Discussion of Some International Evidence on Non-Linear Phillips Curves by Benigno and Eggertsson

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January 2024
Figure 2. International Evidence on Inflation and Unemployment Trade-Off

Note: See online Appendix for the details on the data

**Structural Phillips Curve**

\[
\pi_t = \beta E_t \pi_{t+1} + f(v_t/u_t) + \eta_t
\]

\[
\pi_t = E_t \pi_{t+\infty} + \sum_{j=0}^{\infty} [f(v_{t+j}/u_{t+j}) + \eta_{t+j}]
\]

Determinants of inflation:
- Inflation expectations
- Labor market tightness / slack
- Supply shocks
two major data-series at the heart of the empirical analysis: raw annualized inflation rates and the logarithm of labor market tightness at quarterly frequency.

The periods of labor shortage, namely 1960-1969 and 2008-2022, strongly suggest that an inverted L shaped Phillips curve lurks behind the scene. The other two periods, typically used in studies of Phillips curves, show log $\ln \theta < 0$ and – at least at first glance – a relatively flat Phillips curve.

The first main contribution of this paper is empirical. We add more structure to the data, in line with the earlier literature, by considering a series of regressions with both fixed and time-varying coefficients, adding controls, creating proxies for expectations, using an instrumental variable approach and suggesting two alternative ways of testing for nonlinearities.

The empirical analysis leads to two major finding. First, there is evidence in favor of significant non-linearities in the Phillips curve that are statistically significant. This is in line with the visual impression given by Figure 4: In periods of labor shortage, labor market tightness has much larger impact on inflation. Second, supply shocks have a larger impact when there is labor shortage and this increase is statistically significant.

The second main contribution of the paper is to resurrect Phillips' original idea of an inverted-L curve as in Figure 1 within the canonical New Keynesian framework. We think it is important to retain the

By expressing this ratio in logs, it is irrelevant which variable enters in in the denominator or the numerator. See the empirical section and the Appendix for a description of how this variable is constructed.

Source: Benigno and Eggertsson (2023/4)
SUPPLY SHOCKS IN THE 2020s

Cost of Shipping to Europe From China Rising Again
But nowhere near the levels hit during the pandemic

- Shanghai to Rotterdam
- Shanghai to Genoa
- Shanghai to Los Angeles
- Past 6 weeks

Source: Drewry World Container Index, shows freight rate for 40-foot container

Bloomberg
Inflation Expectations in the 1960s

CPI Inflation
Livingston Inflation expectations
The Plucking Property

Unemployment (%)

Figure 1: Peaks and Troughs in the Unemployment Rate

Note: The unemployment rate is plotted in blue. Business cycle peaks are denoted by dashed red vertical lines, while business cycle troughs are denoted by solid red vertical lines.

amplitude of a contraction and the amplitude of the subsequent expansion in our sample period. In other words, the size of a contraction strongly forecasts the size of the subsequent expansion. We have included an OLS regression line in the panel. Table 1 reports the regression coefficient from this regression. The relationship is roughly one-for-one. For every percentage point increase in the amplitude of a contraction, the amplitude of the subsequent expansion increases by 1.12 percentage points on average. Despite the small number of data points, the relationship is highly statistically significant. Furthermore, the explanatory power of the amplitude of the previous contraction is large. The $R^2$ of this simple univariate regression is 0.59.

The right panel of Figure 2 plots the amplitude of an expansion on the x-axis and the amplitude of the subsequent contraction on the y-axis. In sharp contrast to the left panel, there is no relationship in this case. The size of an expansion does not forecast the size of the next contraction. In Friedman's language, each contractionary pluck that the economy experiences is independent of what happened before. The linear regression line in the panel is actually slightly downward sloping. But the association is far from statistically significant and the $R^2$ of the regression is only

Source: Dupraz, Nakamura, Steinsson (2023)
The Plucking Property

Figure 2: The Plucking Property of the Unemployment Rate

Note: The points in the left panel are labeled with the year the contraction in question ended and expansion in question began. The points in the right panel are labeled with the year the expansion in question ended and contraction in question began. OLS regression lines are plotted in each panel.

Jackson and Tebaldi (2017) suggest that the duration (not size) of an expansion is predictive of the size of the following contraction. They motivate this idea by analogy to forest fires: the longer the expansion, the more "underbrush" builds up—e.g., low quality matches and entrants—that becomes fuel in the subsequent contraction. We find no evidence of the forest fire theory at the aggregate level: the duration of an expansion is no more predictive of the size of the following contraction than the size of the expansion is. The relationship is actually negative (but not significantly so), driven by the fact that the three longest post-WWII expansions (1961-1968, 1982-1989, 1992-2000) were followed by relatively mild recessions. Tasci and Zevanove (2019) confirm these results and also present state level results for the plucking model and forest fire theory. Their state level results are similar to our results at the aggregate level: There is strong evidence for the plucking property but no evidence for the forest fire theory.

Source: Dupraz, Nakamura, Steinsson (2023)
This paper proposes to replace the canonical New Keynesian Phillips curve with an Inverted-L New Keynesian Phillips curve (Inv-L NK Phillips curve), which is nonlinear. The Inv-L NK Phillips curve can explain the sharp, unexpected rise in inflation in the U.S. in the early 2020s following the COVID-19 pandemic. Demand shocks are seen to have played a major role in explaining the surge, which carries policy implications. At the same time, if the economy enters the non-linear part of the Phillips curve, this supercharges the effect of supply shocks on inflation. Accordingly, according to our account, supply shocks also played a major role in the inflation surge, especially early on. Another implication is that appropriate monetary policy can engineer a “soft landing.” That is, for each percentage point decrease in inflation, the Federal Reserve can achieve a smaller increase in unemployment compared to the Volcker recession, which successfully curbed inflation following the 1970s’ Great Inflation but at the expense of a substantial increase in unemployment.

The U.S. time series data show statistically significant and quantitatively important support for a non-linear Phillips curve. Moreover, the data indicates increased amplification of supply shocks once the non-linearity kicks in. Below we set out the broader motivation for our approach, the historical background, and the main contribution of this paper.

The early Keynesian literature assumes a stark relationship between prices and output, namely the
Very thought provoking paper! (and companion paper)

Perspective that should receive more attention

Policy implications are quite different from standard view