Measuring Inflation in the Modern Economy – a Micro Price-Setting View

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discussed by Michael Weber

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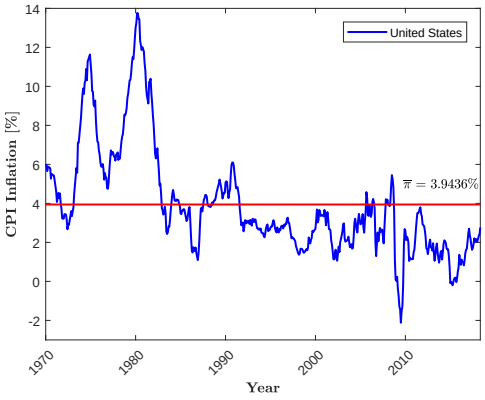
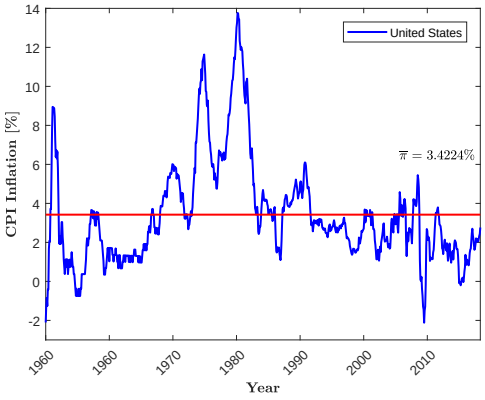
Inflation over time in the U.S.



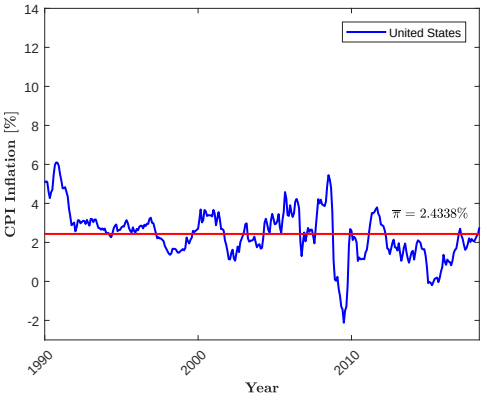
- Sample Jan 1970 – May 2018
- Average CPI inflation of 4% p.a.
- Last 10 years below historical mean

Inflation over time in the U.S.



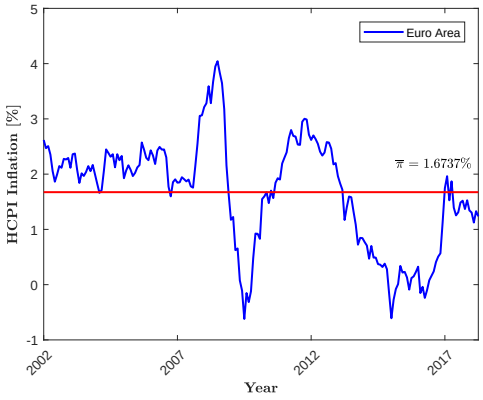
- Sample Jan 1960 – May 2018
- Average CPI inflation of 3.4% p.a.
- Last 10 years below historical mean

Inflation over time in the U.S.



- Sample Jan 1990 – May 2018
- Average CPI inflation of 2.4% p.a.
- Currently below historical mean?

Inflation over time in the Eurozone



- Sample Jan 2002 – April 2018
- Average CPI inflation of 1.7% p.a.
- Currently below historical mean

Low Inflation? Determinants

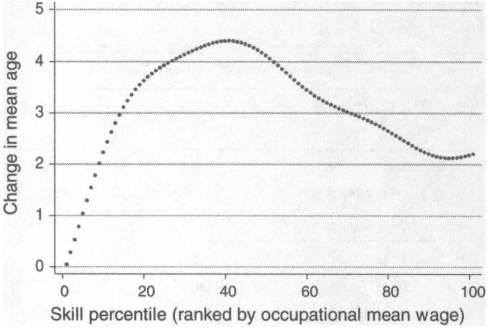
- Depending on sample period inflation historically low
- What are potential drivers?
  - Change in age composition of workforce?
  - Change in market power?
  - Change in expectations?

Change of Age Composition of Labor Force

- Substantial heterogeneity in inflation across industries
- Large heterogeneity in age composition across industries over time
- Recent trend: tech industry top employer for college grads
- Increasing age in middle-class jobs

Low wage-bargaining power in industries with primarily old workers?

Aging Middle-Class Job



Source: This Job Is "Getting Old" by Autor & Dorn, AER P&P (2009)

- Routine-task jobs getting older
- High & low skill jobs younger

Age Composition and Industry Inflation

- Automation drives out routine-task middle class jobs
- Results in aging labor force within those industries
- Do industries with larger share of old workers have lower inflation?
- Does lower wage growth drive lower inflation?

Age Composition and Industry Inflation cont.

- Use Census IPUMS data to create senior to all ratio (S2A)
  - Hours worked by workers with age btw. 55 & 64 to total hours worked
- Average 5-year PPI industry inflation data from BLS (INF)
- Labor intensity (INT) as ratio of labor costs to value added
- Add. controls: shipping costs (CE), industry unemployment (UE), unionization (MEM), commodity-price inflation

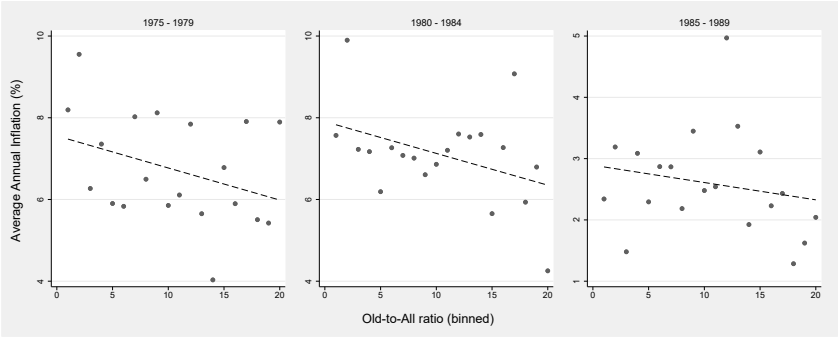
Age Composition and Industry Inflation: Evidence

	(1)	(2)	(3)	(4)	(5)	(6)
S2A	−0.0603 ∗ ∗	−0.1389∗∗∗	−0.3763∗∗∗	−0.3617∗∗∗	−0.3680∗∗∗	−0.2961∗∗∗
	(0.03)	(0.03)	(0.07)	(0.07)	(0.07)	(0.07)
INT				−0.0349 ∗ ∗	−0.0335 ∗ ∗	−0.0074
				(0.02)	(0.02)	(0.03)
S2A × INT				−0.0014 ∗ ∗	−0.0015 ∗ ∗	−0.0023 ∗ ∗
				(0.00)	(0.00)	(0.00)
SC					0.0711	−0.0083
					(0.10)	(0.08)
UE					−0.0729	−0.0919
					(0.07)	(0.06)
MEM					0.0049	−0.0106
					(0.02)	(0.02)
Nobs	825	825	825	825	825	825
R2	0.009	0.2516	0.687	0.6935	0.6954	0.7721
Ind FE		X	X	X	X	X
Period FE			X	X	X	X
Commodity Prices						X

Standard errors in parentheses
$*p < 0.10, **p < 0.05, ***p < 0.01$

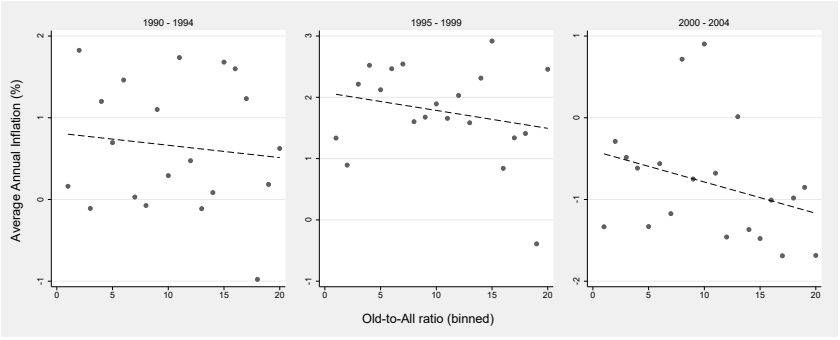
- Higher ratio of old workers negatively associated with future inflation: S2A 1 std higher → inflation 0.5 std lower
- Especially in industries with higher labor intensity

Age Composition and Industry Inflation: Evidence over Time



- Residualized industry inflation and ratio of old-to-all workers negatively associated

Age Composition and Industry Inflation: Evidence over Time



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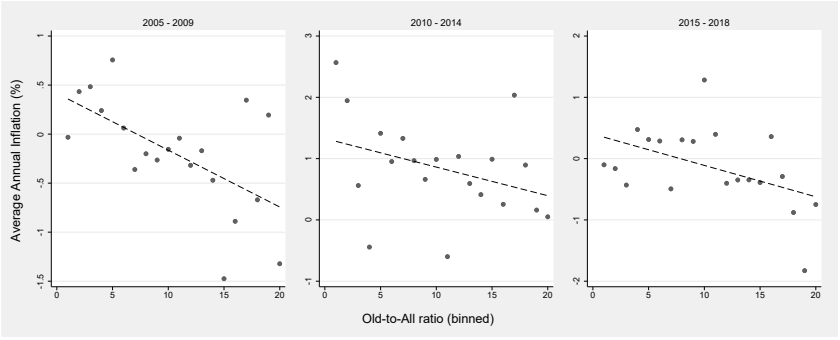
Age Composition and Industry Inflation: Evidence over Time



- Residualized industry inflation and ratio of old-to-all workers negatively associated

Age Composition and Industry Inflation: Channel

	(1)	(2)	(3)	(4)	(5)	(6)
S2A	−0.0736 ∗ ∗	−0.1051∗∗∗	−0.1891∗∗∗	−0.1792∗∗∗	−0.1940∗∗∗	−0.1569 ∗ ∗
	(0.03)	(0.03)	(0.05)	(0.05)	(0.05)	(0.07)
INT				−0.0286 ∗ ∗	−0.0261 ∗ ∗	−0.0316
				(0.01)	(0.01)	(0.03)
S2A × INT				−0.001∗	−0.0011 ∗ ∗	−0.0010∗
				(0.00)	(0.00)	(0.00)
SC					0.1343	0.0876
					(0.08)	(0.07)
UE					−0.1252 ∗ ∗	−0.1382∗∗∗
					(0.05)	(0.05)
MEM					−0.0052	−0.0125
					(0.01)	(0.01)
Nobs	825	825	825	825	825	825
R2	0.0184	0.1731	0.6597	0.6646	0.6719	0.7441
Ind FE		X	X	X	X	X
Period FE			X	X	X	X
Commodity Prices						X

Standard errors in parentheses
$*p < 0.10, **p < 0.05, ***p < 0.01$

- More old workers negatively associated with future wage growth: S2A 1 std higher → Δ wages 0.3 std lower
- Especially in industries with higher labor intensity

Industry Concentration and Price Setting

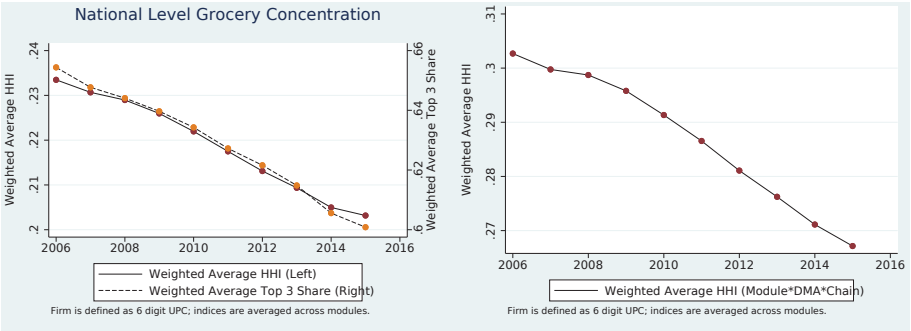
- Growing industry concentration over time
- Lower pass-through of shocks in more concentrated industries?
- Evidence from AC Nielsen retail scanner data

Industry Concentration and Price Setting: Definitions

- Market: identify products that are substitutable within market
- Baseline: designated market area (DMA) $\times$ product module
- Examples:
  - DMA: SF-Oakland-San Jose
  - Module: Candy-Chocolate
- Use first 6 digits of UPC to proxy for firms
- Concentration measures: Herfindahl-Hirschman Index (HHI) and "leave-out version"

$$HHI_{S,t} = \sum_{i(t)\in M(t)} \left(\frac{Sale_{i,t}}{\sum_{i(t)\in M(t)} Sale_{i,t}} \right)^2$$

Concentration Trends in Retail



- Decreasing concentration in retail over time
- Robust feature across measures and market definition

Concentration and Price Setting: Evidence

$$LogP_{M,t} = \alpha + \beta HHi_{M,t} + \gamma FE_{M,t} + \varepsilon_{M,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
HHI	−0.056 * **	−0.056 * **	−0.058 * **	−0.058	−0.056 * **	−0.056 * **
	(0.02)	(0.01)	(0.02)	(0.04)	(0.02)	(0.02)
FE	Firm × Year	Firm × Year	× DMA Firm × Year	× DMA Firm × Year	× Chain Firm × Year	× Chain Firm × Year
Cluster	Firm	DMA × Chain	Firm	DMA × Chain	Firm	DMA × Chain
Nobs	16,816,747	16,816,747	12,620,216	12,620,216	16,346,276	16,346,276

Standard errors in parentheses
$*p < 0.10, **p < 0.05, ***p < 0.01$

- Focus on main product for each firm by sales for practical purposes
- Lower prices in more concentrated markets
- Holds across definitions for concentration and in changes
- Need better understanding of IO of retail sector

Inflation Expectations

- New Keynesian Philipps Curve: inflation = f(inflation expectations)
- $\pi_t = \beta \mathbb{E}_t \pi_{t+1} + \frac{(1-\theta)(1-\theta\beta)}{\theta} \hat{mc}_t^r$
- Low inflation because low inflation expectations?
- How do households form inflation expectations?
- Did households revise expectations upward with forward guidance?

Shopping Experiences and Inflation Expectations

- Central Banks typically focus on core inflation
- Gas and food prices volatile
- Trips to grocery store frequent price experience
- Well-known "fact": women higher inflation perception than men
- Do households extrapolate from salient price changes to overall inflation?

D'Acunto, Malmendier, Ospina, Weber (2018):

Large Salient Price Changes, Inflation Expectations, and Household Behavior

Shopping Experiences and Inflation Expectations: Evidence

From gender effect to "grocery effect". LHS: perceived inflation

	All	All	Women	Men
Male	−1.32***	−0.46		
	(0.18)	(0.32)		
Makes Groceries		1.64***	3.89***	4.89***
		(0.32)	(0.60)	(1.06)
Household FE	X	X		
Nobs	25,595	25,595	17,246	8,349
Adjusted R^2	0.95	0.95	0.99	0.99

- Run customized survey on AC Nielsen panel: identify main grocery shopper within household
- Grocery shopping drives gender effect
- Households extrapolate from shopping experience to overall inflation **and** act on inflation expectations

Cognitive Abilities and Inflation Expectations

"[We assume] Unrealistic cognitive abilities of decision makers"

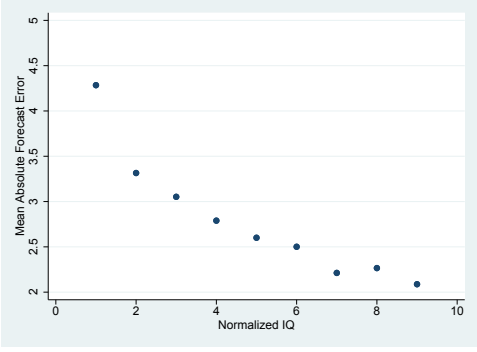
Woodford (2018)

- Many policies complex and difficult to understand
- Large XS heterogeneity in cognitive abilities + complex policies
- (How much) Does limited cognition matter for policy effectiveness?
- Main empirical hurdles
  - Need to measure cognitive abilities for a representative sample
  - Need to measure impact on policy effectiveness

D'Acunto, Hoang, Paloviita, Weber (2018):

Human Frictions to the Transmission of Economic Policy

Mean Absolute Forecast Error by IQ



- Absolute forecast errors twice as large for low IQ men than for high IQ men
- Monotonic relationship btw absolute forecast error and IQ

Euler Equations: Good Time to Purchase Durables

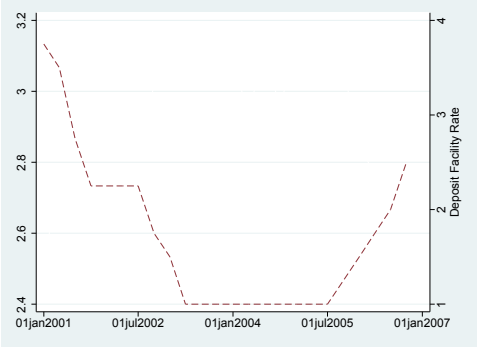
Marginal Effects: $$\frac{\partial P(y=t|x)}{\partial x} = P(y=t|x)\left[\beta_{tx} - \sum_{z=0,1,2} P(y=z|x)\beta_{zx}\right]$$

	Men high IQ (1)	Men low IQ (2)
Inflation expectation	0.0358***	−0.0096
	(0.0119)	(0.0138)
Demographics	X	X
Pseudo R^2	0.0108	0.0091
Nobs	16,606	16,256

Standard errors in parentheses
$*p < 0.10, **p < 0.05, ***p < 0.01$

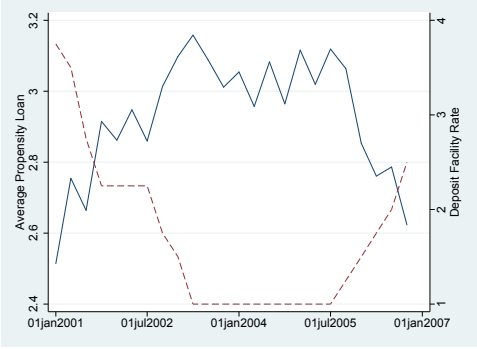
- Strong positive assocation for men with high IQ: if expect higher inflation, 4% more likely to purchase durables
- No assocation for men with low IQ

ECB Deposit Facility Rate: Beginning of Quarter



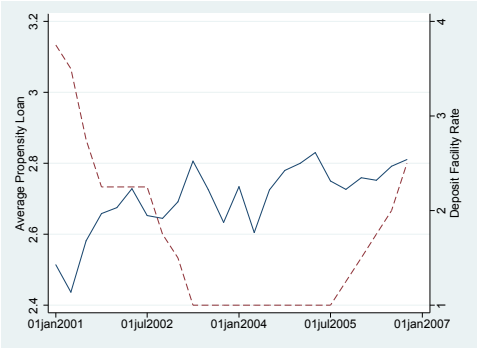
- Until end of 2001: rate falls from 3.75% to 2.25%
- Trough of 1% in June 2003
- December 2005 rates start to increase; 2.5% end of 2006

Propensity to take out Loan: High IQ



- Early 2001: average propensity to take out loans is about 2.5
- 2001-2003: rates fall and propensities increase to more than 3
- Until mid-2005: rates and propensities flat
- 2005-2007: rates increase, propensities fall

Propensity to take out Loan: Low IQ



- Early 2001: average propensity to take out loans of around 2.6
- 2011-2007: propensities flat, hover around 2.8

Conclusion

- Inflation might have been historically low in last 10 years
- Aging societies possibly play a role
- Little evidence for increasing competition in retail
- Shopping experiences matter
- Complexity of policies crucial: *human frictions*
- Role for policy salience, policy communication, and education