A note on technology shocks and the Great Depression

Inklaar, Robert; de Jong, Harmen; Gouma, Fokke Reitze

Published in:
Journal of Economic History

Publication date:
2016

Citation for published version (APA):
Inklaar, R., de Jong, H., & Gouma, F. R. (2016). A note on technology shocks and the Great Depression. Journal of Economic History, 76(3), 934-936.

A note on technology shocks and the Great Depression

Robert Inklaar, Herman de Jong and Reitze Gouma

March 2016

The paper by Shingo Watanabe (2016) analyses whether technology shocks – the prime driver of business cycles in Real Business Cycles (RBC) models – could have set off the Great Depression, adding to a recent discussion in this JOURNAL. In line with our own work (Inklaar, de Jong and Gouma, 2011), he concludes that an appropriately constructed technology series does not have the positive relationship with factor inputs that is required for RBC models to hold true.

His paper and ours are inspired by the work of Basu, Fernald and Kimball (BFK, 2006), who analyse the same question ("are technology shocks contractionary?") and we each reach the same conclusions as BFK did for the post-World War II period. However, compared with the 'gold standard' of BFK, analysing the pre-WW II period requires compromises; for instance, regarding the data. In our paper, this led us to analyse biennial *census data* on gross output and inputs for 19 manufacturing industries for the 1919–1939 period, which precluded us from analysing annual fluctuations. Watanabe (2016) used annual value added data for the private non-farm sector for the period 1892–1996, which requires assumptions regarding technology. Neither empirical setting matches BFK's annual industry-level data which covered the entire non-farm sector after WW II, but taken together the paper of Watanabe (2016) and our own (Inklaar, de Jong and Gouma, 2011) present a compelling case against RBC models of the Great Depression.

Although Watanabe (2016, p. 17) argues that our results "may be partly due to coincidence", we would argue that the criticisms raised do not warrant such a drastic assertion and that, instead, the two papers should be seen as providing convincing and complementary evidence.

Comparing the empirical analyses, Watanabe argues that we should have run a weighted regression and excluded oil prices as an instrument. Yet both changes would have led to a fairly modest increase in the estimated return to scale (from 1.17 to 1.23) with no effect on our findings.[1] Another criticism is that the change in his (non-farm sector) technology series is differently signed than in our (manufacturing) technology series in many periods. However, there are very few years in which the sign of non-farm technology change can be determined

[1] Details available on request, or easily estimated from the online dataset to our paper.

with (statistical) confidence (Watanabe, 2016; Figure 1) and no compelling reason why the signs should match in the two different sectors. The argument that we should have been able to recover an (effectively) one-year negative response of technology on hours worked with biennial data is even less convincing.[2]

A larger discussion is whether our specification lets us adequately capture unmeasured changes in input utilization. It is true that by not finding a significant effect of changes in average hours paid per worker, we cannot follow the same identification strategy as BFK and Watanabe, ending up, rather, with a different specification than the theoretical ideal. At the same time, in his analysis, Watanabe has to resort to stringent assumptions about production technology; specifically that intermediate inputs and factor inputs are used in strict proportion. Such an assumption has been repeatedly rejected in the literature, including in our work when we demonstrate the bias in coefficients when estimating our parameters in a value added rather than a gross output framework (Inklaar, de Jong and Gouma, 2011, page 847 and Online Appendix Table 8).

It is not hard to come away from this discussion with a sense of disappointment about the quality of the data available to hold this debate. However, we would offer a more optimistic conclusion, namely that whatever the shortcomings in the analyses, they are apparently not critical to the central argument of these two papers. And the fact that two studies, each with its own limitations, comes to the conclusion that technology shocks did not drive the Great Depression should certainly be considered scholarly progress.

References

Basu, Susanto, John G. Fernald, and Miles S. Kimball. "Are Technology Improvements Contractionary?" *American Economic Review* 96*,* no. 5 (2006): 1418–48.

Inklaar, Robert, Herman de Jong, and Reitze Gouma. "Did Technology Shocks Drive the Great Depression? Explaining Cyclical Productivity Movements in U.S. Manufacturing, 1919-1939." *Journal of Economic History* 71, no. 4 (2011): 827-858.

Watanabe, Shingo. "Technology Shocks and the Great Depression" forthcoming *Journal of Economic History*, (2016).

[2] In a regression of technology z on hours worked h, the parameter of interest is β_1 in $\log(h_t - h_{t-1}) \equiv dh_t = \beta_1 dz_t + \beta_2 dz_{t-1} + \beta_3 dz_{t-2}$, which was significantly negative in BFK. The same equation, lagged one year is $dh_{t-1} = \beta_1 dz_{t-1} + \beta_2 dz_{t-2} + \beta_3 dz_{t-3}$. The biennial nature of our data means that dx_t and dz_t are not observed, but rather $(dx_t + dx_{t-1})$ and $(dz_t + dz_{t-1})$. This means that β_1 cannot be identified using biennial data: adding up the two equations leads to $(dx_t + dx_{t-1}) = \beta_1 dz_t + (\beta_1 + \beta_2) dz_{t-1} + (\beta_2 + \beta_3) dz_{t-2} + \beta_3 dz_{t-3}$.