IS THE PHILLIPS CURVE ALIVE AND WELL AFTER ALL? INFLATION EXPECTATIONS AND THE MISSING DISINFLATION

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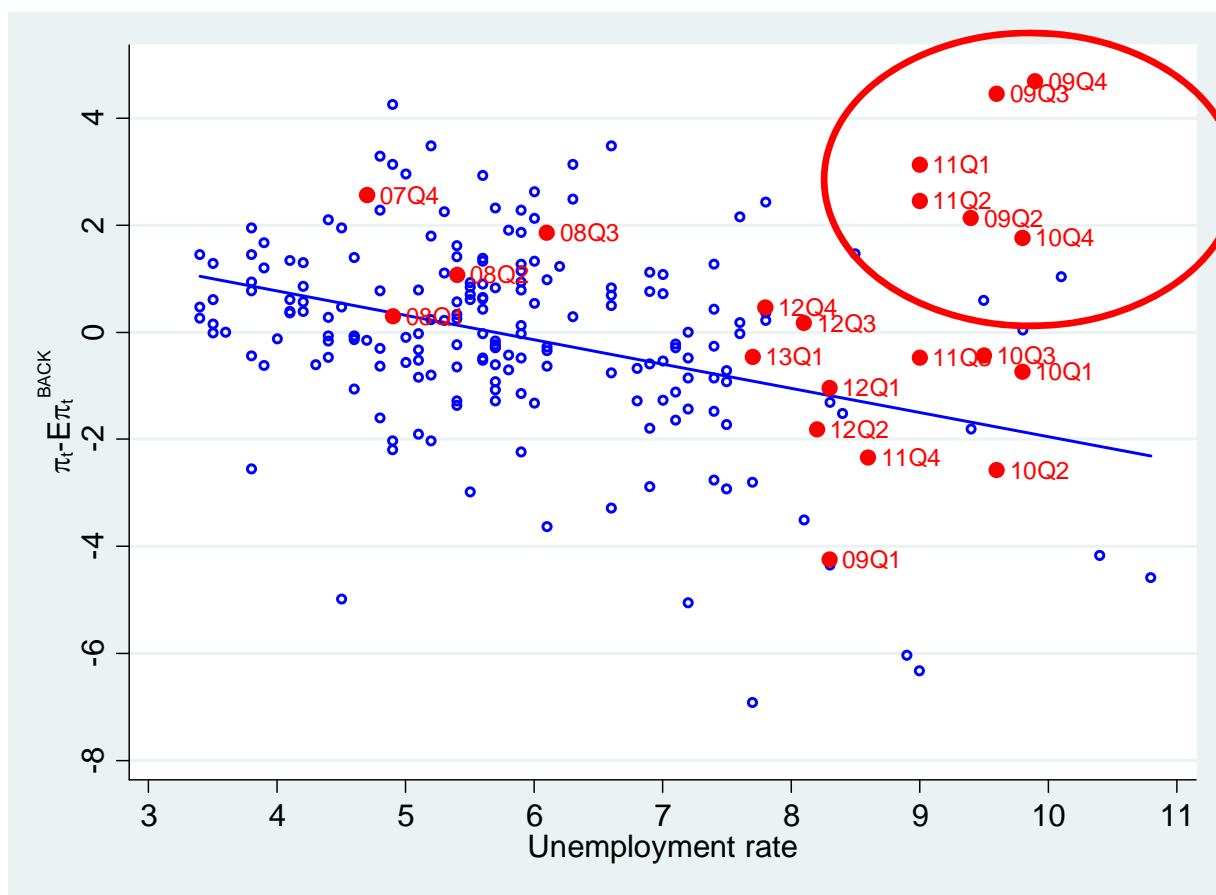
THE MISSING DISINFLATION IN THE U.S.

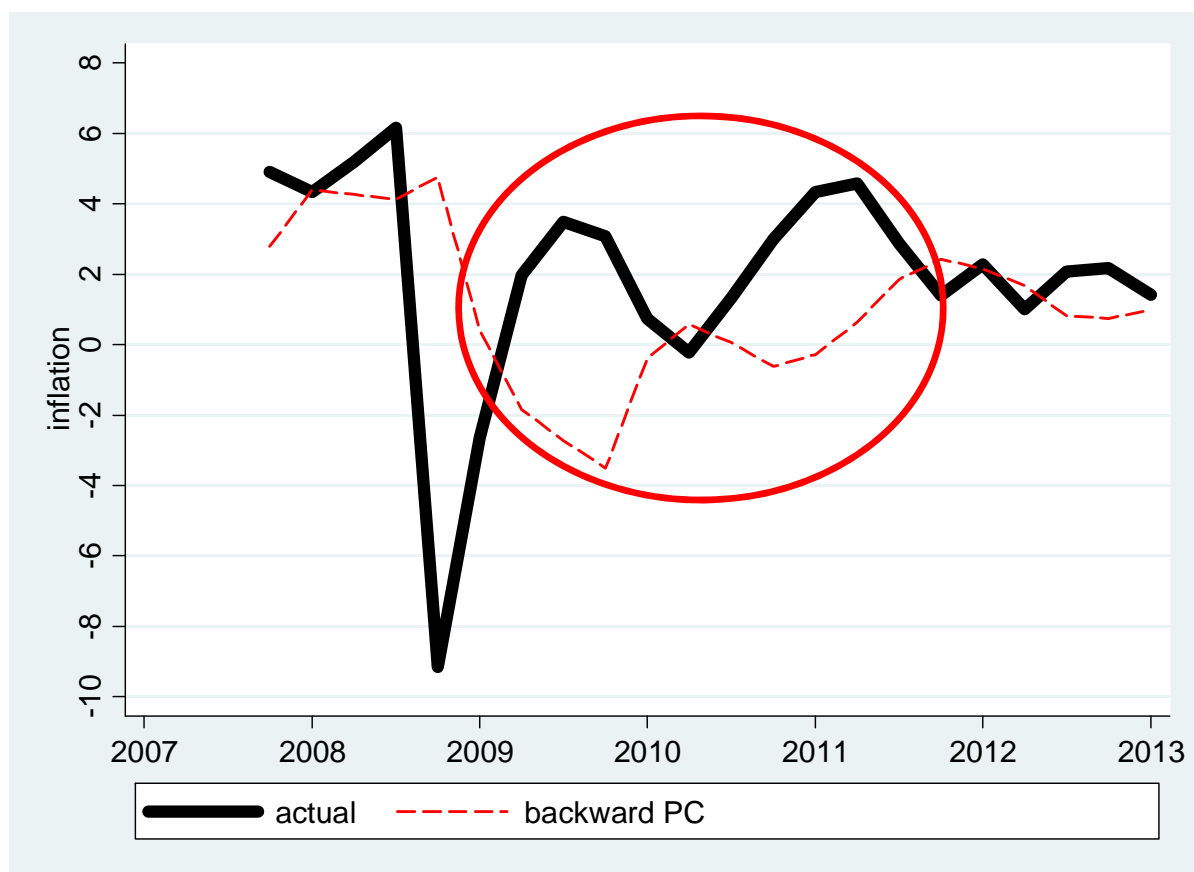## Benchmark: Expectations-Augmented Phillips Curve

$$\pi_t - E_t\pi_{t+1} = c + \kappa x_t + v_t$$

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Benchmark: Expectations-Augmented Phillips Curve

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POTENTIAL EXPLANATIONS FOR THE MISSING DISINFLATION

- Core inflation (Ball and Mazumder 2011)

- Oil price shocks shifted Phillips curve

- Anchored expectations (Bernanke 2010, IMF 2013)

- Change in slope of the PC (Ball and Mazumder 2011, IMF 2013)

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THE MISSING DISINFLATION: INFLATION EXPECTATIONS

$$\pi_t - E_t^{Firms}\pi_{t+1} = c + \kappa x_t + v_t$$

How do price-setting firms form their inflation expectations?

THE MISSING DISINFLATION: FIRMS' INFLATION EXPECTATIONS

$$\pi_t - E_t^{Firms}\pi_{t+1} = c + \kappa x_t + v_t$$

How do price-setting firms form their inflation expectations?

Quantitative Inflation Expectations Data:

- Households: Michigan Survey of Consumers

- Professional Forecasters: SPF, BCEI, Consensus Economics, …

- Financial Market Participants: TIPS spreads

- Federal Reserve: Greenbook & FOMC forecasts

- Firms: ???

The Missing Disinflation: Firms' Inflation Expectations
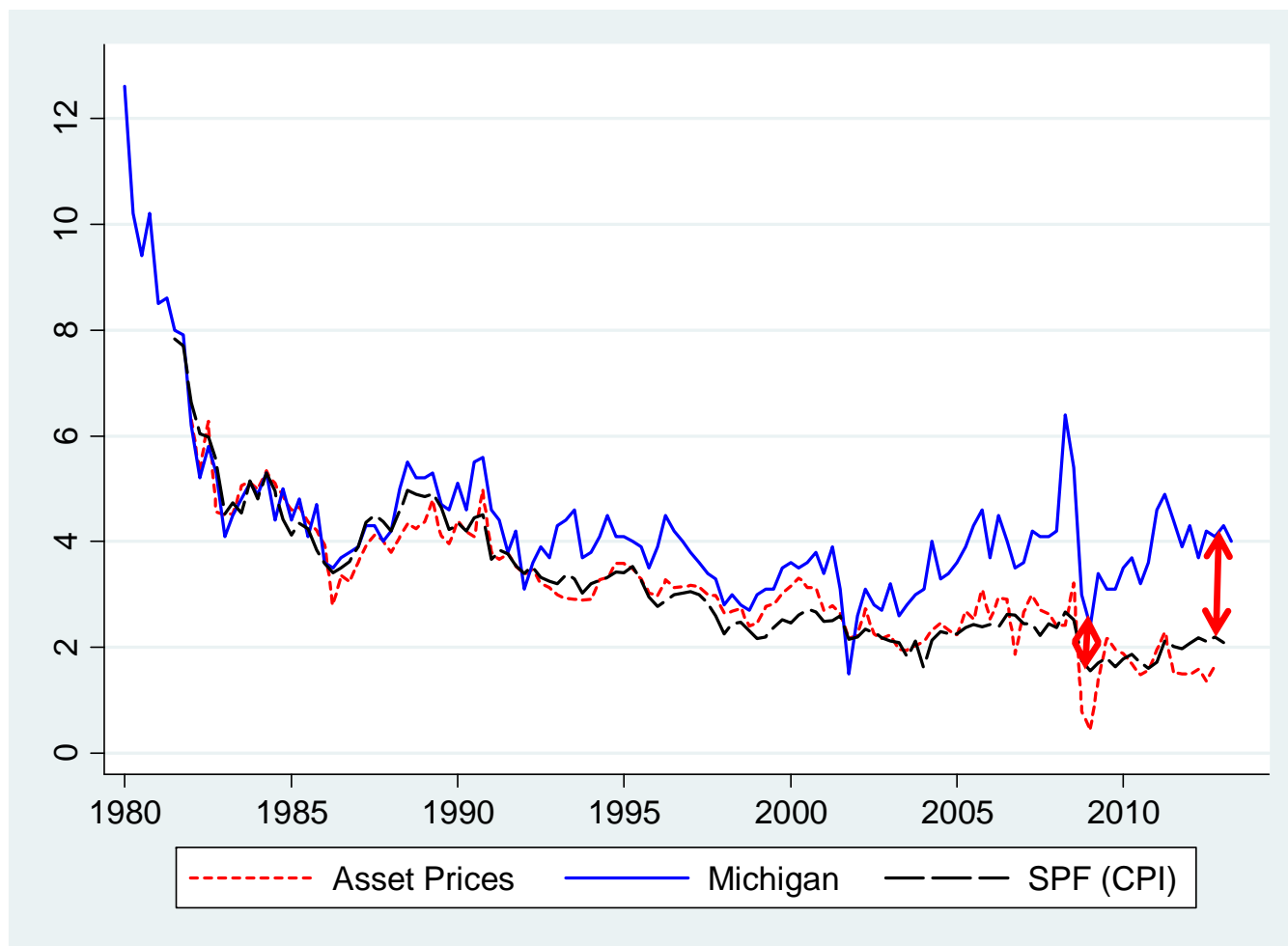
THE MISSING DISINFLATION: FIRMS' INFLATION EXPECTATIONS

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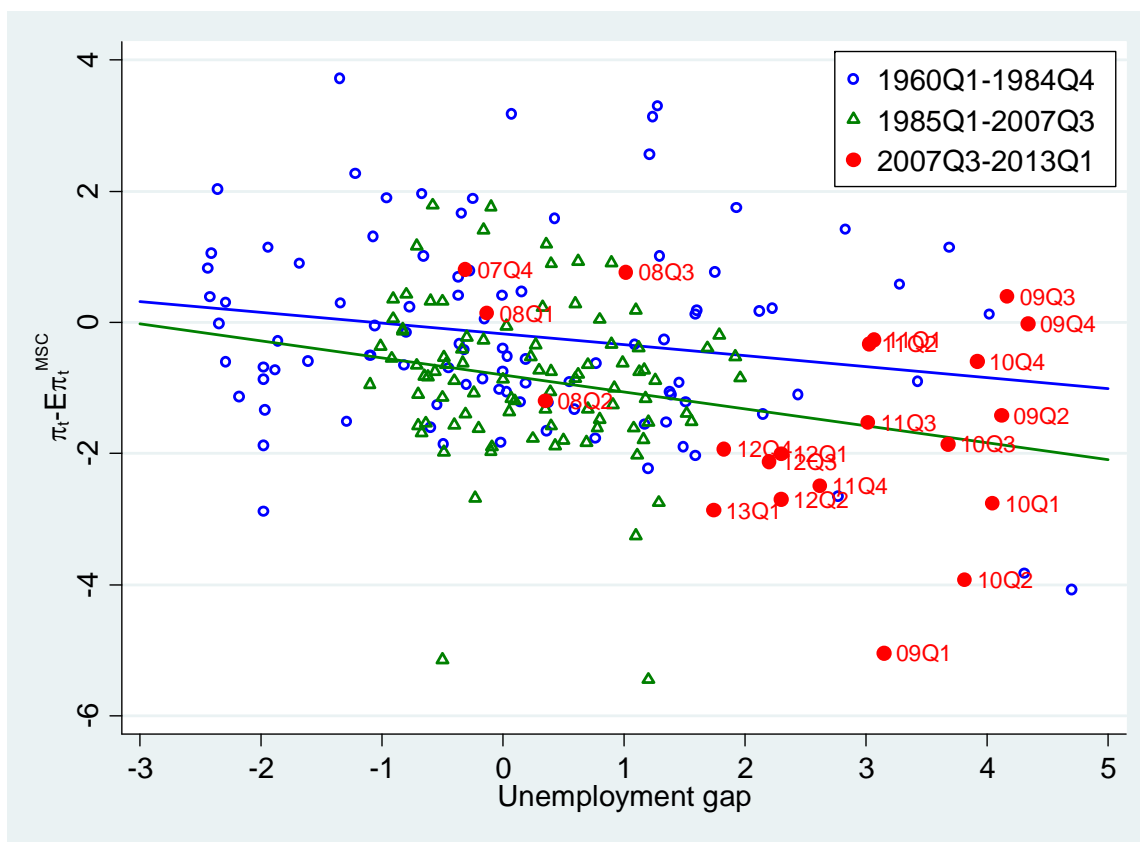Stable Phillips curve and no missing disinflation.

THE MISSING DISINFLATION: FIRMS' INFLATION EXPECTATIONS

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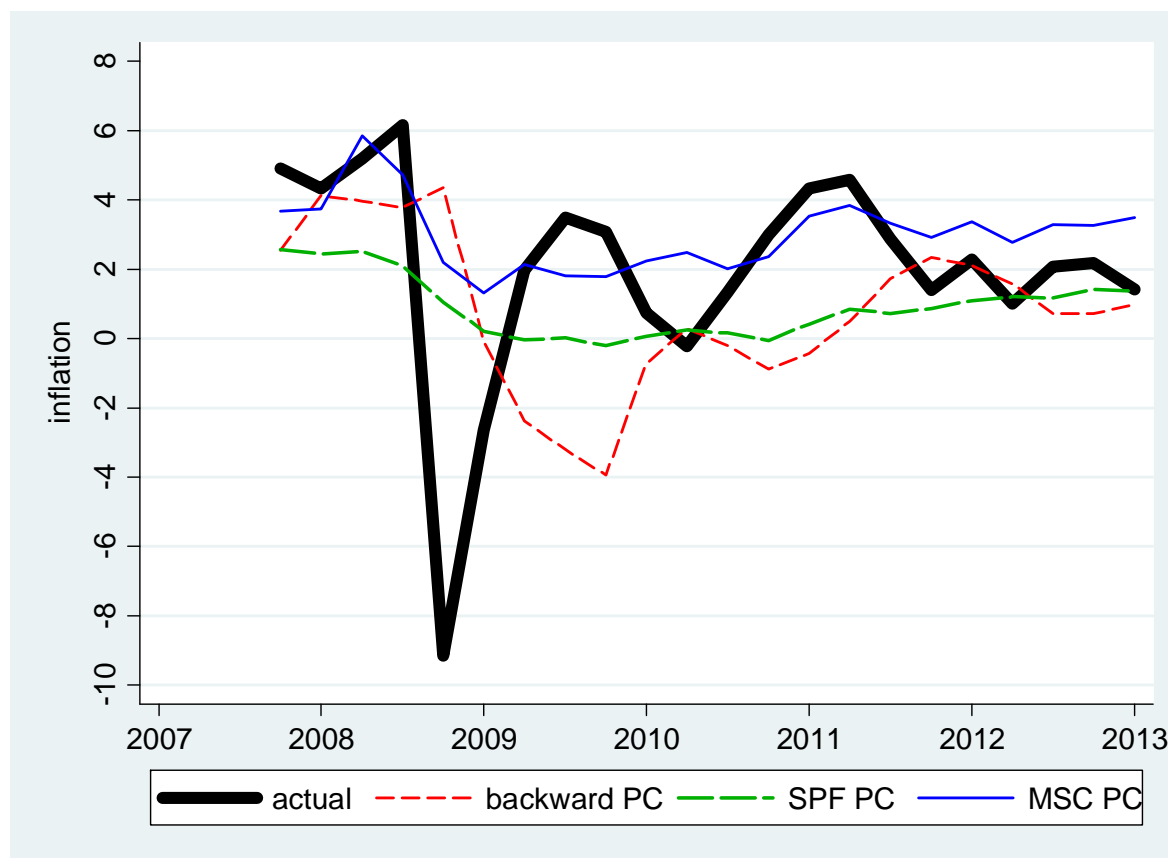
Average predicted inflation since 2009 ≈ 2.5%

DO FIRMS HAVE SIMILAR BELIEFS AS HOUSEHOLDS?

<u>Test #1</u>: Nested PC Regressions $\pi_t = \beta_1 E_t^{MSC} \pi_{t+h} + \beta_2 E_t^{SPF} \pi_{t+h} + \kappa x_t + \varepsilon_t$

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	Pre-Great Recession, 1981Q1-2007Q3
	(1)
$E_t \pi_{t+1,t+4}^{MSC}$	1.442***
	(0.218)
$E_t \pi_{t+1,t+4}^{SPF}$	0.018
	(0.200)
UE_t	-0.250**
	(0.106)
$\log\left(\dfrac{OilP_t}{OilP_{t-1}}\right) \times$ 400	
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	(0.218)	(0.210)
$E_t \pi_{t+1,t+4}^{SPF}$	0.018	0.289*
	(0.200)	(0.171)
UE_t	-0.250**	-0.235**
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$\log\left(\frac{OilP_t}{OilP_{t-1}}\right) \times 400$		0.009***
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<u>Test #1</u>: Nested PC Regressions $\pi_t = \beta_1 E_t^{MSC} \pi_{t+h} + (1 - \beta_1) E_t^{SPF} \pi_{t+h} + \kappa x_t + \varepsilon_t$

	Pre-Great Recession, 1981Q1-2007Q3			
	(1)	(2)	(3)	(4)
$E_t \pi_{t+1,t+4}^{MSC}$	1.442***	1.089***	1.128***	0.803***
	(0.218)	(0.210)	(0.214)	(0.179)
$E_t \pi_{t+1,t+4}^{SPF}$	0.018	0.289*	-0.128	0.197
	(0.200)	(0.171)	(0.214)	(0.179)
UE_t	-0.250**	-0.235**	-0.077	-0.095
	(0.106)	(0.096)	(0.100)	(0.086)
$\log\left(\frac{OilP_t}{OilP_{t-1}}\right) \times 400$		0.009***		0.010***
		(0.003)		(0.002)
Observations	105	105	105	105
R^2	0.537	0.612	0.262	0.394

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Similar results obtain with UE gap and/or including Great Recession
and/or using backward-expectations in place of SPF.

DO FIRMS HAVE SIMILAR BELIEFS AS HOUSEHOLDS?

<u>Test #2</u>: Ongoing Survey of Firms' Inflation Expectations in New Zealand (CGK 2014)

- Ongoing survey of 3000 firms

- Preliminary trial run of 60 firms (20 manuf., 20 retail, 20 finance)

- Average age of 23 years (min of 3, max of 155)

- Average size of 23 full-time employees (min of 7, max of 85)

- Question: "During the next twelve months, by how much do you think prices will change overall in the economy? Please provide a quantitative answer."

DO FIRMS HAVE SIMILAR BELIEFS AS HOUSEHOLDS?

	New Zealand (Sept. 2013)		
	Mean	Median	St. Dev.
Annual CPI Inflation	0.7		
Central Bank Forecast of Year Ahead Inflation	1.7		

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Households' Forecasts of Year Ahead Inflation				
All participants	5.3	N.A.	5.4	
Truncated	3.1	3.0	1.7	

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	New Zealand (Sept. 2013)			United States (Feb. 2013)		
	Mean	Median	St. Dev.	Mean	Median	St. Dev.
Annual CPI Inflation	0.7			2.0		
Central Bank Forecast of Year Ahead Inflation	1.7			1.5		
Professionals' Forecasts of Year Ahead CPI Inflation	1.9	1.9	0.2	1.9	1.8	0.3
Households' Forecasts of Year Ahead Inflation						
All participants	5.3	N.A.	5.4	4.4	3.0	4.4
Truncated	3.1	3.0	1.7	3.8	3.0	3.0

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Truncated	3.1	3.0	1.7	3.8	3.0	3.0
Firms' Forecasts of Year Ahead Inflation						
All participants	**8.8**	5.0	**7.8**			
Truncated	**5.3**	4.5	**3.3**			

DO FIRMS HAVE SIMILAR BELIEFS AS HOUSEHOLDS?

While there is no systematic time series of firms' inflation forecasts,

1. If Phillips curve represents firms' pricing decisions and expectations, then household forecasts appear to be the best proxy for time series of firms' inflation forecasts.

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1. If Phillips curve represents firms' pricing decisions and expectations, then household forecasts appear to be the best proxy for time series of firms' inflation forecasts.

2. At one moment in time, the moments of the distribution of firms' inflation forecasts shares same properties as those of contemporaneous household forecasts:

   - High mean/median forecast relative to professionals and central bank

   - Very high levels of dispersion in forecasts

WHY DID HOUSEHOLDS THINK INFLATION WOULD BE HIGH?

Why Did Households Think Inflation Would be High?
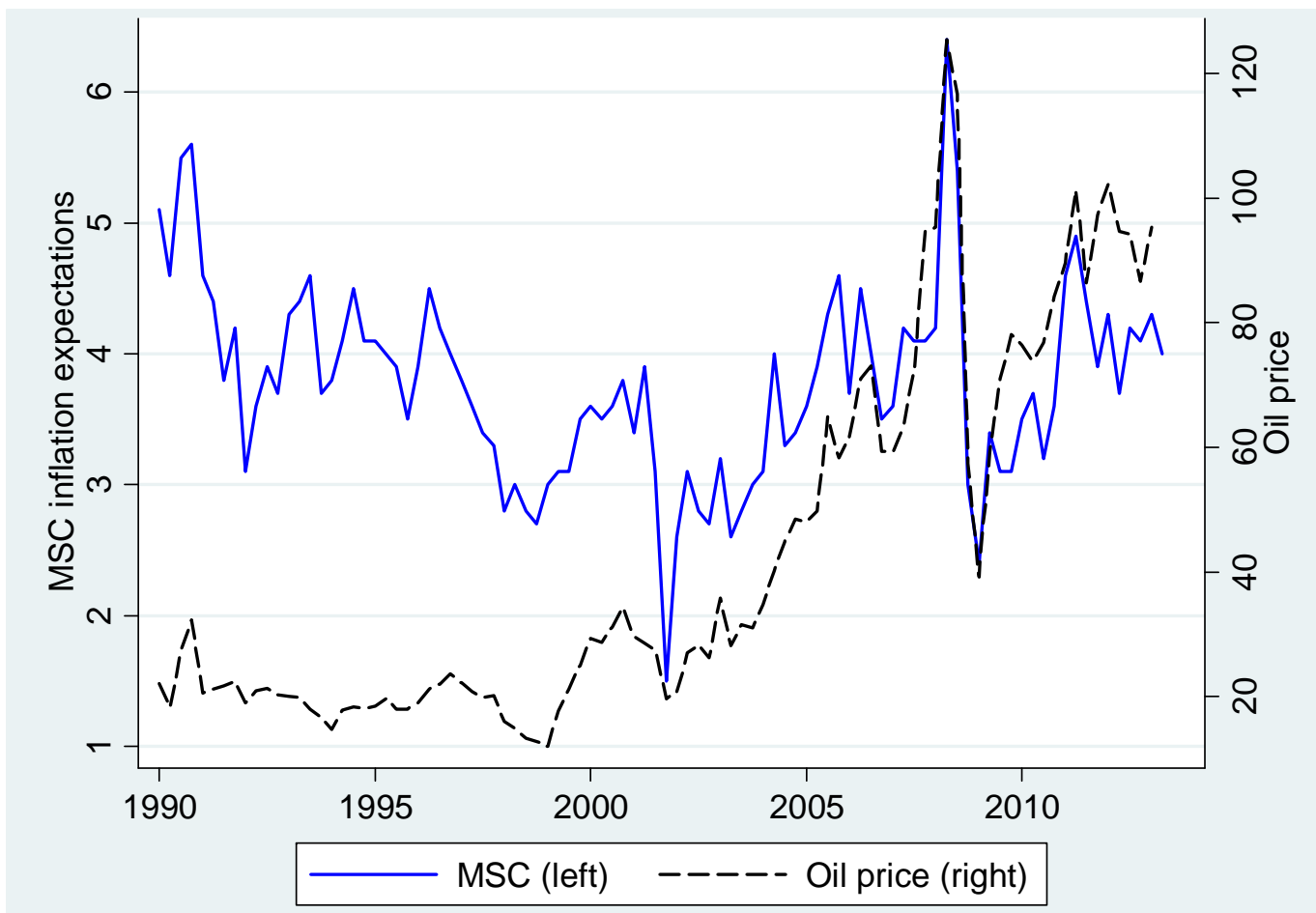
$$\rho(E_t^{HH}\pi_{t+12}, Oil_t) = 0.74 \text{ from } 2000\text{-}2013$$

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Dependent variable: $E_t^{MSC} \pi_{t+1,t+4} - E_t^{SPF} \pi_{t+1,t+4}$	(1)
Panel A: Levels	
$OilP_t$	**0.026*****
	(0.002)
R^2	**0.523**

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Panel A: Levels			
$OilP_t$	**0.026*****	**0.024*****	
	(0.002)	**(0.005)**	
$PriceAgro_t$		0.002	0.016***
		(0.004)	(0.002)
R^2	**0.523**	**0.524**	0.421

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R^2	0.523	0.524	0.421
Panel B: Growth rates			
$log\left(\frac{OilP_t}{OilP_{t-1}}\right) \times 100$	0.013**	0.011**	
	(0.005)	(0.005)	
$log\left(\frac{PriceAgro_t}{PriceAgro_{t-1}}\right) \times 100$		0.015	0.020
		(0.017)	(0.016)
R^2	**0.048**	**0.060**	**0.024**

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The increase in oil prices since 2009 can fully
account for the rise in household inflation expectations since then.

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- <u>Explanation 1</u>: consumers use highly visible gasoline prices as signal of evolution of other prices
  - o Households who buy gas more regularly should adjust inflation forecasts more than others.

- <u>Explanation 2</u>: consumers forecast the prices of their own consumption bundles rather than aggregate inflation
  - o Households who spend larger share of income on gas should adjust their inflation forecasts more than others.

We use MSC individual data to distinguish between these.

WHY ARE HOUSEHOLDS SENSITIVE TO OIL PRICES?

$$E_t^i \pi_{t,t+12} - E_{t-6}^i \pi_{t-6,t+6} = \alpha + \beta \times \log\left(\frac{OilP_t}{OilP_{t-6}}\right) \times 100 + error_{i,t}$$

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Dependent variable $E_t^i \pi_{t,t+12} - E_{t-6}^i \pi_{t-6,t+6}$	Main effect, β		Interaction, γ		Obs.	R2	Spending on fuel, annual, CEX, 2011	
	coef.	s.e.	Coef.	s.e.			$	Share, %
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Full sample								
All	1.686***	(0.177)			68,355	0.010		

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Panel B: Income quintiles								
HH income quintiles								
1 (bottom)							1,227	5.6
2							1,981	6.2
3							2,694	6.4
4							3,295	5.7
5 (top)							4,073	4.3

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1 (bottom)	**0.665***	(0.257)			7,883	0.001	**1,227**	5.6
2	**1.488***	(0.225)			10,979	0.007	**1,981**	6.2
3	**1.956***	(0.282)			12,841	0.013	**2,694**	6.4
4	**1.965***	(0.268)			15,918	0.014	**3,295**	5.7
5 (top)	**2.066***	(0.202)			16,926	0.018	**4,073**	4.3

Consistent with use of gasoline prices as signals of other prices.

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Interact with $	**0.484***	(0.099)	**0.771***	(0.248)	64,547	0.010		
Interact with budget share	**2.629***	(0.547)	**-0.931*	(0.546)	64,547	0.010		

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- ~~Downward wage rigidity (Krugman 2012, Daly et al. 2012)~~

- ~~Rise in natural rate of unemployment (Mulligan)~~

- Rise in firms' inflation expectations since 2009 due to oil price movements.

CONCLUSION

We can explain the missing disinflation through rising inflation expectations starting in 2009, due to rising oil prices.

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The absence of deflation after the Great Recession may therefore be the positive side-effect of the rise in oil prices (i.e. "good luck").

"Unanchored" expectations also played a central role, so this experience is cautionary tale against overemphasizing benefits of "anchoring" expectations.