Macroeconomic Regimes, Technological Shocks and Employment Dynamics: Online Appendix

Tommaso Ferraresi* Andrea Roventini† Willi Semmler‡

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In this report we provide evidence about the robustness checks mentioned in Section 5.3 of the main paper. First, we normalize GDP and hours by dividing the series by the US civilian population. Second, we change the threshold values in the different samples. Finally, we control for the timing of the break. Indeed, in addition to the pre and post Volcker sub-periods, we also consider the dates for possible structural breaks in U.S. labor productivity (i.e., 1973Q2; 1995Q4; 2003Q4) proposed by Fernald (2007, 2014). We accordingly obtain three different sub-periods: 1957Q1-1973Q2, 1984Q1-1995Q4 and 1996Q1-2003Q4. Finally, we report the results from a rolling window exercise so as to show the point(s) in time at which the shift in the response of hours as to technology shocks has to be dated. Differently with respect to the paper version, in which we use 20 years as length for each window, here we alternatively use 15 years time spans, which should be more reactive to changes, at the price of a lower precision in the estimates, due to the fewer observations.

1 Normalized GDP and hours

In the benchmark model, GDP and hours worked are expressed in aggregate terms. We test the robustness of our result by normalizing the series by the civilian population as in Gali (1999). Again, both GDP and hours are held in first differences. The results are qualitatively similar. First, the Tsay tests reject linearity in all the samples (see Table 2 in the paper). Second, we obtain the same results reported above for the i) full sample; ii) pre-Volcker period; iii) Great Moderation cum Great Recession period. We do focus upon the responses of hours worked, which are of main interest here. Figure 1 shows that, whereas not much happens in the high growth regime, a clear shift from negative to positive in the 1984-2011 sample characterizes the responses within the low growth period. The results are confirmed for the pre-Volcker vs. post mid 80s period even when we consider normalized hours in levels as suggested by Christiano et al. (2003) (Figure 2). Notice that employing the capital utilization adjusted TFP so as to identify technology shocks, differently from setups based on long-run restrictions (e.g., Francis

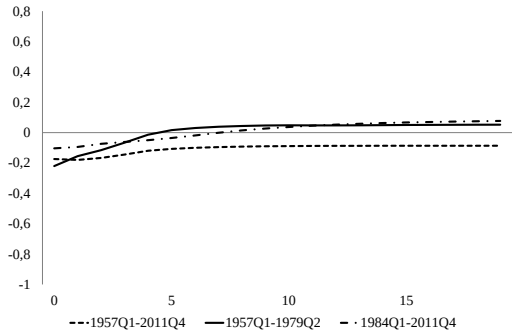
*Corresponding Author. Mail address: IRPET, Via P. Dazzi 1, I-50141, Firenze, Italy. Tel: +39-055-4591281. Email: tommaso.ferraresi@irpet.it

†Scuola Superiore Sant'Anna, Pisa, Italy, OFCE, Sciences Po, Sophia-Antipolis, France. Email: a.roventini@sssup.it

‡Department of Economics, New School for Social Research, New School University, USA. Email: semmlerw@newschool.edu

Figure 1: Response of hours (normalized with civilian population; log first differences) as to a 1% sd shock to TFP in different sub-samples.

(a) High growth regime



(b) Low growth regime

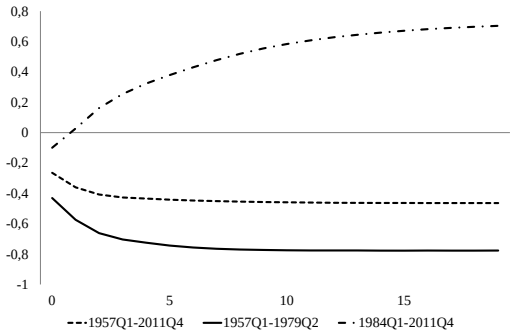
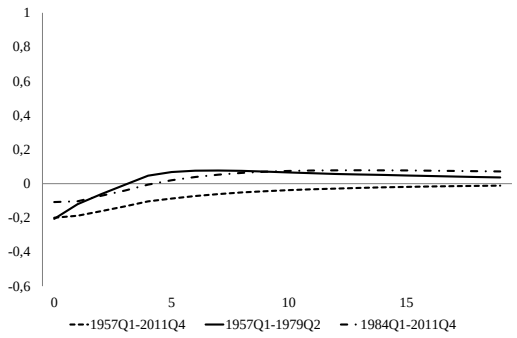
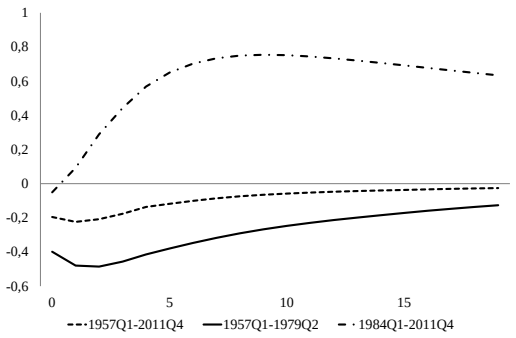


Figure 2: Response of hours (normalized with civilian population; log levels) as to a 1% sd shock to TFP in different sub-samples.

(a) High growth regime



(b) Low growth regime



and Ramey, 2005), delivers qualitatively similar responses of hours independently of how they enter the VAR model (first differences, levels).

2 Different threshold values

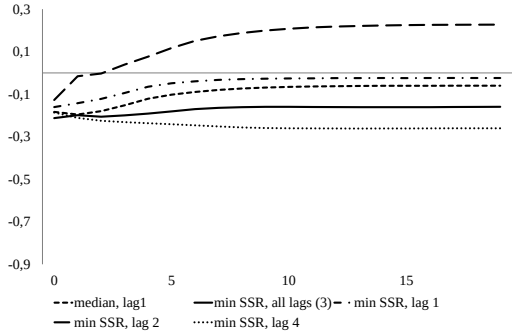
Since our results may be sensitive to the value and the number of lags of the estimated threshold, we check whether they are robust to changes in the estimation procedure. First, we employ the median value of the threshold variable at each lag. Second, we perform estimation searching for the model minimizing the sum of squared residuals at all lags. Again, the results do not qualitatively change.

In Figure 3, we do show that in the full sample, independently of the estimation criterion, the response of hours worked is rather mute in the high growth regime and abundantly negative in the low growth regime.

As we have noticed in the paper, however, results for the whole sample mix the evidence stem-

Figure 3: Response of hours as to a 1% sd shock to TFP using different criteria for estimating the threshold value and lag. 1957Q1-2011Q4.

(a) High growth regime



(b) Low growth regime

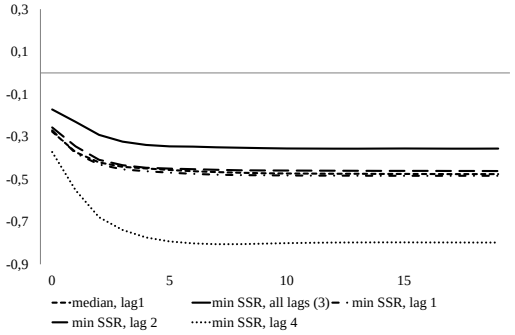
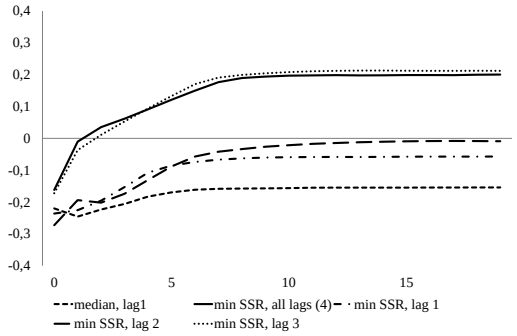
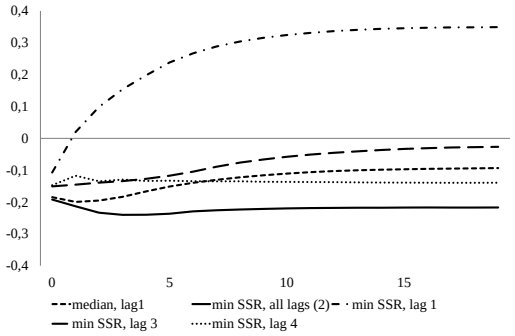


Figure 4: Response of hours as to a 1% sd shock to TFP using different criteria for estimating the threshold value and lag. 1957Q1-1979Q2 vs. 1984Q1-2011Q4. High growth regime.

(a) 1957Q1-1979Q2



(b) 1984Q1-2011Q4



ming from two rather diverse sub-periods. The responses characterizing sub-samples 1957Q1-1979Q2 and 1984Q1-2011Q4 are reported in Figures 4 (high growth regime) and 5 (low growth regime).

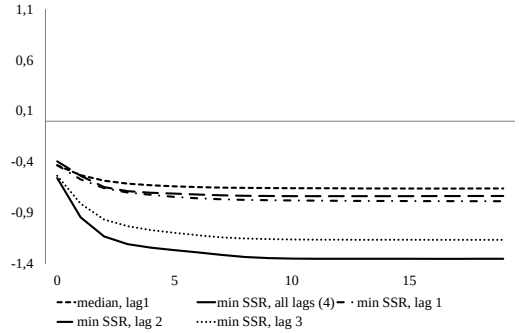
Again, whereas not much changes in terms of response of hours in the high-growth regime, a clear flip in the sign is visible when concentrating upon the low growth state of the economy.

3 Different sub-samples

As we wrote in the paper, with respect to our sub-sampling strategy, another possible source of breaks stems from the rate of growth of labor productivity. Indeed, according to Fernald (2007, 2014), labor productivity growth has been characterized by major changes over the post WWII periods, with high growth periods (1957Q1-1973Q2 and 1996Q1-2003Q4) being followed by low growth years (1973Q3-1995Q4 and 2004Q1-2011Q4). Starting from our sub-samples (1957Q1-1979Q2 and 1984Q1-2011Q4), we narrow our analysis controlling whether our results change if we

Figure 5: Response of hours as to a 1% sd shock to TFP using different criteria for estimating the threshold value and lag. 1957Q1-1979Q2 vs. 1984Q1-2011Q4. Low growth regime.

(a) 1957Q1-1979Q2



(b) 1984Q1-2011Q4

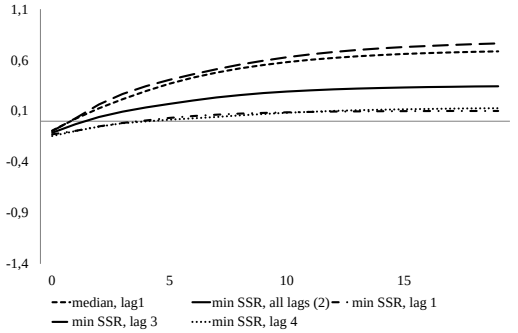
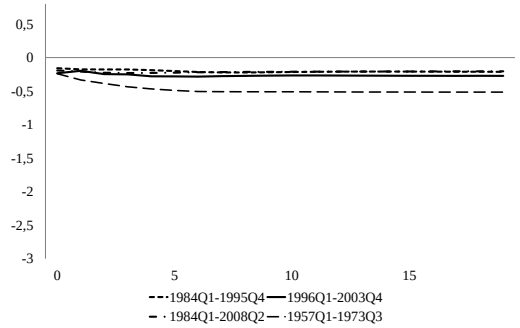
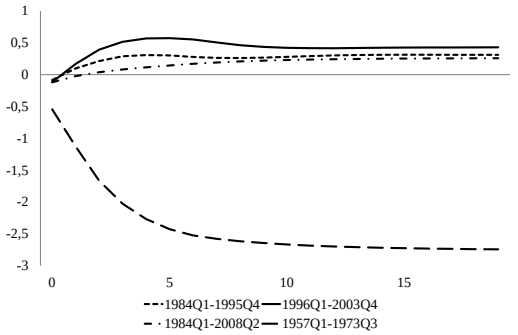


Figure 6: Response of hours as to a 1% sd shock to TFP in different sub-samples. Threshold fixed at the median value of each sample, lag 1.

(a) High growth regime



(b) Low growth regime



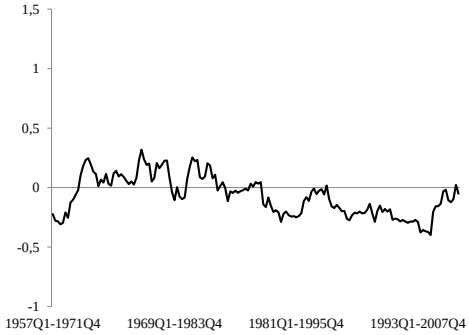
concentrate upon shorter time periods, namely, the pre-Volcker high productivity growth periods (1957Q1-1973Q2); the Great Moderation low productivity growth era (1984Q1-1995Q4), and the Great Moderation high productivity growth sample (1996Q1-2003Q4).[1] Moreover, we add the response of hours worked during the Great Moderation period (without the Great Recession). As it is shown in Figure 6, independently on the chosen period, nothing changes in the high-growth regime, whereas it is clear the switch in the pattern of the GIRFs in the bad state of the economy, with the response of hours abundantly negative in the first part of the sample (1957Q1-1973Q2), turning positive in the second part. Also notice that the two periods characterized by high productivity growth, namely 1957Q1-1973Q2 and 1996Q1-2003Q4, return the lowest (the former) and the highest (the latter) response of hours worked as to technology shocks.

Finally, in the paper we provide evidence stemming from a (20 years) rolling window exercise

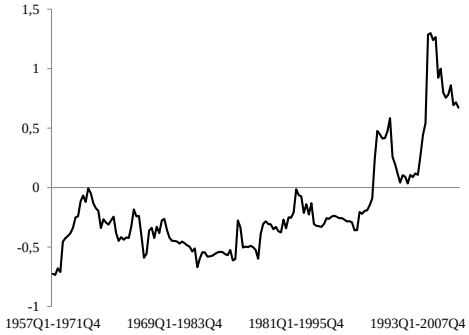
[1]We excluded from our analysis the pre-Volcker low productivity growth sample (1973Q3-1979Q2), given the extremely limited amount of observations. We also did not considered the last low productivity growth period (2004Q1-2011Q4), as the last results would be strongly affected by the Great Recession.

Figure 7: Response of hours after 10 quarters as to a 1% sd shock to TFP. 15 years rolling windows. Threshold fixed at the median value of each sample, lag 1.

(a) High growth regime



(b) Low growth regime



showing that the exact timing of the break in the response of hours as to technology shocks has to be fixed at around the mid 80s. It goes without saying that the chosen length of the window may affect the results. In Figure 7 we report evidence based on a shorter window length (15 years). With respect to the main results reported in the paper, we observe that the timing of the shift has to be placed a couple of years later (1988Q4). This does not only coincide with the full inclusion of the high productivity growth period in the sample, but also with the dot-com bubble and ensuing recession in the early 2000s. Moreover, the peak in the response (1994Q2-2009Q1) contains both periods characterized by high productivity growth and quarters in which productivity has been more stagnant. Moreover, both dot-com bubble recession and 3 quarters of the Great Recession have to be included. Thus the response during recessions and the role of transmission mechanisms at work in bad state of the economy seem to have been key in shifting the GIRFs of hours since the mid eighties.

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