ICT and Future Productivity: Evidence and Theory of a GPT*

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Abstract

Information and Communication technology (ICT) is able to explain accelerations in productivity in sectors that are ICT users. We employ Structural VARs to investigate the effects of ICT supply shocks on Total Factor Productivity (TFP) and other macroeconomic variables. In response to this sector-specific supply shock relative prices of ICT goods and services immediately fall, ICT investment rises on impact, and TFP displays a delayed significant and persistent increase. In line with theories of ICT as a general-purpose technology, we analyze a two-sector general equilibrium model in order to rigorously rationalize previous results and estimate key parameters via impulse-response matching. We conclude that ICT accumulation is able to enhance productivity through a positive spillover effect which takes into account the overall level of diffusion of ICT capital in the economy.

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1 Introduction

Although there is large consensus on the importance of productivity as a driver of economic performances, less agreement is on the underlying sources that enhance its growth. For several years, most of the business-cycle literature purposely decided to avoid such a question by proxying movements in productivity as random shocks.[1]

However, the robust empirical evidence of the slowdown in productivity right before the great recession is summoning the literature to take a step back and devote more attention on the drivers of medium-term productivity growth.[2]

Along Comin and Gertler (2006), some theoretical contributions rationalize endogenous productivity dynamics by adapting features of endogenous growth models into DSGE models. Following Romer (1990), most of those papers augment final-good production functions with an expanding composite of intermediate goods produced by the R&D sector in order to allow for an endogenous rate of adoption of new technologies.[3] Consistent with those previous models, some other papers are exerting effort to show that although research effort is rising, the productivity of the research sector is slowing down.[4]

Motivated by this wave of research, in this paper we empirically investigate which has been one of the main driver of total factor productivity (hereafter TFP) in the last 30 years and how our results can be theoretically rationalized.

We employ Structural VARs to investigate the effects of ICT supply shocks on Total Factor Productivity (TFP) and other macroeconomic variables. In response to

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

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

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

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

this sector-specific supply shock relative prices of ICT goods and services immediately fall, ICT investment rises on impact, and TFP displays a delayed significant and persistent increase. In line with theories of ICT as a general-purpose technology, we analyze a two-sector general equilibrium model in order to rigorously rationalize previous results and estimate key parameters via impulse-response matching. We conclude that ICT accumulation is able to enhance productivity through a positive spillover effect which takes into account the overall level of diffusion of ICT capital in the economy.

2 Empirics

3 Model

4 Conclusion

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References

Anzoategui, D., D. Comin, M. Gertler, and J. Martinez (2016). Endogenous technology adoption and r&d as sources of business cycle persistence. Technical report, National Bureau of Economic Research.

Bianchi, F., H. Kung, and G. Morales (2014). Growth, slowdowns, and recoveries. Technical report, National Bureau of Economic Research.

Bloom, N., C. I. Jones, J. Van Reenen, and M. Webb (2017). Are ideas getting harder to find? Technical report, National Bureau of Economic Research.

Byrne, D. M., J. G. Fernald, and M. B. Reinsdorf (2016). Does the united states have a productivity slowdown or a measurement problem? *Brookings Papers on Economic Activity 2016*(1), 109–182.

Cette, G., J. Fernald, and B. Mojon (2016). The pre-great recession slowdown in productivity. *European Economic Review 88*, 3–20.

Comin, D. and M. Gertler (2006). Medium-term business cycles. *American Economic Review 96*(3), 523–551.

Grossman, G. M. and E. Helpman (1991). Quality ladders in the theory of growth. *The Review of Economic Studies 58*(1), 43–61.

Jones, B. F. (2009). The burden of knowledge and the "death of the renaissance man": Is innovation getting harder? *The Review of Economic Studies 76*(1), 283–317.

Kydland, F. E. and E. C. Prescott (1982). Time to build and aggregate fluctuations. *Econometrica: Journal of the Econometric Society*, 1345–1370.

Long Jr, J. B. and C. I. Plosser (1983). Real business cycles. *Journal of political Economy 91*(1), 39–69.

Moran, P. and A. Queralto (2017). Innovation, productivity, and monetary policy. *Journal of Monetary Economics*.

Romer, P. M. (1990). Endogenous technological change. *Journal of political Economy 98*(5, Part 2), S71–S102.