EXTENDED ABSTRACT

IMPACT OF FDI ON TECHNOLOGICAL INNOVATION AND ECONOMIC GROWTH IN DEVELOPING- ASIAN COUNTRIES

A. M. Priyangani Adikari[*,1,2]

[1]Huazhong University of Science and Technology, China

[2]Rajarata University of Sri Lanka, Sri Lanka.

[*] adikari@ssh.rjt.ac.lk

(Published 15 October 2021)

Abstract

Foreign direct investment (FDI) has been used as a catalyst for economic growth in both developing and developed countries. While the global FDI to developing countries increases over time, competition among countries to attract FDI intensifies. One critical question is whether FDI has a positive impact on developing economies. This study aims to examine the effect of FDI inflows on technological innovation and economic growth in developing Asian countries. Quantitative data analysis based on unit root test, cointegration test, and Vector Error Correction Model (VECM) using data from 10 South Asian developing countries (China, India, Iran, Pakistan, Sri Lanka, Republic of Korea, Thailand, Saudi Arabia, Turkey, and Vietnam) over the 2010-2019 period. According to the study's findings, FDI has a long-run relationship with technological innovation, but no long-run relationship could be found between FDI and economic growth. The current study contributes to the debate over how FDI can assist developing economies in meeting its Sustainable Development Goals (SDGs) because FDI is considered a principal resource for financing sustainable development goals. It is suggested that the government should take a more proactive role in encouraging innovation and then integrating it with economic growth. The growth in the number of innovations would therefore become a factor inviting more FDI.

Keywords: Foreign direct investment inflows, technological innovation, economic growth.

1. Introduction

Over the last few decades, the importance of FDI in the global economy, particularly in developing economies, has increased dramatically. As a result, the link FDI, technological innovation, and economic growth offers researchers great interest in identifying foreign direct investment's spillover effects. FDI is regarded as one of the most effective means of transferring technology across borders, and FDI inflows contain new technologies and materials, production methods, or organizational management skills (Bodman & Le, 2013). Through spillover channels such as reverse engineering, skilled labor turnovers, demonstration effects, and supplier-customer relationships, foreign direct investment can benefit host-country innovation activity (Cheung & Lin, 2004). One of the main objectives of attracting FDI in developing countries is establishing domestic innovation capability acquiring advanced technology from home countries (Cheung & Lin, 2004; Sivalogathasan & Wu, 2014). FDI frequently comes with new technologies and innovations, and they are an essential source of productivity growth. Because FDI helps host country domestic industries develop with

the international technology frontier (Newman et al., 2015; Nyeadi & Adjasi, 2020). Many studies have concluded that FDI promotes innovation since the seminal work of Schumpeter (Śledzik, 2013). According to the literature, new technology and innovation drive economic growth (Aghion et al., 2005; Grossman & Helpman, 1994; Romer, 1990; Solow, 1956). Economic productivity and growth are aided by innovative activity. Long-term economic growth is dependent on the environment, which provides incentives for new technology innovation and application, such as intellectual property rights. The distribution of innovation in economic activity manifests economic growth. This procedure increases labor productivity and total factor productivity, which accelerates economic growth Crepon et al., 1998. Given these arguments, this study aims to study the impact of FDI on technological innovation and economic growth, selecting a sample from developing countries.

Since the 1980s, most countries have introduced liberalization of trade and investment policies due to globalization. In recent decades, FDI and trade in goods and services have grown faster than the world output due to trade and investment policies liberalization. The average growth rate of global world trade activities recorded 6%, while the average growth of FDI inflow accounted for 13% between 1981-2015 (UNCTAD, 2016). In 2010, FDI recovery took place after a drastic worldwide decline in FDI flows in 2009. Developed countries accounted for the largest share of FDI inflows until 2008, although FDI inflows continuously increased. In 2015, FDI recovery was strong, reaching the highest level since the global economic and financial crisis of 2008–2009.FDI to developing countries recorded a new high amount higher than 2014, and developing Asia remained the largest FDI recipient globally. The share of global FDI to developing countries accounted for 54 percent by 2019.FDI to developing countries has been relatively stable compared to developed countries since 2010. Although FDI to developing Asia declined by 5 percent in 2019, it remained the largest FDI recipient's region, receiving more than 30 percent of global FDI. More than half of global FDI inflows are absorbed by developing economies (UNCTAD,2019; UNCTAD2020). While the global FDI to developing countries increases over time, competition among countries to attract FDI intensifies. One critical question is whether FDI has a positive impact on developing economies.

Based on the preceding, the following study problem can be posed: What is the impact of FDI on technological innovation and economic growth in developing countries. The current study contributes to the debate over how FDI can assist developing economies in meeting their sustainable development goals (SDGs) because foreign direct investment is considered as a principal resource for financing sustainable development goals. Furthermore, studying the effects of FDI in the Asian region is timely more imperative because this region is already the world's largest FDI recipient receiving more than half of global FDI.

2. Methodology

This study aims to examine the impact of FDI inflows on technological innovation and economic growth in developing 10 Asian countries, namely; China, India, Iran, Pakistan, Sri Lanka, Republic of Korea, Thailand, Saudi Arabia, Turkey, and Vietnam. Out of these selected countries, three countries (China, India, Republic of Korea) were the largest FDI recipient countries during 2018-2019. Analysis was based on the data from 2010 to 2019 in selected countries. Although there are many indicators used to represent innovation in the literature, this study use number of granted patents to residents to measure technological innovation following previous studies (Adikari et al., 2021; P. Aghion et al., 2005; Ang, 2010; Kim & Lee, 2015; Maradana et al., 2017; Sun & Du, 2010). Economic growth was measured using the gross domestic product (GDP, current USD). FDI inflows (in current USD) were used. Data sources are World Development Indicators (WDI) and World Intellectual Property Organization (WIPO).

The unit root tests are applied to determine whether the time series is stationary. Two unit

root tests were used in this study. The first was the Levin-Lin-Chu test (LLC), a new test that used pooled t-statistics (Levin et al., 2002). The second test, which used a non parametric approach, was an ADF-Fisher unit root test proposed by Maddala and Wu (Maddala & Wu, 1999). The panel cointegration test was used after testing the stationarity of panel data. It looked for the occurrence of long-run associations between variables. Although a cointegration analysis shows that the variables have a causal relationship, the time lag of their impact was not captured. Hence, the Vector Error Correction Model (VECM) was used to capture long-run and short-run relationships between variables to be tested. The proposed model to discuss the role of FDI on innovation and economic growth can be specified by the following two models.

Model 1: Economic growth and FDI inflows

$$\begin{bmatrix} \Delta LGDP_{it} \\ \Delta LFDI_{it} \end{bmatrix} = \begin{bmatrix} \alpha_{01} \\ \alpha_{01} \end{bmatrix} + \sum_{p=1}^{q} \begin{bmatrix} \beta_{11,p} & \beta_{12,p} \\ \beta_{21,p} & \beta_{22,p} \end{bmatrix} \begin{bmatrix} \Delta LGDP_{t-1} \\ \Delta LFDI_{t-1} \end{bmatrix} \begin{bmatrix} \varphi_{01} \\ \varphi_{02} \end{bmatrix} ECT_{it-1} + \begin{bmatrix} \varepsilon_{1,it} \\ \varepsilon_{2,it} \end{bmatrix} \quad (1)$$

Model 2: Innovation and FDI inflows

$$\begin{bmatrix} \Delta LIN_{it} \\ \Delta LFDI_{it} \end{bmatrix} = \begin{bmatrix} \alpha_{01} \\ \alpha_{01} \end{bmatrix} + \sum_{p=1}^{q} \begin{bmatrix} \beta_{11,p} & \beta_{12,p} \\ \beta_{21,p} & \beta_{22,p} \end{bmatrix} \begin{bmatrix} \Delta LIN_{t-1} \\ \Delta LFDI_{t-1} \end{bmatrix} \begin{bmatrix} \varphi_{01} \\ \varphi_{02} \end{bmatrix} ECT_{it-1} + \begin{bmatrix} \varepsilon_{1,it} \\ \varepsilon_{2,it} \end{bmatrix} \quad (2)$$

3. Results

The panel unit root results are presented in Table 1, which shows all variables rejected the null hypothesis.

Having established stationarity for the variables at the first difference, panel cointegration was applied using Pedroni residual cointegration test. In both models, the null hypothesis of no cointegration was rejected with intercept and deterministic trend and intercept (Table 2).

After confirming the cointegration of the variables in each model, the next task would be to determine the dynamic relationship between the target variables and the explanatory variables. Panel VECM was used to examine the short-run and long-run relationships between FDI and economic growth and innovation. The results of the panel VECM model are in Table 3.

The t-statistics of the error correction terms (ECT) were used to explain the long-run association. The value of ECT should be negative and significant to confirm the long-run associations between variables. The ECT coefficient value of LGDP is negative (-0.0061) but not significant with the LFDI in model 1. It confirms that no association between economic growth and FDI in long

Table 1. Panel Unit Root Test Results[a]

Variable	LLC	ADF	Status
LGDP	12.7296 (1.0000)	6.3509 (0.9983)	
ΔLGDP	-3.2562 (0.0006)***	41.2386 (0.0035)***	I(1)
LFDI	2.0928 (0.9818)	9.6454 (0.9742)	
ΔLGDP	-11.0007 (0.0000)***	114.7350 (0.0000)***	I(1)
LIN	3.3948 (0.9997)	9.4391 (0.0772)	
ΔLIN	-7.7561 (0.0000)***	85.0047 (0.0000)***	I(1)

a. Note 1: ***means significant at 10%. Note 2: Δ denotes the first-order difference operator.

run. In model 2, the ECT value is -0.0575 and is significant at 1%, confirming the long association

between innovation and FDI. Further, the error correction term implies that the log of IN adjusted by 57% in one year to the long-run equilibrium when LFDI was considered as the independent variable.

Table 2. Pedroni Residual Cointegration Test Results[b]

Pedroni Residual				
Statistics	**Model1**		**Model2**	
	No trend	**With trend**	**No trend**	**With trend**
Panel Statistics				
Panel v-Statistic	0.086987	19.53731***	-2.395238	-3.324590
Panel rho-Statistic	-0.257858	2.087842	-2.482230***	0.678716
Panel PP-Statistic	-1.153531	-0.092947	-4.419081***	-11.61584***
Panel ADF-Statistic	-0.839385	-2.701793***	-4.544710***	-7.444233***
Group Statistic				
Group rho-Statistic	1.931133	3.049559	1.039908	2.326432
Group PP-Statistic	-1.124547	0.753163	-3.260926***	-7.747699***
Group ADF-Statistic	0.571407	-1.476393*	-2.310923**	–6.314270***

4. Discussion and Conclusion

This study attempted to examine how foreign direct investment inflows affect the economic growth and innovation of developing Asian countries based on panel data for 2010–2019. The study used the panel cointegration and VECM approaches to examine the effect of FDI on economic growth and innovation as two major objectives. First, the study concludes that economic growth is not significant with FDI inflows in the long run.

Second, the study provides evidence that FDI is an important factor of innovation in the long run. Understanding the impact of FDI inflows on innovation support understanding of the role of FDI as a catalyst for economic growth. As a result, it is suggested that the government should take a more proactive role in encouraging innovation and then integrating it with economic growth. The growth in the number of innovations would therefore become a factor inviting more FDI. In this

Table 3. Results of panel VECM [a]

Independent Variables	Model 1 (ΔLGDP)	Model 2 (ΔLIN)
CointEq1	-0.0061(0.0052)	-0.0575***(0.0207)
Δ(LGDP(-1))	0.4537***(0.1059)	
Δ(LGDP(-2))	0.0577(0.1056)	
Δ(LIN(-1))		-0.4333***(0.1089)
Δ(LIN(-2))		-0.2073**(0.1026)
Δ(LFDI(-1))	0.3275(0.6868)	-15.5374(9.5124)
Δ(LFDI(-2))	0.2643(0.6487)	-10.7856(8.6244)
c	0.0128**(0.0058)	0.1704***(0.0610)

a. Note: standard errors in brackets and, *** for 1%, ** for 5%, * for 10% level of significance.

study, we interpreted our results considering only ten years of panel data. But, it is vital to analyze

the country-specific effects using a large sample. This limitation will be considered in further studies.

References

Adikari, AM Priyangani, Haiyun Liu, and MMSA Marasinghe. (2021). Inward foreign direct investment induced technological innovation in sri lanka? empirical evidence using ardl approach.

Aghion, Philippe, Nick Bloom, Richard Blundell, Rachel Griffith, and Peter Howitt. (2005). Competition and innovation: an inverted-u relationship. *The quarterly journal of economics* 120(2): 701–728.

Ang, James B. (2010). Research, technological change and financial liberalization in south korea. *Journal of Macroeconomics* 32(1): 457–468.

Bodman, Philip, and Thanh Le. (2013). Assessing the roles that absorptive capacity and economic distance play in the foreign direct investment-productivity growth nexus. *Applied Economics* 45 (8): 1027–1039.

Cheung, Kui-yin, and Lin Ping. (2004). Spillover effects of fdi on innovation in china: evidence from the provincial data. *China economic review* 15(1): 25–44.

Crépon, Bruno, Emmanuel Duguet, and Jacques Mairessec. (1998). Research, innovation and productivi [ty: an econometric analysis at the firm level. *Economics of Innovation and new Technology* 7(2): 115–158.

Grossman, Gene M, and Elhanan Helpman. (1994). Endogenous innovation in the theory of growth. *Journal of Economic Perspectives* 8(1): 23–44.

Kim, Jeeeun, and Sung joo Lee. (2015). Patent databases for innovation studies: a comparative analysis of uspto, epo, jpo and kipo. *Technological Forecasting and Social Change* 92: 332–345.

Maddala, Gangadharrao S, and Shaowen Wu. (1999). A comparative study of unit root tests with panel data and a new simpletest. *Oxford Bulletin of Economics and statistics* 61 (S1): 631–652.

Maradana, Rana P, Rudra P Pradhan, Saurav Dash, Kunal Gaurav, Manju Jayakumar, and Debaleena Chatterjee. (2017). Does innovation promote economic growth? evidence from european countries. *Journal of Innovation and Entrepreneurship* 6(1): 1–23.

Newman, Carol, John Rand, Theodore Talbot, and Finn Tarp. 2015. Technology transfers, foreign investment and productivity spillovers. *European Economic Review* 76: 168–187.

Nyeadi, Joseph Dery, and Charles Adjasi. 2020. Foreign direct investment and firm innovation in selected sub-saharan african countries. *Cogent Business Management* 7(1): 1763650.

Romer, Paul M. 1990. Endogenous technological change. *Journal of political Economy* 98(5,part 2): S71–S102.

Sivalogathasan, Vasthiyampillai, and Xiaobo Wu. 2014. The effect of foreign direct investment on innovation in south asian emerging markets. *Global Business and Organizational Excellence* 33(3): 63–76.

Śledzik, Karol. 2013. Schumpeter's view on innovation and entrepreneurship. *Management Trends in Theory and Practice,(ed.)Stefan Hittmar, Faculty of Management Science and Informatics, University of Zilina Institute of Management by University of Zilina.*

Solow, Robert M. 1956. A contribution to the theory of economic growth. *The quarterly journal of economics* 70(1): 65–94.

Sun, Yifei, and Debin Du. 2010. Determinants of industrial innovation in china: evidence from its recent economic census. *Technovation* 30(9-10): 540–550.

World investment report. 2016. *United Nations Conference on Trade and Development.*

World investment report. 2019. *United Nations Conference on Trade and Development*.
World investment report. 2020.*United Nations Conference on Trade and Development*.