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Analyzing the impact of Information and Communication Technology on Economic convergence: The case of 63 provinces in Vietnam

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Key words: ICT, convergence, economic convergence, provinces

1. Introduction

The even development between provinces has been one of the most important goals of developing countries, especially in Vietnam as the income gap remains significant between regions. As a result, beside the general economic growth, determining the growth motivations to catch up with the more developed provinces also becomes a vital objective for the less developed ones in Vietnam. A number of factors including education, capital, Foreign Direct Investment (FDI), … have been incorporated into the convergence model in Vietnam, except for the Information and Communication Technology (ICT). Therefore, this study aims to investigate the impact of ICT on the economic convergence between 63 provinces in Vietnam between 2010 and 2020.

A number of previous studies have investigated the positive impact of ICT developments on economic convergence. Dividing 106 nations into four groups based on income level, Minh Thuong et al. (2023) argued that the ICT developments have a positive effect on the convergence of groups of nations. Similarly, Okur Dincsoy (2009) considered ICT as the promoting factor for the convergence process between nine East Asian countries from 1992 to 2022. As for the regional scope, the application of ICT was confirmed to promote the convergence process of the 34 provinces in Indonesia over the nine-year period (Purnama & Mitomo, 2018). This conclusion

was also supported by Chen & Ye (2021) analyzing the 275 cities in China in 2017. Specifically, the lower the Gross Regional Domestic Product (GRDP) that a city had, the higher the impact that ICT had on the growth of that city (Chen & Ye, 2021). In Vietnam, the data of 63 provinces from 2009 to 2019 was collected to come to the conclusion of the positive impact of ICT on the economic growth (Ha, 2021). However, only the provinces in the middle areas were affected more effectively (Ha, 2021).

By contrast, the negative impact of ICT on economic convergence was proved by various research. In particular, Xhaja & Kordha Asc (2017) admitted that the Balkan could not catch up with other European countries despite the application of ICT. The same statement was concluded for the case of Asian nations in 10 years from 2001 to 2010 (Mehmood & Azim, 2013). Particularly, Mehmood & Azim (2013) found that ICT had a great impact on the more developed countries, narrowing the income gap between nations. Furthermore, the divergent impacts of ICT were also confirmed by Zia & Mahmood (2019) as the South Asian countries were found to fall behind other countries due to the difference in the development of ICT infrastructure. In the scale of regional convergence, Wang et al. (2021) considered the gap in the level of ICT development as the main cause of the divergence process between 31 provinces in China from 2009 to 2018. It was also explained that the more developed areas tend to receive more investment in the ICT sectors than the less developed areas did (Wang et al., 2021).

2. Theoretical Framework

The concept of economic convergence refers to the phenomenon in which poorer economies tend to grow faster than richer ones, allowing their income levels to catch up over time (Solow, 1956). In economic theory, this is particularly rooted in the neoclassical growth model, which assumes diminishing marginal returns to capital and posits that economies with similar saving rates, population growth, and technologies will converge in the long run (Barro & Sala-i-Martin, 1995).

According to the Solow-Swan model, long-term economic growth is primarily driven by capital accumulation, labor growth, and technological advancement. However, technological progress is treated as exogenous in this model. In contrast, the endogenous growth theories developed by Romer (1990) emphasize the internal drivers of growth such as innovation, where technology and knowledge creation are outcomes of deliberate investment in education, training, and research and development.

According to the convergence theory (Solow, 1956; Barro & Sala-i-Martin, 1992), less developed economies tend to grow faster due to diminishing returns on capital and the diffusion of technology, leading to long-run income convergence. Convergence is typically assessed through β-convergence and σ-convergence tests (Sala-i-Martin, 1996).

Based on this theoretical foundation, the research team proposes the following econometrics model:

$$g_{it} = \alpha_0 + \alpha_1 lny_{i,t-1} + \alpha_2 FDI_{it} + \alpha_3 ict_{it} + \alpha_4 H_{it} + \alpha_5 pci_{it} + u_{it}$$

Where:

i and t represent the province and the year under study, respectively.

α_i $(0 \leq i \leq 5)$ are the regression coefficients of the model.

y_{it} and $y_{i,t-1}$ denote the per capita gross regional domestic product (GRDP) of province i in year t and $t-1$, respectively.

$g_{it} = ln(\frac{y_t}{y_{t-1}})$ represents the economic growth rate of province i in year t.

FDI: Foreign Direct Investment of the province.

ict: The ICT Readiness Index of the province.

H reflects the quality of human capital in the province.

pci indicates the institutional quality (Provincial Competitiveness Index) of provinces in Vietnam.

u_{it} is the error term of the model.

3. Methodology

Data from 63 provinces of Vietnam during the 2011–2020 period were collected from the General Statistics Office, the Vietnam Chamber of Commerce and Industry (VCCI), and the Ministry of Information and Communications. The model was estimated using three methods: pooled OLS (POLS), fixed effects (FE), and random effects (RE). After detecting issues of autocorrelation and endogeneity, the two-step system Generalized Method of Moments (SGMM) was applied to address these problems.

4. Results

The results of the first-order and second-order autocorrelation tests are 0.018 and 0.924, respectively, indicating that the SGMM method was applied under appropriate conditions to ensure high efficiency (Blundell & Bond, 1998). The p-values of the Hansen (1982) and Sargan (1958) tests are both greater than 0.1, confirming the validity of the chosen instruments and endogenous variables.

The findings confirm the existence of economic convergence among Vietnamese provinces during the 2011–2020 period. Preliminary estimates suggest that full convergence in economic growth may be achieved in approximately 12 years. The ICT index, by leveraging IT to boost productivity in manufacturing, is shown to be an effective tool for helping less-developed provinces catch up with more advanced ones. Additionally, foreign direct investment (FDI) and institutional quality have a positive impact on improving provincial economic growth rates.

5. Originality

Firstly, this is the first study to examine the impact of information technology as an independent factor on the economic convergence process among provinces. In addition, the research provides further empirical evidence on the role of information technology in narrowing development gaps across Vietnamese provinces. Lastly, this study can be considered the first to analyze economic convergence using the generalized method of moments (GMM). With these findings, the government is better informed about the key drivers of economic growth at the local level.

6. Implications

From the findings of this research, it is recommended for the government to implement a comprehensive strategy for digital infrastructure development, particularly emphasis on regions that still face significant barriers to technology access. Investments in ICT infrastructure are essential to ensure access to digital technologies, thereby narrowing the development gap across regions. Moreover, the strategy for attracting foreign direct investment should be controlled to encourage investment in high-tech sectors, thereby generating spillover effects in technological advancement at the local level. Additionally, it is necessary to enhance provincial-level competitiveness in the context of digital transformation by promoting the application of digital technologies in local governance and public administration. Lastly, digital skills training should be prioritized and designed flexibly and dependently on businesses and local innovation ecosystems. This approach will not only improve the adaptability of the labor force to the digital economy and the Fourth Industrial Revolution but also contribute to achieving balanced regional development.

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