Reciprocal Relationship among Migration, FDI, and Economic Growth

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Abstract

The relationship between migration and Foreign Direct Investment (hereafter called "FDI") with respect to economic growth remains a topic of interest to researchers and policymakers. Debates have also been going on about whether migration and FDI are substitute or complement to each other. To respond to the debates, research has been carried out on partial relationships among the three variables and/ or one-directional relationships among the variables. However, the three variables may be reciprocally related to each other as a system. This paper's first contribution is an empirical examination of the possible existence of reciprocal relationships as a system, using panel data from 150 countries from all over the world in 2000, 2005, 2010, and 2015. The second contribution is an empirical examination of whether migration and FDI are substitutes or complements. A simultaneous three-equation model is utilised to test the possible reciprocal relationships and whether migration and FDI are substitutes or complement. This paper concludes the existence of reciprocal causal relationships except between FDI and economic growth, where their relationship is only one way (from FDI to economic growth). It also concludes that FDI and migration are complementary to each other with respect to economic growth.

Keywords: FDI, Migration, Economic Growth, Complement, Substitute

INTRODUCTION

The relationship between migration and Foreign Direct Investment (hereafter called "FDI") with respect to economic growth remains a topic of interest to researchers and policymakers. Some studies focused on how FDI affected economic growth, the so-called investment-led growth. (Agbloyor et al., 2016; Klobodu & Adams, 2016; Yaqub et al., 2013). The studies showed mixed results: positive, negative and no effect of FDI on Economic growth. Others dealt with growth-led investment, how economic growth affected FDI (Gossel & Biekpe, n.d.; Oladipo, 2013), also with mixed results.

There are also studies which focused on how migration affected economic growth (Boubtane et al., 2016; Dolado et al., 1994; Strzelecki et al., 2020). The results also varied, depending on the skills of the migrants and the locals. Other research concentrated on how economic growth affected migration through higher wage brought by higher economic growth, with a result of positive impact of economic growth on migration. (González-gómez & Giráldez, 2018; Morley, 2006)

The relationship between migration and FDI also had various results. The results depended on human resources and quality of institution. Therefore, the relationship between FDI and migration can be one-way or two-ways and may be

either positive, negative or not significant. (Buch et al., 2006; Carp, 2013; Foad, 2012; Gheasi et al., 2011; van der Waal, 2013).

On the other hand, it is possible that the three variables are related to each other, with feedback from one variable to the other two variables. They may have reciprocal relationships. Yet, all studies focused on partial analyses (between two variables only), not treating the three variables in a system. Moreover, most studies were limited to one directional relationships. Therefore, the first contribution in this paper is to examine whether FDI, migration and economic growth have reciprocal relationships as a system. This paper provides a new empirical result to this debate, by examining possible reciprocal relationships among migration, FDI, and economic growth as a system.

Furthermore, another debate on this complex relationships among migration, FDI, and economic growth is whether migration and FDI are substitute or complement in promoting economic growth. (Bang & Macdermott, 2018). FDI complements migration in promoting economic growth, if FDI affects migration positively and migration affects economic growth positively. If FDI affects migration negatively, then FDI substitutes migration. If migration does not affect economic growth, then FDI does not complement nor substitute migration in relation to economic growth. On the other hand, migration complements FDI in promoting economic growth, if migration affects FDI positively, and FDI affects economic growth positively. Migration substitutes FDI, if the impact of migration on FDI is negative.

Therefore, the second contribution of this paper is a new empirical finding on whether migration and FDI are complement or substitute to promote economic growth. The third contribution is the use of data from 150 countries all over the world in 2000, 2005, 2010 and 2015.

The next section discusses literature on relationship between FDI and economic growth, between migration and economic growth, and between FDI and migration. Section 3 is on the empirical framework. Section 4 describes the variables, data, and descriptive statistics. Section 5 presents empirical results and discussion. The paper is closed with concluding remarks in Section 6.

LITERATURE REVIEW

Migration and economic growth

There have been debates on how migration (or in-migration) affects economic growth in the countries of destinations. Some studies showed that migration brought higher economic growth, as the migration may be related to high skill, education, and experience. (Boubtane et al., 2016; Şerban et al., 2020; Strzelecki et al., 2020). On the other hand, low human capital among migrants may bring lower economic growth in the countries of destinations, as migrants with low human capital faced difficulties in finding high quality jobs, and/ or the migrants replaced the locals. (Aboelsoud et al., 2020; Dolado et al., 1994; Kane & Rutledge, 2018).. Furthermore, Tipayalai (2020), with data on Thailand during 2003-2015, found that low-skilled migrants were needed by the economy, but the contribution to economic growth was much lower than the contribution from high-skilled migrants.

With data from Australia during 1930-2002, Morley (2006) showed how economic growth may attract migration, through higher wages/ better standard of living in the countries of destination. A similar result was found in European Union

(Sprenger, 2013) and South Africa (Dinbabo & Nyasulu 2015). On the other hand, Lucas (2005) described how administrative and politics within the countries of destinations slowed down the flow of migration

Furthermore, González-gómez & Giráldez (2018) concluded the existence of various relationship between migration and economic growth, using 2015-2016 data from EU / EFTA countries. Bi-directional causality was found in Italy and Denmark. One way relationship from migration to economic growth was seen in Switzerland, Slovenia and Finland. Migrants had a positive impact on GDP in Germany, Iceland, the Netherlands and Spain. Finally, there was no relationship between migration and economic growth in Latvia and Sweden.

FDI and economic growth

There are many different empirical results relating to the relationship between FDI and economic growth. One group (Iqbal et al., 2013; Koojaroenprasit, 2012; Pashtoon, 2017) argued that FDI promoted economic growth in Afghanistan, South Korea and Pakistan respectively. The positive impact was also found by Zekarias (2016) in Africa and Trojette (2016) in five country groups (MENA, Europe, America, Asia and SSA). They all argued that an increase in human capital and the transfer of advanced technology had contributed to higher economic growth. Other factors that contributed the positive impact of FDI on economic growth were market size, government incentives, inflation rate, institutional quality, better infrastructure and business climate (Agbloyor et al., 2016; Agrawal & Khan, 2011; Ali & Hussain, 2017; Javaid, 2016; Uwubanmwen & A, 2016; Zekarias, 2016).

On the other hand, another group (Ayanwale 2007; Klobod and Adams 2016) showed that FDI was not favourable to economic growth. Ayanwale showed that the weak industry structure in Nigeria during 1970-2002 was not able to gain from the mining sector. Klobod and Adams argued that the existence of corrupt behaviour and inefficiency in government in Ghana during 1970-2014 was one reason why FDI reduced economic growth.

Other studies found that FDI and economic growth had no relationship. For example, Yaqub et al. (2013) in Nigeria and Bermejo Carbonell & Werner (2018) in Spain concluded that FDI had no effect on economic growth. In Nigeria, 1980-2006, there have been investment reversion as a result of the decline in infrastructure quality and the industry was concentrated in extractive field. In Spain, 1984-2019, the FDI was dominated by foreign take-over in construction sector. Zandile & Phiri (2019) also found that there was no relation between FDI and economic growth in Brukina-Faso. The FDI had not been translated into improved human capital and technology transfer as Brukina-Faso had not been historically attractive to foreign investment.

FDI and economic growth may have a bi-directional causality. Gupta & Singh (2016), Ilgun et al. (2010), Younus et al. (2014) found that FDI affected economic growth positively and that economic growth affected FDI positively. The bi-directional relationships were perhaps because FDI has provided capital accumulation, technology transfer and innovation, and thereby increased economic growth. Furthermore, economic growth may have become an attraction and motivation for the inflow of FDI.

On the other hand, with data from Indonesia from 1970 to 2015, Fazaalloh (2019) showed that economic growth positively affected FDI, but not the other way around. He argued that the economic growth in Indonesia was accompanied by better

macroeconomic policies, better physical infrastructure, and better business climate. His findings differed from Sothan (2017) in Cambodia, because Cambodia's policies were not facilitating FDI.

Migration and FDI

The relationship between FDI and migration is also mixed. On one hand, migration affects FDI through changes in capital stock or through other channels such as similarity of culture. On the other hand, FDI is also likely to affect migration through skilled labour.

Theoretically, Mundell (1957) showed the existence of substitution between migration and capital in promoting economic growth. He used factor price equalization theorem in Hecker-Ohlin-Samuelson model (Samuelson, 1948): once price of goods are equalized, price of factors will also be equalized and vice versa. Free trade are substitutes for movement of factors; migrant (labour) and FDI (capital) also moved in an opposite direction.

However, Markusen (1983) argued that the price equalization theorem made the following assumptions: (a) countries have different relative factor endowments; (b) countries have identical technologies;(c) countries have identical homothetic demand;(d) production is characterized by constant returns to scale;(e) production is characterized by perfect competition; and(f) there are no domestic distortions in either country. Markusen argued that if assumptions (b) to (f) were dropped, there would not be any apriori hypothesis on the relationships among trade and factors of production (labour and capital)

Furthermore, empirically, Jayet & Marchal (2016) concluded that this relationship can be substitution or complement, depending on skill of migrants. High skilled migrants are more likely to be complement to FDI. On the other hand, low skilled migrants do not attract FDI. In addition to high skill, Buch et al. (2006) added cultural similarities as another factor affecting this relationships.

It is possible that migration and FDI have a two-way relationship, as indicated by Buch et al. (2006) using data in 1991-2002 in German and OECD countries. They argued that high skills and cultural similarities among migrants may explain this two-way relationship. In contrary, different results were shown by Gheasi et al. (2011), with data in UK, during 2001 to 2007. The results showed that the migration did not have any impact on FDI entering the UK.

The result is different from the one in US during 1990-2004. (Foad (2012)showed that impact of migration on FDI may be dynamic. In 1990-1991, migration had a negative impact on FDI, but in 1992-1996 migration had a positive impact. After 1997, the relationship remained still positive, but with smaller coefficients. High wages and migration networks may have contributed to this dynamics.

On other hand, FDI may affect migration positively directly or indirectly through economic growth in OECD countries. The FDI may have created more opportunities in the host country and therefore attracted more migrants to come. Indirectly, FDI may promote economic growth, which then created more economic opportunity (Bang & Macdermott, 2018). A similar result was found between Netherland and non-OECD countries. Higher FDI in Netherland attracted more migrants from countries that were mostly nearby and many of them were asylum seekers or refugees. In addition, there were also migrants who wanted to invest in the Netherlands (van der Waal, 2013).

METHOD

Empirical Model

This paper examines the possible existence of reciprocal causal relationship among the three variables, where all endogenous variables may have feedback to each other. Following Baltagi (2021), this paper uses a simultaneous three-equation model with three endogenous variables: migration, FDI, and economic growth, as shown in Figure 1. A simultaneous equation model is selected as this paper is not limited to examine a one-direction causal relationship while holding the other causal directions constant. This paper focuses on the relationships among the three variables as a system.
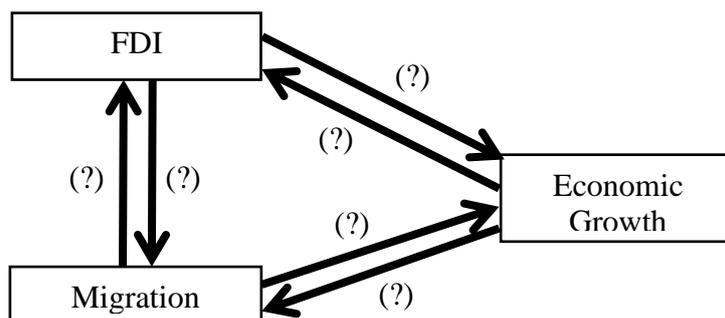
Figure 1. Relationship among Migration, FDI, and Economic Growth

As previous studies used partial análisis of the relationship among the three variables and their results differed from one to another, this paper does not have any a priori hypotheses on the complex relationship. The next sub-section describes each of the three equations. The second sub-section shows how this paper identifies the simultaneous equation model.

Equations

The model is carried out using two-stage least square technique. To satisfy the identification of the simultaneous equation model, there are some exogenous variables in one equation which are not used in the two other equations. Below is the discussion on each equation.

FDI equation

The equation analyses the determinants of FDI, with migration and economic growth as the two primary independent variables. The FDI equation (eq.1) was adapted from Jurčić et al. (2020), with institutional factors (rule of law, government effectiveness and regulatory quality) as control variables. Natural resource rent is added as a control variable following Paul et al (2021), inflation was added as in Mustafa (2019), and fixed telephone was selected as in Wangpeizhi & Bangash (2021).

$$\text{FDI}_{it} = \omega_0 + \omega_1 \text{Ln(Mig)}_{it} + \omega_2 (\text{Growth})_{it} + \omega_3 (\text{RL})_{it} + \omega_4 (\text{GE})_{it} + \omega_5 (\text{RQ})_{it} +$$
$$\omega_6 (\text{VA})_{it} + \omega_7 (\text{Inf})_{it} + \omega_8 (\text{Tel})_{it} + \omega_9 (\text{Nat})_{it} + \varepsilon_{it}$$

(eq.1)

where, *FDI*: Foreign Direct Investment (USD); *Ln (Mig)*: Number of migrants in each country (in Ln); *Growth*: GDP per capita (PPP) each country (in Ln); *RL*: Rule of law; *GE*: Government effectiveness; *RQ*: Regulatory quality; *VA*: Voice and accountability;

Inf: Inflation level (%); *Tel*: Fixed telephone subscriptions (per 100 people); *Nat*: Total Natural Resources Rents; and ε : Error

Migration equation

The equation (eq. 2) analyses the determinants of migration, with FDI and economic growth as the two primary independent variables. The control variables are Human Development Index (HDI) as selected in Ravlik (2014), number of population in Sprenger (2013), unemployment in Matouskova (2020), and surface in Ruyssen (2016). The equation is therefore as the following.

$$\text{Ln(Mig)}_{it} = \alpha_0 + \alpha_1 (\text{FDI})_{it} + \alpha_2 (\text{Growth})_{it} + \alpha_3 (\text{HDI})_{it} + \alpha_4 (\text{Unemp})_{it} +$$
$$\alpha_5 \text{Ln(Pop)}_{it} + \alpha_6 \text{Ln(Surf)}_{it} + \varepsilon_{it} \qquad \text{(eq. 2)}$$

where, *Ln(Mig)*: Number of migrants (in Ln); *FDI*: Foreign Direct Investment (USD); *Growth*: GDP per capita (PPP) (in Ln); *HDI*: Human Development Index; *Unemp*: Unemployment rate (in %); *Ln(Pop)*: Total number of population (in Ln); *Ln (surf)*: A surface area (in Ln); and ε : Error

Economic growth equation

This is the equation on the determinants of economic growth (eq. 3), with FDI and migration as the two primary independent variables, following Bove & Elia (2017). The control variables include institutional quality and government expenditure in (Siyakiya 2017), population and internet use in Sethy & Sahoo (2015) and Lubis & Febrianty (2018). The equation is therefore as the following.

$$\text{Growth}_{it} = \delta_0 + \delta_1 (\text{FDI})_{it} + \delta_2 \text{Ln(Mig)}_{it} + \delta_3 (\text{CC})_{it} + \delta_4 (\text{RQ})_{it} + \delta_5 (\text{GE})_{it} + \delta_6 (\text{RL})_{it} +$$
$$\delta_7 (\text{Inf})_{it} + \delta_8 (\text{HDI})_{it} + \delta_9 \text{Ln(Pop)}_{it} + \delta_{10} (\text{Int})_{it} + \delta_{11} (\text{GTE})_{it} + \varepsilon_{it} \qquad \text{(eq. 3)}$$

where, *Growth*: GDP per capita (PPP) (in Ln); *Ln(Mig)*: Number of migrants (in Ln); *FDI*: Foreign Direct Investment (USD); *CC*: Control of corruption; *RQ*: Regulatory quality; *GE*: Government effectiveness; *RL*: Rule of law; *Inf*: Inflation level (in %); *HDI*: Human Development Index; *Ln(Pop)*: Number of population (in Ln); *Int*: Individual using the Internet (in %); *GTE*: General government final consumption expenditure (in % GDP); ε : Error; *i*: referring to countries; and *t*: referring to years

Identification of Models

Prior to conducting the simultaneous equation model, identification of variables in the equation is carried out to test whether the simultaneous equations model among FDI equation, migration equation, and economic growth equation can be carried out. This paper uses the following order and rank conditions for the identification:

If K – k = m – 1 then the equation is exactly (just) identified
If K – k > m – 1 then the equation is over identified
If K – k < m - 1 then the equation is under identified

where, *M*: the number of endogenous variables in the system; *m*: the number of endogenous variables in each structural equation; *K*: the number of exogenous variables in the system; and *k*: the number of exogenous variables in each structural equation.

The result of this identifying test is used to determine whether the simultaneous equation model can be carried out. If the model is under identified, the model needs to be modified to make it identified or over identified. The result of identifying test is shown in Table 1.

Table 1. Result of Identification Test

	Model	K	k	M	K-k = m-1	Classification
1	FDI	12	6	3	6 > 2	over identified
2	Migration	12	3	3	9 > 2	over identified
3	Growth	12	4	3	8 >2	over identified

As all equations have been identified, a three-equation simultaneous equation model can been carried out. It uses   two-stage least square method. Each equation has two primary independent variables, which are also endogenous variables in the system. The two endogenous variables are correlated with the error in each equation. Therefore, Instrument Variables (IVs) are needed. The IVs should be highly correlated with the endogenous variables, but not correlated with the error. The next step is constructing a reduced form for each equation. A reduced form is an equation that expresses each endogenous variable in term of all exogenous variables in the system. As result of running the reduce forms, the endogenous variables are estimated. The estimated endogenous variables are in turn used as the instrument variables. The second stage is to run each equation with OLS, but the endogenous variables are replaced with their IVs.

Data, Variables, and Descriptive Statistics

Data

This paper uses existing/ published data in the form of panel data in 2000, 2005, 2010 and 2015 from 217 countries around the world, as recorded by the World Bank. However, not every country had information on all needed variables in each of the years of 2000, 2005, 2010, and 2015. Therefore, number of observations (countries) varies depending on the availability of the data. The paper is limited to the observations that had information on the needed variables in the four points of time. This paper deletes the countries without information on a variable. A large number of information omission is found in 2000. As a result of all deletions, this paper has 150 observations (countries).

Variables

The variables used in this study are FDI, Migration, GDP per capita, Human Development Index (HDI), Population, Inflation, Exchange Rate, Surface, Government Effectiveness, Regulatory quality, Rule of Law, Control of Corruption, Individual Using of Internet, General Government Final Consumption Expenditure. See Table 2.

Table 2. Variables in the Analysis

No	Variables	Meaning	Data Source
1	GDP per capita (PPP)	GDP growth rate per capita	https://www.worldb ank.org/
2	International Migration	Number of migrating residents	

No	Variables	Meaning	Data Source
3	FDI	Foreign Direct Investment	
4	Inflation	Inflation Level	
5	Population	Total population	
6	Unemployment	Unemployment Rate	
7	Surface	A Surface Area each country	
8	Individuals Using Internet	Individuals who access the internet	
9	General Government Final Consumption Expenditure	Total expenditure carried out by the government	
10	Telephone	Fixed telephone subscriptions (per 100 people)	
11	Total Natural Resources Rents	Total Natural Resources Rents	
12	HDI	Human Development Index	http://hdr.undp.org.
13	Voice and Accountability	The level of participation in choosing the government	www.govindicators.org
14	Government Effectiveness	government quality level to serve to the community	
15	Regulatory Quality	government ability level to formulate and implement policies / regulations	
16	Rule of Law	Compliance level with the application of the law	
17	Control of Corruption	The level of the government's ability to prevent corruption	

Endogenous Variables

GDP Per capita

GDP per capita is the GDP per capita in current international dollars converted by purchasing power parity (PPP) conversion factor. This data was obtained from the World Banks through the website https://www.worldbank.org/ accessed on 29 June 2018.

International Migration

International migration data was accessed through the United Nation website https://www.worldbank.org/. This data is the number of migrants residing in a country, whether born in that country or not, but living in that country, including refugees. This data was accessed on May 16, 2019.

Foreign Direct Investment (in thousand million USD)

FDI data is obtained from the World Bank via https://www.worldbank.org/. This data indicates the amount of FDI in a country. This data was accessed on 20 June 2019.

Control Variables

Population

Population data are cited from the World Bank via https://www.worldbank.org/ accessed on 29 June 2018. Population is the number of population in a country.

Human Development Index (HDI)

HDI data is obtained from the United Nations Development Program via http://hdr.undp.org/en/data, accessed on February 15, 2019. HDI is an index obtained from combining life expectancy index, education index, and purchasing power.

Inflation

Inflation data can be accessed through the World Bank website at https://data.worldbank.org/. This data was taken on 12 June 2019 with the last update on 24 April 2019.

Surface (in km²)

Data on surface is cited from World Bank through the website https://data.worldbank.org/. This variable represents the total area of a country, including the area beneath inland water bodies and some coastal waterways. This data was obtained on June 13, 2019.

Total Natural Resources Rents (in % of GDP)

Total natural resources rents data is obtained from the World Bank via https://www.worldbank.org/. This data represents the total number of natural resource rents in a country. This data was updated on 01 July 2020.

Fixed Telephone Subscriptions (per 100 people)

Data on Fixed telephone subscriptions (per 100 people) was obtained from the World Bank via https://www.worldbank.org/. This data is the number of telephone, voice-over-IP (VoIP), fixed wireless local loop (WLL) users in a country. This data was updated on 01 July 2020.

Unemployment (%)

Unemployment rate is obtained from the World Bank via https://www.worldbank.org/. This data is the percentage of the labour force that is without work but available for and seeking employment. This data is updated on April 2019.

General Government Final Consumption Expenditure (in % of GDP)

Data on general government final consumption expenditure was obtained from the World Bank via https://www.worldbank.org/. This data refers to the number of general government final consumption expenditure on GDP in a country. This data was updated on 16 October 2019.

Use of Internet by Individuals (%)

Data on individuals using the Internet were obtained from the World Bank via https://www.worldbank.org/. This data refer to the percentage of individual using the Internet (from any location) in the last 3 months. The internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc. This data was updated on 16 December 2020.

Worldwide Governance Indicators (WGI)

Government indicator data can be accessed through the website www.govindicators.org. Government indicator data is measured through 6 variables. These variables are Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption. This data was downloaded on February 14, 2019.

Voice and Accountability Indicator

Voice and Accountability is one of assessment of the government indicator. This variable is the perception of how far citizens can participate in choosing their government, as well as freedom of expression, freedom of association, and freedom to exercise their voting rights.

Government Effectiveness Indicator

Government Effectiveness is one of the indicators for assessing the government. This variable refers to perception of the quality of public services, the quality of the civil service and the level of independence from political pressure, the quality of policy formulation and implementation, and the government's commitment to implementing the policy.

Regulatory Quality Indicator

Regulatory Quality is one of the indicators for evaluating the government. This variable represents the perception of the government's ability to formulate and implement appropriate policies and regulations to enable and encourage private sector development.

Rule of Law Indicator

Rule of law is one of the indicators for evaluating the government. This variable is the perception on how far officials have confidence and obey the rules of society, and in particular the quality of law enforcement, property rights, police and courts, as well as the possibility of crime and violence.

Control of Corruption Indicator

Control of Corruption is an indicator of assessment of the government. This variable refers to the perception on how far public opinion power is exercised for private gain, including minor and major forms of corruption, as well as capture of the state by elites and private interests.

Descriptive Statistics

Table 3 shows that the minimum GDP Per Capita (PPP) growth rate was 6.10 % in Congo, Dem. Rep.; and the maximum at 11.50 % in the State of United Arab Emirates.

Standard deviation is smaller than the mean, implying a relatively "normal" distribution.

Table 3. Descriptive Statistics

Variables	Mean	Standard Deviation	Min	Max
GDP per capita (PPP) (Ln)	9.031	1.212	6.103	11.496
FDI (per billion USD)	11.870	41.170	-25.093	509.087
International Migration (per 1000 People)	1283.991	3827.275	2.585	46627.102
Population (per million people)	41.550	147.941	0.081	1371.220
HDI	0.681	0.166	0.2620	0.947
Inflation	6.665	26.375	-4.299	513.907
Unemployment (%)	7.939	5.852	0.390	37.250
Surface (Ln)	11.845	2.264	5.704	16.655
Individuals using internet (%)	27.925	28.162	0.006	98.200
General government final consumption expenditure	16.298	6.72816	2.0425	59.0686
Fixed telephone subscriptions (per 100 people)	19.067	18.69106	0.0000	73.2910
Total natural resources rents (% of GDP)	7.198	11.040	0.0000	62.700

Source: compiled by the authors from https://www.worldbank.org/, https://data.imf.org, http://hdr.undp.org/en/data, https://www.un.org/

The minimum value of the number of international migrants is 2,585 seen in Slovenia, while the maximum value is 46,627,102 in the United States. The standard deviation is 3,827,275, much larger than the mean (1,283,991), implying a skewed distribution of international migrants. The minimum value of the FDI is -25.093 million USD seen in Australia, while the maximum value is 509.087 thousand million USD in the United States. The standard deviation is 41.170 million USD much larger than the mean (11.870 thousand million USD), implying a skewed distribution of FDI.

RESULT AND DISCUSSION

The statistical results of the paper are shown in Table 5.1 and summarised in Figure 4. In the next sub-sections, the paper discusses the results on the relationships between migration and economic growth, between migration and FDI, and between FDI and economic growth as well as among the three variables together.

Table 4. Results of Analysis of FDI, Migration and Economic Growth Equations

Equation	Notation	Coefficient and t-statistic
A. Foreign Direct Investment		-128.457 (-2.397)
	Migration	12.981 (8.113)***
	Economic growth	-2.541 (-0.404)
	Rule of Law	8.638

Equation	Notation	Coefficient and t-statistic
		(1.525)
	Regulatory quality	-3.596
		(-0.671)
	Government effectiveness	0.525
		(0.086)
	Voice and accountability	-1.703
		(-0.492)
	Fixed telephone subscriptions	0.242
		(1.368)
	Total natural resources rents	-0.427
		(-1.870)*
B. Migration		5.543
		(2.998)
	Foreign Direct Investment	0.049
		(6.653)***
	Economic growth	0.512
		(2.582)***
	Unemployment	-0.019
		(-1.234)
	Surface	0.159
		(3.347)***
	Rule of law	-0.568
		(-2.875)***
C. Economic growth		7.586
		(5.773)
	Foreign Direct Investment	0.014
		(1.990)**
	Migration	0.711
		(5.288)***
	Inflation	-0.002
		(-1.138)
	Population	-0.499
		(-8.146)***
	Individuals using internet	0.008
		(2.991)***
	General government final consumption expenditure	0.010
		(1.123)
N		600

***$p < 0.01$, $p < 0.05$, $p < 0.1$.
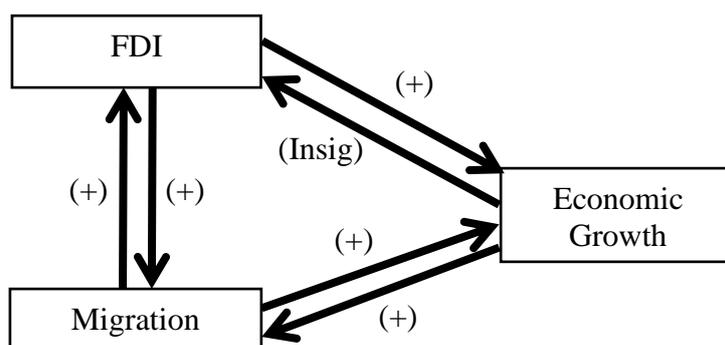
Figure 2. Empirical Results of the Relationship among FDI, Migration and Economic Growth

Migration and economic growth

As shown in Table 4 and Figure 2, this paper finds a two-way positive relationship between migration and economic growth. This result confirms González-gómez & Giráldez (2018), who found a two-way relationship between migration and economic growth in Italy and Denmark. This paper concludes that migration may have been dominated by high-skilled migration, education, and experience (Strzelecki et al., 2020). Role of low-skilled migrants on economic growth may not be significant as found in Thailand (Tipayalai, 2020). Another possibility is that the migrants provide important information and innovation by forming new businesses so as to have a positive influence on economic growth. (Şerban et al., 2020). As a result, migration promoted economic growth.

On the other hand, economic growth may have brought more migration through better labour market in countries of destinations, as seen in (Hanson, 2012) Migration may also come because of population ageing accompanying economic growth in destination countries, as for example seen in many countries in East Asia (Ananta & Arifin, 2021). The paper's finding refutes Lucas (2005) that strict regulation in countries of destinations had deterred migration.

Migration and FDI

As shown in Table 4 and Figure 2 show that migration and FDI also have a two-way positive relationship. The dominant effect of highly skilled migrants may have been the factor contributing to this complementary nature of FDI and migration (Foad, 2012). This finding is consistent with the current paper's finding, on the dominant role of skilled migrants in promoting economic growth.

Availability of migrants may have attracted FDI as there are relatively abundant labor in the countries of destination (Bang & Macdermott, 2018; Foad, 2012). On the other hand, the existence of FDI in countries of destination may have attracted people from other countries to come to work (Malan, 2015). Similarity of culture may have dominated the reciprocal relationship between migration and FDI, as found by Buch et al. (2006) among OECD countries, Burchardi et al. (2018) in US, and Fensore (2018) in 195 countries (OECD and non OECD).

FDI and economic growth

However, Table 4 and Figure 2 indicate that the relationship between FDI and economic growth is only one-way, from FDI to economic growth—investment-led growth. The finding on the positive impact of FDI on economic growth confirm

previous studies (Agbloyor et al., 2016; Ali & Hussain, 2017; Javaid, 2016; Uwubanmwen & A, 2016; Zekarias, 2016).

There are several factors which may explain the positive impact of FDI on economic growth. FDI may have been able to provide a larger amount of capital and/or better transfer of technology, which in turn increases productivity and then economic growth (Supriyadi & Satria, 2017). FDI may have been supplemented by large market sizes (Javaid, 2016), institutional quality (Trojette, 2016) and better infrastructure (Zekarias, 2016).

However, finding in Table 4 and Figure 2 refutes Klobodu & Adams (2016), who found negative impact of FDI on economic growth. The negative impact may be attributed to corruption or the impact of FDI was not spilling to other sectors because it focused on mining and oil exploration. The negative impact may also be a result of a small production base as found by Sothan (2017) in Cambodia. Therefore, the empirical positive results reveal that the existence of corruption and no spill-over FDI may have been over compensated by increase in productivity, larger market size, better institutional quality and infrastructure and that the FDIs may have been mostly related to large production bases.

Results from Table 4 and Figure 2 do not find growth-led investment, that economic growth attracted FDI. The results confirm Mohammad & Gharaibeh (2015) with data in Bahrain. Investors may have not be attracted by economic growth in the potential host country. To invest in a country, they may have been more interested in knowing the economic stability of the country along with its inflation rate, availability of needed labour force, trade open-ness, and quality public education.

Indirect impact of migration and FDI on economic growth

Table 4 and Figure 2 reveal that FDI directly affects economic growth and indirectly affects economic growth through migration. This paper concludes that FDI complements migration in promoting economic growth. In other words, FDI brings more migration which are needed for economic growth. Similarly, migration also has indirect positive impact on economic growth through FDI. Migration brings more FDI and in turn economic growth. Migration also complements FDI in promoting economic growth.

Results shown in Table 4 and Figure 2 refute Mundell (1957), who argued that FDI and migration were substitutes in promoting economic growth. Mundell used price-equalization theorem in Hecker-Ohlin-Samuelson model (Samuelson 1948). This model assumes that (a) countries have different relative factor endowments; (b) countries have identical technologies;(c) countries have identical homothetic demand;(d) production is characterized by constant returns to scale;(e) production is characterized by perfect competition; and(f) there are no domestic distortions in either country.

On the other hand, the results confirm Markusen (1983), who argued that there was no a priori empirical hypothesis on the relation between FDI and migration once the assumption from (b) to (f) are dropped. The results show that migration and FDI empirically complement each other. As shown in Table 4 and Figure 2, there exists a circular causal relationship on the positive direction from migration to FDI, then from FDI to economic growth, and back to migration. However, this circular relationship is not seen with FDI, because economic growth does not have any impact on FDI.

CONCLUDING REMARKS

This paper contributes new empirical insights on the debate related to the possible reciprocal relationships between migration, FDI, and economic growth, using panel data from 150 countries in the world in 2000, 2005, 2010 and 2015. It finds the existence of simultaneous, two-way relationship between migration and economic growth and between migration and FDI, but not between FDI and economic growth. FDI affects economic growth, but not vice versa. It also concludes that FDI and migration are complements to each other, not substitutes, in promoting economic growth.

It also finds a circular positive flow of causality from migration to FDI to economic growth and back to migration. It implies that an increase in migration will continue raising the other two variables and in turn raising the migration further. It implies that policies to raise migration may promote economic growth, given socio-political conditions.

On the other hand, there is no circular causality in the other direction. FDI promotes economic growth directly and indirectly through migration, but economic growth does not bring more FDI, breaking the circle.

Further studies can be carried out by having more refined measurements of the variables. For example, FDI should be differentiated by goods, services and type of sectors. Migration should be categorized by level of education or skills. Finally, further studies should update the data and have a smaller number of missing observation because of non-existence of data.

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