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PANEL DATA ANALYSIS OF RELATIONSHIP BETWEEN ECONOMIC GROWTH, FOREIGN DIRECT INVESTMENT, EXCHANGE RATE AND TRADE OPENNESS IN NEWLY INDUSTRIALIZED COUNTRIES

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ABSTRACT

This study examines the effects of foreign direct investment, gross fixed capital formation, real exchange rate, and trade openness on economic growth in newly industrialized countries from 1982 to 2019 by using the panel ARDL method. Before estimating panel ARDL, we tested the existence of cross-sectional dependence among the countries, determining the degree of the integrations of variables by using second-generation panel unit root tests and examining the cointegration among the variables. Finally, we carry out the Dumitreuscu Hurlin causality test to determine the direction of the causal relationship between variables. The study results indicate a positive long-run relationship between economic growth and FDI, gross capital formation and real exchange rate, and a negative long-run relationship with trade openness. The study's findings have significant implications for the industrial policies that these countries should adopt to reach developed countries.

Anahtar Kelimeler: *Economic Growth, Newly Industrialized Countries, Panel ARDL, Panel Unit Root Tests, Panel Cointegration Tests, Dumitrescu Hurlin Causality Test.*

JEL Kodları: *C23, F43, O47*

YENI SANAYİLEŞEN ÜLKELERDE EKONOMIK BÜYÜME, DOĞRUDAN YABANCI YATIRIM, DÖVİZ KURU VE TİCARİ AÇIKLIK ARASINDAKİ İLİŞKİNİN PANEL VERİ ANALİZİ

ÖZET

Bu çalışma, yeni sanayileşen ülkelerde 1982 ve 2019 yılları için doğrudan yabancı yatırım, brüt sabit sermaye oluşumu, reel döviz kuru ve ticarete açıklığın ekonomik büyüme üzerindeki etkilerini panel ARDL yöntemiyle araştırmaktadır. Panel ARDL'yi tahmin etmeden önce, ülkeler arasında yatay kesit bağımlılığının varlığını test edilmiştir. İkinci nesil panel birim kök testleri kullanarak değişkenlerin

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entegrasyon derecesi belirlenmiş ve aralarındaki eşbütünleşme incelenmiştir. Son olarak değişkenler arasındaki nedensel ilişkinin yönünü belirlemek için Dumitreuscu Hurlin nedensellik testi yapılmıştır. Çalışma sonuçları, ekonomik büyüme ile DYY, brüt sermaye oluşumu ve reel döviz kuru arasında uzun dönemli pozitif bir ilişkiye ve ticari açıklık ile uzun dönemli negatif bir ilişkiye işaret etmektedir. Çalışmanın bulguları, bu ülkelerin gelişmiş ülkelere ulaşmak için benimsemeleri gereken sanayi politikaları üzerinde önemli etkilere sahiptir.

Keywords: *Ekonomik Büyüme, Yeni Sanayileşen Ülkeler, Panel ARDL, Panel Birim Kök Testleri, Panel Eşbütünleşme Testleri, Dumitrescu Hurlin Nedensellik Testi.*

JEL Kodları: *C23, F43, O47, O49*

1. INTRODUCTION

Today's highly competitive world to have a sustainable and inclusive growth, the countries should establish an economy heavily dependent on technology, advanced industry, and very efficient agriculture. To create such an environment, the countries should have enough human, capital, and/or natural resources.

Unfortunately, most of the countries has fallen shortages of enough capital resources and necessary technology to become a competitive country across the globe. Therefore, sum of the countries must attract foreign direct investment (FDI) and/or obtain foreign funds to finance their investments. Also, the countries should use their external competitiveness to increase their exports. Besides these, the countries ought to have highly skilled labor force. Thus, the countries that invest in more in capital resources, attracting more FDI in greenfield investment type, adopting export-led industrialization policies and finally enhancing the external competitiveness will have a sustainable growth.

Our data includes heterogeneities newly industrialized countries. These countries have some similarities but significant differences as well most of them has been trying to increase the share in the global value chain offering many opportunities for FDI and adopting highly competitive industrial policies. Sample countries differ from each other in terms of the GDP per capita, income inequality, human development index and their export and import share of world export and import. For example, according to the IMF in 2020 China has the largest GDP per capita with 10,839 USD , followed by Malaysia with 10,192 USD and India has the lowest GDP per capita with 1877 USD. South Africa has the worst income distribution, followed by Brazil and China. Thailand seems to have better income distribution relative to other countries in the sample based on the GINI coefficients for 2018. China has the largest share of World trade among the newly industrialized countries (NICs). According to World Trade Statistical Review 2020, China's share of global exports is 13.2 % while it's share of imports is 10.8 %. Mexico follows China with 2.4% of both global exports and imports. Rest of the NIC countries

shares vary between 2.5% (India's import share) to 0. 4% (Philippines's export share). Based on the Human Development Index statistics for 2019, Malaysia and Turkey are ranked as very high; South Africa, Mexico, Brazil, China, Indonesia, Philippines, and Thailand are classified has high; while India is classified as a medium developed country.

The aim of this study to analyze these factors' effects on growth rate of NICs such as South Africa, Mexico, Brazil, China, India Indonesia, Malaysia Philippines, Thailand, and Turkey. For this purpose, we use panel data which consists of annual observations over the period of 1982 to 2019. We employ panel ARDL method to obtain the short and the long run relationships between GDP growth rate and foreign direct investment (FDI) to GDP ratio, gross fixed capital formation (GFCF) to GDP ratio, real exchange rate (REER) and trade openness (TO) GDP ratio.

Our study contributes the existing literature in two folds. First, to the best of our knowledge this is the first study examining the relationships among these variables for the NICs. Second, this is the first study to use external competitiveness in addition to traditional determinants of capital, foreign direct investment and trade openness.

According to the results of the cross-sectional dependence tests, there is a cross sectional dependence among the countries in the sample both across each variable and for the model. Also, both first and the second generation cointegration tests results indicate that there is a long run relationship between GDP growth rate and FDI, GFCF, REER and trade openness (TO). This result is confirmed by panel ARDL results as well indicating that all variables do have a statistically significant effects on economic growth in the long run. Finally, Dumitrescu-Hurlin panel causality test results provide evidence about the direction of the causality between the pairs of variables. Based on the results of the study, we can conclude that the countries having a high FDI to GDP ratio, high ratio of GFCF to GDP and high trade openness to GDP ratio along with enhancing the external competitiveness could have a high and sustained economic growth.

Our paper is organized as follows. Section two reviews the existing literature. Section three explains the data and preliminary analysis. Section four explains estimation strategy used in the study. Section five presents and discusses the empirical results. Section six presents our conclusions.

2. LITERATURE REVIEW

The factors affecting economic growth have been researched extensively in the literature by analyzing the effects of macro-economic variables such as FDI, trade openness, inflation, exchange rate, capital formation, financial development. The extant studies mostly use some combinations of these variables and include different country groups and/or individual countries. The panel data econometric methods are widely used especially in recent studies.

Makki and Somwaru (2004) analyzed the effects of FDI and trade on economic growth in developing countries. They emphasized a significant positive effect of FDI and trade on economic growth. Klasra (2011) searched the effects of FDI, trade openness on GDP growth throughout the period of 1975 and 2004 by using the autoregressive distributed lags (ARDL) model. The findings of their study showed a bi-directional causality between FDI and exports for Turkey, and trade openness and exports relationship for Pakistan. Also, results of the said study show the presence of a long-run equilibrium relationship between variables. Adhikary (2011) investigated the relation between GDP growth rates, trade openness, FDI, capital formation of Bangladesh from 1986-2008. The result indicates a long-run equilibrium between economic growth and the variables. Pradhan, Bagchi, Chowdhury, and Norman (2012) found that there is long-run equilibrium between FDI, trade openness, and GDP growth using the panel VAR method for 10 OECD countries. Bibi, Ahmad, and Rahid (2014) examined the contribution of trade openness, inflation, exports, imports, exchange rate, and FDI to Pakistan's GDP growth for the period 1980-2011 using the Co-integration and DOLS techniques. They found that there is a long-run relationship between the selected variables. Asghar and Hussain (2014) analyzed the causal relationship between financial development, trade openness, and GDP growth in developing countries for 1978-2012. As a result of their studies, they found the existence of a long-run relationship between the variables. They also emphasized that there is a bidirectional causality between financial development and FDI. Yusoff and Febrina (2014) investigated the link between economic growth, domestic investment, real exchange rate, and trade openness in Indonesia by applying the Johansen cointegration test and Granger causality test. In their findings, they emphasized that there is a long-run relationship between the variables. Yusoff and Nuh (2015) emphasized FDI and trade openness are major determinants of GDP growth for Thailand.

Pradhan, Arvin, Hall, and Nair (2017) investigated the effects of selected macro-economic variables (trade openness, FDI, financial development) on economic growth by using a panel vector error correction model (VECM) for the period of 1988 to 2013 in 19 Eurozone countries. They found that the variables were cointegrated. Olabisi and Lau (2018) searched the link between trade openness, FDI, and economic growth using recently developed panel time series econometric methods in 23 Sub-Saharan African countries for 1980-2016. According to the findings of the study, there is a long-term cointegration between trade openness, FDI, and economic growth, and there is a positive and strong relation between economic growth, FDI and trade openness. Haque and Amin (2018) searched the relationship between trade openness, FDI, inflation, and economic growth in Bangladesh during the period of 1980 to 2015, using Granger Causality tests. According to their study's findings, while there is unidirectional causality from trade openness to economic growth, from trade openness to inflation, there is a bidirectional causal relationship between FDI and economic growth, unless, according to the study's findings, there is no causality between trade openness and inflation of FDI. Using a vector

autoregressive model, Nguyen (2019) analyzed the relationship between trade openness, GDP growth, real exchange rate, and tariff rate for 3 Northeast Asian countries for 1998-2017. He found a long-term relationship between the selected variables. Nketiah, Cai, Adjei, and Boamah (2019) searched the effects of FDI, trade openness on GDP growth for Ghana throughout 1975 and 2017 using different techniques and found that the main factor affecting economic growth is trade openness in Ghana. Wiredu, Nketiah, and Adjei (2020) created a panel for four West African countries covering the years 1998-2017 and investigated the link between economic growth, FDI, and trade openness, and found a positive and significant relation between the variables.

Although majority of the studies existing in the empirical literature does include FDI and trade openness, there are some studies that also including the real exchange rate as an additional variable. However, there is no study considering the effects of FDI, trade openness, gross capital formation, and real exchange rate on economic growth. Moreover, it is hard to find any single study carried out for NICs. Therefore, it is extremely important to examine the effects of these variables on economic growth of NICs as a group, and this study is aims to this.

3. DATA AND PRELIMINARY ANALYSIS

This study uses panel data which consists of annual observations over the period of 1982 to 2019 to estimate the relationships between GDP growth rate and FDI to GDP ratio, gross fixed capital formation to GDP ratio, real exchange rate and trade openness to GDP ratio. The countries included in the sample are newly industrialized countries (NICs)[1]. These countries are South Africa, Brazil, Mexico, China, India, Indonesia, Malaysia, Philippines, Thailand and Turkey.

In the study, we use percentage real GDP growth rate as a dependent variable in panel ARDL estimates. As independent variables, we use ratio of FDI to GDP, ratio of gross fixed capital formation to GDP, real exchange rate and trade openness GDP ratio. We couldn't include any variable representing the labor input, since we failed to obtain any completed data about labor in sample countries. We use the real exchange rate as a proxy for external competitiveness of the countries. To measure the trade openness of the countries, we divide the sum of the exports and the imports by GDP. Table 1 provides a brief information about the variables and data sources and Table 2 represents the summary statistics of the variables. All the variables in the sample do have a positive mean during the study period. They all have an excess Kurtosis and do not have a normal distribution. GFCFGDP ratio exhibits highest volatility. Table 3 gives the estimated values of the pairwise correlations and their significance.

Table 1. List of Variables and Data Sources

[1] Newly industrialized countries are countries whose development level considered between developing and highly developed countries.

Variable	Abbreviation	Data Source
GDP Growth Rate (%)	GDPGROWTH	World Development Indicators
Ratio of Foreign Direct Investment to GDP (%)	FDIGDP	World Development Indicators
Ratio of Gross Fixed Capital Formation to GDP (%)	GFCFGDP	World Development Indicators
Real Exchange Rate	REER	World Development Indicators
Trade Openness GDP Ratio (%)	TO	World Development Indicators

Table 2. Summary Statistics

	GDPGROWTH	FDIGDP	GFCFGDP	REER	TO
Mean	4.6671	1.8924	2.5071	1.0226	6.1888
Median	4.9889	1.6411	2.3498	9.9371	5.0193
Maximum	1.5192	8.7605	4.4519	2.5891	2.2041
Minimum	-1.3127	-2.7574	1.4396	5.1167	1.2220
Std. Dev.	3.8300	1.5760	6.8270	2.7567	4.2616
Skewness	-0.6400	0.8679	0.9572	1.8479	1.6696
Kurtosis	4.7888	4.2995	3.4403	9.0938	5.5642
Jarque-Bera	7.6600	7.4440	6.1098	8.0421	2.8065
Probability	0.0000	0.0000	0.0000	0.0000	0.0000
Observations	380	380	380	380	380

Table 3. Pairwise Correlations

Probability	GDPGROWTH	FDIGDP	GFCFGDP	REER	TO
GDPGROWTH	1.00				
FDIGDP	0.2101 (0.0000)	1.00			
GFCFGDP	0.5173 (0.0000)	0.3077 (0.0000)	1.00		
REER	0.14471 (0.0047)	-0.0951 (0.0641)	0.2444 (0.0000)	1.00	
TO	0.0373 (0.4682)	0.4529 (0.0000)	0.1537 (0.0027)	0.0292 (0.5700)	1.00

Except for REER and FDIGDP, there is a positive correlation between the variables. But the correlations between TO and GDPGROWTH, and between TO and REER are not statistically significant. Figures 1-4 display scatter diagram between GDPGROWTH and each independent variable separately.

Figure 1. The Real Exchange Rate and GDP Growth Rate (%)

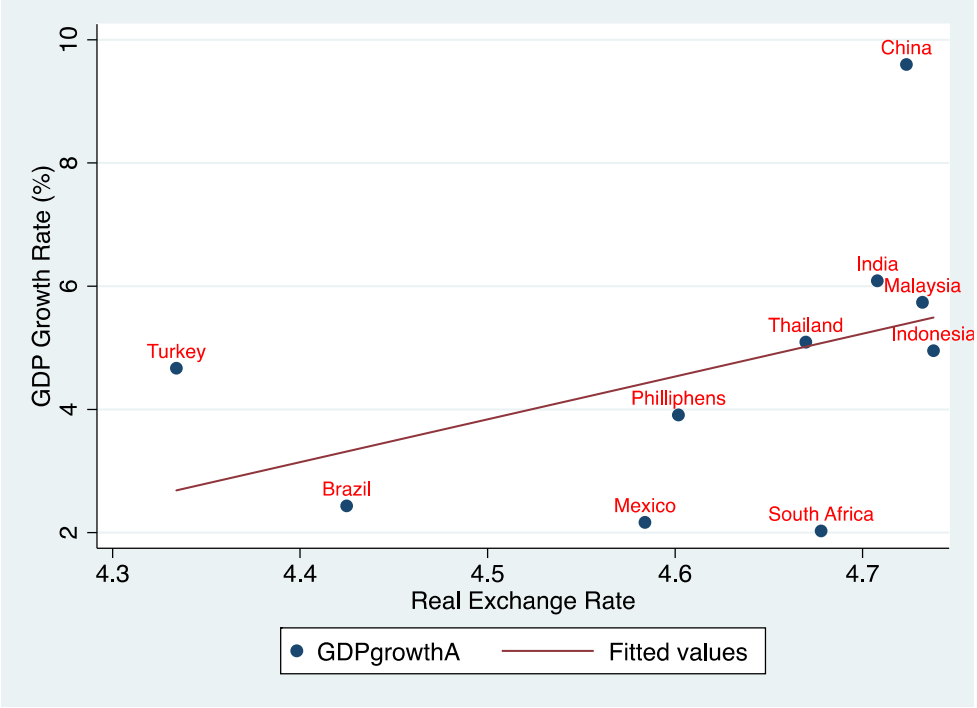


Figure 2. The Ratio of Foreign Direct Investment to GDP (%) and GDP Growth Rate (%)

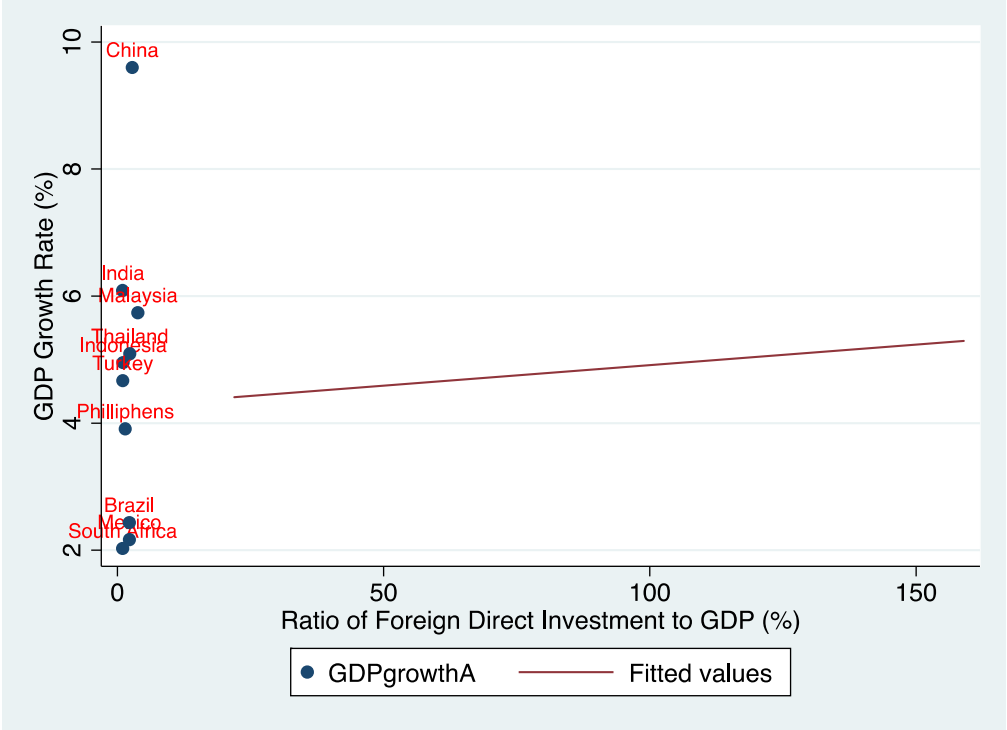


Figure 3. The Ratio of Gross Fixed Capital Formation to GDP (%) and GDP Growth Rate (%)

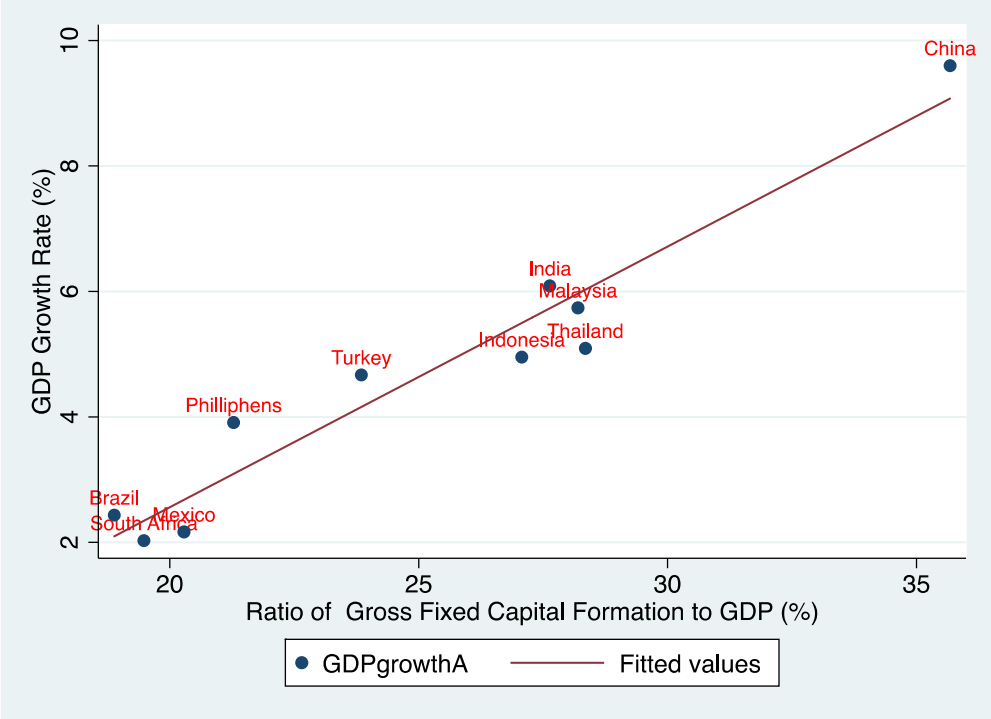
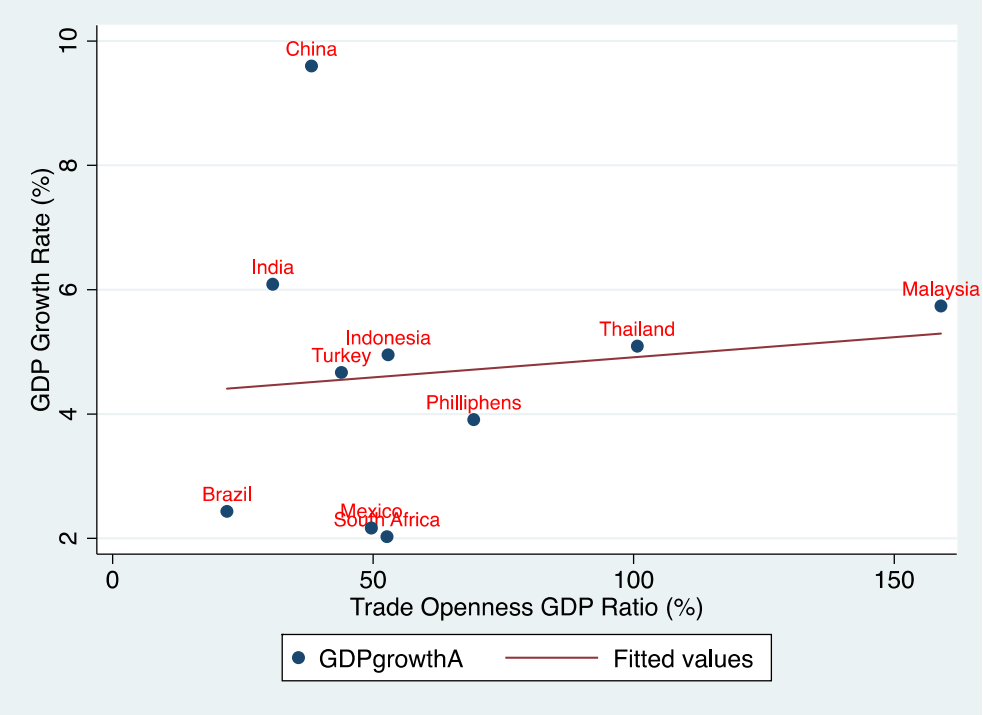


Figure 4. The Ratio of Trade Openness to GDP (%) and GDP Growth Rate (%)



On average, except for the scatter diagram between GDPGROWTH and FDIGDP ratio which displays no definite relation, all scatter diagrams show a positive relationship between GDPGROWTH and each independent variable. China seems to be an outlier in each case showing high average growth

rate during the period. The scatter diagram between GDPGROWTH and GFCFGDP ratio shows positive relationship between two variables.

4. ESTIMATION STRATEGY

To estimate the relationship between GDP growth rate and FDI to GDP ratio, GFCF to GDP ratio, REER and trade openness GDP ratio, we start by testing the presence of cross-sectional dependence among the countries to implement appropriate panel unit root and cointegration tests. For this purpose, we carry out cross sectional dependence tests such as Lagrange Multiplier-LM test of Breusch-Pagan (1980)'s and the Cross-section Dependence-CD test of Pesaran (2004)'s and Bias-Adjusted Cross Sectionally Dependence Lagrange Multiplier- CD_{LM} test of Pesaran, Ullah and Yamagata (2008)'s for each variable and the model.

After finding the presence of cross-sectional dependence, we examine the unit root properties of the variables using two of the most popular the second-generation panel unit root tests. The first one is the cross-section augmented Dickey–Fuller (CADF) developed by Im , Pesaran and Shin (2003), and the second is the cross-sectionally augmented IPS (CIPS) tests developed by Pesaran (2007). Also, to determine the presence of long-run relationship among the variables, we carry out both first generation and second generation cointegration tests to cross validate the results. For this purpose, we use two first generation cointegration tests of KAO and Pedroni which are based on Engle-Granger (1987) two-step (residual-based) cointegration tests and second-generation cointegration test of Westerlund error-correction-based panel cointegration tests developed by Westerlund (2007).

After establishing the degrees of integration of the variables, which are not I(2) and finding evidence of cointegration among the variables, we continue our analysis estimating the panel ARDL model to obtain the short and the long run effects of variables on economic growth. One of the methods used to determine whether there is cointegration between variables in panel data is the Panel ARDL approach. With this approach, it is investigated whether there is cointegration among the variables in a panel with different degrees of integration. The estimator used to estimate the panel ARDL is the pooled mean group (PMG) estimator developed by Pesaran and Smith (1997). This estimator is a preferred estimator for estimating dynamic panels with large number of sections and time. It allows us to estimate different constant term, different error variance and short-term effects for each cross-section unit in the panel by means of the PMG estimator. In the study, this situation will be valid for every country. In contrast, the long-run coefficients remain the same for all countries. We can also estimate the estimated value of the coefficient of fit using the PMG method. Speed of adjustment coefficients is the estimated value of the coefficient of error correction term in the model showing short-term effects. With this coefficient, we have the opportunity to determine the degree of compliance in each period. In other

words, we determine the time required to reach a new equilibrium as a result of an imbalance with the help of this coefficient.

To form the panel ARDL model, we start with following economic growth model:

GDPGROWTH=f(FDIGDP,GFCFGDP,REER,TO) (1)

The ARDL(p,q,q,..,q) model, which we estimated to investigate the link between dependent and independent variables, is as follows:

$$Y_{it} = \sum_{j=1}^{p} \alpha_{ij} Y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij}' X_{i,t-j} + \mu_i + \varepsilon_{it} \quad (2)$$

Where X_{it}= (FDIGDP,GFCFGDP,REER,TO). By rearranging the Equation (2), we obtain the Panel error correction model.

$$\Delta Y_{it} = \phi_i \left(Y_{i,t-1} - \beta_i' X_{i,t-1}\right) + \sum_{j=1}^{p-1} \alpha_{ij}^{*} \Delta Y_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij}^{*\prime} \Delta X_{i,t-j} + \mu_i + \varepsilon_{it} \quad (3)$$

The coefficient vector $\beta_i$in equation (2) gives the long-term coefficients, which are the main coefficients we tried to estimate in the study. In other words, it represents the long-term effects of FDI to GDP ratio, gross fixed capital formation to GDP ratio, real exchange rate and trade openness GDP ratio on real GDP growth rate. ϕ gives speed of adjustment coefficient and the remaining coefficients give the short-term effects. The ε_{it} means the error term with zero and constant variance and a distribution independent of both time and cross-section units.

Finally, we use Dumitrescu-Hurlin panel granger causality test to determine the directions of the causality between the pairs of variables.

5. EMPIRICAL RESULTS

We start our empirical analysis by testing the existence of cross-sectional dependence for each variable and the model carrying out cross-sectional dependence tests of Lagrange Multiplier-LM test of Breusch-Pagan (1980) and Cross-section Dependence-CD test developed by Pesaran (2004) and Bias-Adjusted Cross Sectionally Dependence Lagrange Multiplier- CD_{LM} test improved by Pesaran et al. (2008) and Table 4 presents these results.

Table 4. The Results of the Cross-Sectional Dependence Tests

Test	GDPGROWTH	FDIGDP	GFCFGDP	REER	TO	MODEL*
CD_{BP}	129.0496 (0.0000)	228.6496 (0.0000)	270.7195 (0.0000)	438.1262 (0.0000)	577.0710 (0.0000)	154.7466 (0.0000)
CD_{LM}	8.859609 (0.0000)	19.35836 (0.0000)	23.79292 (0.0000)	41.43914 (0.0000)	56.08521 (0.0000)	11.56831 (0.0000)
CD	6.850744 (0.0000)	10.14302 (0.0000)	2.915032 (0.0000)	10.67677 (0.0000)	19.40778 (0.0000)	7.547271 (0.0000)
LM_{adj}	8.724474 (0.0000)	19.22323 (0.0000)	23.65779 (0.0000)	41.30401 (0.0000)	55.95007 (0.0000)	11.43317 (0.0000)
*GDPGROWTH=f(FDIGDP,GFCFGDP,REER,TO)						

The cross-sectional dependence tests result in Table 4 show that there is a cross sectional dependence across both variables and the models. Therefore, we continue our empirical analysis by implementing second generation panel unit root tests of CADF and CIPS to determine the degree of the integration of variables and Table 5 displays results of these tests.

Table 5. The Results of Panel Unit Root Tests

Variables	CADF	CIPS+	Result
GDPGROWTH	-4.342* (0.0000)	-3.851	I(1)
DGDPGROWTH	-11.339* (0.0000)	-6.001	
FDIGDP	-3.254* (0.001)	-3.125	I(1)
DFDIGDP	-10.599* (0.0000)	-5.870	
GFCFGDP	-0.898 (0.185)	-1.813	I(1)
DGFCFGDP	-8.432* (0.000)	-5.178	
REER	-1.126 (0.130)	-2.164	I(1)
DREER	-8.624* (0.000)	-5.426	
TO	0.849 (0.802)	-1.235	I(1)
DTO	-6.709* (0.000)	-4.610	

Notes:
i. Numbers in parenthesis are p-values of the test statistics.
ii.* indicates the significance of the test statistic at 1 percent significance levels.
iii.+ table critical values are - 2.21, -2.33, -2.55 at 1,5 and 10 percent significance levels.

The results of panel unit root tests tell us that we can search the existence of long run relationship among the variables and obtain the short and the long run effects of independent variables on economic growth by using panel ARDL since none of the variable is I(2). Table 6 includes the results of cointegration tests.

Table 6. The Results of Cointegration Tests

First Generation Cointegration Tests			**Second Generation Cointegration Test**			
Model: GDPGROWTH=f(FDIGDP,GFCFGDP,REER,TO)						
Pedroni Residual Cointegration Test			**Westerlund Test**			
	Statistic	p-value	Statistic	Value	Z-value	P-value
Panel v-Statistic	-0.484910	0.6861	Gt	-3.942	-6.038	0.000*
Panel rho-Statistic	-2.713461	0.0033*	Ga	-16.053	-2.745	0.003*
Panel PP-Statistic	-6.775855	0.0000*	Pt	-11.465	-5.014	0.000*
Panel ADF-Statistic	-4.942956	0.0000*	Pa	-20.105	-6.052	0.000*
	Statistic	p-value	Note: The Westerlund (2007) tests take no cointegration as the null hypothesis. The test regression is with a constant, and a range of lags (1, 1) and leads (1, 1).			
Group rho-Statistic	-1.209990	0.1131				
Group PP-Statistic	-9.757459	0.0000*				
Group ADF-Statistic	-5.666913	0.0000*				
Kao Residual Cointegration Test						
ADF t-Stat	-7.269756	0.0000*				
*,**,*** represent 1%, 5% and 10% level of significance.						

Fortunately, results of the both first and second generation cointegration tests show that there is a long-run relationship among variables so we can use both panel ARDL and Dumitruescu Hurlin test to determine the causality among variables, since the existence of cointegration implies the causality between variables. Table 7 presents short and long run PMG estimates of our model.

Table 7. Panel ARDL Short and Long Run Equation Results (PMG)

Dependent Variable= GDPGROWTH				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Long- Run Equation				
FDIGDP	0.892929	0.096804	9.224051	0.0000*****
GFCFGDP	0.058021	0.031916	1.817917	0.0717***
REER	0.050297	0.010702	4.699768	0.0000*****
TO	-0.056317	0.007616	-7.395021	0.0000*****
Short- Run Equation				
ECT	-0.804930	0.246237	-3.268930	0.0014*
D(GDPGROWTH(-1))	-0.050528	0.223337	-0.226241	0.8214
D(GDPGROWTH(-2))	-0.154652	0.193928	-0.797469	0.4268
D(GDPGROWTH(-3))	-0.084755	0.126299	-0.671062	0.5035
D(GDPGROWTH(-4))	-0.017497	0.076810	-0.227797	0.8202
D(FDIGDP)	-0.477030	0.421299	-1.132284	0.2599
D(FDIGDP(-1))	-0.713664	0.508023	-1.404787	0.1628
D(FDIGDP(-2))	-0.563907	0.488014	-1.155514	0.2503
D(FDIGDP(-3))	-0.969335	0.338651	-2.862337	0.0050*
D(FDIGDP(-4))	-1.115455	0.529520	-2.106539	0.0373**
D(GFCFGDP)	0.483301	0.152321	3.172915	0.0019*
D(GFCFGDP(-1))	-0.038731	0.125866	-0.307717	0.7588
D(GFCFGDP(-2))	0.007619	0.248568	0.030651	0.9756
D(GFCFGDP(-3))	-0.345014	0.193476	-1.783242	0.0772***
D(GFCFGDP(-4))	-0.024905	0.192796	-0.129179	0.8974
D(REER)	0.112574	0.039382	2.858501	0.0050*
D(REER(-1))	0.051128	0.034016	1.503064	0.1355
D(REER(-2))	0.001415	0.039127	0.036167	0.9712
D(REER(-3))	-0.023976	0.051108	-0.469129	0.6399
D(REER(-4))	-0.047264	0.044069	-1.072512	0.2857
D(TO)	0.206587	0.129297	1.597778	0.1128
D(TO(-1))	0.156896	0.096999	1.617498	0.1085
D(TO(-2))	0.116624	0.064069	1.820282	0.0713***
D(TO(-3))	0.165384	0.135417	1.221287	0.2245
D(TO(-4))	0.065081	0.094616	0.687839	0.4929
C	0.323743	0.909654	0.355896	0.7226

Notes:

i. *, ** and*** indicates 1%, 5% and 10% significance level respectively.
ii. ECT stands for error correction term.

Except for TO, the long-run estimates of the coefficients indicate that there is a positive and significant relationship between economic growth and each independent variable. Also, there is a negative relation between TO and GDPGROWTH. The reason for this is that most of the countries in the sample suffered from the trade deficit in most of the sample period. Even China started to have trade surplus only after 2003.

When we examine the short-run estimates, we can easily conclude that there are significant and insignificant lag values of the independent variables. Speed of adjustment coefficient is negative and less than one and statistically significant. It implies that approximately 80% of the imbalances are

corrected within a year. It takes more than a year to restore the equilibrium. Table 8 summarizes the country specific short run results.

Table 8. Country Specific Short Run Dynamics

Variable	South Africa	Mexico	Brazil	China	India	Indonesia	Malaysia	Philliphens	Thailand	Turkey
ECT	-0,5311* 0.0002	-0,0338 0.4185	-1,2407* 0.0004	-0,3743* 0.0000	-1,3742* 0.0027	0,2067 0.0431	-0,8206* 0.0000	-0,0700* 0.0038	-2,1304* 0.0007	-1,6809* 0.0003
D(GDPGROWTH(-1))	0,1639** 0.0209	-1,5658* 0.0001	0,2758* 0.0036	-0,0068 0.5020	0,4019** 0.0256	-0,9501* 0.0012	0,4993* 0.0007	-0,2668* 0.0003	0,7270* 0.0043	0,2163** 0.0529
D(GDPGROWTH(-2))	0,1951* 0.0032	-1,4348* 0.0002	0,0671** 0.0143	-0,2455* 0.0000	0,1929 0.0372	-0,9687* 0.0003	0,6960* 0.0003	-0,0164 0.3173	0,0130 0.8102	-0,0451 0.4803
D(GDPGROWTH(-3))	-0,3552* 0.0005	-0,6300* 0.0004	0,0265 0.2354	-0,1613* 0.0000	0,0087 0.9123	-0,7055* 0.0001	0,5067* 0.0002	0,1843* 0.0006	-0,1162 0.0201	0,3945* 0.0004
D(GDPGROWTH(-4))	-0,1634* 0.0018	-0,0107 0.1159	0,3784* 0.0000	-0,1875* 0.0001	0,1894 0.0185	-0,4615* 0.0010	0,1606* 0.0001	-0,2124* 0.0000	0,0523 0.0026	0,0797* 0.0007
D(FDIGDP)	-0,9288* 0.0001	-0,4515*** 0.0717	-0,8945* 0.0055	0,8414* 0.0001	-2,7824 0.0209	1,7476 0.0006	0,8845* 0.0002	-1,1335* 0.0005	-1,6202 0.0039	-0,4328 0.2389
D(FDIGDP(-1))	-1,4253* 0.0000	-1,8463* 0.0040	-0,0861 0.2507	0,0942 0.1377	-3,9232 0.0317	1,5229 0.0024	-0,2219* 0.0066	-0,6000** 0.0111	-1,8309 0.0004	1,1799** 0.0169
D(FDIGDP(-2))	-1,1204* 0.0000	-4,2328* 0.0018	0,0259 0.7173	0,7793* 0.0000	0,7926 0.6757	0,2449 0.0478	0,3694 0.0007	0,1022 0.3445	-1,8565 0.0002	-0,7437 0.0966
D(FDIGDP(-3))	-0,9592* 0.0000	-3,3319** 0.0103	0,4698** 0.0110	-1,0417* 0.0000	-0,9250 0.2731	0,4365 0.0080	-0,4295 0.0003	-1,2323* 0.0016	-1,4974* 0.0002	-1,1825** 0.0183
D(FDIGDP(-4))	-0,9185* 0.0000	-1,1754** 0.0244	-1,7840* 0.0007	0,2424* 0.0057	-5,3025** 0.0127	-0,1773 0.1822	0,5451* 0.0007	-1,8412* 0.0001	-0,5944* 0.0014	-0,1486 0.7216
D(GFCFGDP)	-0,5882* 0.0021	0,9834* 0.0002	1,1247* 0.0000	0,1520* 0.0000	0,5471* 0.0012	0,3414* 0.0047	0,2903* 0.0000	0,5698* 0.0001	0,7198* 0.0000	0,6928* 0.0001
D(GFCFGDP(-1))	-0,4404* 0.0063	-0,0737 0.3965	0,1620 0.1058	0,2951* 0.0000	0,1511 0.1729	-0,4569* 0.0026	-0,7654* 0.0000	-0,0436** 0.0494	0,4136* 0.0004	0,3710** 0.0118
D(GFCFGDP(-2))	0,7212* 0.0005	-1,9828* 0.0000	0,6759* 0.0002	0,0829* 0.0002	-0,0947 0.2324	0,0702*** 0.0982	-0,4048* 0.0001	0,2472* 0.0015	0,6228* 0.0001	0,1384** 0.0408
D(GFCFGDP(-3))	-0,7618* 0.0002	-1,4684* 0.0043	-0,2516* 0.0002	0,2161* 0.0000	0,3450** 0.0323	0,1180** 0.0167	-0,0987* 0.0005	-0,7112* 0.0001	0,1786* 0.0017	-1,0160* 0.0005

D(GFCFGDP(-4))	0,1798*** 0.0673	-1,5928* 0.0002	-0,1004** 0.0108	0,3129* 0.0000	0,0043 0.9736	-0,1168** 0.0127	-0,1619* 0.0001	0,7025* 0.0001	0,3057* 0.0005	0,2177** 0.0028
D(REER)	0,0650* 0.0000	0,3005* 0.0000	0,0732* 0.0000	-0,1034* 0.0000	0,2350* 0.0001	0,0024 0.3193	0,2642* 0.0000	0,0559* 0.0000	0,1017* 0.0003	0,1312* 0.0001
D(REER(-1))	0,0300* 0.0000	0,1857* 0.0000	0,0189* 0.0001	-0,0484* 0.0000	0,2240* 0.0000	-0,0233* 0.0004	0,1300* 0.0000	-0,0942* 0.0000	-0,0324** 0.0067	0,1209* 0.0000
D(REER(-2))	0,0507* 0.0000	0,2380* 0.0000	0,1735* 0.0000	-0,0617* 0.0000	-0,1570* 0.0000	0,0225* 0.0004	-0,0421* 0.0002	-0,0503* 0.0000	-0,1151* 0.0001	-0,0444* 0.0012
D(REER(-3))	-0,0320* 0.0000	-0,0995* 0.0000	0,1147* 0.0000	0,0682* 0.0000	-0,1032* 0.0001	-0,0595* 0.0000	0,3073* 0.0000	0,0183* 0.0000	-0,2210* 0.0000	-0,2330* 0.0000
D(REER(-4))	0,0241* 0.0000	-0,0658* 0.0001	0,0315* 0.0000	0,0359* 0.0000	-0,0713* 0.0001	-0,0779* 0.0000	0,1318* 0.0000	0,0487* 0.0000	-0,1678* 0.0001	-0,3618* 0.0000
D(TO)	0,3831* 0.0000	0,9490* 0.0000	0,5730* 0.0000	-0,0801* 0.0000	-0,2718** 0.0018	-0,3654* 0.0000	0,0637* 0.0000	0,1784* 0.0000	0,0901* 0.0000	0,5458* 0.0000
D(TO(-1))	0,2758* 0.0000	0,4195* 0.0002	0,1704* 0.0002	-0,0151* 0.0002	0,8428* 0.0001	-0,2279* 0.0001	0,0970* 0.0000	-0,1569* 0.0000	0,0501* 0.0001	0,1132* 0.0002
D(TO(-2))	0,1876* 0.0000	0,3320* 0.0001	0,5559* 0.0000	-0,0695* 0.0000	0,0681** 0.0467	-0,0475* 0.0003	-0,0916* 0.0000	-0,0156* 0.0014	0,1312* 0.0000	0,1157* 0.0009
D(TO(-3))	0,3486* 0.0000	-0,1008* 0.0007	1,0712* 0.0000	0,3042* 0.0000	-0,5815* 0.0004	-0,0129** 0.0278	0,1109* 0.0000	0,1049* 0.0000	-0,0266* 0.0001	0,4359* 0.0000
D(TO(-4))	0,0650* 0.0003	-0,2858* 0.0000	0,6636* 0.0004	0,0737* 0.0000	0,4628* 0.0000	-0,1305* 0.0001	0,0310* 0.0001	-0,0424* 0.0001	0,086*9 0.0001	-0,2736* 0.0004
C	-1,1827** 0.0160	-0,6236 0.4321	-5,1622** 0.0197	-0,0190 0.9236	0,3818 0.8376	-0,8037* 0.0054	5,5727*** 0.0852	0,3134* 0.0008	3,7600 0.6577	1,0007 0.6798

Notes:
i. Numbers in parentheses are p-values of t-statistics.
ii. ***, ** and* indicates 1%, 5% and 10% significance level respectively.

Short run results for each country show that the established long run results for the panel hold for most of the countries except for Mexico and Indonesia. For Mexico speed of adjustment coefficient has a correct sign and negative but insignificant. On the other hand, for Indonesia it has a positive sign. The speed of adjustment coefficients for Thailand has the largest in absolute terms as opposed to the smallest value for Mexico. Most of the short run coefficients for all countries in the sample are significant.

After estimating the short and the long run effects and finding the long run relationship among the variables, we implemented Dumitrescu Hurlin panel granger causality test to find the direction of causality between the variables and the results of the causality test are displayed in Table 9.

Table 9. Dumitrescu Hurlin Panel Granger Causality Test Results

Null Hypothesis	$\mathbf{W^{HCN}}$	Z_{NT}^{HNC}	**Prob**
FDIGDP ↛ GDPGROWTH	2.43482	-0.86803	0.3854
GDPGROWTH ↛ FDIGDP	6.92652	4.03040	6.E-05*
GFCFGDP ↛ GDPGROWTH	5.46030	2.43142	0.0150**
GDPGROWTH ↛ GFCFGDP	8.28397	5.51077	4.E-08*
REER ↛ GDPGROWTH	4.99729	1.92648	0.0540**
GDPGROWTH ↛ REER	4.45578	1.33594	0.1816
TO ↛ GDPGROWTH	4.34967	1.22022	0.2224
GDPGROWTH ↛ TO	4.80026	1.71161	0.0870***
GFCFGDP ↛ FDIGDP	7.30607	4.44433	9.E-06*
FDIGDP ↛ GFCFGDP	2.78571	-0.48536	0.6274
REER ↛ FDIGDP	7.61691	4.78332	2.E-06*
FDIGDP ↛ REER	3.73338	0.54812	0.5836
TO ↛ FDIGDP	6.35002	3.40171	0.0007*
FDIGDP ↛ TO	6.14137	3.17417	0.0015*
REER ↛ GFCFGDP	4.15739	1.01052	0.3122
GFCFGDP ↛ REER	5.09016	2.02777	0.0426**
TO ↛ GFCFGDP	6.32138	3.37047	0.0008*
GFCFGDP ↛ TO	4.72556	1.63015	0.1011***
TO ↛ REER	5.24754	2.19939	0.0278**
REER ↛ TO	4.51419	1.39963	0.1616

Note: ***, ** and* indicates 1%, 5% and 10% significance level respectively.

According to the results presented in Table 9, there is a uni-directional causality running from GDP growth to FDIGDP ratio. Also, there is a feedback between GDP growth and GFCFGDP ratio. While REER cause to GDP growth, the GDP growth causes TO unidirectionally.

When we examine the results of the causalities among the independent variables, we can conclude that GFCFGDP granger causes FDIGDP and REER. Also, there is a feedback between GFCFGDP and TO. REER granger cause FDIGDP and TO granger causes REER unidirectionally. Moreover, there are feedbacks between TO and FDIGDP and GFCFGDP.

6. CONCLUSION

This study investigates the effects of FDI to GDP ratio, GFCF to GDP ratio, real exchange rate, and trade openness GDP ratio on economic growth in NICs by using panel data for 1982 and 2019. We used the panel ARDL model and Dumitrescu Hurlin panel granger causality test to analyze the relationship between economic growth and the other variables.

The study results show a statistically significant relation between economic growth and FDI, gross capital formation, and real exchange rate. On the other hand, results also yield a negative significant long-run relation between economic growth and trade openness. Short-run results of the countries support these findings except for Mexico and Indonesia.

Considering that NICs continue to reach developed country status, the study results have several implications for these countries. First of all, to keep growing, they need to encourage more FDI, increase their capital stock, and enhance their external competitiveness. However, it is also the fact that most of these countries are heavily import-dependent countries. To overcome the negative effect of trade openness on their economic growth, they have to produce import substitutes and encourage more industrial exports. The best way to become a strong competitor in international trade is to understand that they have to develop their technologies and produce high value-added products. That requires adaptation of a new industrial policy supported by exchange rate policy, monetary policy, education system, and countries' institutional quality. The study can be replicated by using different country groups and alternative methods such as MG and Dynamic Fixed Effects.

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