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Structural changes and growth factors of the ICT industry in Korea: 1995–2009

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ABSTRACT

This study performs an Input–Output Structural Decomposition Analysis on the ICT industry in Korea between 1995 and 2009 to examine its structural changes and growth factors. According to the results of the structural change analysis, the ICT manufacturing field exhibited a deepening of the so-called jobless growth phenomenon. Although the output of the ICT manufacturing field grew dramatically, employment consistently decreased. In contrast, the ICT service field began to show a problem with reduced labor productivity. Although the ICT service field's output experienced a slowdown in growth, employment experienced an exponential increase. According to the results of the growth factor analysis, the ICT industry's growth was fueled by export expansion, followed by consumption expansion, technological change, inventory expansion and investment expansion. However, import substitution of intermediate goods and end goods had negative effects on the ICT industry's growth in Korea. In the industrial sector, the electronic component sector and broadcasting and telecommunication equipment sector experienced marked growth, and the electronic component sector scored the greatest contribution. Furthermore, in spite of the rapid growth in other ICT manufacturing sectors, the information equipment sector sank into stagnation, and the contribution of the ICT service sector was constantly decreasing.

1. Introduction

Pushing for export-oriented industrialization through six successive 5-year economic development plans implemented between 1962 and 1996, Korea achieved expeditious economic growth and advanced industrialization. Korea's GDP, which was a mere 352 billion won (current prices) in 1962, increased over 1300 times in one-third of a century. GNI, $87 (current prices) in 1962, grew by over 140 times during the same period. However, although the Korean economy continued to thrive, it experienced negative growth (−5.7%) in 1998 in the wake of the foreign exchange crises that occurred at the end of 1997. Furthermore, the economy is currently encountering a critical situation because of the global financial crisis that began in the latter half of 2008. In response, the Korean government has committed to establishing policies that make the information and communication technology (ICT) industry a driving force to overcome the economic crisis. Moreover, the

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government cares deeply about inter-industrial convergence to ensure that the ICT industry is positioned to lead national economic growth (Shin et al., 2012).

Korea has proven that it is the strongest ICT leader in the world, ranking 1st on the ICT development index for the past 4 years (ITU, 2011, 2013); the index is a comprehensive assessment based on ICT readiness, ICT intensity and ICT capability. However, Korea's position is not as positive in the IT industry competitive index, which is based on a comprehensive analysis of the R&D environment, the business environment, the support of the resources for the ICT industry's development, the ICT infrastructure, human resources and legal resources; it took a nosedive to the 19th position 5 years after it was ranked 3rd in 2007 (BSA, 2011). It is naturally difficult to accept this deteriorated ranking in the IT industry competitive index as a genuine competitive devaluation of the ICT industry in Korea. However, this drastic decrease can be interpreted as a wake-up call that the ICT industry needs to implement an overhaul. In this regard, it is necessary to examine the structural changes and growth factors in the ICT industry in an effort to create new growth engines for the ICT industry.

To understand changes in the socioeconomic structure, it is essential to analyze their impetus or sources. Input–Output Structural Decomposition Analysis (I–O SDA hereinafter), a method of analyzing structural changes through the comparative static transformation of various socioeconomic factors, has been widely used to assess the effects of economic growth and how changes in sectors and technologies affect socioeconomic factors within a nation or among nations (Hoekstra & van den Bergh, 2003). Initially, such studies primarily concentrated on changes in the economic structure at the national level. Representative studies include those conducted by Feldman, McLain, and Palmer (1987), who examined changes in the economic structure in the U.S., and by Skolka (1989), Dewhurst (1993) and Liu and Saal (2001), who performed structural decomposition analyses on the economies in Austria, Scotland and South Africa. Thereafter, researchers began focusing on structural transformation at an industrial level.

Representative studies of the latter include those conducted by Barker (1990) who analyzed the causes behind the service industry's structural changes in the U.K., Lee and Schluter (1993) who delved into the structural changes in the food and textile industries in the U.S., and Hayashi (2005) who examined the changes in the industries and trade structure in Indonesia. Studies on changes in the industries and in the trade structure among nations were also conducted by researchers such as Oosterhaven and van der Linden (1997), who conducted a comparative analysis on changes in the economic structure in eight nations in the EC, and Fujikawa and Milana (2002) who compared and analyzed the comparative level of price differences by industrial sector in Japan and China.

In recent years, a growing number of people have developed an interest in the structural changes of socioeconomic factors in various social sectors including employment, the environment and energy. Representative studies on changes in the employment structure were conducted by Han (1995), who examined factors and aspects of the changing employment structure in Japan; Koller and Stehrer (2010) who examined the changing employment structure according to integrated trade and transformed outsourcing patterns in Austria; and Pei, Oosterhaven and Dietzenbacher (2012) who analyzed the effects of exports of advanced electronic products on increased income in China. Representative studies in the environment and energy sectors have been conducted by Rose and Chen (1991) who analyzed changes in the energy consumption structure in the U.S.; Wier (1998) who examined changes in the exhaust gas emission structure in Denmark; Jacobsen (2000) who delved into relations between trading patterns in the manufacturing industry and energy consumption in Denmark; Kagawa and Inamura (2004) who conducted a comparative analysis on embodied energy demand in Japan and China; Yamakawa and Peters (2011) who conducted research on changes in energy consumption and CO_2 and green-house gas emissions in Norway; and Su and Ang (2012) who explored changes in energy consumption and the emission structure of exhaust gas.

In the I–O SDA model, the results of an analysis can vary dramatically depending on the weight, and it is thus necessary to be cautious when determining the weight method. Previously, a simple viewpoint method or combination method was widely used. However, alternatives such as the average contribution rate method, the mid-point weight method, the Mongomery method and the Sato-Vartia method, which can generate theoretically ideal results, have recently been suggested. These methods consider the determination of viewpoint to be arbitrary, and the contribution is dramatically changed by factor according to the time applied. The average contribution rate was applied in studies by Holland and Cooke (1992) and Wang, Sun, and Chou (1992), whereas the mid-point weight method was applied in research by Wyckoff and Sakurai (1992), Dietzenbacher and Los (1998), Hitomi, Okuyama, Hewings, and Sonis (2000) and Miller and Blair (2009). Dietzenbacher and Los (1998) suggested the mid-point weight method, which can be conveniently calculated with two factorizing formulae based on the result of an empirical analysis based on 24 factorizing formulae through the use of 4 factorizing variables. Additionally, de Boer (2008) concluded that it is possible to obtain a value closer to the average values of all factorizing formulae if the Mongomery method, which could be indicated in a single formula, is applied. In addition, de Boer (2009) presented the Sato-Varia method, according to which it is possible to obtain a value closer to the average values of all factorizing formulae and to be indicated in a single formula at the same time.

This study's objective is to perform an Input–Output Structural Decomposition Analysis on the ICT industry in Korea to examine its structural changes and its growth factors. Thus, this is an extension of research performed by Barker (1990), Lee and Schluter (1993) and Hayashi (2005), who analyzed the structural changes in specific industries in a particular nation. The empirical data include the Input–Output table for 2009 at 2005 constant prices, which was recently announced by the Bank of Korea; linked Input–Output tables for 1995, 2000, and 2005 at 2005 constant prices; and the employment index attached to the annual Input–Output table. In this research, the structural changes are classified into the output aspect