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The productivity paradox and the new economy: The Spanish case

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Abstract

This paper studies the impact of the information and communication technologies (ICT) on economic growth in Spain using a dynamic general equilibrium approach. Contrary to previous works, we use a production function with six different capital inputs, three of them corresponding to ICT assets. Calibration of the model suggests that the contribution of ICT to Spanish productivity growth is very relevant, whereas the contribution of non-ICT capital has been even negative. Additionally, over the sample period 1995–2002, we find a negative TFP growth and productivity growth. These results together aim at the hypothesis that the Spanish economy could be placed within the productivity paradox.

JEL classification: E22; O30; O40

Keywords: New economy; Information and communication technologies; Technological change; Productivity paradox

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1. Introduction

An easy beginning for this paper could highlight the impact of information and communications technologies (ICT) on economic growth. Indeed, the US has experienced a robust acceleration in its productivity growth rate during the 1990s, compared to that of EU. This episode has taken place in a context in which the US investment in ICT has been much higher than that of the EU. Particularly, Jorgenson and Stiroh (2000) and Jorgenson (2001) have related the increase in the US productivity growth since the mid-1990s to the growth rate of investment in ICT and the rise in total factor productivity (TFP) growth, mainly in IT production. Oliner and Sichel (2000) and Baily and Lawrence (2001) have extended these positive effects to the non-IT production sector of the US economy. By contrast, investment in ICT appears to be less growth-enhancing in a number of countries where the levels of ICT investment are smaller (Colecchia and Schreyer, 2002; Daveri, 2002; Vijselaar and Albers, 2002).

But things are more complex than a first sight might guess. The measured impact of ICT on aggregate productivity has been very limited so far and their effects take long to become visible in the macro-economic aggregates. Even for the successful cases, a number of papers have found that the positive impact of ICT on growth is not so straightforward as expected, but a set of issues appear as necessary conditions to be hold (Wolff, 1996; Samaniego, 2006). In this regard, the statement by Robert Solow is probably one of the most categorical: "You can see the computer age everywhere these days, except in the productivity statistics" (New York Times Book Review, July 12th 1987). Henceforth, we will refer to the case where investment in ICT does not seem to be reflected in productivity as the productivity (or Solow) paradox.

In this context, Spain is an interesting case to be studied. Its high growth rates of output since 1995 (above 3.5% a year as average) contrast to the small contribution of ICT to growth and labor productivity (the smallest within the EU-15). Moreover, this situation is compatible with higher rates of growth in ICT capital assets than in non-ICT capital and a negative growth rate of the TFP. Mas and Quesada (2006) detect that the behavior of ICT intensive sectors in terms of growth rates of output is better as relative to the non-intensive ICT sectors. However, they also find negative TFP growth rates even in the ICT intensive sectors.

This paper tries to shed light on the effect of ICT expansion on output and labor productivity growth in Spain. With this aim, we have used a computable dynamic general equilibrium (DGE) model. Papers by Greenwood et al. (1997, 2000), Kiley (2001), Pakko (2002a, 2005) – all of them calibrated to the US economy – Carlaw and Kosempel (2004) for the Canadian economy and Bakhshi and Larsen (2005) for the UK economy, provide examples of this methodology applied to technological changes. To the best of our knowledge, this is the first paper dealing with a DGE model for capturing the impact of ICT on Spanish economy and the first paper calibrating a DGE model with six types of capital and considering the technological change specific to each type of capital. Moreover, regarding the data used in the calibration, we follow the main branch of recent literature of growth accounting and the recommendations of OECD (2001a,b); (Mas and Schreyer, 2006), which focus on the concept of capital services, instead of gross or net capital stocks.

On the basis of model calibration over the period 1995–2002, our main results show that Spain may be placed in the productivity paradox. Despite the relatively high growth rates of ICT investment, we find a negligible impact on productivity of the traditional