FORECASTING TRADE NETWORK OF THAILAND AND ASEAN THROUGH GRAVITY MODEL APPROACH

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Abstract
Purpose: Through the geographical characteristics, Thailand has been proclaimed as the central hub of ASEAN region. Extensive trade activities and economic prosperity are expected within the region. This study investigates the trade value of Thailand and its network to obtain benefits of the forthcoming ASEAN Economic Community (AEC).
Design/methodology/approach: This study is divided into three steps. The first step is to evaluate the trade relationship of Thailand in comparison with other ASEAN member states by using Regression Analysis. The second step is to use the past trend to forecast the future trend via Gravity Model. Finally, the result from the model of Thai trade network performance will be analysed under the context of AEC.
Findings: The study identified the possible future trend of Thailand trade network among other ASEAN member states under the content of the forthcoming AEC.
Research limitations/implications: This study uses adjusted Gravity Model to fit under the AEC content of the Thai trade network. Therefore, the model is derived from Thai trade perspective.
Originality/value: To perform the appropriate model to evaluate the future trend of ASEAN trade network with Thailand as the central pivot point. The analysis is not limited to the ASEAN member states but also to the selected developed countries.

Keywords: Trade Value, Trade Network, Forecasting, ASEAN, AEC, Gravity Model

Article Classification: Conceptual Paper

Introduction

As global supply chain plays an important role in the growth of the global economy, the definition of international trade through cross-border activities has been on a continuum of changes (Chao, 2011). The growth of the global economy is much determined by the export and import indices of a particular country. Therefore, identifications of trade flow are important in forecasting future trade trends. Exporting indices is one of the main indicators in revenue earning of a country, while the importing indices portraits the production requirements (i.e. capital goods and raw materials) and consumption capabilities. As international trade continues to evolve, a rise in trade complexity has posited challenges for shippers. Furthermore, policy clarification in between countries and government support has become a crucial factor in a country"s ability to expand its trade with others. In order to gain a whole understanding of these subject matters, Thailand was selected as the country of interest for this research. Thailand is well known for its capability of both regional and international trade. It has a high competitiveness in penetrating new markets when compared with neighbouring countries.

It can be seen from Figure 1 and Figure 2 that the trade value of Thailand with the other ASEAN member states of both export and import has increased steadily. These particular phenomena can be seen as remark of the forthcoming ASEAN Economic Community (AEC). Factorial facets of trade, whether in production base, mobility of workers and others will have an expected impact on the trade value of Thailand. The results of these studies would contribute to a fuller understanding of the current trade trend, especially for practitioners and academics.

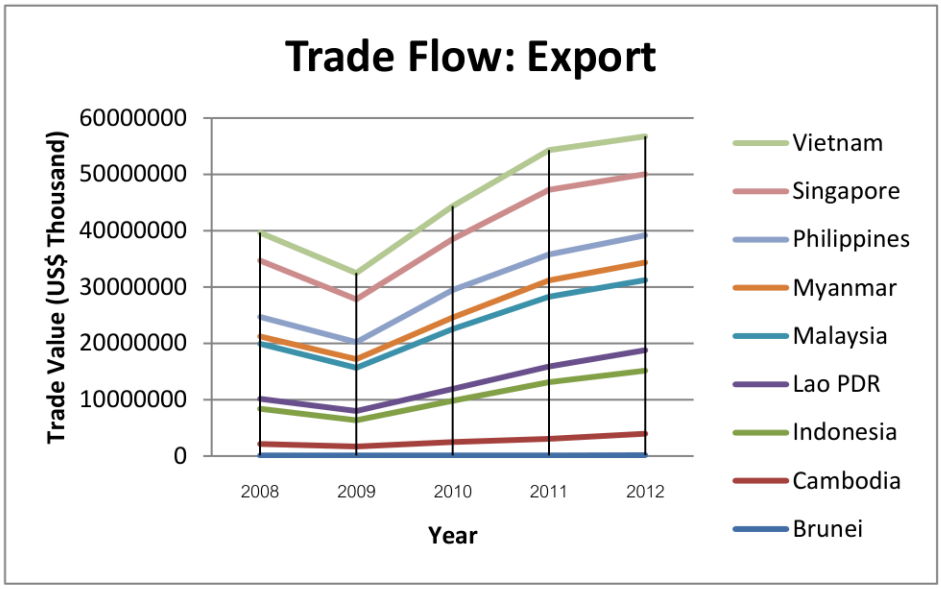

Figure 1: Thailand"s export value to ASEAN from 2008-2012; adapted from WITS (2014)

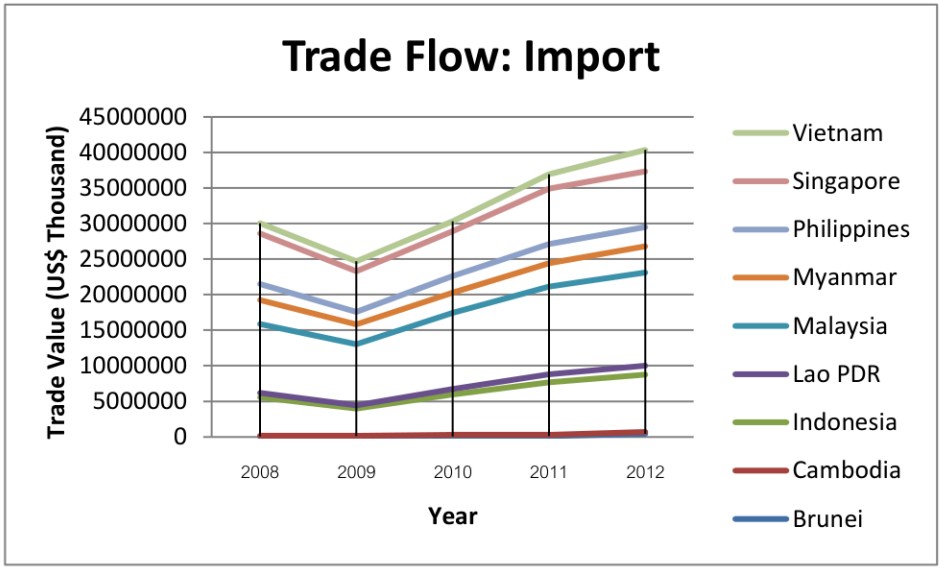

Figure 2: Thailand"s import value from ASEAN from 2008-2012; adapted from WITS (2014)

The Association of Southeast Asian Nations (ASEAN) was established on 8 August 1967 in Bangkok by the five original member countries: Indonesia, Malaysia, Philippines, Singapore, and Thailand. Brunei Darussalam joined on 8 January 1984, Vietnam on 28 July 1995, Laos and Myanmar on 23 July 1997, and Cambodia on 30 April 1999.

The ASEAN Declaration states that the aims and purposes of the Association are: (1) to accelerate the economic growth, social progress and cultural development in the region through joint endeavors in the spirit of equality and partnership in order to strengthen the foundation for a prosperous and peaceful community of Southeast Asian nations, and (2) to promote regional peace and stability through abiding respect for justice and the rule of law in the relationship among countries in the region and adherence to the principles of the United Nations Charter. In 1995, the ASEAN Heads of State and Government re-affirmed that "Cooperative peace and shared prosperity shall be the fundamental goals of ASEAN." The ASEAN Secretariat (2009)

In order prepare for the forthcoming AEC event in the end of year 2015, the ASEAN countries have prepared plans for the economic integration of different or blueprint for the establishment of an

ASEAN Community (AEC Blueprint) has four major components which are Single Market and Production Base, Competitive Economic Region, Equitable Economic Development and Integration into the Global Economic; the details of each component are in Table1.

Single Market and Production Base	Competitive Economic Region	Equitable Economic Development	Integration into the Global Economy
- Free flow of goods - Free flow of services - Free flow of investment - Freer flow of capital - Free flow of skilled labor - Priority Integration Sectors	- Competition Policy - Consumer Protection - Intellectual Property Rights - Infrastructure Development - Taxation - E-Commerce	- SME Development - ASEAN Integration	- Coherent Approach towards External Economic Relations - Enhanced participation in global supply networks

Table 1: AEC Blueprint; Department of Trade Negotiations (2013)

As the impact of the AEC blueprint, this research aim to estimate the trade value of Thailand with its trade partners. Then, identify the possibility trend to inform the involved stakeholders to preparation about the forthcoming AEC how it will impact to each sector.

Literature Review

This research aims to study the impact on trade network of Thailand and other ASEAN member states of the forthcoming AEC. This research relevant to forecasting the trade value and analyze the impact of economic integration. There are several interesting methods (Table 2). And the gravity model is more suitable with this research than other models under the condition of various variable and policy.

Econometrics Model	Researchers	Research Result
Market Share Model	Chen, Chew and Liu (1998) Clausing (2001) Liu and Luo (2004)	This model can predict the market share of the country's membership in the target market. However, this approach does not contemplate other factors that affect the market share of the country"s" membership, such as changes in technology, changes in economic policy and etc.
Price-discrimination Model	Kelegeme (1997) Winter and Chang (2002)	This model gauges the impact from economic integration that affects the price by considering to the cost of the tariffs differences among country"s membership and other countries which not membership due to the economic integration. But this method does not gauge the impact on the export and import value.
Balassa Ex-ante and Ex-post, Import Demand Function	Lalith (1998) Heien and Sims (2000)	This model gauges the impact from changes of prices and income due to the economic integration on the value and volume of imports of the country"s membership and not considering the other factors that affect to the value and volume of imports.
Gravity Model	Bergstrand (1985) Primo Braga and Fink (1999) Polder (2000) Rose (2000)	This model uses economic variables, geographic variables, and multiple policy variables to explain the impact of economic integration. And the

	Soloaga and Winters (2001) Lane and Burke (2001) Egger and Pfaffermayr (2003) Roberts (2004)	most importantly, gravity model concern about distance between countries which is a variable that reflects the logistics cost and international transportation cost too.

Table 2: Review of the research result of each model

Research Objective
To perform the appropriate model in forecasting the trade value and also trade network between Thailand and other ASEAN member states. To analyzes the trend changing of trade network on the forthcoming AEC.

Research Methodology
This study uses trade historical data to collect the empirical data. The first step is to evaluate the trade relationship of Thailand in comparison with other ASEAN member states by using Regression Analysis as an estimate method. The second step is to use the past trend to forecast the future trend via Gravity Model. Finally, the result from the model of Thai trade network performance will be analysed under the context of AEC.

Regression Model
This purpose of this research is to estimate the target-year trade value by export and import for each partner within the region. Because Regression is a statistical measure that attempts to determine the strength of the relationship between one dependent variable (usually denoted by Y) and a series of other changing variables.
The Regression Model can be employed in connection with trade value. The selection of the most appropriate form in a particular case is usually based on experience and preliminary investigations into the matter. (Papacostas and Prevedouros 1993). This study uses the linear multiple-regression model, which has the form

$$Y = a_0 + a_1X_1 + \ldots + a_rX_r$$

Where *Y* is the dependent variable, the *X*"s are the relevant independent or explanatory variables, and the *a*"s are the parameters of the model that must be estimated prior to applying the model
The output from this model is the simple correlation of the trade behavior of Thailand and other ASEAN member states.

Gravity Model
The gravity model gets its name from the fact that it is conceptually based on Newton"s law of gravitation. (Papacostas and Prevedouros 1993) The gravity model is a well-known econometric model that is often adopts to model flows from various kinds. The flow is regarded as the resultant of the attraction between two objects. The attraction is positively related to the masses of the objects: the attraction among two objects with a larger mass is higher than among two objects with a smaller mass. On the other hand, the mutual distance of the two objects decreases the attraction; when objects are farther away from each other, the mutual attraction is smaller. It is also similar to the trade value; the attraction among two countries with a large size of economic has gravitation more than among two countries with a small size of economic.

When the flow concern international trade, Polder M. (2000) stated that the objects are exporting and importing countries. The „masses' of the countries are size of their economics, from which a certain potential trade flow result. The larger economies of the concerning countries, the larger the trade among these countries will be. However, the mutual distance causes a resistance to trade, because of transport costs and time, among other things. Additional trade hampering factors are import tariffs, border controls, quantity restrictions and etc. these are indirect or artificial transport costs that are not related to distance, but more to the mere fact that the goods are transported from one country to another.

The grvity model is represented in Figure 3. It can be seen that form the sizes of economies of the exporting country and importing country, respectively a potential supply and a potential demand arises. This leads to a potential trade flow between the countries. This flow is subject to certain trade resistance factors. Trade resistance at its turn is lessened by trade arrangements, which in general

concern arrangements with respect to the artificial transport costs. Finally, the actual trade flow results.
The mathematical expression as the following model:

$$X_{ij} = \beta_0 Y_i^{\beta_1} Y_j^{\beta_2} N_i^{\beta_3} N_j^{\beta_4} D_{ij}^{\beta_5} A_{ij}^{\beta_6} u_{ij}$$

where

X_{ij}	=	export/import value from i to j
Y_i . Y_j	=	the gross domestic product (GDP) of countries i and j
N_i , N_j	=	the population size of countries i and j
D_{ij}	=	the distance between countries i and j
A_{ij}	=	trade arrangement dummy
U_{ij}	=	error term

The above equation can be expressed in terms of log-linear as follows:

$$lnX_{ij} = \beta_0 + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 lnN_i + \beta_4 lnN_j + \beta_5 lnD_{ij} + \beta_6 lnA_{ij} + u_{ij}$$

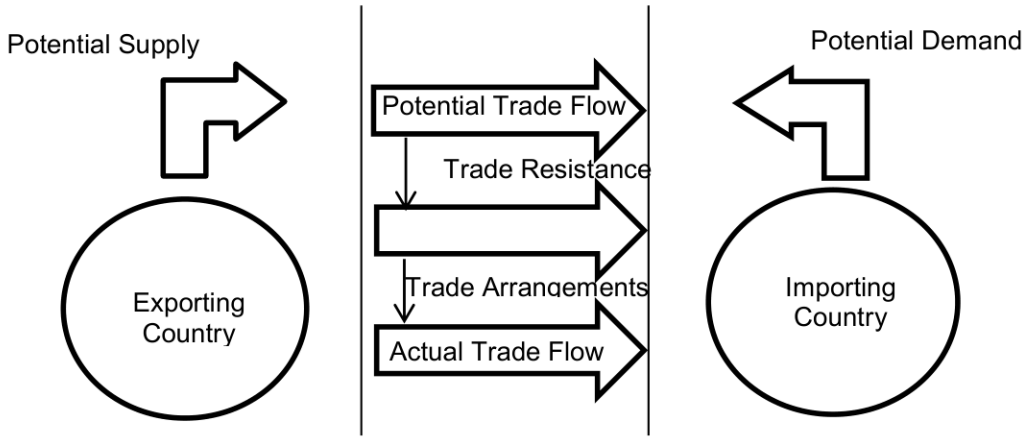

Figure 3: Graphical representation of the gravity model; Polder (2000)

Benefits/Anticipated Outcome

To perceive the current trade network between Thailand and other ASEAN member states. And also comprehend the trend of trade value between Thailand and the country's trading partners which are ASEAN member states in any directions along with the trend changing between Thailand and other ASEAN member states on economic integration on forthcoming AEC in the end of 2015. In order to guide for oriented into the AEC integration under the content of AEC blueprint.

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