Chapter VIII
A Time Series Analysis of International ICT Spillover

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ABSTRACT

This article studies the role of international spillover of information and communication technology (ICT) in economic growth. We examine the performance of ten countries from 1982 to 1999. By empirically analyzing the relationship between total factor productivity (TFP) and domestic and foreign ICT investment with time series analysis tools, we find limited evidence that there exist international ICT spillovers for a group of countries. Further, we discuss the possible ICT policies to improve productivity and balance out a win-win situation for both ICT spillover sending and receiving countries.

INTRODUCTION

Nowadays, ICT is considered an extremely important factor that contributes to the accelerated rate of productivity of a nation, especially in many newly industrialized economies (NIEs) and developing countries. ICT is the combined utilization of electronics, telecommunications, software, networks, and decentralized computer workstations, and the integration of information media (Granville, Leonard, & Manning, 2000), all of which impact firms, industries, and the economy as a whole. ICT is comprised of a variety of "communication equipment" which includes radio, TV, and communication equipment and software. Therefore, ICT investment includes "investments in both computer and telecommunications, as well as related hardware, software and services" (Dedrick et al., 2003, p. 4).

In recent years, the combination of computer and telecommunication equipment helps and enables businesses and organizations to share and

exchange huge amounts of information. It also eliminates vast amounts of paperwork and speeds up transaction processes by the Internet, Intranets and other networks. In addition, technology and computer production has been a high growth sector in many countries. The ICT industry itself can be a source of economic growth and jobs (Kraemer & Dedrick, 2001). Consequently, it is widely believed that ICT investment helps to enhance productivity and economic growth.

ICT capital exhibits both traditional and non-traditional effects (Dedrick, et al., 2003). As traditional capital, ICT's returns accrue primarily to the firms, industries, or countries that make the investment, and diminish with continuing investment. Contrarily, due to its informational and transformational roles, ICT capital is similar to knowledge capital (Dedrick et al., 2003). ICT capital, if used properly, facilitates knowledge creation. We define knowledge capital as the data, information, knowledge, and wisdom necessary to support and grow an organization or economy. ICT enhances the productivity of employees, and therefore contributes positively to the generation of knowledge capital. Since knowledge capital is not rivalrous and has public goods properties, it leads to potential "spillovers.".

Grossman and Helpman (1991) define spillovers as follows: "By spillovers, we mean that (a) firms can acquire information created by others without paying for that information in a market transaction, and (b) the creators (or current owners) of the information have no effective recourse, under prevailing laws, if other firms utilize (the) information so acquired." From this definition of spillover, one may derive that ICT spillover is an increase in social benefits without compensating the ICT investors. If we regard investors as a national economy as a whole, then we have the concept of "international ICT spillover." In other words, international ICT spillover is an increase in national productivity due to ICT investments in foreign countries.

ICT spillover emerges when social returns on investment exceed their private returns, creating situations in which investment in ICT becomes an innovator or investor, thereby, also benefiting other parties (Leeuwen & Wiel, 2003). "The Information Technology Boom" has given rise to many discussions about the potential of ICT to yield production externalities. Production spillovers or externalities can show up in the form of rent (pecuniary) spillovers or in the form of so-called technology/knowledge spillovers. These arise from the fact that knowledge and technology have some public good characteristics—knowledge capital can be owned and used by many parties simultaneously, leading to potential spillovers (Leeuwen & Wiel, 2003).

Globalization and rapid communications among innovators in different locations facilitate the process of invention and the spread of new ideas across different countries. Scholars have concluded that R&D is transferred from the innovating country to other countries mainly through trade, which helps to stimulate the receiving countries' economic growth. Many researchers have also tried to prove ICT spillovers among firms or industries within a country. However, to our knowledge, studies on international ICT spillovers are rare. Therefore, our main research question is whether foreign ICT investments, just like R&D expenditures, will have spillover effects on domestic productivity growth.

In this article, we would like to examine the relationship between international ICT spillovers and national productivity growth. This article would fill the literature gap on ICT spillovers at the country level. A sample of 10 countries was chosen based on data availability. We deployed time series analysis. If the existence of ICT spillovers at country level is empirically proven, it may have strong policy implications especially for developing countries.

The organization of the article is as follows: The next chapter is a review of relevant studies in productivity and technology spillovers. Sec-