

Standard Economy Methodologies For Applying The Gravity Model in International Trade

Dr.Khalidi Malika ^{1*}, Dr.Souad Djermoun ²

¹ *University of Eloued/Algeria, Sali6salam3@gmail.com*

² *University of Eloued/Algeria), djermoun-souad@univ-eloued.dz*

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Abstract:

In this study, we reviewed the most important standard methodologies used in the literature of traditional and modern international trade gravity models, based on the OLS methodology, through the PPML methodology and through the PPMLHDFE methodology, which is the latest technique, based on the analytical historical descriptive method of presenting experimental methodologies with the aim of Arabic studies.

Keywords: Gravity Model, OLS methodology, Fixed Effects Methodology, PPML methodology, PPMLHDFE methodology.

JEL Classification: C33 ; C3 ; C31; C33; C39.

* Dr. Malika Khalidi Interim Professor, EL-OUED University Algeria

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Introduction

The literature of international trade at the beginning of the third millennium has undergone rapid transformations, reflected in the expansion and interconnectedness of international trade flows, and to study these interlinkages more deeply, researchers have relied on the theoretical foundations of the methodology (GMT) adopted to describe intraregional trade in goods and services, in a basic and traditional form, in order to reach the latest standard methodologies for interpreting this, we will generally learn about the most important and up-to-date methodologies adopted in applying the gravity model for interpreting trade flows.

General Problematic:

In applying the gravity model for measuring States' intraregional trade flows, we ask the following question:

- ✓ What Is the Most effective Pilot Methodology For applying the Gravity Model To Measure International Trade Flows?

- Partial problematic:

order to respond to the previous problematic, and based on the methodology of scientific research, these problems require the dismantling of a molecule, so that we can facilitate the process of answering the following partial problematic:

- ✓ The extent to which standard models have contributed to the interpretation of international trade flows?

- **General hypothesis:**

To answer previous questions, we review the following hypotheses:

- ✓ Fixed-effects methodologies are best interpreted in international trade flows.

- **partial hypothesis:**

To clarify further, we put forward the following hypothesis:

- ✓ PPMLHDFE's methodology for estimating the gravity model is the best in interpreting international trade flows.

- **Objectives**

- importance of the study:

The importance of this study is to identify the most important modern standard methodologies for applying the attractiveness model in the field of international trade and thus to identify the pros and cons of international trade.

- **Methodology applied:**

In this study, we drew on the analytical descriptive and historical curriculum to present the history of the evolution of the international trade gravity model..

1- Theoretical literature of the gravity model

According to this study, we will address the theoretical evolution of the theory of different gravity models as follows:

1-1- Evolution of gravitational theory: According to the Comprehensive Gravitational Law of Physics, the renowned scientist Newton (1687). In his analysis, any particle in the universe attracts with other particles thanks to a frictional force that corresponds expressly to each other's size and inversely to the square of distance between the (Hala A. Y., 2010):as follows:

$$F_{ij} = G \frac{M_i M_j}{D_{ij}^2}$$

F_{ij}: Magnitude of gravity.

M_i · M_j: Sizes;

D_{ij}: Distance between the two objects

G: Gravity constant depends on the force measurement units and their range.

Applying this concept to international trade, States' trade is commensurate with their market size while reversing the distance between them. The first application of the notion of the law of gravity was to clarify the range of interactions for humanitarian activities (Erlander, 1980). as well as where the law of gravity was applied in the study of population migration, by absorbing the centres of trade and industry where they were found to grow less with

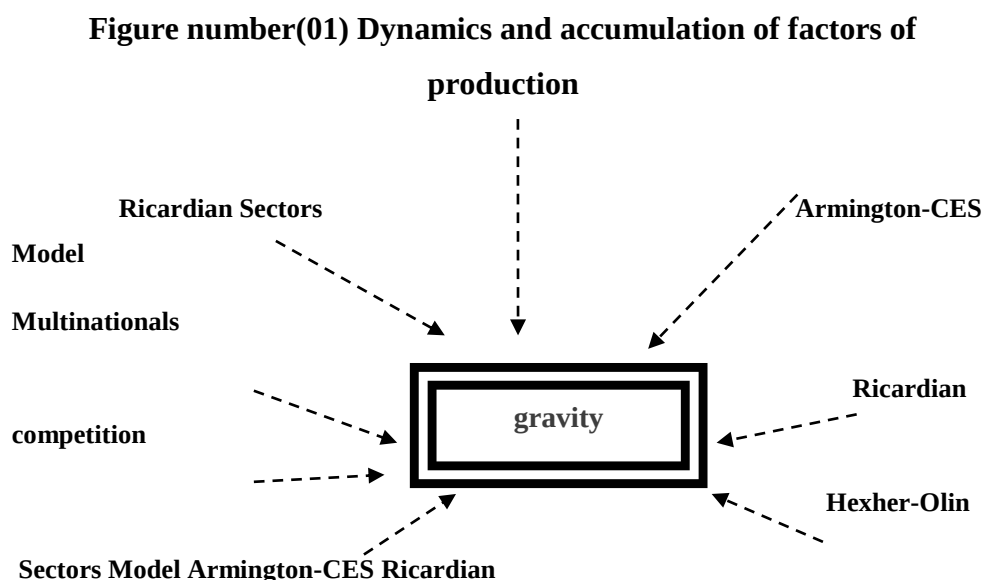
the relative distance (Peter, A; G, Van Bergeijk University Combridge New York, 2010), only previous studies The first to empirically demonstrate the negative impact of distance on different types of both domestic and international transport, the experimental application of the gravity model in the field of economics is due to a group of Dutch economists headed by Tinbergen who were the first to actually publish the gravity model (1962), Made some theoretical arguments to justify the formulation of the commercial flow equation by placing transport and freight costs as reflecting the distance between the two States (Sven, 1980).

is the first to present the economic fundamentals of gravity equation assuming differentiation of products by place of origin and constant flexibility in replacing (CES) expenses, also there is a contribution from those who adopted the theory of supply-side gravity as a Ricardi structure with intermediate goods, in which circulated the Armington-CES model and emphasized the importance of the effects of the overall balance of trade

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costs and most recently, it was stimulated, which demonstrated that a wide range of models generate interlocking equations of gravity. trade gains, which sustain trade gains, as trade gains are not fixed on a series of alternative small firms in a single economy, according to the monopolistic competition model, in the framework of Heckscher-Ohlin. In the Ricardi framework, multinational companies entered to choose the markets; in the framework of the model - Armington and under the model ricardi study ‘ Linking inputs and outputs for gravity parts based on a study, and in the dynamic framework with the accumulation of factors of production .

Recently has created a global force of gravity by deriving sufficient conditions for excellence in the trade balance of a broad category of balance of general trading model (Yoto V Y. a., An Advanced Guide To Trade Policy Analysis: The Structural Gravity Model). The following figure illustrates the main foundations of the gravity model as follows:



Source: Yoto V. Yotov and others, An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model, UNCTAD and WTO publications, 2016, P12

And besides those foundations there (Badi H., H., & Katharina, 2017):
Preferences Dixit-Stiglitz

- Written cost posts; -Trade Balance, -Gross profits that are a fixed share of gross revenue,- Import Demand System CES It can be consistently estimated by multidimensional effects. In the light of the foregoing and

based on multidimensional data within the concepts of the international economy, the famous gravity equation of international trade is estimated. as follows:

y_{ij} :The affiliate variable is double value, where it includes:

$i \in \{1....N1\}$ Exporting Country Indicators

$j \in \{1...N2\}$ Importing State indicators

When followed up on such data in terms of time (years or months) or products, the dimension of the data increases, leading to multiple problems, but the old experimental characteristics of the gravity equation in the international economy lack a deep theoretical basis but have been greatly successful thanks to their strong interpretive power.

1-2- Basic gravity equation

Overall, in the light of the above, we conclude that previous studies have concluded that the theoretical foundations of foreign trade lead to an attractive relationship for trade flows, and we will review the basic form of gravity equation to measure bilateral trade flows as follows (PeterA.G, 2010):

$$T_{ij} = \frac{GDP_i^\alpha GDP_j^\beta}{D_{ij}^\theta}$$

T_{ij} : Bilateral trade between States i, j;

GDP_j : Economic size of the j State, expressed in GDP,

D_{ij} : Bilateral distance between the two States i, j

Pop_k : The city's population means k,

Pop_i : The city's population means i,

θ :Binary Distance Trade Flow Sensitivity Parameter ,

D_k : to calculate the distw,

β, α, θ : Parameters estimated through the model's written reworking.

This equation can be transformed into a linear form to achieve the purposes of the standard economy, by employing (Abdulgallah, 2010)

$$\ln(T_{ij}) = \alpha_0 + \alpha \ln(GDP_i) + \beta \ln(GDP_j) + \theta \ln(D_{ij})$$

Where the linear equation notes the interpretation of trade flows (imports exports), representing the dependent variable, Relying on three interpretative variables: logarithm, the size of the economy of the exporting State, logarithm importing state , Model parameters can also be used α, β, θ , As a measure of the flexibility of trade flows to explain the level or distance between countries' economies. Based on the foregoing and given its simplicity in international trade literature at its inception, it has become one of the most important models used in the economic analysis of trade flows, given its broad importance in interpreting trade movements between States, so recent academic studies have increased to better assess the model's

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parameters based on foreign trade theories and modern standard economics techniques.

1-3-Expanded Gravity Model

The Expanded The expanded attractiveness model is relative in that it analyzes trade policies of different environments of countries Ricardi ",based on technological differences, factors of production, increasing production in the Ricardi framework, First hicksaw model, distance, economy size of Contracting States, commercial partner's average per capita income, Geographical boundaries, language, common history, quality of institutional environment... etc., and many studies have been directed at assessing the trade implications of regional trade agreements When States form agreements within the framework of promoting their trade, they eliminate tariffs, In other policy areas that reduce costs by including as an dummy variable whether or not there is a trade agreement between States which takes the value of 1 if the business partner belongs to the Convention, and 0 otherwise, (Abdumollah, Gravity Models For Trade Flow Interpretation, 2010)as follows:

Border_{ij} the dummy variable takes value 1 if there is a common border between States i and J, and 0 otherwise,

Language_{ij} the dummy variable takes value 1 if the first language is common between States IJ, and 0 otherwise;

Colonizer_{ij} the dummy variable that takes on value 1 if the two States participate in colonial history, and otherwise 0;

RTAS_{ij} the dummy variable, where you take the value of 1 if the business partner belongs to the agreement, and 0 otherwise.

2- The most important methodologies for estimating the gravity model

2-1- Normal micro-box methodology (OLS):

called classic methodology, is a broad method used in statistical applications, It depends on a relationship between two or more variables and the principle of this method is based on the creation of that straight line, which permeates the points of diffusion form. in such a way as to make the sum of the points' dimension boxes as little as possible, The process of estimating the linear relationship between several variables, one of which is the dependent variable and the rest is illustrative, while the parameters are generally estimated according to the following regression equation (Al-Safawi & Ammar Hazim, 2005):

$$Y_i = \beta_0 + \beta_1 \times X_{i1} + \beta_2 \times X_{i2} + \dots + \beta_k \times X_{ik} + U_i \dots$$

2-1-1- Methodological Application Characteristics (OLS):

The characteristics of this method can be displayed as follows (Sheikhi, 2011):

2-1-1-1-The characteristic of impartiality, and prejudice, means the difference between an ability and the medium of its distribution. If this difference is different from zero, we say about that estimated to be biased, and if we return to the capabilities of small squares and partial derivatives it is equal to the real value of the capabilities.

2-1-1-2-The best non-biased linear estimator BLUE is consistent, as this idea is based on the Markov-Gauss theory that says "Among linear and unbiased assessments, regular micro-square assessments are best linear and unbiased, It has the smallest possible contrast compared to the rest of the other linear and unbiased capabilities And if we encounter a problem of discretionary bias, we look at the approximate characteristic of that estimate. And this happens when the independent variable is a subordinate variable and slowed down by a period of time, We say about the estimate

that it is consistent, if: $n \rightarrow \infty$ The distribution of the estimated inspection approaches the real value of the estimate, which is not enough to obtain a consistent estimate, unless the values of bias and variation are close or equal to zero whenever n approaches infinity.

2-2-Fixed Effects Assessment (Fixed Effects Estimation): is the use of the constant impact assessment technique for panel data. Estimation of fixed effect models simply depends on the creation of dummy variables for each importer and source, and then adding them as interpretive variables to the model. However, the introduction of fixed effects imposes significant limitations on the model because of the third assumption, variables that differ only in the same dimension as fixed effects cannot be included in the model, as they will be completely overlapping with fixed effects.

2-2-2Characteristics of Fixed Effects Estimation:

-First advantage: The model's interpretative power is much greater once fixed effects are included, and this power is due to the introduction of a large number of variables.

-Second advantage: Emphasizing the important role played by the multilateral resistance factor in explaining the results of the foreseeable trade.

2-2-3- Pseudo Poisson Maximum Likelihood Methodology(PPML): This is a technique of estimating the data reviewed, which is characterized by heterogeneous flexibility as the best option for studying large-scale 3D models of States and a few time periods and They are possible ways of obtaining a more efficient rating

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without resorting to non-parametric regression, based on the assumption of functional form of: (Victor, 2019):

$$\text{var}(y_i/x_i)$$

A possible specification, assuming that the police variation is commensurate with the police medium, is as follows:

$$E[y_i/x_i] = e^{x_i^t B_i} \alpha \text{var}(y_i/x_i)$$

Where B is appreciated by resolving the following set of first class conditions:

$$\sum_{i=0}^n [y_i - e^{x_i^t \hat{B}}] x_i = 0$$

The estimate set out below is numerically equal to "PPML" and is often used to calculate the number of data, and the formula of the formula means that the correct specification of the conditional average:

$$E[y_i/x_i] = e^{x_i^t B_i}$$

Therefore, it is not necessary to distribute Poisson (number of data) and y_i A valid number in order for the estimator based on Poisson's probability function, where the maximum is calculated according to the PPML methodology even when the dependent variable is not a valid number, because the assumption of!

$$E(y_i/x_i) \propto E\{y_i/x_i\}$$

This estimate is unlikely to be retained. It does not need to be calculated to the maximum extent of the model's heterogeneous flexibility. As a result, the conclusion must be based on the assessment of the common variation of Eicker-White robust, and generally the regression model of Poisson is defined by:

$$p_r(y_i = j/x_i) = \frac{e^{-\sigma} \sigma^j}{j!}, j=1,2,3\dots$$

so that it is selected σ in general $\sigma = e^{x_i^t B_i} = e^{B_0 + B_1 X_{j1}} = B$ can be estimated by logarithmic as

$$\text{follows: } \ln L(\beta) = \sum_{i=1}^n \left[-e^{x_i' \beta} + (x_i' B) y_i - \ln(y_i!) \right]$$

Poisson's decline is not the most widely used model of data multiplicity, but it has become more popular in estimating multiplier models. The reasons why this estimate was more popular can be understood to match the direction of the grades and the Hessian matrix respectively below:

$$S(\beta) = \sum_{i=1}^n [y_i - e^{x_i' \beta}] x_i \text{ and } H(\beta) = - \sum_{i=1}^n e^{x_i' \beta} x_i x_i'$$

2-2-3-1 Pseudo Poisson Maximum Likelihood Methodology characteristics:

On the basis of the foregoing, the characteristics of this methodology can be inferred in the following points:

2-2-3-1-1 Using Poisson's regression with strong standard errors is the best in estimating the linear logarithm model compared to the OLS methodology.

2-2-3-1-2- Allow for periods of confidence, for adverse predictions that explain changes in multilateral resistance.

2-2-3-1-3- Estimate PPML always comes with theory, even if trade flows are randomly lost.

2-2-3-1-4- PPML methodology to be better appreciated with mock variables (Michael, 2017).

Fast Poisson Estimation with High-Dimensional Fixed Effects (PPMLHDFE): we show that PPML with HDFE can be implemented with almost the same ease as linear regression with HDFE. To this end, we present PPMLHDFE, a new STATA command for fast estimation of Poisson regression models with HDFE. The PPMLHDFE command is to Poisson regression what REGHDFE represents for linear regression in the STATA world—a fast and reliable command with support for multiple fixed effects. Moreover, PPMLHDFE takes great care to verify the existence of a maximum likelihood solution, adapting the innovations and suggested approaches described. It also introduces some novel acceleration techniques relative to existing algorithms for HDFE nonlinear estimation that eliminate some unnecessary steps and lead to faster computation of the parameters of interest (Sergio Corriea, 2019).

3- Methodologies for applying the gravity model in international trade

The theory of gravity in the literature of international trade has evolved considerably since its experimental beginnings by addressing all the distortions and criticisms of the estimated models of economic researchers, especially the problem of zero control and the resulting standard differences in estimation and multilateral problems. In general, we will address the knowledge of this applied tool and how it evolves as follows:

3-1- The structural equation of the gravity model: given the pluralistic nature of the structural gravity equation, and assuming that it carries at each time t , Part of the error expressed by the term $(\varepsilon_{ij,t})$ The expanded linear formula illustrates its pluralistic form as follows (Yoto V Y. a., 2016) :

$$\ln X_{ij,t} = \ln E_{j,t} + \ln y_{i,t} - \ln y_t + (1 - \sigma) \ln \pi_{ij,t} - (1 - \sigma) \ln P_{j,t} - (1 - \sigma) \ln \pi_{i,t} + \varepsilon_{ij,t}$$

X_{ij} :Exports from countries i and j ;

$E_{j,t}$:Country's total expenditure j

$y_{i,t}$:Country of local production;

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t_{ij} :Total inter country trade costs i and j

P_j :Represents multilateral resistance to the importer's easy access to the market

π_i :The multilateral resistance to the source's access to the market is easy.

To analyse the above equation, it uses various bilateral trade determinants. Whether distance, demographic growth, RTAs, tariffs, export subsidies, bans, trade sanctions, WTO membership, monetary unions, foreign aid, migration, foreign direct investment, cultural relations, monopoly unions, massive sporting events (Olympic Games and World Cup), melting ice caps, etc., and their impact on international trade. However, many of these estimates still suffer from prejudices, distortions, and this is due to an absolute lack of commitment to the basics of gravitational theory when applied to measurement, generally the most important of these difficulties and solutions can be presented as follows.: (Yoto V Y. a., An Advanced Guide to Trade Policy Analysis: the Structural Gravity Model, 2016).

3-2-Challenges and empirical solutions to estimate the gravity model:
the following points:

3-2-1- Challenge of market access by Contracting Parties: Challenge to Contracting Parties' market access: they reflect the ability of Contracting Parties and multiple Parties to access the market, expressed in the terms P_j and Π_i , so that they cannot be observed directly by the researcher and are falsely called gold medal. To address this problem in the estimates, he suggested:

- Non-linear interconnectedness of micro-box programming to measure multilateral resistance in constant position.

- The terms of multilateral resistance converge with so-called "dimension indicators" (e.g., bilateral distance connotations).

3-2-Zero Commercial Flows: The OLS method is the most commonly used method for estimating different models of gravity equation. However, the obvious impediment to the OLS methodology is that it cannot take into account the information contained in zero trade flows and to access the treatment of this problem used the following:

- Adding very small values to replace zero commercial flows, but flexibility is lost;

- The use of a Tobit estimate as a standard economic solution for the existence of zeros and applies to a situation where the actual trade is non-existent. The difficulty associated with estimating the model is overcome with Tobit's methodology according to the following two steps:

- Phase I: Use of Probit methodology that determines export probability;
- Phase II: Applying the micro-square approach based on the positive sample of trade flows, which is the choice in export due to fixed costs. (Yoto V & others, 2016).

3-3-Trade data heterogeneity: It is well known that trade data suffer from the problem of heterogeneity, and this problem was founded which is supposed to generate bilateral trade flow data at original estimates rather than converting to logarithm, and this problem is divided as follows:

3-3-1- In the case of cross-section data: In the case of cross-section data: estimate the non-linear exponential gravity model with the addition of an error term for the model, as in the following figure::

Non-linear axial gravity equation

$$X_{ij} = \exp(h_{ij}\gamma + \alpha + \mu_i + \mu_j) + \epsilon_{ij}, i = 1, \dots, E, j = 1, \dots, F.$$

Source: Badi H. Baltagi and others, 2014, Panel Data Gravity Models of International Trade, CESIFO WORKING PAPER NO. 4616 CATEGORY 8: TRADE POLICY, JANUARY, p12.

When the original model is converted to logarithm, it leads to a disturbance and assumes Poisson's distribution of linear logarithm variation, attributing the extreme difference with variations commensurate with the average of the data. The gravity equation should be as follows:

Original logarithm of estimated model

$$y_{ijt} = \mu_t + \alpha_j^* + \alpha_{it} + \alpha_{jt}^* + \gamma_{it} + \epsilon_{ijt}$$

Source: Laszlo Matyas Editor, 2017, The Econometrics of Multi-dimensional Panels, Theory and Applications ,Advanced Studies in Theoretical and Applied Econometrics 50, Badi H. Baltagi, Peter H. Egger and Katharina Erhardt , Chapter 11, The Estimation of Gravity Models in International Trade, Springer International Publishing AG; p327

When converting the above equation to linear logarithm, we will get biased parameters, OLS estimates are inconsistent, and applied there is a significant difference with real data that creates problems beyond the standard structural gravity model, especially trade cost homogeneity data.

3.3.2. In the case of data with repeated cross-sections (3D): PPML methodology can be applied to large size 3D models of States

3.4. Bilateral trade costs: Bilateral trade costs are necessary to achieve partial balance and overall trade policy balance, and to analyse these costs we find in the gravity model structure as in the following formula:

Gravity equation with bilateral trade cost

$$(1 - \sigma)Int_{ij,t} = B_1 \ln DIST_{ij} + B_2 CNTG_{ij} + B_3 LANG_{ij} + B_4 CLNY_{ij} + B_5 RTA_{ij,t} + B_6 T_{ij,t}$$

Source: Yoto V. Yotov and others, An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model, UNCTAD and WTO publications, 2016,p21.

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3.5 Trade policy coherence: One of the greatest challenges to the effects of trade policy as internal variables, which suffers from "reverse causation", and to address this problem as follows: Applying average treatment impact methods (ATE) in order to address policy coherence in aggregated trade data, use fixed effects between countries that will absorb all fixed binary variables in gravity regression as the best measure of bilateral trade costs than the standard set of gravity variables.

3.6. Non-discriminatory trade policy: Despite the importance of unilateral and non-discriminatory trade policies, such as subsidies to measure their effects on trade flows, she suggested a solution to the problems of the Gravity model

3.6.1 Multilateral convergence expressed by "dimension indicators" rather than incorporating the trend between (source and importer), relinquishing the source and persistent effects of the importer enables identification of the effects of each country's policies, yet it is not recommended because it does not function properly in terms of multilateral resistance and is therefore likely to produce biased gravity estimates.

3.6.2 The last model estimate solution is in two stages, where multilateral resistance estimates, and this resistance is explained within the gravitational decline of the first phase in auxiliary regression that includes the common non-discriminatory variable.

Conclusion

The study reviewed the most important methodologies and tests in the literature of traditional and modern international trade gravity models, based on the "OLS" methodology. PPMLHDFE methodology, and the results as follows::

1. the estimation methodology (OLS) for estimating the three study models is considered; Incompatible with the test as being biased and inconsistent, as a result of multilateral resistance among mutual and expressed members (MR); The methodology's inability to control these strong standard discrepancies and errors;
2. the persistent effects methodology, although positive in many standard studies, but in this study it has demonstrated its disadvantages and biases in estimating the study models, as well as the status of the persistent effects methodology in two-way and imported;
3. :The application of the BB2009 methodology, which assumed that the distance variable reflected the cost of trade, to eliminate the problem of the trade margin constraining the movement of interchange between exporters and importers, but demonstrated its bias in estimating the study's models;

4. The modern and widespread PPML methodology in the field of econometric metrics adopts its strong ability to deal with Heteroskedasticity error, although estimated study models have improved but in some cases proved biased;
5. The application of the PPMLHDFE modern technical methodology in the estimates of structural gravity models, which are quick to implement, has proven to be efficient in estimating the study models, especially in explaining the problem of the study working to determine the role of various regional trade agreements, with some reservations recorded, especially with conflicting estimates concerning the basics of gravity models such as GDP, population.

Bibliography List:

1. Badi H. Baltagi, Peter H. Egger and Katharina Erhardt , 2017, The Estimation of Gravity Models in International Trade, Springer International Publishing AG.
2. Sven Erlander,1980 ‘ Optimal Spatial Interaction and The Gravity Model‘,New York
3. Peter A. G. van Bergeijk 2010 ‘the gravity Model In International Trade ‘UniversitypressCombridge‘ New york‘
4. ¹ -Yoto V. Yotov and others, , 2016. An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model, UNCTAD and WTO publications
5. Laszlo Matyas Editor, 2017 The Econometrics of Multi-dimensional Panels, Theory and Applications ,Advanced Studies in Theoretical and Applied Econometrics, Springer International Publishing AG.
6. Safa Younis al-Safawi, Ammar Hazim Taha, Some methods of traditional and Biz-estimated capabilities for general linear regression parameters, comparative study with application in medical field, article published in the Journal of Rafdin Development 70 (28), Iraq, 2005, p. 94.
7. Mohammed Sheikhi,(2011) , Standard Economics Methods, Lectures and Applications, Preliminary Edition, Dar El Hamid, Algeria, pp. 22-23.
8. Hala Ali Yusuf, Applied Study of Tourist Export Flow Determinants using the State of Jordan Gravity Model, Yarmouk Research, Yarmouk Series, Humanities and Social Sciences Series, Yarmouk University, Jordan, vol. 26, No. 4, 2010, p. 749
9. .Walid Abdulmollah, Gravity Models for Trade Flow Interpretation, Arab Planning Institute Development Bridges, No. 97, November 2010, Kuwait, p. 3
10. Victor Motta, Estimating Poisson pseudo maximum-likelihood rather than log-linear model of a log transformed dependent variable, Published article in the RAUSP Management Journal, Vol. 54 No. 4, (8 August 2019) , PP, 510-511

Standard Economy Methodologies For Applying The Gravity Model in International Trade

11. Sergio Correia, Paulo Guimara~es, and Tom Zylkin). "ppmlhdf: Fast Poisson Estimation with High-Dimensional Fixed Effects" Cornell University. August,5, 2019arXiv:1903.01690v2,