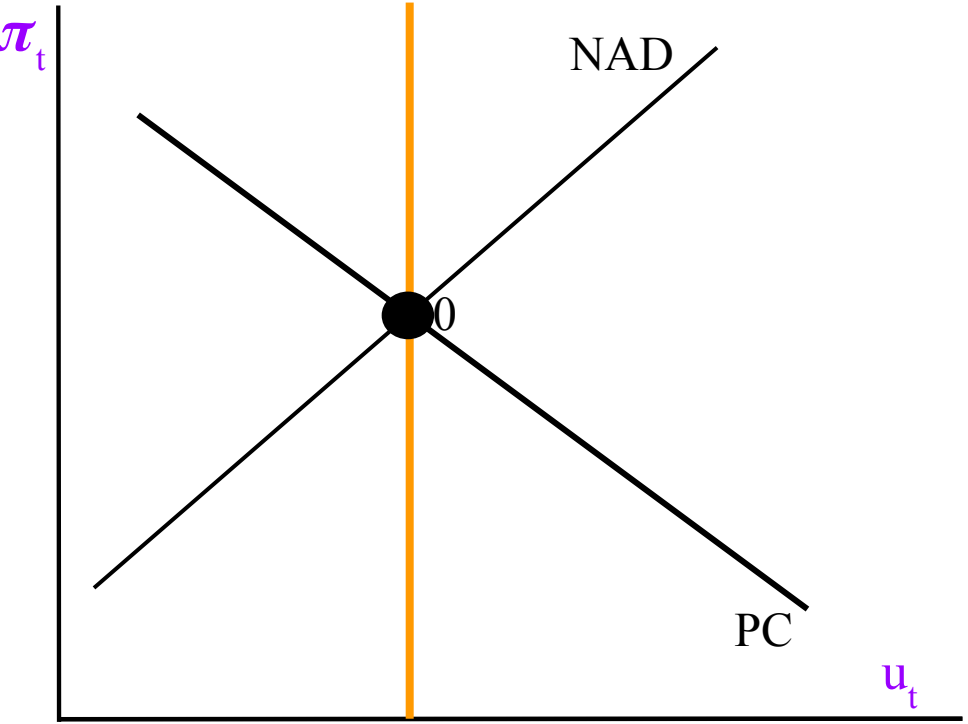
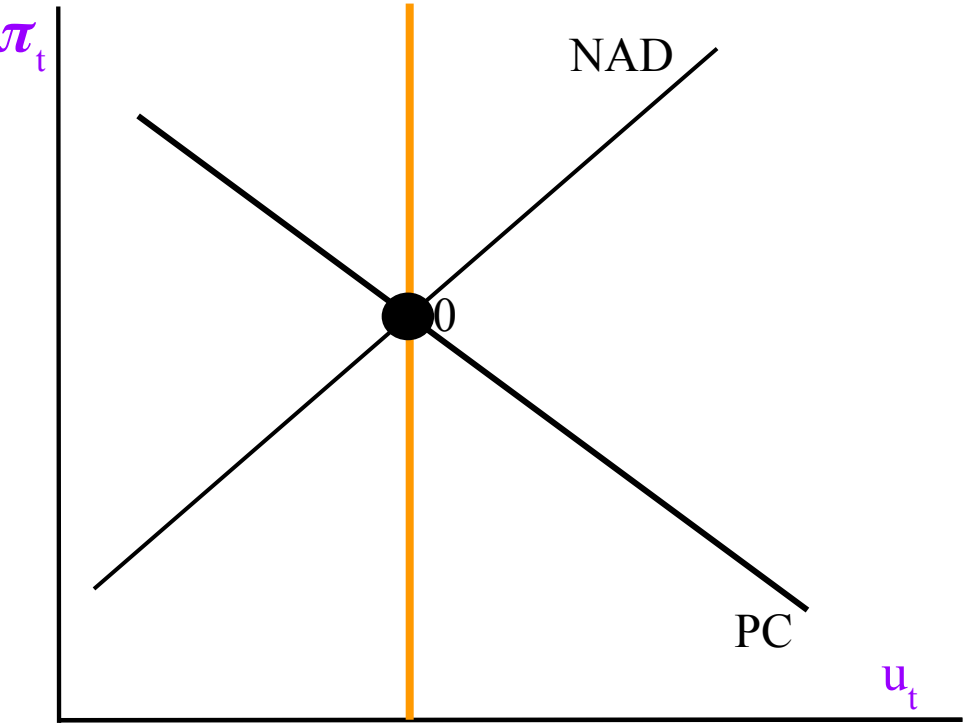



- An independent central bank is a bulwark against this – it can counteract such shenanigans

# Rational Expectations

- Suppose the central bank simply did the President's bidding and so played along with this vote-getting scheme.
- So policy would regularly try to push $u < u_N$. How would that go?



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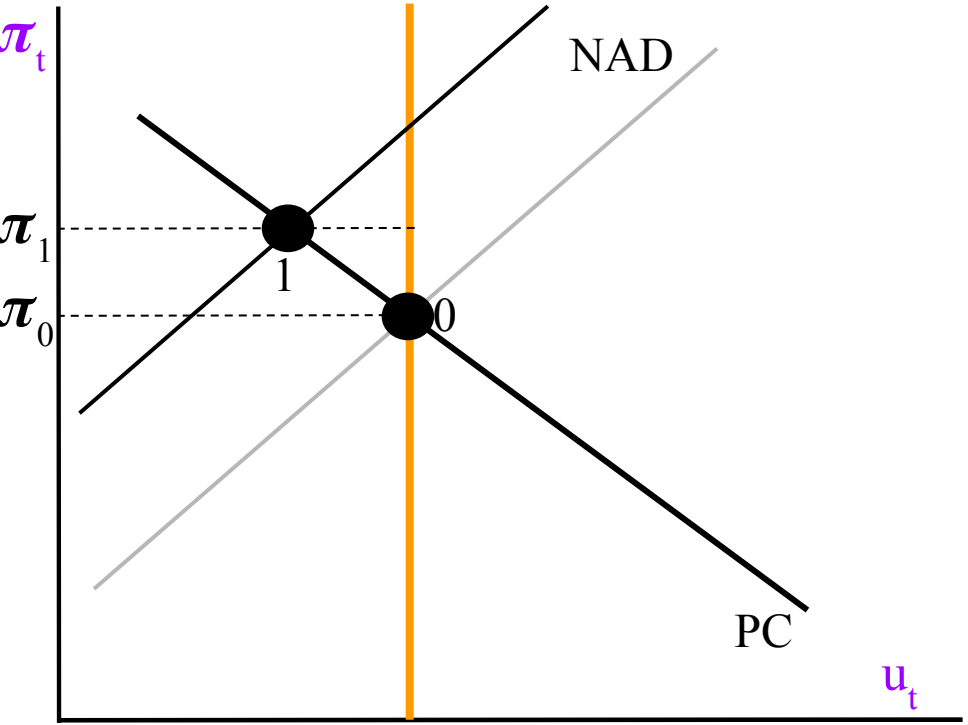


The simple answer with adaptive expectations is that it would achieve its short-term goal (reach "1"), though we know there would be a long-term consequence of high inflation or a deep recession.

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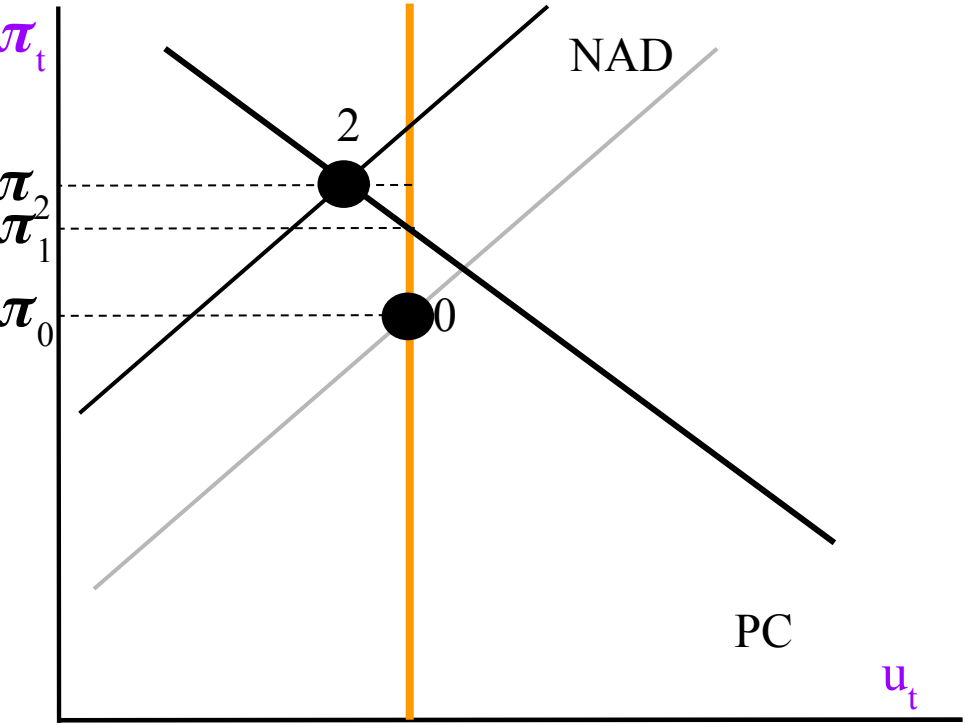


But this is naive! If this were common, people would anticipate it and so $\pi^e = \pi_1$. This shifts PC up and causes self-fulfilling inflation while eliminating part of the boom.

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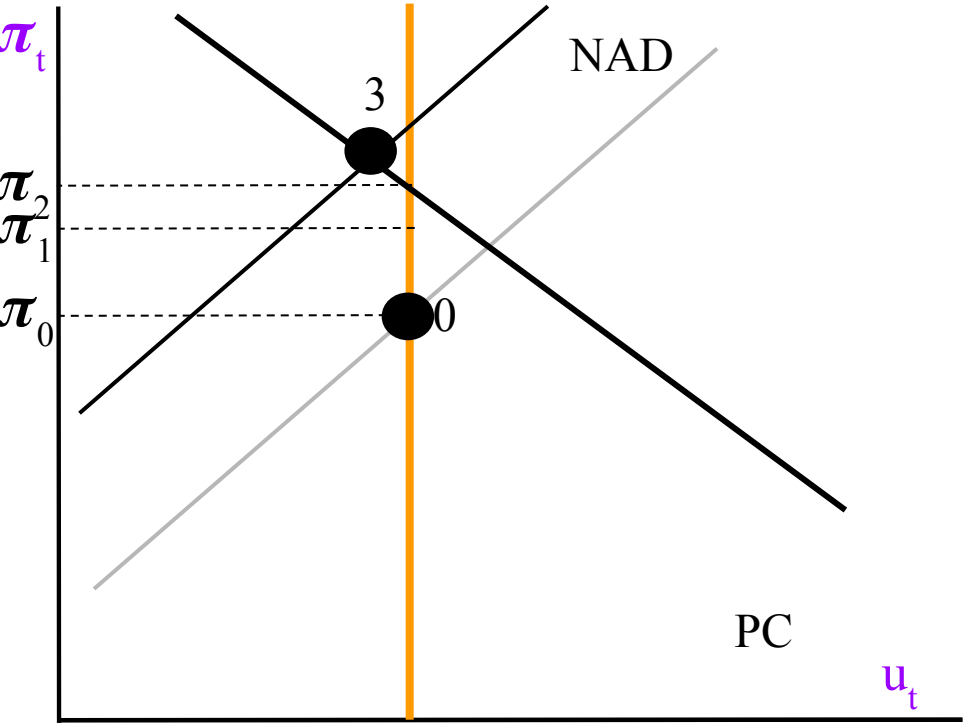


But that's naive, too! That shift in PC will in fact cause $\pi > \pi_1$. Since that's predictable, PC needs to shift up further.

# Rational Expectations

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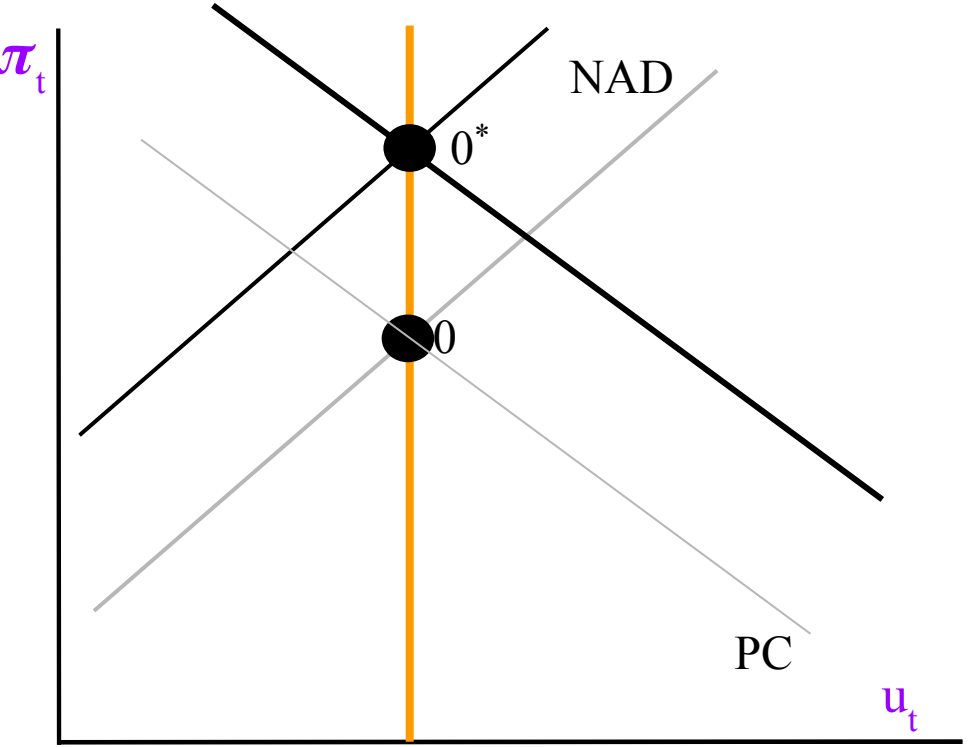


The logic of these forward-looking, "rational" expectations ($\pi^e = \pi_t$), pushes us all the way to $0^*$. I.e. the Phillips Curve adjustment happens immediately, not instages.
In words, the lack of central bank independence creates higher inflation with no benefit for unemployment!

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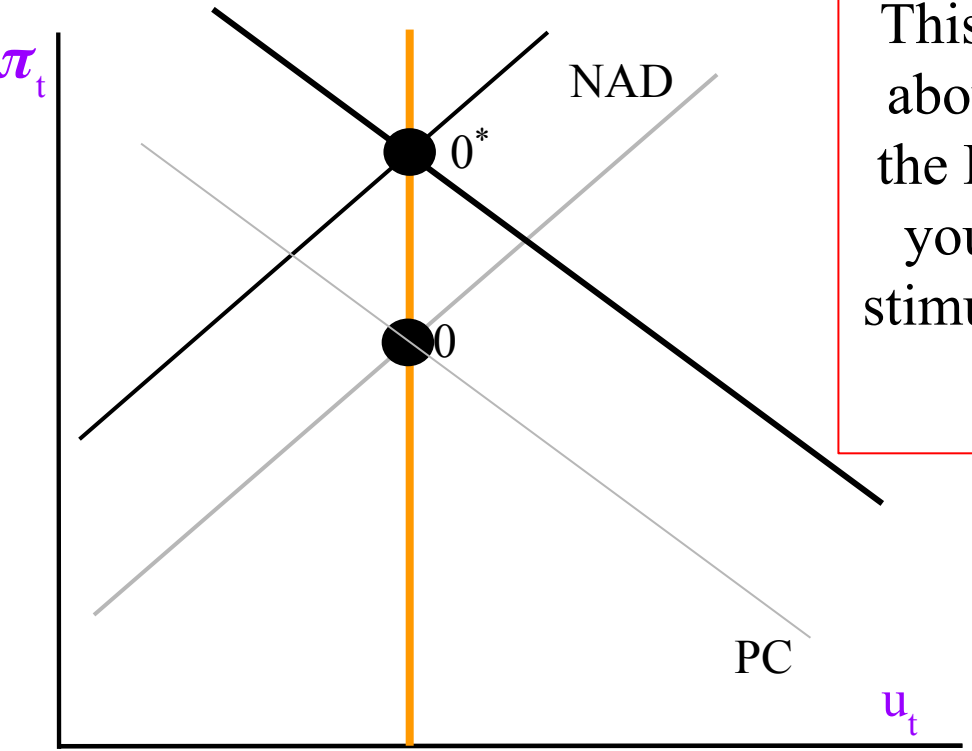


This is why economists are so concerned about Donald Trump's attempt to coerce the Fed into providing stimulus. Whether you think the Fed should provide more stimulus or not, it is problematic to have it dictated by politicians.

# The data is consistent with this story

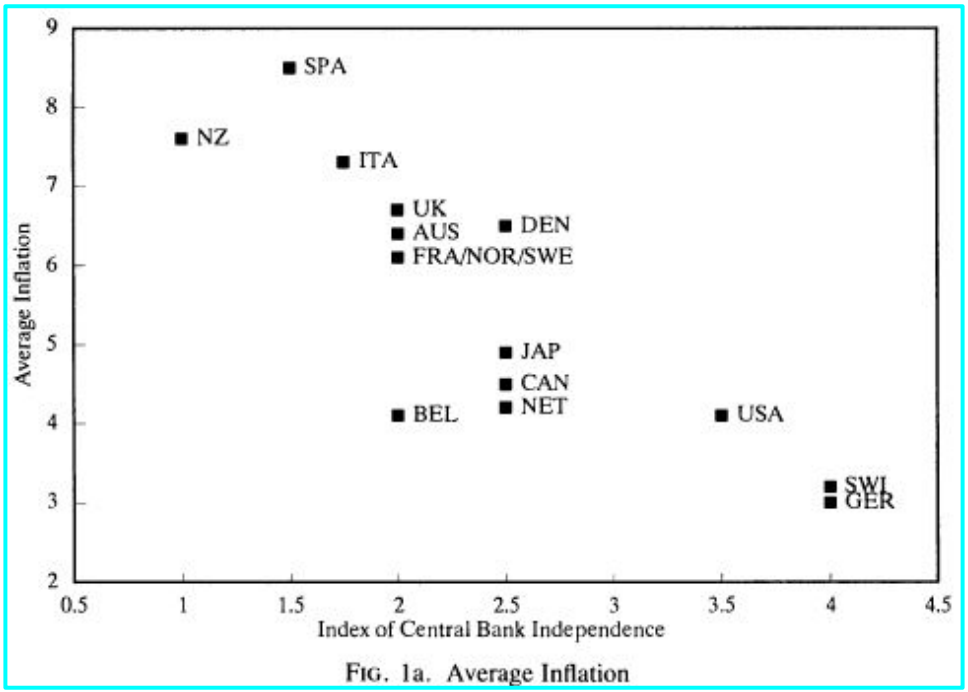

FIG. 1a. Average Inflation

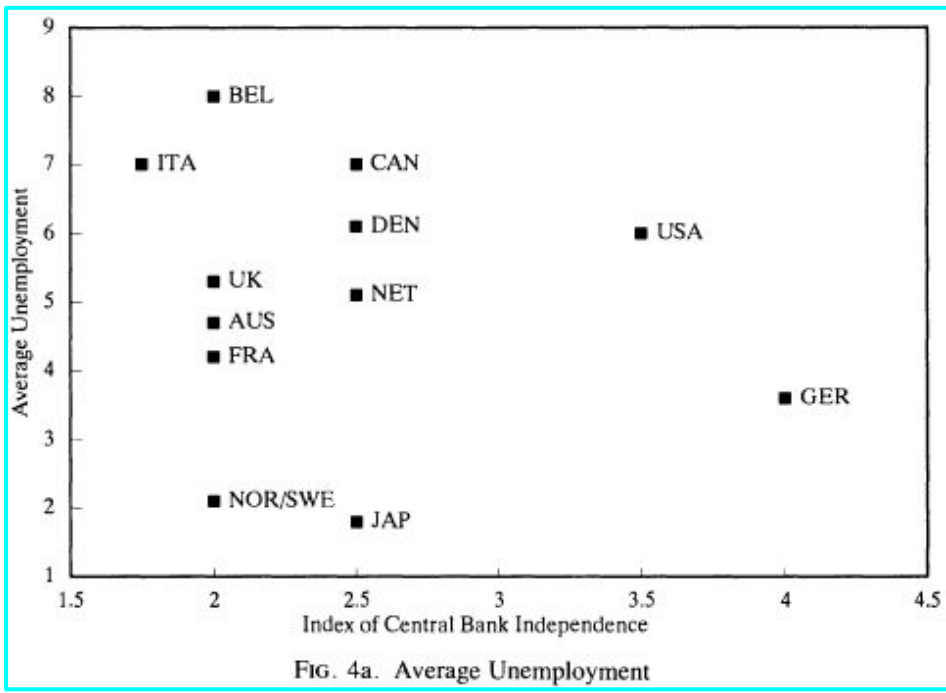

FIG. 4a. Average Unemployment

Source: Alesina and Summers (1993)

# Costs of Inflation

- If inflation is uniform and expected, it's fine
  - Relative prices are unchanged, interest rates can account for it
- Non-uniform inflation creates distortions
  - Bad, though hard to measure
- Unexpected inflation messes with real interest rates, as discussed in the context of "debt deflation"
  - Unexpectedly high inflation is good for borrowers, bad for lenders
- So inflation volatility is dangerous – it makes inflation hard to predict and therefore makes it hard to make financial contracts and decisions
- When inflation is high, so is its volatility, which has real costs.
- This is probably not the reason people hate inflation. Part of the story is "behavioral." When wages and prices both go up, people think:
  - "I earned my higher wage…"
  - "but the high prices at the grocery store are *'inflation*.'"