Chapter 3
Do Investments in ICT Help Economies Grow?
A Case of Transition Economies

Sergey Samoilenko
Averett University, USA

ABSTRACT

A common assumption behind investments in information and communication technologies (ICT) is that of the resultant improvements in productivity. To substantiate this assumption with empirical evidence in the context of transition economies (TE), the authors use time series data sets spanning the period from 1993 to 2008 to inquire into the impact of investments in telecoms on total factor productivity (TFP). Results indicate that the improvements in productivity of the most of TEs in the sample was inconsistent and not based on the increase in the levels of investments and labor. Additionally, the results of the data analysis suggest that the dominant source of growth in productivity is not static, but changes over time. While in an earlier period (1993-2002) of transition, TEs grew based on technological change, it is efficient utilization of the already available technology that became a dominant source of growth in the later (2003-2008) period of transition.

INTRODUCTION

The overall tendency associated with the outcome of investments in Information and Communication Technologies (ICT) is to expect an increasingly greater "bang for a buck." No longer ICT is viewed as a tool of an automation, but rather it is expected to be an agent of transformative change (Balcı, Medeni & Nohutçu, 2013; Abu Tair & Abu-Shanab, 2014). This expectation holds true regardless of the scale of implementation of ICT- be it a case of a bank (Haider & Tang, 2016) or a single economy (Eilu & Auma, 2017), or a group of economies (Samoilenko, 2016). Such expectations are well substantiated by the examples of the impact of investments in ICT on the macroeconomic bottom line in the United States (Oliner & Sichel, 2000; Van Ark *et al*., 2002; Jorgenson, 2003) and in some of the OECD countries (Colecchia & Schreyer, 2002; Van Ark *et al*., 2002).

DOI: 10.4018/978-1-5225-6367-9.ch003

But in the context of transition economies (TE) the outcomes of investments in ICT are mixed (Dewan & Kraemer, 2000), and more evidence is needed that such investments can be effectively and efficiently transformed into significant macroeconomic outcomes (Heeks, 2009). The case of TEs is not unique, for while some European economies increased their level of adoption of ICT in the period around 1998-2002, their levels of productivity actually started to decline, thus demonstrating the disparities in the outcomes of investments in ICT among economies (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). The term *transition economy* refers to a country in the process of transitioning from a centrally planned economy to a market-oriented economy. It does not mean, however, that all TEs constitute a homogenous group in terms of the level of economic development. The World Bank, for example, groups some of them with the developed, and some with the developing countries, depending on the level of industrialization

In order to explore whether investments in ICT can impact the macroeconomic outcomes in the context of TEs, in this study we utilize the research framework of neoclassical growth accounting that is widely used in Information Systems (IS) research (McGuckin & Stiroh, 2002; Brynjolfsson & Hitt, 1996). Within the context of this framework, an increase in the macroeconomic bottom line (e.g., GDP) can come from two sources. The first source is represented by the "white-box" components, such as the available levels of capital (e.g., investments in ICT) and labor (e.g., ICT workforce). The origins of the "white-box" component are clear-cut and transparent. The second source is reflected by Total Factor Productivity (TFP), a "black-box" component origin and composition of which is less clear.

Resultantly, if we are to conceptualize the growth in GDP as a function of capital investments, labor, and "something else", then within the framework of neoclassical growth accounting the term "something else" is represented by TFP, where it serves as the residual (often referred to as *Solow's residual*) term capturing that contribution to GDP that is left unexplained by the inputs of capital and labor.

Of the three inputs used by the growth accounting model, only capital and labor are empirically observable, while the values for TFP must be derived computationally. Based on the idea of the productivity index, originally suggested by Malmquist (1953), Caves et al. (1982) defined the Malmquist index of TFP growth. Later, Färe et al. (1994) demonstrated that the Malmquist index could be constructed based on the results of Data Envelopment Analysis (DEA). Let us recall that DEA calculates the scores of the relative efficiency of Decision Making Units (DMU) (e.g., Transition Economies in the case of our study) relative to the efficient frontier which "envelops" the data set. Since DEA relative efficiency scores are calculated for each point in time t (e.g., year 1993), for a given DMU it is possible to calculate the change that took place between any pair of consecutive points in time t and $t+1$ (e.g., year 1993 and year 1994). The value of the Malmquist index captures the change in efficiency and reflects TFP.

Undoubtedly, TEs can grow via investing more and more money in ICT, and by hiring more and more ICT workers. But this is not the most efficient way to grow, and it is not clear, at this point, if TEs could grow efficiently - via increasing their productivity.

The overall purpose of this research, therefore, is to identify whether the ICT sector of TES 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). 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.