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**Article**

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Peter Hennecke

# A Simple Post-Crisis EMU Phillips Curve – Implications for Monetary Policy

The persistently low wage and price growth in the EMU after the Great Recession of 2009 led some economic observers to conclude that the Phillips Curve has broken down and that the ECB should therefore reconsider its inflation target. This study makes use of the considerable cross-country and cross-time heterogeneity in terms of inflation and capacity utilisation of EMU member states after the Great Recession to investigate whether these claims are corroborated by empirical evidence. The results point to the conclusion that the Phillips Curve is alive and well in the EMU and centred at or only slightly below the ECB's inflation target. Therefore, a readjustment of the inflation target seems unjustified. Furthermore, as the ECB can expect inflation to return to its target, it possibly can accelerate tapering its unconventional monetary policy measures as the recovery continues.

The Great Recession of 2009, that followed the global financial crisis of 2007 and 2008, hit all member states of the European Monetary Union (EMU). However, the recovery from the crisis was very heterogeneous. While Germany in particular, the EMU's largest economy, bounced back in a textbook V-shaped recovery, others suffered years of shrinking economic activity and have only recently returned to solid growth rates. Overall, the capacity utilisation of the EMU was well below its potential output and inflation was consistently below the ECB's medium-run target rate of "below but close to two percent". That prompted the ECB to adopt an unprecedented expansionary policy stance with very low and even negative policy rates and a whole set of unconventional monetary policy measures such as quantitative easing and forward guidance.

Beginning in 2016, the economic recovery engulfed the entire EMU including the so-called crisis countries. However, wage increases remain low in the EMU's member states. This has led some observers, including Claudio Borio<sup>1</sup> – chief economist at the Bank for International Settlements – and the German Central Bank to believe that the short-run relationship between the capacity utilisation and the wage and price growth, i.e. the Phillips Curve, has

broken down in the post-crisis era<sup>2</sup>. Some pundits also call for a reconsideration of the ECB's monetary policy strategy, particularly the inflation target. German economist Bert Rürup even suggested redefining the inflation target as a range between one and three percent in order to avoid the ECB's loss of credibility due to the continuous failure to bring inflation back to its target.<sup>3</sup>

This study investigates whether these claims hold true for the EMU countries and whether they are substantiated by empirical evidence by estimating a simple Phillips Curve using a small post-crisis panel data set. The results suggest that these claims seem to be vastly exaggerated for the EMU countries, at least on average.

## The EMU Phillips Curve

For the ECB, the Phillips Curve is of central interest. If the Bank's inflation target is credible, the Phillips Curve should be centred at the ECB's target rate, i.e. if the capacity utilisation is at its normal level, the inflation rate should equal the target rate. If capacity utilisation deviates from its normal level over the business cycle, i.e. unemployment is higher or lower than the natural rate of unemployment and the output gap is not zero, the Phillips curve describes how much the inflation deviates from the

1 C. Borio: Through the looking glass, OMFIF City Lecture in London, 22 September 2017, available at <https://www.omfif.org/media/3449020/claudio-borio-through-the-looking-glass.pdf>.

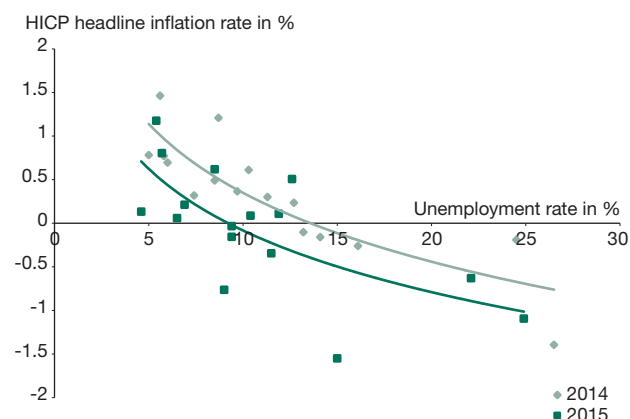
2 Deutsche Bundesbank: The Phillips curve as an instrument for analysing prices and forecasting inflation in Germany, Bundesbank Monthly Reports, April 2016, pp. 31-45.

3 B. Rürup: How to enhance ECB credibility, Saying goodbye to inflation target, OMFIF, 25 October 2017, available at <https://www.omfif.org/analysis/commentary/2017/october/how-to-enhance-ecb-credibility/>.

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Figure 1

### The cross-country EMU Phillips Curves during the oil price decline 2014-2015



Note: Annual data for the EMU-16 countries. The Phillips Curves are shown as log-linear regression curves using cross-country data of the respective year.

Source: Eurostat online database available at <https://ec.europa.eu/eurostat/data/database>; own figures and calculations.

ECB's target rate. In times of economic slumps and particularly in severe economic crises, below target inflation rates are to be expected and call for a loose monetary policy stance. The opposite is true in times of economic booms.

Figure 1 shows two simple cross-country Phillips Curves for the years 2014 and 2015, which relate the HICP headline inflation to the unemployment rate. This cross-country comparison demonstrates that EMU member states with a higher unemployment rate tend to exhibit lower inflation rates and, thus, yield the result that one would expect when the Phillips Curve is valid. Moreover, comparing the 2014 and 2015 Phillips Curves shows that the stark decline in the world market price for crude oil in 2015 shifted the Phillips Curve downwards but the relationship remained stable.

However, while looking at cross-country differences in inflation and employment is straightforward, it has a major drawback; it ignores the likely differences in the levels of natural unemployment rates (NAIRU<sup>4</sup> or NAWRU<sup>5</sup>) of the countries. Using the output gap (the percentage difference between the actual and potential output of an economy) as an alternative measure of capacity utilisation instead avoids this problem since the output gap is

4 Non-Accelerating Inflation Rate of Unemployment.

5 Non-Accelerating Wage Rate of Unemployment.

Table 1

### Estimation results for the post-crisis EMU Phillips Curve

	Model 1 (pooled)	Model 2 (RE)  Country- specific effects	Model 3 (RE)  Country- and time-specific effects
Constant	1.47*** (11,27)	1.50*** (22,64)	1.55*** (23,52)
Output gap	0.07* (1,75)	0.08*** (3,80)	0.10*** (4,61)
Observations	128	128	128
Degrees of freedom	126	126	126
R <sup>2</sup>	0,03	0,72	0,76
SIC	3,41	2,66	2,62
Hausman Test (p-value)	-	0,76	0,14
Breusch-Pagan (p-value)	0.00***	-	-

Note: \*\*\* 99% significance level, \*\* 95% significance level; \* 90% significance level; absolute, robust (Newey-West) t-values in parentheses.

Source: Own table and calculations.

by definition centred at zero for every country. Another advantage of using the output gap when running a regression analysis is that the constant term yields the average inflation over the business cycle, which can be directly compared with the ECB's medium-run inflation target. Such a simple Phillips Curve that uses merely the output gap to explain cross-country and cross-time differences in inflation with differences in the output gap is estimated using annual data from the EMU-16<sup>6</sup> countries from 2010 to 2017.

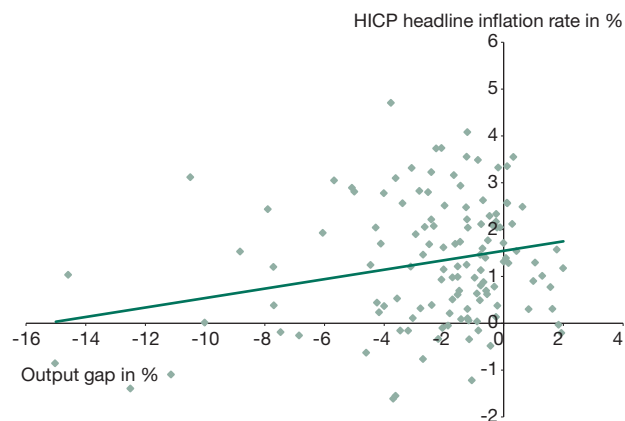
$$(1) \quad \pi_{it} = c + \beta \tilde{y}_{it} + u_{it}$$

Equation (1) describes the Phillips Curve in a linear form<sup>7</sup>, where  $\pi$  denotes the inflation rate in percent of country  $i$  in year  $t$ ,  $c$  the constant term,  $\tilde{y}$  the output gap in percent of the production potential;  $\beta$  the slope parameter and  $u$  the error term. For inflation, the year-over-year change in the Eurostat headline Harmonised Index of Consumer Prices (HICP) is used; for the output gap, the estimate by

6 The EMU-16 countries encompass all countries that were EMU member states during the entire sample period from 2010 to 2017: Austria, Belgium, Cyprus, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia and Spain.

7 A linear model is used since negative values of both the inflation rate and the output gaps are incompatible with natural logs. However, the linear model should present a good approximation when the output gap is (close to) zero.

Figure 2  
The EMU Phillips Curve 2010-2017 (model 3)



Note: Annual data for the EMU-16 countries.

Source: Eurostat, European Commission AMECO database available at [https://ec.europa.eu/economy\\_financial/ameco/user/serie/SelectSerie.cfm](https://ec.europa.eu/economy_financial/ameco/user/serie/SelectSerie.cfm); own figures and calculations.

the European Commission<sup>8</sup> is used, obtained from their AMECO online database.<sup>9</sup>

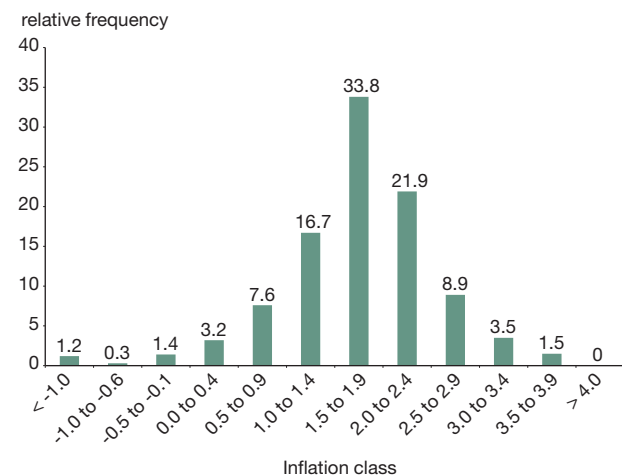
The regression results are shown in Table 1. The Breusch-Pagan Test for heterogeneity rejects the null hypothesis of homogeneity and therefore rejects the pooled-OLS model 1. Hence, unobserved heterogeneity needs to be taken into account which is done in model 2 and includes country-specific random effects. Adding time-specific random effects (model 3) as well increases the quality of the model further as evident from the lower Schwarz Bayesian Information Criterion (SIC). Hence, model 3 is the superior model and is used in the following interpretations. Moreover, the Hausman Test does not reject the random effects modelling in favour of a fixed effects modelling of the unobserved heterogeneity.

The regression results indicate that there is a statistically significant relationship between the inflation rate and the capacity utilisation of the real economy. With a one percentage point increase in the output gap, the inflation rate rises by 0.1 percentage points which is, admittedly, economically not very strong. Moreover, the average inflation

8 K. Havik, K. Mc Morrow, F. Orlandi, C. Planas, F. Raciborski, W. Röger, A. Rossi, A. Thum-Thysen, V. Vandermeulen: The Production Function Methodology for Calculating Potential Growth Rates & Output Gaps, European Economy, Economic Paper No. 535, European Commission 2014.

9 The data were obtained in January 2018.

Figure 3  
Relative frequency of forecasts for the EMU inflation rate in five years



Note: Survey data from the 4th quarter 2017.

Source: European Central Bank: ECB Survey of Professional Forecasters (SPF), 2017; own figures.

rate of an EMU member state over the business cycle is 1.5% to 1.6%, which is in line with or maybe just slightly below the ECB's inflation target, depending on the interpretation of "below but close".<sup>10</sup>

Maybe the estimated average inflation rate would be somewhat higher if there had been more observations of inflation rates with positive output gaps. As figure 2 shows, the observations are asymmetrically concentrated on the negative output gap side. This is expected to change in the ongoing economic recovery in the EMU. Figure 2 also shows the linear regression line of model 3 that intersects at the average inflation rate of 1.6%.

The result that inflation is centred at or maybe only slightly below the ECB's target rate fits very well with inflation expectations, which have been disregarded so far in this analysis. Figure 3 shows the distribution of inflation forecasts (regarded as a proxy for actual inflation expectations) for the EMU inflation rate in five years from the ECB's survey of professional forecasters. The expectations of the pundits are fairly symmetrically distributed around the ECB's medium-term inflation target with over a third of experts expecting the year-over-year inflation

10 Caveat: The ECB's inflation target is defined for the EMU as a whole. The regression yields the average inflation of an average EMU country. Hence, the countries are not weighted according to their share in the EMU aggregate.

rate in five years to be between 1.5% and 1.9%. Hence, the inflation expectations appear to be well-anchored at the ECB's target and the alleged loss of credibility seems limited.

### Conclusion and policy implications

This study makes use of the considerable cross-country and cross-time heterogeneity in terms of inflation rates and capacity utilisation of EMU member states after the Great Recession in order to investigate whether the Phillips Curve has broken down in the post-crisis era. The results point to the conclusion that the Phillips Curve is alive and well in the EMU. Moreover, even after several years of below-target inflation rates, the Phillips Curve seems centred at or just slightly below the ECB's medium-term inflation target. This result is supported by inflation expectations, which seem well anchored to the ECB's inflation target as well. Hence, if the economic recovery in the EMU continues, as forecasted by many observers, the ECB can expect the inflation rates to return to their target as the output gap closes.<sup>11</sup> Increased oil prices already pushed the headline HICP inflation back to around two percent in early summer of 2018. Calls for a readjustment of the ECB's inflation target therefore seem unjustified as the below target inflation seems not to have been the result of a structural shift or even breakdown of the Phillips Curve but merely the result of a protracted economic slump. Moreover, the results suggest that the ECB should continue and most likely accelerate the exit from its unconventional monetary policy measures (tapering).

<sup>11</sup> For example, the spring forecast 2018 of the European Commission expects the output gap to shift from -0.5% in 2017 to 0.4% in 2018 and to 0.9% in 2019.