FREE TRADE AGREEMENT:
HOW TO EVALUATE ITS POTENTIAL IMPACTS, ITS REAL IMPACTS
AND THE ISSUES

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Abstract

In this paper, we will first provide the definition of free trade agreement (FTA), give an analysis on proliferation of free trade agreement recently, and point out its theoretical impacts on member countries. The authors, then, repute how to evaluate its potential impacts using GTAP model and assess its real impacts on member countries in a given period since FTA entered into force employing gravity model. After that, we mention the issues, in terms of economic models and estimation techniques employed, that researchers from all over the world usually face with when they appraise those impacts. Finally, some suggestions are also proposed.

Key words: FTA, GTAP model, gravity model, impact, issue

Tóm tắt

Trong bài báo này, trước tiên chúng tôi sẽ đưa ra định nghĩa về hiệp định thương mại tự do (FTA), phân tích tổng quát về sự phổ biến các hiệp định thương mại tự do gần đây, chỉ ra tác động về mặt lý thuyết của nó tới các nước thành viên. Các tác giả, sau đó, sẽ chỉ ra làm thế nào để đánh giá các tác động tiềm năng sử dụng mô hình GTAP và các tác động trên thực tế tới các nước thành viên trong một giai đoạn cụ thể kể từ khi FTA có hiệu lực sử dụng mô hình lực hấp dẫn. Sau đó, chúng tôi sẽ đề cập tới một số vấn đề, dựa trên các mô hình kinh tế và các phương pháp ước lượng được sử dụng, mà các nhà nghiên cứu trên thế giới thường xuyên phải đối mặt khi đánh giá các tác động nêu trên. Cuối cùng, một số gợi ý quan trọng cũng được đề xuất.

Từ khóa: FTA, Mô hình GTAP, Mô hình Lực hấp dẫn, tác động, vấn đề

1. INTRODUCTION

Free Trade Agreement is an agreement signed by two or more countries to establish a free trade area where commerce in goods and services can be conducted across their common borders without tariffs or hindrances.[1] Free trade agreement eliminates/reduces tariffs, quotas, non-tariff

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[1]See Free Trade Agreement. Accessed 1 November 2015. Available: http://www.businessdictionary.com/definition/freetrade-agreement.html; See also WTO. 2009. Regional

barriers, hindrances, and references on most goods and services traded between its country members. Free trade agreement/area can be considered as the first stage of economic integration.[2] FTA often covers not only trade in goods and services but also other areas such as government procurement, intellectual property rights, competition policy, investment measures, environment, labor, financial services, e-commerce, development, institution etc. Countries sign/join FTAs to promote free trade because free trade improves resource allocation, lowers prices for consumers, and leads to a more efficient production. An open trade regime also encourages the integration of an economy into the global trading system and increases imports of modern technology, which results in productivity improvements. Moreover, FTA members can attract foreign capital resources through portfolio and foreign direct investment. Therefore, the most intuitive and important impacts of FTA are effects to foreign trade and foreign direct investment of member countries. The others are impacts on institutional changes, environment, competitiveness, poverty reduction, income, etc. The questions are that: (i) what are the theoretical, potential, real impacts of FTA? (ii) How can we evaluate its potential impacts, its real impacts on member countries? And, (iii) what are the issues that researchers from all over the world usually face with when they assess those impacts? This paper will try to find out the comprehensive answers for those questions. The structure of the paper is as followed. Section 2 provides the theoretical, potential, and real impacts of FTA on member countries. Section 3 reputes how to evaluate the potential impacts and the real impacts of FTA on member countries as well as discusses the issues that researchers from all over the world usually face with when they assess those impacts. The final Section regards to concluding remarks and recommendations.

2. THE THEORETICAL, POTENTIAL, AND REAL IMPACTS OF FTA

Theoretically, researchers, mentioned in their researches or standard books supporting by axioms or economic theories, can classify the economic impacts of a FTA into two groups: (1) "Static Effects" and (2) "Dynamic Effects". The "Static Effects" include the "Trade Creation" and "Trade Diversion". "Trade creation is defined as the replacement of higher cost domestic production by lower cost sources of supply within the new union". "Trade diversion means that

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Trade   Agreements.   Accessed   November   1,   2015.   Available: Http://Www.Wto.Org/English/Tratop_E/Region_E/Region_E.Htm.

[2]The others are Customs Union (the second stage), Common Market (the third stage), Economic Union (the fourth stage), and Political Union (the last/fifth stage). To develop a free trade area, participating nations must develop rules for how the new free trade area will operate. What customs procedures will each country have to follow? What tariffs, if any, will be allowed and what will their costs be? How will participating countries resolve trade disputes? How will goods be transported for trade? How will intellectual property rights be established and managed? The goal is to create a trade policy that all countries in the free trade area agree.

trade has been diverted by discriminatory tariffs from a low cost external source to higher cost source within the new union". The "Dynamic Effects" consist of three main effects in the long-term. First, the increased size of the domestic market, now including other member countries, will enable producers to exploit economy of large-scale production, leading to an expansion into the international market (trade expansion). Second, there will be increase in competitive pressure on inactive industries. Third, it will stimulate investment (Urata, 2010). The potential impacts of FTA on member countries mentioned in this paper are impacts estimated by researchers using economic models before FTA enters into force. The real impacts of FTA on member countries are the impacts in reality/happened in a given period since FTA came into effect.
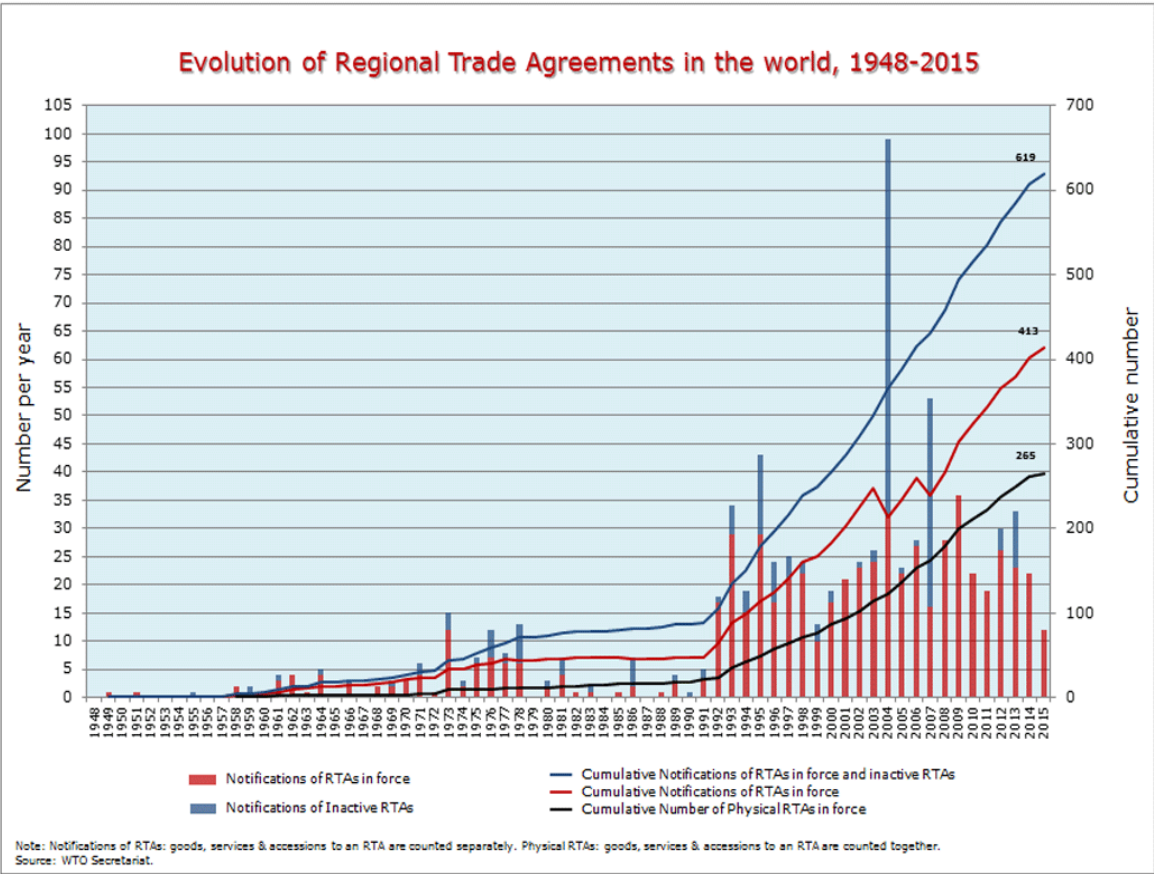

Figure 1: Regional Free Trade Agreements in the World during 1948-2015

Source: WTO Secretariat, 2015[3]

Figure 1 above indicates the recent development of several RTAs during 1948-2015. In the period 1948-1994, the GATT received 124 notifications of RTAs (relating to trade in goods), and

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since the creation of the WTO in 1995, over 400 additional arrangements covering trade in goods or services have been notified. What have induced proliferation of FTA recently? Firstly, the current round of multilateral trade negotiations under the WTO, or Doha Development Agenda (DDA), has been deadlocked. There are a number of problems behind this stalemate such as the decision making system, issue coverage, treatment of developing countries, and others. The controversy over agricultural trade policy between the U.S. and India was the direct cause of the breakup of the DDA in July 2008. Faced with the deadlock in the DDA, many countries have turned to free trade agreements. FTAs involving small number of members are likely to be able to conclude negotiations in a shorter time-period compared to the WTO negotiations with 150+ members. Many FTAs have gone beyond the commitments at the WTO (or WTO plus commitments) by including, for example, liberalization in foreign direct investment, movement of natural persons, etc. Besides, they include trade and FDI facilitation, whose progress at the WTO has been slow. FTAs may contribute to trade liberalization at greater scale compared to the WTO liberalization. Under FTAs import tariffs are to be removed either immediately or within a certain period, while under the WTO negotiation gradual tariff reduction is pursued. FTAs may contribute to WTO negotiations as FTAs reduce the influential power of the opposition group against trade liberalization. Secondly, it is due to the domino effect of FTAs, which has contributed to the proliferation of FTAs. This may eventually lead to global trade liberalization by consolidating FTAs into global trade liberalization. Somewhat from a different perspective and somewhat contradictorily, one may argue that proliferation of FTAs may lead to global trade liberalization as disintegration of the global trading system caused by FTAs makes policy makers realize the importance of open global trading system (Urata, 2010).

3. EVALUATE THE POTENTIAL IMPACTS AND THE REAL IMPACTS OF FTA ON MEMBER COUNTRIES AND THE ISSUES

3.1. Evaluate the Potential Impacts of FTA

The most common/popular methodology employed to evaluate the potential impacts of FTA on member countries, before FTA enters into force, is to use the standard GTAP model or the comparative static GTAP model.

GTAP (Global Trade Analysis Project) is a global network of researchers (mostly from universities, international organizations, or the economic ministries of governments) who conduct quantitative analysis of international economic policy issues, especially trade policy. They cooperate to produce a consistent global economic database, covering many sectors and all parts of the world. The database describes bilateral trade patterns, production, consumption and intermediate

use of commodities and services. There are satellite databases for such things as greenhouse gas emissions, and land use etc. There is software for aggregation to different levels of sectoral and regional detail.

The GTAP project is coordinated by a team at the Center for Global Trade Analysis (CGTA), based in the Agricultural Economics Department at Purdue University located in Lafayette, Indiana, the USA. The team maintains a global computable general equilibrium model (CGE model), which uses the GTAP database. Computable general equilibrium models are a class of economic models that use actual economic data to estimate how an economy might react to changes in policy, technology or other external factors. CGE models are also referred to as AGE (applied general equilibrium) models. Besides the core model, there are many variants (including one focused on agricultural analysis), each focusing on a different issue in economic policy analysis. Figure 2 below outlines the structure of standard GTAP model in a form of tree diagram.
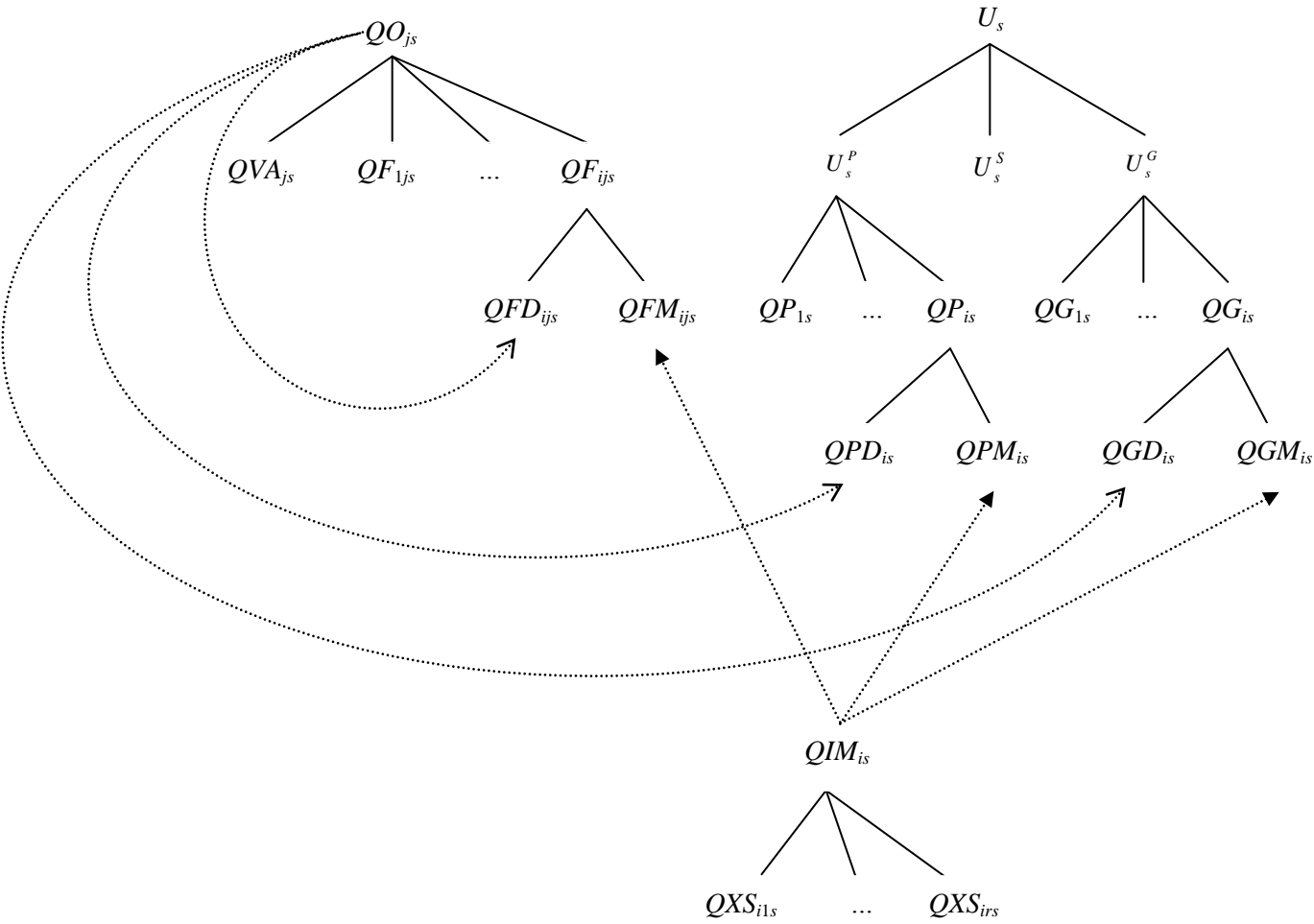

Figure 2: The Structure of GTAP Model

On the right-hand part, economic welfare of the representative regional household in region s, U_s is determined by private consumption, U_s^P, of goods and services (QP_{is}), savings, U_s^S, and public expenditures, U_s^G, on QG_{is}. Goods and services are composed of domestic products (QPD_{is}, QGD_{is}) and imports (QPM_{is}, QGM_{is}). Here, the substitution between domestic and imported goods is based on product differentiation by the place of origin. Further, the imports are also differentiated by the sources where the goods are produced (QXS_{irs}). The left-hand part of the tree diagram describes the production of good j, QO_{js}. Under the constant return to scale production technology, value added items (QVA_{js}) such as labor and capital are assembled with intermediate inputs (QF_{ijs}) that is again subject to the product differentiation by the place of origin, domestic and import. To estimate the potential impacts of FTA on specific item, economic growth, etc. of FTA members researchers use the GTAP Data base covering 140+ regions (countries) and 57+ industrial sectors with 2009 or 2011 benchmark year which can be readily accessed at the GTAP website (www.gtap.org). The aggregated GTAP database is used to compute average applied import tariff rates.

The standard GTAP model generally assumes the followings: no explicit treatment of time, perfectly competitive markets, constant returns to scale production technology, fixed endowments of primary factor inputs such as land, natural resources, capital, skilled and unskilled labor for production activities. Goods and services are allowed to move across borders but not for the primary factors. Other factors such as technology growth, possible economic crises, and government policies… can promote or hinder these changes in the economy. Early CGE models were often solved by a program custom-written for that particular model. Models were expensive to construct, and sometimes appeared as a "black box" to outsiders. Today most CGE models are formulated and solved using one of the GAMS or GEMPACK software systems. AMPL, Excel and MATLAB are also used. The use of such systems has lowered the cost of entry to CGE modeling; allowed model simulations to be independently replicated; and increased the transparency of the models (the notable studies employed GTAP model are Hertel 1997; McDougall 2003; Narayanan, Aguiar, and McDougall 2015; etc.). However, it should be noted here that the simulation results could be affected by the degree of aggregation.

3.2. Evaluate the Real Impacts of FTA

The most effective way/methodology employed to assess the real impacts of FTA on member countries, in a given period since FTA came into effect, is to use gravity model. The gravity model in international economics, similar to other gravity models in social science, can be employed to

predict bilateral trade or FDI flows based on the sizes of the economy (often using the Gross Domestic Product (GDP) measurements, GDP per capita, Gross National Product (GNP), and GNP per capita), and the distance between two trade/FDI partners. Tinbergen first used the model in 1962.[4] It was given the name "gravity model" for its analogy with the Newton Law of Universal Gravitation, which also takes into consideration the distance and physical size between two objects. The basic theoretical model for trade/FDI flows between two countries i and j takes the following formula:

$$F_{ij} = G(M_i M_j)/D_{ij} \ (1)$$

In which:

- F_{ij} is the bilateral trade/FDI flow between country i and country j

- M_i is the economic mass of country i (often using GDP, GNP measurements)

- M_j is the economic mass of country j (often using GDP, GNP measurements)

- D_{ij} is the distance between country i and country j, and

- G is a constant.

The model has also been used in international relations to evaluate the impact of treaties or alliances on trade, FDI flows, and it has been used to test the effectiveness of trade agreements and organizations such as the North American Free Trade Agreement (NAFTA) or the World Trade Organization as well.

In the original gravity model, two opposing forces that determine the trade and FDI flows between two countries are based on the levels of their economics (usually measured by GDP, GNP, $GDP_{per \ capita}$, $GNP_{per \ capita}$ or "Economic space" calculated by the sum of GDPs of two countries, etc.) and the distance between them. For further development, many other variables can be added in the model such as:

- Exchange rate regime

- Cultural differences: colonial history, language diversity (number of languages used) and literacy rates (%)

- Institution, uncertainty (conflict intensity, terrorism, and crisis), various bottlenecks (aggregated indicators that reflect the macroeconomic, political stability, governance effectiveness, etc.)

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[4]Jan Tinbergen (12nd April 1903-9th June 1994) was a Dutch economist. He was awarded the first Bank of Sweden Prize in Economic Sciences in Memory of Alfred in 1969, which he shared with Ragnar Frisch for having developed and applied dynamic models for the analysis of economic process, retrieved from website: http://en.wikipedia.org/wiki/Jan_Tinbergen, accessed on November 3rd, 2015.

- Preference schemes (Generalized System of Preferences (GSP), Preferential Trade Agreements (PTAs))

- Market access, openness (tariff line at average level (%), ratio measured by (Exports + Imports)/GDP), WTO, FTA, etc.)

- Index of country similarity in size, Economic size similarity, Differences in relative endowments ($[\ln(GDP/Pop_{it}) - \ln(GDP/Pop_{jt})]$ or $[\ln(GDP_{per\ capita\ it}) - \ln(GDP_{per\ capita\ jt})]$).[5]

The gravity model has been used comprehensively in many empirical studies in international economics (e.g., Poyhonen 1963; Linnemann 1966; Anderson 1979; Bergstrand 1985; Bayoumi and Eichengreen1995; Deardorff 1998; Aderson and van Wincoop 2003; Rose 2004; Subramanian and Wei 2007; Tomz et al. 2007; Helpman et al. 2008; Silva and Tenreyro 2006, 2010; Eicher and Henn 2011; Pham 2011, Hoang et al. 2015; etc.). To capture the effects of FTA on dependent variable (DV) such as trade flows and FDI flows, researchers added a dummy variable, which takes the value of unity if country pairs belong to the same FTA and vice versa, to the standard gravity model.

The simplest way used to estimate the coefficients/parameters of independent variable (IV) in gravity model is ordinary least squares (OLS) that makes assumption that $V(\varepsilon_j) = \sigma^2$ for all j. That is, the variance of the error term is constant (homoskedasticity/homoscedasticity). If the error terms do not have constant variance, they are said to be heteroskedasticity/heteroscedasticity.[6] However, economists have long been aware that Jensen's inequality implies that $E(\ln y) \neq \ln E(y)$, that is, the expected value of the logarithm of a random variable is different from the logarithm of its expected value. This basic fact has been neglected in many econometric applications. Indeed, one important implication of Jensen's inequality is that the standard practice of interpreting the parameters of log-linearized models estimated by OLS as elasticities can be highly misleading in the presence of heteroskedasticity (Silva and Tenreyro, 2006). It is undeniable that the violation of the homoskedasticity assumption must be quite severe in order to present a major problem given the robust nature of OLS regression.

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[5]International Trade Central-UNCTAD/WTO, Market Analysis Section, "Trade Sim (second version), a gravity model for the calculation of trade potentials for developing countries and economies in transition", Explanatory notes, 2003, p.1.

[6] The assumption of homoskedasticity (literally, same variance) is central to linear regression models. Homosckedasticity describes a situation in which the error term (that is, the "noise" or random disturbance in the relationship between the independent variables and the dependent variable) is the same across all values of the independent variables. Heteroskedasticity (the violation of homoskedasticity) is present when the size of the error term differs across values of an independent variable. The impact of violating the assumption of homoskedasticity is a matter of degree, increasing as Heteroskedasticity increases.

In a panel data setting, random-effects and fixed-effects models have been traditionally and widely used for the estimation of gravity models. The choice between them is using the Hausman test. However, both methods have their own disadvantages. While the random-effects models do not incorporate country fixed-effects (which are likely to be presented in a heterogeneous country sample), time-invariant variables will not yield coefficient estimates in a fixed-effects model. It means that we cannot gain/acquire/produce/ estimates for the variation that is captured in the country fixed-effects, although these can be quite interesting in a gravity model, since they reveal the distance between two countries and reveal whether they share a land border (the econometric software, e.g., Stata, will notify omitted in estimation results).

As a remedy, Hausman and Taylor (1981) and Wyhowki (1994) proposed a different model that could incorporate the advantages of both the random-effects and the fixed-effects models. Egger (2005) stated that the Hausman-Taylor estimator is consistent and the performance is at least equivalent to the random-effects and the fixed-effects estimators. McPherson and Trumbull (2003) also tested different estimators and found the Hausman-Taylor estimator to be superior in the estimation results. The Hausman-Taylor (1981) estimator is basically a hybrid of the fixed-effects and the random-effects models and takes the following formula:

$$y_{it} = \beta_1 x'_{1it} + \beta_2 x'_{2it} + \alpha_1 z'_{1i} + \alpha_2 z'_{2i} + \varepsilon_{it} + u_i \ (2)$$

In which, y_{it} reflects the dependent variable for country i in period/time/year t; x'_{1it} denotes variables that are time varying and uncorrelated with the error term in the random-effects model (u_i); x'_{2it} refers to a set of variables that are time varying and correlated with u_i; z'_{1i} represents the time invariant variables that are uncorrelated with u_i; z'_{2i} describes the time invariant variables that are correlated with u_i; β_i and α_i are the vectors of coefficients associated with the covariates; and ε_{it} is the random error. Accordingly, one of the main assumptions of the Hausman-Taylor (1981) estimator is that the explanatory variables that are correlated with u_i must be identified.

By construction, the ordinary least squares (OLS) or generalized least squares estimators will be inconsistent if any of the variables used in the model are correlated with the random effects. And this technique, sometimes, leads to significant bias in estimation results/skewed results. Therefore, Hausman and Taylor (1981) instrument their estimates by taking deviations from group means such as:

$$y_{it} - \bar{y}_i = \beta_1 (x_{1it} - \bar{x}_{1i})' + \beta_2 (x_{2it} - \bar{x}_{2i})' + \varepsilon_{it} - \bar{\varepsilon}_i \ (3)$$

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In which $\bar{y}_i$, $\bar{x}_{1i}$, $\bar{x}_{2i}$, and $\bar{\varepsilon}_i$ represent the mean of the respective variables. The authors show that these instruments are sufficient as long as the number of time-varying and exogenous variables is at least equal to the number of variables that are time invariant and correlated.

To estimate the coefficients of independent/explainable variables in gravity equations, researchers usually use econometric software such as Eview or Stata. The Stata software seems to be favored. Command depends on specific estimation technique used.

Recently, one of the related problems with the analogy between Newtonian gravity and trade or FDI data is that gravitational force can be very small, but never zero, whereas trade or FDI data between several pairs of countries is literally zero. In many cases, these zeros occur simply because some pairs of countries did not trade or invest in a given period. The existence of observations for which the dependent variable (the trade, FDI variable) is zero creates an additional problem for the use of the log linear form of gravity equation. To deal with the problem several methods have been developed (e.g., Frankel, 1997). The approach followed by the large majority of empirical studies is simply to drop the pairs with zero trade or FDI from the data set. Rather than throwing away the observations with $T_{ij} = 0$ (T_{ij} is the value of dependent variable such as trade value or FDI value), some authors add 1 to T_{ij}, now it becomes $T_{ij} + 1$, or use tobit model/tobit estimation. Nevertheless, these methods may lead to inconsistent estimators of the parameters of interest. The severity of these inconsistencies depends on the particular characteristics of the sample and method employed (Silva and Tenreyro, 2006).

To solve the problems of zero trade and zero FDI and heteroskedasticity mentioned above, Silva and Tenreyro (2006, 2010), Silva (2011) argued that the gravity equation should be estimated in their multiplicative form and the authors proposed a simple Poisson Pseudo Maximum Likelihood (PPML) estimation technique. However, practitioners should take a consideration in possible convergence problems resulting from shortcomings of Stata's poisson command.[7]

4. CONCLUDING REMARKS AND RECOMMENDATIONS

Free trade agreement has proved to be one of the best ways to open up imports and exports as well as other economic activities of a country to the global economy. It has a wide range impacts on member countries from foreign trade and FDI attraction to economic welfare, poverty reduction, environment, institution etc. To evaluate the potential impacts of FTA researchers usually use the standard GTAP model. However, it is costly and complicated. In addition, the estimated results depend much on the degree of aggregation (regions/countries and industries/sectors collected) with

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[7] For further arguments, please see Santos Silva (2011).

certain assumptions that, in fact, might change. To assess the real impacts of FTA in a given period since it entered into force economists mostly occupy gravity model. Nevertheless, the estimation results are diverse due to the economic models and estimation techniques employed. While OLS can lead to severely significant bias when the violation of the homoskedasticity assumption exists, the random-effects models do not incorporate country fixed-effects, and time-invariant variables will not yield coefficient estimates in a fixed-effects model. As a remedy, Hausman and Taylor (1981) and Wyhowki (1994) proposed a different model that could incorporate the advantages of both the random-effects and the fixed-effects models. This can be a superior estimation technique, which is suitable for non-zero trade and non-zero FDI data. To deal with problems of zero trade and zero FDI researchers regularly drop the pairs with zero trade and zero FDI from the data set or add 1 to T_{ij} and use tobit model. Conversely, these methods may lead to inconsistent estimators of the parameters of interest. Recently, to solve the problems of zero trade and zero FDI data and heteroskedasticity Silva and Tenreyro (2006, 2010), Silva (2011) proposed a simple Poisson Pseudo Maximum Likelihood (PPML) estimation technique.

Overall, "no one is perfect" and "every coin has two sides", practitioners should pay attention to these issues when estimate or evaluate the potential and the real impacts of FTA on member countries. This is to have more persuasive research results in scientific fields so that policy makers can reduce risks in the process of making policies.

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