Review of Economic Dynamics 17 (2014) 224–242

Contents lists available at ScienceDirect

Review of Economic Dynamics

www.elsevier.com/locate/red

Sources of business fluctuations: Financial or technology shocks?

Sohei Kaihatsu, Takushi Kurozumi *

Bank of Japan, 2-1-1 Nihonbashi Hongokucho, Chuo-ku, Tokyo 103-8660, Japan

ARTICLE INFO

Article history:
Received 5 November 2011
Received in revised form 1 August 2013
Available online 13 August 2013

JEL classification:
E22
E32
E44
E51

Keywords:
Business fluctuation
Neutral and investment-specific technology shocks
Financial accelerator mechanism
External finance premium shock
Boom–bust cycle

ABSTRACT

Despite the widespread belief that technology shocks are the main source of business fluctuations, recent empirical studies indicate that in the absence of financial frictions, a shock to the marginal efficiency of investment is the main source and is closely related to financial conditions for investment. We incorporate a financial accelerator mechanism and two types of financial shocks to the external finance premium and net worth in a dynamic stochastic general equilibrium model with shocks to the marginal efficiency of investment, the investment-good price markup, and the rates of neutral and investment-specific technological changes. This model is estimated using eleven US time series that include data on loan, net worth, the loan rate, and the relative price of investment. Our estimation results show that the (non-stationary) neutral and investment-specific technology shocks primarily drive output and investment fluctuations, while the external finance premium shock plays an important role for investment fluctuations. This financial shock induced substantial falls and subsequent sharp hikes in the external finance premium and caused boom–bust cycles over the past two decades.

1. Introduction

In the literature (e.g., King and Rebelo, 1999), technology shocks have been considered the main source of business fluctuations. Prescott (1986) claimed that "technology shocks account for more than half the fluctuations in the postwar period, with a best point estimate near 75 percent." However, the recent severe economic downturn caused by the collapse of credit bubbles has provoked a re-evaluation of this conventional view on business fluctuations. Moreover, Justiniano et al. (2010, 2011) empirically demonstrate that in the absence of financial frictions, a shock to the marginal efficiency of investment (MEI)—which affects the transformation of investment goods into capital goods (Greenwood et al., 1988)—is the main source of both output and investment fluctuations in US and that this shock is highly correlated with a credit spread and is thus likely to represent a disturbance to the intermediation ability of the financial sector.[1] Similarly, Hirose and Kurozumi (2012a) show that the investment boom–bust cycle during the late 1980s and the 1990s in Japan was caused by a MEI shock and that this shock is related to firms' financial position. These empirical findings pose the question as to what is the major source of business fluctuations, financial or technology shocks.

To address this question, we incorporate the financial accelerator mechanism of Bernanke et al. (1999) and two types of financial shocks to the external finance (EF) premium and net worth in a dynamic stochastic general equilibrium (DSGE)

* Corresponding author.
E-mail addresses: souhei.kaihatsu@boj.or.jp (S. Kaihatsu), takushi.kurozumi@boj.or.jp (T. Kurozumi).

[1] See also Khan and Tsoukalas (2011, 2012) and Schmitt-Grohe and Uribe (2012) for the importance of a MEI shock for US business fluctuations in an estimated dynamic stochastic general equilibrium model with no financial friction.

1094-2025/$ – see front matter
http://dx.doi.org/10.1016/j.red.2013.08.001

model with shocks to the MEI, the investment-good price markup, and the rates of neutral and investment-specific (IS) technological changes. This model is estimated using eleven US time series: output growth, consumption growth, investment growth, labor, wage growth, consumption price inflation, changes in the relative price of investment, the policy rate, the loan rate, loan growth, and net worth growth.

This paper obtains three main findings. First, technology shocks mainly drive output and investment fluctuations. The primary source of fluctuations in output growth is the (non-stationary) neutral technology shock. This shock generates the comovement of output growth with consumption growth, investment growth, loan growth, and net worth growth observed in the data and hence primarily drives output fluctuations. The main source of fluctuations in investment growth is the (non-stationary) IS technology shock, since this shock causes investment growth to comove with output growth, loan growth, and net worth growth and to have weak correlation with the loan rate as observed in the data.[2] Second, the EF premium shock plays an important role for investment fluctuations, whereas the roles of the net worth and MEI shocks are minor. A negative shock to the EF premium and positive shocks to net worth and to the MEI all boost investment and output growth. Then, the EF premium shock lowers the loan rate (i.e., a countercyclical loan rate) and raises loan growth and net worth growth, but the net worth shock reduces loan growth (i.e., countercyclical loan) and the MEI shock increases the loan rate (i.e., a procyclical loan rate) and decreases net worth growth (countercyclical net worth). The EF premium shock represents a disturbance to the financial sector that boosts the EF premium beyond the level warranted by currently available information about the state of the economy. This financial shock induced substantial falls and subsequent sharp hikes in the EF premium and caused boom–bust cycles over the past two decades. Third, the joint use of the four data on loan growth, net worth growth, the loan rate, and changes in the relative price of investment in estimation is indispensable to our results regarding investment fluctuations. In the absence of the loan rate data, the EF premium shock becomes the main source of fluctuations in investment growth, whereas the MEI shock does so without the data on loan or net worth,[3] and no data on loan makes the net worth shock the secondary source of the fluctuations. Moreover, the absence of the data on the relative price of investment causes the investment-good price markup shock to become the primary or secondary source.

In the literature, the most closely related, complementary studies have been done by Christiano et al. (2010b) (henceforth, CMR) and Gilchrist et al. (2009b) (henceforth, GOZ).[4] Compared with our study, CMR develop a model that has a richer structure of the financial sector, and estimate it with 16 US time series that contain more financial data such as bank reserves and liquidity aggregates. Consequently, their estimation result is in favor of a financial shock called the risk shock—which is similar to our EF premium shock—as the main source of US business fluctuations. In addition to the baseline model, they also estimate a simpler model called the financial accelerator model—which is similar to our model but contains no non-stationary IS technology shock—using eleven US time series that include the data on the relative price of oil but not the loan data. They then show that a neutral technology shock is the primary source of output fluctuations, while a financial wealth shock—which is consistent with our net worth shock—and a MEI shock are the main sources of investment fluctuations. Their estimation of the financial accelerator model is comparable to ours and there are two crucial differences. First, the IS technology shock is non-stationary in our model. Second, our estimation uses the loan data. As mentioned above, the absence of the loan data in our estimation enlarges the contribution of the MEI shock as well as that of the net worth shock—which is identical to the financial wealth shock in CMR—to investment fluctuations. Besides, without the non-stationary IS technology shock, the investment-good price markup shock—which captures almost the same wedge as the stationary IS technology shock in CMR—is determined only by the data on the relative price of investment, which in turn lessens the contribution of such a shock to investment fluctuations. Indeed, when we exclude the non-stationary IS technology shock from our model and the loan data from our dataset as in CMR's estimation of the financial accelerator model, the estimation result is in line with theirs.

GOZ estimate a DSGE model that is similar to ours but does not incorporate any investment shocks, using eight US time series that include the credit spread measured by Gilchrist et al. (2009a). GOZ then show that financial shocks—a net worth shock in particular—explain a substantial portion of fluctuations in output and investment growth. Our study differs from theirs in two respects. First, the IS technological change and the shocks to the IS technology, the MEI, and the investment-good price markup are present in our model. Second, the data on loan, net worth, and the relative price of investment are used in our estimation. The IS technological change is incorporated because a downward trend is observed in the data on the relative price of investment.[5] This data is thus indispensable to the estimation of the trend in IS technological change—which is a decisive factor for the trend in investment—and the shocks to the IS technology and the investment-good price

[2] Greenwood et al. (2000) indicate that an IS technology shock plays a crucial role for US business fluctuations, using a calibrated DSGE model. Fisher (2006) estimates a structural vector autoregression model and shows the importance of a non-stationary IS technology shock for US business fluctuations.

[3] As Justiniano et al. (2011) indicate, the MEI shock induces a countercyclical capital price. This countercyclicality is not consistent with movements in total capital determined by the data on loan and net worth. Therefore, the joint use of these two data in estimation weakens the role of the MEI shock for business fluctuations.

[4] CMR, GOZ, and our study all develop a DSGE model for non-stationary variables and estimate it with non-detrended data, whereas in previous studies on the financial accelerator mechanism (e.g., Christensen and Dib, 2008; De Graeve, 2008; and Hirose, 2008) a DSGE model for stationary variables is estimated with detrended data. Our strategy of modeling and estimation is of crucial importance in examining the sources of business fluctuations, since the estimates of trends in technological changes determine those of trends in data for estimation and hence the magnitude and direction of the business cycle component of the data.

[5] Greenwood et al. (1997) indicate the importance of IS technological change for US economic growth.