

# Causal Link Between FDI and Economic Growth? Panel Data Analysis of MINT Economies

Karan Sabharwal\*

## Abstract

This paper attempts to find out the relationship between foreign direct investment (FDI) and economic growth in MINT economies namely, Mexico, Indonesia, Nigeria and Turkey, during 1981–2015. It investigates the causal link between the two variables, i.e. whether FDI causes economic growth or economic growth causes FDI. To test the relationship between the variables, panel data of four countries is analysed. Cointegration technique, Granger causality test and Vector Error Correction Model (VECM) have been used to validate the relationship between the variables. The analysis of the results shows that there exists cointegration between FDI and economic, i.e. there exists a long-run relationship between FDI and economic growth. Long-run causality was found moving from GDP to FDI in Mexico, Nigeria and Turkey. This is important for policy decision-making as barriers to FDI inflows should be removed, and growth can be maximized by increasing the capacity to absorb FDI inflows.

**Keywords:** JELC01, JELB23, JEL049, Economic Growth, Granger Causality, Foreign Direct Investment, Cointegration, Unit Root

## Introduction

The causal linkage between economic growth and foreign direct investment (FDI) is an issue which has been debated for long and no consensus has been reached in the field of development economics. Many researchers have supported the unidirectional linkage that FDI causes economic growth. FDI integrates economies and promotes internationalization by simulating new production techniques, trade-in technology and resources in terms of administrative skills, capital inflows as well as income

generation. FDI has been found to be one of the chief factors in promoting economic growth and development of the least developed countries (LDCs).

The spillover effect of the transfer of technology (ToT) and new product techniques from multinational corporation to indigenous firms increases economic growth. Thus, economic growth follows FDI. However, the spillover effect will only be visible if the absorption ability of the country of destination is developed. In anticipation of positive effect on returns from capital inflows, technology and skill transfer, job opportunities, developed countries have started seeking FDI by removing all the barriers which were restricting the growth and development of the country. The flow of FDI need not to essentially flow from developed to developing countries or from developing countries to developed countries. Even the less developed sectors provide profitable opportunities to MNCs for R&D and provide huge markets for expansion.

The causal link between FDI and economic growth needs careful investigation, which has major policy implications for developing economies or less developed countries. The linkage between FDI and economic growth can be expressed in three possible ways: Firstly, there can be a causal link from economic growth to FDI. If economic growth of a country attracts FDI, policymakers must make policies which accelerate economic growth rather than making efforts to seek FDI. Secondly, the causal relationship between the two variables can move from FDI to economic growth. If causality happens to flow from FDI to economic growth, FDI not only leads accumulate capital and increase employment opportunities but would also contribute to increasing the economic growth of the host counties. In this scenario, decision makers' decisions must focus on bringing FDI to the host country by removing barriers and making the host country an

\* Assistant Professor in Economics, Institute of Management Studies (IMS) Ghaziabad, Uttar Pradesh, India.  
Email: karan2mds1987@gmail.com

attractive destination. Finally, there can be bidirectional causality between economic growth and FDI. If the causal link runs in both ways, both economic growth and FDI strengthen each other and favourably affect one another.

There is no clarity on the direction of causality between the two variables besides the availability of huge literature. The literature suggests that the direction of causality largely depends on the past developments of the host country. There is no consensus on whether FDI causes economic growth or economic growth causes FDI. This paper examines the direction of causality between FDI and economic growth with respect to MINT economies.

This paper is organized as follows: Section II provides a survey of the literature. Section III discusses the data and empirical methodology. Analysis and interpretation of the results are explained in Section IV.

## Recent Literature

During the last two decades, a large number of studies focused on the role of FDI in stimulating economic growth in the LDC. But there is no consensus with regard to the direction of causality. Mello (1997) surveyed the literature on the impact of FDI on growth in developing countries. The paper concludes that the impact of FDI on the growth of the host country depends on the capacity of the domestic firms to absorb the technology transfer and spillovers due to FDI inflows. Shan et al. (1997) examine the causal link between FDI and economic growth of China over 1985–1996 by using VAR model and Causality test by Toda and Yamamoto (1995). The analysis of this paper shows a robust relationship between FDI and economic growth in both directions.

Reichert and Weinhold (2001) analyses the role of gross domestic investment (GDI) and control for openness to trade as well as the rate of inflation. To test the causal relationship between FDI and economic growth, the paper used data from 1971 to 1995 of 24 developing countries. This paper used Mixed Fixed and Random (MFR) estimator to deal with heterogeneous Panel data. The results of the causal relationship between FDI and growth are highly heterogeneous and differ from one country to the other. Homogeneity of assumptions for all countries should be avoided. Carkovic and Levine (2002) analysed data from 72 countries from 1960–1995 to make

panel data. The results are obtained by using Generalized-Method-of-Moments (GMM) estimators. The paper did not find any strong cause and effect relationship between FDI and economic growth. Chakroborty and Buckley et al. (2002) assess the relationship between growth FDI inflows and economic growth of China over a period of 1989–1999. At the provincial level, FDI positively affects the growth in economically strong and highly competitive provinces. However, the analysis of the paper found that the conditions of the host country have huge impact on the growth of the countries.

Dritsaki (2004) analyses the relationship between trade, FDI and economic growth using time series data over the period 1960–2002 for Greece. The causality test confirms a bidirectional causal relationship between them and cointegration analysis confirms long-run equilibrium relationship. Chowdhury & Mavrotas (2005) tested the causality between FDI and economic growth. To test causality between variables, Toda-Yamamoto test is applied to the data covering the period 1969–2000 for Chile, Malaysia and Thailand. The results for all the countries have been different. In the case of Chile, there run causal relationship from economic growth to FDI only, while the causal relationship existed between the two variables in both directions for both Malaysia and Thailand.

Hansen and Rand (2005) examine causal relationships between FDI and GDP of 31 developing countries of 31 years. The results confirm that FDI causes growth. In addition, using a model for GDP and FDI as a fraction of gross capital formation (GCF), the paper confirms long-run effects from FDI to GDP. Duasa (2007) does not find a causal relationship between FDI and economic growth over the period using Yamamoto's (1995) non-causality test. Applying Generalized Autoregressive Conditional heteroskedasticity (GARCH) model to test volatility between the two variables supports the hypothesis that FDI provides stability to economic growth and vice versa.

Mun et al. (2008) studied the relationship between FDI and economic growth in Malaysia for the period 1970–2005 by applying Ordinary least square (OLS) regression analysis. The analysis suggest that the relationship between GDP and foreign direct investment direct and noteworthy. Nunnenkamp (2008) assess the impact of FDI in post-reform India promotes economic growth.

They used industry-specific FDI and output data to test for Granger causality and cointegration tests. The results show that the results are different in different sectors. FDI and output effects are seen in the manufacturing and service sector. While no causal relation was found in the primary sector.

The relationship between FDI and economic growth was examined for five ASEAN countries only for a period of 1970–2007. The countries were Indonesia, Malaysia, Philippines, Singapore and Thailand. The results confirm bidirectional causality between the two variables at the panel and individual level except for Malaysia (Pradhan, 2009). The empirical analysis gives evidence that the variables are cointegrated, i.e., there exist long-run relationship between them. Sridharan et al. (2009) analyse the direction of the causal relationship between economic growth and FDI. Industrial Production Index (IPI) is used to measure of economic growth of each country. The Vector Error Correction Model (VECM) model confirms the existence of long-run relationship between FDI and economic growth. The results confirm that there exist bidirectional causality between economic growth and FDI for Brazil, Russia and South Africa and FDI cause economic Growth for India and China.

Iqbal et al. (2010) examine the causality relationship between FDI, trade and economic growth in Pakistan over the period 1998 to 2009. On applying the VAR model, the results confirm the long-run relationship between variables and exhibit the bidirectional causal relationship between factors with economic growth. The results confirm that FDI enhances trade growth in Pakistan. ESSO (2010) re-examined the relationship between foreign direct investment and economic growth in the case of ten Sub-Saharan African countries. By using Pesaran et al. (2001) approach to cointegration and Toda and Yamamoto (1995) procedure for the non-causality test, the paper reports that there is a positive and long-run relationship between FDI and economic growth. However, the causal relationship between them is different for different countries. In Angola, Cote d'Ivoire and Kenya, FDI cause economic growth while in Liberia and South Africa, economic growth causes FDI.

Abbas et al. (2011) investigated the impact of foreign direct investment (FDI) on GDP of SAARC countries by using multiple regressions for the period of 2001 to

2010. The results confirm that the correlation between GDP and FDI were positive and considerable for all the countries except the Maldives. The paper concludes that economic growth increases with the increase in FDI. Akpan et al. (2014) examine the determinants of FDI in BRICS and MINT economies using panel data over the period 2001–2011. The paper estimates the model on determinants of FDI for BRICS only, MINT only, and BRICS and MINT combined. The results of this paper show that there are other significant factors which play an important role in increasing the amount of FDI are market size, infrastructure availability and trade openness. The endowment of national resources wasn't that significant.

Rahaman & Chakroborty (2015) examines the causal relationship between FDI and economic growth measured in terms of GDP for Bangladesh. The cointegration test confirms the existence of long-run association between the two variables and the Granger causality test provides strong evidence of FDI causes economic growth and not vice versa. Marobhe (2015) found out a causal relationship and cointegration between FDI and economic growth in Tanzania for a period 1970–2014. The results show that there is a unidirectional causality between the two variables i.e., FDI cause economic growth in Tanzania long term association between them.

The consensus in the literature seems ambiguous. The above earlier findings give the evidence that the nexus between foreign direct investment and economic growth varies from country to country and with different periods in a country. The article aims to investigate causality between FDI and economic growth for four developing economies based on a theoretical framework and estimation methods used in the previous studies.

## Methodology

GDP and FDI data are measured in current dollars and on an annual basis. The paper focuses on data from four countries, namely, Mexico, Indonesia, Nigeria and Turkey. The data has been obtained from the World Bank database source. The sample period runs from 1981 to 2015. In exploring the causal relationship between GDP and FDI, cointegration and Error Correction models are applied.

Before applying these estimation methods, statistical properties of the variables in the time series data are examined.

The order of integration for the two variables of the four countries has been found by using Augmented Dickey-Fuller (ADF) test. The result of the ADF test is provided in Table 1. Then, the cointegration properties of the variables are examined. If the variables are found to be unit root and yet their linear combination may be stationary, they are said to be cointegrated. To test for cointegration, this paper applies two most commonly used tests- the residual-based test of Engle and Granger (EG), (1987) and the VAR based Johansen (1988) test.

If the two variables are found to be cointegrated, there must be at least one-way the causal relationship between the two variables. In addition, the variables have long term relationship with each other and that their deviations from the long-run equilibrium path are corrected. On applying EG or AEG test, if the two variables are cointegrated, there exists long-run equilibrium and there exists a valid error correction mechanism. The null hypothesis that FDI does not Granger causes GDP. On the other hand, if GDP and FDI are not cointegrated, there might be short-term relationship and short-run equilibrium. In other words, there may exist a short-run relationship between the two variables.

## Empirical Results

For time-series data, it is very important for the variables to be stationary or unit root. Thus, to test the stationary condition Augmented Dickey-Fuller unit root test has been used. For the panel data, Levin-Lin (LLC) Tests and Im-Pesaran-Shin (IPS) Test have been used because the IPS test also can be used in association with any parametric unit-root test. However, the condition is that the panel data should be balanced and secondly, all the t-statistics for the unit-root should have the same mean and variance, i.e., they are identically distributed in every cross-section.

The ADF unit root test in Table 1 indicates that both series of GDP and FDI at the level are unit root for all the four countries, Mexico, Indonesia, Nigeria and Turkey. Hence, the values have been found to be significant and hence the behaviour of variables is non-stationary. To make them stationary, the first difference of the variables has been taken. The first difference of both variables rejects the null hypothesis that the variables are unit root at the 5 percent significance level. That is, GDP and FDI series are not unit root (stationary) at first difference, I (1) for all four countries.

**Table 1: Results of Unit Root Test**

Countries	GDP		FDI		Conclusion
	Level	First Difference	Level	First Difference	
Indonesia	3.75	-3.20**	3.38	-4.77*	I(1)
Mexico	1.25	-3.83**	0.38	-3.87*	I(1)
Nigeria	3.55	-3.60**	-3.38	-6.65*	I(1)
Turkey	3.055	-4.12*	-0.91	-4.94*	I(1)
Panel Unit Root test					
LLC	5.70	-4.48*	1.75	-6.62*	I(1)
IPS	7.50	-3.47*	2.25	-8.39*	I(1)

Note: GDP: Economic Growth; FDI: Foreign Direct Investment; LLC: LLC statistics; IPS: IPS statistics; \*: indicates the variable significant at 1% significance level. \*\*: indicates the variable significant at 5% significance level.

**Table 2: Results of Johansen's Cointegration Test**

Countries	Null Hypothesis	Trace Statistics	MEV Statistics
Indonesia	None	11.28 [0.19]	6.19 [0.58]
	At most 1	5.08 [0.02]	5.08 [0.02]
Mexico	None	15.49[0.01]	18.52[0.01]
	At most 1	3.84[0.25]	3.84[0.25]

Countries	Null Hypothesis	Trace Statistics	MEV Statistics
Nigeria	None	13.44[0.99]	12.58[0.09]
	At most 1	0.86[0.35]	0.86[0.35]
Turkey	None	19.90[0.01]	11.23[0.14]
	At most 1	8.67[0.0032]	8.67[0.0032]

Note: Parentheses indicate the probability of significance.

Two or more time series are said to be cointegrated if they have a common stochastic drift. Time series data exhibit a time trend and are therefore generally non-stationary; i.e., the means, variances, and covariances that are not consistent over time. If OLS (Ordinary Least Square) or GLS (Generalized Least Square) is applied to non-stationary data, it results in spurious regressions. Engle and Granger Panel cointegration technique in Table 2 addresses this issue by defining common long-run relationships between a set of variables from individual members of a panel (Engle and Granger, 1987).

The Panel cointegration technique allows pooling of information from individual series of panel data. Pedroni test provides seven different statistics for testing unit roots in the residuals of the variables having common long-run relationship. The first four statistics of Pedroni test are known as panel cointegration statistics; the remaining three are referred to as group mean panel cointegration statistics. Table 3 reports the results of the Pedroni's test which check the possibility of the existence of a long-run relationship between the variables, FDI and economic growth.

It is observed in the test results that five out of the seven statistics are significant which implies that the null hypothesis of no cointegration between variables at 5 percent level of significance is rejected. This implies the existence of a long-run co-integration of FDI and Economic Growth at Panel level. However, these results do indicate prospects of the causal relationship between FDI and economic growth.

**Table 3: Results of Pedroni's Panel Cointegration Test**

Test Statistics	Calculated Value	Probability
Panel v- statistic	0.238235	0.4058
Panel rho-Statistic	-2.978199	0.0014
Panel PP-Statistic	-2.693772	0.0035
Panel ADF-Statistic	-1.519134	0.0644
Group rho-Statistic	-1.902604	0.0285
Group PP-Statistic	-1.665753	0.0479
Group ADF-Statistic	-0.265003	0.3955

The null hypothesis of Engle Granger causality test is that there is no cointegration between variables which is rejected at a significant level of less or equal to 5%. This is supported by both EG residual and Johansen trace tests. The establishment of cointegration between the two series suggests that their exists long-run relation or equilibrium for three countries, Nigeria, Mexico and Turkey. For Indonesia, Johansen trace test indicates that two series (GDP and FDI) are not cointegrated. The null hypothesis that there is no cointegration cannot be rejected. Thus, the result suggests that there exist long-run relationship or equilibrium for Mexico, Nigeria and Turkey, except Indonesia.

Even if variables are not cointegrated, there is a possibility that the variables may have a short-run relationship between them. Thus, the absence of causality or relationship in the short run between the variables in these countries cannot be ignored. The variables are said to be cointegrated if they move together in the short run. If GDP and FDI do not move together, in the long run, they are not cointegrated but it is possible that they may affect each other in the short run. Granger causality test is the most appropriate tool to determine the causal relation between variables.

Vector Error Correction Model (VECM) is applied where GDP and FDI are cointegrated. This helps in determining the causal relation between them. However, if they are not cointegrated unrestricted VAR is the appropriate tool. In Table 4, the results of the Granger causality test have been shown. At lag 2, there exists a causal relationship from GDP to FDI and not vice-versa. In Indonesia, FDI and GDP are not found to be cointegrated. These variables do not affect each other in the short run and long run. The results based on VECM between these variables shows that GDP cause FDI in Mexico, Nigeria and Turkey. Thus, there exists a uni-directional relationship between these variables for these countries. F-statistics for these three countries indicates that the null hypothesis that GDP does not Granger cause FDI can be rejected at a 5 percent level of significance.

Three countries exhibit unidirectional and positive short-run causal relationship from GDP to FDI, namely, Mexico, Nigeria, and Turkey. Thus, GDP growth provides market and attracts foreign investment in these countries.

**Table 4: Granger Causality Test for Short-Run Causality Based on ECM**

Granger Test for Short Run Causality		
Countries	Null Hypothesis	F-statistics
Mexico	GDP does not Granger cause FDI	12.1
	FDI does not Granger cause GDP	0.89
Indonesia	GDP does not Granger cause FDI	2.17
	FDI does not Granger cause GDP	0.92
Nigeria	GDP does not Granger cause FDI	5.03
	FDI does not Granger cause GDP	0.98
Turkey	GDP does not Granger cause FDI	5.77
	FDI does not Granger cause GDP	1.76

**Table 5: Granger Causality Test based on VECM (Vector Error Correction Model)**

Countries	Variables	GDP	FDI
Indonesia	GDP	----	✗
	FDI	✗	----
Mexico	GDP	----	✓
	FDI	✗	----
Nigeria	GDP	----	✓
	FDI	✗	----
Turkey	GDP	----	✓
	FDI	✗	----
Panel Granger			
Causality	GDP	----	✓
	FDI	✗	---

Note: ✓: Represents the presence of causality; ✗: Represents the absence of causality

### Concluding Remarks

The present paper tests the direction of causality between FDI and growth for MINT economies in the developing world, namely Mexico, Indonesia, Nigeria and Turkey. All these countries have different macroeconomic history, policies and growth patterns over the period 1981–2015. The empirical findings based on the Engel Granger causality test seem to suggest that it is GDP that causes

FDI in Mexico, Nigeria and Turkey and not *vice versa*. No bi-directional causality between GDP and FDI was found in any of these countries.

The above findings have provided an understanding of the direction of causality between the two variables which is important for formulating policies. In view of findings, the traditional view which suggests that the direction of causality runs from FDI to economic growth is not valid in the case of MINT economies. While in the case of Mexico, Nigeria and Turkey, the causality is uni-directional from FDP to FDI. Consequently, careful attention is required while framing policy guidelines which emphasise the FDI causes economic growth and stability in developing countries. Results also suggest that the causality between the two variables is also country-specific and hence, there is a need for more individual country studies.

### References

Agrawal, G. (2015). Foreign direct investment and economic growth in BRICS economies: A panel data analysis. *Journal of Economics, Business and Management*, 3(4), 421–424.

Alici, A. A., & Ucal, M. Ş. (2003, September). *Foreign direct investment, exports and output growth of Turkey: Causality analysis*. In European Trade Study Group (ETSG) Fifth Annual Conference, Madrid (pp. 11–13).

Buckley, P. J., Clegg, J., Wang, C., & Cross, A. R. (2002). FDI, regional differences and economic growth: Panel data evidence from China. *Transnational Corporations*, 11(1), 1–28.

Blomström, M., & Sjöholm, F. (1999). Technology transfer and spillovers: Does local participation with multinationals matter?. *European Economic Review*, 43(4), 915–923.

Belloumi, M. (2014). The relationship between trade, FDI and economic growth in Tunisia: An application of the autoregressive distributed lag model. *Economic Systems*, 38(2), 269–287.

Chakraborty, C., & Nunnenkamp, P. (2008). Economic reforms, FDI, and economic growth in India: A sector level analysis. *World Development*, 36(7), 1192–1212.

Chowdhury, A., & Mavrotas, G. (2005). *FDI and growth: A causal relationship* (No. 2005/25). Research Paper, UNU-WIDER, United Nations University (UNU).

- De Mello Jr, L. R. (1997). Foreign direct investment in developing countries and growth: A selective survey. *The Journal of Development Studies*, 34(1), 1–34.
- Dritsaki, M., Dritsaki, C., & Adamopoulos, A. (2004). A causal relationship between trade, foreign direct investment and economic growth for Greece. *American Journal of Applied Sciences*, 1(3), 230–235.
- Duasa, J. (2007). Malaysian foreign direct investment and growth: Does stability matter?. *Journal of Economic Cooperation Among Islamic Countries*, 28(2), 83–98.
- Esso, J. L. (2010). Long-run relationship and causality between causality between foreign direct investment and growth: Evidence from ten African countries. *International Journal of Economics and Finance*, 2(2), 168–177.
- Frimpong, J. M., & Oteng-Abayie, E. F. (2006). Bivariate causality analysis between FDI inflows and economic growth in Ghana. Retrieved from <https://mpra.ub.uni-muenchen.de/351/>
- Hansen, H., & Rand, J. (2006). On the causal links between FDI and growth in developing countries. *The World Economy*, 29(1), 21–41.
- Har, W. M., Teo, K. L., & Yee, K. M. (2008). FDI and economic growth relationship: An empirical study on Malaysia. *International Business Research*, 1(2), 11–18.
- Iqbal, M. S., Shaikh, F. M., & Shar, A. H. (2010). Causality relationship between foreign direct investment, trade and economic growth in Pakistan. *Asian Social Science*, 6(9), 82–89.
- Karimi, M. S., & Yusop, Z. (2009). FDI and economic growth in Malaysia. Retrieved from <https://mpra.ub.uni-muenchen.de/14999/>
- Lee, C. C. (2005). Energy consumption and GDP in developing countries: A cointegrated panel analysis. *Energy Economics*, 27(3), 415–427.
- Marobhe, M. (2015). Do foreign direct investment inflows cause economic growth in Tanzania? The granger causality test approach. *Journal of Economics and Sustainable Development*, 6(24), 144–150.
- Nair-Reichert, U., & Weinhold, D. (2001). Causality tests for cross-country panels: A new look at FDI and economic growth in developing countries. *Oxford Bulletin of Economics and Statistics*, 63(2), 153–171.
- Ozturk, I., & Kalyoncu, H. (2007). Foreign direct investment and growth: An empirical investigation based on cross-country comparison. Retrieved from <https://mpra.ub.uni-muenchen.de/9636/>
- Ozturk, I. (2007). Foreign direct investment-growth nexus: A review of the recent literature. *International Journal of Applied Econometrics and Quantitative Studies*, 4(2), 79–98.
- Pradhan, R. P. (2009). The FDI-led-growth hypothesis in ASEAN-5 countries: Evidence from cointegrated panel analysis. *International Journal of Business and Management*, 4(12), 153–164.
- Qaiser Abbas, S. A., Nasir, A. S., Ullah, H. A., & Muhammad, A. N. (2011). Impact of foreign direct investment on gross domestic product: A case of SAARC countries. *Global Journal of Management and Business Research*, 11(8), 34–40.
- Rahaman, A., & Chakraborty, S. (2015). Effects of foreign direct investment on GDP: Empirical evidence from developing country. *Advances in Economics and Business*, 3(12), 587–592.
- Samad, A. (2009). Does FDI Cause Economic Growth? Evidence from South-East Asia and Latin America. Working Paper 01–09.
- Shan, J., Tian, G. G., & Sun, F. (1997). The FDI-led growth hypothesis: Further econometric evidence from China. Economic Division Working Papers 97/2, NSDS, Australia.
- Tang, S., Selvanathan, E. A., & Selvanathan, S. (2008). Foreign direct investment, domestic investment and economic growth in China: A time series analysis. *The World Economy*, 31(10), 1292–1309.
- Vijayakumar, N. (2009). Causal relationship between foreign direct investment and growth: Evidence from BRICS countries. *International Business Research*, 2(4), 198–203.