New Keynesian Hybrid Phillips Curve

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As promised, this post looks the hybrid version of the Phillips curve (PC), identified last week as the New Keynesian standard for explaining inflation persistence. What follows briefly recounts the PC origin story and examines the GEM Project's superior version.

Adaptive expectations. Early Keynesians quickly added a lagged inflation term to A.C. Phillip's original nominal wage equation, greatly enhancing its capacity to fit the available evidence: $w(t)=a_o+a_1U(t)+a_2p_L(t)+e(t)$, such that $a_1 0$, In the equation, *w* stands for nominal wage change, *U* is unemployment, p is the price inflation, *L* indicates a lag structure, *t* denotes time, and e is an error term. EK theorists somewhat casually thought of their inflation term as an outcome of adaptive expectations. Their cyclical analysis heavily relied on the nominal-real tradeoff produced by the lagged-inflation term. (See last week's post.) They emphasized the their PC should be understood as describing a short-term phenomenon; in the longer-run, the trade-off disappears.

In the late 1960s, Edmund Phelps and Milton Friedman independently looked at the EK Phillips curve, judged it inadequate, and rewrote the wage equation in the attempt to provide more satisfactory micro foundations for longer-run money neutrality. In their formulation, permanently lower joblessness cannot result from permanently higher inflation: $w(t)=a_o+a_1(U^N-U(t))+a_2p_L(t)+e(t)$, where U^N denotes the natural rate of unemployment. Beyond the cyclical short-term, *U* converges on U^N, causing nominal wage behavior to be dominated by price inflation.

Friedman-Phelps continued to use adaptive expectations to motivate the causal link from lagged price inflation to wage change, producing results broadly consistent with original EK thinking. In each formulation, both wage stickiness relative to shifting labor-market conditions and inflation persistence in the aftermath of monetary shocks follows from inflation catch-up. This early stage of the expectations revolution did not challenge Samuelson's Neoclassical Synthesis and was readily accommodated in the consensus EK framework.

Rational expectations. The PC game fundamentally changed when neoclassical macro theorists began examining the rationality of the behavior motivating EK wage dynamics. Adaptive expectations are clearly inconsistent with optimization and, as a result, were increasingly rejected by macro theorists. Led by the formidable Robert Lucas, critics reasonably argued that inflation expectations must be constructed on the cost-effective use of available information. Rational-expectations (RE) theory rules out the systematic errors implicit in adaptive expectations. The adjustment of wages for price inflation became forward-looking: $w(t) = a_o+a_1(U^N-U(t))+E_tp(t+1)+p(t)-E_{t-1}p(t)+\varepsilon(t)$, where *E* denotes expectations rationally constructed on the cost-effective use of available information. The equation is not typical, in that it properly includes a correction for forecast errors.

New Keynesian Phillips Curve. The RE elimination of systematic influences from the past produced disarray in stabilization analysis and policy advice. Labor pricing no longer demonstrates short-term market independence, wage recontracting is no longer suppressed, and discretionary government interventions in total nominal spending no longer induces real as well as nominal effects. Modern macroeconomics was pushed badly out of line with how highly-specialized economies actually behave. Some economists in rescue mode responded by modeling labor pricing with some sort of combination of rational expectations and arbitrarily staggered wage change, reintroducing influences from the past. New Keynesian theory is rooted in never-microfounded models of staggered wage setting from Fischer (1977a), Phelps and Taylor (1977), Taylor (1980), and Calvo (1983) that differ little from EK thinking.

David Romer (2001, p.251) was the first to specify the hybrid version of NK short-term nominal wage dynamics. He believed it to be the "natural compromise" between the catch-up and expectations: $w(t)=a_o+a_1(U^N–U(t))+(1\psi)p_L(t)+\psi E_tp(t+1)+\varepsilon(t)$. In the Romer Phillips curve, $\psi \in [0,1]$ governs the relative contribution of rational expectations to aggregate nominal wage change. Like the Early Keynesian adaptive expectations, the NK version is assumed, not derived from rational exchange. Indeed, Romer took the argument a step further, asserting that the critical ψ is theoretically indeterminate. From the perspective of the generalized-exchange theory, it is unsurprising that Rudd and Whelan (2005), testing the "natural compromise" hybrid approach, found little support for an important role played by forward-looking adjustments.

GEM model. Workplace-equilibrium innovations in labor pricing are almost wholly confined to large, highly

specialized establishments, subject to costly, asymmetric workplace information and routinized jobs. Employer-employee rational interaction makes labor productivity ($\acute{Z}_j$) partly endogenous to the firm, mandating wages that variably exceed labor's market opportunity costs. Such information-challenged firms are home to optimizing labor-pricing decision rules, constraints, and mechanisms of exchange that differ fundamentally from the rules, constraints, and exchange mechanisms that govern choice in the marketplace. Practitioners crucially learned long ago that employees resent being treated as a commodity governed by the arbitrary interaction of supply and demand. They want, instead, to be treated fairly and have sufficient on-the-job latitude to enforce that preference. In practice, fair treatment is manifest in workplace reference standards, which the GEM model denotes with $\mathbb{K}_j$.

Baseline (durable-$\mathbb{K}$) continuous-equilibrium generalized-exchange theory insightfully guides the building of following rational-behavior GEM Phillips curve that merges wage dynamics in the labor market and information-challenged workplaces: $w(t)=b_o+b_1(U^N-U(t))+b_2p_{\text{Ł}}(t)+b_3(E_tp^N(t+1)-E_{t-1}p^N(t))+e(t)$, where p^N is the perceived central-bank inflation target. For useful elaboration, see my 2009 paper, "Getting Serious about Understanding the Phillips Curve" (2009), available on the Research-Exchange page of the GEM Project Website.

The GEM Phillips relation posits that terms of trade remain unchanged, as do small-firm trend labor-productivity growth, relative venue size, the natural rate of unemployment, and government intervention. It imposes a tight structure b_i. The constant term reflects the interaction of trend LEV real wage growth (embedded in $\mathbb{K}$), small-firm trend productivity growth, and relative venue size. To the extent that any of those factors change during an estimation period, b_o will be unstable. Also, the employment coefficient (b_1) incorporates microfounded MWR, limiting its short-term impact to market-sector wage determination and helping to explain the surprisingly modest estimated influence of joblessness on aggregate wage behavior.

The specification of inflation catch-up and labor terms-of-trade dynamics provide important restrictions. Domestic or international shifts in labor's terms of trade make b_2 unstable. The GEM Phillips curve, given its simplifying assumptions, could not have predicted or explained the stagflation of the 1970s and early 1980s. The GEM specification also notably restricts the role of price expectations, which are now limited to anticipated shifts in the central bank's inflation regime and only affect large-establishment labor pricing. Rational models of wage dynamics must include both inflation-regime expectations and catch-up.

Finally, generalized-exchange Phillips dynamics reveals the significance of the interaction between the rates of growth in large-establishment nonstationary productivity gains (γ^n) and its real wage growth (r^n). In GEM analysis, $\Delta\gamma^n>\Delta r^n$ exerts upward pressure on profit, increasing equity prices, capital investment, and aggregate spending and income while reinforcing $\mathbb{K}$ durability. If $\Delta\gamma^n$