Is the Phillips Curve Getting Flatter?

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Monetary Theories   (*roughly*)

■ Quantity Theory/Monetarism   *transaction role/medium of exchange*

    ■ $P_t Q_t = v_t M_t$

■ Fiscal Theory   *store of value role/safe asset*

    ■ $\frac{B_t + M_t}{P_t} = \mathbb{E}_t \left[\sum_{\tau=t+1} SDF_{t,\tau} (primary\ surplus_\tau) \right] + Bubble$

                      ↑ time varying   *service flow*

                      ↑ financial frictions (I Theory) ⎯⎯⎯⎯⎯⎯

                      (debt deflation, redistribution, …

■ New Keynesian Theory − Phillips curve   *stickinesss*

    ■ $\pi_t = \beta \mathbb{E}_t[\pi_{t+1}] - \kappa(u_t - u_t^n) + v_t$

Phillips Curve Thinking

- $\pi_t = \beta \mathbb{E}_t[\pi_{t+1}] - \kappa(u_t - u_t^n) + \nu_t$
- If unemployment falls below *natural* rate, inflation will follow
- Policy maker questions:
  - What is the *natural* rate?
  - How long can monetary policy be loose before inflation will pick up?
  - Crucial role for inflation expectations and the inflation anchor!

- Theory: low unemployment $\Rightarrow$ wage pressure
- (Little) Correlation:
 - Monetary policy puts breaks on if π rises

Phillips curve: **German Weimar Republic 1922-23**

With Sergio Correia, Stephan Luck and Tom Zimmermann

- Prior to hyperinflation
  - Jan. 1920 through July 1922
  - Downward sloping
  - Slope not robust to time FE in cross-sectional regression

- During hyperinflation
  - Aug. 1922 through Dec. 1923
  - Upward sloping
  - (Hyper)Stagflation

- $\pi_t = \beta \mathbb{E}_t[\pi_{t+1}] - \kappa(u_t - u_t^n) + \nu_t$

- 1980s US Volcker disinflation
  - Inflation expectations were to high
    it was not clear whether Volcker can stay course

- 1922 German "high" inflation
  - Inflation expectation were "way" too low ➡ zero unemployment
  - Belief that Germany would be able to bring
    fiscal situation under control, like UK
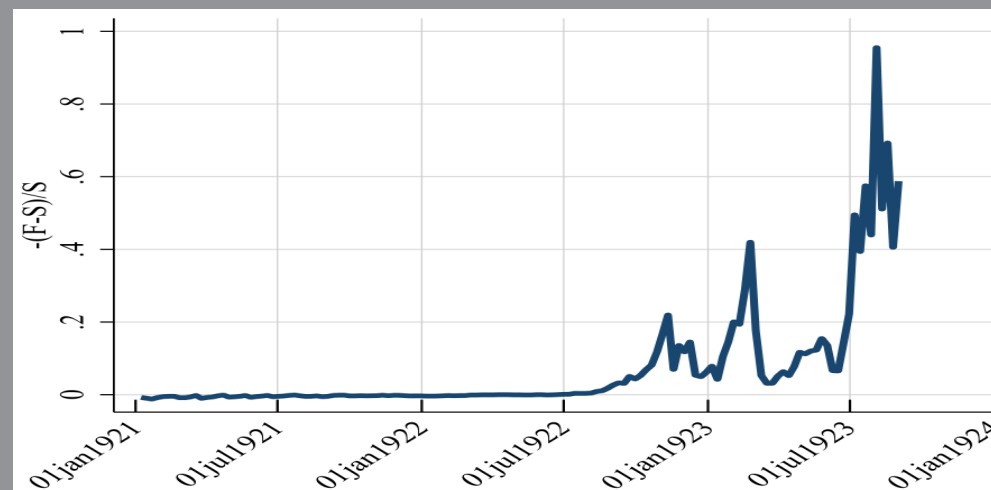
*Back out inflation expectations
from FX forward market*

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Poll Questions

1. Is there a systematic "Phillips curve" relationship between inflation and cyclical unemployment?
   a. No
   b. Yes

2. Has the Phillips curve gotten flatter over time?
   a. No
   b. Yes

3. Is the Federal Reserve more or less "independent" from political pressure than it was in the early 1980s?
   a. More independent
   b. Less independent
   c. Roughly the same

# IS THE PHILLIPS CURVE GETTING FLATTER?

Emi Nakamura UC Berkeley

April 2021

*This presentation draws heavily from joint work with: Jonathon Hazell (Princeton & LSE), Juan Herreño (Columbia & UCSD), and Jón Steinsson (UC Berkeley),

"The Slope of the Phillips Curve: Evidence from U.S. States"

- Substantial slope during Volcker disinflation

- Muted response to unemployment more recently
  - Great Recession: missing disinflation
  - More recently: missing reinflation

CONVENTIONAL WISDOM
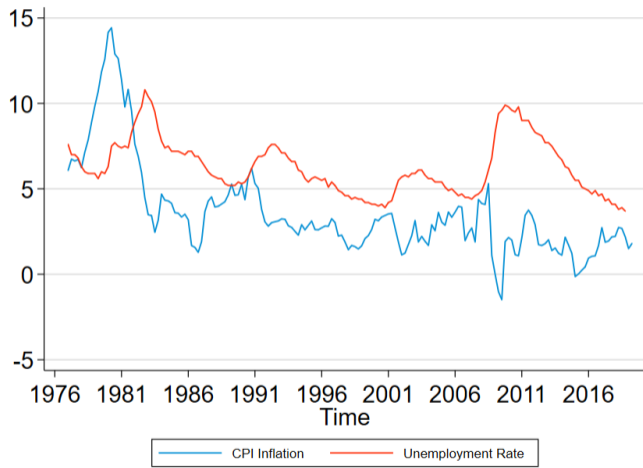
- Volcker disinflation:
    - Tight policy $\rightarrow$ high unemployment $\rightarrow$ lower inflation
    - Suggests the Phillips curve is steep

- Since 1990:
    - Muted response of inflation to unemployment
    - Great Recession: missing disinflation
    - Late 2010s and 1990s: missing rise in inflation

- Phillips curve is getting flatter or hibernating (or dead)
    - Perhaps an important flaw in the Keynesian model

Stock and Watson (2019):

$$\Delta \pi_t = -\kappa(u_t - u_t^n) + \nu_t,$$

- $\Delta \pi_t$: Annual change in 12-month core PCE inflation
- $u_t - u_t^n$: CBO unemployment gap
- Refer to κ as "Phillips correlation"

OLD-KEYNESIAN PHILLIPS CURVE
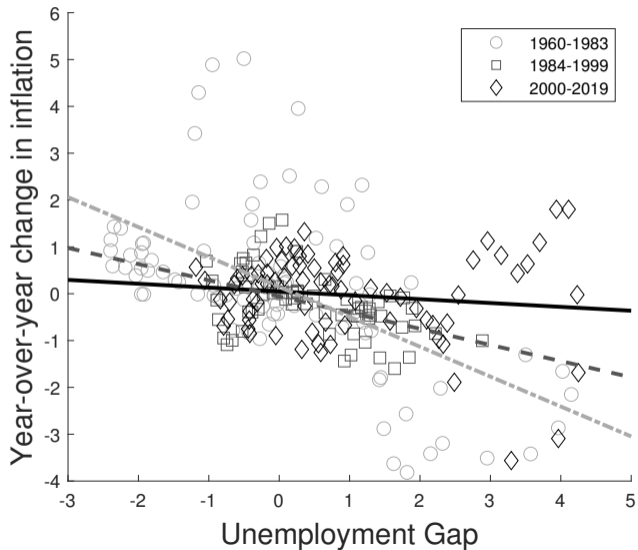
Demand-Driven inflation

- $u_t > u_t^n$: Weak economy
  - Little incentive to raise prices

- $u_t < u_t^n$: Overheated economy
  - Pressure to raise wages, prices

OLD-KEYNESIAN PHILLIPS CURVE

- Late 1960's

- Milton Friedman (Chicago) and Ned Phelps (Columbia)

- Argument:
  - Suppose inflation is consistently above (or below) target
  - Firms will eventually start to anticipate this

- Predicted Old-Keynesian Phillips curve would break down

And they were right!

- Empirical relationship completely broke down shortly after paper was published

$$\pi_t = \beta E_t \pi_{t+1} - \kappa(u_t - u_t^n) + \nu_t$$

Drivers of inflation:

- Expected inflation: $E_t \pi_{t+1}$
- Measure of "output gap": $u_t - u_t^n$
- Cost-push shocks: ν_t

Object of interest: Slope coefficient κ

- How much does an increase in "demand" affect inflation

INTUITION

Abraham Lincoln:

"You can fool some of the people all of the time, and all of the people some of the time, but you can not fool all of the people all of the time."

Logic:

- Firms will eventually start to anticipate high inflation
- At this point, firms will raise prices "in advance"

$$\pi_t = -\psi \tilde{u}_t + E_t \pi_{t+\infty} + \omega_t$$

- Long-run inflation target major determinant of current inflation
  - Has a coefficient of one
  - Current inflation moves one-for-one with beliefs about long-run inflation target

- Inflation can vary without **any** variation in $\tilde{u}_t$
  - Purely due to changes in $E_t \pi_{t+\infty}$

- Correlation between $E_t \pi_{t+\infty}$ and $\tilde{u}_t$ potentially a source of severe omitted variables bias
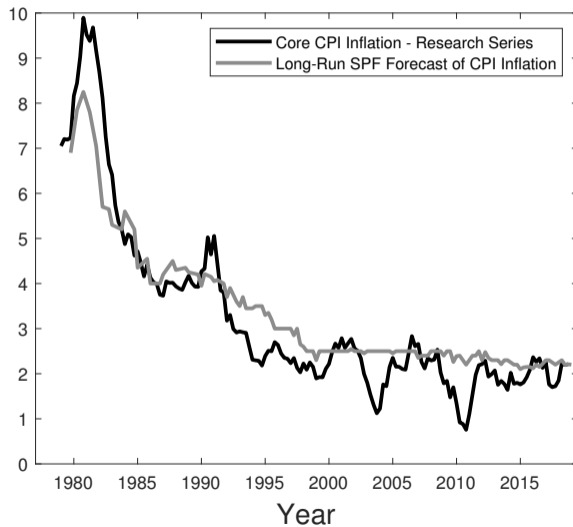
- Volcker disinflation:
  - Sharp regime shift
  - Rapid fall in long-run inflation expectations
  - Rapid fall in inflation

- Since 1990:
  - Long-run inflation expectations have become anchored
  - Consequently, inflation has become more stable

- Apparent "flattening" of Phillips curve due to anchoring of inflationary expectations (Bernanke, 2007; Mishkin, 2007)

$$\pi_t - \beta E_t \pi_{t+1} = -\kappa(u_t - u_t^n) + \nu_t$$

- Useful to look at difference between π_t and $E_t \pi_{t+1}$ in the data

- Measurement issue:
  - Before 1983, housing services constructed from house prices and mortgage costs (interest rates)
  - PCE deflator and CPI research series use modern methods back in time (i.e., rents)

CPI

Core CPI

Core PCE

Core CPI Inflation Research Series
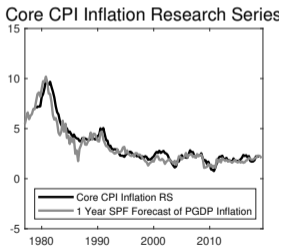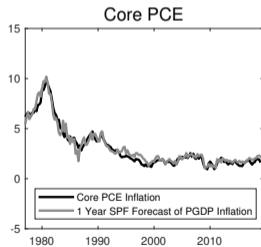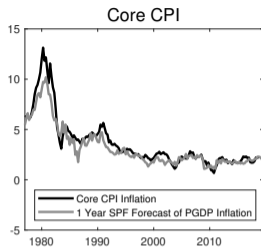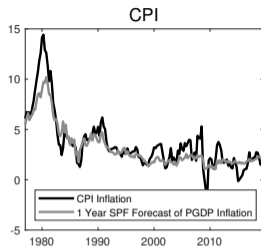
CAN REGIONAL DATA HELP?

Idea:

- Want to measure Phillips curve slope independent of regime change

- Changes in monetary regime affect *all* states

- Changes in long-run inflation expectations cancel out across states

- Difference-in-differences empirical strategy

- New state-level inflation indexes (focus on non-tradeables, no imputation)

- Analyze housing separately
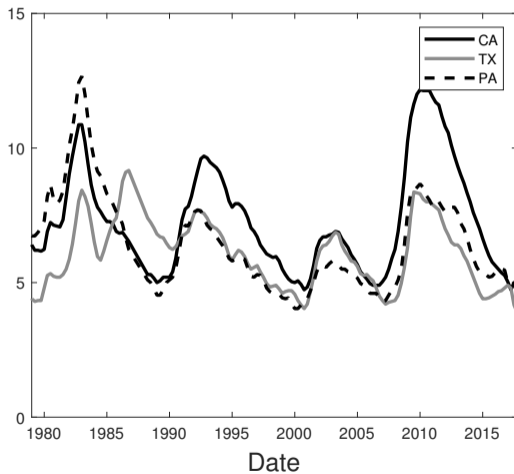
- Regional Phillips Curve for Non-Tradeables:

$$\pi_{Ht}^N = \beta E_t \pi_{H,t+1}^N - \kappa \hat{u}_{Ht} - \lambda \hat{p}_{Ht}^N + \nu_{Ht}^N$$

- Aggregate Phillips Curve:
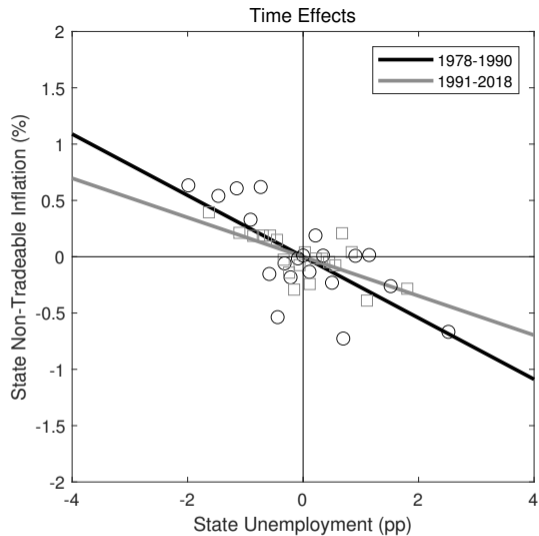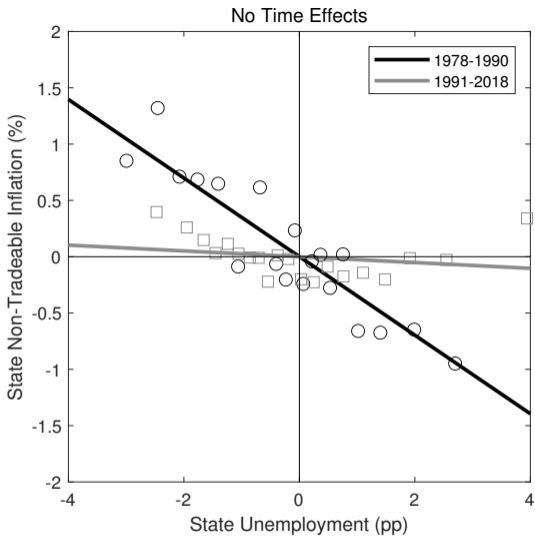
$$\pi_t = \beta E_t \pi_{t+1} - \kappa \hat{u}_t + \nu_t$$

where $\hat{u}_{Ht} = -\hat{n}_{Ht}$ and $\hat{u}_t = -\hat{n}_t$

- Result: Can use slope of the regional Phillips curve to estimate slope of aggregate

Results

FIGURE: Scatterplots—Non-Tradeable Inflation and Unemployment

MAIN CONCLUSIONS

- Slope of Phillips curve small
  - $\kappa = 0.0062$ implies that even a 5 percentage point increase in unemployment decreases inflation by only 2 percentage points
    (if inflation expectations remain unchanged)

- Apparent "flattening" mainly due to anchoring of expectations
  - No time fixed effects: Factor >100 flattening
  - With time fixed effects: Factor 2 flattening

 - Interpretation: Time fixed effects absorb movements in long-run inflation expectations

- Can our cross-section estimate of κ explain aggregate time-series fluctuations in inflation?

- Many have argued:
  - Missing disinflation during Great Recession
  - Missing reinflation during late 2010s and late 1990s

- Are cross-sectional estimates of Phillips curve steeper than
  time-series estimates?

AGGREGATE IMPLICATION

- Plot RHS and LHS of

$$\pi_t - E_t \pi_{t+\infty} = -\kappa \zeta \tilde{u}_t + \omega_t$$

  assuming no supply shocks $\omega_t = 0$

- Aggregate includes housing
  - Estimate aggregate Phillips curve for shelter
  - Data from American Community Survey for 2001-2017
  - $\kappa = 0.0243$ (s.e. 0.0053)
  - About four time larger than for non-shelter
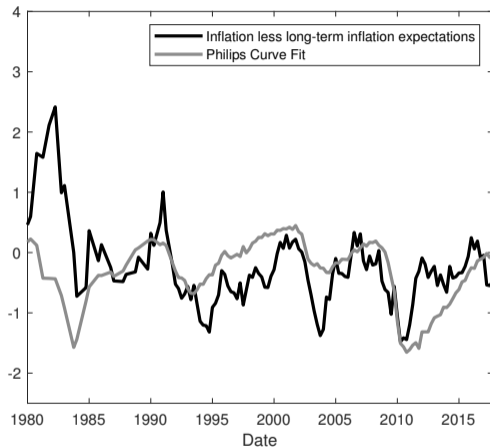
FIGURE: Aggregate Phillips Curve and Housing: Predicted vs. Fit

- Post-1990: Predictions fit data reasonably well
  - Essentially no missing disinflation or missing reinflation
  - Most of the cyclical variation in inflation comes from housing (imputed rents)

- Pre-1990: Data deviates substantially from predictions
  - Actual inflation gap much higher than predicted
  - Natural Explanation: Adverse supply shocks

- Opposite of conventional wisdom

THE ELEPHANT IN THE ROOM

- Key determinant of inflation: $E_t \pi_{t+\infty}$

- But how does the monetary authority change $E_t \pi_{t+\infty}$
  - Fundamentally hard!!
  - How does it convince people that what it says is credible?
  - Answering this is not a strong suit of economists (need more research)

- Sometimes beliefs do change rapidly
  (e.g., Volcker disinflation, ends of hyperinflations)

- Many (unsuccessful) attempts to curb inflation in 70's
  - Nixon 1971: Wage and price controls
  - Ford 1974: Inflation "public enemy number one"

    WIN: Whip inflation now

    COURTESY: GERALD R. FORD PRESIDENTIAL MUSEUM

- Carter:
  - "Persistent high inflation threatens the economic security of our country"
  - Oct 1979: Appoints Paul Volcker Chairman of Fed

The favorite word at the time... was "gradualism." ... Bringing down inflation will take "years, decades, whatever, and you can do it without hurting the economy." I never thought that was realistic.... we threw everything we could into the October 1979 announcement.

THE VOLCKER DISINFLATION

- In 1979/80 the newly elected chairman of the U.S. Federal Reserve, Paul Volcker
    - Sets as a goal to bring inflation below 4%
    - Dramatically raises interest rates
    - Fed funds rate reached record high of 20% in 1980!

- Huge recession

- Volcker disinflation involved enormous political challenges
- Political attacks came from both parties
  - "We are destroying the small businessman" (Conservative George Hansen)
  - Democratic initiative to impeach Volcker and most of the Fed's governors
- Volcker sent coffins of keys from unsold cars and pieces of wood from unbuilt houses

HOW DOES ONE CHANGE LONG-RUN BELIEFS?

- Volcker tightened policy dramatically
    - Caused massive recession
    - Didn't get fired

- Perhaps this was crucial in changing beliefs about long-run monetary regime

- Fundamentally different from view that inflation fell rapidly due to steep Phillips curve

- Slope of the Phillips curve is small and has been small since 1978

- Apparent flattening in time series due to anchoring of expectations
  - No time fixed effects: Factor 100 flattening
  - With time fixed effects: Factor 2 flattening

- Volcker disinflation:
  - Mostly due to fall in long-run expectations
  - Key issue for inflation dynamics is formation of long-run beliefs