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ICT, FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN ASEAN COUNTRIES

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Abstract

This paper examines the impact of and relationship between ICT diffusion, financial development and economic growth in selected ASEAN countries. In order to investigate this query, panel data estimations are used by utilizing data from 2003 to 2017. The finding indicates that ICT diffusion and financial development have an impact on economic growth of ASEAN countries. Consequently, the findings of the study could be an aid for the future researcher to study deeper in this research. The policymakers need to take a further initiative to improve the information technology and its applications in these countries. To gain benefit from the ICT drivers of economic growth, policymakers should enact several important policies that permit the development of financial sectors, provide a more convenient regulatory and institutional environment, increase economic openness, prioritize the allocation of resources to the development of ICT infrastructure, and contain the negative effects of inflation and government consumption.

Keywords: ASEAN, ICT diffusion, financial development, economic growth.

1. Introduction

Over the last two decades, Information and Communication Technologies (ICT) has played a dominant role in economies and societies by broadening the access to information and various types of knowledge, which empowers people and intensifies participation in socio-economic life (Lechman & Marszk, 2019). Through digital technologies, new platforms can be developed to improve economic function especially in rural areas such as by introducing online banking and digital investment in financial sector, and online entrepreneur in retail sector. Hence, digital technologies have a good potential to improve the market functions by improving the limited infrastructure and economic constraints (Hernandez et al, 2016). Moreover, with the exponential growth of digital technologies in financial sector, the global financial system can now become virtual (Lechman & Marszk, 2019). ICT can also improve human participation in the financial system, especially with the reduction of transaction cost and easy accessibility to digital financial services (Pradhan et al., 2017). This shows that ICT can create a more efficient market and increase the productivity of financial market.

The organization of this paper can be divided into a few sections. The first section is the introduction, followed by section two on literature review. Chapter three discusses research methodology, chapter four on findings of the result, and finally chapter five concludes.

2. Problem Statement

Albeit the world's extensive focus on the connection between financial development and the environment, previously observed studies on the link Several recent studies have revealed the positive effect of financial development on economic growth, and these include Hassan et al. (2011), Hsueh et al. (2013) and Khoutem et al. (2014) especially in Asian countries including China. However, in contrast, Adu et al. (2013) argued that the positive or negative impact of financial development on economic growth depends on which proxy measure being used for estimation.

The examination by previous studies on the relationship between ICT and economic growth leads to the discovery of positive correlation for both developed countries (Evangelista et al., 2014; Toader et al., 2018) and developing countries, but at different magnitude (Sepehrdoust, 2018; Yousefi, 2011). Financial development especially from financial liberalization can benefit from the diffusion of ICT sector as well as economic growth. Previous studies on the relationship between ICT, financial development and economic growth can be seen in the table 1 below:

Table 01. Selected Literature on ICT Diffusion and Financial Department

Author	Country	Period of study	Methods	Main findings
Sassi and Goaied, (2013)	17 MENA countries	1960-2009	GMM	The interaction between ICT penetration and financial development is found to be positive and significant in the growth regression. This implies that economies in the Mena region can only benefit

				from financial development once the threshold of ICT development
Pradhan, Mallik & Bagchi (2018)	G-20 countries (EU countries)	2001-2012	Panel cointegration	The effect of gross domestic capital formation is positive and significant in both the broadband and internet users' cases.
Das, Chowdhury & Seaborn (2016)	43 developing countries	2000-2014	GMM	The joint effect of ICT and finance is positive, suggesting that the direct effect of ICT diffusion on economic growth in developing countries is realized because of the development of the financial sector.
Sepehrdoust (2018)	15 OPEC Countries	2002-2015	GMM	The results extracted from the econometric model showed that an increment of one percent in the financial development index and ICT variables caused economic growth to increase, respectively

3. Research Questions

ICT diffusion, financial development and economic growth in 8 ASEAN countries have a significant impact?

4. Purpose of the Study

To analyze the impact of ICT diffusion and financial development on the economic growth of 8 ASEAN countries.

5. Research Methods

5.1. Sample and Data Collection

The data were collected from World Development Indicators database from year 2003 to 2017. This study will utilize panel regression analysis to determine how financial development and ICT diffusion (represented by ICT Index) will affect the economic growth of 8 ASEAN Countries.

The regression models for this study can be specified as follows:

$$GDP_{it} = \alpha_0 + \alpha_1 FD_{it} + \alpha_2 ICT_{it} + \varepsilon_{it} \qquad (1)$$

Where GDP is a natural log of GDP per capita (constant 2010 US$), FD is a natural log of financial development and ICT index consists of multiple indexes of five sub-indicators; i.e. a landline telephone, mobile phones, internet services, internet users, and fixed broadband. We compiled five sub-indicators of ICT infrastructure by employing Principal component analysis (PCA). This technique had been

implemented by Pradhan et al. (2017) and Latif et al. (2018). PCA subsequently transforms the data into variables (Principal components) and generates a factor analysis.

5.2. Methodology

The data will be analysed using panel estimation, namely Panel unit root test and General Least Square (GLS) regression analysis to determine the relationship between the dependant variables and independent variables.

Since panel data would relate to individual country, heterogeneity is unavoidable in these units. The GLS pooled time-series cross sectional specification assumes that all countries have the same behaviours. In other words, it is assumed that the slope and intercept of all countries are constant across individuals and time. These assumptions of uniform behaviour deny any form of heterogeneity, which in practice is very likely to materialize. The pooled regression may result in heterogeneity bias as there are often reasons for the intercept or the slope for each country maybe different across units and time. Therefore, in order to control for any country-specific effect, this study will examine the GLS estimator for random effect (RE) and GLS estimator for fixed effect (FE) in our model.

6. Findings

This section provides the empirical evidence on the role of ICT diffusion and financial development towards ASEAN's economic performance. A broad description of the characteristics of the variables used in the study is given in Table 2, which reports the statistical means and standard deviations of the variables.).

Table 02. Descriptive Statistics of Variables

Variable	Mean	Std. Dev.	Min	Max
GDP	8.554802	1.396576	6.227688	10.94625
FD	4.062238	0.694596	1.975641	5.006449
ICT	-4.17e0.7	0.9701426	-2.074	2.03399

The results of unit root tests for all variables are tested using Levin et al. (2002) and Im et al. (2003) as reported in Table 3. For all variables, the null hypothesis of a unit root cannot be rejected at their levels. However, upon taking first differences, the null of unit roots is rejected at 5% and 1% levels. Therefore, it is concluded that all the variables are stationary and integrated of order one.

Table 03. Panel Unit Root

Variable	Levin et al.		Im et al.	
	In level with intercept	**1st difference with intercept**	**In level with intercept**	**1st difference with intercept**
FD	-0.80623	-6.89370***	1.18507	-4.52578***
GDP	-0.66776	-7.16977***	3.12135	-5.09796***
ICT	2.90600	-3.80655***	2.00354	-2.24796**

Note: ** and*** denote statistical significance at the 5% and 1% levels, respectively.

In this study, we implement three regression methods. First, the Pooled OLS is used with the assumption that both the intercept and the slope of every country are the same across time. From the result in Table 4, it shows that all variables based on Pooled GLS are significant and have positive relationship except for financial development. The R^2 shows the goodness of fit of each model, i.e. between 0.13 (Pooled OLS) 0.74 (Random Effect) to 0.73 (Fixed Effect). Therefore, 13%, 74% and 73% variations in the growth are explained by the independent variables for the regression analysis, respectively. The F-test is the test for overall fitness of the model and the results have rejected the null hypothesis for all models. This suggests that at least one or more of the independent variables had influenced the dependent variable, namely, economic growth. The t test on each variable suggests that financial development (FD) is significant in influencing GDP at 1% significance level. Meanwhile, ICT index is significant in affecting economic growth as shown under random effect and fixed effect at 1% significance level, respectively. The coefficients for the ICT index are consistently positive and significant at 1% level. These findings indicate that ICT diffusion has a significant positive impact on the economic growth of ASEAN countries. The result is supported by Das et al. (2016) and Sepehrdoust (2018) whereby financial inclusion can stimulate economic growth with better ICT penetration.

Table 04. Results of Pooled OLS, Fixed-Effect and Random-Effect GLS Regression Estimation for Growth

	Pooled OLS	Random effect	Fixed Effect
Constant	5.6023***	7.3124***	7.3149***
	(7.72)	(15.03)	(67.70)
FDt	0.7268 ***	0.3058***	0.3052***
	(4.12)	(11.49)	(11.51)
ICT	0.1262	0.0657***	0.0658***
	(0.08)	(7.15)	(7.19)
N	120	120	120
R^2	0.1316	0.743	0.7259
F	8.87	158.2	145.62
P	0.00	0.00	0.00
Breusch-Pagan test		814.31***	
Hausman test			-0.09

Number in parenthesis is the t-test and z-test results ***, ** and * indicate significant at 1%, 5% and 10% levels

The selection of best estimation model is based on the value of Breusch-Pagan and Hausman test. The Breusch-Pagan result in Table 4 shows that the result from GLS with random effect is better than GLS with pooled least square at 1% level for all the models. This result indicates that there are group-specific effects in the data.

In order to treat the group-specific effects, this study will perform GLS with fixed effect and GLS with random effects regressions. To test the appropriate model with the hypothesis that the individual effects are uncorrelated with other regressors in the model, the Hausman test will be utilized. The results of Hausman test, as shown in Table 4 for the estimation of LGDP indicate that the results of GLS with random effect explain better relative to the fixed effects for all the three models. The results from Hausman test also imply that the null hypothesis of absence of correlation between individual effects and the explanatory variables failed to be rejected, and the GLS estimator of the fixed effect is inconsistent.

At the same time, the interaction between financial development and ICT index is also positive and significant, implying that financial sector in ASEAN countries can grow faster when ICT penetration is increased. This means that better connectivity and higher internet usage can cultivate economic growth when the level of credit to private sector increases. These results are supported by Andrianaivo and Kpodar (2011), Das et al. (2016), and Sassi and Goaied (2013).

7. Conclusion

This main objective of this research is to investigate the relationships among ICT diffusion, financial development and economic growth. FD and ICT diffusion have a positive impact on economic growth. From the above findings, it can be concluded that FDI and ICT diffusion play a very important role to the economic development of ASEAN countries. The policymakers need to take a further initiative to improve the information technology and its applications in these countries. To gain benefit from the ICT drivers of economic growth, policymakers should enact several important policies that permit the development of financial sectors, provide a more convenient regulatory and institutional environment, increase economic openness, prioritize the allocation of resources to the development of ICT infrastructure, and contain the negative effects of inflation and government consumption.

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References

Adu, G., Marbuah, G., & Mensah, J. T. (2013). Financial development and economic growth in Ghana: Does the measure of financial development matter? *Review of Development Finance 3*, 192-203.

Andrianaivo, M., & Kpodar, K. (2011). ICT, *Financial inclusion and growth evidence from African countries* (No. 11-73). International Monetary Fund.

Das, A., Chowdhury, M., & Seaborn, S. (2016). ICT Diffusion, Financial Development and Economic Growth: New Evidence from Low and Lower Middle-Income Countries, *Journal of the Knowledge Economy*, 1-20.

Evangelista, V., R., Guerrieri, P., & Meliciani, V. (2014). The economic impact of digital technologies in Europe, *Economics of Innovation and New Technology, 23*(8), 802-824.

Hassan, M. K., Sanchez, B., & Yu, J. S. (2011). Financial development and economic growth: New evidence from panel data. *The Quarterly Review of Economics and Finance, 51*(1), 88-104.

Hernandez, K., Faith, B., Martín, P. P., & Ramalingam, B. (2016). The impact of digital technology on economic growth and productivity, and its implications for employment and equality: an evidence review. Evidence Report, No. 207, Digital and Technology, Institute of Development Studies, UK.

Hsueh, S. J., Hu, Y. H., & Tu, C. H. (2013). Economic growth and financial development in Asian countries: A bootstrap panel Granger causality analysis. *Economic Modelling, 32*, 294-301.

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of econometrics, 115*(1), 53-74.

Khoutem, B., Thouraya, B., & Kamel, H. (2014). Financial development and economic growth: New evidence from Tunisia. *Journal of Policy Modeling, 36*, 883-898.

Latif, Z., Latif, S., Ximei, L., Pathan, Z. H., Salam, S., & Jianqiu, Z. (2018). The dynamics of ICT, foreign direct investment, globalization and economic growth: Panel estimation robust to heterogeneity and cross-sectional dependence. *Telematics and Informatics, 35*(2), 318-328.

Lechman, E., & Marszk, A. (2019). ICT-Driven Economic and Financial Development Analyses of European Countries, *Academic Press*. https://doi.org/10.1016/C2017-0-00344-0

Levin, A., Lin, C. F., & Chu, C. (2002). Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties. *Journal of Econometrics, 108*, 1-24.

Pradhan, R. P., Arvin, M. B., Bahmani, S., & Bennett, S. E. (2017). The innovation- growth link in OECD countries: Could other macroeconomic variables matter? *Technology in Society, 51*, 113-123.

Pradhan, R. P., Mallik, G., & Bagchi, T. (2018). Information communication technology (ICT) infrastructure and economic growth: A causality evinced by cross-country panel data. *IIMB Management Review, 30*(1), 91-103.

Sassi, S., & Goaied, M. (2013). Financial development, ICT diffusion and economic growth: Lessons from MENA region. *Telecommunications Policy, 37*(4-5), 252-261.

Sepehrdoust, H. (2018). Impact of information and communication technology andfinancialdevelopment on economic growth of OPEC developing economies, *Kasetsart Journal of Social Sciences*, 1-6.

Toader, E., Firtescu, B., Roman, A., & Anton, S. (2018). Impact of Information and Communication Technology Infrastructure on Economic Growth: An Empirical Assessment for the EU Countries. *Sustainability, 10*(10), 3750.

Yousefi, A. (2011). The impact of information and communication technology on economic growth: evidence from developed and developing countries. *Economics of Innovation and New Technology, 20*(6), 581-596.