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Whose expectations augment the Phillips curve?

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HIGHLIGHTS

- Policymakers should monitor disaggregated survey data when analyzing inflation dynamics.
- Different demographic groups' expectations have varying significance in the Phillips curve.
- High-income, highly-educated males' expectations have greatest weight in the Phillips curve.

ARTICLE INFO

ABSTRACT

This letter uses consumer survey data to estimate expectations-augmented Phillips curves with inflation expectations disaggregated by socioeconomic and demographic groups. The inflation expectations of high-income, college-educated, male, and working-age people play a larger role in inflation dynamics than do the expectations of other groups of consumers or of professional forecasters.

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Introduction

Inflation dynamics since the Great Recession have reinvigorated a debate about the viability and specification of the Phillips curve (Gordon, 2013). Efforts to rehabilitate the expectations-augmented Phillips curve include a re-examination of the measurement of inflation expectations and their role in inflation dynamics (Bernanke, 2010; Coibion and Gorodnichenko, 2013). Survey measures of inflation expectations are often used in Phillips curve estimation, but since inflation expectations are heterogeneous, it is not obvious which measures should be used. Bernanke (2007) points out that "Median measures of inflation expectations often obscure substantial cross-sectional dispersion," and asks, "On which measure or combination of measures should central bankers focus to assess inflation developments…?"

In the New Keynesian Phillips curve, the expectations of price setters shape inflation dynamics. In the absence of direct surveys of price setters, Coibion and Gorodnichenko (2013) suggest that

households' expectations are a better proxy than professional fore-casters' expectations. But expectations vary substantially across households, with pronounced differences between demographic groups (Bryan and Venkatu, 2001; Mankiw et al., 2004; Souleles, 2004; de Bruin et al., 2010).

In this letter, I estimate Phillips curves using the inflation expectations of different socioeconomic and demographic groups from the Michigan Survey of Consumers. The expectations of higher-income, higher-education, male, and working-age consumers play the largest role in inflation dynamics.

1. Theory

The Phillips curve is a relationship between inflation (π_t), expected inflation ($\pi_t^e = E_t[\pi_{t+1}]$), some measure of real economic slack (X_t), and, in some specifications, lagged inflation (π_{t-1}) (Calvo, 1983; Gali and Gertler, 1999; Roeger and Herz, 2012):

$$\pi_t = \gamma \pi_t^e + \alpha \pi_{t-1} + \lambda X_t + \epsilon_t. \tag{1}$$

Though expectations are commonly modeled as rational, a strand of research uses survey expectations to estimate the Phillips curve (Roberts, 1997; Nunes, 2010; Fuhrer, 2012). Typically, the

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Table 1
Phillips curve with inflation expectations by income tercile.

	(1) Baseline	(2) Hybrid	(3) PCE inflation	(4) 1997–2014	(5) Constrained
π^e Low income	0.35 (0.23)	0.29 (0.19)	0.01 (0.16)	−0.34 (0.45)	−0.16 (0.19)
π^e Middle income	0.15 (0.35)	0.02 (0.33)	0.13 (0.24)	0.36 (0.59)	−0.04 (0.30)
π^e High income	1.01*** (0.37)	0.67** (0.27)	1.00*** (0.26)	1.76** (0.79)	1.20*** (0.25)
Unemployment gap	−0.22* (0.11)	−0.15* (0.09)	−0.02 (0.08)	−0.09 (0.14)	−0.21** (0.10)
π_{t-1}		0.33*** (0.08)			
Constant	−1.66*** (0.44)	−1.07** (0.43)	−0.97*** (0.28)	−2.27*** (0.81)	0.29 (0.19)
Observations	423	423	423	216	423
R^2	0.366	0.377	0.359	0.378	0.383

Notes: Newey West standard errors in parentheses. Dependent variable is CPI inflation, but PCE inflation in column (3). In column (5), coefficients on expected inflation are constrained to sum to one. See Eq. (2).
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

Table 2
Phillips curve coefficient on expected inflation by group.

Group	Coefficient on π_e	t-statistic
Income		
First (lowest) tercile	0.347	1.5
Middle tercile	0.148	0.42
Upper tercile	1.01***	2.72
Age		
18–34	0.166	0.55
35–54	0.951***	2.57
55–97	0.403	1.45
Education		
High school	0.584**	2.36**
Some college	0.069	0.31
College degree	0.802***	3.7
Gender		
Male	1.48***	4.28
Female	−0.033	−0.09

Notes: Median inflation expectations by demographic group come from the MSC.
** $p < 0.05$.
*** $p < 0.01$.

median forecast from a survey of professional forecasters is used as a proxy for price setters' expected inflation in the New Keynesian Phillips curve, though Coibion and Gorodnichenko (2013) find that consumers' expectations are a better proxy.

Since expected inflation varies across economic agents, Branch and McGough (2009) incorporate heterogeneous expectations into a New Keynesian model in which one type of agent is rational and the other type has simple adaptive expectations. Though agents have heterogeneous expectations, all are "yeoman farmers" and play an equal role in the price-setting process. Thus, the Phillips curve equation includes a convex combination of each type's expectations, where weights correspond to each type's population share.

Akerlof et al. (2000) also derive a Phillips Curve with heterogeneous agents. Instead of emphasizing differences in agents' expectations formation process, they emphasize differences in agents' *use* of their inflation expectations. A fraction of the population called "near-rational" either ignore expected inflation or do not take it fully into account when making price and wage decisions. The fraction of near-rational agents varies in accordance with the economic incentives of correctly anticipating inflation. The Phillips

curve includes the inflation expectations of rational and near-rational economic agents through the nominal wage-setting process. Since near-rational agents do not take expected inflation fully into account in wage decisions, the coefficient on their inflation expectations is smaller than the coefficient on rational agents' expectations. Since information access and processing ability and inflation uncertainty vary by demographic group, and households play different roles in price- and wage-setting and consumption, the Phillips curve coefficient on various demographic groups' expectations may not correspond to that group's population share (Pfajfar and Santoro, 2008; Binder, 2015).

2. Estimation and results

I modify Eq. (1) to include the inflation expectations of multiple demographic groups, and run regressions of the form:

$$\pi_t = \sum_{g \in G} \gamma_g \pi_{t,g}^e + \alpha \pi_{t-1} + \lambda U_t + \epsilon_t \qquad (2)$$

where G is a set of groups (e.g. age or income groups), $\pi_{t,g}^e$ is the median inflation expectations for group $g \in G$ from the Michigan Survey of Consumers (MSC),[1] and U_t is the unemployment gap.[2] In the baseline regression, π is annualized month-over-month CPI inflation and α is constrained to 0.

Table 1 displays estimation results for $G = $ {lowest income tercile, middle income tercile, highest income tercile}. The first column shows baseline results. Column (2) includes a lag of inflation as a regressor, column (3) uses PCE inflation instead of CPI, and column (4) only includes the latter half of the time sample, 1997 onward. In column (5), the sum of the coefficients on expected inflation are constrained to equal 1.[3] In all specifications, only the coefficient on the high-income consumers' expectations is positive and statistically significant.

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[1] The MSC is a monthly telephone survey of at about 500 households beginning in 1978.

[2] The unemployment gap is the civilian unemployment rate minus the Congressional Budget Office estimate of the natural rate of unemployment (monthly series interpolated from quarterly). Results are robust to the use of alternative measures of real activity or labor market slack.

[3] Coibion and Gorodnichenko (2013) impose this coefficient constraint.