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Global forces - the missing piece in the inflation puzzle

Claims that US inflation no longer responds to cyclical unemployment are misguided. Job market gains have so far been offset by weak global activity, a key driving force of consumer prices. As the world economy strengthens, inflation should accelerate.

The relationship between inflation and unemployment, the Phillips curve, has been called into question as of late [1]. The main source of contention is that although labour markets in many countries have tightened, prices and wages remain subdued (Figure 1). To be fair, simple correlations between both variables reveal a much weaker link than in the past, but as economics teaches us early on, correlation does not imply causation. No doubt, part of the explanation has to do with there being considerably more slack than headline unemployment figures suggest. Long-term unemployment and underemployment in many OECD countries remain well above their pre-recession average. But, at least in the United States, where the vacancy-to-unemployment ratio is at a 2-decade high, this explanation is starting to wear thin.

In this research note, we investigate the role of global forces in driving US CPI inflation. In our view, the debate has been much too focused on domestic cyclical conditions, and on the role of central banks in anchoring inflation expectations. While both these factors matter, we find external supply shocks now play a much greater role in the evolution of consumer prices. Our findings have major implications for monetary policy. If inflation is less responsive to local developments, stabilizing inflation may come at the cost of higher debt burdens and large output fluctuations. For macro investors and forecasters, the results also imply that anticipating future changes in interest rates and bond yields requires a better grasp of global economic conditions.

Figure 1: US unemployment rate and inflation relative to Fed 2% target
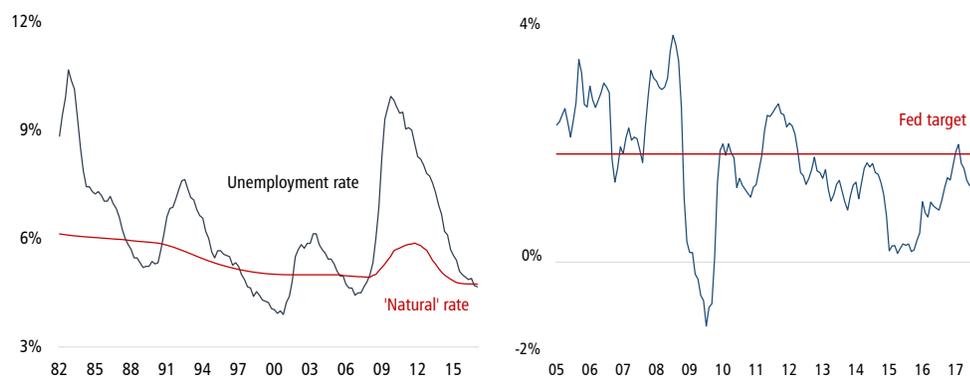
Source: BLS, CBO, BEA

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[1]For recent examples, see Giles, C. (2017, October 12). "Setting policy in the dark". Financial Times, p. 7, or The Economist (2017, November 1). "The Phillips curve may be broken for good". Economist.com

The great inflation debate

Standard macroeconomic theory predicts consistent reductions in economic slack will eventually drive up prices and wages. This relationship, known as the Phillips curve, lies at the heart of most research on monetary policy, including the general equilibrium models formulated by major central banks. In its modern setup (see e.g. Galí 2008), the Phillips curve sets headline inflation against long-term inflation expectations, domestic cyclical conditions, past changes in inflation and fluctuations in import prices.

Crucially, the basic framework assumes full parameter constancy, such that marginal changes in the unemployment gap generate the same response in consumer prices irrespective of the stage of the cycle. To examine whether the link between inflation and unemployment has weakened over time, the textbook version must be modified to allow for time-varying parameters. Time-varying versions of the Phillips curve have become increasingly popular in recent years (e.g. Albuquerque and Baumann 2013, Blanchard 2016), primarily to understand the lack of deflation in the United States following the Great Recession. But while considerable attention has been given to the unemployment gap and to central bank commitment, much less emphasis has been placed on the shifting role of global factors.

In open economies, consumer price inflation depends on external forces in two major ways. First off, commodity price movements affect headline inflation through food, energy or any other products whose prices depend on raw material costs. Secondly, highly integrated supply chains make consumer prices more exposed to foreign developments than in the past (Simon, Matheson and Sandri 2013). Depending on the strength of this 'globalization' effect, lacklustre conditions abroad could offset cyclical reductions in the unemployment rate. In addition, changes in other variables (e.g. exchange rates, short-term interest rates) triggered by external shocks may accentuate or lengthen the initial inflation response.

Figure 2: Phillips curve time-varying coefficients
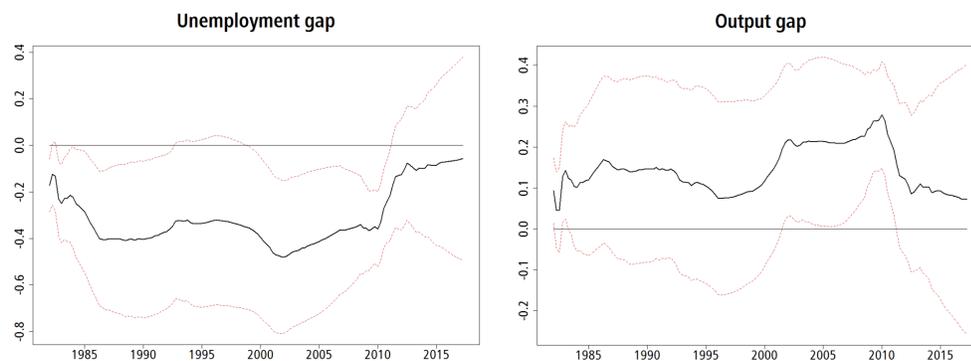
Note: Kalman smoother estimates; dotted lines denote +/-1 standard deviations

To investigate the role of external factors in driving US CPI inflation, we fit a time-varying Phillips curve in state space form, with parameters and variances estimated by maximum-likelihood with the Kalman filter. Details of the model and the data sources can be found in the appendix. In line with recent work on the subject, we find evidence of an inverse relationship between inflation and unemployment, with a substantial decline in the magnitude of the effect after 2010. As

can be seen from Figure 2, the results appear invariant to the choice of slack measure. Equally important, the degree of uncertainty surrounding the slope coefficients has increased markedly in recent years, highlighting the challenges currently faced by central bankers.

Figure 3: Real import price coefficients (1982/Q1 - 2017/Q2)
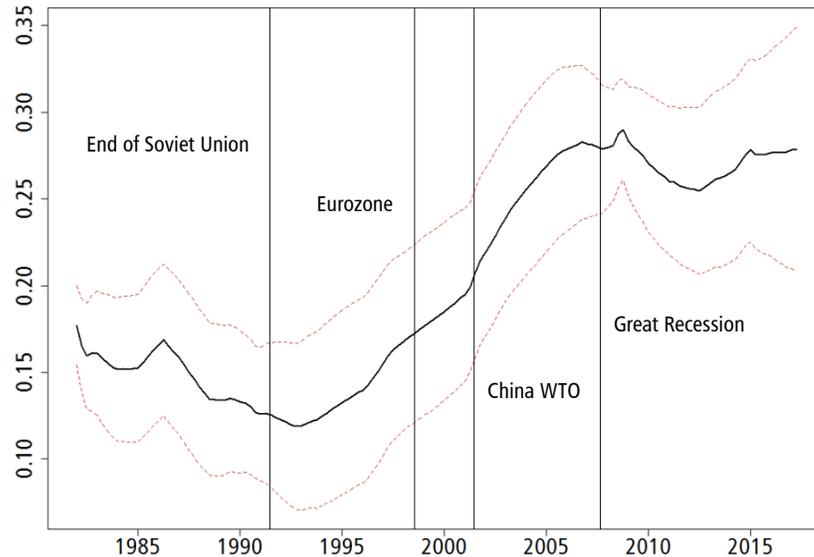
Note: Kalman smoother estimates; dotted lines denote +/-1 standard deviations

But weak inflation is not just the result of a flatter Phillips curve. Figure 3 plots the weight of real import prices for the specification that uses cyclical unemployment as the measure of excess demand. The slope coefficient captures both the influence of trade integration and of commodity price fluctuations on US CPI inflation. Its evolution is entirely consistent with the globalization hypothesis, with steady increases from the early 1990s (collapse of the Soviet Union and signing of the Maastricht Treaty) until the Great Recession. The influence of external forces also appears to have increased markedly at the turn of the century, consistent with China's entry into the WTO and the debut of the euro area. Since 2009, the impact of global forces on US CPI has stabilized, even declining slightly between 2010 and 2014 as international trade flows lost momentum. Today, a one-percentage point increase in import prices generates a 0.28 point instantaneous increase in headline inflation, more than double the effect that it had in the early 90s[2]. Considering the world economy has been operating below potential for quite some time (Figure 5), weak external conditions may well explain the failure of CPI inflation to hit the Fed's 2% target even in the context of very expansionary monetary policy.

What happens if we ignore global factors?

To illustrate the importance of external forces on headline inflation, we carried out a forecast evaluation on the last third of our data sample (2005/Q4 – 2017/Q2). The idea is to compare the

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[2]A linear regression (i.e. one with constant parameter coefficients) yields a coefficient of 0.18 if estimated over the full sample period.

Table 1: Forecast evaluation (2005/Q4 - 2017/Q2)

| Quarters ahead | With imports | | Without imports | | DM test |
	Mean Error (%)	RMSE	Mean Error (%)	RMSE	Test Statistic
1 quarter	0.0	0.018	0.1	0.029	-0.0005*
4 quarters	-0.2	0.016	-0.4	0.033	-0.0008**
8 quarters	-0.3	0.017	-0.2	0.032	-0.0008**

Note: One/two asterisks refer to statistical significance at the 90%/95% level based on HAC standard errors.

out-of-sample performance of our time-varying Phillips Curve with and without import prices. Unlike a full-fledged out-of-sample evaluation, we take the future path of other variables as given (long-term expectations, unemployment), so the results should not be interpreted as an assessment of the model's true predictive power. Table 1 shows the mean errors, root mean squared errors and Diebold-Mariano test statistics for both specifications at 1, 4 and 8 quarters ahead. Even though the model without imports does not appear to generate biased results (we fail to reject the null that the mean error is unbiased), the RMSEs are almost twice as high as the baseline specification. In fact, the Diebold-Mariano tests reject the null that the predictive accuracy of both procedures is comparable. Along with the finding that the Phillips curve is flatter than in the past, the results suggest that ignoring the growing influence of external forces could make it hard to anticipate future changes in inflation.

Figure 4: Drivers decomposition: US real import prices (year-over-year %)
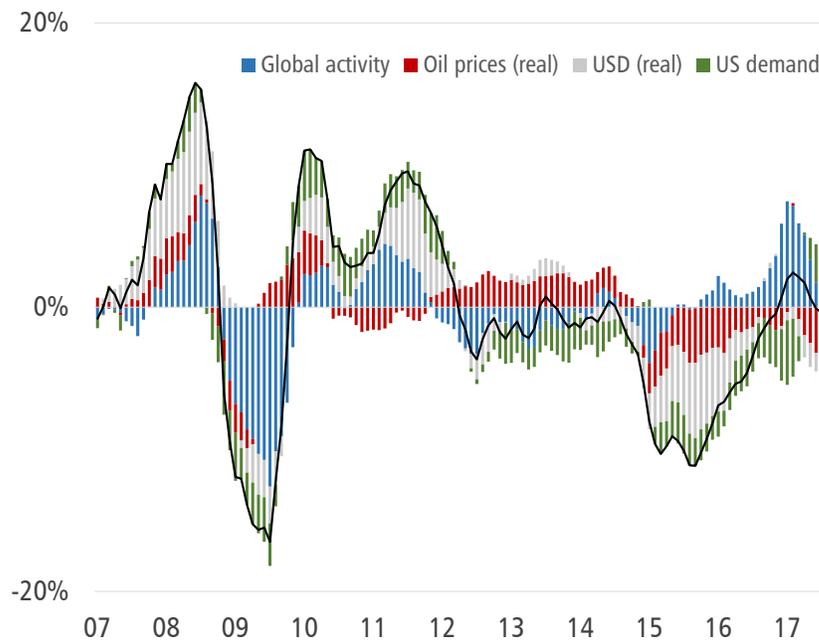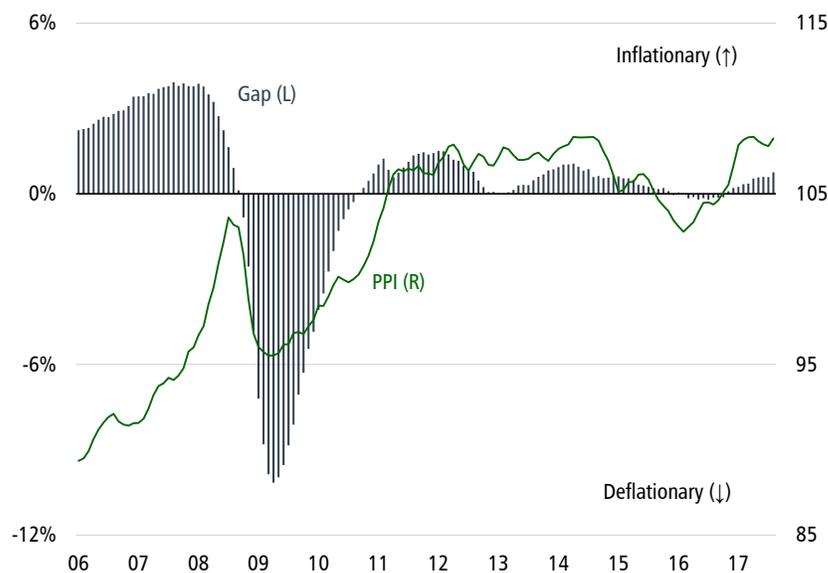

Source: Numera Analytics

In practice, of course, forecasting headline inflation with Phillips curve equations requires a stance on the future evolution of its different components. Import prices are notoriously hard to predict, as they depend on factors (like energy prices) that usually have very high forecast errors.

To offer some insights on the drivers of US import price inflation, we carried out a historical decomposition of our structural econometric model for US merchandise trade. Figure 4 shows the contribution of a series of domestic and external factors to real import prices since 2007. Real import prices fell sharply in 2015, mainly as a result of falling oil prices and a stronger US dollar. So far this year, imported inflation is at 0.8%. The entirety of the increase is explained by a pick-up in global activity, which lifted producer prices in most regions in the world (Figure 5).

Figure 5: Global manufacturing output gap (deviations from potential, %)

Source: Numera Analytics, Global Manufacturing Report, October 2017

Offsetting these factors are still weak global energy prices, the carry-over effect of past currency appreciations (the effect has now turned positive) and modest growth in the US industrial sector. Since capital goods and materials represent over half of all imports of goods into the United States, stronger investment spending and a pick-up in US manufacturing should support imported inflation over the next few years. With global manufacturing activity running above potential, global PPI inflation is also expected to strengthen (we expect it to rise 3.9% this year, up from -0.8% in 2016). To the extent global trade flows maintain their current momentum, the weight of import prices in the Phillips curve should also increase (increased protectionism would have the reverse effect). Hence, barring a sharp increase in the value of the US dollar, or a sudden decline in global commodity prices, the strengthening of global activity should bring CPI inflation near the Fed's 2% target. Much higher inflation is unlikely over the medium-term considering the importance of long-term expectations as a determinant of current inflation.

Economists, investors and policymakers should put less emphasis on the inflation-unemployment link, and view domestic cyclical conditions as just one part of the puzzle.

This special research note was written by Joaquín Kritz Lara, senior economist and head of Macro Research at Numera Analytics. For inquires about Numera's macro research coverage, the author can be reached at jklara@numeraanalytics.com or +1.514.861.6865.

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Appendix

We fit an expectations-augmented Phillips curve with time-varying parameters. The specification is similar to the hybrid Phillips curve of Galí and Gertler (1999) and Albuquerque and Baumann (2017):

$$\pi_t = \alpha_t \pi_t^e + \sum_{i=1}^{p} \phi_{it} \pi_{t-i} + \rho_t \pi_t^m + \beta_t (u_t - \bar{u_t}) + \epsilon_t \qquad \epsilon_t \sim iid\, N(0, \sigma_\epsilon^2)$$

The parameters α_t, ϕ_{it}, ρ_t and β_t are all assumed to follow random walks with no drift and fixed variances. π_t denotes annualized CPI inflation, π_t^e long-term inflation expectations, π_t^m real (CPI adjusted) import prices, u_t the US unemployment rate and $\bar{u}_t$ the natural rate of unemployment. Hence, $(u_t - \bar{u_t})$ denotes cyclical deviations in the unemployment rate. Although the model is estimated in state-space form, we fit a preliminary OLS regression to determine the appropriate lag length. The sample period is 1982/Q1-2017/Q2.

Instead of assuming a functional form for long-term expectations, we use 10-year expected inflation estimates by the Cleveland Fed[3]. Since most of the debate revolves around the link between inflation and unemployment, we use the CBO's quarterly estimates for the unemployment gap (i.e. unemployment relative to its equilibrium rate) as our measure of excess demand.

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[3]Very similar results are obtained using long-term inflation forecasts from the Survey of Professional Forecasters.