

ICT-Specific Investment Shocks and Economic Fluctuations

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Convegno RECent

Modena

Motivation

Empirical Fact. U.S. output has expanded only slowly in the aftermath of the financial crisis

Fernald, Hall, Stock and Watson (2017) empirically show that two components explain nearly all this growth gap

- ① Slow growth in total factor productivity (TFP)
- ② Falling labor force participation

In this paper we focus on the **slowdown in TFP**,

⇒ Which variable actually boosted productivity in the last three decades? Why?

An alternative to R&D Investment

Several papers endogenize TFP through **R&D investment**

- Financial crisis $\Rightarrow \downarrow Y \Rightarrow \downarrow \text{R\&D} \Rightarrow \downarrow \text{TFP}$

However, as showed by Oliner et al. (2007) and Jorgerson et al. (2008), TFP have started slowing down **before** the crisis.

\Rightarrow R&D cannot be the full story

We follow an alternative avenue and focus on the relation between **Information and Communication Technology Investment** (ICTI) and total factor productivity

- *Acquisition of equipment and computer software meant to be used in production for more than a year.*

Our Contribution

- ① **Empirical Contribution** that contemporaneous jumps in ICTI explain significant and persistent increases in future TFP
 - Structural VAR techniques on U.S. aggregates to identify ICT investment shocks

- ② We analyze a **theoretical model** to rationalize our empirical findings and draw conclusions concerning the nature of ICT
 - We extend the 2-sector GE model of Greenwood et al. (1997) to accommodate for the role of ICT capital in production

Empirical Analysis

We estimate a structural VAR using aggregate quarterly US data from 1989Q1 to 2017Q2.

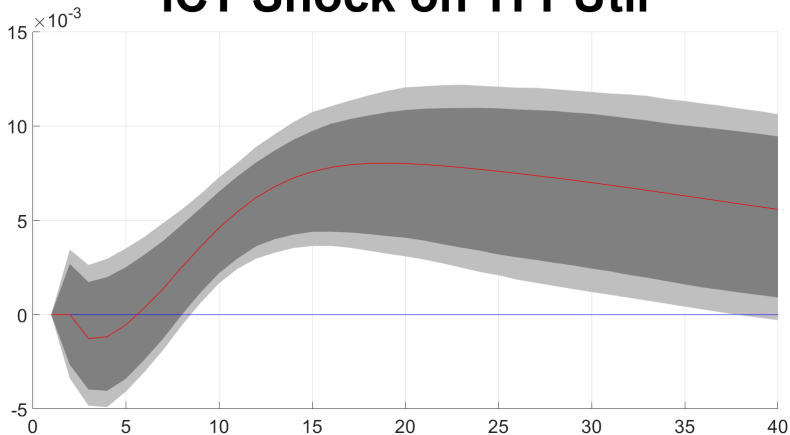
$$X_t = B(L)X_{t-1} + \underbrace{A\varepsilon_t}_{u_t} \quad (1)$$

- $X_t = [TFP_t \quad ICTI_t \quad RP_t \quad Y_t]$ where $RP_t = \pi_t^{IT} / \pi_t^{CPI}$
- Y_t represents the log transformations of endogenous variables
- A is Cholesky decomposition of $\Sigma_u = u_t' u_t$

Focus is on the second structural shock $\varepsilon_{2,t}$

$\Rightarrow \varepsilon_{2,t}$ maximizes the impact effect on $ICTI_t$ and is orthogonal to contemporaneous innovations in TFP

ICT Shock on TFPUtil



Impulse Responses of X_t to $\varepsilon_{2,t}$

Variance Decomposition Analysis and Robustness Checks

- ICT shocks are an **important driver** of economic fluctuations
 - Around 30% of TFP fluctuations over 10-year horizon
 - Almost 40% of GDP fluctuations over BC frequencies
- **Results are robust** after
 - controlling for news shocks à la Barsky and Sims
 - controlling for other shocks estimated via narrative approach
 - ordering TFP after ICT investment

Takeaway

We identify a shock specific to the ICT sector where prices and quantities move in different directions

Although TFP does not move on impact, it start rising significantly after a couple of years

- this effect is significant and economically meaningful
- Supply shocks specific to the ICT sector explain a large part of medium-run TFP fluctuations
 - ICT prices fall relatively to CPI
- Shocks which explains large part of TFP fluctuations