Investigation of Determinants of Total Factor Productivity: 
An Analysis of the Impact of Investments in Telecoms on Economic Growth in Productivity in the Context of Transition Economies

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ABSTRACT

The limited resources of Transition Economies (TE) accentuate the need for formulating effective and efficient policies for investments in Information and Communication Technologies (ICT). However, the empirical evidence required for sound decision making is scarce, thus prompting a call for additional studies in the area of macroeconomic impact of investments in ICT. Using two time series data sets, one for the period from 1993 to 2002, and another for the period from 2003 to 2008, we investigate the impact of investments in telecoms on Total Factor Productivity (TFP) in the context of the TEs of Central Europe. Results suggest that while all TEs exhibited overall growth in productivity, the annual growth of the majority was inconsistent and not determined by the increase in the levels of investments in telecoms and full-time telecom labor. Further, a comparison of the two periods suggests that the most significant difference between those periods is that the dominant source of growth in productivity in the later transition period (2003-2008) is efficient utilization of the already available technology, while in the former transition period it was technological changes.

Keywords: Economic Development, Information and Communication Technologies (ICT), Investments in ICT, Total Factor Productivity, Transition Economies

1. INTRODUCTION

An overall reduction in the level of investments in information and communication technologies (ICT) is just one of the likely results brought about by current economic conditions. The depth of reduction, however, is not uniform across economies. During the 1990s, the impact of investments in ICT on the macroeconomic bottom line was especially pronounced in the United States (Oliner & Sichel, 2000; Van Ark et al., 2002; Jorgenson, 2003) and, albeit to a lesser degree, in some of the OECD countries (Colecchia & Schreyer, 2002; Van Ark et al., 2002; Jorgenson, 2003).
Because it has been established that investments in ICT contribute reliably to the macroeconomic bottom line of the developed countries (OECD, 2002), the reduction in the level of investments in these economies might be minimal.

In the context of developing and transition economies (TE), however, the outcomes of investments in ICT are mixed (Dewan & Kraemer, 2000); as a result, a TE might be required to present evidence that such investments can be effectively and efficiently transformed into macroeconomic output (Heeks, 2009). Moreover, despite the significant increase in the level of adoption of ICT by European countries in the period around 1998-2002, their levels of productivity, unlike those in the US, started to decline and disparities in the macroeconomic outcomes of investments in ICT among economies became obvious (Daveri, 2002). Such a reduction in growth, even among well-heeled developed countries, clearly requires TEs to demonstrate that their limited technical, financial and human resources are not wasted (Indjikian & Siegel, 2005).

From the perspective of the widely used framework of neoclassical growth accounting (Brynjolfsson & Hitt, 1996), an increase in the macroeconomic bottom line, often represented by GDP, may come from two sources. The first source is provided by the available levels of capital and labor, and the second source is reflected by Total Factor Productivity (TFP). While the most straightforward way of improving a macroeconomic bottom line is simply by increasing the levels of available capital and labor, for economies with limited resources a contribution coming from TFP is preferable. This is because TFP represents the macroeconomic growth that is not accounted for by the increase in the levels of capital and labor, and is not subject to the law of diminishing returns. Most investigations linking ICT and growth in productivity have been conducted in the context of developed countries (McGuckin et al., 1998).

The overall purpose of this research, conducted in the context of European TEs, is to identify whether the ICT sector of those economies exhibited growth in TFP (heretofore we use TFP and productivity interchangeably) associated with investments in ICT; specifically, we investigate two periods: a period of early transition (1993-2002) and a period of a later transition (2003-2008). We have decided to start our analysis in 1993 because that year provided a common starting point for TEs. Our reasoning was that it took a year from the fall of the Berlin’ Wall in 1991 for the process of transition to start, but year 1992 as a starting point could have favoured “early starters.” After that, ten years seemed to be a reasonable period of time to allow for the changes to occur and the first results to take place. The duration of the second period was primarily determined by the availability of relevant data and the beginning in 2008 of the period of economic instability. In this investigation we use telecoms as a surrogate for general ICT. Not only it is a subset of ICT, but investments in telecoms are also common to almost all economies of the world.

Overall, we aim to answer two questions: 1) Do the TEs in the sample exhibit continuous growth in TFP? and 2) What are some of the factors impacting growth in TFP? The potential for investments in ICT to generate high levels of productivity growth in the context of TEs has been noted (Indjikian & Siegel, 2005); however, it is not clear whether that potential has been realized. Previous investigations established that in order for investments in ICT to impact the economic bottom line, the level of investments must be above a certain threshold, and such investments must be complemented by other factors, notably, investments in human resources (Bresnahan et al., 2002; Brynjolfsson et al., 2000; OECD, 2004). In this study we focus on the following questions that emerge from our major research questions:

1. **RQ1:** Does the given TE exhibit annual growth in TFP?
2. **RQ2:** Does the given TE exhibit continuous growth in TFP?
3. **RQ3:** Is there a relationship between changes in the level of investments in telecoms and changes in TFP?
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