

What caused the U.S. pandemic-era inflation?

Ben Bernanke and Olivier Blanchard

The focus of this paper on the United States. We are currently running a project with ten other central banks, estimating the model for their economies, and drawing implications.
A hint of results at the end of this presentation.

(Harvard, October 2023)

The theme.

Go back to early 2021: Major fiscal packages

2020: CARES act (March) 2.2 tr. Covid package (December): 0.9 tr

2021 American Rescue Plan (March) 1.9 tr

Two views at the time, both focused on the labor market.

Optimists: Phillips curve flat, expectations anchored.

Pessimists: Given size of package, Phillips curve may steepen, expectations may deanchor.

The outcome: Both views were partly right/partly wrong. There was inflation but:

Action came mainly from goods market: commodity prices, other price spikes

What happened:

High frequency: Headline inflation dominated by relative price shocks.

Lower frequency. Overheating leading to a small but sustained increase in wage inflation

As price shocks have receded, headline inflation has decreased.

Dynamic effects of overheating in labor market have become dominant

Going back to 2% target probably requires a decrease in v/u . Implications for u ?

The approach.

A simple analytical model. (old fashioned, “thought organizer,” easy to understand by policy makers)

Distinction between wages and price dynamics

Wage equation, reflecting labor market state, inflation expectations, catch up effects

Price equation, reflecting cost/profit shocks

Short and long run inflation expectations

Estimation of the model on both pre-covid sample and full sample.

Same specification as the analytical model, more generous lag structure.

Conclusions:

Given labor market state and price shocks, pre-covid relations have held up well.

Little evidence of catch up or deanchoring .

Implications, looking at impulse response functions and historical decompositions:

Strong but short-lived effects of price shocks.

Small but sustained direct and indirect effects of labor market overheating

Increasing role over time of the second relative to the first.

The model

The wage equation

$$w = p^e + \omega^a + \beta x$$

ω^a aspiration wage. x : labor market variable

$$\omega^a = \alpha \omega^a(-1) + (1 - \alpha) (w(-1) - p(-1)) + z_w;$$

α catchup coefficient >0 : $\alpha=0$ no catchup

So: $w - w(-1) = (p^e - p(-1)) + \alpha (p(-1) - p^e(-1)) + \beta (x - \alpha x(-1)) + z_w;$

The price equation

$$p = w + z_p$$

z_p relative price shock: e.g. energy price relative to the wage or shortage price spike

$$p - p(-1) = w - w(-1) + (z_p - z_p(-1))$$

Short run expectation equation

$$(p^e - p(-1)) = \delta \pi^* + (1 - \delta) (p(-1) - p(-2))$$

π^* long run inflation expectation
 δ degree of anchoring of short run expectations

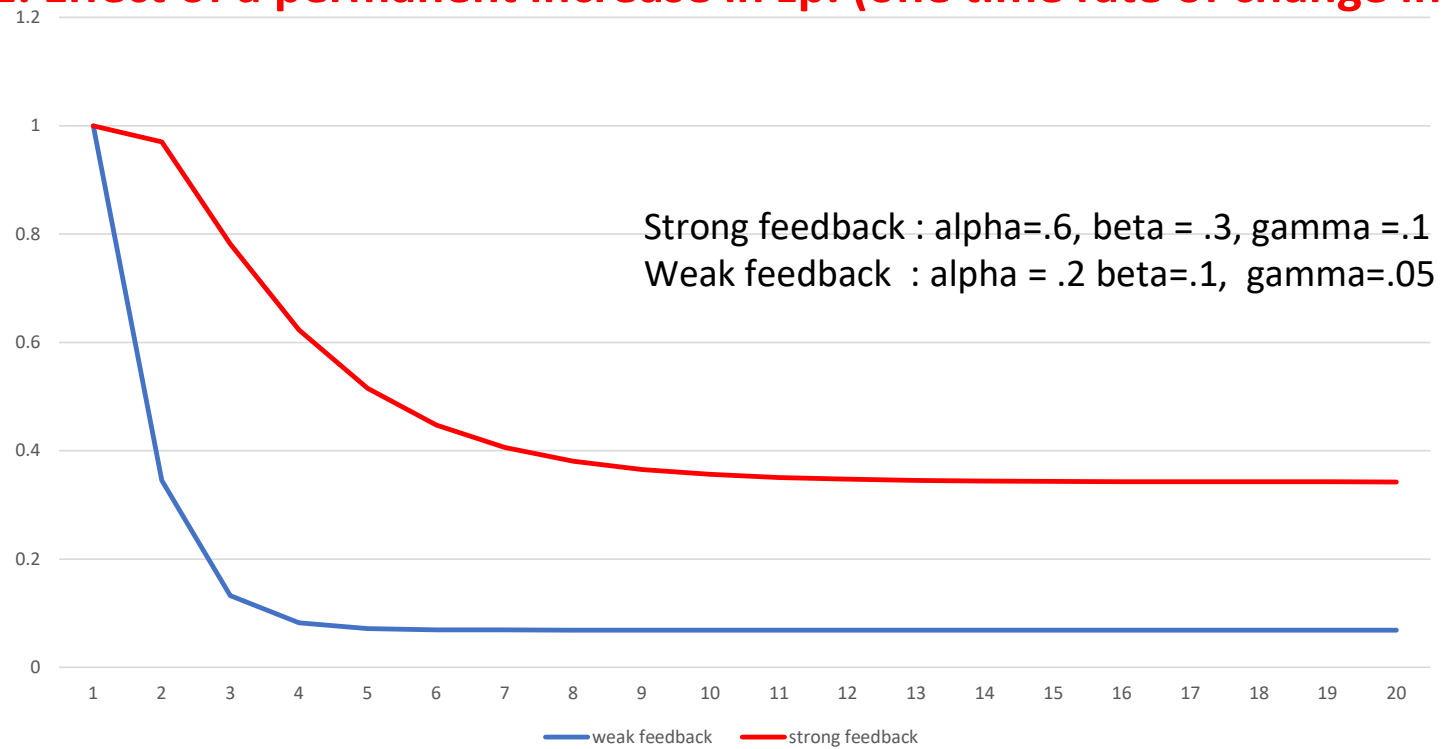
Long run expectation equation

$$\pi^* = \gamma \pi^*(-1) + (1 - \gamma) (p(-1) - p(-2))$$

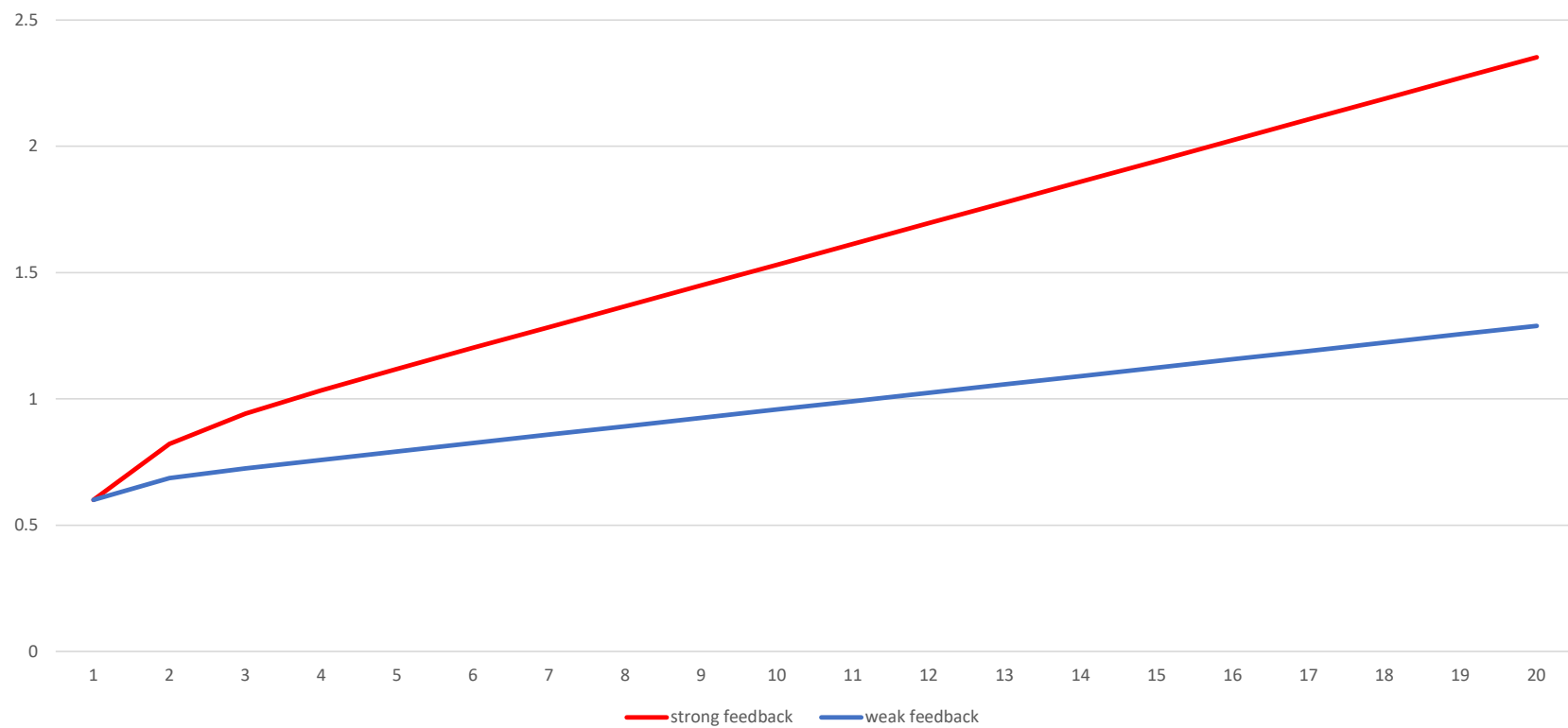
γ degree of anchoring of long run expectations

Two useful IRFs

1. Effect of a permanent increase in z_p . (one time rate of change in z_p)



2. Effect of a permanent increase in x .



The empirical model.

Estimate the four equations, using quarterly data, allowing for 4 lags of all included variables.

Identification: Wage inflation responds only to lagged variables.

Samples. Pre-covid: 1990: 1 to 2019:4. Full :1990:1 to 2023:2

Empirical counterparts for the main variables

- Price level: CPI (parallel estimation with PCE)

- Wage variable. Employment Cost Index

- Expectations: Cleveland Fed forecasts 1year, 10-year. (parallel estimation with SPF)

- Price shocks. CPI energy component, CPI food component ,relative to the wage.

 - “Shortage” (from Google trends. Explained later)

- Labor market variable. v/u rather than u . Why?

- (Productivity growth. 8-quarter moving average)

Homogeneity restriction imposed (but accepted by the data), implying no long run trade off.

Estimation results

Wage equation. Regression results, full sample

Independent variable	gw	v/u	catch-up	cf1	gpty
Lags	-1 to -4	-1 to -4	-1 to -4	-1 to -4	-1
Sum of coefficients	0.544	0.688	-0.021	0.456	0.038
p-stat (sum)	0.000	0.012	0.727	0.002	.517
p-stat (joint)	0.004	0.000	0.886	0.0035	0.517
R-squared	0.660				
No. observations	134				

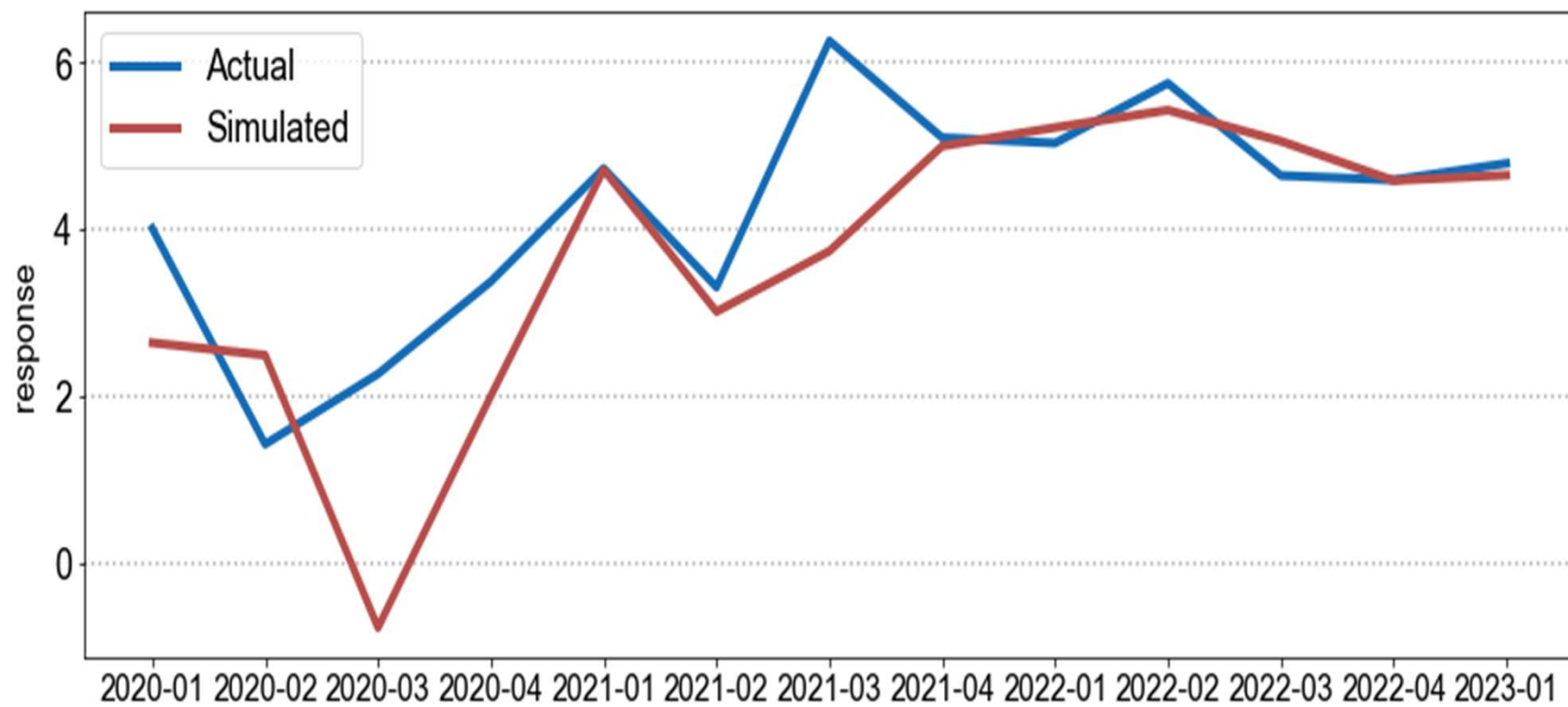
Main conclusions

Decent fit. Subsample stable. (Big miss in 2020:3)

Significant but small effect of v/u. No evidence of non-linearity.

No evidence of catch up.

Wage equation. Actual and predicted values post 2020:1



Price equation. Regression results, full sample

Independent variable	gcpi	gw	grpe	grpf	shortage	gpty
Lags	-1 to -4	0 to -4	0 to -4	0 to -4	0 to -4	-1
Sum of coefficients	0.232	0.768	0.072	0.212	0.006	-0.115
p-stat (sum)	0.168	0.000	0.000	0.002	0.732	0.084
p-stat (joint)	0.013	0.000	0.000	0.002	0.068	0.084
R-squared	0.939					
No. observations	134					

Subsample stable. Good fit.

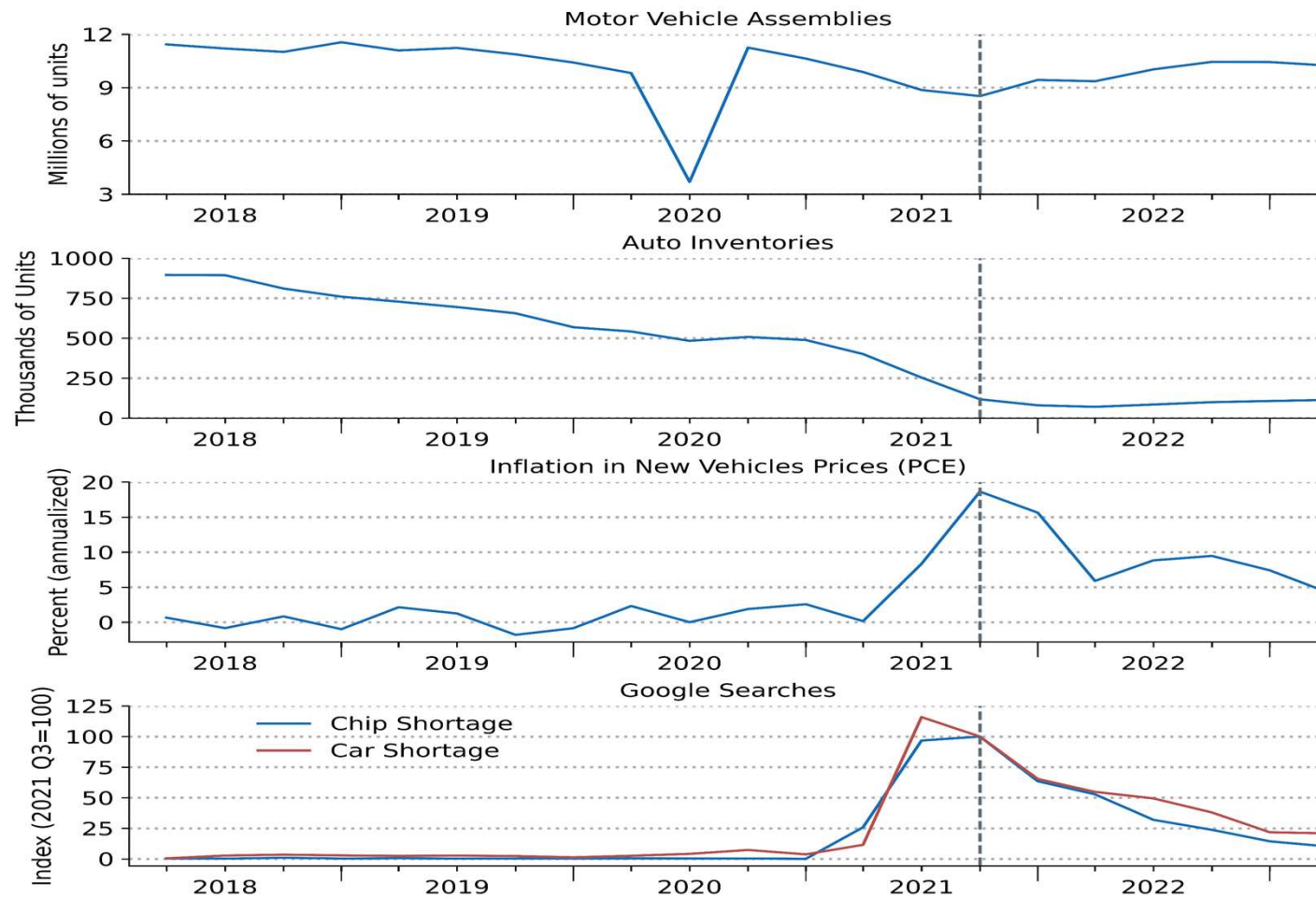
How to capture price spikes? We explored a number of variables

We found that “shortages” on google trend worked best. (more recently LLM alternative)

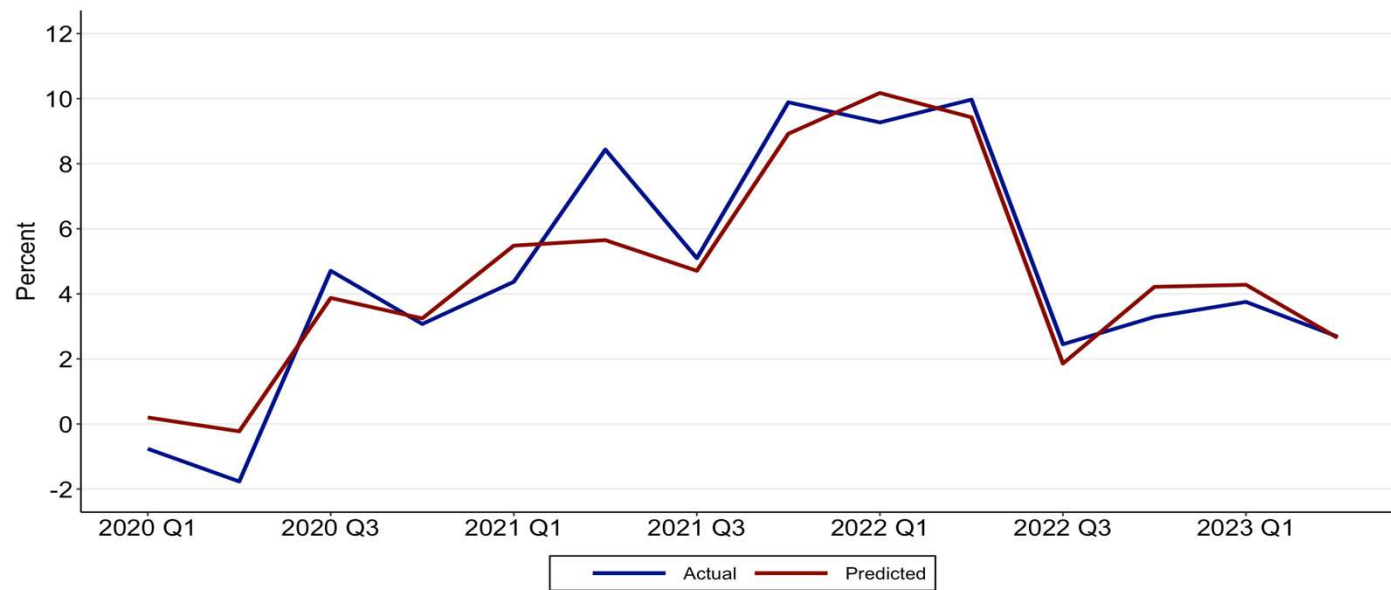
Long run effect of price and food only 20% larger than their share in CPI.

(Surprisingly) limited second round price-price effects.

The role of shortages and price spikes. Car industry



Price equation. Actual and predicted values post 2020:1



Strong aggregate demand or supply constraints?

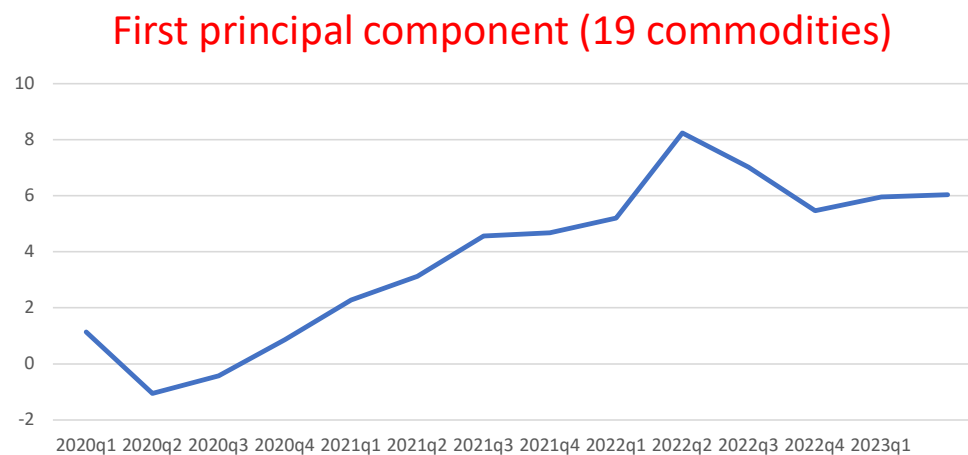
A pass at the answer, based on the behavior of commodity prices:

Assume that commodity prices are the result of common aggregate demand and largely idiosyncratic supply shocks

Then the first principal component should reflect aggregate demand.

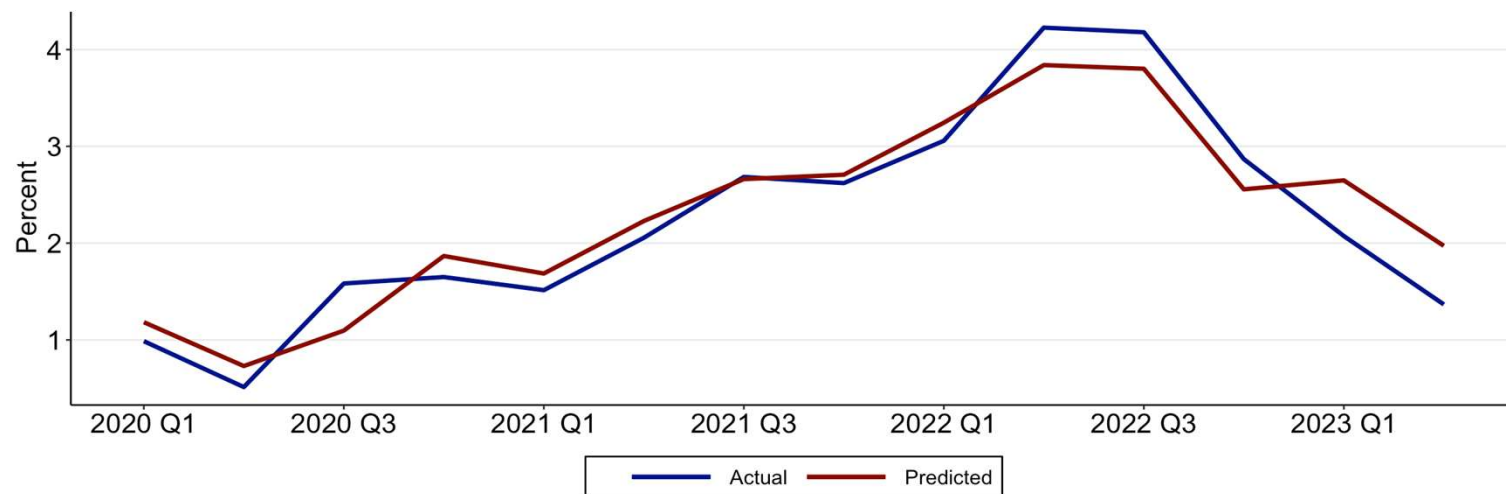
This is done below, using the 19 commodities in the CRB commodity price index

Evidence. Steady increase in first PC from 2020:1 to 2022:2



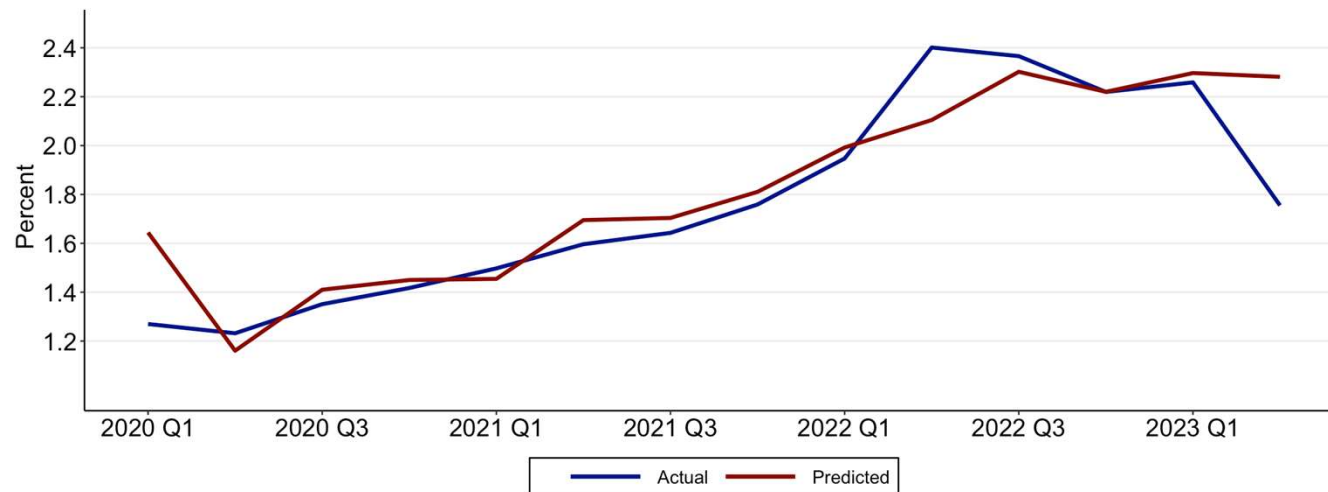
Short run expectations. Regression results, actual and predicted values post 2020:1

Independent variable	cf1	cf10	gp
Lags	-1 to -4	0 to -4	0 to -4
Sum of coefficients	0.369	0.506	0.124
p-stat (sum)	0.014	0.000	0.001
p-stat (joint)	0.001	0.000	0.000
R-squared	0.901		
No. observations	134		



Long run expectations. Regression results, actual and predicted values post 2020:1

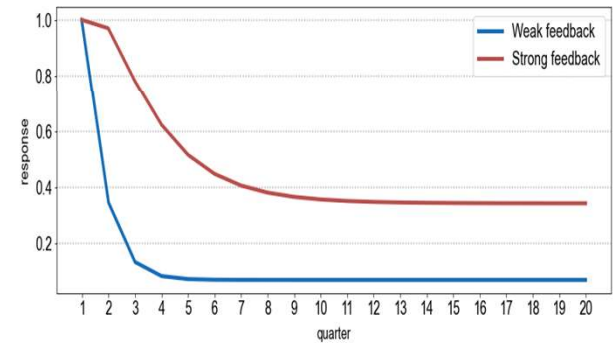
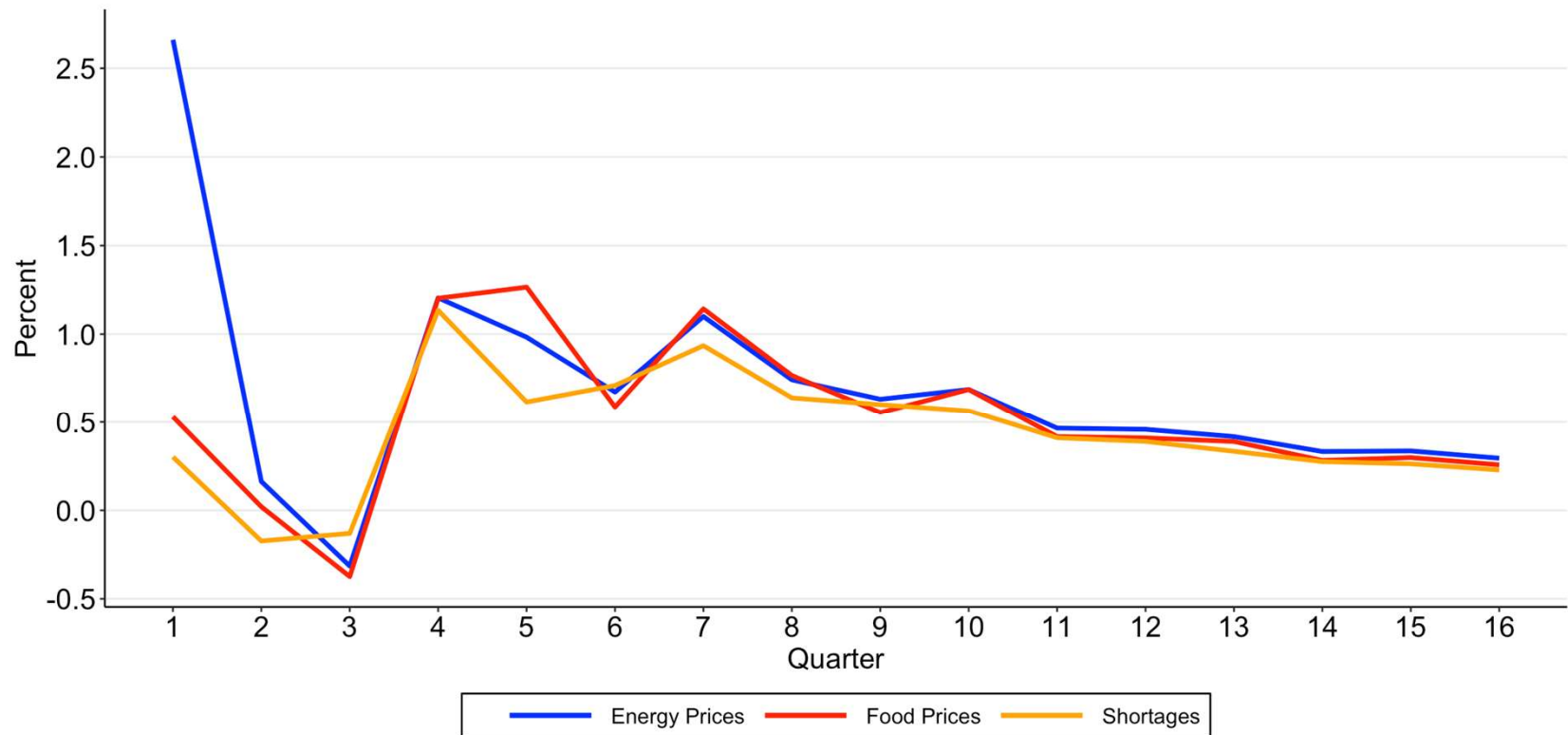
Independent variable	cf10	gp
Lags	-1 to -4	0 to -4
Sum of coefficients	0.975	0.025
p-stat (sum)	0.000	0.208
p-stat (joint)	0.000	0.004
R-squared	0.931	
No. observations	134	



Impulse response functions

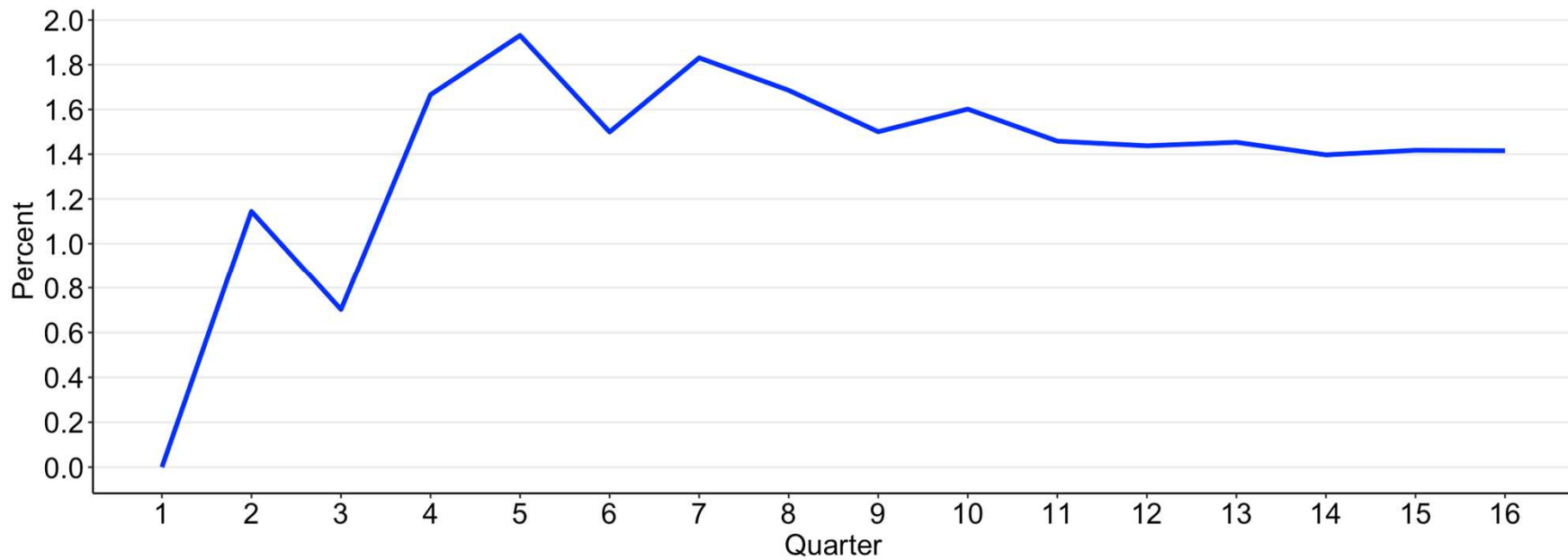
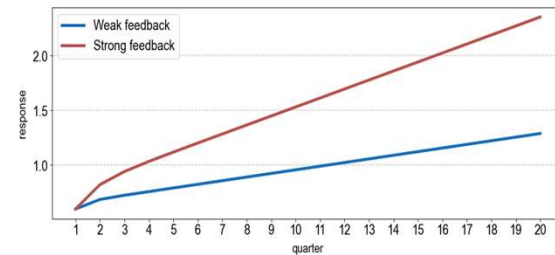
Empirical impulse responses of inflation to a 1 sd price shocks

Small second round effects



Empirical impulse responses of inflation to a 1 sd permanent increase in v/u

Effects build up but build up slowly.



Historical decompositions.

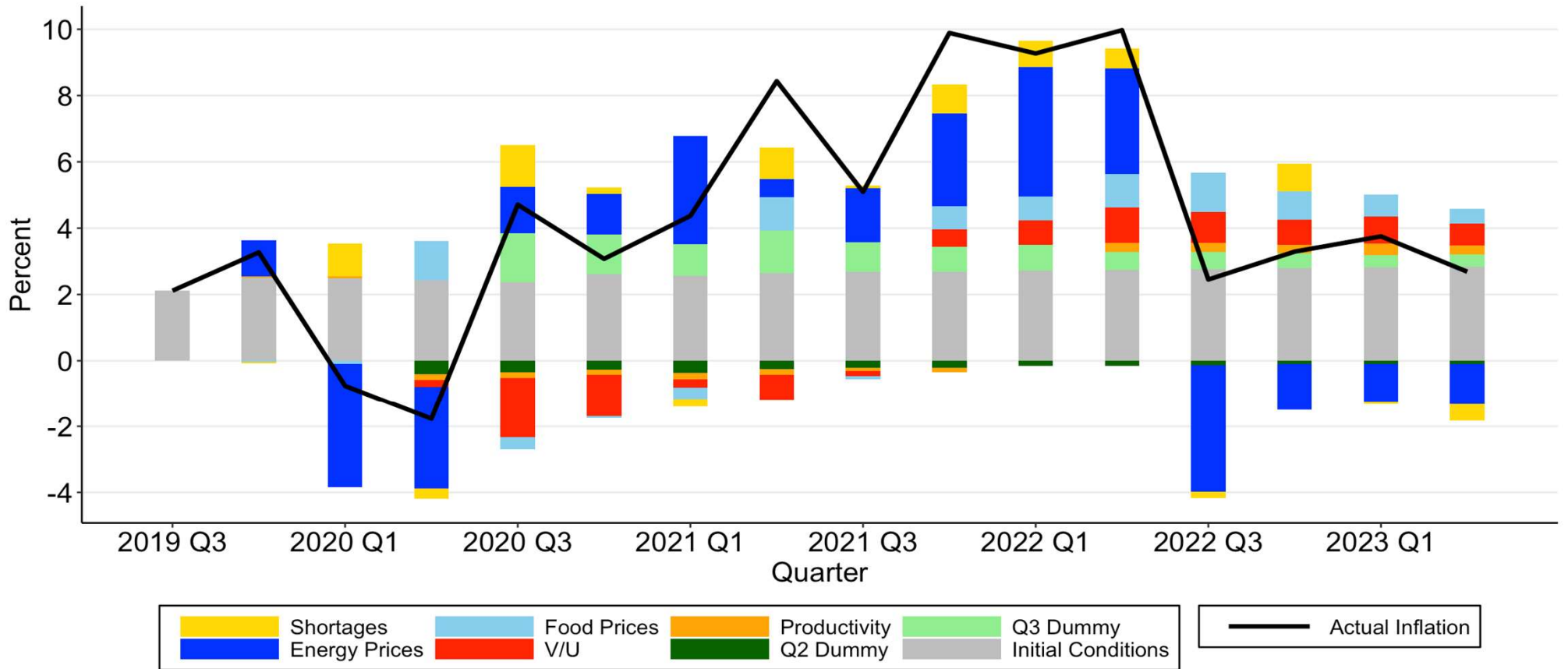
Starting in 2020:1, what would have happened to inflation if
no relative price shocks, shortages at pre-covid average
 v/u remaining at its 2019:4 value
productivity growth at its pre-covid average

Interpretation: where v/u was in 2019:4 relative to implied v/u^*

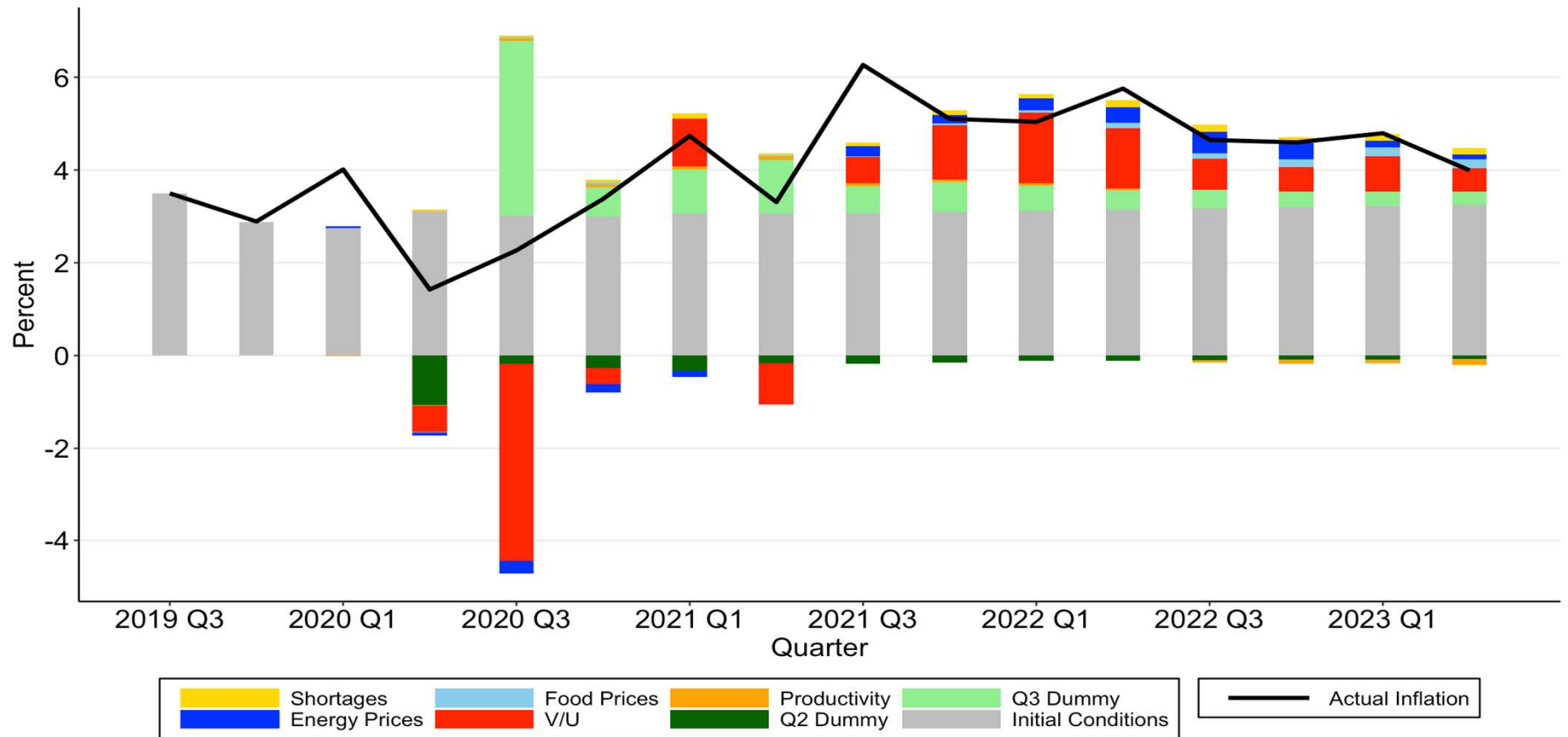
Then, what would have happened if

relative prices of food took its actual values
relative price of energy took its actual values
shortages took their actual values
 v/u took its actual values
productivity took its actual value

Historical decomposition. Price inflation

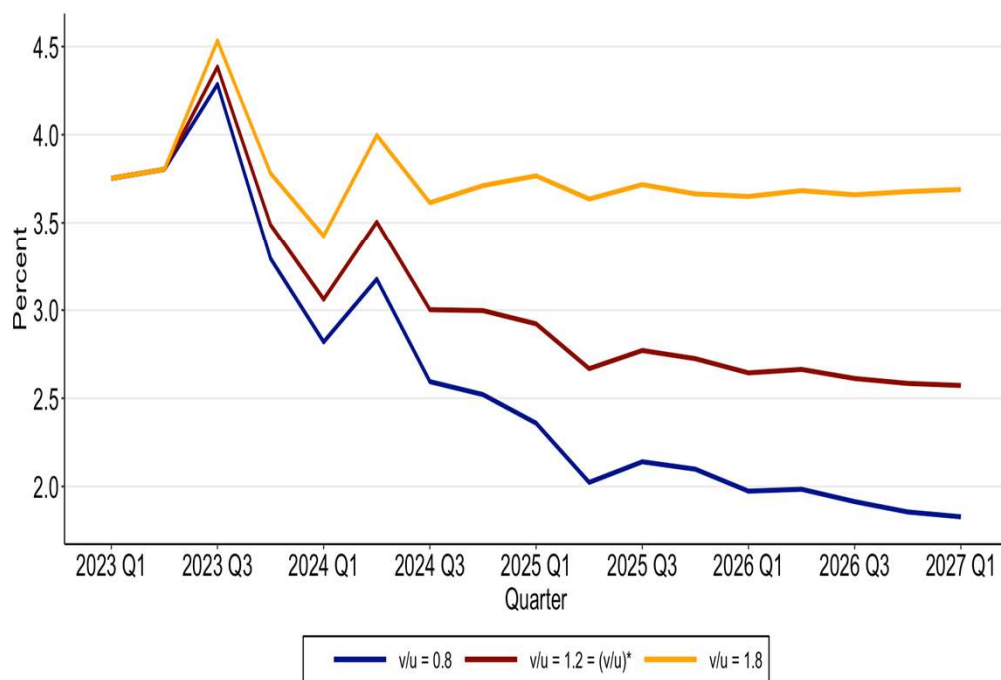


Historical decomposition. Wage inflation



Conditional forecasts

Model projections under alternative paths for the ratio of vacancies to unemployment.



Conditional simulations, not forecasts (timing, granularity).
All shocks equal to zero from 2023:2 on.

Inflation under three paths for v/u .
 v/u remains at its 2022:2 level
 v/u over 8 quarters to v/u in 2019:4
 v/u over 8 quarters to v/u less than v/u in 2019:4

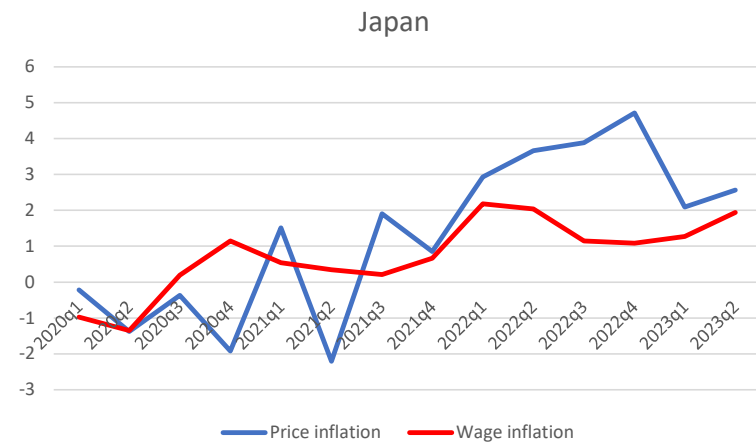
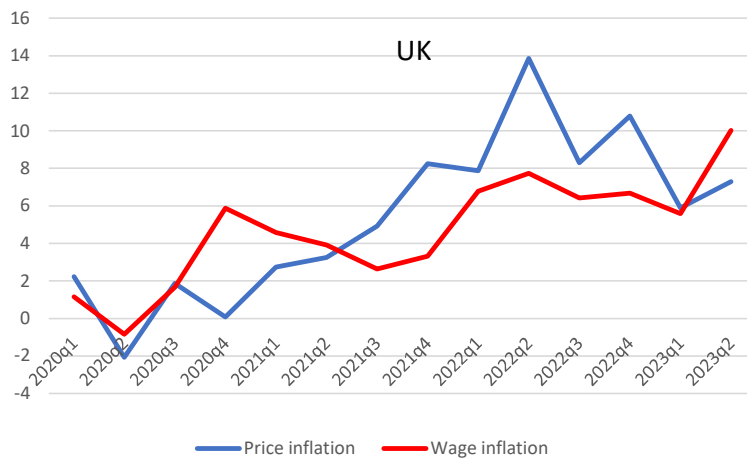
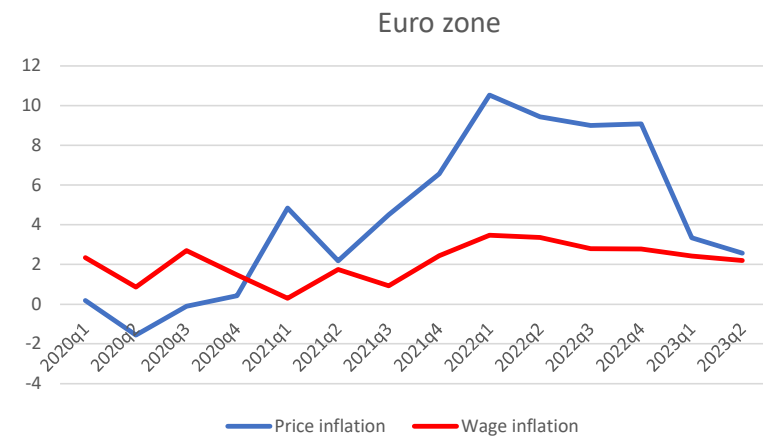
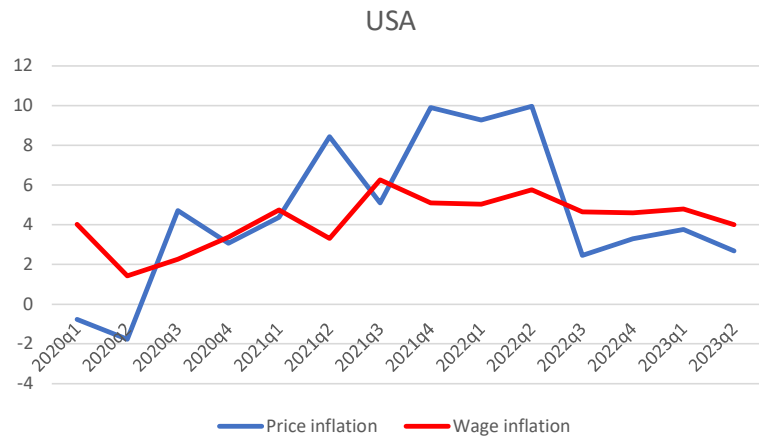
Bottom line: Flat wage Phillips curve...
Large required decrease in v/u (increase in u)

Two issues
Has v/u^* remained the same over the sample?

Given v/u , what implications for u ?
Will the shift in the B curve go away?

The 11-economy project

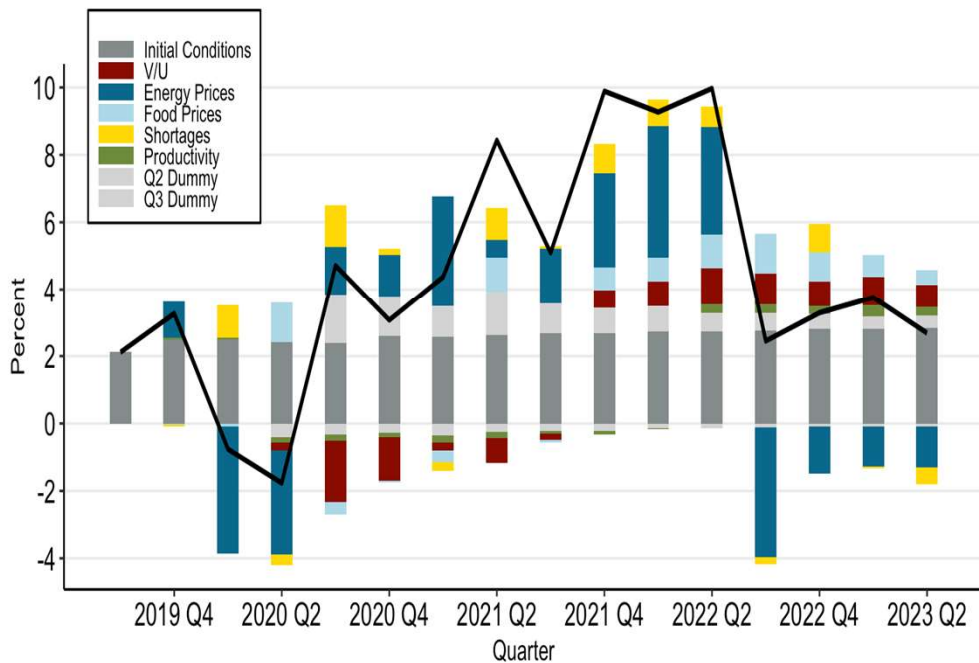
Price and wage inflation. Some examples



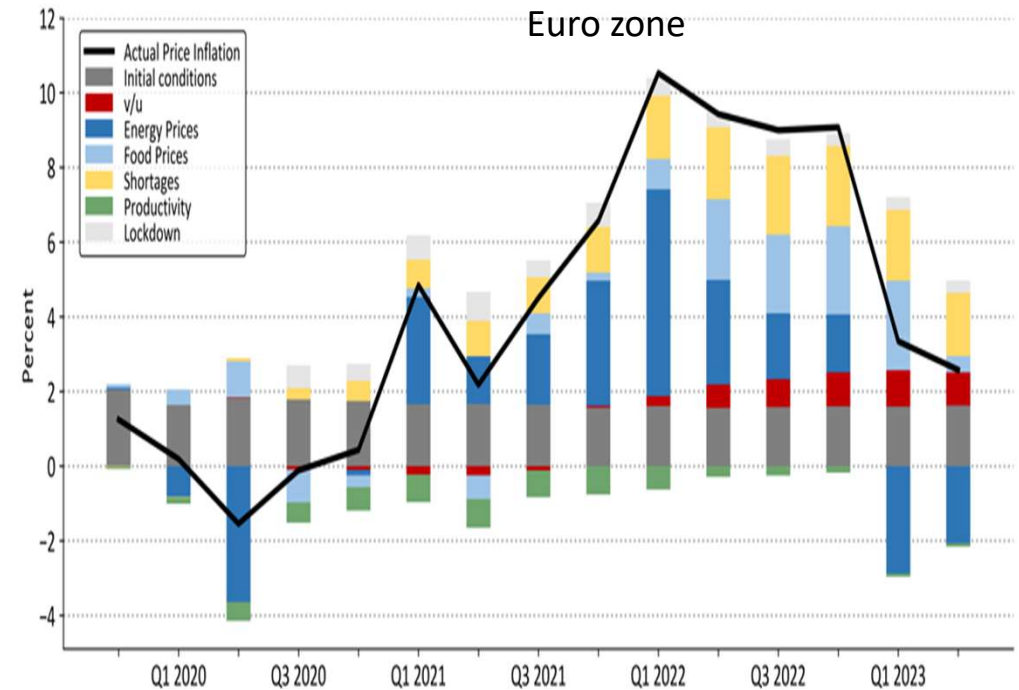
Historical decompositions

Bottom line: Similar general story. Differences in relative importance of shocks, and degree of labor market pressure.

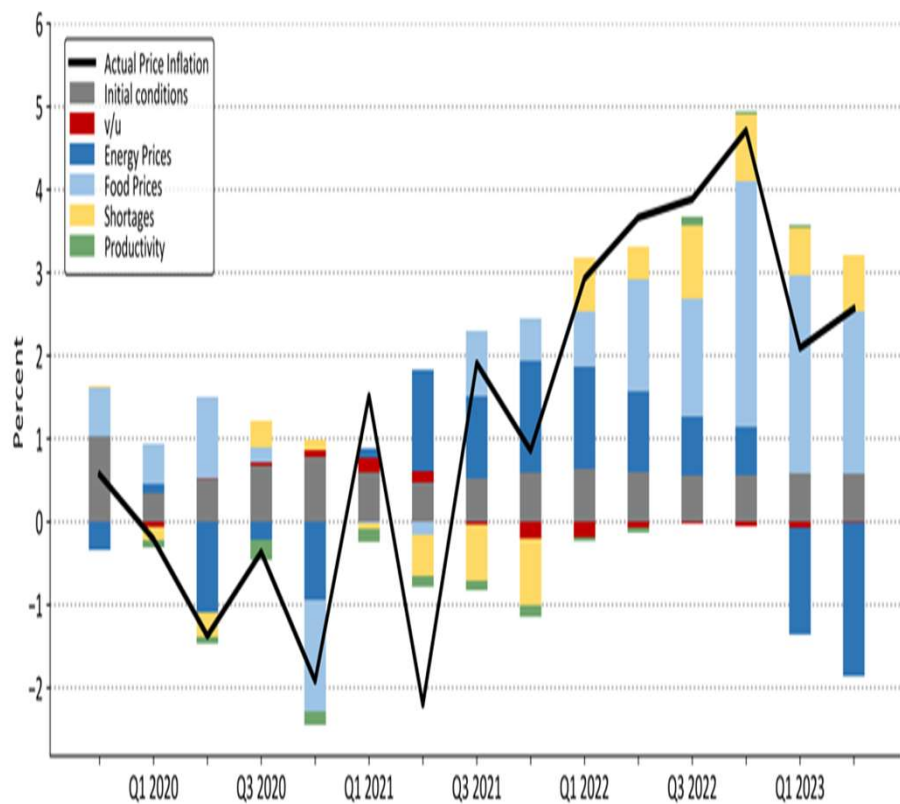
US



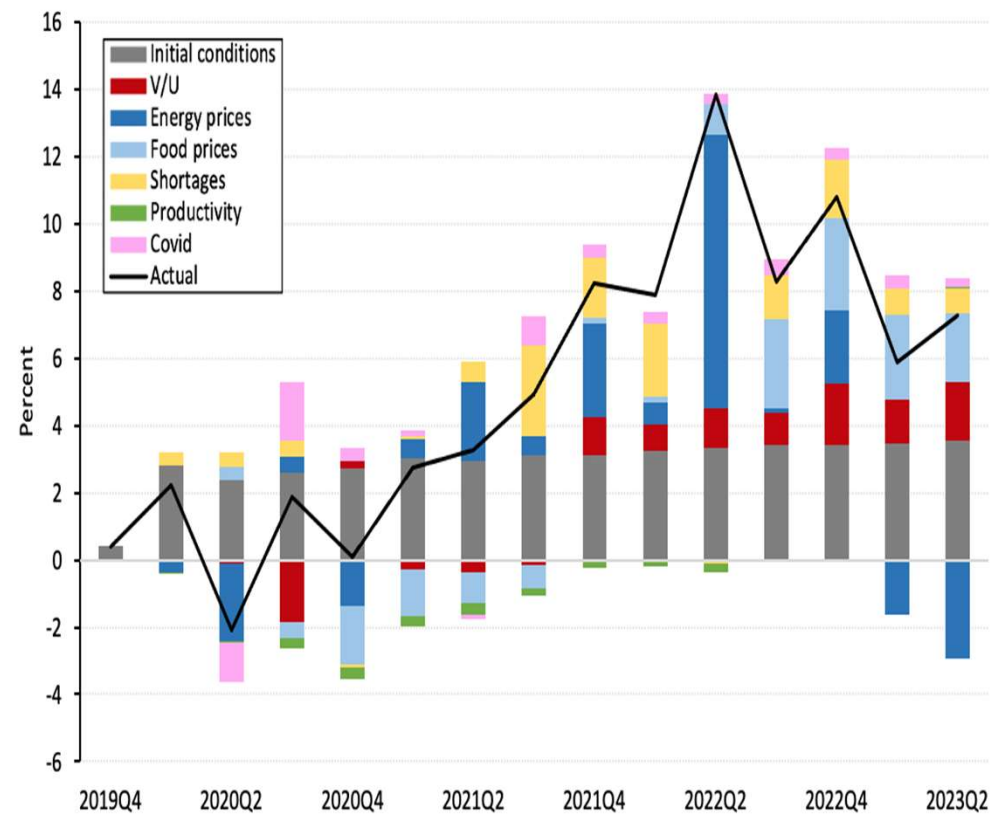
Euro zone



Japan



UK



Conclusions

No need for a major revision of our understanding of inflation. The traditional wage-price analytical framework still works well.

The episode however has shown the complexity of the shocks, and the relevance of both the labor **and the goods market** in the determination of inflation.

Price shocks in the goods markets have dominated headline inflation, but with mostly short-lived effects. This is good news, in large part due to the anchoring of expectations, and credibility of the Fed.

Overheating in the labor market has played a minor role but an increasing one over time. As price shocks fade, it is likely to be the dominant factor, likely requiring a slowdown of the economy to return inflation to target.

Reasons to worry. Catch up coming? (UAW) De-anchoring if further price shocks (oil?)