

Web-appendix for:
The Phillips Multiplier

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Abstract

In this web-appendix we provide the following additional empirical results:

1. A formal test for the difference between the pre- and post-1990 estimates.
2. Phillips multiplier for the US based on "cleaned" Romer and Romer (2004) series.
3. Phillips multiplier for the US based on alternative high frequency shocks.
4. Phillips multiplier for the UK for different sampling periods.

Additional empirical results

Testing the difference pre- and post-1990

In the main text we present results for different sampling periods: pre- and post-1990. In this section we provide a formal test to investigate whether the Phillips multiplier is significantly different across the different sampling periods. In particular, we consider the following modification of our baseline iv regression

$$\sum_{j=0}^h \pi_{t+j} = (\mathcal{P}_h + \mathbf{1}(t > 1990)\mathcal{D}_h) \sum_{j=0}^h u_{t+j} + w_t' \gamma_h + e_{t+h} \quad h = 0, \dots, H$$

where $\mathbf{1}(t > 1990)$ denotes an indicator that is equal to 1 if t corresponds to the post 1990 period. The difference between the pre- and post-1990 multiplier is captured by the parameters \mathcal{D}_h . We estimate the coefficients using an instrument series that is equal to the Romer and Romer (2004) series for the pre-1990 period and equal to the high frequency identified monetary shock series FF4 after 1990. We treat the indicator $\mathbf{1}(t > 1990)$ as exogenous.¹

Figure 1 shows the coefficient estimates for \mathcal{D}_t (top panel) and their corresponding p-values (bottom panel).² We find that the coefficients are increasing with h indicating that the differences between the pre- and post-1990 Phillips multipliers are largest at longer horizons. This is in line with our estimates in Figure 4 in the main text which show that the Phillips multiplier is considerably more negative for the pre-1990 sampling period. The p-values indicate that differences are significant at the 90% level from $h = 16$ onward.

Cleaning the Romer & Romer shocks

As we saw in section 4 of the main text, Romer and Romer (2004) identify monetary shocks holding constant the staff's Greenbook forecasts for output and inflation, but one concern is

¹Ideally one would like to use the same instrument series pre- and post-1990, however for the post-1990 period the Romer and Romer (2004) series are largely uninformative and the high frequency shocks are not available before 1990.

²The p-values are based on the normal approximation of the corresponding t -statistic.

that policy makers respond to information beyond what is in the Greenbook. If this response is in reaction to cost-push factors, the exogeneity condition could be violated for the R&R shocks. To get at this possible issue, we regress the R&R shocks on lagged common factors that are obtained from a large panel of macro variables.³ The residuals of this regression are then considered a cleaner version of the R&R series. Note however that in doing so we might be removing useful variation that is unrelated to supply factors (Cochrane, 2004).

In Figure 2 we show the Phillips multiplier that was obtained using this cleaned instrument series. The estimates are computed exactly as Figure 1 in the main text. The confidence sets are similar (albeit slightly larger), and the point estimates are broadly consistent, if anything pointing to a slightly larger Phillips multiplier.

Cleaning the HFI shocks

The high frequency identified monetary policy surprises are also not perfect. In particular, the limitation comes from a possible Federal Reserve information effect, whereby an FOMC announcement releases some information that was known by the Federal Reserve but not by private agents (Romer and Romer, 2000; Nakamura and Steinsson, 2017). If some of the Fed informational advantage is related to cost-push factors, the orthogonality condition could be violated.

Miranda-Agrippino and Ricco (2019) developed a method to clean the high frequency shocks from a possible information effect by notably controlling for the central bank’s private information. In particular, Miranda-Agrippino and Ricco (2019) extracts the component of market surprises that is orthogonal to central banks’ forecasts. To verify the robustness of our results we re-estimate the Phillips multiplier for the post-1990 period using this “cleaner” shock series. The results are shown in Figure 3. We find that the estimates are similar to our baseline results based on the standard FF4 instrument series.

³In particular, we consider the panel from Stock and Watson (2012) ($N = 144$) and estimate the number of common factors using the IC2 criteria from Bai and Ng (2002). The criteria indicates that there are 2 common factors for the 1969-2007 sampling period. These factors are used in the predictive regression.

UK pre- and post-1990

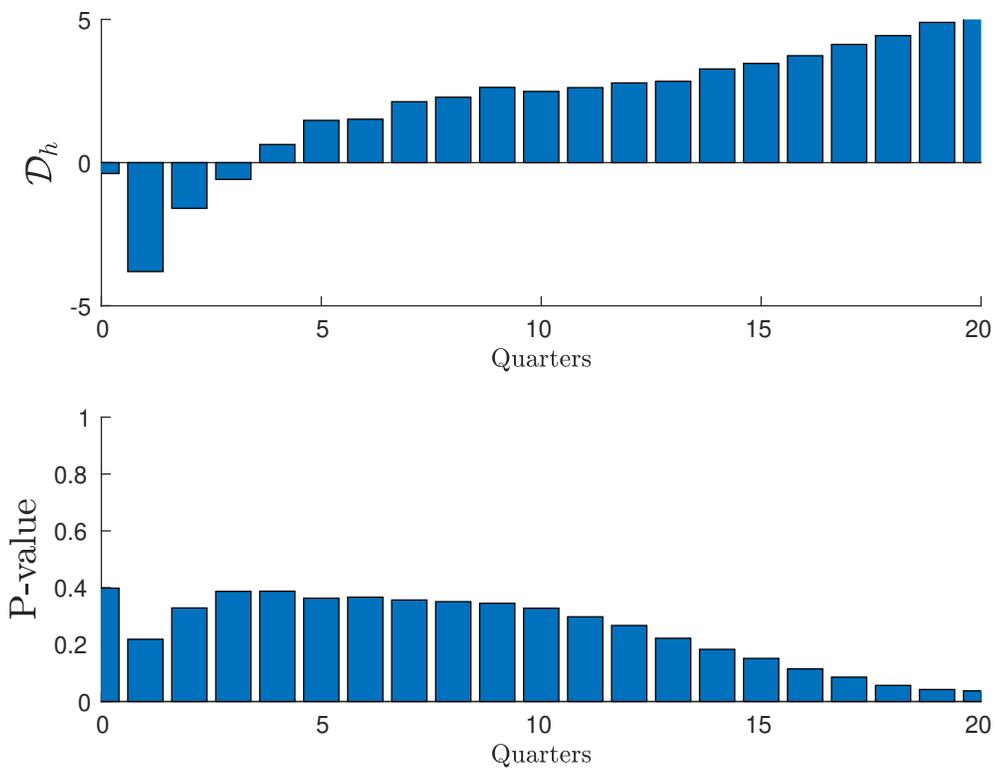
Finally, we make an attempt to estimate the Phillips multiplier for the UK for different sampling periods to investigate whether a similar decline in the multiplier exists for the UK. To do so, we split the sample in 1990 and use the Cloyne and Hurtgen (2016) shocks in both periods.

The estimates are shown in Figure 4. While the point estimate indeed imply that the multiplier has become smaller in the post-1990 period, the confidence bands are wide making it difficult to reach any formal conclusions.

References

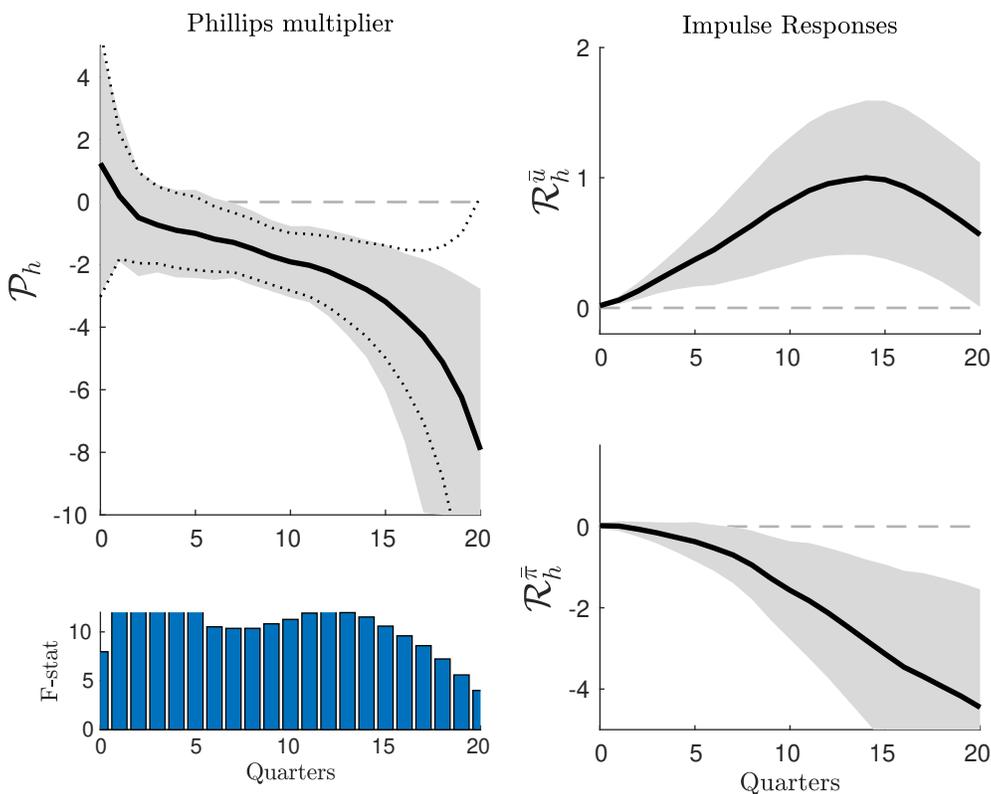
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Figure 1: Difference \mathcal{D}_h between the pre-90 and post-90 Phillips multiplier — 1969-2007, RR/HFI id.



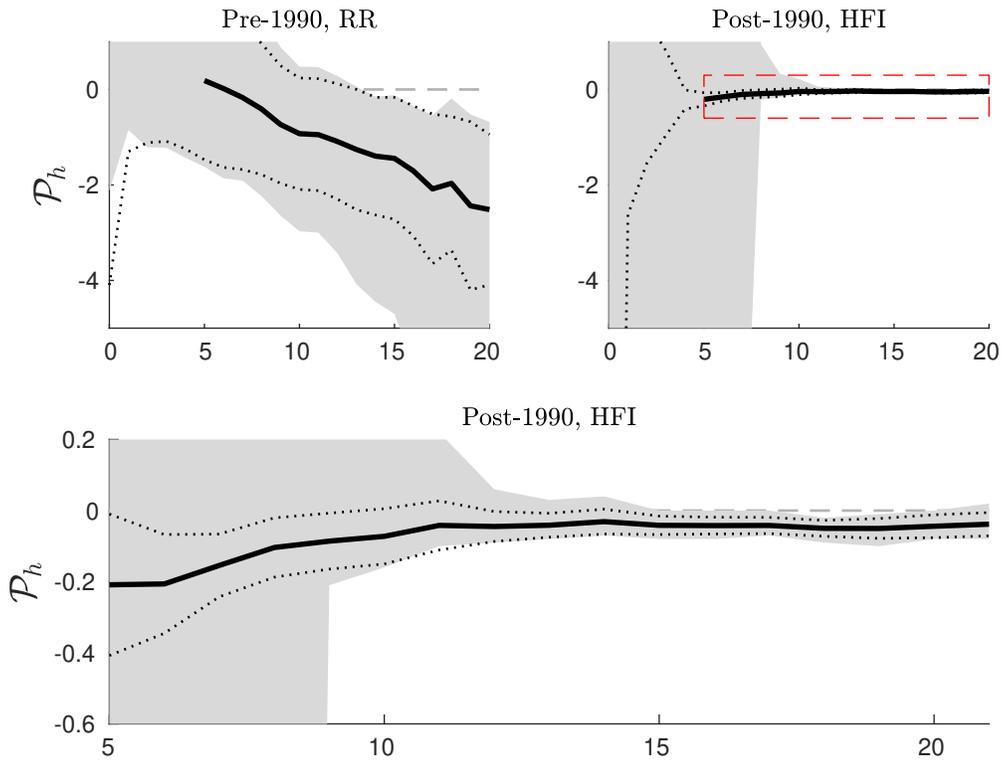
Notes: IV estimates for \mathcal{D}_h (top panel), the difference between the pre-90 and post-90 Phillips multiplier \mathcal{P}_h , with the corresponding p-values (bottom panel). The instruments are the Romer and Romer (2004) shocks for the pre-1990 period and the FF4 high frequency shocks for the post-1990 period.

Figure 2: The US Phillips multiplier \mathcal{P}_h — 1969-2007, RR cleaned



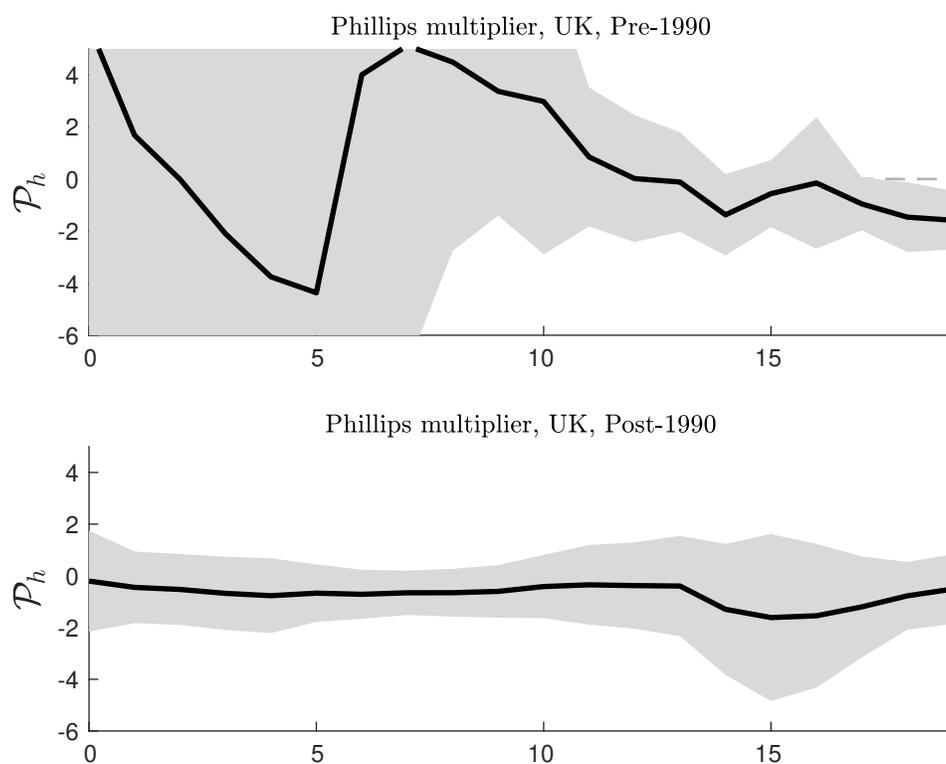
Notes: US Phillips multiplier estimated using as instrument the residual of the Romer and Romer (RR) narrative monetary shocks, after projecting out the principal components from a large macro panel. The sample is 1969q1-2007q4. For the multiplier (upper-left) the shaded area corresponds to the weak instrument robust 95% confidence interval that is obtained by point-wise inversion of the AR-statistic, see Appendix B. The dotted lines correspond to the confidence bounds implied by the normal limiting distribution of the 2SLS estimator. The *average* impulse responses (right panels) for inflation and unemployment are obtained from the OLS regressions (5) in the main text with the confidence bounds computed using Newey and West (1994). The *F*-statistics (bottom left) are computed as discussed in Olea and Pflueger (2013).

Figure 3: The Phillips multiplier \mathcal{P}_h over time — 1969-2007, RR/HFI cleaned



Notes: Upper left: Phillips multiplier estimated using Romer-Romer (RR) monetary shocks over 1969q1–1989q4. Upper right: Phillips multiplier estimated using High-Frequency Identified (HFI) monetary surprises (cleaned shock series from Miranda-Agrippino and Ricco (2019)) over 1990q1-2008q4. Lower panel: Phillips multiplier estimated using High-Frequency Identified (HFI) monetary surprises (part corresponding to the red dashed rectangle in the upper right panel). The shaded areas indicate the 95% weak instrument robust confidence regions computed by point-wise inverting the AR-statistic, see Appendix B. The dotted lines correspond to the confidence bounds implied by assuming the normal limiting distribution of the 2SLS estimator.

Figure 4: The UK Phillips multiplier \mathcal{P}_h — 1975-2007, CH



Notes: UK Phillips multiplier estimated using Cloyne and Hurtgen (2016) (CH) narrative monetary shocks as instruments. The sampling periods are 1975q1-1990q4 (top panel) and 1991q1-2007q4. For the multiplier the shaded area corresponds to the 95% confidence interval that is obtained by inverting the standard (not-weak iv robust) t -statistic.