

# ICT as a source of output and productivity growth in Finland

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## Abstract

This paper analyses the impacts of information and communications technology on output and labour productivity growth in Finland in 1995–2005. Information and communications technology (ICT) accounted for 1.87 percentage points of the observed labour productivity growth at the average rate of 2.87 per cent. The contribution from increases in ICT capital intensity was 0.46 percentage points. The rest is attributed to multi-factor productivity growth in ICT production, especially in telecommunications production. The ongoing outsourcing of ICT production to low-wage countries provides a threat to productivity performance in the future. Policy makers should consider where the next wave of productivity growth will come from.

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*Keywords:* ICT; Information and communications technology; Economic growth; Labour productivity; Multi-factor productivity

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## 1. Introduction

Finland transformed itself in the 20th century from a backward agrarian country reliant on its natural resources into a modern industrial society whose telecommunications manufacturing is at the cutting edge of the world. The flagship of Finnish telecommunications is of course Nokia (see Häikiö, 2002). Back in 1950, the Finnish living standard, as measured by gross domestic product (GDP) per capita, was less than half of the US equivalent. In 2003, this ratio was three-quarters.<sup>1</sup> The road to prosperity, however, has not always been smooth (see Ojala, Eloranta, & Jalava, 2006). The largest peace-time hurdle was the recession in the early 1990s when real GDP plummeted by 11 per cent during the years from 1990 to 1993.

The tale of Finnish economic growth is very much one of productivity. From the year 1900 to 2005, the standard of living has increased 13-fold although the number of hours worked per capita has declined. This was possible because labour productivity—GDP per hour worked—rose 14-fold.

In historical perspective, Finland is now in a similar situation as it was a century ago when the basis for electricity and telecommunications—the new technologies of the day—was laid. Past economic success was achieved through the adoption of electricity in the extraction of rents from its natural endowments—forests

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<sup>1</sup>Source: Groningen Growth and Development Centre and The Conference Board, Total Economy Database, August 2004 <<http://www.ggdc.net>>.

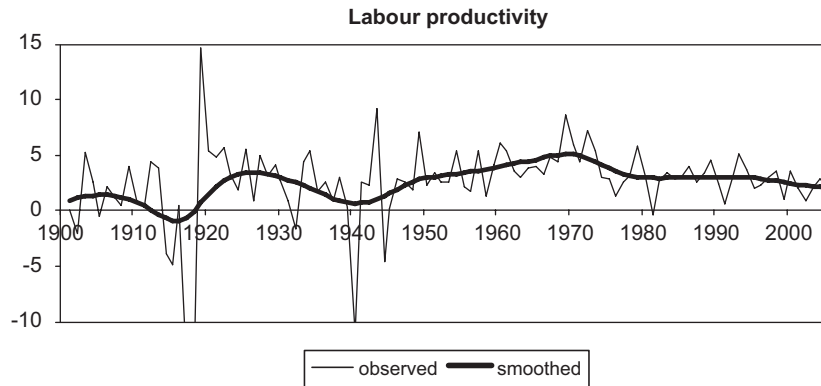


Fig. 1. Growth of labour productivity, 1901–2005 (%). *Data source:* National Accounts, Statistics, Finland.

and minerals. The process created the present industrial structure in which the forest and metal sectors dominate. At best, GDP per hour worked increased at the average rate of 5 per cent per year. Starting in the early 1970s, however, there has been a worrisome shift into slower gear, as the gains from industrialization have been depleting. After the turn of the millennium, labour productivity change averaged only half of its earlier peak figures (Fig. 1).<sup>2</sup>

The slowing down of productivity growth would not be a policy problem if it could not be remedied. But as the recent success of the US economy shows, decelerating productivity growth can be turned into accelerating growth. The observed step-up in the trend of US labour productivity in the post-1995 era was traced by Jorgenson, Ho, and Stiroh (2003, 2006) to the impact of information and communications technology (ICT) on GDP growth. This growth resurgence prompts the question: How can the same outcome be accomplished elsewhere? This is especially topical in a country like Finland which has reaped the benefits of the Nokia-phenomenon—the case in point of a successful production of a new technology—but there is still room for improvement in the use of the new technology in the production processes of other industries.

Like electricity, ICT is a general-purpose technology (Bresnahan & Trajtenberg, 1995) that spreads to all sectors of the economy, improving and becoming cheaper over time and facilitating the creation of new goods, services and modes of operation. It affects economic growth both as a component of aggregate output in the form of ICT production and as a component of aggregate input in the form of ICT capital services. Furthermore, it has an impact on growth via the effect of multi-factor productivity (MFP) gains induced by rapid technological advances in the ICT-producing industries.

To provide a background for policy conclusions, a brief history of ICT in Finland is presented in Section 2. Neoclassical growth accounting is then applied to delineate ICT's influence on output and labour productivity growth. Due to the extraordinary severity of the recession in the early 1990s, the focus is on the 1995–2005 period. In Section 3, the growth accounting methodology is outlined. Section 4 describes the data, and Section 5 presents the results. The last section presents a projection of labour productivity growth in the future and draws conclusions for policy.

## 2. A brief history of ICT in Finland

Finland was one of the leading countries in adopting the telephone. The first line was built in Helsinki in December 1877, only 18 months after the telephone was patented in the United States (Turpeinen, 1981). The Helsinki Telephone Corporation was established in 1882. There were already 3.3 telephone lines per 100 inhabitants in Helsinki in 1900, making it one of the major telephone cities in the world.

According to historians (e.g., Turpeinen, 1981), politics was one of the factors explaining the rapid adoption of the new communication technology.<sup>3</sup> When the telephone was invented, Finland was an autonomous

<sup>2</sup>The labour productivity series was smoothed using the Hodrick-Prescott (1997) filter.

<sup>3</sup>Castells and Himanen (2002, pp. 56–57) provide a summary in English.

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