AEA Papers and Proceedings 2019, 109: 465–469
https://doi.org/10.1257/pandp.20191055

Is Inflation Just Around the Corner? The Phillips Curve and Global Inflationary Pressures†

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Ten years after the start of the Great Recession and in the midst of one of the longest US expansions on record, concern is gradually turning to rising inflation. This is not limited to the United States: a growing chorus suggests that output gaps have finally closed for most advanced economies and that inflationary pressures may already be building (e.g., World Bank Group 2018). Figure 1 shows that, from the lows of the mid-2010s, inflation has slowly risen both in the United States and across the world. Is inflation just around the corner?

The link between inflation and the level of economic activity is generally characterized through a Phillips curve, and increasingly through the type of expectations-augmented Phillips curve suggested by modern macroeconomic models (see Coibion, Gorodnichenko, and Kamdar 2018 for a review). Establishing this link between inflation and the real side of the economy, however, hinges on being able to measure inflation expectations of price-setters: traditional backward-looking Phillips curves yield no systematic relationship between inflation and economic slack.

Few countries have long-running surveys of inflation expectations. As a result, it is not generally feasible to estimate country-specific expectations-augmented Phillips curves in the same way as can be done for the United States (e.g., Coibion and Gorodnichenko 2015, Binder 2015). But by pooling across a range of countries who have consumer or firm surveys available for shorter periods, we are able to document a robust and negative relationship between the inflation gap (the deviation of inflation from expected inflation) and the unemployment gap (the deviation of unemployment from the natural rate). The robustness of this relationship across countries confirms a fundamental theoretical prediction of modern macroeconomic models (e.g., Woodford 2003; Clarida, Galí, and Gertler 1999).

An expectations-augmented Phillips curve provides a useful real-time metric for assessing the degree of economic slack: when inflation is well-below inflation expectations, it is unlikely

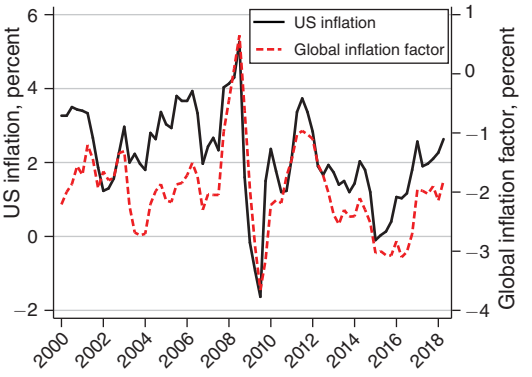

Figure 1. US Inflation and Global Inflation

Notes: The figure plots time series of the US annual CPI inflation and the global inflation factor. The global inflation factor is measured as the time fixed effects λ_t in the following regression: $\pi_{it} = \alpha_i + \lambda_t + error_{it}$ where i and t index countries and time. In this regression, we include country specific linear time trends for select countries with histories of recent disinflations (Czechia, Turkey, Chile, Israel) or major changes in unemployment insurance (Germany). The global inflation factor is scaled to have zero mean.

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† Go to https://doi.org/10.1257/pandp.20191055 to visit the article page for additional materials and author disclosure statement(s).

that unemployment is below the natural rate given the historical experience. Using our novel dataset of inflation expectations, we estimate the global inflation gap: the common component of the deviation of inflation from inflation expectations across advanced economies. We find that this gap has risen gradually since its low in the mid-2010s, but remains negative, as in the United States. This suggests that there remains economic slack not just in the United States but across most advanced economies. In short, while output gaps are likely closing given that the gap between inflation and inflation expectations is shrinking, we find no evidence that inflation is on the brink of surging ahead.

I. Cross-Country Inflation Expectations

We begin by compiling historical inflation expectations of households and firms across a wide range of countries. To understand inflation, one would ideally prefer the inflation expectations of firms, who are the price-setters. However, in most countries, such data are unavailable and surveys of expectations are commonly available only for households and professional forecasters (Coibion, Gorodnichenko, and Kamdar 2018 provides an overview of available surveys of firms' inflation expectations). Coibion and Gorodnichenko (2015), Binder (2015), and Pfajfar and Roberts (2018) provide evidence that the inflation expectations of firms are best proxied through those of households rather than professional forecasters. We follow this approach and focus on inflation expectations of firms and households (if a survey of firms is not available) across a range of countries.

We assemble time series of inflation expectations for 18 countries/regions (Australia, Canada, Chile, Czechia, Denmark, Finland, France, Germany, Israel, Italy, Japan, New Zealand, South Korea, Sweden, Turkey, United Kingdom, United States, as well as the entire eurozone) over different periods (see online Appendix Table 1 for details). Most countries have surveys that become available around 2000. Consistent with the structure of the New Keynesian Phillips curve, we rely on one-year-ahead inflation expectations. Online Appendix Figure 4 shows historical time series of inflation expectations across countries. There is a striking amount of comovement in expectations across countries, in particular during episodes of large swings in commodity prices. This is consistent with the sensitivity of inflation expectations of households and firms to commodity, and particularly energy, price movements (e.g., Coibion and Gorodnichenko 2015). In addition, there is a common decline in inflation expectations from 2011 to 2015, followed by a gradual increase thereafter. The eurozone stands out for having experienced unusually high inflation expectations from 2004 to 2009. Arioli et al. (2017) show that this is driven largely by very high inflation expectations in Spain, Italy, and Portugal following the adoption of the euro, but country-specific estimates of inflation expectations for all countries within the eurozone are not yet readily available.

II. Expectations-Augmented Phillips Curves across Countries

Coibion and Gorodnichenko (2015) document that, when one conditions on the inflation expectations of households, an expectations-augmented Phillips curve for the United States provides a stable description of the link between the nominal and the real sides of the economy, resolving in particular the puzzle of the "missing disinflation" during the Great Recession.

While time series of expectations are not generally long enough to replicate this analysis for individual countries, the available expectations data suggest that this argument successfully extends beyond the United States. Using our cross-country data, we plot pooled estimates of the inflation gap on the vertical axis versus the unemployment gap on the horizontal axis (Figure 2). Unemployment gaps are as measured by the Organization for Economic Cooperation and Development (OECD 2018); the methodology is described in Guichard and Rusticelli (2011). As discussed in Coibion, Gorodnichenko, and Ulate (2018), the OECD approach (like that of other official sources) to estimating the equilibrium unemployment rate (or potential output) is well approximated with moving averages of actual unemployment (actual output). To ensure comparability across countries, we demean both inflation and unemployment gaps for each individual country.[1]

[1] We also linearly detrend variables for select countries with histories of recent disinflations (Czechia, Turkey,

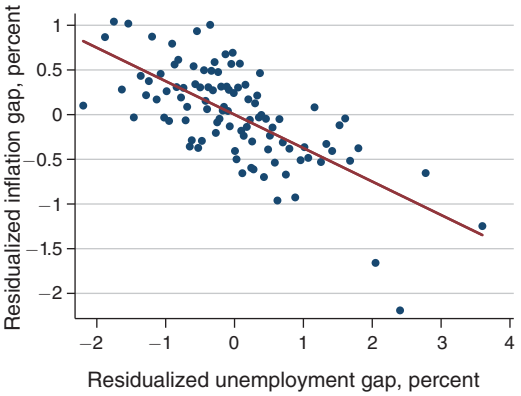

FIGURE 2. THE EXPECTATIONS-AUGMENTED PC ACROSS COUNTRIES

Notes: The figure presents a binscatterplot (100 bins) of inflation gap $(\pi_{it} - E_t\pi_{i,t+1})$ versus unemployment gap $(u_{it} - u_{it}^*)$ where i and t index countries and time, π_{it} is year-on-year CPI inflation rate, $E_t\pi_{it}$ is one-year-ahead inflation expectations of households or firms, u_{it} is unemployment rate, u_{it}^* is non-accelerating inflation rate of unemployment rate (NAIRU) provided by the OECD. We residualize inflation gap and unemployment gap, i.e., we remove country fixed effects (and country-specific linear time trends for Czechia, Chile, Turkey, Israel, and Germany). The scatterplot for raw data is provided in online Appendix Figure 1.

The relationship between inflation and unemployment gaps, pooled across countries and periods, is very strong. The slope of the relationship is −0.37 (standard error 0.07), a value which changes little when we restrict our attention to advanced economies (slope of −0.34 with standard error 0.06).[2]

Central to the strength of this Phillips curve relationship is the use of actual inflation expectations. As shown in online Appendix Figure 1, there is no discernible relationship between the change in inflation and unemployment gaps. In other words, the so-called backward-looking or accelerationist Phillips curve is not successful in linking inflation and economic tightness. This stands in sharp contrast to the ability of the expectations-augmented Phillips curve to match the data across a wide range of countries.

III. Global Inflation Gap

The strength of the relationship between inflation gaps and unemployment gaps supports the interpretation of the expectations-augmented Phillips curve as a structural relationship. It can also be used to make inferences about the unemployment gap using the inflation gap when the measurement of the former is contentious. This has recently been the case in the United States, for example, because of the dramatic decline in labor force participation since the Great Recession. These declines make current unemployment rates a potentially questionable metric of the state of labor utilization (e.g., Coibion, Gorodnichenko, and Ulate 2018) while employment-to-population ratios point toward continued slack in the labor market. As illustrated in online Appendix Figure 5, changes in employment-to-population ratios in many other countries are broadly similar: there have been pronounced declines in the share of working age adults working after the Great Recession that have not yet been reversed. Despite this apparent unused labor, organizations like the World Bank estimate that advanced economies are producing at capacity.

Assuming the expectations-augmented Phillips curve is a correct representation of the relationship between the inflation gap and the degree of economic slack, we can look at the inflation gap to make inferences about how much economic slack remains in the United States and other countries. For the former, we plot the difference between inflation and inflation expectations directly in Figure 3. For the latter, we estimate a global inflation gap that pools information across different countries. Specifically, we regress country-specific gaps on country fixed effects and time dummies. We then interpret the coefficients on time dummies as the global inflation gap (after normalizing their level to be zero on average during 2000–2007). The resulting estimate of the global inflation gap is also plotted in Figure 3.

The United States and global inflation gap display qualitatively similar dynamics. Both were steady around zero through much of

Chile, Israel) or major changes in unemployment insurance (Germany).

[2] Despite the short samples, almost every country displays a clear negative relationship between inflation gaps and unemployment gaps. One of only two exceptions is Australia, for whom only five years of data (2014–2018) is available. The other is Germany, largely due to the Hartz reform which was followed by a long secular decline in unemployment. Online Appendix Figure 6 shows the scatterplots of raw inflation and unemployment gaps for each country separately.

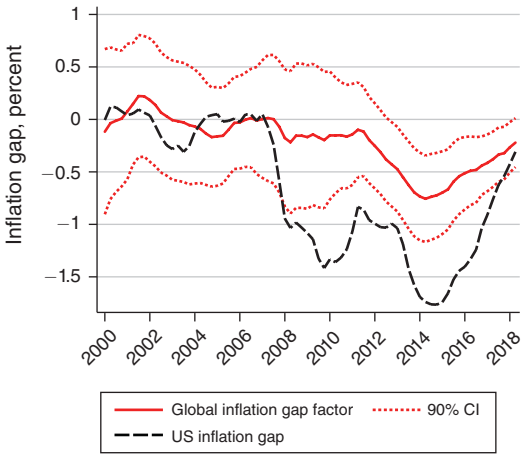

FIGURE 3. THE GLOBAL AND US INFLATION GAP

Notes: The figure plots time series of inflation gap, i.e., the difference between actual inflation and one-year-ahead inflation expectations of households or firms. The global inflation gap is measured as the time fixed effects λ_t in the following regression: $\pi_{it} - E_t\pi_{i,t+1} = \alpha_i + \lambda_t + error_{it}$ where i and t index countries and time. In this regression, we include country specific linear time trends for select countries with histories of recent disinflations (Czechia, Turkey, Chile, Israel) or major changes in unemployment insurance (Germany). The global inflation factor and the US inflation gap are scaled to have zero mean over the 2000–2007 period. The time series are smoothed using one-year moving averages. Unsmoothed series are reported in online Appendix Figure 3.

the 2000s but fell with the onset of the Great Recession, consistent with global declines in economic activity at the time. These gaps experienced further declines from 2011 to 2014 as economic weakness remained pronounced or increased further depending on the country. Since then however, both the United States and global inflation gap have been shrinking. By mid-2018, we estimate a global inflation gap of approximately −0.3 percent below the average levels from the 2000s, implying that unemployment remains above natural rates of unemployment globally. To get a sense of the implied magnitude of the unemployment gap, we use the estimated slope of the Phillips curve shown in Figure 2. This yields an estimate of the implied unemployment gap of approximately 1 percentage point, although there remains considerable sampling uncertainty in this estimate. This positive gap supports the notion that some economic slack remains and that inflation is unlikely to surge anytime soon in the absence of a rapid rise in inflation expectations or significant further declines in unemployment.

IV. Conclusion

The length of the recovery since the Great Recession and the low reported levels of the unemployment rate in the United States are increasingly generating concerns about inflationary pressures. We document that an expectations-augmented Phillips curve can account for inflation not just in the United States but across a range of countries, once household or firm-level inflation expectations are used. Given this relationship, we can infer the dynamics of slack from the dynamics of inflation gaps and vice versa. We find that the implied slack was pushing inflation below expectations in the years after the Great Recession but the global and US inflation gaps have shrunk in recent years thus suggesting tighter economic conditions. While we find no evidence that inflation is on the brink of rising, the sustained deflationary pressures following the Great Recession have abated.

REFERENCES

Arioli, Rodolfo, Colm Bates, Heinz Dieden, Ioana Duca, Roberta Friz, Christian Gayer, Geoff Kenny, Aidan Meyler, and Iskra Pavlova. 2017. "EU Consumers' Quantitative Inflation Perceptions and Expectations: An Evaluation." European Central Bank (ECB) Occasional Paper Series 186.

Binder, Carola Conces. 2015. "Whose Expectations Augment the Phillips curve?" *Economics Letters* 136 (C): 35–38.

Clarida, Richard, Jordi Galí, and Mark Gertler. 1999. "The Science of Monetary Policy: A New Keynesian Perspective." *Journal of Economic Literature* 37 (4): 1661–1707.

Coibion, Olivier, and Yuriy Gorodnichenko. 2015. "Is the Phillips Curve Alive and Well after All? Inflation Expectations and the Missing Disinflation." *American Economic Journal: Macroeconomics* 7 (1): 197–232.

Coibion, Olivier, Yuriy Gorodnichenko, and Rupal Kamdar. 2018. "The Formation of Expectations, Inflation, and the Phillips Curve." *Journal of Economic Literature* 56 (4): 1447–91.

Coibion, Olivier, Yuriy Gorodnichenko, and Mauricio Ulate. 2018. "The Cyclical Sensitivity in Estimates of Potential Output." In *Brookings Papers on Economic Activity*, edited by Janice Eberly and James Stock. Washington, DC: Brookings Institution.

Guichard, Stéphanie, and Elena Rusticelli. 2011. "Reassessing the NAIRUs after the Crisis." OECD Economics Department Working Papers 918.

OECD. 2018. "OECD Economic Outlook May 2018." http://www.oecd.org/eco/outlook/economic-outlook-may-2018/.

Pfajfar, Damjan, and John M. Roberts. 2018. "The Role of Expectations in Changed Inflation Dynamics." Finance and Economics Discussion Series 2018-062.

Woodford, Michael. 2003. *Interest and Prices: Foundations of a Theory of Monetary Policy*. Princeton: Princeton University Press.

World Bank Group. 2018. "Is the Global Economy Turning the Corner?" In *Global Economic Prospects: Broad-Based Upturn, but for How Long?* 8–12. Washington, DC: International Bank for Reconstruction and Development.