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Applying Gravity Model to Analyze Determinants of International Migration from Developing Countries

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I. Introduction

Individuals make the decision to migrate from their homelands to other countries for various reasons; and migration continues to occur in our present times until it became one of the most prominent problems of the modern era, because there are still many causes that motivate people to leave their home lands and settle somewhere else, no matter that these causes might differ from the previous reasons. The scope of international migration has expanded to involve all societies, especially in developing countries. migration happens in several legal and illegal ways, and thus it may affect many economic and social aspects of the migrant and both of the country of origin and the destination country.

Since migration affects the demographics of the country of origin and the destination country, their development path, and their level of growth, there is an urgent need to study migration and understand its aspects and determinants through investigating the causes of this phenomenon, so that decision and policy makers can deal better with it, and find solutions to address the negative effects that it might cause.

This study aims to answer these questions: Are the immigration flows responding to the push and pull factors? What is the effectiveness of the determinants in increasing and decreasing the number of immigrants from developing countries?

II. Literature Review

International migration and individuals' moving across borders is one of the most important current issues of concern to policymakers, international organizations, and researchers around the world. This issue has been adequately interpreted through theories that focused on the determinants, causes, economic and social implications of migration.

"Ravenstein" was the first researcher to write in the field of migration explaining the motives for immigration in 1885; he listed these motives in laws later called the laws of Ravenstein. In 1966 "Lee" improved these laws by focusing on the size of migratory flows and their characteristics. According to Lee: migration depends on the homeland's economy to an extreme extent; Lee acknowledged the existence of push factors that lead to the migration of persons, which are associated with the country of origin, and "pull" factors that attract international migrants to a specific country, in addition to the presence of overlapping obstacles and personal factors connected with the immigration decision.

The theory of the neo-classics by Lewis (1954) & Ranis and Fei (1961) explained international and internal migration. According to this theory, migration occurs due to geographical and economic variations affecting the labor market, as countries with abundant employment have lower workers 'wages, while workers' wages increase in capital-intensive countries, which makes the individual think about moving in search of higher wages. This theory assumes that eliminating wage variations could end employment migration. On an individual level, Todaro (1967) believes that individuals plan to emigrate based on their expectations for the cash return, but they must consider the expenses of migration. An immigrant should consider the costs of the trip to another country, and should consider the

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consequent efforts that will encouner them in searching of a job and adapting to the new work and new language; not to mention the psychological fluctuations related to moving away from family and home (Massey et al., 2011).

Many researchers in studying international migration combined the theoretical frameworks and the applied frameworks in attempts to study this phenomenon, its determinants, as well as its effects on economic growth. many studies addressed the phenomenon of international migration by analyzing and researching its motives and effects. (Poot and Cochrance, 2004) conducted a study to measure the economic impact of international migration on New Zealand, they found that migrants affected the economy in both demand and supply; they recommended that future international migration researches should take into account that migratory flows have changed and are not only made for a living, but have become diverse in terms of the composition of migrants, such as skilled labor migration and student flows.

While in another study (Bertochi and Strozzii, 2006), investigated the determinants of mass immigration that occurred since the nineteenth century until World War I for fourteen countries (Belgium, Denmark, France, Britain, Germany, Italy, Netherlands, Norway, Portugal, Spain Sweden, Australia, Canada, and America); the results of this study assured that the variances of income and the level of development between countries in addition to the population structure play a prominent role in determining the rate of migration to the countries included in the study sample.

In an analytical study on the economic and non-economic determinants of the international migration of fourteen OECD countries, (Mayda, 2007), has reached annual data for the period from 1980 to 1995; that data indicated that one of the pull factors that attracted immigration is the increase in financial return. On the other hand, the study found that the impact of the "push" factors was not in the individual's share of the total income of the country of origin as expected, but the greatest impact was that of the distance between the country of origin and the destination country, as it had a significant negative impact on international migration. (Mayda, 2010) conducted an applied study on the impact of the economic, social, cultural and demographic determinants of migration on OECD countries, and on measuring the impact of migration on the average income in both sending countries and receiving countries; this study found that obtaining employment opportunities and increasing the average income in receiving countries as well as their less restrictive laws, significantly increase the international immigration rates.

Lewer and Van den Berg, 2008, used the gravity model to test the international migration, response to different pull forces. Panel Data covered migration data for 16 OECD countries among all the sending countries of immigrants, for a ten-year period 2008- 1991; the results of the analysis of the geographical dimension were not very significant, which indicates the ease of moving across borders for immigrants; on the other hand, it was found that international migration depends on the stock of migrants in the receiving country.

Based on the Ageing population and the low birth rates on the European continent, (Ramos and Surinach, 2013) believe that the European Union countries need to import labor from neighboring countries; Ramos and Surinach also analyzed the relationship of bilateral migration with many different factors in the year 2011, by estimating the gravity model of 200 sending countries between 1960 and 2010, this analysis resulted in the size of the population having a positive and important relationship with migration, in addition to the existence of a common language and colonial relationship between receiving and sending countries.

Gonzalez and Mesanza, 2011 examined the factors affecting migration of graduate students according to the Erasmus program, they used a sample of Panel Data, from the bilateral flows of the countries participating in the program. Their study showed that the cost of living, the quality of the university, language, and climate were among the most important factors influencing student migration, which amounted to two million in 1987.

From the perspective of the sending countries, (Ullah, 2012), chose to study the determinants of labor migration from Bangladesh to 23 countries, during the period 2009-2012, and by using Panel Data, he concluded that economic, demographic and cultural factors had a major impact on labor migration. To call attention to the relationship between economic and political factors in the both origin and host countries, (Westmore, 2014) analyzed data on highly skilled migrants as well as low skilled ones between ninety-two sending and forty-four receiving countries; his findings indicated that high private wages given to skilled labor in the receiving country is linked with the increase in the number of immigrants; these results supported the impact of the differences in policies related to business and labor markets, as the more stringent policies constitute an incentive for highly skilled people to emigrate, while they do not constitute a significant incentive for people with low skills to do so. the study also showed that wage differences were the main driver of migration, especially for high skilled people.

As for international migration as an option for individuals driven by several factors at the micro and macro level, the study of (Porumbescu, 2015) added, that the decision to migrate is not only taken at the individual level, but is taken with the participation of all family members; most members work not only to maximize their income, but also to reduce risks that

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occur as a result of the failure of local markets to allocate resources efficiently. Many economists focus their attention on market defects, such as high rate transactions in the markets as well as limited access to information and weak communication and transportation infrastructure; all this focus creates incentives to send family members away. (Pavkovic et al., 2018) used annual Panel Data for the period 1995- 2016, following the Poisson distribution and the "Negative Binomial Regression" model, to study the determinants of migration to 28 European Union countries; these determinants include demographic, economic, social and political variables. the study found that job opportunities and a good standard of living are the two factors that mostly influence the attraction of migrants, which supports the economic incentive for international migration.

III. The Methodology

The increased numbers of international migrants to developed countries has imposed itself over the past five decades on all those interested in this phenomenon, and the issue of migration and its impact on various activities in the receiving countries is still drawing intense attention. This obliged academics to work to formulate a model for migration, where international voluntary migration represents a choice for individuals based on specific motivations. (Smith, 2012) believes that it is easy to understand the migration motives on the personal level, but find it hard to study the effects at the country level. Therefore, the Newton Law of Gravity, which is often used to measure trade exchange between countries, has been expanded to include the study of international migration. This model assumes that every country has distinct characteristics (push and pull factors), in addition to the presence of bilateral impacts between countries (factors of distance and common language).

However, despite the great interest in the topic of international migration, we find that studies related to the determinants of migrations are few. Most studies on international migration came to study the relationship of migration with some economic variables without looking at the causes and motives of this migration, such as the studies on migrations to the United States of America, (Karemera et al. 2000) and (Greenwood and McDowell, 1999), and the study of international migration to the United Kingdom (Mitchell and Pain, 2003), and the migration to Germany, (Voglar and Rotte, 2000); (Fromentin, 2013) study was on the relationship between international migration and unemployment in France.

Several studies have adopted the theoretical framework in the migration model, whereby potential immigrants choose the country that presents the benefits they seek, and thus the immigration decision is a function of the push and pull factors according to the following: (Grogger and Hanson, 2011), (Ortega and Peri, 2013).

$$m_{ihf} = (w_{if} + t_{if}) - (w_{ih} + t_{ih}) - c_{ihf} \quad (1)$$

Where w_{if} and w_{ih} refer to the wage of the individual (i) in the origin country (h), and the destination country (f).

t_{if} and t_{ih} indicates the benefits granted to the individual.

c_{ihf} is the cost of migration. Assume that

$$cov(w_{if}, w_{ih}) > 0 \quad , \quad cov(t_{if}, w_{if}) < 0 \quad ,$$

$$cov(t_{if}, w_{ih}) < 0$$

The cost of migration can be illustrated as follows:

$$c_{ihf} = c_{hf}(x_{hf}) + z_{ihf} \quad (2)$$

Where x_{hf} includes all direct and indirect costs, while z_{ihf} means the non-monetary costs that relate to the immigrant himself, such as moving away from family and friends.

(Borjas, 1987) assumes that an individual's wages depend on his skill level si, and thus the wages of the individual in either the country of origin or the host country are as follows:

$$W_{if} = \alpha_f + \beta_f s_I \,, \qquad W_{ih} = \alpha_h + \beta_h s \quad (3)$$

By subtracting equations (3), (2), (1) we produce the following equation:

$$m_{ifh} = (\alpha_f - \alpha_h) + (\beta_f - \beta_h) + (t_{if} - t_{ih}) - c_{hf}(x_{hf}) - z_{ihf} \quad (4)$$

As long as the individual is looking to maximize his benefit, he will choose migration if (m_{ifh}) is greater than zero.

Thus, we can include a set of variables related to the push and pull factors in equation (4), so the study can examine the effect of these factors on the individual's decision to migrate.

Numerous literatures on international migration has relied on random utility maximization models by combining various factors into the gravity model, which has become common in statistical analysis, especially with regard to measuring bilateral flows between two geographical regions. This model was based mainly on the law of gravity between objects developed by the "Newton" and named (Newton's law) in 1687, which states that the attraction forces between two bodies are directly proportional to their size and inversely proportional to the distance between them. This model is no longer confined to the science of physics but has become used in many sciences, especially the study of economic phenomena, related to the movement of goods, services, capital and individuals. The spatial interaction has been likened to the law of gravity. One of the first researchers who used this model is (Tinbergen, 1962).

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The basic form is as follows: (Burger et al. 2009)

$$GF_{ij} = g\ (m_i\ \ m_j\ /d_{ij})\ ,\ \ i \neq j \qquad (5)$$

Where:

g is the Constant of the equation

m i is the size of the sending country

m j is the size of the receiving country

d ij is the distance between the two countries

GF ij is the power generated by gravity between the two countries

As this model became dominant in applied studies in the field of international migration, it was enhanced to include variables that indicate factors of push and pull to understand the determinants of migration.

IV. Econometric Model

Even though studies differ in determining the factors of gravity explained by the phenomenon of migration flow between countries according to the nature of the study and the views of researchers, but never the less they shared the use of basic variables in the traditional model such as: the population of sending countries and receiving countries and the distance between countries.

For the purpose of the study we added other variables to the gravity model; as many studies that were conducted to explain the factors affecting international migration and its determinants supported the addition of demographic, economic, political and social variables; Thus, the form of the regression equation to study the determinants of international migration will be as follows:

$$Immig_{i,j,t} = c_0 + c_1\ \ Gdpcap_{i,t} + c_2\ \ ur_{i,t} + c_3\ Polscore_{i,t} + c_4\ \ Pop_{i,t} + c_5\ Edu_{i,t} + c_6\ Pov_{i,t} + c_7\ Gini_{i,t} +$$

$$c_8\ Gdpcap_{j,t} + c_9\ Polscore_{j,t} + c_{10}\ Pop_{j,t} + \ c_{11}\ Emig_{i,j,t} + c_{12}\ Dis_{i,j,t} + c_{13}\ Dcomlang_{i,j,t} + e_{i,j,t} \qquad (*)$$

The dependent variable is immig $_{ij}$, which expresses the number of migrants between the sending and receiving countries, while the other variables act as independent variables, and the symbols in the form indicate:

i is the sending country, j is the receiving country, t denotes time, e to the error term, pop is the number of population in each country, dis is the distance between the two countries, gdpcap is per capita income in each country, ur is an unemployment rate, edu is the average years of education, gini is the inequality index of income distribution, polscor, is the political stability index, pov is the poverty index, dcomlang is an dummy variable equal to one if the two countries speak the same language, Emig is the stock of immigrants from the sending country in the receiving country, and c_0 to c_{13} denote the parameters to be estimated. The unbalance panel data were used, which is distinguished in that it combines the cross-section data and time series data, which contributes to increasing degrees of freedom, which in turn increases the efficiency of the estimate and raises the explanatory power of the regression (Gujarati, 2003).

V. Estimation Strategy

To avoid the problems facing estimating the gravity model in commercial exchange and spatial mobility, by giving the dependent variable the logarithmic form, the search for an alternative and more appropriate estimation technique for the gravity model has become necessary. a number of researchers directed attention to the quality of using the count data estimator in estimating the gravity model. (Silva and Teneyro, 2006) (Wooldridge, 2012).

a) Poisson Maximum Likelihood Estimator (PML)

This method of estimation is applied when the dependent variable takes a valid positive value (0,1,2,3…..).

This variable may take many small values including zero, and when being estimated the dependent variable is not in the logarithmic form. the count data form follows the following equation.

$$E\ (Y/X_1, X_2, \ldots\ldots, X_k) = exp(\beta_0, \beta_1 X_1, \ldots\ldots, \beta_k X_k) \qquad (6)$$

Equation (6) is a nonlinear equation where the exponential function is a nonlinear function.

Greene (2002) considered that this method is the best method to accommodate the heterogeneity of cross- sectional data over time, as this estimation is characterized by equal variance with the mean of the data that follows the Poisson distribution, since this distribution is assumed to have a conditional mean, in the sense that the dependent variable is required for the factors of push and pull factors. for the purposes of the assessment, it is written:

$$E\ (y) = u\ ,\quad Var\ (y) = u \qquad (7)$$

b) Maximum Likelihood Negative Binomial (NBM L)

This method is an example of a Poisson estimator, when the dependent variable follows count data, which takes positive integer values, with repeated numbers from zero and small values, and the variance exceeds the mean of E (Y) <Var (Y), the negative binomial distribution occurs ; As the depended variable of this study, NBML estimator is appropriate, and the parameter estimation follows the maximal Likelihood method (Ismail and Jemain, 2007).

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VI. Data and Sources Used in the Study

Do migration flows respond to push and pull factors? What are the determinants that affect increasing or reducing the number of migrants?

To answer these questions, the study assumed that there are several factors behind the increase in the number of migrants heading to other countries for the purpose of residency, and there are different determinants of the decision to make international migration, which translates into a flow of individuals and groups to another country. To investigate the impact of these various factors, a number of 94 countries in the developing world were chosen as sending countries, classified into three groups: The Low-Income, 21 countries, the (Lower- Middle-Income) 40 countries, and the (Upper-Middle-Income) 33 countries, while 5 receiving countries from High-Income countries were selected. (See Appendix).

This study assumes that there are many factors that motivate individuals to migrate from their countries, and other factors that attract them to certain countries. The study merged data related to international migration with macroeconomic data for the sample sending and receiving countries as follows:

- We note in this study that international migration data do not cover the entire period of time, in addition to the presence of serious fluctuations on migratory flows data during the study period. it must be noted also that international migration data covers only legal migration (Inflows of Foreign Population by Nationality), and even though there are many sources for the data, but they were taken according to the same classification.
  The United Nations (UN SD, 2017) defined the stock of migrants as the number of international migrants residing in a country other than where they were born on a given date, (Stock of Foreign-Born Population by Country of Birth).
- As for the education index, the average number of years of education received by individuals over the age of 25 years was adapted and transferred from academic achievement levels, using official periods for each level.
- The study adopted the poverty index based on the percentage of the population living below the international poverty line ($ 1.9) per day according to the World Development Indicators.
- Despite the multiple sources of the Gini Index in income distribution, the study adopted the sources that follow the same method in calculating the indicator, namely the extent of the deviation of income distribution between individuals in the economy, with Lorenz curved line for the cumulative percentages of the total income received against the cumulative number for individuals starting from the poorest individual, expressed by the space between the curve and the hypothetical line of absolute equality, therefore zero is representative of absolute equality, and 100 indicates complete inequality. the written data on this indicator has been extrapolated for some of the unavailable years, based on data of other years from the same country.
- The Political Stability Index and the absence of violence are expressed in a percentage, with zero indicating the lowest degree of political stability, and the 100 for the highest rank in political stability.
- The unemployment index in the sending country shows the ratio of the unemployed to the population.
- The GeoDist database provides information developed specifically for applied research to estimate the gravitational equation in particular, because it contains bilateral data linking the pairs of countries, which allowed the study to adopt the variable of distance between sending and receiving countries used in the first model, which is the distance between the capitals of countries in kilometres.
- In this study, the language that is commonly used in both countries is expressed as a Dummy variable, which is equal to one in case the two countries speak the same language, otherwise it is equal to zero.

The study adopted various sources to create a database for the study sample for a number of developing countries as immigration origin countries and for a limited number of destination countries. This data covers a number of (23) years for the time period 1995 to 2017. The symbol (i) is given to denote the origin country, whereas the symbol (j) indicates the destination country for all variables of the equation (*) The following table (1) shows the variables used in the model and their sources:

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Table 1: Variables used in the model and their sources

Symbol	The Sources
Immigij	OECD. Stat (International migration database) + United Nations Division,2015 + United States Census + office of National Statistics.
Gdpcapi *Gdpcapj*	World Development Indicators (WDI) + Gapminder Indicator(http://www.gapminder.org)
Uri	ILOSTAT database, 9/ 2018.
Popi *Popj*	World Development Indicators (WDI).
Ginii	GINI index (World Bank estimate) + World Development Indicators (WDI) + Fred Economic research (FRED).
Povi	Human Development Reports (HDR) + World development Indicator (WDI) + Knoemia corporation (US).
Edui	Human Development Reports (HDR).
Polscorei *Polscorej*	The Worldwide Governance Indicators, 2018 Update
Emmigij	OECD. Stat (International migration database) + United Nations Division,2017 + United States Census + office of National Statistics
Disij	CEPII GeoDist database
Dcomlangij	Dummy Variable, (http://www.cepii.fr/anglaisgraph/bdd/distances.htm).

VII. Variables Description

Table (2) displays a statistical description of the variables used in the study, showing the mean and standard deviation of the variables, with the largest and smallest values of the variables in the presence of missing values for some countries; in addition to that the table shows the number of observations during the study period of 1995 to 2017. The standard deviation measures the deviation of the data set in relation to the arithmetic mean, and indicates the fluctuation in the values that the variable takes during the study period. Looking at this scale, the standard deviation of the dependent variable (Immig ij) shows the fluctuation in the values during the study period as it is affected by the extreme values, as it reached a large number (12530) because there were no flows of immigrants between countries in some years, while in contrast there were flows of very large numbers in other years, as in the case of immigration from Mexico and Cuba to the United States of America. the largest flows recorded during the study period were from Syria to Germany in the year 2015 where it reached 309699 immigrants (OECD. Stat). these results indicate a large dispersion about the arithmetic mean of the dependent variable. Study data for the dependent variable contain zero observations in some years for the sample country pairs.

Table 2: Variables description

Variable	Mean	St Dev.	Min	Max	Obs.
Immig I,j	3780.223	12530.05	0	309699	9860
Gdpcap I	7263.654	7406.055	373.4353	57421.55	10810
ur I	8.2128	5.967	0.160	44.157	10810
Polscore I	33.031	20.265	0	90.476	10325
Pop I	50543180	1.80E+08	1066.223	1.39E+09	10810
Edu I	6.422	2.928	0.700	13.4	10605
Pov I	21.767	22.699	0	86	9800

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Gini I	41.415	7.229	23.600	63	10375
Gdpcap j	39607.88	5649.694	28682.34	54225.45	10810
Polscore j	71.492	13.201	37.378	95.238	10340
Pop j	1.07E+08	96778453	29354000	3.26E+08	10810
Emmig I,j	116237.4	601045.3	15	11746539	7478
Dis I,j	7301.881	3384.371	436.077	16595.08	10810

**Source: Eviews version 9 output.*

Figure (1) shows the distribution of the dependent variable's value as it appeared in the study database, which takes non-negative integers, including zero and small values in an indication that there is no flow of immigrants in a specific time period; the distribution is largely concentrated on the left side of the figure, While it seems clear that the data slant to the right, indicating that small values represent the majority and a few high values, as shown by the statistical description in table (2) that the variance is greater than average. Figure (1) shows that the dependent variable does not follow the normal distribution, because the normal distribution is for variables that take all the values. (Wooldridge, 2016).

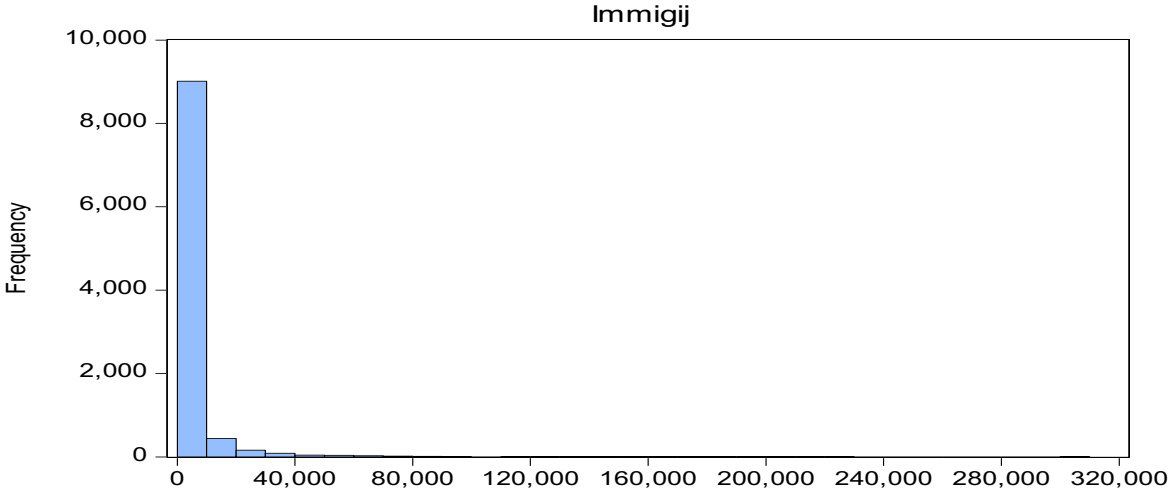

Figure 1

** Histogram of Dependent Variable, Eviews output.*

VIII. Estimation Results

Before starting to estimate the model, the study's expectations are reviewed for the parameters to be estimated; the study expects a positive relationship between the flow of immigrants and pull factors, on the other side a negative relationship is expected between the dependent variable and push factors according to previous studies and in line with the theories related to migration, which is presented in table (3).

Table 3: The sign expectations for the parameters

The Variable	***Limmig$_{ij}$***	***lGdpcap$_i$***	***ur$_i$***	***Polscore$_i$***	***lPop$_i$***	***Edu$_i$***	***Pov$_i$***
Expected Sign	*Dep. Var*	-	+	-	+	+	+
The Variable	*Gini$_i$*	*lGdpcap$_j$*	*lPop $_j$*	*Polscore$_j$*	*lEmmig$_{ij}$*	*lDis$_{ij}$*	*Docmlang$_{ij}$*
Expected Sign	+	+	-	+	+	-	+

** By author based on economic theories.*

The study estimated the equation (*) in a non-linear method, using (NBML), where the dependent variable (immig$_{ij}$) is at the level instead of taking the logarithm, which allows zero occurrences in the dependent variable, and repeating small values with the existing of other extreme value, which results in the negative binomial distribution of dependent variable data. Many applied studies found that the use of this model is characterized by the smallness of standard errors compared to other methods.

Parameters are estimated using data on the flow of migrants from different developing countries (i) to the five countries (j) used in the study sample as receiving countries, during the period 1995-2017.

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Where they indicate:

Developing Countries. i = 1, ... , 94

High-Income-Countries. j = 1,....., 5

The results of the gravity model estimation are summarized in Table (4), and the results are presented according to the different model specifications and the relationships of independent variables with each other.

The estimated values of the coefficients are expressed in IRR, which indicates the percentage change in the rate of occurrence of the dependent variable due to the increase in the explanatory variable by one unit. The IRR value appears directly in the table, and is calculated as follows: (Croux, NA)

$$IRR=(e^{\beta_i} - 1)\ \% \quad if \quad \beta_i > 0 \ \text{IF}$$

$$IRR=(1- e^{\beta_i})\ \% \quad if \quad \beta_i < 0 \ IF$$

Looking at the results in Table (4), and from the Wald chi-square test, p value appeared, as in Table (4), we can see that the models are statistically significant.

The results of the NBML estimate showed variables that have a great relationship with the dependent variable ($Immig_{ij}$) with a high statistical significance in all estimated regression equations, such as: per capita income in developing countries, individual's income in receiving countries, immigration stock, and distance between countries, which is consistent with several previous studies in the field of international migration and it is also consistent with the study's expectations.

- The estimate shows an inverse relationship with statistical significance between the per capita income in developing countries (*Lgdpcapi*) and the influx of immigrants, as this result indicates weak per capita income in these countries, which encourages migration. the results support the economic drive behind international migration, and the desire to have a higher income.
- Per capita income in receiving countries (*Lgdpcapj*) maintains its immense importance for immigrants, and is the strongest economic factors attracting international migration ever. the results of the estimate were consistent with economic theories and expectations of this study and the results of other applied studies in this field. The results indicate that there is a direct significant relationship between the individual's income in the receiving countries and the number of immigrants from developing countries, where the results indicate that increasing the individual's income in the receiving countries (% 1) leads to the possibility of migration in developing countries by a rate of (1.33).

Table 4: Assessment result

Dep. Variable	immig i j	
InDep. Variables	*Developing Countries*	
	IRR	*Prob.*
lgdpcap i	*-0.1401*	*(0.0000)*
ur i	*-0.0073*	*(0.0005)*
Polscore i	*-0.0036*	*(0.0000)*
lpop i	*0.0650*	*(0.0000)*
Edu i	*0.0050*	*(0.3752)*
Pov i	*-0.0009*	*(0.2711)*
Gini i	*-0.0089*	*(0.0000)*
lgdpcap j	*1.3349*	*(0.0000)*
Polscore j	*0.0070*	*(0.0000)*
lpop j	*0.0682*	*(0.0123)*
lemmig i,j	*1.0938*	*(0.0000)*

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ldis $_{i,j}$	*-0.2716*	*(0.0000)*
Docmlang $_{i,j}$	*-0.0582*	*(0.0717)*
Constant	*-7.0389 (0.0000)*	
R- squared	*0.523*	
Log likelihood	*-48941.20*	
Wald Chi Seq. (P-value)	*25892.160 (0.0000)*	
Total Unbalanced Panel Obs.	*6051*	

**Significant level is shown in parentheses.*

- The importance of distance was also estimated, and the results confirm the primary role of the distance variable in explaining migration flows, as the results revealed an inverse relationship with statistical significance between the flow of migrants and the distance between sending and receiving countries among developing countries, which is consistent with economic theories and Newton's gravity theory, as it turned out that the greater the geographical distance between sending and receiving countries, the more this reflects negatively on the possibility of migration of individuals from developing countries. many individuals refrain from immigration in order to avoid the material cost, in reference to the costs of movement.
- The results of the estimate in relation to the income distribution inequality index was negative. the estimate in the table that shows that the parameter signal does not agree with the study's expectations despite the statistical significance, in addition to the low value of the parameter. high ratios in the Gini index indicate a rise in the number of poor people. A feature of mostly low-income countries, which does not enable individuals to migrate.
- Maximizing the benefit to the individual is one of the main causes of migration, results that support individual migration in desire to obtain high income have emerged, but the Poverty Index has produced an interesting but possible result in the case of developing countries. the relationship between a high poverty index and the increases of poor people' numbers in these countries, so these people cannot migrate because of the cost associated with migration. This result supports the belief that adopts the concept of restricting poverty, so we find that the relationship between the poverty index and the numbers of migrants is an inverse relationship, and without statistical significance, as the increase of the poverty index by one unit reduces the possibility of migration by a rate of (0.001).
- Results of the estimation of the dummy variable which expresses the commonly used language in the sending and receiving countries. The variable expressing the language ($Dcomlang_{ij}$) did not come in line with the study's expectations for the relationship between it and the dependent variable according to the estimates listed in the table (4). The study found that the probability of migration is less among the countries that speak a common language, and this contrasts with many applied studies that investigated determinants of international migration and contrasts the expectations of the study, but it is consistent with (Sprenger, 2013)study, who found that the common language had a negative impact on international migration between 21 developed countries from the European Union and the Organization for Economic Cooperation and Development.
- Stock of immigrant's variable ($Lemmig_{ij}$) indicates the importance of the presence of former immigrants in the receiving country from the same country of the new immigrant, as this variable indicates a positive relationship with high statistical significance, and it is considered one of the important variables in increasing the number of immigrants significantly according to the results of the estimate. The results indicate that the increase in the stock of migrants (1%) leads to the possibility of migration from developing countries by (0.01) unit, indicating that the presence of former migrants in the receiving country from the migrant country, provides the newcomer with moral support and reduces the psychological cost of the migrant.
- Concerning the variable that expresses political stability ($polscore_i$), the results came to highlight the expected reverse relationship between the index of political stability in sending countries and international migration with high statistical indications. an increase in the index of political stability in developing countries leads to a decrease in the incidence of migration by (0.003). the estimates indicated that there is a direct significance relationship between the political stability index ($polscore_j$) in the receiving countries and the migration of individuals to it, as the increase in the political stability index by one unit leads to the possibility of migration by (0.007).
- There is a direct and statistically significant relationship between the population of the sending country ($Lpop_i$) and the number of people

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immigrating from it. The results show that an increase in the population in the total of developing countries by (1%) leads to a possible increase in the occurrence of migration at a rate of (0.06) which is consistent with the study expectations. population density often indicates low income and lack of job opportunities, but the population of the receiving country ($Lpop_j$) came contrary to the study's expectations; the estimates indicated that there is a direct relationship with statistical significance between the population of the receiving country and the migration of individuals to it, perhaps this is due to the sample countries that were chosen as receiving countries, where each of them is characterized by population density.

- The results of the estimation in relation to the rate of unemployment in the sending country (Ur_i) came contrary to expectations, as there was a statistically significant reversal relationship between the unemployment rate in the sending countries and the increase of immigrants from them. The results indicated that increasing the unemployment rate by a unit (1) leads to a decrease in the rate of migration occurrence of the developing countries by (0.01). this can mean that the increase in unemployment means lack of money to carry out migration.
- The study found that there is a direct relationship between the average years of education in developing countries (Edu_i) and international migration, which is in line with the study's expectations that individuals with high level of education emigrate to obtain better job opportunities and higher income that encourages innovation.

IX. Conclusion

In this paper, I examine the determinants of migration flows from the selected developing countries to five high income countries for the period 1995-2017. To estimate the gravity model for migration flows, I use the NBML estimator. This estimator is appropriate, where the descriptive statistics show that the variance is greater than mean for dependent variable, and has a large percentage of zero values. Using the dataset, I try to study the determinants of immigration flows. The immigration flow data enabled me to account for both country of destination and country of origin effects. To sum up, the estimations results support hypotheses that there are positive relationship between international migration and pull factors; income, political instability and emigration in destination country, on the other hand one can conclude that there is enough evidence to support study expectation about negative relationship between the international migration and push factors; income and distance between developing countries and destination countries. Results show, the main reasons of migration flows are high per capita income, former migrants in destination countries, low migration costs combined with their low per capita income in origin countries. Perhaps the interesting result of this study is that unemployment rate in developing countries did not show the expected positive result. To reduce the migrant's number from developing countries, governments should improve the macroeconomic setting. Regarding future directions for research, indicators on quality of governance or other institutional determinants could be included as additional explanatory variables in order to assess the future evolution of international migration from developing countries. This study is a modest addition to the literature of international migration. while this paper looks at the determinants of international migration, it provides a framework to analyze the impact of migration, on developing countries economies.

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Appendix

Developing Countries			High Countries
Low-Income-Countries	Lower-Middle-Income-Countries	Upper-Middel-Income-countries	
Afghanistan	Angola	Albania	Canada
Benin	Armenia	Algeria	France
Burkina Faso	Bangladesh	Argentina	Germany
Burundi	Bolivia	Azerbaijan	UK
Central African Rep	Cabo Verde	Belarus	USA
Ethiopia	Cambodia	Bulgaria	
Gambia	Cameroon	China	
Guinea	Cote d'Ivoire	Colombia	
Guinea-Bissau	Egypt	Costa Rica	
Haiti	El Salvador	Croatia	
Madagascar	Georgia	Cuba	
Malawi	Ghana	Dominican Rep.	
Mali	Guatemala	Ecuador	
Mozambique	Honduras	Fiji	
Nepal	India	Guyana	
Rwanda	Indonesia	Iran	
Senegal	Jordan	Iraq	
Sierra Leone	Kenya	Jamaica	
Tanzania	Kyrgyzstan	Kazakhstan	
Uganda	Lao	Lebanon	
Zimbabwe	Lesotho	Libya	
	Mauritania	Malaysia	
	Mongolia	Mexico	
	Morocco	Namibia	
	Myanmar	Panama	
	Nicaragua	Paraguay	
	Nigeria	Peru	
	Pakistan	Romania	
	Philippines	Russian Federation	
	Rep Moldova	South Africa	
	Sri Lanka	Thailand	
	Sudan	Turkey	
	Switzerland	Venezuela	
	Syrian Arab Rep.		
	Tunisia		
	Ukraine		
	Uzbekistan		
	Viet Nam		
	Yemen		
	Zambia		

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