The Impact of FDI Inflows and ICT Development towards Economic Growth: Evidence for China and Malaysia

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Abstract

This paper examines whether there is a long-run relationship between foreign direct investment (FDI) inflows, ICT development and economic growth in China and Malaysia. We use a newly developed cointegration test, the autoregressive distributed lag (ARDL), to examine this long-run relationship by employing annual data from 1980 to 2017. The study results show that ICT has a positive relationship with economic growth in China while negative in Malaysia. Capital and labour were found significantly influence economic growth in China and Malaysia. FDI inflows and human capital failed to influence economic growth in China, but human capital significantly influenced Malaysia. The findings are important for formulating policies by recommending mandatory policies related to FDI inflows, human capital and labour to achieve long-term and sustainable development in China and Malaysia.

Keywords: Economic growth, FDI inflows, ICT development, ARDL Bound test

1. Introduction

In 2015, the heads of state of United Union nations agreed that the Sustainable Development Goals (SDG) would be a new agenda that will continue the achievement of the Millennium Development Goals (MDG). The MDG can be regarded as one of the most important and successful initiatives to eradicate poverty in modern economies. The establishment of the SDG discourse followed the need to address. It was structured as a guideline for creating a better and more sustainable future for everyone. The SDG consists of 17 separate priorities representing sustainability and balancing economic, environmental, and social change. Some priorities are decent jobs and Sustainable Economic Growth (henceforth, SEG), no poverty, good health and well-being, quality education, and sustainable cities.

From an economic perspective, the ASIA region has been the largest contributor to economic growth and has become the fastest growing economic region, according to International Monetary Fund (2018). In 2018, China was the largest economy in ASIA based on its GDP growth. China is ranked as the world's second-largest economy and has the highest payment penetration, which has transformed into an Information and Communications Technology (henceforth, ICT) leader. Many multinational companies are looking forward to China's future market outlook. Meanwhile, Malaysia, the fourth largest economy in South Asia, is on track to achieve a high-income nation status in 2024, when Malaysia has one of the highest standards of living with a low unemployment rate in South East Asia (IMF, 2016). China and Malaysia are chosen for the present study due to their SEG. Based on the 2030 Agenda, both nations have implied their national plans to achieve sustainable goals.

As the largest developing country, China has issued a national plan called the "China's 13th Five-Year Plan", which was launched in January 2016 to realise the "2030 Agenda for Sustainable Development". China promotes sustainable growth by focusing on the three main areas of building an ecological civilisation, eliminating extreme poverty, and contributing to the global climate and sustainable development. China is committed to eradicating extreme poverty and reducing poverty through targeted policy measures. This measure will identify the poor and explain why they are still stuck in this situation. According to the MOFA (2019), five years later, 700 million people in China have been lifted out of poverty. China has been pursuing development consistent with the economic, social and environmental goals of the 2030 SDG. China has played its responsibilities in terms of international cooperation by aligning the "Belt and Road" initiative with the SDG. As the leader of the South-South Cooperation Assistance Fund and the China-United Nations Peace and Development Fund, China is providing assistance to support its developing counterparts in realising the 2030 Agenda.

Since 1970, Malaysia has focused on achieving sustainable development through its New Economic Policy (NEP). In 2010, Malaysia launched the New Economic Model (NEM) that will bring Malaysia toward becoming a high-income and inclusive nation in 2020. Under the NEM, they are four different pillars that act as the guidance to achieve its goals which are the Government Transformation Programme (GTP), the National Transformation Programme (NTP), the Economic Transformation Programme (ETO), and the Tenth and Eleventh Malaysia Plans. For the last five years, Malaysia has launched The Eleventh Malaysia Plan 2016-2020 (11MP), a national development plan that focuses on balancing basic infrastructure and utilities, access to education and healthcare service, and green growth for sustainability. The Eleventh Malaysia Plan 2016 consists of six strategies: to enhance inclusiveness towards an equitable society, improve the well-being of all, accelerate human capital development, pursue green growth, strengthen infrastructure, and re-engineer growth.

Every country has come out with their national plan to achieve the 2030 Agenda. The goals and objectives of the SDG are to achieve sustainability and balance among economic, environmental, and social changes. Decent work and SEG, part of the SDGs, were established by the United Nations General Assembly in 2015. According to OECD Development Centre (2019), GDP in Emerging Asia is estimated to grow by an annual average of 6.1% from 2019 until 2023. In addition, an SEG can be accomplished with higher economic growth in the long term. Economic growth depends on various economic factors, including Information and Communications Technology (ICT) and Foreign Direct Investment (FDI) which are seen as drivers of economic growth in developing countries (Dunne and Masiyandima, 2017; Fanta and Makina, 2017 & Boamah, 2017).

Hans Vestberg, President and CEO of Ericsson, believes that ICT provides an incredible platform for achieving sustainable development (Sachs et al., 2016). A good ICT infrastructure may lead to substantial changes in global relations. It may increase competitive advantages and expand opportunities for socio-economic development. For the spread of ICT, FDI inflows have always been an important channel. The importance of ICT has been emphasised through the development of ICT and the form of market networks, which can increase productivity and the efficiency of global networks (Lipsey and Sjoholm, 2010; Urata, 1998). Therefore, the inflow of FDI and the development of ICT have been identified as two important indicators for achieving SEG.

2. Literature Review

Research examining the impacts of ICT on economic growth by using the Autoregressive Distributed Lag (ARDL) approach has delivered significant positive results. Rath and Hermawan (2019) measured the impacts of ICT, factor productivity, human capital, and capital per worker on economic growth in Indonesia. The study used the annual data for the period from 1980 until 2014. In this paper, the authors focused on the impacts of ICT on economic growth. Of the four standard model growth control variables used, all variables were significantly influenced. These variables were ICT development (positive relationship), total factor productivity (positive relationship), human capital (positive relationship), and capital per worker (positive relationship).

A previous study by Albiman & Sulong (2016) examined the impacts of ICT on economic growth in the Sub-Saharan African region. This study used the panel method technique by implementing the Autoregressive Distributed Lag (ARDL) approach based on data collected from 1990 to 2014 from 45 SSA countries. This study used three main ICT proxies: fixed telephone lines, mobile phone users, and internet users per 100 inhabitants. Using the Autoregressive Distributed Lag (ARDL) model approach, the study showed that ICT penetration positively influenced economic growth in Sub-Saharan African countries. However, the result showed that positive economic growth could be achieved when mobile phones and internet reached 4.5 per cent and fixed telephone lines reached 5 per cent. The impacts of ICT also were influenced by controlling variables: financial development, human capital, institutional quality, and domestic investment during the study period.

Meanwhile, some previous studies found that FDI inflows can influence economic growth performance. According to a study by Chandio, Marini and Shar (2019) on the linkage between FDI and economic growth in Pakistan. The robustness of long-run linkage is checked by employing the autoregressive distributed lag (ARDL) approach, dynamic ordinary least squares (DOLS), fully modified ordinary least square method (FMOLS) and the canonical cointegration regression (CCR). The VECM Granger causality test investigates the causal linkage between the selected variables. By significantly implying the Autoregressive Distributed Lag (ARDL) approach, they found that FDI positively influenced economic growth.

Sarker and Khan (2020) investigated the correlation between FDI and economic growth in Bangladesh from 1972 to 2015 using the Autoregressive Distributed Lag (ARDL) modelling approach. This study variables consist of GDP proxy by real series measured in constant 2000 U.S. dollars and FDI proxy by net inflow converted to a real unit by applying a GDP deflator. This study applied a different unit root test, including the augmented Dickey-Fuller (ADF), augmented Dickey-Fuller Generalized Least Square (DF-GLS), Lee-Strazicich (LS), and Kwiatkowshi-Phillips-Schmidt-Shin (KPSS) unit root tests. The long-run estimation results show that FDI positively impacted Bangladesh's economic growth. As Bangladesh experienced stable economic growth from its FDI inflows, it confirmed the export-led growth hypothesis in this country.

Onafowora and Owoye (2018) investigated the relationship between public debt, FDI inflows,

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and output growth for Caribbean countries using the ARDL approach from 1975 until 2015. The Caribbean countries in this paper included the Bahamas, Barbados, Dominican Republic, Jamaica, and Trinidad and Tobago. The estimation shows that foreign investment inflows, domestic investment, trade openness, human capital, and measure of institutional quality had a positive relationship with economic growth. At the same time, external public debt and inflation rate gave a negative impact during the period of the study. The results also revealed unidirectional causality from economic growth to public debt in The Bahamas, Barbados and the Dominican Republic and bidirectional causality between these two variables in Jamaica and Trinidad and Tobago.

Table 1. Summary of Literature Review

Studies of	Sample Period	Time Series	Explanatory variables
Rath and Hermawan (2019)	Indonesia 1980-2014	ARDL	GDP, ICT, TFP, HC
Albiman & Sulong (2016)	Sub Saharan African Region1990-2014	ARDL	GDP, ICT, FD, HC, TO, IQ
Chandio, Marini and Shar (2019)	Pakistan 1991-2013	ARDL	FDI, GDP
Sarker and Khan (2020)	Bangladesh 1972-2017	ARDL	FDI, GDP
Onafowora & Owoye (2018)	Caribbean 1975-2015	ARDL	GDP, DI, FDI, HC, TO, IQ

3. Methodology

The proposed econometric models are introduced in this section. All variables are transformed into log-linear from (LN); thus, the estimated results from these models represent elasticities. According to Shahbaz et al. (2013), modelling the log-log model specification will provide efficient results by reducing the sharpness in time series data compared with the simple linear-linear specification.

3.1 Model of Economic Growth

In this paper, the following model was adopted as follows:-

$$GDP = \left(ICT, FDI, K, HC, L\right) \quad (1)$$

Where *GDP* is real gross domestic product constant 2010 USD, *ICT* is the development of Information and Communications Technology Information. Communications Technology development ICT consists of fixed telephone subscriptions (per 100 people). *FDI* is foreign direct investment, represented by the net inflow of FDI as a percentage of GDP, *K* is capital expressed in gross capital, *HC* is human capital that accounts for middle school enrolment, and *L* is total labour. All variables are converted to logarithmic form to measure elasticity. The logarithmic linear form of *Ln* in the above formula is as follows:

$$LNGDP_t = \alpha_0 + \beta_1 \text{LNICT}_t 燥 \beta_2 \quad \text{NFDI}_t 燥 \beta_3 \quad \text{NK}_t 燥 \beta_4 \quad \text{NHC}_t + \beta_5 \text{LNL}_t ? + \varepsilon_t \quad (2)$$

The residual term ε is added to the model to capture the unobserved effects and is assumed to be white noise. The log-linear specification can produce more consistent and efficient results than the linear model. The expected sign of β1 is expected to have a positive or negative sign. β2, β3, β4 and β5 are expected to be positive. Meanwhile, according to the dependency hypothesis, it is expected that β2> β3, while based on neoclassical and neoliberal theory or modernisation hypothesis, it is expected that β3> β2.

4. DATA

This study used annual data from 1980 to 2017, comprising 37 years, as a sample period. Data such as GDP, FDI, ICT, K, L, FD, INF and L were taken from World Development Indicator (WDI) 2016. HC data was taken from Barro and Lee database.

Table 2. Sources of Data

Model	Description	Sources
Model of Economic Growth		
FDI	FDI inflows as % of GDP	WDI
GDP	Real GDP constant (2010) USD	WDI
ICT	Fixed telephone subscriptions (per 100 people)	WDI
FD	Money supply, M2 as % of GDP	WDI
INF	Inflation rate	WDI
L	Total labour force	WDI

5. Empirical Findings

The first section begins with the statistical description of the third model, GDP, as shown in Table 3. The explanation consists of GDP, ICT, FDI, K, HC and L. The highest mean for GDP was shown by China (mean = 28.304), followed by Malaysia (mean = 25.643). There was a slight increase from the minimum to the maximum value, with the highest GDP difference recorded in China. Throughout the 37 years of observation, there has been an increasing trend of economic growth in China and Malaysia. Next, the mean and median values for the rest of the variables in China and Malaysia were close to each other. This concludes that the variables were normally distributed.

Table 3. Descriptive Statistic for Model of Economic Growth

	LNGDP	LNICT	LNFDI	LNK	LNHC	LNL
China						
Mean	28.304	1.311	0.581	3.682	0.737	20.309
Median	28.318	2.037	1.072	3.685	0.762	20.398
Maximum	29.950	3.320	1.822	3.865	0.943	20.481
Minimum	26.556	-1.535	-3.507	3.487	0.519	19.853
Standard Deviation	1.049	1.846	1.185	0.114	0.129	0.201
Skewness	-0.0407	-0.414	-1.556	0.063	-0.172	-1.044
Kurtosis	1.779	1.481	5.263	1.890	1.700	2.620
Malaysia						
Mean	25.643	2.480	1.185	3.315	0.899	16.015
Median	25.738	2.749	1.367	3.245	0.937	16.025
Maximum	26.622	3.035	2.170	3.776	1.120	16.531
Minimum	24.547	1.053	-2.870	2.881	0.577	15.498
Standard Deviation	0.638	0.553	0.840	0.227	0.161	0.317
Skewness	-0.217	-1.095	-3.208	0.613	-0.505	0.002
Kurtosis	1.764	3.013	15.729	2.427	2.027	1.777

The unit root test begins with ADG, followed by the PP unit root test, which establishes the order of integration of the variables. Table 4 reports the outcomes of the ADF and PP unit root tests on the natural logarithms of the tested variables (LNGDP, LNICT, LNFDI, LNK, LNHC, and LNL) for both levels as well as at first difference. The results suggested a mixed order of integration at I (0) and I (I) for the variables introduced in the economic growth model in China and Malaysia.

Table 4. ADF and PP unit Root Tests for Model of Economic Growth

Model	Variables		ADF test		PP test	
			Intercept	Trend and Intercept	Intercept	Trend and Intercept
China	Level	LNGDP	-1.36(2)***	-3.39(3)*	-1.23(0)	-0.94(0)
		LNICT	-2.44(3)	-1.18(2)	-1.47(5)	0.24(4)
		LNFDI	-2.30(1)*	-1.19(1)*	-5.10(1)***	-3.18(1)*
		LNK	-2.30(1)	-3.35(1)*	-1.51(4)	-2.47(3)
		LNHC	-0.26(1)	-2.59(1)	-0.67(4)	-1.45(4)
		LNL	-27.93(9)***	-27.66(9)***	-4.24(1)***	-1.05(3)
	First	LNGDP	-4.63(1)***	-4.29(1)***	-3.37(2)**	-3.52(3)**
	difference	LNICT	-1.49(1)	-2.22(1)	-0.92(1)	-1.82(2)
		LNFDI	-5.69(0)***	-4.83(1)***	-5.69(2)***	-9.62(11)***
		LNK	-4.95(1)***	-4.30(0)***	-4.19(9)***	-4.12(9)***
		LNHC	-1.191(0)	-8.08(9)***	-2.04(2)	-1.99(2)
		LNL	-22.23(9)***	-2.10(5)	-4.88(3)***	-6.68(3)***
Malaysia	Level	LNGDP	-1.12(0)	-1.25(0)	-1.08(2)	-1.41(2)
		LNICT	-0.30(1)	-1.84(1)	-3.56(3)***	-2.21(3)
		LNFDI	-5.16(0)***	-5.18(0)***	-5.16(0)***	-5.18(1)***
		LNK	-1.793(0)	-2.076(0)	-1.92(1)	-2.31(2)
		LNHC	-2.67(1)***	-1.70(1)*	-7.80(4)***	-0.93(4)*
		LNL	-1.38(3)	-3.00(3)*	-0.089(1)	-2.46(1)
	First	LNGDP	-4.94(0)***	-4.96(0)***	-4.95(1)***	-4.97(1)***
	difference	LNICT	-1.40(2)	1.20(0)	-1.36(1)	0.73(1)
		LNFDI	-6.81(1)***	-6.72(1)***	-25.08(23)***	-24.68(23)***
		LNK	-5.39(0)***	-5.31(0)***	-5.39(1)***	-5.31(1)***
		LNHC	-0.89(0)*	-2.25(0)**	-0.89(0)	-2.30(2)
		LNL	-4.60(2)***	-4.17(2)***	-4.69(2)***	-4.61(2)***

Note: 1. (*)(**)(***) indicate significant at 10%, 5% and 1% significant level respectively. 2. The optimal lag length is selected automatically using the Schwarz information criteria for the ADF test, and the bandwidth has been selected using the Newey-West method for the PP test.

The approach started with the F-test to confirm the existence of cointegration (refer to Table 5) between the variables in the model. F-test was obtained from the optimum lags based on AIC. AIC-based ARDL suggested that the optimum order was 1,1,0,0,0,0 (China) and 1,0,0,0,0,0 (Malaysia). The results of the F-statistic were greater than its upper bound critical value for China and Malaysia and significant at 1%, 5% and 10% levels, thus confirming the existence of cointegration in the model.

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Table 5. ARDL Test for cointegration for Model of Economic Growth

Model	AIC (Lag order)	F Statistic
China	(4, 0, 3, 3, 4, 2)	11.31
Malaysia	(1, 0, 0, 0, 0, 0)	3.101
Critical Values for F-statistic	Lower Bound, I(0)	Upper Bound, I(I)
1%	3.41	4.68
k = 5 5%	2.62	3.79
10%	2.26	3.35

Note: # The critical value is obtained automatically under Eviews 9, k is several variables (IV), critical values for the bounds test: case III: unrestricted intercept and no trend *,**, and *** represent 10%, 5% and 1% level of significance, respectively.

The validation of the model's long-run and short-run elasticities can only be considered when the introduced econometric model passes all its diagnostic tests. The results of the diagnostic test are shown in Table 6. Given that the probability values for every test for China and Malaysia were greater than 10% of the significant level, thus it failed to reject the null hypothesis of no serial correlation, no heteroscedasticity, no misspecification of functional form and the model was normally distributed.

Table 6. Diagnostic Test for Model of Economic Growth

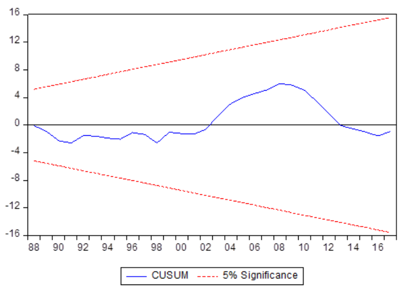
Model	Serial Correlation χ^2 (I) [p-value]	Functional Form χ^2 (I) [p-value]	Normality χ^2 (I) [p-value]	Heteroscedasticity χ^2 (I) [p-value]
China	1.059 [0.382]	2.405 [0.149]	0.485 [0.785]	0.650 [0.812]
Malaysia	1.621 [0.216]	0.017 [0.986]	41.266 [0.000]	2.024 [0.100]

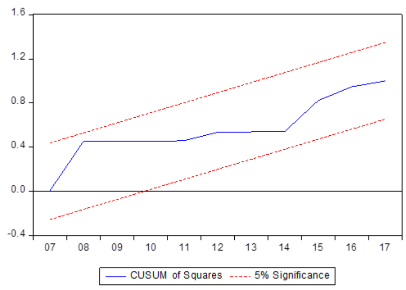
Note: In squared brackets, the probability values of the battery of diagnostic tests are displayed. A Lagrange multiplier test for residual serial correlation; B. Ramsey's RESET test utilising the square of the fitted value; C. Based on residual skewness and kurtosis tests; D. Based on regression of square fitted values.

CUSUM and CUSUMQ were also tested on the model to enhance the reliability of the output. The stability was supported in China and Malaysia because the plots of both CUSUM and CUSUMQ fell within the critical bounds of 5%. Figure 1 below displays the plots of the CUSUM and CUSUMQ tests.

CUSUM CUSUMQ

China





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Malaysia

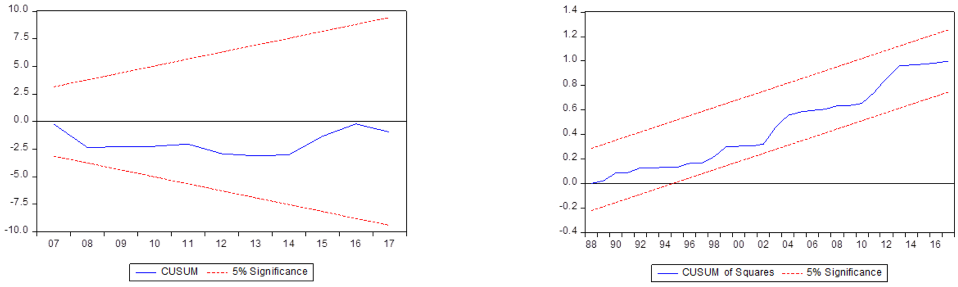

Figure 1. CUSUM and CUSUMQ Stability Test for Model of Economic Growth

Table 7 shows the outcome of the long-run elasticities. Based on the model of economic growth, the result for the LNICT indicator revealed a positive relationship and significant sign for China while a negative relationship and insignificant sign for Malaysia. The positive impact of LNICT on economic growth in China is linked with a previous study by Shehzad et al. (2021). They found that countries with better ICT development can easily achieve a higher growth rate. Next, for LNFDI, there was a negative relationship and significant sign for China, while a positive and insignificant sign for Malaysia. The study's outcome in this model is the opposite of Ali et al. (2018). They found that FDI inflows positively correlate with China's GDP growth. Meanwhile, Ridzuan et al. (2018) found a positive relationship between FDI and Malaysia economic growth.

Besides, for capital LNK, a positive relationship and sign were detected for both China and Malaysia. The magnitudes of 1.52% and 0.22% implied that a 1% increase in LNK increases the economic growth of China and Malaysia by around 1.52% and 0.22%, respectively. As for LNHC, it was found that this variable was significant and had a positive relationship with economic growth in Malaysia. The positive impact of LNHC on economic growth is in line with previous studies done by Onafowora & Owoye (2019) and Rath and Hermawan (2019), who found that countries with positive human capital can influence boosting economic growth. Lastly, the outcome for labour LNL was a positive and significant sign for both countries. A 1% increase in labour increased economic growth by 6.51% for China and 1.06% for Malaysia. This model's outcome of LNL for China and Malaysia is the opposite of Ho and Bernard (2018). They found that labour is negatively correlated with GDP growth. The analysis in this section is short-run elasticities. Table 4.18 presents the output.

Similar to the previous analysis, the highlight was emphasised based on the lag 0 outcomes. Based on the short-run elasticities for LNICT, it shows a positive relationship and a significant sign for China (0.06) while an insignificant one for Malaysia (-0.01). Next, LNFDI showed a positive and insignificant sign for China and Malaysia. Besides, for LNHC, both countries showed a positive and significant relationship. Lastly, for LNK and LNL, China showed positive and insignificant signs. In contrast, Malaysia showed a positive relationship and significant sign. A higher coefficient value represents the higher speed of adjustment for the variables to converge in the long run.

Table 7. Long-Run Elasticities for Model of Economic Growth

Country DV Lag order	China LNGDP (4,0,3,3,4,2)	Malaysia LNGDP (1,0,0,0,0,0)
IV	Coefficient	Coefficient
LNICT	0.509*	-0.037
LNFDI	-1.313*	0.024
LNK	1.518*	0.219***
LNHC	-0.763	2.106*
LNL	6.507*	1.056**
C	-109.82*	6.266

Note: (*), (**), (***) indicate significance at 10%, 5% and 1% significance level respectively.

The last analysis in this section is short-run elasticities. Table 8 presents the output. Similar to the previous analysis, the highlight was emphasised based on the lag 0 outcomes. Based on the short-run elasticities for LNICT, it shows a positive relationship and a significant sign for China (0.06) while an insignificant one for Malaysia (-0.01). Next, LNFDI showed a positive and insignificant sign for China and Malaysia. Besides, for LNHC, both countries showed a positive and significant relationship. Lastly, for LNK and LNL, China showed a positive and insignificant signs. In contrast, Malaysia showed a positive relationship and significant sign. A higher coefficient value represents the higher speed of adjustment for the variables to converge in the long run.

Table 8. Short Run Elasticates and Error Correlation Term for Model of Economic Growth

Variables	China Coefficient	Malaysia Coefficient
Δ (LNGDP(-1))	0.338*	-
Δ(LNGDP(-2))	0.530*	-
Δ (LNGDP(-3))	0.959***	-
ΔLNICT	0.064**	-0.014
ΔLNFDI	0.015	0.009
Δ(LNFDI(-1))	0.065***	-
Δ(LNFDI(-2))	0.063***	-
ΔLNK	0.080	0.084***
Δ(LNK(-1))	0.012	-
Δ(LNK(-2))	-0.263***	-
ΔLNHC	3.022*	0.808**
Δ(LNHC(-1))	-2.376	-
Δ(LNHC(-2))	-0.596	-
Δ(LNHC(-3))	1.966*	-
ΔLNL	0.033	0.405*
Δ(LNL(-1))	-0.627**	-
CointEq(-1)	-0.126*	-0.383***
R square	0.965	0.383
Adj. R square	0.906	0.259

Note: Δ refers to the first difference. The dependent variable is LNGDP. (*), (**), and (***) indicate significance at 10%, 5% and 1% significance level.

6. Conclusion

The research investigated the impact of FDI inflows and ICT development on economic growth in China and Malaysia from 1980 to 2017. This study employed the Autoregressive Distributed Lag (ARDL) approach to looking at the presence of a long-run connection between variables. The long-run elasticities findings revealed that LNICT which represented information and communication technology had a positive and significant sign on LNGDP in China. Meanwhile, Malaysia had a negative relationship and insignificant sign for LNICT. The LNFDI was found to negatively influence economic growth in China as it showed a negative and significant sign.

In contrast, Malaysia showed positive and insignificant signs. For LNK, China and Malaysia found a positive relationship and significantly influenced economic growth. For LNHC, China found a negative relationship and insignificant sign while Malaysia positively and significantly influences economic growth. Lastly, for LNL, there was a positive relationship and significant sign between China and Malaysia.

Meanwhile, for short-run elasticities, LNICT for China found a positive relationship and significant sign while the negative and insignificant sign for Malaysia. While for LNFDI, both countries found positive relationships and insignificant signs. For LNK and LNL, China found positive and insignificant signs, while Malaysia had a positive relationship and a significant sign. Lastly, for LNHC, China and Malaysia found a positive relationship and significant signs toward economic growth. The policymakers for both countries should recommend mandatory policies related to FDI inflows, human capital and labour to achieve long-term and sustainable development in China and Malaysia. This study only uses mobile cellular subscriptions per 100 people as a proxy for ICT development. It is not strong enough to show real data for ICT development. For future research, we suggest forthcoming studies to include more proxies for ICT development indicators like fixed cellular subscription per 100 and individuals using the internet based per cent of the population.

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