Economic Journal of Emerging Markets, 14(2) 2022, 259-270

EJEM
Econ.J.Emerg.Mark.

Economic Journal of Emerging Markets
Available at https://journal.uii.ac.id/jep

Foreign direct investment and economic complexity in emerging economies

Tolulope T. Osinubi[1], Folorunsho M. Ajide[2*]

[1]Department of Economics, Obafemi Awolowo University, Ile-Ife, Nigeria
[2]Department of Economics, University of Ilorin, Ilorin, Nigeria
*Corresponding author's email: ajide2010@gmail.com

Article Info

Article history:
Received 23 June 2022
Accepted 28 October 2022
Published 31 October 2022

JEL Classification Code:
F23, O10, O47

Author's email:
tosinubi@oauife.edu.ng

DOI: 10.20885/ejem.vol14.iss2.art9

Abstract

Purpose — In this study, we investigate the impact of foreign direct investment (FDI) on economic complexity in MINT and BRICS countries.

Methodology — Data on economic complexity from MIT's Observatory of Economic Complexity and data on FDI and other determinants of economic complexity are sourced from World Development indicators which spanned between 1991 and 2020. The countries are divided into three categories: All countries pooled together, MINT and BRICS countries. We employ panel co-integrating regression.

Findings — Findings based on panel co-integration regression show that foreign direct investment positively impacts economic complexity in all the countries and MINT countries, while its impact is negative in BRICS countries.

Originality — This study adds value to the literature by scrutinizing the nexus between FDI and economic complexity in the context of emerging economies and employs the panel co-integration technique for robust analysis. The study's findings shed light on the need for governments in developing countries to implement appropriate policies encouraging FDI inflows into their respective countries. Contributing to the host country's economic complexity, FDI inflows should be focused on highly technical investment and, most importantly, should be selective to enhance the development of priority sectors. An investment promotion policy may be required to encourage foreign investment in the host country.

Keywords — FDI, economic complexity, MINT countries, BRICS countries, panel dynamic OLS.

Introduction

Recent literature underlines the beneficial impacts of economic complexity concerning entrepreneurship (Ajide, 2022), remittances (Saadi, 2020), finance (Nguyen, Schinckus, & Su, 2020), and other economic variables (Gao & Zhou, 2018; Lapatinas, 2019; Zhu & Li, 2017). However, one area that has received little attention is the impact of foreign direct investment (FDI) on economic complexity. Except for the study of Antonietti and Franco (2021), Gómez-Zaldívar, Llamosas, and Gómez Zaldívar (2021), and Khan, Khan, and Khan (2020) that examine the causality between the two variables, little is known about the nexus between FDI and economic complexity in emerging economies. This paper fills this lacuna found in the literature. This study aims to examine the impact of FDI on economic complexity in emerging economies.

P ISSN 2086-3128 | E ISSN 2502-180X

Economic complexity has to do with the production structure and capability of the economic system. It reflects the nature of knowledge accumulation by economic agents exercise in the process of production (Ajide, 2022; Nguyen, Nguyen, Duy Tung, & Su, 2021). It uses domestic knowledge to convert inputs to outputs, including products diversifying for country's exportation. The recent study of Antonietti and Franco (2021) posits that one channel for improving the economy's complexity is through foreign direct investment (FDI). Theoretically, this idea relates to the view of Romer (1993), as explained in the endogenous growth model. The author emphasizes that foreign direct investment represents the channel by which new ideas and products are introduced into the domestic economy that lacks the technical know-how of the productive knowledge in the economy.

The presence of multinational entrepreneurs in the economy may bring economic prosperity and expansion and improve the economic production capabilities to upgrade the processes and introduction of new ideas while the products' sophistication is enhanced (Antonietti & Franco, 2021; Nguyen & Su, 2021). FDI may improve the economic complexity via knowledge spillovers in the interaction between multinational and domestic companies via technology transfer from the foreign subsidiaries operating in the host country. Further enhances efficient operations, imitation of ideas, or generation of new ideas (Anand, Mishra, & Spatafora, 2012; Arnold & Javorcik, 2009). On the other hand, FDI may negatively impact economic complexity by enhancing greater competitive exposure to local firms, especially infant firms.

Furthermore, greater exposure to the competition may throw out or reduce the activities of foreign firms in the host countries in the presence of higher transaction costs, including wages and other operating costs. These actions may reduce the sophistication of the host economy and its export diversifications (De Backer & Sleuwaegen, 2003; Kosová, 2010). On empirical notes, few studies have examined the impact of FDI on economic complexity. For instance, Antonietti and Franco (2021) show causality moving from FDI to economic complexity. This is against the study of Khan et al. (2020), who document a bidirectional causality between FDI and economic complexity. Gómez-Zaldívar et al. (2021) reveal that an economy with higher sophistication attracts FDI in Mexican states. Nguéda and Kelly (2022) show that economic complexity is affected by FDI positively. Our study complements this budding literature by investigating the impact of FDI on economic complexity in emerging economies.

The contributions of this paper are as follows. To the best of the authors' knowledge, it is the first study to examine the impact of FDI on economic complexity in the group of emerging economies: Mexico, Indonesia, Nigeria, Turkey (MINT countries), Brazil, Russia, India, China, and South Africa (BRICS countries) between 1991 and 2020. According to O'neill (2001), the countries are chosen based on the claim that they have rising economies. The MINT countries are considered the most potent emerging markets in the world since it is anticipated that they will experience rapid economic expansion over the following decades, luring both domestic and foreign investors in search of investment possibilities. Similarly, the BRICS countries are expected to become dominant suppliers of raw materials, manufactured goods, and services by the year 2050, according to O'neill (2001) in Pradhan, Sachan, Sahu, and Mohindra (2022). According to Klafke, Lievore, Picinin, de Francisco, and Pilatti (2016), these countries have attained stable social and economic indices. They have historical records of comprehensive knowledge management and employ innovative strategies to boost the production of innovative products and services. These countries are recognized for their potential in the global market. For instance, India is a great exporter of technological workforce. In South America, Brazil stands out as a grain exporter, while China is a great country in the global market (Rubbo, Picinin, & Pilatti, 2021).

Furthermore, Russia stands out in the energy market, while South Africa has the best product sophistication in sub-Saharan Africa (Ajide, 2022). In addition, the study employs a panel dynamic co-integrating technique. This technique accounts for endogeneity, is robust to multicollinearity and autocorrelation, and produces efficient estimates. This panel data technique has not been previously employed in the study of the FDI and economic complexity nexus. The rest of the paper is organized as follows. Section two discusses the methodology used, including the data, descriptive statistics, and correlation analysis, together with the model specification and

analysis method. Section three provides empirical results, while section four concludes the paper and provides the policy implications.

Methods

Data

Based on a panel data analysis, the study analyzes annual secondary data on nine emerging economies: Mexico, Indonesia, Nigeria, Turkey (MINT countries), Brazil, Russia, India, China, and South Africa (BRICS countries) between 1991 and 2020. The data used include economic complexity, foreign direct investment, economic growth, capital, mobile cellular subscriptions, human capital, and trade openness. Except for economic complexity, which is accessible from MIT's Observatory of Economic Complexity (http://atlas.media.mit.edu), all of the data on the variables used were sourced from the World Bank's World Development Indicators Database's online edition. The variables are employed in their level form. Table 1 provides a summary of the variable descriptions.

Table 1. Variables Descriptions

Variable	Symbol	Measurement	Source
Economic Complexity	COM	Economic Complexity Index	MIT's Observatory of Economic Complexity (http://atlas.media.mit.edu)
Foreign Direct Investment	FDI	Foreign direct investment, net inflows (% of GDP)	WDI Database
Economic Growth	GDP	GDP per capita (constant 2015 US$)	
Capital	GCF	Gross capital formation (% of GDP)	
Mobile Cellular Subscriptions	MOB	Mobile cellular subscriptions (per 100 people)	
Human Capital	SSE	School enrollment, secondary (% gross)	
Trade Openness	TOP	Trade (% of GDP)	

Note: WDI represents World Development Indicators. Source: authors' compilation

Model Specification and Method of Analysis

In line with Lapatinas (2019), Nguyen et al. (2020), and Nguyen and Su (2021a, 2021b), the study adopts their model to capture the effect of FDI on economic complexity in MINT and BRICS countries as stated in the equation below. The study contributes by looking into factors that can influence economic complexity in MINT and BRICS countries.

$$COM_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 GDP_{it} + \beta_3 CAP_{it} + \beta_4 MOB_{it} + \beta_5 SSE_{it} + \beta_6 TOP_{it} + \pi_t + \mu_i + \mathcal{E}_{it} \quad (1)$$

Where *COM, FDI, GDP, CAP, MOB, SSE, and TOP* represent economic complexity, foreign direct investment, economic growth, capital investment, mobile cellular subscriptions, human capital, and trade openness, respectively. *"i" and "t"* denote the number of countries involved and study period. π_t is the unobserved period-specific effect, while μ_i indicates the unobserved country-specific effect. The term, $\mathcal{E}_{it}$ is the disturbance term.

Additional factors might have an impact on economic complexity as informed by theories and earlier empirical studies, such as economic growth, capital investment, mobile cellular subscriptions, human capital, and trade openness are among the control variables. One of the key factors influencing economic complexity is economic growth, as noted by Gala, Camargo, Magacho, and Rocha (2018), Hartmann, Guevara, Jara-Figueroa, Aristarán, and Hidalgo (2017), Ivanova, Strand, Kushnir, and Leydesdorff (2017), Khan et al. (2020), Lapatinas (2019), Nguyen et al. (2020), Nguyen and Su (2021a, 2021b), Saadi (2020). Economic growth is anticipated to

contribute favorably to economic complexity since GDP per capita might affect product quality. As expected, capital investment will positively affect economic complexity and, as measured by Gross capital formation (% of GDP), is employed by Nguyen and Su (2021).

The model includes a variable for mobile cellular subscriptions, which is comparable to how Lapatinas (2019) and Nguyen and Su (2021a, 2021b) use internet usage. If phone subscribers truly use their mobile phones to acquire the skills and knowledge required to improve economic complexity, then we expect a positive relationship between mobile cellular subscriptions and economic complexity. Economic complexity is proven to be highly correlated with human capital, regardless of how it is measured (Anand et al., 2012; Cabral & Veiga, 2010; Chu, 2020; Costinot, 2009; Gao & Zhou, 2018; Hausmann, Hidalgo, & Bustos, 2014; Lapatinas, 2019; Lin & Wang, 2008; Nguyen et al., 2020; Saadi, 2020; Zhu & Li, 2017). This is predicated on the idea that education boosts people's productivity, knowledge, creativity, and skills, which are relevant for an improved economic complexity. Additionally, according to Khan et al. (2020), endogenous growth theory strongly emphasizes the role that human capital plays in transforming resources and enhancing productive capabilities.

Trade openness, as argued by some studies (such as Gala et al., 2018; Gao & Zhou, 2018; Ghebrihiwet, 2019; Nguyen et al., 2020; Nguyen & Su, 2021a; Saadi, 2020; Teixeira & Fortuna, 2010), promotes technological advancement, and thus, we expect a positive relationship between trade openness and economic complexity. In other words, Keller (2010) concurs that openness will allow a nation to benefit from the diffusion of technology, which has the potential to increase economic complexity. In the same vein, Khan et al. (2020) reveal that openness enables firms to be more efficient in allocating scarce resources, thereby increasing their revenues. The increase in revenue due to trade openness, according to Bustos (2011), can make firms upgrade technology and production.

Given that there could be a co-integration among the variables in equation 1, this study uses a dynamic ordinary least square (DOLS) estimation technique to achieve its goals. This method is, thus, preferred to the other estimation techniques in that it includes the contemporaneous values, leads, and lag values of the independent variables in its first difference form to solve the issues of endogeneity and serial correlation (Kumar, Nayak, & Pradhan, 2020; Pradhan et al., 2022). Endogeneity may occur due to a reversed causality between FDI and economic complexity (Khan et al., 2020; Sadeghi, Shahrestani, Kiani, & Torabi, 2020). Therefore, the use of DOLS is appropriate for solving the potential issue.

Results and Discussion

Descriptive Statistics and Correlation Analysis

The descriptive and correlation statistics for the variables used, as shown in Tables 2 and 3, respectively, are discussed in this subsection. The mean, standard deviation, minimum and maximum values are highlighted in Table 3. The average economic complexity index (ECI)for the MINT countries is -0.268, while the average value for the BRICS countries is 0.332. Compared to the MINT countries, the BRICS countries are increasingly moving away from agriculture and pollution-intensive production toward sophisticated knowledge-based economies. This is because Nigeria and Indonesia, which are part of the MINT countries, are placed lower in the ECI, with negative values throughout the study period. This implies that most of the two countries' exports are not technologically sophisticated but agricultural and pollution-intensive products. All the countries involved show a positive average value of 0.0741, which is lower than that of the BRICS countries. The negative average value recorded in the MINT countries provides this rationale. The minimum and maximum values of ECI in MINT countries are -2.764 and 1.160, respectively, observed in Nigeria in 2009 and Mexico in 2016. In BRICS countries, South Africa in 1991and China in 2012 record the minimum and maximum values of -0.168 and 1.007, respectively. These results can be explained, in that Nigeria and South Africa are the only African countries among the selected countries with fewer exports of technologically advanced products, while Mexico sharing a border with America, has improved her exports based on technologically sophisticated products,

and China is known for producing and exporting technologically advanced products. Given all the countries under the study period, Mexico has the highest ECI, while Nigeria records the lowest ECI, both MINT countries.

Table 2. Descriptive statistics

	All Countries						
	COM	FDI	GDP	GCF	MOB	SSE	TOP
Mean	.0741	1.894	5297.268	26.334	54.092	74.726	44.553
Std. Dev.	.831	1.362	3131.737	8.402	52.049	23.597	14.524
Min.	-2.764	-2.757	527.515	12.745	.00020	23.551	15.635
Max.	1.160	6.186	12038.6	48.405	165.661	109.994	110.577
	MINT Countries						
	COM	FDI	GDP	GCF	MOB	SSE	TOP
Mean	-0.268	1.681	5364.111	26.456	49.782	66.131	48.702
Std. Dev.	1.116	1.200	3381.416	24.511	45.336	24.511	13.143
Min.	-2.764	-2.757	1414.1	23.551	0.008	23.551	20.722
Max.	1.160	5.790	12038.6	105.992	164.441	105.992	96.186
	BRICS Countries						
	COM	FDI	GDP	GCF	MOB	SSE	TOP
Mean	0.332	2.065	5242.794	26.236	57.539	82.719	41.234
Std. Dev.	0.242	1.462	2927.174	9.725	56.767	20.249	14.762
Min.	-0.168	0.002	527.515	12.745	0.0020	38.984	15.635
Max.	1.007	6.186	10370.4	46.660	165.661	109.994	110.577

Source: Authors' Computations

Table 3. Pairwise correlation

	All Countries						
	COM	FDI	GDP	GCF	MOB	SSE	TOP
COM	1.000						
FDI	0.178	1.000					
GDP	0.565	0.174	1.000				
GCF	-0.097	0.241	-0.316	1.000			
MOB	0.133	0.148	0.475	-0.048	1.000		
SSE	0.697	0.150	0.756	-0.333	0.524	1.000	
TOP	0.192	-0.044	0.197	0.051	0.154	0.190	1.000
	MINT Countries						
	COM	FDI	GDP	GCF	MOB	SSE	TOP
COM	1.000						
FDI	0.148	1.000					
GDP	0.771	0.269	1.000				
GCF	-0.286	0.158	-0.289	1.000			
MOB	0.125	0.205	0.280	0.130	1.000		
SSE	0.794	0.194	0.797	-0.210	0.576	1.000	
TOP	0.537	0.048	0.362	-0.121	0.062	0.505	1.000
	BRICS Countries						
	COM	FDI	GDP	GCF	MOB	SSE	TOP
COM	1.000						
FDI	0.324	1.000					
GDP	0.430	0.114	1.000				
GCF	0.122	0.286	-0.351	1.000			
MOB	0.192	0.103	0.637	-0.121	1.000		
SSE	0.426	0.006	0.851	-0.545	0.509	1.000	
TOP	-0.028	-0.042	0.066	0.130	0.246	0.104	1.000

Source: Authors' Computations

Similarly, the mean value of FDI in the BRICS countries is higher than in the MINT countries. In particular, the mean value of FDI as a percentage of GDP in BRICS countries is 2.065, while it is 1.681 in MINT countries. This can also explain the average values of ECI obtained in both categories of countries. The overall mean value of FDI is 1.894 as a percentage of GDP. In MINT countries, Indonesia in 2000 and Nigeria in 1994 have the minimum and maximum values of FDI as -2.757 and 5.790 as a percentage of GDP, respectively. South Africa in 1992 and China in 1993 recorded 0.002 and 6.186, respectively, as the minimum and maximum values of FDI as a percentage of GDP. This implies that Indonesia and China have the lowest and highest FDI as a percentage of GDP, considering all the countries' panels.

In sum, the mean values of all the variables falling between the minimum and maximum values indicate that all the variables are consistent. In contrast, the level of volatility of all the variables, as measured by the standard deviation values, reveals that all values of the variables employed do not deviate significantly from their mean values.

Table 3 shows the pairwise correlation among the variables. Except for capital investment in the whole sample and MINT countries and trade openness in BRICS countries, which show a negative association with economic complexity, the results from the table reveal that all the independent variables are positively associated with economic complexity. Also, it is proven that there is no indication of multicollinearity among the independent variables as all the correlation coefficients are within the tolerance rate.

Panel Unit Root and Co-integration Tests

This study employs the Fisher-type-unit root test based on Augmented Dickey-Fuller (ADF) test and Im-Pesaran-Shin (IPS) unit root test to check the stationarity properties of the variables. The results of the two tests indicate that all the variables are stationary at the first difference and that none of the variables are stationary at levels. The panel unit root tests are presented in Table 4.

Table 4. Panel Unit root tests

	Fisher-type unit-root test based on ADF test			Im-Pesaran-Shin unit-root test		
Variables	All Countries	MINT	BRICS	All Countries	MINT	BRICS
COM	0.773	-0.462	1.451	-1.246	-1.743	-0.848
ΔCOM	-10.364***	-8.614***	-6.200***	-4.442***	-5.226***	-3.816***
FDI	-0.479	0.302	-0.914	-0.872	-0.054	-1.121
ΔFDI	-3.654***	-2.260**	-2.880**	-6.024***	-6.093***	-5.970***
GDP	1.659	2.746	2.484	0.415	-0.252	0.950
ΔGDP	-4.640***	-4.806***	-1.927**	-2.820***	-3.528***	-2.254***
GCF	-0.405	-1.477	-1.349	-0.653	-2.137	-2.049
ΔGCF	-4.303***	-9.053***	-8.486***	-5.084***	-5.516***	-4.740***
MOB	-0.297	1.568	0.698	-0.199	-0.862	0.331
ΔMOB	-5.254***	-4.587***	-2.946***	-3.006***	-3.474***	-2.632***
SSE	0.835	1.744	1.115	-0.955	-0.820	-1.064
ΔSSE	-3.094***	-8.289***	-6.830***	-4.575***	-5.133***	-4.128***
TOP	0.155	-1.100	-0.053	-0.169	-1.977	-0.394
ΔTOP	-6.398***	-10.017***	-10.694***	-5.884***	-5.982***	-7.108***

Source: Authors' Computations***, **, & * imply significant at 1%, 5% and 10% respectively.

Since all of the variables are integrated of order one, the results of the unit root tests compel us to investigate whether there is a long-run relationship among the variables. The study uses Kao (1999) in Table 5 and Pedroni (2004) in Table 6 co-integration tests to determine whether the variables are co-integrated. Table 5 shows that the null hypothesis of no co-integration is rejected in MINT and BRICS countries when all the statistics are considered. While using the full sample (that is, all countries), three out of the five statistics in the Kao test and two in the Pedroni test reject the null hypothesis of no co-integration. The conclusion is a possible long-run relationship among the variables using the three samples (All countries, MINT countries, and BRICS countries). This, therefore, suggests that all the variables move together in the long-run and that all the

regressors employed in the model can empirically explain the level of economic complexity in MINT and BRICS countries.

Table 5. KAO Test for Panel Cointegration (H_0: No co-integration Vs H_a: All Panels are co-integrated)

	All Countries	MINT Countries	BRICS Countries
Modified Dickey-Fuller t	-1.824**(0.034)	-3.120***(0.0009)	-2.051**(0.020)
Dickey-Fuller t	-1.189(0.117)	-2.102**(0.017)	-2.086**(0.018)
Augmented Dickey-Fuller t	-3.062***(0.001)	-3.527***(0.0002)	-2.160**(0.015)
Unadjusted modified Dickey-Fuller t	-1.527*(0.063)	-3.086***(0.001)	-1.472*(0.070)
Unadjusted Dickey-Fuller t	-1.051(0.146)	-2.093**(0.018)	-1.886**(0.029)

Source: Authors' Computations, Augmented lags=1. Figures in ( ) are P-values. ***, **, & * imply significant at 1%, 5% and 10% respectively.

Table 6. Pedroni Test for Panel Cointegration (H_0: No co-integration Vs H_a: All Panels are co-integrated)

	All Countries	MINT Countries	BRICS Countries
Modified Phillips-Perron t	3.476***(0.0003)	1.515**(0.064)	3.165***(0.0008)
Phillips-Perron t	0.933(0.175)	-1.609*(0.053)	1.751**(0.040)
Augmented Dickey-Fuller t	1.923**(0.027)	-1.785**(0.037)	2.489***(0.006)

Source: Authors' Computations, Augmented lags=1. Figures in ( ) are P-values. ***, **, & * imply significant at 1%, 5% and 10% respectively.

FDI-Economic Complexity Nexus

In this section, we examine the impact of FDI on economic complexity using the three samples. The result for all countries pooled together is presented in Column 2 of Table 7, while Columns 3 and 4 present the results in MINT and BRICS countries. The study employs the Dynamic Ordinary Least Square (DOLS) technique after confirming that the variables of interest can have one or more co-integrating connections. Results for the entire sample, MINT, and BRICS countries are shown in Columns 1-3, respectively.

Table 7. Estimated Results Based on Panel Dynamic OLS

	All Countries	MINT Countries	BRICS Countries
FDI	0.074***	0.104***	-0.064***
	(0.000)	(0.000)	(0.000)
GDP	-0.00007	-0.00006	-0.0001***
	(0.853)	(0.881)	(0.000)
GCF	-0.005	-0.007	0.008**
	(0.333)	(0.154)	(0.052)
MOB	-0.018***	-0.015***	-0.013***
	(0.000)	(0.000)	(0.000)
SSE	0.064***	0.058***	0.071***
	(0.000)	(0.000)	(0.000)
TOP	0.006*	0.0005	-0.011***
	(0.011)	(0.838)	(0.000)
Wald chi^2	852.67***	656.94***	510.33***
	(0.000)	(0.000)	(0.000)
No of group	9	4	5
R-Squared	0.247	0.243	0.800

Source: Authors' Computations, Augmented lags=1. Figures in ( ) are P-values. ***, **, & * imply significant at 1%, 5% and 10% respectively.

As shown in table 7, FDI has a significant positive effect on economic complexity in all countries combined and MINT countries, while its effect on economic complexity in BRICS countries is negative and significant. The positive impact of FDI on economic complexity in all

countries and MINT countries suggests that foreign direct investment can improve product quality for the host country through technological advancement and skill spillovers. This further clarifies the claim made by Eck and Huber (2016), Hausmann (2016), Javorcik, Lo Turco, and Maggioni (2018), Khan et al. (2020), Saadi (2020), and Xu and Lu (2009) that FDI allows the transfer of knowledge, technology, management abilities that can encourage the production of more sophisticated goods. In other words, FDI is seen as one of the key drivers of economic complexity when all countries are pooled together, and MINT countries are considered. By manufacturing unique goods or services that have never been produced before and increasing the production of existing goods, FDI can further increase economic complexity, claim Antonietti and Franco (2021).

Surprisingly, the fact that FDI in BRICS countries might drive out domestic investment and economic activities can be used to explain the negative link between FDI and economic complexity in BRICS countries (see Nguyen & Su, 2021a, 2021b). In addition, if FDI inflows are low technology FDI (Arvanitis, 2005) or polluting FDI (Singhania & Saini, 2021), or are intended at natural resource rents (Bokpin, Mensah, & Asamoah, 2015; Ndikumana & Sarr, 2019; Nguyen & Su, 2021a, 2021b; Poelhekke & van der Ploeg, 2013), its impact on economic complexity can be negative. Despite the argument that China is the fourth largest destination for foreign investors, with $1491 billion in 2017 according to the UNCTAD (2018) in Khan et al. (2020), the BRICS countries still show a negative relationship between FDI and economic complexity. This may be explained by the fact that the other nations that joined China to form the BRICS countries are not performing well in foreign investment. Furthermore, the fact that FDI has a larger positive impact on economic complexity in MINT nations than in BRICS countries contributes to the good results observed across all the countries combined.

When examining the effects of all the included control variables, it is found that economic growth has a negative impact on economic complexity in each of the three samples, but this effect is only significant in the BRICS countries. This result contradicts the assertion made by Gala et al. (2018), Hartmann et al. (2017), Ivanova et al. (2017), Khan et al. (2020), Lapatinas (2019), Nguyen et al. (2020), Nguyen and Su (2021a, 2021b), and Saadi (2020) that a larger economic size s associated with higher levels of economic sophistication. It is surprising that economic growth negatively affects economic complexity in all three samples as seen in the study of Njangang, Asongu, Tadadjeu, and Nounamo (2021). Furthermore, capital investment has an insignificant negative effect (Lapatinas, 2019) on economic complexity both in the full sample and MINT countries. However, in the BRICS countries, there is a significant positive relationship between capital investment and economic complexity.

Contrary to the findings of Nguyen and Su (2021a), the positive effect of capital investment on economic complexity in BRICS countries means that capital investment can result in technological improvement that can support the production of more sophisticated products. Put differently, more efficient capital goods can increase efficiency and labor productivity, thus improving economic complexity. The effect of mobile cellular subscriptions on economic complexity in all three samples is significantly negative, indicating that mobile cellular subscriptions reduce economic complexity across the board. The explanation could be that most subscribers use their phones more for social interactions than for learning the skills and knowledge needed to increase economic complexity.

The research on human capital shows that the ability to produce goods depends heavily on human capital and that countries with higher levels of human capital can produce more complex goods than countries with lower levels of human capital (Costinot, 2009; Hausmann et al., 2014). In line with the studies of Chu (2020), Gao and Zhou (2018), Lapatinas (2019), Nguyen et al. (2020), Saadi (2020), and Zhu and Li (2017), to mention a few, human capital is positively related to economic complexity in all the samples. Also, the findings point to the fact that both MINT and BRICS countries are doing well in improving human capital, as measured by secondary school enrolment. Lastly, trade openness has a significant positive and negative effect on economic complexity in all countries and BRICS countries, respectively, while its impact on economic complexity is insignificantly positive in MINT countries. Trade openness having a positive effect on economic complexity in BRICS countries aligns with the findings of Bustos (2011), Gala et al.

(2018), Gao and Zhou (2018), Ghebrihiwet (2019), Keller (2010), Khan et al. (2020), Nguyen and Su (2021a), Saadi (2020), and Teixeira and Fortuna (2010). In contrast to MINT countries, where trade openness has a detrimental impact, BRICS countries use trade openness as an opportunity to advance technology and produce more sophisticated goods.

Conclusion

This study investigates the impact of foreign direct investment on economic complexity in MINT and BRICS countries between 1991 and 2020. The samples are divided into three categories: All countries pooled together, MINT and BRICS countries. This study employs panel co-integrating regression to show that foreign direct investment positively affects economic complexity in all the countries and MINT countries, while its effect is negative in BRICS countries. The surprising outcome is that FDI inflows have a reducing effect on economic complexity in BRICS countries. This result implies that while foreign direct investment increases economic complexity in the whole sample and MINT countries, it decreases it in BRICS nations.

As a result of these findings, governments in both MINT and BRICS countries should be concerned about the policies that will encourage FDI inflows into their respective countries. An investment promotion policy, for instance, is required to encourage foreign investment in the host country and contribute to the economic complexity of the host country. FDI inflows should be focused on highly technical investment. Thus, this study recommends future research to examine the sectoral analysis of how FDI affects economic complexity in MINT and BRICS nations.

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