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Fields

Monetary Economics & Macroeconomics, with special interest in expectations

Education

PhD in Economics, Boston College, USA, Expected 2021.
Master in Economics, Boston College, USA, 2016.
Master in International and Monetary Economics, University of Berne, Switzerland, 2013.
Master in Art History and Curatorial Studies, University of Berne, Switzerland, 2014.
Bachelor in Economics, University of Berne, Switzerland, Major: Economics, Minor: Art History, 2011.

Working Papers

ICT-Specific Investment Shocks and Economic Fluctuations - Evidence and Theory of a General-Purpose Technology (with Marco Brianti)

Talking in Time - Dynamic Central Bank Communication

Key Coursework

Advanced Marco: Computation, Estimation & Applications
Monetary Economics II
Time Series Econometrics
International Finance
Empirical Methods in Macro & Finance
Applied Macroeconomics
International Macroeconomics
Applied Econometrics

Research undertaken in AI:

ICT-Specific Investment Shocks and Economic Fluctuations - Evidence and Theory of a General-Purpose Technology (with Marco Brianti)

Project Description

Although there is large consensus on the importance of productivity as a driver of economic performance, there is less agreement on the underlying sources of productivity growth. For several years, much of the business-cycle literature decided to avoid such questions by proxying movements in productivity by exogenous shocks.[1] However, the robust empirical evidence of the slowdown in productivity right before the Great Recession has led recent literature to take a step back and devote more attention to the drivers of medium-term productivity growth.[2]

Along with Comin and Gertler (2006), theoretical contributions rationalize endogenous productivity dynamics by incorporating features of endogenous growth models in standard models of business cycles. Following Romer (1990), most of these papers augment final-good production functions with an expanding composite of intermediate goods invented by the Research & Development (R&D) sector in order to allow for an endogenous rate of adoption of new technologies.[3] Guided by the prediction of such theoretical work that R&D developments matter for growth, other papers attempt to provide empirical evidence of a slowdown in the productivity of the R&D sector. Specifically, they show that although research effort keeps rising, the rate of new ideas and discoveries is slowing down.[4]

Motivated by this wave of research, this paper follows a different path and argues that Information and Communication Technology (hereafter ICT) plays an important role in driving medium-term productivity in sectors that are ICT users. Our contribution is twofold. First, we provide robust empirical evidence to show that current rises in ICT investment explain significant and persistent increases in future Total Factor Productivity (hereafter TFP). Second, we analyze a standard theoretical framework in order to both rationalize our empirical results and to draw conclusions concerning the nature of the ICT contribution to future productivity.

In the empirical section, we identify technological shocks specific to the ICT sector in a Structural VAR context.[5] Our multivariate system includes three key variables: TFP, ICT investment (hereafter ICTI), and relative prices (hereafter RP). ICTI is defined as the total expenditure in equipment and computer software meant to be used in production for more than a year. Thus, an

[1] Kydland and Prescott (1982) and Long Jr and Plosser (1983) are among the first papers which consider productivity shocks in general equilibrium models.

[2] See Cette et al. (2016) and Byrne et al. (2016) among others.

[3] Bianchi et al. (2014), Anzoategui et al. (2016), Moran and Queralto (2017) and Guerron and Jinnai (2015) use similar techniques to endogenize growth. Bianchi et al. (2014) augment a DSGE model using a quality ladders model in the vein of Grossman and Helpman (1991). Anzoategui et al. (2016), Moran and Queralto (2017) and Guerron and Jinnai (2015), similarly to Comin and Gertler (2006), use a model of expanding variety à la Romer (1990).

[4] Jones (2009) and Bloom et al. (2017) are two contributions that highlight these facts.

[5] An interesting paper related to our empirical work is Jafari Samimi and Roshan (2012). The authors identify ICT shocks as a potential driver of the Iranian business cycle using a completely different identification strategy and obtaining qualitatively different results.

increase in ICTI is ICT capital deepening. RP is the ratio between the price level of ICT durable goods and the price level in the overall economy.

In response to this shock, ICTI rises on impact and remains significant for several quarters. RP persistently and significantly declines for more than two years, suggesting that we are indeed identifying the correct sectoral shock. Our main result is that TFP, restricted not to respond on impact, rises after few quarters and remains significant and stable for at least 5 years, despite the tiny size of the ICT sector relative to the economy. Finally, variance decomposition analysis suggests that ICT shocks explain a remarkable size of economic fluctuations over the medium and long run. These shocks drive about 40% and 33% of the overall GDP and TFP fluctuations over a 10-year horizon, respectively.

In order to understand the economics behind our empirical results, we then analyze a two-sector DSGE model which allows ICT to be the general-purpose technology (hereafter GPT) of the whole economy. There are two main justifications for interpreting ICT as a GPT. On the one hand, there is a vast literature that makes a case for the general-purpose nature of ICT capital.[6] On the other hand, the tiny share of the ICT sector both in overall investment and overall output makes our results of a strong and persistent TFP increase after an ICT shock hard to interpret in absence of an additional force such as an externality coming from the general-purpose property of ICT capital.

In our model, both sectoral production functions are fed with three inputs: (i) labor, supplied by households, (ii) hard capital, produced by the final sector, and (iii) ICT capital, produced by the ICT sector. As explained by both Basu et al. (2003) and Basu and Fernald (2007), a GPT should be able to enhance accelerations in productivity in sectors that are users of the underlying technology. We then interpret ICT as the GPT of the last 30 years of the U.S. economy assuming that exogenous technological changes in the ICT sector are able to affect economy-wide productivity above the direct effect coming from the technology increase itself.[7] In particular, when an ICT technology shock arrives, both sectors accumulate ICT capital since it is easier to produce and cheaper to buy. This ICT capital deepening consequently enhances the productivity of both sectors by means of a spillover coming from the accumulated ICT capital stock.

As a last step, we use both our empirical and theoretical results to estimate the key parameters of the model via impulse-response matching to an ICT technology shock. The key parameters are (i) the elasticity of productivity to ICT capital diffusion, namely the parameter which governs the spillover effect, and (ii) the standard deviation and (iii) persistence of ICT technology shocks. Results consistently obtain a positive spillover effect of ICT capital deepening on TFP, confirming that within this class of theoretical models, data supports the existence of spillovers from ICT capital. Thus, our theoretical model suggests to interpret the responses obtained in the empirical

[6] See for example Oliner and Sichel (2000) and Stiroh (2002) amongst others.

[7] A clarification is in place here. In a two-sector model, total factor productivity is a convolution of the two exogenous productivities. Thus sectoral productivity changes trivially show up in TFP as a direct effect. Our assumption of ICT capital being a GPT means that overall productivity responds much more to an ICT-sector-specific technology shock than warranted by this shock directly. We address this question in detail in the main text in Section **??**.

section in light of ICT as a general-purpose technology which enhances productivity of ICT capital users through a spillover effect related to its own diffusion.

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