No. 7 / 2014

Mekong Institute

Research Working Paper Series 2014



A Study of Impacts of Real Exchange Rates on Bilateral Trade Balance Between Lao PDR and Major Trading Partners

Somphon CHANGDABOUT

MEKONG INSTITUTE
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Somphone CHANGDABOUT

December, 2014

Somphone CHANGDABOUT – started to study the Bachelor Degree of General Economics at Faculty of Economics and Business Management, National University of Lao (NUoL), Lao PDR. He has various experiences in several research projects, including Monetary and Fiscal Sectors.

This publication of Working Paper Series is part of the Mekong Institute – New Zealand Ambassador's Scholarship (MINZAS) program. The project and the papers published under this series are part of a capacity-building program to enhance the research skills of young researchers in the GMS countries.

For more information, please contact the Communications and Knowledge Management Department of Mekong Institute, Khon Kaen, Thailand.

Telephone: +66 43 202411-2
Fax: + 66 43 343131
Email: library@mekonginstitute.org

Technical Editors: Dr. Phouphet KYOPHILAVONG, Vice Dean, Faculty of Economics and Business Management, National University of Laos, Lao PDR
Dr. Buasawan SIMMALA, Communications and Knowledge Management Manager, Mekong Institute

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Comments on this paper should be sent to the author
Somphone CHANGDABOUT: Dongdok Village, Xaythany District, Vientiane Capital, Lao PDR. Tel: + 856 20 777 89 500, Email: changdabout@gmail.com

or

Communications and Knowledge Management Department, Mekong Institute

Table of Contents

List of Abbreviations

AEC	:	ASEAN Economic Community
ARDL	:	Auto-Regressive Distributed Lag
CHY	:	Chinese Yuan
DOTS	:	Direction of Trade Statistics
ECM	:	Error Correction Model
GDP	:	Gross Domestic Product
HS Code	:	Harmonized System Code
IFS	:	International Financial Statistics
IMF	:	International Monetary Fund
ITC	:	International Trade Centre
LAK	:	Lao Kip (local currency)
Lao PDR	:	Lao People’s Democratic Republic
OLS	:	Ordinary Least Square
VND	:	Vietnamese Dong
WTO	:	World Trade Organization
YP	:	Trade Partner’s Income

List of Figures

List of Tables

Acknowledgements

This thesis would not have been possible without the help and support from many people. I would like to express my sincere gratitude and deep appreciation to my thesis advisors, Assoc. Prof. Dr. Phouphet KYOPHILAVONG and Dr. Buasawan SIMMALA for their advice. I would also like to express my sincere thanks to Dr. Phanhpakit ONPHANHDALA for his encouragement and guidance. Thanks are also due to Assoc. Prof. Sengchanh CHANTHASENE, Dr. Bounlert VANHNALAT, Dr. Alay PHONVISAY, and Mr. Khamneekone SIPASEUTH for their valuable comments to improve this paper.

I would also like to thank Mekong Institute for providing an opportunity for me to be trained in research methodology in Khon Kaen, Thailand. A sincere thank is also due to the Embassy of New Zealand to Thailand in Bangkok for their funding of MINZAS.

Last but not least, I would like to extend my thanks to my friends and family, who have directly and indirectly contributed to this study, not only for their assistance but also for their comments, support and encouragement throughout my training period at the Mekong Institute.

Abstract

This thesis studies the impacts of real exchange rates on bilateral trade balance between Lao People's Democratic Republic (Lao PDR) and its major trading partners. The main objectives of this thesis are: (1) to study general trade balance between Lao PDR and each of its major trading partners (Thailand, China, and Vietnam). (2) to compile policies and information related to exchange rates applied in Lao PDR, and (3) to investigate the impacts of the exchange rate devaluation on trade balance of Lao PDR with its trading partners, and evidencing the J-curve phenomenon, if observed, on the country.

A descriptive analysis was performed using the annual import-export data from 2001to2012 (IMF, ITC) and the yearly exchange rate data between 1990 and 2012 (IMF). A quantitative analysis was also performed using data on quarterly imports and exports, exchange rates, and real GDP data from the 1993Q1 to 2012Q4 (IMF), calculated by using the Auto-Regressive Distributed Lag (ARDL) approach.

The descriptive analysis found that Lao PDR has been running a trade deficit. The country's main exports are copper, wood, ores, and electricity; while its main imports are fuels, vehicles, machinery, metals, and electrical equipments. The principal exporter to Lao PDR is Thailand, to which Lao PDR exports mainly copper. China imports mainly ores and Vietnam wood from Lao PDR.

The quantitative analysis reveals that on the one hand, when the real GDP of Lao PDR increases, the country's trades balance decreases. On the other hand, when the real GDP of trading partner trading partners increase, Lao's trade balance could actually increase. Moreover, the analysis of impacts of the increase in the real exchange rate shows that countries respond to this phenomenon differently: whereas the J-curve phenomenon is observed in the trade balance between Laos and Thailand, it is not the case for the trade balances between this country and China, and Vietnam.

1. Introduction

1.1 Overview and Research Rationale

Nowadays, the world's economy has become more interlinked with and interdependent on each country's economy. It is driven by increasing exchanges of goods, services, labors, capitals, technologies, etc. Thus, international trade plays an important role in the development of the economy of each country, especially for least developed countries and developing economies.

In the previous decades, many researchers were interested in the topics of international trade. In those studies, the relationship between exchange rate and trade balance is often arguable whether the devaluation of domestic currency would lead to an improvement of the country's trade balance. Many people found that, by lowering the domestic currency value, exports will become cheaper, and imports will become more expensive. Suzuki and Bangura (2012) mentioned that according to the Marshall Learner (ML) condition, devaluation or depreciation of a currency improves trade balance. Magee (1973) and Krueger (1983) explained that the devaluation or depreciation of a currency will worsen trade balance at an initial stage, but will improve the trade balance after some time, making the curve look like letter "J"; hence the name 'the J-Curve phenomenon'. Studies of the J-curve over the last three decades have adopted two approaches: the Aggregate Trade Balance Approach and the Bilateral Trade Balance Approach. The Aggregate Trade Balance Approach is to study trade between own country and rest of the world; whereas the Bilateral Trade Balance Approach is to study trade between own country and one other country.

Lao PDR is one of the Least Developed Countries (LDCs), with a high level of economic interdependence on other economies. This is true, especially after 1986 when the country's system changed from Centralization to the New Economic Mechanism. It was an important step towards opening up the country towards internationalization, while also widening the economy in the fields of Finance, Trade, Investment, etc. For International Trade, Lao PDR has a rather high level of dependence on trading partners' economies, and has always had a balance of trade deficit with other countries since 1986. For example, in 1986, Laos faced a trade deficit of 45.98 million USD, which reached 3,015.25 million USD in 2012. It was approximately 65 times higher than the benchmark figure (Year 1986) in just 27 years. In

2012, Laos had a total trade value of 9,662.93 million USD with the rest of the world, of which imports accounted for 6,339.09 million USD and exports for 3,323.84 million USD. Compared to 2011, imports increased by 36.76% in just one year and exports increased by only 6.53% during the same period (IMF, 2014a).

The continuous deficit for many years will lead to a decrease in foreign exchange reserves, and will finally result in an unsustainable and unstable economic situation (MSU, 2014). In 2010, Laos' foreign exchange reserves was 2.6 months of prospective imports, in 2012 it was only 1.7 months of prospective imports, and the forecast for 2014 is that the reserves would decrease to 1.5 months of prospective imports (IMF, 2013). In general, the foreign exchange reserves should be at least 3 months of prospective imports. For Laos' economy that uses multiple currencies, the reserves should be even higher, at least 4 months of prospective imports, in order to prevent potential risks resulting from external crises (NERI, 2014)

To address the deficit of trade balance, many studies have found that the depreciation of exchange rates is an effective tool to curb trade deficits for many countries. For example, studies conducted in 26 developing and developed countries by Bahmani-Oskooee and Niroomand (1998) found that most countries' trade balance had improved in the long term when applying the exchange rate depreciation. Matesanz and Fugarolas (2009) also found similar results for the case of Argentina. However, using this kind of exchange rate could be problematic, in that while it improves trade balance, it could also cause higher inflation. For Lao PDR, Kyophilavong (2009) and NERI (2013) demonstrated that when the Lao currency depreciated, it would create greater inflation. Therefore, this study will further investigate the impacts of exchange rates on trade balance in the case of Lao PDR.

In the past, Lao PDR had been trading with many countries. The most important trading partners are Thailand, China, and Vietnam, as shown in Table 1.2 of Appendix 1. During 1986-2012, trade values with these 3 countries accounted for 73.09% of Lao's total trade values. In 2012, most of Lao's imports were from Thailand (USD 3,923.25 million), while other major sources of imports for Lao PDR were China (USD 1,027.66 million), Vietnam (USD 463.53 million), South Korea (USD 181.54 million), Germany (USD 158.76 million), and others. Most of Lao's exports were also to Thailand (USD 1,131.05 million), China (USD 713.65 million), Vietnam (USD 404.28 million), Japan (USD 112.38 million), and

others. Based on these statistics, this study has selected the 3 major trading partners of Lao PDR, which are Thailand, China, and Vietnam, to be case studies.

How would trade balance of Lao PDR be affected, and by what factors, when there were changes in these countries' economies, especially the Real Exchange Rates? This is because different countries have different economic foundations and with different relative advantages/disadvantages. Thus, this study will investigate the "Impacts of Real Exchange Rates on Bilateral Trade Balances between Lao PDR and its Major Trading Partners, namely Thailand, China, and Vietnam".

1.2 Problem Statement

- Lao PDR has a long history of trade deficit, in both the short- and long-runs.
- Currently, there is a lack of studies of the J-Curve between Lao PDR and its major trading partners in bilateral trade data.
- Whether the J-Curve exists or not, is not clear.
- The lack of results of studies on the topic makes policy implementation unclear.

1.3 Research Objectives

1. To study general trade situations between Lao PDR and its major trading partners, namely Thailand, China, and Vietnam.
2. To investigate impacts of the devaluation of real exchange rates on trade balances between Lao PDR and its major trading partners, and to explore if the J-curve phenomenon exists, by studying the situation of each of Lao PDR's trading partner country.

1.4 Research Questions

- How does depreciation or devaluation of a domestic currency impact bilateral trade balance of Lao PDR? By how much, and whether the impact is significant?
- Does the J-Curve phenomenon exist in the case of Lao PDR?

1.5 Scope and Delimitations

The scope of the data to study the general trade situation is from 2001 to 2012. To investigate the impacts of the real exchange rates on bilateral trade balances, the data used are from 1993 to 2012.

1.6 Conceptual Framework

This study of the Marshall-Lerner Condition and previous studies on this similar topic will attempt to demonstrate that when the Real Exchange Rate increases ($RER_i \uparrow$), exports will increase ($EX \uparrow$) and imports will decrease ($IM \downarrow$), so the trade balance will increase ($TB \uparrow$, or a trade surplus). When the domestic real GDP increases ($YD \uparrow$), then imports will increase ($IM \uparrow$), so trade balance will decrease ($TB \downarrow$, or a trade deficit). When trading partner's real GDP increases ($YP_i \uparrow$), then Lao's exports increase ($EX_{Lao} \uparrow$), and the trade balance will increase ($TB_{Lao} \uparrow$ = trade surplus). When there is an unusual situation (Structural Break), it would affect trade balance of Lao PDR o decrease via each variable. This is shown in Fig. 1.

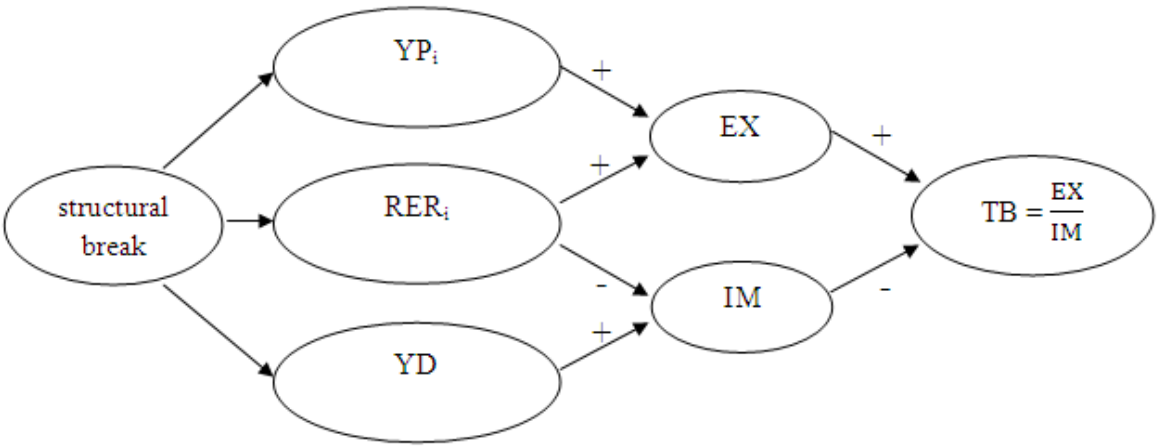

Figure 1: Conceptual Framework

1.7 Operational Definitions

- **Trade Balance (TB)**, in this study, is defined as a ratio of Exports to Imports of a country within a time period. Generally, it would mean exports minus imports and not a ratio of the two, so in order to distinguish between the two terms (Trade Balance **vs.** Net Export), in this study, the term "Net Export" is used in the latter case.

- **Net Export (NX)** is defined as exports minus imports of a country within a time period.
- **Exchange Rate** means an equivalent buy-sell price of one unit of foreign currency to domestic currency.
- **Real Exchange Rate (RER)** means Exchange Rate adjusted by ratio of foreign price level to domestic price level.
- **J-Curve Phenomenon** is the impact of a devaluation or depreciation of a domestic currency that will worsen trade balance at an initial stage, but which will then improve the trade balance after some time, making the curve look like letter "J".
- **Price Level** refers to the Consumer Price Index (CPI), which essentially means a weighted average price of final goods and services purchased by the household in a country.
- **Real GDP** is the Gross Domestic Products normalized by GDP deflator of a period in a country

2. Literature Review

2.1 Theory

2.1.1 Marshall-Lerner Condition

According to many studies, such as Kyophilavong et al., (2013), Suzuki and Bangura (2012), Bahmani-Oskooee and Kantipong (2001), etc., the Marshall-Lerner Condition concludes that, in the long term, when a domestic currency depreciates, it will result in increased exports and decreased imports, hence improving the net export. In other words, when the domestic currency depreciates (exchange rate increases), the export price in a foreign currency becomes cheaper, so more quantity can be exported to a trading partner. At the same time, when the exchange rate increases, the import price in the domestic currency becomes more expensive, so less quantity will be imported into the country. This means exports increase while imports decrease; therefore, the net export increases. However, it must meet the Marshall-Lerner condition that the magnitude of the absolute value of exports and imports demand elasticity must be greater than 1 ($|\varepsilon_t| > 1$). But if $|\varepsilon_t| < 1$ or $|\varepsilon_t| = 1$, the result will be different. This is because for $|\varepsilon_t| < 1$, if the domestic currency depreciates, the net export will worsen. For $|\varepsilon_t| = 1$, if the domestic currency depreciates, the net export will not change.

2.1.2 Export Supply and Import Demand functions

- **Export Supply Function**

The export function (X) is defined as a function of the exchange rate (e) and the domestic price level (P). Since e and P are both parameters (Suzuki and Bangura, 2012):.

$$X = X(e, P)$$

Where $X_e = \frac{\partial X}{\partial e} > 0$; and $X_P = \frac{\partial X}{\partial P} < 0$

When the exchange rate (e) depreciates, consumers in trading partner countries will purchase more imports because the price of imported goods are cheaper than before. Therefore, exchange rate depreciation will lead to more export of product A. In other words, if an exchange rate appreciates, it will lead to less export of product A to other countries.

When the domestic price level (P) rises, consumers in trading partner countries will purchase less because the price of goods are more expensive than before. So, a rise in P will lead to less export from home country. In other words, if P falls, it will lead to more exports of Product A.

- **Import Demand Function**

An import function (M) is an increasing function of the domestic price level (P) and GDP (Y), but it is a decreasing function of the exchange rate (e). However, the import function (M) is an increasing function of only GDP (Y) as P and e are parameters (Suzuki and Bangura, 2012).

$$M = M(P, e, Y)$$

Where $M_P = \frac{\partial M}{\partial P} > 0$; $M_e = \frac{\partial M}{\partial e} < 0$; and $M_Y = \frac{\partial M}{\partial Y} > 0$

When the exchange rate (e') depreciates, a country will import less because the prices of goods become more expensive than before. On the contrary, if e' appreciates, it will lead to more imports.

When the domestic price level (P) and GDP (Y) rise, consumers in the importing country will increase their purchases because the prices of imported goods are cheaper than before. Therefore, the rise in the domestic P and Y will lead to more imports from a foreign country. In other words, if P and Y fall, it will lead to less import.

To summarize, the Export function and the Import function are functions of the domestic price level (P) and exchange rate (e), but in the opposite direction. In addition, only the Import function is the function of the GDP (Y).

2.1.3 J-Curve Phenomenon

The United States (US) faced a net export deficit in 1972, even when the deficit should have improved because of the depreciation of the US dollar in 1971. As such, many researchers had tried to find out why the US situation at the time did not follow the Marshall Learner condition, which stated that as a currency depreciated, it would take a period of time for the net export to improve. Initially, the net export would worsen but then would slowly rise in the long run. This situation would make it look like letter J, hence the name the "J-Curve Phenomenon" as shown in Figure 2.3. Magee (1973) was the first to explain this J-Curve Phenomenon that it was because of the Currency Contracts period, during which the currency was used by exporters for pricing. When the currency depreciated during the Currency Contracts period, the quantity of the product could not be changed in a short period of time for both its Demand and Supply. This was true especially for the Supply, so the net export became worsened. However, when passing through the period, the quantities of the demand and supply of the product can vary, so its net export can slowly improve.

The international trade between Lao PDR and Thailand is a case in point. Suppose that, initially, the exchange rate between the two countries is 200 LAK per 1 THB (200 LAK/THB), and there is a contract to export from Lao PDR to Thailand at the price of 20,000 LAK, and to import from Thailand at the price of 100 THB. Suppose also that prior to a currency depreciation, Lao PDR has a deficit to Thailand at the amount of 2 million LAK or 10,000 THB at point A (Figure 2.3), which is equivalent to an export value of 6 million LAK or 30,000 THB (Price P_{x1} = 20,000 LAK or 100 THB multiplied by quantity Q_x = 300. See Figure 2.1a), and to an Import value of 8 million LAK or 40,000 THB (Price P_{m1} = 100 THB multiplied by quantity Q_m = 400) see Figure 2.1b

When there is a currency depreciation from 200 LAK/THB to 220 LAK/THB, the export that was valued at 6 million LAK or 30,000 THB is now only 27,300 THB (Price P_{x2} = 20,000 LAK or 91 THB multiplied by Quantity Q_x = 300. [See Fig. 2.1 a] The import that was valued at 40,000 THB is now only 39,500 THB, when converted to LAK the price is now 8.69 million LAK whereas previously it was only 8 million LAK (Price P_{m2} = 100 THB or 22,000 LAK multiplied by Quantity Q_m = 395) [See Figure 2.1 b.]. The reason is because the quantity of supply cannot be increased in a short time (The supply curve (S) is perpendicular to the horizontal axis.), so Lao PDR can export only 300 unit , by right Lao PDR could export up to 305 unit. For the demand side, consumers also cannot adapt in the short time (Demand curve (D) in the short term has a high slope.); therefore the net export deficit becomes 2.69 million LAK or 12,200 THB at point B in Fig. 2, which worsens by 0.69 million LAK or 2,700 THB compared to before the domestic currency depreciation.

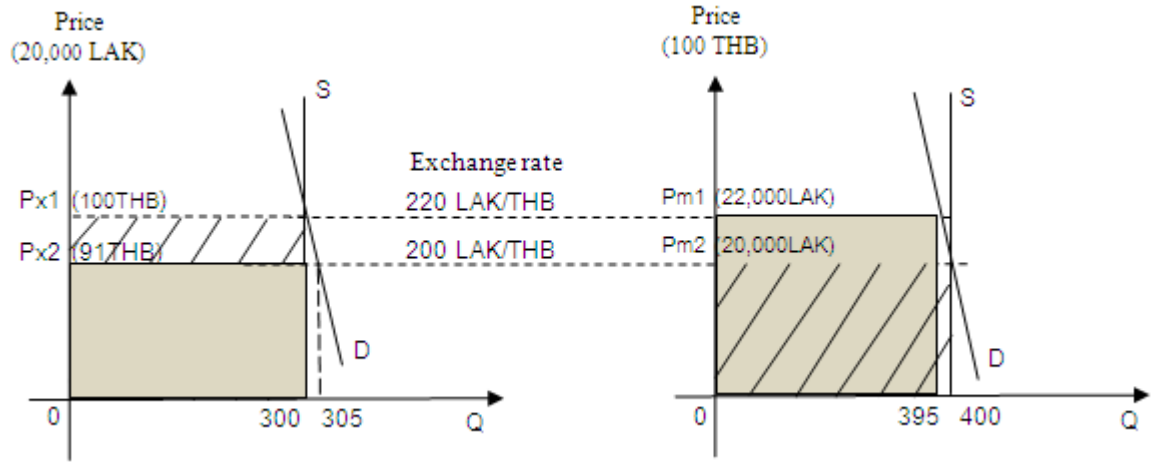

Figure 2.1 a: Export of Lao PDR in the short term Figure 2.1 b: Import of Lao PDR in the short term

After a considerable period has passed, both demand and supply can adjust according to the situation; Lao PDR can produce more and able to supply more to the increased demand of Thai consumers, as the price has become cheaper for them from 100 THB (P_{x1}) to 91 THB (P_{x2}). This means the supply curve of Lao PDR is shifted to the right from S_{x1} to $S_{x2,}$, resulting in Thailand being able to import more goods from Lao, from 300 unit (Q_{x1}) to 385 unit (Q_{x2}), as seen in Fig. 2.2 a. Therefore, the export value of Lao PDR increases to 8.47 million LAK or 35,035 THB. On the other hand, Lao people would feel that goods from Thailand has become more expensive, so Lao PDR would import fewer goods from Thailand, from 400 units (Q_{m1}) to 300 units (Q_{m2}) as seen in Figure 2.2b. So the import value of Lao

PDR decreased to 30,000 THB or 6.6 million LAK. Therefore, the net export of Lao PDR improved from point A which is a deficit of 2 million LAK (before the domestic currency depreciation), or point B which is a deficit of 2.69 million LAK (initially after the domestic currency depreciation), to become point C which is a surplus of 1.87 million LAK, as seen in Fig. 2.

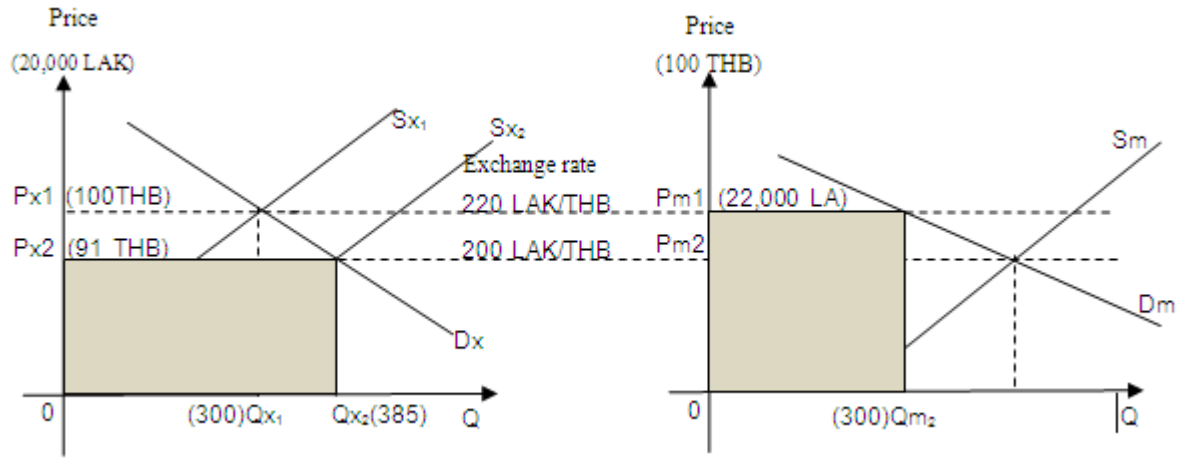

Figure 2.2 a: Export of Lao PDR in the long term Figure 2.2 b: Import of Lao PDR in the long term

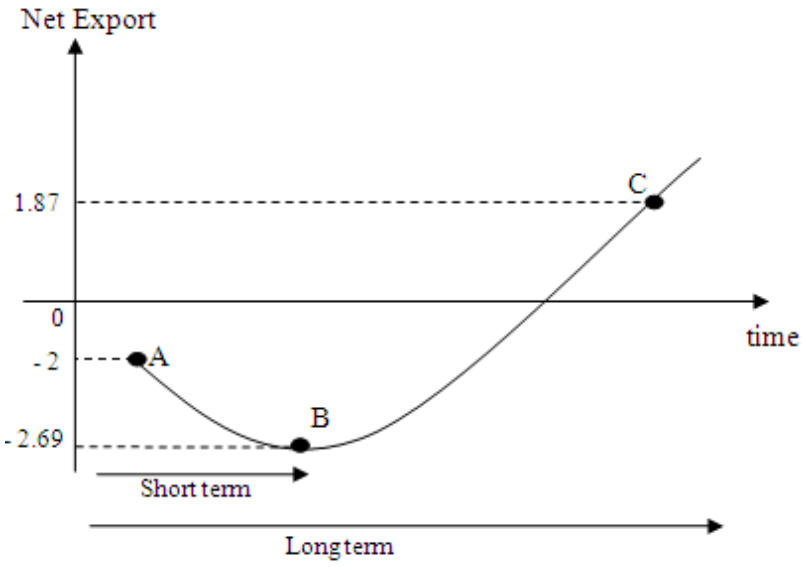

Figure 2: J-Curve Phenomenon of Net Export

2.2 Related Researches

Kyophilavong et al. (2013) studied the question of: "Does the J-Curve Phenomenon Exist in the Case of Laos?" by using time series data from 1993 Q1 to 2010 Q4, with a dependent variable (Trade Balance) and independent variables (Real Exchange Rates, Real GDP of Lao PDR, and Real GDP of the world), by using the Auto-Regressive Distributed Lag (ARDL) approach. The result found that the model had co-integration among the variables. In the long run, all the three independent variables had impacts onthe trade balance in the same direction; however, only the Real GDP of Lao PDR has a significant impact. In the short run, if domestic currency depreciates, it would result in a lower trade balance at the initial stage, but after three quarters the trade balance would improve; so the J-curve phenomenon exists in Lao PDR for the short term.

Thanuxay (2012) studied impacts of factors affecting bilateral exports and imports between Lao PDR and its major trading partners (Thailand, China, and Vietnam), by using the Ordinary Least Square (OLS) method on time series data from 1990 to 2010. Factors used were the GDPs of Lao PDR and those of its trading partners, Lao's Foreign Direct Investment (FDI), and its Real Effective Exchange Rate (REER). The results showed that all of the three factors had impacts on the export of Lao PDR to each trading partner. The GDP factor had impacts in the same direction for all the three countries.. The FDI factor also had impacts in the same direction for all the three countries, but the impact was not significant for China. The REER factor had impacts in the same direction for Vietnam, but the impacts were in the opposite direction for China and Thailand, although the impacts for these two countries were not significant. The result for factors to import showed that the GDP of Lao PDR had impacts in the same direction for all the three countries. The FDI had impacts in the same direction for Thailand, but in the opposite direction for Vietnam and China, although this was not significant. REER had impacts in the same direction for Thailand and Vietnam, and the opposite direction for China, however, this was not significant, either.

Bahmani-Oskooee and Kantipong (2001) studied the Bilateral J-Curve between Thailand and its trading partners (USA, Japan, Singapore, UK, and Germany), using time series data from 1973Q1 to 1997Q4, with a dependent variable (Trade Balance) and some independent variables (Real Exchange Rates, Real GDPsof Thailand, and Real GDPs of its trading partners) by the ARDL approach. The result showed that, the bilateral model had co-

integration for all of Thailand's trading partners except Singapore. In the long run, when the Thai currency depreciated, it would result in improved bilateral trade balance in the cases of Thailand's trade with Japan and the USA, but the results were not significant for the other three countries. In the short run, when the Thai currency depreciated, trade balances between Thailand and Japan, and Thailand and the USA initially worsened, but slowly improved after the 6^{th} and the 11^{th} Quarters respectively. However, for the other three countries, the trade balances only worsened. So it can be summarized that there existed the bilateral J-Curve phenomenon for only the cases with Japan and the USA, and not with the other three countries.

Anoupharb (2010) studied various factors that influenced the export function of Lao PDR in the ASEAN Free Trade Area, by using the Ordinary Least Square (OLS) method with the Gravity Model of Trade, on panel data from 1998 to 2008. The result found that impacts of the exchange rate of Lao PDR on its GDP per Capita, and on those of the ASEAN countries (excluding Lao PDR), had the same direction as the impacts on the export values. However, the exchange rates and the GDPs per capita of ASEAN countries, and the GDP and CPI of Lao PDR, had the oppositedirection impacts on those of the export value.

Thalongsy (1999) studied factors that affected the bilateral net export of Thailand with its major trading partners (the USA, Japan, and Germany), by using the OLS method on time series data from 1968 to 1995. The result found that the factors that influenced exports were the GDP of Thailand's trading partners, Thailand's export of the previous year, the comparative price level, and the REER of Thailand. The factors that influenced imports were the GDP of Thailand, the REER of Thailand, and its comparative price levels. To improve bilateral net export between Thailand and the USA, the Contractionary Fiscal Policy should be used. To improve the bilateral net export between Thailand and Japan, the Contractionary Fiscal Policy and the Contractionary Monetary Policy should be used. For the case of Thailand's trade with Germany, the Contractionary Monetary Policy should also be used.

From these related researches, two methods were used, i.e. the ARDL and the OLS methods. Three types of exchange rates i.e. the Nominal Exchange Rate, the Real Exchange Rate, and the Real Effective Exchange Rate, were used as factors to study impacts on the trade balance (aggregate data and bilateral data). This study will use the ARDL method on the quarterly data together with the variables. This approach is similar to that adopted by the studies of

Kyophilavong et al. (2013), and Bahmani-Oskooee and Kantipong (2001). However, the differences between this study and the other two are: 1) Kyophilavong et al. used aggregate trade data, but this study uses bilateral trade data; 2) Bahmani-Oskooee and Kantipong studied the case of Thailand, whereas this study focuses on the case of Lao PDR. In addition, the current study is similar to that of Thanuxay's in that it also uses bilateral trade data of Lao PDR with 3 trading partners (Thailand, China, and Vietnam). However,it is different from Thanuxay's study in that it uses the ARDL approach whereas Thanuxay used the OLS approach. In addition, this study uses trade balance wheares Thanuxay used net export. Another difference is that this study uses real exchange rates wheares Thanuxay used real effective exchange rates (REER). Also, this study uses dummy variables which are structural break by using Perron's unit root test , The structural break refers to the point in time that variables fluctuate highest , wheares Thanuxay used the data during the ASEAN crisis year as dummy variables and his method to unit root test is already outdated (the ADF unit root tests).

3. Research Methodology

3.1 Data Collection

This thesis uses secondary data obtained from the International Monetary Fund (IMF) online source which includes two datasets: the Direction of Trade Statistics (DOTS) and the International Financial Statistics (ITC) for the quantitative analysis. Another set of data was obtained from the International Trade Centre (ITC) online source for the descriptive analysis. In addition, for further explanation, this thesis also uses various documents and reports from The Bank of Laos (BOL), the Ministry of Planning and Investment (MPI), and other Internet sources. Details of sources are shown in Table 1.

Table 1: Data and Sources used for analysis

Description	Variable	Unit	Source
Export value from Lao PDR to trade Partners J	EX_j	million USD	IMF, ITC
Import value of Lao PDR from Trading Partner J	IM_j	million USD	IMF, ITC

Description	Variable	Unit	Source
Net export value between Lao PDR and major Trading Partner J	NX_j	million USD	($NX_j = EX_j - IM_J$)
Exchange rate of Lao's domestic currency (LAK) per one unit of Trading Partner J's currency	EXR_j	LAK/THB LAK/CHY LAK/VND	IMF
CPI of Lao PDR (in Year 2005 = 100)	PL	Unit	IMF
CPI of Trading Partner J (in Year 2005 = 100)	PP_j	Unit	IMF
Trade Balance (with Trading Partner J)	TB_j	Unit	($TB_{j=}\frac{EX_j}{IM_j}$)
Real Exchange rate (with Trading Partner J)	RER_j	LAK/THB LAK/CHY LAK/VND	($RER_j = EXR_j * \frac{PP_j}{PL}$)
Real GDP of Lao PDR	YD	million USD	IMF
Real GDP of Trading Partner J	YP_j	million USD	IMF
Dummy (with Trading Partner J-)	DP_j	Equal 1	Perron Unit Root test

For a descriptive analysis of the general trade situation between Lao PDR and its major trading partners, this thesis uses yearly data from 2001-2012, of variables EX_j, IM_j, and NX_j from the IMF and the ITC statistics, then categorizes them into main product catalogues based on the 2-digit Harmonized System (HS) Code, which is an internationally standardized system of names and numbers to classify traded products. For the quantitative analysis of the impacts of the real exchange rates devaluation on trade balances between Lao PDR and its trading partners, the thesis uses quarterly data from the IMF (IFS and DOTS datasets) for the values of the variables TB_j , RER_j, YD, and YP_j. The YD is the data obtained through interpolation of yearly data into quarterly data for Lao PDR, China, and Vietnam. This interpolation has also been used by Kyophilavong et al., (2013), Samreth (2008), and Chaisrisawatsuket et al., (2004). The data are from 1993Q1 to 2012Q4 in the case of Thailand and China; and from 1998Q1 to 2012Q4 in the case of Vietnam. In addition, DP_j is a dummy variable which is a structural break by Perron unit root test.

3.2 Method and Technique of Data Analysis

3.2.1 Method of Data Analysis

This thesis analyses data by using two methods: Descriptive Analysis and Quantitative Analysis.

- **Descriptive Analysis**

Is a consolidation of data, which is later analysed for existence of evidences and chart/graph plotting to describe general trade situations between Lao PDR and its major trading partners between 2001 and 2012.

- **Quantitative Analysis**

Is an analysis of data by creating bilateral trade balance models of Lao PDR and its major trading partners. This is followed by an investigation of the existence of co-integration among variables, and to find impacts of the variables in the short run and the long run by the Coefficient values, using the Auto-Regressive Distributed Lag (ARDL) bound test approach. The values of the variables are calculated in the natural logarithm form. The software used for this analysis is Microfit 5 and EViews 7.

3.2.2 Technique of Data Analysis

In previous researches, no matter whether the aggregate data or bilateral data are used to create a trade balance model in order to find co-integration among variables and impact in the short and long runs, researchers would use independent variables such as Real Exchange Rate, Real Domestic GDP, and Real Trading Partner's GDP; and would convert them into the logarithm form. For instance, in the studies by Kyophilavong et al. (2013), Bahmani-Oskooee and Kantipong (2001), and Matesanz and Fugarolas (2009). Therefore this thesis creates the model as Equation (1):

$$\ln TB_{j,t} = \alpha_0 + \beta_1 \ln RER_{j,t} + \beta_2 \ln YD_t + \beta_3 \ln YP_{j,t} + \varepsilon_t \quad (1)$$

This thesis adds a dummy variable, which is obtained by the Perron Unit Root Test, to the equation in order to get a stationary variable, as in Equation (2)

$$\ln TB_{j,t} = \alpha_0 + \alpha_1 DP_j + \beta_1 \ln RER_{j,t} + \beta_2 \ln YD_t + \beta_3 \ln YP_{j,t} + \varepsilon_t \quad (2)$$

Where:

- '$TB_{j,t}$' is trade balance between Lao PDR and Trading Partner j and is defined as the ratio of exports to imports
- YD_t is the real domestic GDP
- $YP_{j,t}$ is the real GDP of trading partner j
- $RER_{j,t}$ are real exchange rate which defined as $EXR_{j,t} \cdot PP_{j,t} / PL_t$
- $EXR_{j,t}$ are nominal exchange rate (LAK/THB for Thailand, LAK/CHY for China, and LAK/VND for Vietnam);
- $PP_{j,t}$are CPI of Trading Partnertrading partners j;
- PL_t is Lao CPI;
- DP_j is a dummy variable defined as structural break.
- ε_t is error term

All data values have been converted into natural logarithms except DP_j. because DP_j is just dummy variable that has value of 1 or 0 only.

Three main reasons that many past studies defined trade balance as a ratio of exports to imports are: first, to be able to compute trade balance in the logarithm form; second, units of measurement below are less sensitive to the ratio value; and third, the ratio value reflects nominal or real trade balance. And because exports of Lao PDR always less than imports, this would result in negative values if take different of the two, so in order to avoid take logarithm of negative values, the ratio was used instead.

Following the existing literature, the sign of (β_1) coefficient is expected to be positive if the real exchange rate increases (in other words, domestic currency depreciation). This would decrease imports and increase exports, which also satisfies the Marshall-Lerner condition. It is important to note that according to the J-curve hypothesis, β_1 is negative in the short-run. Therefore, it is important to incorporate short-run dynamics into the long-run. Secondly, it is expected that the estimation of the real domestic GDP coefficients (β_2) would be negative because an increase in the GDP would lead to an increase in imports from trading partners. (Suzuki and Bangura, 2012; Bahmani-Oskooee and Cheema, 2009). Thirdly, an estimation

of the real GDP coefficient (β_3) of trading partners would be positive because an increase in trading partners' GDP would enable Lao PDR to export more (Suzuki and Bangura, 2012; Thanuxay, 2012).

Equation (2) shows a general model in the long run; however, this thesis also studies the J-curve phenomenon. Therefore, it studies both the short-run dynamics and the long run. Therefore, this thesis uses the ARDL-bound testing approach developed by Pesaran et al.(2001). This approach has a number of advantages compared to the Johansen co-integration techniques (Johansen and Juselius, 1990). Firstly, it requires a smaller sample size compared to the Johansen co-integration technique (Ghatak and Siddiki, 2001). Secondly, all variables are assumed to be endogenous, and the ARDL approach provides unbiased long-run estimates with valid *t*-statistics if some of the model regressors are endogenous (Narayan, 2005). Thirdly, the ARDL approach does not require variables to be integrated in the same order. It can be applied whether the variables are purely integrated at level I(0) or integrated at the first difference I(1), or both. However Johansen's technique requires that the variables should be integrated in the same order (Narayan, 2005). Fourthly, this approach provides a method of assessing the short-run and long-run effects of one variable on the other simultaneously and it also separates the short run and long run effects from each other (Bentzen and Engsted, 2001).

The ARDL-bound testing approach can distinguish between dependent and explanatory variables. In order to implement the bounds testing procedure, Equation (2) is transformed to the Unconditional Error Correction Model (UECM) as follows:

$$\Delta \ln TB_{j,t} = \alpha_0 + \sum_{i=1}^{p} b_i \Delta \ln TB_{j,t-i} + \sum_{i=1}^{p} c_i \Delta \ln YD_{t-i} + \sum_{i=1}^{p} d_i \Delta \ln YP_{j,t-i} + \sum_{i=1}^{p} e_i \Delta \ln RER_{j,t-i} + \pi_1 \ln TB_{j,t-1} + \pi_2 \ln YD_{t-1} + \pi_3 \ln YP_{j,t-1} + \pi_4 \ln RER_{j,t-1} + \pi_5 DP_{j,t} + u_t \quad (3)$$

Where

- Δ denotes the first difference operator.
- α_0 is an intercept.
- *DP* is a dummy variable
- *p* is the maximum lag starting from 1 and u_t and is the usual white noise residual.

The procedure of the ARDL-bound testing approach has two steps: 1) The first step

is the F-test for the joint significance of lagged level variables: the null hypothesis of the non-existence of co-integration, denoted by $F_{TB}(TB/YD, YP, RER)$, '$H_o: \pi_1 = \pi_2 = \pi_3 = \pi_4 = 0$'. On the contrary, '$H_1: \pi_1 \neq \pi_2 \neq \pi_3 \neq \pi_4 \neq 0$' means the existence of co-integration. Pesaran et al. (2001) generated the lower and upper critical bounds for the F-test: the lower bound critical values assume that all variables are I(0) while the upper bound critical values assume that all variables are I(1).

If the calculated F-statistics exceeds the upper critical bound, the null hypothesis of no co-integration among variables may be rejected. If the calculated F-statistics falls below the lower bound, then the null hypothesis of no co-integration is accepted. If the calculated F-statistic is between the upper and the lower bound, then the null hypothesis of no co-integration is neither rejected nor accepted. However, we can see an error correction (EC_{t-1}) in the short-run model (Equation (6)); if it is statistically significant, it would mean there exists co-integration as in Equation (3) (Bahmani-Oskooee and Ratha, 2008).

The second step is the estimation of the long-run coefficients that are involved in determining the ARDL model with optimal lags. The selection criterion for the optimal lags is based on the Schwartz Bayesian Criterion (SBC) to determine the order of the ARDL model. The next step is the estimation of the short-run parameters using the Error Correction Model (ECM). To ensure the convergence of the dynamics with the long-run equilibrium, the sign of the lagged error correction term (EC_{t-1}) coefficient must be negative and statistically significant. Furthermore, the diagnostic tests also comprise of the testing for serial correlation, function form, normality, and heteroscedasticity (Pesaran and Pesaran, 2009) to confirm quality of the models.

Next, we can create the long-run and short-run models using the ARDL approach as in Equation (2) to Equation (4); the ARDL model can be denoted by *ARDL (P, Q_1, Q_2, Q_3)*. This method will estimate the best coefficient values for the long-run and short-run models, and it can also resolve many problems in the time series model such as Heteroskedasticity, Auto-correlation, etc.

$$\left.\begin{aligned}\Phi(L, P)\, \ln TB_{j,t} = {} & \alpha_0 + \alpha_1 DP_j + \beta_1(L, Q_1)\ln RER_{j,t} + \beta_2(L, Q_2)\ln YD_t \\ & + \beta_3(L, Q_3)\ln YP_{j,t} + \varepsilon_t\end{aligned}\right\} \quad (4)$$

Where $\phi(L, P) = 1 - \phi_1 L - \phi_2 L^2 - \phi_3 L^3 - \ldots - \phi_p L^p$;

$\beta_i(L, Q_i) = \beta_{i0} + \beta_{i1} L + \beta_{i2} L^2 + \beta_{i3} L^3 + \ldots + \beta_{iQ} L^Q$; (i = 1, 2, 3)

L is a lag operator such that $Ly_t = y_{t-1}$;

P is an optimal Lag of dependent variable;

Q_i are optimal Lags of independent variables i;

α_0 is an intercept;

α_1 is a coefficient of a Dummy variable;

β_i are coefficients of variables 'i' (i = 1, 2, 3)

For the Schwartz Bayesian Criterion **(**SBC), to select optimal Lags of dependent variable and independent variables, it is based on the maximum value of SBC from Equation (4) by the Ordinary Least Square: i.e. the OLS method for all possible values that estimate the Lag of P = 1, 2, 3, …, m; Q_i = 0, 1, 2, 3, …, m; and i = 1, 2, 3. This study runs ARDL up to = $(m + 1)^{3+1}$ times to find the best model based on the maximum value of SBC; for this study maximum lag 11 is used (m = 11), so there are 20,736 different ARDL models.

When choosing an optimal Lag of dependent and independent variables, it can be denoted by *ARDL*($\hat{P}$, $\widehat{Q_1}$, $\widehat{Q_2}$, $\widehat{Q_3}$). To make sure the models can be used, we perform cumulative sum (CUSUM) and cumulative sum of squares ($CUSUM_{SQ}$) following Brown et al. (1975) based on the recursive regression residuals, to test residuals for stability during the period to be able to create equations (5) and (6).

$$\ln TB_{j,t} = Y_0 + Y_1 DP_j + \theta_1 \ln RER_{j,t} + \theta_2 \ln YD_t + \theta_3 \ln YP_{j,t} + u_t \quad (5)$$

Where

θ_i and Y_1 are coefficients of the Long-run model.

Y_0 is an intercept.

Estimated by

$$\theta_i = \frac{\widehat{\beta_i}\,(1,\ \widehat{Q_i})}{\hat{\Phi}\,(1,\ \hat{P})} = \frac{\hat{\beta}_{i0} + \hat{\beta}_{i1} + \ldots + \hat{\beta}_{i\widehat{Q_i}}}{1 - \widehat{\Phi_1} - \widehat{\Phi_2} - \cdots - \widehat{\Phi_{\hat{P}}}} \qquad (i = 1, 2, 3)$$

$$Y_i = \frac{\widehat{\alpha_i}\,(\hat{P},\ \widehat{Q_1},\ \widehat{Q_2}, \widehat{Q_3})}{1 - \widehat{\Phi_1} - \widehat{\Phi_2} - \cdots - \widehat{\Phi_{\hat{P}}}} \qquad (i = 1, 2)$$

Where $\hat{P}$ is an optimal Lag of dependent variable; $\widehat{Q_1}$, $\widehat{Q_2}$ and $\widehat{Q_3}$ are optimal lags of independent variables that were initially chosen; the values of $\widehat{\alpha_i}, \widehat{\beta_i}$ and $\hat{\Phi}$ are coefficients of variables in each lag.

The Short-run model using the error correction model, and the variables are in the first difference.

$$\Delta \ln TB_{j,t} = -\Phi(1, \hat{P})\, EC_{t-1} + \beta_1 \Delta \ln RER_{j,t} + \beta_2 \Delta \ln YD_{j,t} + \beta_3 \Delta \ln YD_{j,t} + \alpha_1 \Delta DP_j$$

$$- \sum_{n=1}^{\widehat{Q_1}-1} \beta_{1n}^{`} \Delta \ln RER_{j,t-n} - \sum_{n=1}^{\widehat{Q_2}-1} \beta_{2n}^{`} \Delta \ln YD_{,t-n} - \sum_{n=1}^{\widehat{Q_3}-1} \beta_{3n}^{`} \Delta \ln YP_{j,t-n} \qquad (6)$$

$$-\sum_{n=1}^{\hat{P}-1} \Phi_n^{`} \Delta \ln TB_{j,t-n} + \mu_t$$

Where $EC_t = u_t = \ln TB_{j,t} - (Y_0 + Y_1 DP_j + \theta_1 \ln RER_{j,t} + \theta_2 \ln YD_t + \theta_3 \ln YP_{j,t})$ are error terms.

$\Phi(1, \hat{P}) = 1 - \hat{\Phi}_1 - \hat{\Phi}_2 - \ldots - \hat{\Phi}_P$ is an adjusted level from the short-run to the long-run equilibrium. In other words, if the value of $\Phi(1, \hat{P})$ is 0.5, it shows the level of adjustment is medium; values lower than 0.5 mean fast adjustment, and values higher than 0.5 mean slow adjustment. The remaining $\Phi_n^{`}$ and $\beta_{in}^{`}$ are coefficients in the short-run model.

These are calculated by

$$\Phi_1^{`} = \Phi_{\hat{P}} + \Phi_{\hat{P}-1} + \ldots + \Phi_3 + \Phi_2$$

$$\Phi_2^{`} = \Phi_{\hat{P}} + \Phi_{\hat{P}-1} + \ldots + \Phi_3$$

$$\vdots \qquad \vdots \qquad \vdots$$

$$\Phi_{\hat{P}-1}^{`} = \Phi_{\hat{P}}$$

And similarly,

$$\grave{\beta}_{i1} = \beta_{i,\widehat{Q_i}} + \beta_{i,\widehat{Q_i}-1} + \ldots + \beta_{i,3} + \beta_{i,2}$$

$$\grave{\beta}_{i2} = \beta_{i,\widehat{Q_i}} + \beta_{i,\widehat{Q_i}-1} + \ldots + \beta_{i,3}$$

$$\vdots \qquad \vdots \qquad \vdots$$

$$\grave{\beta}_{i,\widehat{Q_i}-1} = \beta_{\hat{P}}$$

- **Unit Root Test**

To make sure that every variables are in I(0) and/or I(1), and not I(2), in order to get a better estimating model according to the ARDL approach, we will conduct the Unit Root test by Perron (1990) to find the structural break. As Perron mentioned, if one does not care for the structural break, it will lead to creating a spurious model, resulting in a wrong forecast and a wrong policy.

There are two steps for the Perron Unit Root test:

1. Find residuals by the OLS method:

$$X_t = \mu + \gamma DU_t + \varepsilon_t \qquad (7)$$

Whereby $DU_t = 1$, if $t > T_b$, and 0 = otherwise. T_b is Structural Break;

2. Use the OLS method in Equation (8) and (9).

$$\Delta\varepsilon_t = \sum_{i=0}^{k} \phi_i (DUTB)_{t-i} + \gamma\varepsilon_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta\varepsilon_{t-i} + u_t \qquad \text{(Level)} \qquad (8)$$

$$\Delta\Delta\varepsilon_t = \sum_{i=0}^{k} \phi_i (DUTB)_{t-i} + \gamma\Delta\varepsilon_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta\Delta\varepsilon_{i-i} + u_t \quad \text{(first difference)} \qquad (9)$$

Whereby $(DUTB)_t = 1$, if $t = T_b + 1$ and 0 = otherwise. T_b is Structural Break;
DUTB is a dummy variable for break time.

- Schwartz Bayesian criterion (SBC)

The **SBC** by Schwarz (1978) can be found in Equation (10).

$$\mathbf{SBC_I} = l_n(\hat{\theta}) - \frac{1}{2} p \log n \quad (10)$$

where

$l_n(\hat{\theta})$ is maximum log-likelihood in the model

n is sample size

p is Dimension

θ is the number of freely estimated parameters

4. Results and Discussion

4.1 General Trade Situation of Lao PDR

Since Lao PDR opened the country in 1986, international trade has become more important to the Laotian economy. The trade value, for example, has rapidly increased. In 1986, the country's total trade value was USD 74.21 million, of which USD 14.12 million were exports and USD 60.10 million were imports. In 2012, Lao's total trade value increased to USD 9,662.93 million, of which USD 3,323.84 million were exports and USD 6,339.09 million were imports. This was 129.20 times higher than that of the trade value in 1986. . For the net export in 1986, Lao faced a trade deficit of USD 45.98 million; in 2012, the country's net export increased to USD 3,015.25 million ((equivalent to 33.20% of Lao's GDP), which was 64.58 times higher than the figure in 1986. Also, notice that the export has grown at an average of 29.95% per year, while the country's import has grown at an average of 22.01% per year (IMF, 2014a).

Between 2001 and 2012, Lao PDR's trade value, export, and import have grown at similar rates, at 20.83%, 21.32%, and 20.98% respectively. The country's deficit averaging at 25.71% per year. Export grew every year except in 2001 and 2009. The highest growth rate was in 2006, at 68.85%, so the net export of that year also grew at the highest rate of 21.68%;

because it was the first time that Lao PDR has exported, at industry level, minerals (such as Copper and Gold). The second highest year was in 2010 when the export grew by 44.37% because it was the first year that Lao PDR exported electricity from Nam Theurn 2 Hydro Power Dam, plus the lowered export value in 2009 because of the world economic crisis and the European financial problem. In 2009, Lao PDR could export less Copper, Garment and Textile to Europe and the rest of the world, but the situation had recovered in 2010. Imports have been increasing every year especially in 2012 when imports grew at the highest rate of 36.78%. This almost doubled the country's deficit, from 1.52 billion USD in 2011 to 3.02 billion USD in 2012. Besides, another fast growing year of import was from 2004-2008, which grew more than 30%. These were mainly because the government had focused on expanding the country's infrastructures, especially road construction, and the building of infrastructure across the country to prepare itself for becoming the host country for the 9th ASEM meeting in 2012 and the ASEAN Summit in 2014. In addition, Lao also imported more Metals and Machineries to build hydropower dams and factories. The country also increased the number of vehicles and fuel usage in recent years.

From 2001 to 2012, Lao's top exported goods were Copper, at 23.87% of the country's total export value. Lao's copper export was mainly to Thailand, valued at USD 689.93 million in 2012 alone. Wood export (20.24%) was mainly to Vietnam. Garment and Textile (16.56%) was mainly destined to European countries.. The exports of other items are as follows: approximately 11.68% of Ores was mainly to China and 11.14% of electricity was exported to Thailand Electricity (ITC, 2014). (For more detail, see Appendix 2)

Lao PDR's top exports were mainly natural resources, such as Copper and Ores, which cannot be replenished once they are depleted; and their prices always fluctuate as they do not depend on any exporter, but on the global market. When the aggregate demand of Copper and Ores increase, their prices will also increase. Wood is a reserved resource that depends on the government's quota to harvest, so there is a limited supply while the demand for wood continues to be high. Garment and textile are goods that mostly follow the market mechanism (Demand and Supply). Electricity is goods that are sold based on long-term contracts, because it cannot be stocked, nor can its production rate change in a short period of time.

Between 2001and 2012, the main imports of Lao PDR were: Fuels - 17.03% (of the total import value), Vehicles - 14.50%, Machinery - 11.86%, Metals - 8.92%, Agricultural goods - 7.89%, and Electrical equipment - 7.49% (Source: ITC, 2014). (For more detail, see Appendix 2).

It is noted that the quantities and prices of imported goods have generally increased year by year. For example, the value of fuel import was USD 983.23 million in 2012, which was approximately 10 times higher than USD 80.23 million in 2001. Since Laos's economy has been growing, it therefore requires more fuels to be used in factories and for machines. In addition, the increased number of vehicles, especially those using petrol, also plays an important role in the increase in Lao's fuel consumption. The value of vehicle sales has also increased from USD 69.23 million in 2001 to USD 951.10 million in 2012, because of the growth of the economy helping more people to be able to afford vehicle purchase, plus more convenient road networks. Demand for machinery and metals also increased by large amounts due to their rising needs, especially for iron, in the construction of roads, buildings, factories, and hydro-power dams, and because Lao PDR cannot produce these products domestically. Agricultural goods have also been imported at a high amount even though Lao PDR is an agricultural country, because the agricultural production was still lower than the country's domestic demand. The reason is that much of its production process still relies on nature and not much on agricultural technologies, leaving the farmers to face natural disasters such as floods and droughts. In addition, economic growth also allows Lao people to increase their purchasing power and to want diversity in agricultural products, particularly some products that cannot be produced in Lao PDR. Demand for electrical equipments also increased, because as Lao people's income increased, the economic growth allowed them to afford more electrical equipments to facilitate their lifestyles. Since most of these equipments cannot be manufactured in Lao PDR, they need to be imported from abroad. Overall, the main imports of Lao PDR are mostly from Thailand.

Lao PDR has three major trading partners for both imports and exports: Thailand, China, and Vietnam In 2012, Lao PDR has imported USD 3,923.24 million from Thailand, and exported USD 1,131.05 million to the country, which were 61.89% and 34.03% of Lao's aggregate import and export values in that year respectively. For its trade with China, Lao imported USD 1,027.65 million (or 16.21% of its total import in that year) and exported USD 713.65 million to China, equivalent to 21.47% of Lao's total export in 2012. As for Vietnam, Lao

imported USD 463.53 million from Viet Nam, equivalent to 7.31% of its total import. Lao exported USD 404.28 million to Viet Nam in 2012, or 12.16% of its total import in that year. (See Appendix 1 for detail.)

4.1.1 Bilateral Trade Situation between Lao PDR and Thailand

The net export of Lao PDR to Thailand has always been in deficit, and the deficit continues to rise every year. Especially in 2007 and 2012, the deficit had increased to 55.40% and 40.85% from their respective previous years. The reason for the 2007 deficit was that imports remained on the rise while exports decreased by 9.25% of previous year, especially the export of electricity. And for 2012, the reason was that the export increased by a small value while the import increased significantly, particularly the import of fuels, and vehicles; which were imported to be used during the ASEM 9 meeting, plus the increase of Lao people's income which raised the people's purchasing power to buy vehicles. These resulted in more usage of fuels (particularly petrol). However, except in 2002, the deficit did not increase, but had in fact decreased by 3.15%. The reason was that Lao PDR reduced the import of vehicles and electrical equipment from Thailand, and then shifted to import those products from China instead.

The export from Lao PDR to Thailand has always increased except in 2007 and 2009, as shown in Figure 8, where it exhibits that the year 2005 and 2006 witnessed the highest export growths, at 96% and 132.62% respectively. This was because it was the first time that Lao PDR had exported Copper at the industry level; plus an increase in the export of electricity. For 2007, the year that the overall export decreased, the decrease was partly because the electricity export decreased due to insufficient contract condition, and partly due to an increase in the domestic demand for electricity. Wood export to Thailand also decreased due to the country's shift to exporting the product to Vietnam instead. Agricultural exports also decreased due to floods in the middle and southern provinces during the year. For the cause of export decreased in 2009 it was mainly due to the fall of Copper prices in the global market.

The main exports from Lao PDR to Thailand between 2001and 2012 were: Copper 42.18% of the total Export value ,Electricity 29.73%, Wood 14.01%, and Agricultural goods 5.46% (Source: ITC, 2014).

The import of Lao PDR from Thailand has increased every year, except in 2002 and 2009. The reason that there was a decrease in 2002 import from Thailand was that the import of vehicles, luxury goods, and sugar had decreased due to the shift of Lao PDR to import from China and Vietnam. For 2009, the overall import decreased because the import of fuels declined due to the fall of fuel prices, as influenced by global market prices, plus the shift in the importation of metals from Vietnam instead of from Thailand. And for the remaining years that the import increased, they were mostly influenced by the rise of fuel price in the global market, since Lao PDR has the highest import of fuels from Thailand. For example, in 2008 and 2012 the import of fuels increased from their respective previous years by 34.02% and 30.28% respectively. The global fuel prices for these years were at their peaks. In addition, because of Lao people's recent income rise, their demands for goods particularly vehicles, machinery, and agricultural goods also rose.

The main imports of Lao PDR from Thailand between 2001 and 2012 were: Fuels - 23.13% of total import values, Vehicles - 13.08%, Machinery - 10.22%, Agricultural goods - 10.10%, Chemical products - 8.71%, and Metals - 8.17% (ITC, 2014).

In summary, for the bilateral trade between Lao PDR and Thailand during 2001 – 2012, the net export from Lao PDR has always been in deficit, except in 2002 when the main exports were copper, electricity, and wood. The main import goods are fuels, vehicles, machinery, agricultural goods, chemical products, and metals.

4.1.2 Bilateral Trade Situation between Lao PDR and China

Considering the bilateral trade situation between Lao PDR and China, the net export from Lao PDR has always been in deficit every year except in 2011, and the value of the deficit fluctuated each year. For 2011 when the country was not in deficit because there was an increase in the export of wood from USD 97.06 million in 2010 to USD 230.39 million in 2011. Another reason was due to China's growing demand for wood to make furniture. For 2010 that saw the lowest deficit amount of USD 13.18 million, it was because the export of Ores (copper ore) from Lao PDR to China increased, due to better global economic conditions, which raised the demand for copper as raw material. Consequently, the price of copper ore in the global market increased, resulting in higher prices of ore for Lao PDR to export. The highest deficit was in 2012, because copper price fell, resulting in the decrease

of Ores (copper) export of Lao PDR, together with Lao PDR's importing more goods such as Electrical equipment, Machinery, Vehicles, and Metals, which worsened the country's trade balance in that year.

The main exports from Lao PDR to China during 2001-2012 were: Ores 50.67%, Wood 25.26%, Copper 11.05%, Rubber 5.91%, and Agricultural Goods 5.17% of the total export values during the period (ITC, 2014).

The main imports of Lao PDR from China during 2001–2012 were: Electrical equipments 21.31%, Machinery 20.48%, Vehicles 15.93%, Metals 11.26%, and Garment and Textile 8.85%. of the total import values during the period (ITC, 2014).

The Import of Lao PDR from China has been increasing every year except in 2011, which decreased a little due to the reduction of the importation of Garment and Textile. However, in 2012 the import values had almost doubled due to the increased domestic demand of machinery to be used in factories and hydropower dams, plus the increased need for Metals (especially iron) to construct the hydro power dams and other infrastructure (building, road,…) to prepare for ASEM 9 that Lao PDR hosted in 2012.

In summary, for the bilateral trade between Lao PDR and China during 2001 and 2012, the net export had always been in deficit, except in 2011 which enjoyed a surplus. The main exports from Lao PDR to China were Ores, Wood, and Copper, and the main imported goods were Electrical Equipments, Machinery, Vehicles, Metals, and Garment and Textile.

4.1.3 Bilateral Trade Situation between Lao PDR and Vietnam

The net export of Lao PDR which enjoyed a surplus during 2005-2011; especially in 2011 which had the highest surplus (116.69 million USD) because of the high value of exported Wood (313.73 million USD) due to the increased export quota of Wood in southern provinces in order to finance fiscal balance of those provinces, to prepare for the CLV (Cambodia, Laos, Vietnam) conference hosted in 2011. In 2005, the net export improved by the highest percentage, from a deficit to a surplus, because there was not much change in the import, while the export increased dramatically, particularly the export of Copper to Vietnam for the first year at the industry level. During 2001-2004 and in 2012, the net export of Lao

PDR to Viet Nam had deficits; especially in 2012which had the highest value of USD 59.26 million, due to the sharp export decrease and the import increase, particularly the import of Fuels from USD 76.25 million in 2011 to USD 112.23 million in 2012. 2004 had the highest percentage of deficit (327.91%), from a deficit of USD 1.8 million in 2003 to USD 7.69 million in 2004. This was because the import increased higher than the export, especially the imports of Garment and Textile, and Fuels.

Between2001and 2012, Lao's export value had increased, except in 2003, 2009, and 2012 when its exports slightly decreased. The reason for the 2003 export decline was that Vietnam reduced its importation of vehicles from Lao PDR which Lao PDR imported from Thailand, and which Viet Nam mostly changed to importing from Thailand directly. The reason for the 2009 export decline was because of the decrease in the export of Wood from USD 131.86 million in 2008 to USD 95.98 million in 2009. Similarly for 2012, it was because of the decrease in the export of Wood (Its export quota was adjusted down once again.) and copper (The global market price decreased).

The main Exports from Lao PDR to Vietnam during 2001-2012 were: Wood 57.57% and Copper 24.59% of its total export values (ITC, 2014).

During 2001-2012, the country's import value had always increased except in 2003 when the imports of garment and textile, and agricultural goods decreased from USD 26.35 million and USD 15.89 million in 2002, to USD 15.89 million and USD 9.54 million in 2003 respectively.

The main imported goods of Lao PDR from Vietnam during 2001-2012 were: Fuels (25.9 % of the country's total import values), Metals (21.34%), Garment and Textile (12%), and Agricultural goods (6.54%) (ITC, 2014).

In summary, for the bilateral trade between Lao PDR and Vietnam during 2001 – 2012, the net export experienced both deficits and surpluses; however the majority of the traded goods were in surpluses, in which, the main export goods were Wood and Copper, while the main imports were Fuels, Metals, Garment and Textile, and Agricultural goods.

4.2 Impact of Real Exchange Rate to Trade Balance of Lao PDR

4.2.1 Result of Unit Root Test

When performing the Time Series Analysis, we need to conduct the Unit Root Test to ensure that data to be used in the analysis are stationary (result not found Unit Root). Therefore, this study had conducted the Unit Root Test by using Perron (1990)'s method, in which we also insert the Structural Break point into the model. Therefore, this study chooses the Structural Break by selecting only the Intercept, because the results from the unit root test do not find the unit root for all variables and all countries. Therefore, the Structural Break for Thailand was 1997Q1, China was 1996Q1, and Vietnam was 2008Q1 (For more details, see Appendix 3).

4.2.2 Results of an Analysis on the Trade Balance Model between Lao PDR and Thailand

- **Result of the Co-integration Test**

From the Co-integration test, it still cannot be concluded that there exists co-integration among the variables; because the F-test equals 2.9347 which is in between the Lower bound value of 2.8115 and the Upper bound value of 3.8683, at the 10% significance level, as seen in Appendix 3, Table 2. However, we can still check for the existence of the co-integration by looking at the error term (EC_{t-1}) in Equation (11). The short-run analysis result shows the statistical significance, so it can be concluded that co-integration exists.

- **Trade Balance Model between Lao PDR and Thailand**

Results of the short-run and long-run tests by the ARDL approach can be created in Equation (11) and (12), which choose the maximum value according to the Schwartz Bayesian criterion (SBC) that select the maximum Lag = 4, so as to obtain the best model as ARDL (1, 3, 0, 0), where the values in the parentheses are the optimal Lag of $lnTB_t$, $lnRER_t$, $lnYD_t$, and $lnYP_t$ respectively. The results of the model can be obtained from Equation (11) and (12).. See more details in Table 3, Appendix 3.

- **The Short-Run Model**

$$\Delta lnTB_t = -0.57EC_{t-1}^* + 1.46\Delta lnRER_t^* - 0.05\Delta lnYD_t + 0.77\Delta lnYP_t^* - 0.76\Delta DP - 0.36\Delta lnRER_{t-1} - 1.31\Delta lnRER_{t-2}^* \quad (11)$$

- **The Long-Run Model**

$$lnTB_t = -20.96^* - 1.33DP^* + 2.08lnRER_t^* - 0.09lnYD_t + 1.34lnYP_t^* \quad (12)$$

(**Note:** *, **, and *** are significant at the 1%, 5% and 10% level respectively.)

- Results for the short-run model found that it converges to the Long-Run equilibrium at the medium level (Coefficient of EC_{t-1} = -0.5745) at the 1% significance level, and impacts of variables on the Trade Balance are:
- If the Real Exchange Rate of LAK to THB changes by 1%, it would lead to the change in the Trade Balance between Lao PDR and Thailand by 1.4585% in the same direction; however the Trade Balance would change by 1.3149% in the opposite direction after 2 quarters have passed. In other words, when the Real Exchange Rate (LAK to THB) depreciates by 1%, it would lead to a Trade Balance improve of 1.4548% initially; however, the Trade Balance would worsen by 1.3149% after it passes the 2nd Quarter, at the 1% significance level, assuming other factors are constant. This result is consistent with the study by Bahmani-Oskooee et al., (2005) for the case between Australia and Korea, and the study by Bahmani-Oskooee and Kantipong (2001) for the case of between Thailand and the USA. However, it is not consistent with the study by Kyophilavong et al., (2013) which found that when the Real Exchange Rate (LAK to USD) depreciated, it would lead to a worsened trade balance initially, but which would then improve when it passes 3 quarters.

If the real GDP of Lao PDR changes by 1%, it will lead to a change in the trade balance between Lao PDR and Thailand by 0.0539% in the opposite direction, though this is not significant. This is consistent with the result between Lao PDR and China in this study; and also with the study by Kyophilavong et al., (2013) and that of Bahmani-Oskooee and Cheema (2009) for the cases between Pakistan and France, Hong Kong, Japan, and Saudi Arabia.

If the Real GDP of Thailand changes by 1%, it would lead to a change in the Trade Balance between Lao PDR and Thailand by 0.7674% in the same direction, at the 1% significance

level, assuming other factors are constant. This is consistent with the Import Function that states, when a country's income increases, it will lead to an import increase. The result is also consistent with results for the cases of China and Vietnam in this study; and also with the study by Kyophilavong et al.(2013) that found that the increase in the Real GDP of trading partner would lead to an improved Trade Balance of Lao PDR, though this is not significant. However, the result is not consistent with the results from the study of Bahmani-Oskooee and Cheema (2009).

- **Result for Long-run model found that:**

If the Real Exchange Rate of LAK to THB changes by 1%, it would lead to a 2.0805% change in the Trade Balance between Lao PDR and Thailand in the same direction. In other words, when the Real Exchange Rate (LAK to THB) depreciates by 1%, it will lead to an improved Trade Balance by 2.0805%, at the 1% significance level, assuming other factors are constant. This result satisfies the Marshall-Lerner condition. It is also consistent with the studies by Kyophilavong et al., (2013), Bahmani-Oskooee and Kantipong (2001), Bahmani-Oskooee and Niroomand (1998), Bahmani-Oskooee and Cheema (2009) for cases between Pakistan and China, Hongkong, UK, and United Arab Emirates. It is also consistent with the study by Aruna Kumar (2013) for the case between India and Japan, India and Germany, and Anoupharb (2010). However, the result is not consistent with the study by Thanuxay (2012) that found that the LAK depreciation would lead to an increased import from Thailand and a decreased export to Thailand.

If the Real GDP of Lao PDR changes by 1%, it would lead to a 0.0939% change in the Trade Balance between Lao PDR and Thailand in the opposite direction, but the change is not significant. This is consistent with the study by Thanuxay (2012), Bahmani-Oskooee and Kantipong (2001) for cases between Thailand and Japan, and Thailand and Germany respectively. It is also consistent with the results of the studies by Thalongsy (1999), and Bahmani-Oskooee and Cheema (2009) for cases between Pakistan and Japan, and Pakistan and Hong Kong respectively. However, it is not consistent with Kyophilavong et al., (2013) which found that if the Real GDP of Lao PDR increases, it would lead to an improvement of the Trade Balance, since Lao people would prefer to consume domestic products instead. The reason that the result is not significant is because the increased Real GDP is mainly due

to the fact that the increased FDI into Lao PDR, especially from China and Vietnam, would lead to an increase in the imports of investment goods mainly from their own countries.

If the Real GDP of Thailand changes by 1%, it would lead to a 1.3312% change in the Trade Balance between Lao PDR and Thailand in the same direction, at the 1% significance level, assuming other factors are constant. This is consistent with the Import Function which says that when the Income increases, it will lead to an import increase. It is also consistent with the studies by Thanuxay (2012) and Bahmani-Oskooee et al., (2005) for cases between Australia and New Zealand, and South Africa.

- **In Summary:**

The Impacts of the Real Exchange Rate (LAK to THB) to the Trade Balance between Lao PDR and Thailand found that, when the Real Exchange Rate depreciates by 1%, it would lead to an improved Trade Balance by 1.4585% initially, which would then worsen by 1.3149% when it passes the 2nd Quarter. However, in the long term, the Trade Balance would eventually improve by 2.0805%, at the 1% significance level. The reason is that when the Real Exchange Rate depreciates, it means that the prices of imported goods increase, at the same time Lao people can notice the quick rise in the prices of the main imports (e.g. Fuel and Commodity goods) which are commonly consumed by the Laotians, so they react by reducing import quantities, resulting in an initial improvement of the trade balance.. However, Lao PDR cannot produce many products domestically, plus Lao people are used to consuming products from Thailand, so eventually the country is back to importing the same quantity from Thailand as before, even though the prices are now higher.

For exported goods (such as Copper and Electricity) from Lao PDR to Thailand, it would need a long time to change their supply quantities as the Real Exchange Rate depreciates. This means that domestic prices decrease, so their export values decrease. Therefore, as the imports increase while the exports decrease, the countries Trade Balance worsens. However, in the long term, when Thailand's demands for Copper and Electricity are still high, they would encourage more investment in Lao PDR to supply such products to abroad, hence, increasing the country's exports and thus improving Lao PDR's Trade Balance.

Therefore, the overall impact is similar to the J-curve phenomenon, as shown in Figure 19, from point A to point B and to point C. Although it does not strictly follow the J-curve phenomenon, as described in the studies by Magee (1973) and Krueger (1983), as Trade Balance would worsen initially before improving to become higher than the value before the exchange rate depreciated.

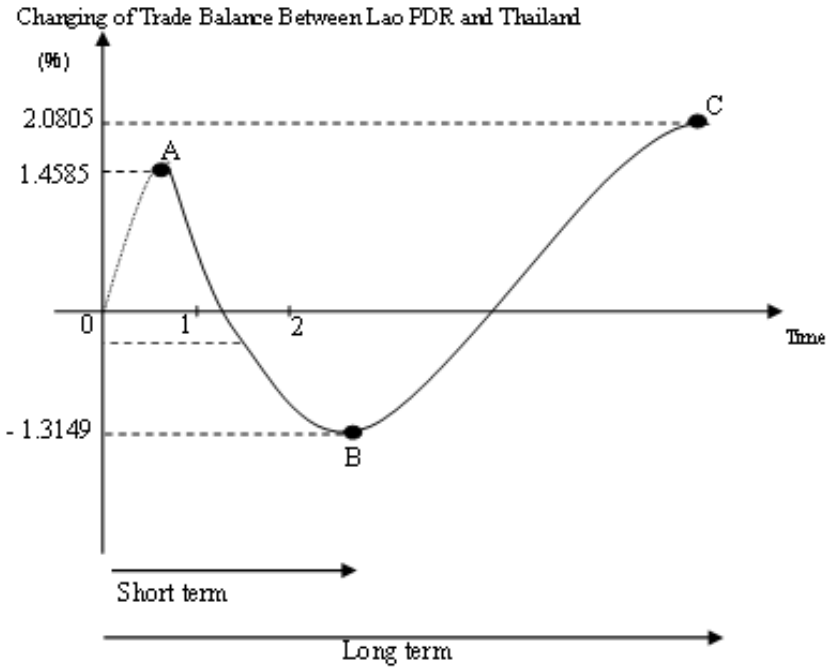

Figure 3: The Impact of the 1% Depreciation of the Real Exchange Rate (LAK to THB) on the Changes in the Trade Balance between Lao PDR and Thailand, in Percentage

4.2.3 Results of the Analysis of the Trade Balance Model between Lao PDR and China

- **Result of the Co-integration Test**

From the Co-integration test, there exists co-integration among the variables; because the F-test = 4.2999 which is more than the Upper-bound value of 3.8535, at the 10% significance level. See Table 2, Appendix 3.

- **Trade Balance Model between Lao PDR and China**

The following section discusses results of the short-run and long-run tests by the ARDL approach, which chooses the maximum values according to the Schwartz Bayesian Criterion

(SBC) that selects the maximum Lag = 6, and therefore obtaining the best model as ARDL(1, 5, 0, 0), where the values in the parentheses are optimal Lags of $lnTB_t$, $lnRER_t$, $lnYD_t$, and $lnYP_t$ respectively. The results of the model can create Equation (13) and (14). See details in Table 4 in Appendix 3.

Short-Run Model

$$\Delta lnTB_t = -0.51EC_{t-1}* + 0.91\Delta lnRER_t - 0.16\Delta lnYD_t + 0.63\Delta lnYP_t* - 2.60\Delta DP* \quad (13)$$
$$+ 0.88\Delta lnRER_{t-1} + 2.81\Delta lnRER_{t-2}* - 1.71\Delta lnRER_{t-3}*** + 1.71\Delta lnRER_{t-4}***$$

Long-Run Model

$$lnTB_t = 11.02 - 5.09DP* - 3.95lnRER_t** - 0.32lnYD_t + 1.23lnYP_t* \quad (14)$$

- Results from the short-run model found that the results converge with the long-run equilibrium at the medium level (Coefficient of EC_{t-1} = -0.5102) at the 1% significance level, and the impacts of variables on Trade Balance are:

→ If the Real Exchange Rate of LAK to CHY changes by 1%, it will lead to the change in the Trade Balance between Lao PDR and China by 2.8124% in the same direction, when it passes 2 quarters. However, the Trade Balance would change by 1.7059% in the opposite direction after it passes 3 quarters, after which it would change to 1.7119% in the same direction when it passes the 4th quarter. In other words, when the Real Exchange Rate (LAK to CHY) depreciates by 1%, it would lead to an improvement of the Trade Balance by 2.8124% when it passes 2 quarters. However, it would worsen by 1.7059% when it passes 3 quarters, and would then improve by 1.7119% when it passes the 4th quarter, which are at the 1%, 10%, and 10% significance levels respectively, assuming other factors are constant. This result is consistent with the study by Bahmani-Oskooee et al., (2005) for cases between Australia and Ireland, Spain, and Switzerland, and the study by Bahmani-Oskooee and Kantipong (2001) for the case between Thailand and the UK.

→ If the Real GDP of Lao PDR changes by 1%, it will lead to a 0.1623% change in the Trade Balance between Lao PDR and China in the opposite direction, but the change is not significant. This is consistent with the result between Lao PDR and Thailand in this study;

and is also consistent with the results of the study by Kyophilavong et al., (2013) for case of Lao PDR and the rest of world, and those of the study by Bahmani-Oskooee and Cheema (2009) for cases between Pakistan and France, Hong Kong, Japan, and Saudi Arabia.

→If the Real GDP of China changes by 1%, it will lead to a 0.6292% change in the Trade Balance between Lao PDR and China in the same direction, at the 1% significance level, assuming other factors are constant. This is consistent with the Import Function that states that an increase in Income will lead to an import increase. It is also consistent with results for the cases of Thailand and Vietnam in this study; and also consistent with the results from the study by Kyophilavong et al., (2013) that found that an increase in the Real GDP of a trading partner would lead to an improved Trade Balance of Lao PDR, although the change is not significant. Nevertheless, these results are not consistent with those of Bahmani-Oskooee and Cheema (2009).

❖ **Result for the Long-run model** found that:

If the Real Exchange Rate of LAK to CHY changes by 1%, it will lead to a 3.9509% change in the Trade Balance between Lao PDR and China in the opposite direction. In other words, when the Real Exchange Rate (LAK to CHY) depreciates by 1%, it wil lead to a worsened Trade Balance by 3.9509%, at the 5% significance level, assuming other factors are constant. This result is consistent with that of the study by Soleymani et al.,(2011) that said that the Trade Balance of Malaysia and China from trading Ores, Wood, Copper, and Metals, would worsen when the domestic Real Exchange Rate depreciates. This conclusion is also consistent with that of the study by Bahmani-Oskooee et al., (2005) for the cases between Australia and Ireland, and Australia and Switzerland. However, the result does not satisfy the Marshall-Lerner Condition, because the main exported goods from Lao PDR to China are Ores, Wood, and Copper, which do not follow the market mechanism.

→ If the Real GDP of Lao PDR changes by 1%, it will lead to a 0.3181% change in the opposite direction of the Trade Balance between Lao PDR and China, although the change is not significant. This is consistent with the result of Thailand in this study. It is also consistent with the study by Thanuxay (2012), Bahmani-Oskooee and Kantipong (2001) for the cases between Thailand and Japan, and Thailand and Germany respectively. However, it

is not consistent with the study by Kyophilavong et al., (2013) which found that if the Real GDP of Lao PDR increases, it would lead to an improved Trade Balance since Lao people would consume domestic products instead. The reason that the result is not significant is because the increase in the Real GDP is mainly due to the increase in foreign investment (FDI) to Lao PDR, the country which imports investment in goods mainly from their own countries, especially from Thailand, Vietnam, and China.

If the Real GDP of China changes by 1%, it will lead to a 1.2331% change in the Trade Balance between Lao PDR and China in the same direction, at the 1% significance level, assuming other factors are constant. This is consistent with the Import Function which says that an income increase will lead to an import increase. It is also consistent with the results of the cases of Thailand and Vietnam in this study; and is also consistent with the study by Thanuxay (2012).

- **In Summary:**

The impacts of the Real Exchange Rate (LAK to CHY) on the Trade Balance between Lao PDR and China are that, when the Real Exchange Rate depreciates by 1%, it will lead to a 2.8124% improvement of the Trade Balance when it passes 2 quarters, but then would worsen the Trade Balance by 1.7059 % when passing 3 quarters, and then would be back to improvement of the Trade Balance by 1.7119% when it passes 4 quarters. However, in the long term, it would eventually worsen the Trade Balance by 3.9505%, at the 5% significance level. The reasons are that the main exports from Lao PDR to China are Ores, Wood, and Copper, which are exported periodically (not continuous), so they do not follow the market mechanism; plus main imports from China to Lao PDR are Electrical equipment and Vehicles, which are imported continuously, so they follow the market mechanism. This means that when the Real Exchange Rate depreciates, the price of goods from China become more expensive, thus import from China to Lao PDR decreases, which improves Lao PDR's Trade Balance with China. However, other main imported goods such as Machinery and Metals, are imported to be used in factories and big projects are not quite continuous, so they do not follow the market mechanism. Therefore, Lao PDR still imports these products at the quantities based on projects' demand, while their prices become more expensive, so the Trade Balance worsens, as shown in Fig. 20, from point A to point B, to point C, and to point D.

Therefore, we conclude that there is no J-curve phenomenon for the impacts of the Real Exchange Rate on the Trade Balance between Lao PDR and China.

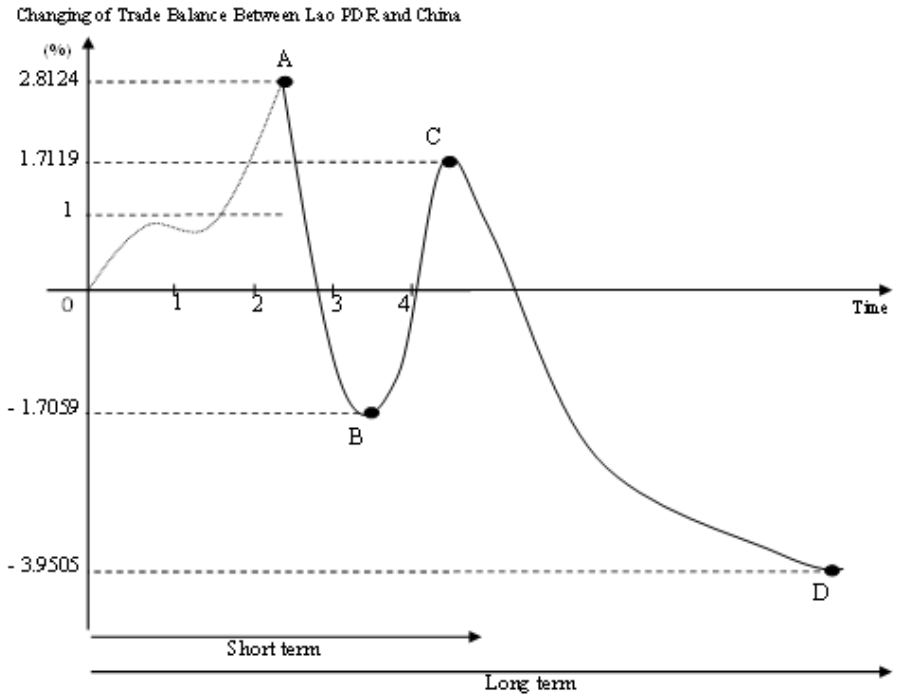

Figure 4: The Impact of Depreciate 1% of Real Exchange Rate (LAK to CHY) to Trade Balance between Lao PDR and China change in percentage

4.2.4 Results of the Analysis of the Trade Balance Model between Lao PDR and Vietnam

- **Result of the Co-integration Test**

From the Co-integration test, it still cannot be concluded that there exists co-integration among the variables; because the F-test = 3.2856 which is in between the Lower bound value of 2.8763 and the Upper bound value of 3.9480, at the 10% significance level, as seen in Table 2 of Appendix 3. However, we can still check for the existence of the co-integration by looking at an Error term (EC_{t-1}) in Equation (15) of the short-run analysis result for statistical signification, so it can be concluded that the co-integration exists.

- **Trade Balance Model between Lao PDR and Vietnam**

Results of the short-run and long-run tests by the ARDL approach, which chooses the maximum value according to the Schwartz Bayesian criterion (SBC), that selects the maximum Lag = 10, in order to obtain the best model as ARDL (1, 0, 0, 0), can be found below, where the values in the parentheses are optimal Lags of $lnTB_t$, $lnRER_t$, $lnYD_t$, and $lnYP_t$ respectively. Results of the model can be created in Equation (15) and (16). See more details in Table 5, Appendix 3.

- **Short-run model**

$$\Delta lnTB_t = -0.39EC_{t-1}* - 0.82\Delta lnRER_t*** - 0.35\Delta lnYD_t*+ 0.73\Delta lnYP_t** + 0.17\Delta DP \quad (15)$$

- **Long-run model**

$$lnTB_t = -8.25 + 0.44DP - 2.10lnRER_t - 0.91lnYD_t + 1.87lnYP_t \quad (16)$$

- Result for the Short-Run Model found that it converges to the long-run equilibrium at medium speed (Coefficient of EC_{t-1} = -0.3898) at the 1% significance level, and the impacts of the variables on the Trade Balance are:

→ If the Real Exchange Rate of LAK to VND changes by 1%, it would lead to a 0.8185% change in the Trade Balance between Lao PDR and Vietnam in the opposite direction. In other words, when Real Exchange Rate (LAK to VND) depreciates by 1%, it will lead to a 0.8185% worsening of the Trade Balance at the 10% significance level, assuming other factors are constant. This result is consistent with the study by Magee (1973) and Krueger (1983) which said that impacts of the exchange rate depreciation would lead to an improvement of the Trade Balance initially. The result is also consistent with that of Bahmani-Oskooee and Cheema (2009).

If the Real GDP of Lao PDR changes by 1%, it will lead to a 0.3546% change in the Trade Balance between Lao PDR and Vietnam but in the opposite direction, at the 1% significance level, assuming other factors is all constant. This is consistent with the Import Function that says an income increase will lead to an import increase. It is also consistent with the study by Bahmani-Oskooee and Cheema (2009) for the cases between Pakistan and Germany, Kuwait, and Malaysia.

If the Real GDP of Vietnam changes by 1%, it will lead to a 0.7313% change in the Trade Balance between Lao PDR and Vietnam in the same direction, at the 5% significance level, assuming other factors are constant. This is consistent with the Import Function that says that an income increase will lead to an import increase; it is also consistent with results from the cases of Thailand and China in this study; and is also consistent with the study by Kyophilavong et al., (2013) that finds that when the Real GDP of a trading partner increases, it would lead to an improvement of the Trade Balance of Lao PDR; however, this improvement is not significant. Nevertheless, this result is not consistent with that of Bahmani-Oskooee and Cheema (2009).

Result for the Long-Run Model found that: If the Real Exchange Rate of LAK to VND changes by 1%, it will lead to a change in the Trade Balance between Lao PDR and Vietnam by 2.1000% in the opposite direction. In other words, when the Real Exchange Rate (LAK to VND) depreciates by 1%, it will lead to a 2.1000% worsening of the Trade Balance, although it is not significant. This result is consistent with the studies by Thanuxay (2012), Soleymani et al.,(2011), Bahmani-Oskooee and Cheema (2009) for the cases between Pakistan and Germany, and Pakistan and Saudi Arabia, and Aruna Kumar (2013) for the case between India and the USA. However, the result does not satisfy the Marshall-Lerner Condition, and is not consistent with those of the studies by Magee (1973) and Krueger (1983) which said that when the exchange rate depreciates for a period of time, the trade balance would improve.

If the Real GDP of Lao PDR changes by 1%, it will lead to a 0.9098% change in the Trade Balance between Lao PDR and Vietnam in the opposite direction, at the 5% significance level, assuming other factors are constant. This is consistent with the Import Function. It is also consistent with the study by Thanuxay (2012), and Bahmani-Oskooee and Kantipong (2001) for the cases between Thailand and Japan, and Thailand and Germany. However, it is not consistent with that of Kyophilavong et al., (2013) which found that if the Real GDP of Lao PDR increases, it would lead to an improvement of a Trade Balance.

If the Real GDP of Vietnam changes by 1%, it would lead to 1.8764% change in the Trade Balance between Lao PDR and Vietnam in the same direction, at the 1% significance level, assuming other factors are constant. This is consistent with the Import Function that says

when Income increases; it will lead to an import increase. It is also consistent with results for the cases of Thailand and China in this study.

- **Summary:**

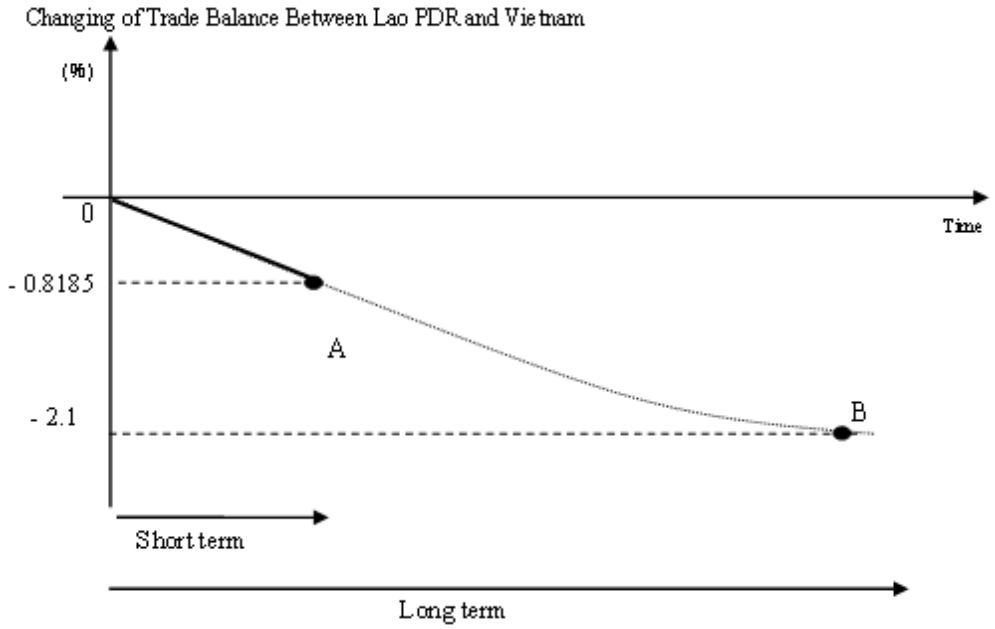

Figure 5: The Impact of Depreciate 1% of Real Exchange Rate (LAK to VND) to Trade Balance between Lao PDR and Vietnam change in percentage

The Impact of the Real Exchange Rate (LAK to VND) on the Trade Balance between Lao PDR and Vietnam is such that, when the Real Exchange Rate depreciates by 1%, it will lead to an initial 0.8185% worsening of the Trade Balance, at the 10% significance level. In the long term, it will eventually worsen by 2.1000%, but this is not statistically significant. The reasons are that the main exports from Lao PDR to Vietnam are Wood and Copper, which are exported periodically (not continuous), so they do not follow the market mechanism, especially Wood that cannot be sold as demanded since it depends on its quota of each year. Therefore, the quantity does not change while prices appear to be cheaper due to the Real Exchange Rate depreciation; thus, the export value decreases. In addition, the main import from Vietnam is Fuels, the amount of which is increasing year by year due to Lao PDR's inability to produce it domestically and its continued increased usage in the country. Thus, the import values increased, and therefore, worsened Lao PDR's Trade Balance with Viet Nam, as shown in Fig. 2, from point 0 to point A, to point B.

Therefore, we conclude that there is no J-curve phenomenon for the impacts of the Real Exchange Rate on the Trade Balance between Lao PDR and Vietnam.

5. Conclusions and Recommendation

5.1 Conclusions

This thesis studies for 2 objectives: Firstly, it studies general trade situation between Lao PDR and its major trading partners. And secondly, it investigates the impacts of the devaluation of the real exchange rate on trade balance of Lao PDR and its trading partners, and to investigate if the J-curve phenomenon exists, by studying per trading partner country.

The study found that the Net Export of Lao PDR has always been in deficit, of which the highest is with Thailand, then with China. For the highest surplus, it is with Vietnam. From 2001 to 2012, for the case of Thailand as a trading partner, Lao PDR has always been in a deficit. The country's main exports to Thailand are Copper - 42.18% of its total export value to Thailand, Electricity - 29.73%, and Wood - 14.01%, especially Copper and Electricity which Lao exported the highest quantity compared to its exports to other countries. The main imports from Thailand are Fuels - 23.13%of the total import value from Thailand, Vehicles - 13.08%, Machinery - 10.22%, and Agricultural goods - 10.10%. In addition, almost every product was imported at the highest amount from Thailand compared to from other countries. For the case of China as a trading partner, Lao PDR has always been in a trade deficit with China except in 2011 when the country had a trade surplus with China. The main exports are Ores - 50.67% of the total export value to China, Wood - 25.26%, and Copper - 11.05%. The impact from Lao PDR's trade with China can be felt especially for Ores that was exported at the highest amount compared to its export to other countries. The main import goods from China are Electrical Equipment - 21.31%, Machinery - 20.48%, Vehicles - 15.93%, and Metals - 11.26% of total import value from China. For the case with Vietnam, Lao PDR mostly enjoyed a trade surplus. The main export goods are Wood (57.57% of the country's total export value to Vietnam), and Copper (24.59%), and especially Wood which the country exported the highest amount to Viet Nam compared to to other countries. The main import goods are Fuels 25.90%, Metals 21.34%, and Garment and Textile 12% of total import value from Vietnam.

The results of the quantitative analysis by creating the Trade Balance Model found that, when the Real GDP of Lao PDR increases, it would lead to a worsening Trade Balance (however, it was significant for the case of Vietnam only), because Lao people can purchase more goods from other countries. When the Real GDP of trading partner increases, it would lead to an improved Trade Balance, because people in trading partner countries have more purchasing power to buy from Lao PDR. When the Real Exchange Rate (LAK to THB) depreciates, it would lead to an initial improvement of Trade Balance between Lao PDR and Thailand, but then would worsen when passing the 2nd Quarter. Eventually, it would improve the Trade Balance in the long term. This shows the existence of the J-Curve phenomenon. When the Real Exchange Rate (LAK to CHY) depreciates, it would lead to an improvement of the Trade Balance between Lao PDR and China when passing 2 quarters, then would worsen when passing 3 quarters, after that it would improve when passing 4 quarters, and would eventually worsen in the long term, so the J-Curve phenomenon does not exist. When the Real Exchange Rate (LAK to VND) depreciates, it would lead to a worsening Trade Balance between Lao PDR and Vietnam in both the short- and long-term. This also shows that the J-Curve phenomenon does not exist like in the case of China.

5.2 Recommendation

After this study, the researcher would recommend to related authorities that deal with trade balance problems of Lao PDR and to interested individuals to conduct further researches, such as:

For related authorities, it is important to support and encourage more variety of products to export. Production of goods to be exported should not rely much on natural resources such as Ores and copper, because natural resources cannot be regenerated easily once they are depleted. We should encourage more factories to domestically manufacture, produce, and/or process more completed products such as Vehicles, Machinery, Agricultural goods. We need to start this process as Lao PDR is now one of the WTO members, and will join the AEC by the end of 2015. This is to avoid further trade deficit to Lao PDR when trade barriers are lifted. The results of the analyses also show that the depreciation of LAK to THB can improve Trade Balance with Thailand. Because the deficit with Thailand is USD 2,792.20 million or 92.60% of the total deficit of Lao PDR in 2012, so by resolving the deficit with Thailand, it will be equivalent to resolving the overall trade deficit of Lao PDR. However,

we should be aware that when LAK depreciates, it will also lead to more deficits with China and Vietnam. And also be aware that more inflation would happen, as in studies by other researchers.

For interested researchers, it would be great if we can add variable Investment into the model in order to find impact of the Investment to the Trade Balance Model. For data of export and import, it should be studied by sector to find clearer impacts of depreciation of Real Exchange Rate to each sector. And could the study apply in depth policies to identify which policy is more effective, which is not, when the domestic currency depreciates.

5.3 Limitation

The main limitation of this study is the unavailability of data. For example, there is only yearly data of the Real GDP of Lao PDR, China, and Vietnam, while the researcher believes that to obtain better results, more frequent data (i.e. Quarterly data is better than yearly data) should be used to study the impacts of the Real Exchange Rate on Trade Balance. It is also difficult to access Investment data to use as a variable in the model, because currently data on Investment used in real sector are not well collected; the available foreign investment data is simply the approved FDI in each year, and is not the real value. In addition, domestic investment data is mostly not collected. Consequently, using the current investment data would lead to biased result. Therefore, this study cannot add the Investment variable into the model, and hence, this study has to interpolate yearly data into quarterly data for the Real GDP variable of Lao PDR, China, and Vietnam.

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Appendix 1

Table 2: List of Variables

Variables	Meaning
CPI	Consumer Price Index
EX	Export Value from Lao PDR to Trading Partners
IM	Import Value of Lao PDR from Trading Partners
NX	Net Export Value between Lao PDR and Major Trading Partners (Export value minus Import value)
TB	Trade Balance between Lao PDR and Major Trading Partners (Ratio of Export Value to Import Value)
EXR	Exchange Rate of Domestic Currency (LAK) per One Unit of Trading Partner's Currency (LAK/THB, LAK/CHY and LAK/VND)
PL	Consumer Price Index (CPI) of Lao PDR (in Year 2005 = 100)
PP	Consumer Price Index (CPI) of Trading Partners (in Year 2005 = 100)
RER	Real Exchange rate (Exchange Rate adjusted by Ratio of Trading Partner's CPI to Lao PDR's CPI)
YD	Real GDP of Lao PDR (in Year 2005 = 100)
YP	Real GDP of Trading Partners (in Year 2005 = 100)
DP	Dummy (structural break)

Table 3: Import and Exports of Lao PDR with Trading Partners during 1986 to 2012

(Unit: Million USD)

	Import (from)							**Export** (to)						
	Thailand	China	Vietnam	Japan	Korea	Germany	**World**	Thailand	China	Vietnam	Japan	Korea	Germany	**World**
1986	32.89	-	0.10	14.41	-	0.77	**60.10**	1.16	8.82	-	1.27	-	-	**14.12**
1987	40.88	0.66	0.12	17.05	-	2.09	**79.82**	5.40	9.64	-	1.36	-	-	**23.25**
1988	56.44	3.30	0.15	21.78	-	0.77	**102.02**	20.38	16.09	-	6.18	-	-	**55.86**
1989	70.21	4.86	3.01	26.80	-	1.91	**128.74**	39.70	11.44	2.53	7.24	-	0.23	**95.35**
1990	72.34	15.93	17.59	21.60	-	0.99	**148.60**	40.33	5.85	3.56	4.56	-	1.74	**64.42**
1991	84.32	12.27	3.92	23.46	-	0.90	**154.27**	42.72	2.02	3.02	4.04	-	8.62	**82.11**
1992	133.12	30.63	17.63	30.81	-	1.43	**258.36**	37.32	3.35	6.97	10.86	-	5.26	**103.46**
1993	164.80	18.10	19.70	56.10	2.30	-	**431.90**	74.80	25.50	23.10	8.80	1.90	9.00	**240.50**
1994	270.30	20.20	22.50	45.80	2.20	-	**564.10**	77.20	8.10	81.20	4.90	-	11.80	**300.40**
1995	287.80	21.50	23.90	48.80	2.30	-	**588.80**	83.30	8.80	87.70	5.30	-	12.70	**311.20**
1996	310.00	23.20	25.80	52.50	2.50	-	**689.60**	96.70	0.80	157.60	1.70	0.50	4.80	**320.70**
1997	336.68	4.92	25.06	10.36	3.28	0.86	**408.51**	34.30	0.28	0.18	6.70	0.68	16.16	**192.11**
1998	411.32	19.62	80.72	21.00	5.28	15.41	**644.57**	28.82	7.18	119.47	17.79	-	21.44	**370.80**
1999	451.99	24.38	181.79	24.89	11.88	9.51	**808.88**	51.56	8.69	179.44	12.28	1.09	26.97	**462.53**
2000	419.05	37.86	77.72	23.64	4.90	3.60	**689.79**	68.88	5.84	96.12	10.93	0.52	20.83	**391.34**
2001	451.70	59.85	70.73	12.97	6.88	7.38	**717.84**	81.02	6.78	61.82	6.30	0.44	25.47	**375.69**
2002	444.00	59.69	71.17	19.63	4.95	4.11	**722.20**	85.01	8.77	56.91	6.11	0.10	22.01	**386.10**
2003	501.54	108.06	56.98	15.02	8.68	7.54	**808.96**	94.35	10.19	55.18	6.71	0.14	23.63	**437.55**
2004	639.55	110.62	75.24	15.40	9.88	27.99	**1,057.64**	104.28	11.47	67.55	7.29	1.31	28.75	**535.27**
2005	846.24	115.87	76.12	21.33	15.32	11.30	**1,270.32**	204.39	23.22	88.64	7.30	1.92	31.57	**726.51**
2006	1,125.43	185.59	104.50	22.55	25.66	11.99	**1,652.59**	475.45	45.12	151.45	11.27	16.15	34.58	**1,226.68**
2007	1,442.09	195.15	120.67	41.70	61.22	34.78	**2,107.03**	431.47	77.26	192.09	10.85	63.94	43.01	**1,323.94**
2008	1,932.67	294.96	176.33	69.13	58.51	25.14	**2,836.83**	560.79	135.89	253.36	16.44	48.15	41.97	**1,600.66**
2009	1,800.52	413.91	186.23	83.47	61.34	18.12	**2,892.50**	423.73	305.97	225.91	24.40	15.94	47.99	**1,521.00**
2010	2,348.37	524.10	218.28	68.25	123.48	21.35	**3,574.40**	689.68	510.92	265.22	34.19	18.17	53.10	**2,195.92**
2011	3,011.43	519.30	301.51	85.91	169.92	38.80	**4,635.09**	1,029.07	729.03	418.20	88.27	3.94	72.88	**3,120.02**
2012	3,923.25	1,027.66	463.53	151.14	181.54	158.76	**6,339.09**	1,131.05	713.65	404.28	112.38	10.31	68.11	**3,323.84**
Sum	**21,608.93**	**3,852.17**	**2,421.02**	**1,045.50**	**762.02**	**405.50**	**34,372.56**	**6,012.88**	**2,700.69**	**3,001.50**	**435.43**	**185.18**	**632.62**	**19,801.31**

Source: IMF, 2014a

Table 4: Data for Estimate Trade Balance model of Lao PDR with trading partners

	Thailand				China				Viet Nam			
	TB	YD (million USD)	YP (million USD)	RER	TB	YD (million USD)	YP (million USD)	RER	TB	YD (million USD)	YP (million USD)	RER
1993Q1	0.37	48.86	436.94	286.77	0.41	48.86	253,568	1,098.63	-	48.86	88.12	-
1993Q2	0.51	49.42	431.11	299.81	1.97	49.42	263,231	1,188.04	-	49.42	89.46	-
1993Q3	0.52	49.96	457.49	291.28	5.42	49.96	268,926	1,149.50	-	49.96	90.18	-
1993Q4	0.41	50.46	478.39	275.91	0.88	50.46	276,025	1,136.28	-	50.46	90.71	-
1994Q1	0.40	52.57	486.13	283.64	0.60	52.57	190,147	835.81	-	52.57	89.77	-
1994Q2	0.31	53.75	474.34	289.57	0.94	53.75	196,558	877.50	-	53.75	90.02	-
1994Q3	0.24	54.88	487.06	261.92	0.36	54.88	204,266	823.18	-	54.88	90.63	-
1994Q4	0.23	55.96	532.08	238.46	0.29	55.96	212,056	795.67	-	55.96	91.22	-
1995Q1	0.32	56.58	542.20	240.06	0.13	56.58	219,065	837.87	-	56.58	97.95	0.497
1995Q2	0.30	55.64	545.08	255.42	0.31	55.64	227,025	892.64	-	55.64	101.25	0.530
1995Q3	0.34	50.55	534.82	278.82	0.65	50.55	233,755	980.47	-	50.55	104.65	0.584
1995Q4	0.22	46.24	560.31	307.61	0.50	46.24	239,269	1,095.74	-	46.24	108.19	0.643
1996Q1	0.29	47.14	560.96	306.12	0.02	47.14	245,022	1,117.55	-	47.14	109.26	0.656
1996Q2	0.36	48.04	565.27	280.81	0.01	48.04	250,570	1,037.77	-	48.04	111.66	0.602
1996Q3	0.33	48.86	567.83	261.06	0.06	48.86	256,895	956.02	-	48.86	114.03	0.547
1996Q4	0.27	49.59	578.20	234.77	0.05	49.59	262,990	868.75	-	49.59	115.76	0.491
1997Q1	0.13	47.09	553.32	245.99	0.06	47.09	269,235	928.37	-	47.09	115.69	0.522
1997Q2	0.14	46.11	548.98	224.22	0.02	46.11	275,196	840.66	-	46.11	114.26	0.454
1997Q3	0.08	38.98	428.34	160.83	0.12	38.98	281,258	740.98	-	38.98	116.11	0.404
1997Q4	0.05	27.23	347.24	151.36	0.05	27.23	287,444	841.18	-	27.23	114.31	0.447
1998Q1	0.09	20.13	282.34	157.06	0.37	20.13	292,280	996.02	1.42	20.13	110.26	0.519
1998Q2	0.08	17.34	303.61	171.81	0.88	17.34	297,730	903.18	1.69	17.34	108.78	0.475
1998Q3	0.07	13.43	296.64	172.00	0.30	13.43	303,177	899.16	1.42	13.43	105.62	0.465
1998Q4	0.05	11.94	354.69	176.34	0.22	11.94	308,698	840.25	1.40	11.94	104.40	0.427
1999Q1	0.09	11.55	357.99	189.17	0.45	11.55	314,790	907.72	1.09	11.55	105.44	0.475
1999Q2	0.16	7.25	340.97	293.93	0.48	7.25	320,520	1,398.78	0.99	7.25	106.50	0.738
1999Q3	0.14	6.02	345.06	335.60	0.24	6.02	326,289	1,631.66	0.92	6.02	107.33	0.851
1999Q4	0.08	7.04	359.76	279.36	0.28	7.04	331,978	1,384.39	0.99	7.04	108.14	0.703

	Thailand				China				Viet Nam			
	TB	YD (million USD)	YP (million USD)	RER	TB	YD (million USD)	YP (million USD)	RER	TB	YD (million USD)	YP (million USD)	RER
2000Q1	0.17	7.30	375.79	283.64	0.20	7.30	340,419	1,369.31	1.23	7.30	110.52	0.695
2000Q2	0.24	7.29	348.17	277.50	0.09	7.29	347,254	1,351.89	1.28	7.29	112.14	0.687
2000Q3	0.15	7.10	330.39	267.05	0.21	7.10	354,014	1,363.47	1.13	7.10	113.58	0.686
2000Q4	0.11	6.87	335.18	256.42	0.12	6.87	360,911	1,408.49	1.30	6.87	112.94	0.686
2001Q1	0.21	6.78	332.93	264.82	0.15	6.78	368,889	1,457.45	0.81	6.78	114.08	0.701
2001Q2	0.18	6.92	302.91	251.58	0.21	6.92	376,179	1,426.83	0.86	6.92	115.21	0.681
2001Q3	0.17	6.52	307.45	264.20	0.15	6.52	383,468	1,467.98	0.78	6.52	116.96	0.707
2001Q4	0.15	6.38	336.33	255.39	0.05	6.38	390,747	1,419.31	1.06	6.38	115.73	0.664
2002Q1	0.15	6.50	343.66	253.91	0.18	6.50	401,393	1,398.09	0.79	6.50	117.11	0.665
2002Q2	0.20	6.52	337.28	259.08	0.13	6.52	410,004	1,366.58	0.82	6.52	118.41	0.658
2002Q3	0.22	6.12	347.48	272.22	0.13	6.12	418,641	1,399.59	0.75	6.12	119.83	0.678
2002Q4	0.19	5.98	364.29	261.08	0.15	5.98	427,249	1,391.19	0.84	5.98	121.38	0.670
2003Q1	0.16	6.17	375.49	260.80	0.07	6.17	440,275	1,383.79	0.91	6.17	123.47	0.669
2003Q2	0.18	6.28	364.49	261.56	0.06	6.28	450,662	1,346.98	1.01	6.28	125.27	0.658
2003Q3	0.23	6.36	377.33	257.09	0.09	6.36	461,042	1,284.14	0.94	6.36	127.02	0.626
2003Q4	0.18	6.53	430.58	257.34	0.22	6.53	471,439	1,268.65	1.01	6.53	128.37	0.601
2004Q1	0.17	6.70	437.37	264.27	0.13	6.70	484,585	1,295.05	0.85	6.70	130.43	0.624
2004Q2	0.16	6.73	407.40	262.22	0.06	6.73	496,090	1,308.18	0.90	6.73	132.70	0.645
2004Q3	0.16	6.68	401.10	255.67	0.12	6.68	507,593	1,299.78	0.86	6.68	134.99	0.651
2004Q4	0.16	6.96	450.04	247.59	0.12	6.96	519,100	1,236.06	0.97	6.96	137.14	0.618
2005Q1	0.13	7.22	460.13	251.09	0.21	7.22	537,336	1,210.61	1.20	7.22	140.32	0.615
2005Q2	0.16	7.17	428.59	252.66	0.16	7.17	551,526	1,230.94	1.29	7.17	142.83	0.641
2005Q3	0.27	7.09	422.73	251.00	0.24	7.09	575,118	1,245.20	1.06	7.09	145.31	0.647
2005Q4	0.38	7.23	462.50	248.02	0.20	7.23	593,783	1,234.84	1.14	7.23	147.84	0.640
2006Q1	0.35	7.68	479.26	253.52	0.10	7.68	619,819	1,228.33	1.28	7.68	149.78	0.644
2006Q2	0.50	8.11	473.74	257.39	0.33	8.11	641,049	1,180.16	1.55	8.11	151.87	0.624
2006Q3	0.39	8.30	485.71	256.47	0.18	8.30	663,102	1,162.32	1.47	8.30	153.88	0.618
2006Q4	0.44	8.66	542.06	252.76	0.60	8.66	690,362	1,138.01	1.48	8.66	155.77	0.594
2007Q1	0.21	8.94	554.17	250.58	0.59	8.94	730,652	1,142.47	1.47	8.94	159.36	0.595
2007Q2	0.28	9.16	544.61	255.99	0.35	9.16	762,640	1,133.49	1.57	9.16	161.60	0.591
2007Q3	0.36	9.33	567.41	249.28	0.45	9.33	798,910	1,123.52	1.60	9.33	162.94	0.573
2007Q4	0.33	9.55	615.99	247.03	0.33	9.55	837,461	1,131.49	1.70	9.55	166.48	0.578

	Thailand				China				Viet Nam			
	TB	YD (million USD)	YP (million USD)	RER	TB	YD (million USD)	YP (million USD)	RER	TB	YD (million USD)	YP (million USD)	RER
2008Q1	0.30	10.34	646.86	257.99	0.39	10.34	880,317	1,194.80	1.82	10.34	168.84	0.617
2008Q2	0.21	10.95	615.59	264.25	0.22	10.95	926,834	1,205.81	1.50	10.95	170.61	0.656
2008Q3	0.39	11.30	587.77	245.00	0.96	11.30	963,746	1,192.07	1.21	11.30	168.79	0.655
2008Q4	0.26	11.64	574.90	224.75	0.37	11.64	985,502	1,155.04	1.29	11.64	170.69	0.637
2009Q1	0.22	11.87	551.58	218.23	1.01	11.87	1,008,549	1,149.54	0.89	11.87	168.51	0.623
2009Q2	0.22	12.05	543.00	223.46	0.50	12.05	1,031,678	1,131.49	1.27	12.05	171.04	0.622
2009Q3	0.24	12.30	569.90	224.82	0.80	12.30	1,053,455	1,108.16	1.33	12.30	172.94	0.613
2009Q4	0.25	12.55	636.84	221.03	0.71	12.55	1,075,985	1,071.82	1.36	12.55	171.08	0.585
2010Q1	0.23	12.86	663.84	226.69	0.65	12.86	1,111,197	1,095.38	1.29	12.86	166.28	0.581
2010Q2	0.25	13.40	636.19	225.04	1.02	13.40	1,139,038	1,058.31	1.20	13.40	166.11	0.561
2010Q3	0.39	13.81	652.12	219.42	1.80	13.81	1,175,497	1,016.42	1.16	13.81	166.93	0.531
2010Q4	0.32	14.35	733.47	224.46	0.85	14.35	1,222,670	1,022.56	1.23	14.35	167.65	0.529
2011Q1	0.30	14.64	736.27	222.00	2.05	14.64	1,263,897	1,056.17	1.49	14.64	161.44	0.529
2011Q2	0.35	14.96	698.08	228.38	1.42	14.96	1,308,032	1,073.07	1.44	14.96	158.34	0.548
2011Q3	0.44	15.28	709.19	225.15	1.44	15.28	1,353,747	1,072.51	1.31	15.28	161.10	0.556
2011Q4	0.28	15.56	645.88	217.49	1.02	15.56	1,398,860	1,083.90	1.35	15.56	162.22	0.557
2012Q1	0.23	15.90	728.48	216.41	0.97	15.90	1,427,948	1,094.82	0.87	15.90	163.51	0.563
2012Q2	0.33	16.20	705.25	213.31	0.52	16.20	1,454,369	1,071.86	0.89	16.20	165.58	0.557
2012Q3	0.32	16.49	702.35	210.50	0.65	16.49	1,473,899	1,046.23	0.86	16.49	167.66	0.549
2012Q4	0.29	16.81	777.92	211.69	0.76	16.81	1,508,085	1,037.59	0.88	16.81	169.74	0.554

Source: IMF, 2014a, and IMF, 2014b

Appendix 2

Main Product Catalogues Based on the 2-Digit Harmonized System (HS) Code

1.	Copper	mean Copper and articles thereof. (HS Code: 74).
2.	Metals	mean Iron and steel, Nickel, Aluminums, Lead, Zinc, Tin, other base metals, articles thereof, tools, implements, cutlery, etc of base metal. (HS Code : 72; 73; 75; 76; 78; 79; 80; 81; 82; and83).
3.	Ores	mean Ores, Slag, and Ash. (HS Code: 26).
4.	Wood	mean Wood, Cork, and article thereof. (HS Code: 44; and 45).
5.	Garment and Textile	mean Apparel, Silk, Wool, Cotton, fibers, manmade filaments and staple fibbers, Wadding, Carpets, Footwear, Headgear, miscellaneous, and parts and article thereof. (HS Code : 50; 51; 52; 53; 54; 55; 56; 57; 58; 59; 60; 61; 62; 63; 64; and 65).
6.	Electricity	mean Electricity. (HS Code: 27.16). it is in HS Code 4 digits of Fuels (HS Code : 27) because electricity is the main export goods of Lao PDR.
7.	Agricultural	goodsmeanLivestock,Friut,Vegetable,FishandSeafood,Cereals,Miscellaneous,andpreparationsand products(Exclude Coffee and Tea).(HS Code: 01; 02; 03;04;05;06;07;08;10;11;12; 13; 14; 15; 16; 18; 19; 20; 21; 23; 41; 42;and 43).
8.	Coffee and Tea	mean Coffee, Tea, Mate and Spices.(HS Code : 09)
9.	Fuels	mean Mineral fuels, oils, distillation products, etc.. (HS Code : 27 minus Electricity HS Code : 27.16)
10.	Chemical products	mean Cement, Stone, Plaster, Lime, Organic and Inorganic chemicals, Tanning, Dyeing extracts, Soap, Glues, Miscellaneous chemical products, Ceramic, Glass, and articles (HS Code : 25; 28; 29; 32; 34; 35; 38; 68; 69; and 70).
11.	Rubber	mean Plastics, Rubber, and articles thereof. (HS Code: 39; and40).
12.	Electrical equipment	mean Electrical, Electronic equipment, Photographic goods, and Cable. (HS Code: 37; and 85).
13.	Vehicles	mean Vehicles, Railway, and Parts and equipment. (HS Code: 86; and 87).
14.	Precious goods	mean Diamond, Precious stones and metals, Coins, etc. (HS Code: 71).
15.	Sugar	mean Sugars and Sugar confectionery. (HS Code: 17).

16. Commodities mean Commodities not elsewhere specified, and Miscellaneous manufactured articles. (HS Code: 96; and 99).
17. Luxury goods mean Beverages, Alcohol, Tobacco, Essential oils, Perfumes, Cosmetics, Games, etc. (HS Code: 22; 24; 33; and 95).
18. Machinery mean Machinery, nuclear reactors, boilers, etc. (HS Code: 84).
19. Fertilizers mean Organic and Inorganic fertilizers. (HS Code: 31).
20. Furniture mean Furniture, Lighting, Signs, Prefabricated buildings, etc. (HS Code: 94).
21. Pharmaceutical products mean Pharmaceutical products, Optical, Photo, Technical, Medical, etc apparatus. (HS Code: 30; and 90).
22. Paper mean Paper, Paperboard and articles thereof, Printed books, newspapers, pictures, etc. (HS Code: 48; and 49).
23. Aircraft mean Aircraft, Spacecraft, and Parts thereof. (HS Code: 88).
24. Boats mean Ships, Boats, and Other floating structures. (HS Code: 89).
25. Miscellaneous mean Miscellaneous goods exclude above goods such as explosives, Work of art, collectors pieces, etc.

Table 5: Export and Import Values of Lao PDR with Major Trading Partners during 2001 – 2012 by Main Product Catalogues

Unit: Thousand USD

	Lao PDR with World				Lao PDR with Thailand				Lao PDR with China				Lao PDR with Viet Nam			
Catalogues of Product	**Export value 2001-2012**	**(%) of Product Export**	**Import Value 2001-2012**	**(%) of Product Import**	**Export value 2001-2012**	**(%) of Product Export**	**Import Value 2001-2012**	**(%) of Product import**	**Export value 2001-2012**	**(%) of Product Export**	**Import Value 2001-2012**	**(%) of Product Import**	**Export value 2001-2012**	**(%) of Product Export**	**Import Value 2001-2012**	**(%) of Product Import**
Copper	3,690,963	23.87%	33,243	0.13%	2,443,216	42.18%	8,829	0.05%	322,781	11.05%	3,557	0.11%	607,530	24.59%	10,359	0.58%
Metals	71,540	0.46%	2,313,386	8.92%	12,662	0.22%	1,379,655	8.17%	3,955	0.14%	371,403	11.26%	6,245	0.25%	378,651	21.34%
Ores	1,806,155	11.68%	5,266	0.02%	24,535	0.42%	1,973	0.01%	1,479,884	50.67%	5	0.00%	15,979	0.65%	663	0.04%
Wood	3,130,308	20.24%	30,029	0.12%	811,517	14.01%	17,872	0.11%	737,593	25.26%	4,476	0.14%	1,422,454	57.57%	4,776	0.27%
Garment and Textile	2,560,150	16.56%	1,525,302	5.88%	30,216	0.52%	834,595	4.94%	7,059	0.24%	292,143	8.85%	6,601	0.27%	212,918	12.00%
Electricity	1,722,012	11.14%	461,281	1.78%	1,722,012	29.73%	433,134	2.57%	-	0.00%	23,939	0.73%	-	0.00%	4,208	0.24%
Agricultural goods	667,140	4.31%	2,047,608	7.89%	316,060	5.46%	1,704,659	10.10%	150,964	5.17%	34,404	1.04%	108,811	4.40%	116,054	6.54%
Coffee and Tea	430,031	2.78%	4,082	0.02%	3,106	0.05%	1,740	0.01%	1,155	0.04%	442	0.01%	55,191	2.23%	1,222	0.07%
Fuels	106,445	0.69%	4,418,100	17.03%	79,521	1.37%	3,904,975	23.13%	15,911	0.54%	6,522	0.20%	1,340	0.05%	459,675	25.90%
Chemical products	272,400	1.76%	1,707,173	6.58%	40,085	0.69%	1,470,457	8.71%	2,791	0.10%	68,964	2.09%	85,627	3.47%	95,870	5.40%
Rubber	218,010	1.41%	981,306	3.78%	2,260	0.04%	769,016	4.55%	172,570	5.91%	69,479	2.11%	22,001	0.89%	67,276	3.79%
Electrical equipment	135,679	0.88%	1,942,453	7.49%	100,705	1.74%	789,783	4.68%	981	0.03%	702,985	21.31%	20,895	0.85%	70,765	3.99%

	Lao PDR with World				Lao PDR with Thailand				Lao PDR with China				Lao PDR with Viet Nam			
Catalogues of Product	**Export value 2001-2012**	**(%) of Product Export**	**Import Value 2001-2012**	**(%) of Product Import**	**Export value 2001-2012**	**(%) of Product Export**	**Import Value 2001-2012**	**(%) of Product Import**	**Export value 2001-2012**	**(%) of Product Export**	**Import Value 2001-2012**	**(%) of Product Import**	**Export value 2001-2012**	**(%) of Product Export**	**Import Value 2001-2012**	**(%) of Product Import**
Vehicles	117,986	0.76%	3,762,132	14.50%	53,848	0.93%	2,209,081	13.08%	-	0.00%	525,500	15.93%	56,296	2.28%	84,589	4.77%
Precious goods	108,052	0.70%	241,184	0.93%	2,171	0.04%	36,554	0.22%	35	0.00%	149	0.00%	-	0.00%	2	0.00%
Sugar	114,354	0.74%	279,297	1.08%	8,761	0.15%	275,687	1.63%	-	0.00%	193	0.01%	66	0.00%	3,076	0.17%
Commodities	78,250	0.51%	305,886	1.18%	31,637	0.55%	128,247	0.76%	555	0.02%	53,229	1.61%	17,503	0.71%	47,207	2.66%
Luxury goods	60,956	0.39%	1,072,233	4.13%	9,221	0.16%	600,488	3.56%	14,351	0.49%	54,639	1.66%	13,769	0.56%	20,476	1.15%
Machinery	58,697	0.38%	3,075,608	11.86%	36,047	0.62%	1,726,112	10.22%	102	0.00%	675,845	20.48%	11,712	0.47%	61,010	3.44%
Fertilizers	36,069	0.23%	199,181	0.77%	18,839	0.33%	108,836	0.64%	-	0.00%	30,596	0.93%	17,180	0.70%	40,877	2.30%
Furniture	24,325	0.16%	241,757	0.93%	3,329	0.06%	67,108	0.40%	8,512	0.29%	140,698	4.26%	306	0.01%	24,370	1.37%
Pharmaceutical products	17,666	0.11%	388,290	1.50%	10,074	0.17%	140,061	0.83%	42	0.00%	73,376	2.22%	648	0.03%	34,601	1.95%
Paper	14,631	0.09%	281,497	1.09%	11,294	0.20%	175,322	1.04%	19	0.00%	20,864	0.63%	14	0.00%	28,939	1.63%
Aircraft	1,291	0.01%	512,648	1.98%	30	0.00%	11,672	0.07%	-	0.00%	112,472	3.41%	-	0.00%	148	0.01%
Boats	793	0.01%	10,566	0.04%	220	0.00%	2,166	0.01%	4	0.00%	5,449	0.17%	2	0.00%	470	0.03%
Miscellaneous	19,028	0.12%	100,782	0.39%	20,409	0.35%	85,808	0.51%	1,224	0.04%	28,271	0.86%	797	0.03%	6,566	0.37%
Total	**15,462,931**	**100.00%**	**25,940,290**	**100.00%**	**5,791,775**	**100.00%**	**16,883,830**	**100.00%**	**2,920,488**	**100.00%**	**3,299,600**	**100.00%**	**2,470,964**	**100.00%**	**1,774,768**	**100.00%**

(Source: ITC, 2014)

Appendix 3

Table 6: Results of Perron Unit Root Test

Trading Partners	Test Level	Variable	Intercept		Time Trend	
			T-statistic	Time Break	T-statistic	Time Break
Thailand	Level	$\ln TBT_t$	-5.32 (5)**	1997Q1	-4.76 (5)***	1997Q3
		$\ln YD_t$	-5.04 (8)***	1997Q4	-4.17 (8)	2001Q3
		$\ln YPT_t$	-7.06 (0)*	1997Q2	-3.18 (0)	2001Q1
		$\ln RERT_t$	-5.35 (11) **	2000Q4	-4.64(11)***	2003Q4
	1st Difference	$\Delta\ln TBT_t$	-10.44 (0)*	1997Q4	-10.03 (0)*	2000Q2
		$\Delta\ln YD_t$	-6.09 (3)*	1999Q2	-4.11 (9)	2006Q2
		$\Delta\ln YPT_t$	-7.49 (0)*	1998Q1	-7.16 (0)*	1997Q3
		$\Delta\ln RERT_t$	-8.85 (0)*	1999Q2	-6.70 (0)*	1999Q2
China	Level	$\ln TBC_t$	-3.27 (8)	2006Q3	-4.13 (8)	2004Q2
		$\ln YD_t$	-5.04 (8)***	1997Q4	-4.17 (8)	2001Q3
		$\ln YPC_t$	-4.94 (1)***	2006Q4	-6.09 (1)*	2004Q1
		$\ln RERC_t$	-9.28 (13)*	1999Q1	-3.56 (13)	2004Q4
	1st Difference	$\Delta\ln TBC_t$	-13.20 (0)*	1996Q1	-11.96 (0)*	2009Q3
		$\Delta\ln YD_t$	-6.09 (3)*	1999Q2	-4.11 (9)	2006Q2
		$\Delta\ln YPC_t$	-9.29 (0)*	2008Q3	-10.11 (0)*	1996Q1
		$\Delta\ln RERC_t$	-9.65 (0)*	1999Q2	-7.78 (0)*	1996Q1
Trading Partners	**Test Level**	**Variable**	**Intercept**		**Time Trend**	
			T-statistic	Time Break	T-statistic	Time Break
Vietnam	Level	$\ln TBV_t$	-2.34 (12)	2005Q4	-2.36 (12)	2008Q3
		$\ln YD_t$	-4.35 (7)	2002Q2	-3.28 (7)	2002Q4
		$\ln YPV_t$	-4.32 (11)	2006Q4	-4.17(11)	2009Q3
		$\ln RERV_t$	-4.88 (1)	2009Q3	-6.62 (1)*	2000Q3
	1st Difference	$\Delta\ln TBV_t$	-10.12 (0)*	2008Q1	-10.37 (0)*	2005Q2
		$\Delta\ln YD_t$	-6.14 (0)*	2000Q2	-7.81 (0)*	2000Q2
		$\Delta\ln YPV_t$	-6.02 (0)*	2008Q2	-4.11 (9)	2006Q2
		$\Delta\ln RERV_t$	-7.04 (5)*	2010Q3	-5.58(0)*	2000Q2

*, **and*** denote significant at 1%, 5%, and 10% level respectively. and value in the ( ) denote selected Lag. with maximum Lag = 15

Source: Result calculated from software EViews 7

Table 7: Results of Co-Integration Test for Trade Balance Model between Lao PDR and Major Trading Partners

	Lao PDR and Thailand		**Lao PDR and China**		**Lao PDR and Vietnam**	
Dependent Variables	**TB_t**		**TB_t**		**TB_t**	
F-test (Structural Break)	2.9347[CN] (1997Q1)		4.2999** (1996Q1)		3.2856 [CN] (2008Q1)	
Critical values	5 per cent level	10 per cent level	5 per cent level	10 per cent level	5 per cent level	10 per cent level
Lower bounds	3.3810	2.8115	3.3816	2.8276	3.4819	2.8763
Upper bounds	4.5143	3.8683	4.5370	3.8535	4.7273	3.9480
Adj R^2	0.7580		0.7097		0.6547	
f-statistics	30.3774*		18.8497*		19.5851*	
*and**denote significant at 5% and 10% level respectively [CN] denote Cannot conclude co-integration exist or not						

Source: Result calculated from software Microfit 5

Table 8: Result of Analysis on Trade Balance Model between Lao PDR and Thailand in long-run and short-run

ARDL(1, 3, 0,0)						
Long-run model Dependent variable: $lnTB_t$				Short-run model Dependent variable: $\Delta lnTB_t$		
Variable	Coefficient	T-Statistic		Variable	Coefficient	T-Statistic
Constant	-20.9577*	-8.5393		$\Delta lnRER_t$	1.4585*	3.4781
$lnRER_t$	2.0805*	5.2221		$\Delta lnRER_{t-1}$	-0.3579	-0.8538
$lnYD_t$	-0.0939	-1.1862		$\Delta lnRER_{t-2}$	-1.3149*	-3.1266
$lnYP_t$	1.3357*	6.5900		$\Delta lnYD_t$	-0.0539	-1.1991
DP	-1.3312**	-2.5850		$\Delta lnYP_t$	0.7674*	4.3480
				ΔDP	-0.7648	-2.9129
				EC_{t-1}	-0.5745*	-5.6924
Diagnostic Tests						
	LM-version			F-version		
	Statistics	P-Value		Statistics	P-Value	
Auto-correlation	$\chi 2$ (4)= 7.3653	0.118		F(4, 63)=1.6902	0.163	
Functional Form	$\chi 2$ (1)=0.5317	0.466		F(1, 66)= 0.46498	0.498	
Normality	$\chi 2$ (2)= 0.2831	0.868		N/A		
Heteroscedasticity	$\chi 2$ (1)=0.0015	0.969		F(1, 74)= 0.0014	0.970	
CUSUM test	Stable					
CUSUM Sq test	Stable					
*, **,and***denote significant at 1%, 5% and 10% level respectively						

Source: Result calculated from software Microfit 5

Table 9: Result of Analysis on Trade Balance Model between Lao PDR and China in long-run and short-run

ARDL(1, 5, 0,0)					
Long-run model Dependent variable: $lnTB_t$			Short-run model Dependent variable: $\Delta lnTB_t$		
Variable	Coefficient	T-Statistic	Variable	Coefficient	T-Statistic
Constant	11.0231	0.8106	$\Delta lnRER_t$	0.9082	0.7762
$lnRER_t$	-3.9505**	-2.3482	$\Delta lnRER_{t-1}$	0.8858	0.7671
$lnYD_t$	-0.3181	-0.8088	$\Delta lnRER_{t-2}$	2.8124*	2.9413
$lnYP_t$	1.2331*	5.0462	$\Delta lnRER_{t-3}$	-1.7059***	-1.8180
DP	-5.0907 *	-2.9650	$\Delta lnRER_{t-4}$	1.7119***	1.9115
			$\Delta lnYD_t$	-0.1623	-0.8056
			$\Delta lnYP_t$	0.6292*	3.6877
			ΔDP	-2.5975*	-3.9870
			EC_{t-1}	-0.51024*	-5.4069

Diagnostic Tests				
	LM-version		F-version	
	Statistics	P-Value	Statistics	P-Value
Auto-correlation	$\chi 2$ (4)= 7.3713	0.117	F(4, 59)=1.9968	0.107
Functional Form	$\chi 2$ (1)=0.6824	0.409	F(1, 62)= 0.5770	0.450
Normality	$\chi 2$ (2)= 0.9637	0.618	N/A	
Heteroscedasticity	$\chi 2$ (1)= 2.2347	0.135	F(1, 72)= 2.2420	0.139
CUSUM test	Stable			
CUSUM Sq test	Stable			
*, **,and***denote significant at 1%, 5% and 10% level respectively				

Source: Result calculated from software Microfit 5

Table 10: Result of Analysis on Trade Balance Model between Lao PDR and Vietnam in long-run and short-run

ARDL(1, 0, 0,0)						
Long-run model Dependent variable: $lnTB_t$				Short-run model Dependent variable : $\Delta lnTB_t$		
Variable	Coefficient	T-Statistic		Variable	Coefficient	T-Statistic
Constant	-8.2508*	-2.8598		$\Delta lnRER_t$	-0.8185***	-1.7964
$lnRER_t$	-2.100	-1.5492		$\Delta lnYD_t$	-0.3546*	-2.7851
$lnYD_t$	-0.9098**	-2.2957		$\Delta lnYP_t$	0.7313**	2.4939
$lnYP_t$	1.8764*	2.7276		ΔDP	0.1716	1.1518
DP	0.4402	1.1550		EC_{t-1}	-0.3898*	1.9115
Diagnostic Tests						
	LM-version			F-version		
	Statistics	P-Value		Statistics	P-Value	
Auto-correlation	$\chi 2$ (4)= 7.0086	0.135		F(4, 40)=1.6302	0.186	
Functional Form	$\chi 2$ (1)=1.8904	0.169		F(1, 43)= 1.6896	0.201	
Normality	$\chi 2$ (2)= 0.6009	0.740		N/A		
Heteroscedasticity	$\chi 2$ (1)= 2.6910	0.101		F(1, 48)= 2.7303	0.105	
CUSUM test	Stable					
CUSUM Sq test	Stable					
*, **,and***denote significant at 1%, 5% and 10% level respectively						

Source: Result calculated from software Microfit 5

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MINZAS program is a partnership program of Mekong Institute and New Zealand Embassy in Bangkok. The objective of this program is to enhance research capacity of young GMS researchers by providing a structured learning and filed research application program for 36 master's degree students from provincial universities in Cambodia, Lao PDR, Myanmar and Thailand.

Through a comprehensive supports – trainings, roundtable meeting, constructive advices from MI advisors including financial supports – which are to be and have been provided to scholarship grantees, students' research skills and conduction of research deem to be developed. The completed research works will be published in 'MI Working Paper Series' and disseminated to related agents among the GMS.

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The Mekong Institute (MI) is an intergovernmental organization with a residential learning facility located on the campus of Khon Kaen University in the northeastern Thailand. It serves the countries of the Greater Mekong Subregion (GMS), namely, Cambodia, Lao P.D.R., Myanmar, Thailand, Vietnam, Yunnan Province and Guangxi Zhuang Autonomous Region of PR. China.

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MI's learning programs services caters to the capacity building needs of current and future GMS leaders and policy makers on issues around rural development, trade and investment facilitation, human migration, with good governance and regional cooperation as cross cutting themes.

Vision

Capable and committed human resources working together for a more integrated, prosperous, and harmonious GMS.

Mission

Capacity development for regional cooperation and integration.

MI Program Thematic Areas

1. **Rural Development for Sustainable Livelihoods**
   - Agriculture value chains
   - Natural resource management
   - Food security and sufficiency
   - Productivity and post harvest support
2. **Trade and Investment Facilitation**
   - SME clusters, business to business and export networking
   - Trade and investment promotion in Economic Corridors
   - Cross-Border Transport Facilitation Agreement (CBTA) and Logistics
   - Public-Private Partnerships
3. **Human Migration Management and Care**
   - Safe migration
   - Labor migration management
   - Harmonization of migration policies and procedures
   - Mutual recognition arrangement for education, training and skills standard

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Research Working Paper Series 2014

NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Aid Programme

This publication of Working Paper Series is part of the Mekong Institute – New Zealand Ambassador's Scholarship (MINZAS) program. A collaboration project between New Zealand Embassy in Bangkok and Mekong Institute aims to bring forth the research development within the Greater Mekong Subregion (GMS) through educational provision that will be given to 36 master's degree students from Cambodia, Lao PDR, Myanmar and Thailand (2012 - 2014).