

International Trade Structure Change and Determinants in Laos, 2000-2014

Abstract

This paper uses the Trade Structure Change Index (TSCI) to analyse the trade structure change of Laos during the period 2000-2014 and then use the panel data regression analysis with fixed effects model to discuss the determinants. Low import TSCI indicates inadequate economic vitality and slow economic growth in Laos, with the cause possibly being insufficient capital goods import. Large export TSCI indicates unsteady export trade structure and comparatively weak product competitiveness. Laos's major export products are still primary products with low value-added; The determinants of the import trade structure of Laos are gross domestic product (GDP), foreign direct investment (FDI) and economic structure similarity with other countries, but the effect of ASEAN Free Trade Area (AFTA) is insignificant; The determinants of the export trade structure of Laos are GDP and AFTA, but the explanatory power remains uncertain due to the serious trade deficit problem in Laos.

Keywords: Laos; Trade Structure Change Index (TSCI); Import Trade Structure; Export Trade Structure; Panel data regression analysis

JEL Classification: F10, F19, F50

I. Introduction

In 1986, Laos began a transition process to change from a centrally planned economy to a market-oriented economy, also referred to as the New Economic Mechanism (NEM). The transition has promoted the trade liberalisation as well as the FDI and international trade in Laos. In 1997, when Laos joined ASEAN, trade development and liberalisation reached a remarkable point for the small landlocked communist state like Laos. It was decided after Laos participation in AFTA to progressively reduce and eliminate AFTA's tariffs and non-tariff barriers in order to encourage foreign producers, investors and entrepreneurs to operate businesses in the

country..

Laos's total international trade volume has seen an increased from \$52.25 million in 1986 to \$11752.14 million in 2014, with import trade volume increasing from \$48.67 million to \$7157.46 million and export trade volume increasing from \$3.58 million to \$4594.67 million. Despite a great improvement in its international trade, the country still suffers from a serious trade deficit with its main exports reliant on primary products with low value-addition such as agricultural ones. Laos international trade structure needs to be improved. Thus, this paper uses Trade Structure Change Index (TSCI) to analyse Laos's international trade structure both in import and export, and further discusses the determinants to provide suggestions and empirical support for its trade structure improvement.

II. Literature Review

Several researchers have discussed the impact of general determinates such as GDP, exchange rate, domestic capacity, income level, factor endowments, trading costs, distance, and cultural similarities on the international trade.

Tinbergen (1962), Poyhonen (1963), Geraci and Prewo (1977), Bergstrand (1985), and Bacchetta and Wincoop (2003) used gravity model to discuss the effects of income, distance, and prices on international trade. Baxter and Kouparitsas (2006) pointed to the significant impact variables such as the scale of factor endowments, fixed exchange rates, the level of development, and current account restrictions all had on the international trade. Disdier et al. (2009) discussed the influencing factors from a cultural angle to prove the significant and positive influence of cultural flows on overall trade. Botrić (2013) analysed the intra-industry trade determinants between Western Balkan nations and old European Union Member States revealing that relative income level, distance, relative factor endowments, and relative trading costs were significant factors. Khan et al. (2013) used the 1990-2010 panel data to analyse Pakistan's bilateral trade flows with major trading partners through gravity model. The results revealed that GDP and GDP per capita positively affected the trade volume while distance and dummy variable for cultural similarities showed negative effects. Lubinga and Kiiza (2013) pointed to the significant negative effect real exchange rate volatility had on Uganda's bilateral trade flows in comparison to the significant positive effect it had on the volatility of the country's bilateral trade flows. (2013) examined the short-run and long-run effects of the exchange rate changes on the trade flows in the bilateral trade between Korea and Japan, showing that Korea's

exports and imports were relatively sensitive to the bilateral exchange rate in the short-run, but less responsive in the long-run while income in the two countries had significant impacts on the bilateral trade flows in both the short-run and long-run; Exchange rate uncertainty and Japanese FDI to Korea are found to have had little impacts on Korea's trade with Japan in the short-run and long-run. Later, Baek (2014) used the same methods to examine the effect of exchange rate fluctuations on the Korea's trade with the US, finding that Korea's major export industries were highly responsive to the bilateral exchange rate, volatility and third country effects in both the long-run and short-run, whereas Korea's imports were mostly insensitive to changes in those three factors. Tay(2014) pointed out that factors like wealth and domestic capacity of importer and exporter, transport costs, common religion, common language, and trade restrictiveness of the importer are the determinants of trade in education by using the data of 1050 observations from new UNESCO database. Some scholars analysed the determinants of international trade from state-ownership and preferential trade agreements aspects. Imports controlled by state-owned enterprises (SOEs) exhibited stronger responsiveness to political relations than imports controlled by private enterprises in the bilateral trade between China and India (Davis et al., 2014). Agbodji (2008) evaluated the impact of the preferential trade agreements and the monetary union on international trade between West African Economic and Monetary Union (also known by its French acronym, UEMOA) member countries by dynamic gravity model. It showed that the real bilateral exchange rate, the distance, and the volatility of the nominal exchange rate all had a negative impact on international trade, while membership in a common monetary zone, UEMOA, and the implementation of economic reforms had significant effects on the bilateral trade within the zone, mainly in terms of diversion of imports and exports. They also pointed that the trade within Economic Community Of West African States (ECOWAS) turned out to be at a much lower level than predicted and lower than trade within UEMOA.

However, research on the international trade of Laos is comparatively less and most of them are discussion paper, like ADB or World Bank working paper series. Recent researches are mostly about AFTA and the international trade of Laos. AFTA would bring some benefits such as stronger political status, larger attraction to foreign investment, higher government income and more economic support from membership

100 countries and wider range of products with lower price for consumer (Vongxay, 2006).
101 Later, Vixathap (2011) did research on the structure of external trade of Laos during
102 1985-2005 and found that exports mostly concentrated on agricultural products and
103 crude natural resources while labour-intensive garment industry had gained
104 competitiveness and the mining industry (copper) tended to forming competitiveness
105 but specialisation tended to occur in the simple product lines within an industry.
106 Leebouapao et al. (2012) found that the competitiveness of wood processing and
107 cement industries based on price and product quality would be affected by the
108 removal of tariffs under AFTA. To maintain domestic market and expand foreign
109 markets, promoting product equality would be of great significance. Keochaiyom
110 (2015) pointed out that AFTA had positive effects on aggregate international trade
111 volume and import while negative effects on export in Laos.

112 To conclude, most researches were about the determinants of international trade
113 flow, few were about international trade structure. There is a lack of depth and
114 detailed research on the international trade structure, especially the trade structure of a
115 least developed country such as Laos. Therefore, this paper studies the international
116 trade structure of Laos both in the import trade structure and the export trade structure
117 by using panel data from 2000 to 2014. Further, considering that new factors like
118 AFTA was considered in recent domestic research in Laos, this paper discusses the
119 determinants of import trade structure and export trade structure in Laos from general
120 factors like GDP, FDI and new factors like AFTA.

121 **III. International trade structure change of Laos**

122 **1. Trade Structure Change Index (TSCI)**

123 Trade Structure Change Index (TSCI)^① can measure the change of products
124 structure in the international trade. For a country, dynamic economic development
125 means stronger economic growth and higher requirement on the quantity and variety
126 of various products. This may lead to insufficient domestic supply to a certain extent,
127 and increase the change degree of trade structure. In this case, the more dynamic the
128 economy is, the greater the import trade structure change index would be. As for the
129 export trade structure change index, it reveals the change of trade pattern based on

^① Trade Structure Change Index (TSCI) was first defined in Chinese article “Changhong Pei (2013). Import Structure and Economic Growth: Rule and Enlightenment. *Economic research*, 7, 4-19”.

comparative advantages. Great export trade structure change index shows unstable comparative advantages in the international trade and may reveal that the product competitiveness have not formed or have not yet adjusted to the stable pattern. The formula of TSCI is as shown below in Figure 1:

$$TSCI = \sqrt{\frac{1}{N} \sum_{i=1}^N (M_{it} - M_{i(t-1)})^2} \quad (1)$$

M_{it} and $M_{i(t-1)}$ indicates the rate of i goods in total trade volume in t period and $t-1$ period respectively. N refers to the quantity of types of goods with regard to Standard International Trade Classification (SITC).

According to the Standard International Trade Classification (SITC), international trade commodities are classified into ten categories SITC0-SITC9, which could be further classified as primary goods, intermediate goods, capital goods and consumer goods. (i) Primary goods, corresponding to SCITC0-SITC4, mainly refer to the resource products and agricultural raw materials, namely raw products, mainly including crude oil, coal, iron ore, and grain. The import of primary products (especially resources) can alleviate the pressure of energy and mineral resources shortage of importers; (ii) Intermediate goods, corresponding to SITC5-SITC6, refer to products which are in the processing before becoming the final product and have to go through a series of production processes from primary product to final consumption, including chemical products, yarn, and other textile intermediate products. The import of intermediate goods can drive the export of processing trade and has a substantial positive effect on the general trade exports and domestic consumption; (iii) Capital goods, corresponding to SITC7, refer to the machinery and equipment that enterprises use for production, including machinery equipment and electrical tools. The import of capital goods can not only fill the gaps of similar goods of importers, but also promote the domestic technology and improve the production efficiency; (iv) Consumer goods, corresponding to SITC8, refer to the products needed to satisfy the requirements in daily life, mainly refers to clothing, furniture and audio-visual equipment. The import of consumer goods can create new market demand and promote the development of new industries. (v) Other, corresponding to SITC9. To ensure data integrity, SITC9 is retained but without special analysis.

2. The import trade structure change of Laos

As is shown in Figure 1, the import trade structure change index of Laos remains

at the low level of 0.006-0.025 and keeps stable during 2000-2014 on the whole. The maximum, minimum and mean of import TSCI in Laos is 0.025, 0.006 and 0.014 respectively. During 2000-2014, the import TSCI of Laos declined from 0.025 in 2000 to 0.014 in 2001 and further decreased to the minimum value of 0.006 in 2007 gradually. Later, it rose to 0.017 in 2009 and kept stable until 2013 but decreased to 0.10 in 2014. Obviously, the import TSCI of Laos fluctuates within a narrow range and remains at the low level of below 0.025.

Reference Pei (2013), the import TSCI could be an indicator of economic development. The stronger the economic growth, the higher the requirement on quantity and variety of various products would be. It leads to insufficient domestic supply to a certain extent, and increases the change degree of trade structure. In this case, lower import TSCI of Laos shows inadequate economic vitality and slow economic growth domestically. The government should endeavour to encourage domestic investment, enlarge domestic demand, and boost economy.

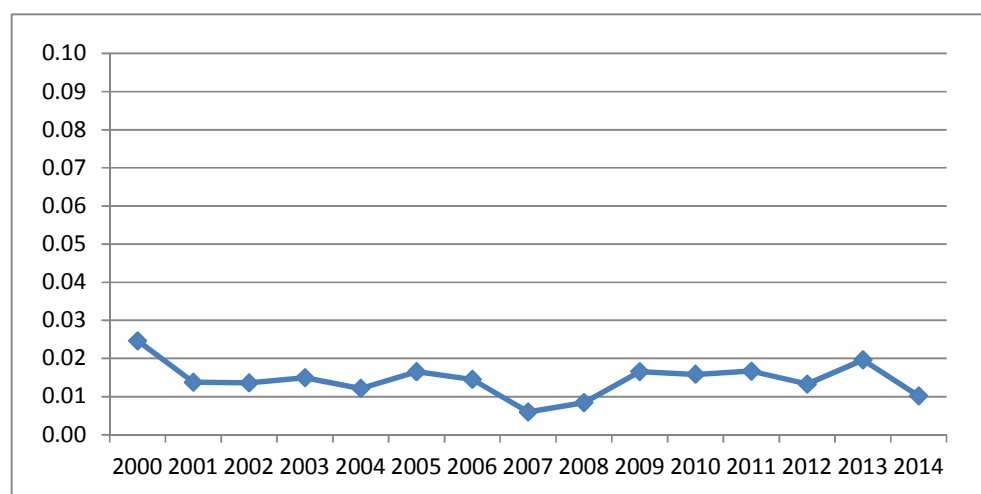


Figure.1 The import trade structure change index of Laos, 2000-2014

For further analysis of the import trade structure in Laos, product composition is shown in Figure 2. Among the four categories, primary goods, intermediate goods and capital goods have higher proportions than consumer goods apparently. The average proportion of primary goods, intermediate goods, capital goods and consumer goods in 2000-2014 is 31.02%, 27.61%, 35.15%, and 4.95% respectively.

As for the relation between the import product composition and the economic growth, the import of capital goods is an important driver to boost economy since capital goods is the most essential factor that could help implement the effect of other factors of production. The ever-rising import of capital goods has become an important phenomenon globally and makes the effect of capital goods import on

economic growth much more significant. While the proportion of capital goods in Laos has not always been the largest, it still increased from 35.66% in 2000 to 43.98% in 2014. Insufficient import of capital goods could be a reason of slow economic growth domestically. At the same time, the demand of primary goods import became weaker with its proportion decreasing from 28.40% in 2000 to 27.49% in 2014. This could be as a result of economic development in modern society where demand for quality and diversity of products becomes more important and leading to comparative decrease in primary goods.

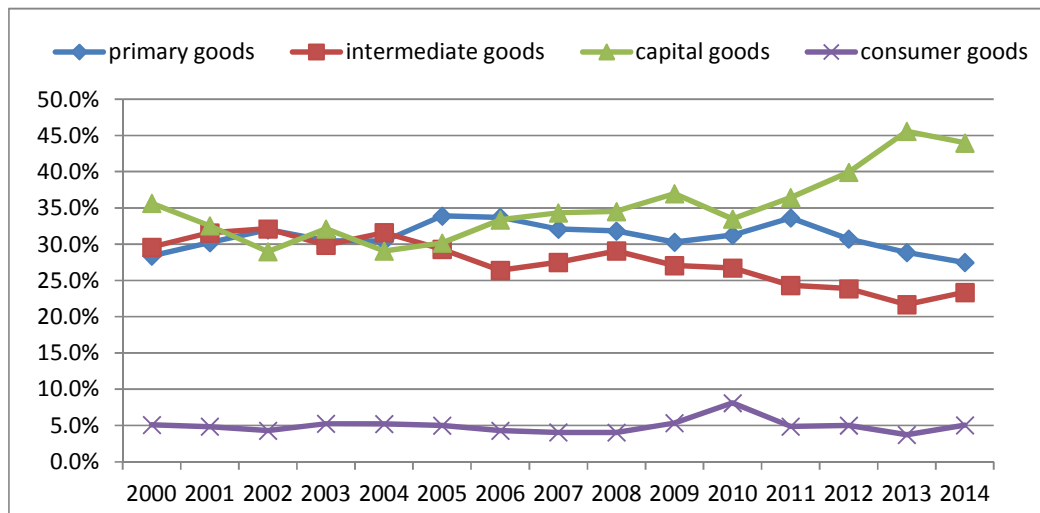


Figure.2 The import product composition in Laos, 2000- 2014

3. The export trade structure change of Laos

As is shown in Figure3, the export trade structure change index of Laos fluctuates significantly between 2000-2014. The maximum, minimum, and mean of export TSCI in Laos is 0.095, 0.008, and 0.037 respectively. During 2000-2014, the export TSCI of Laos declined sharply from 0.095 in 2000 to 0.038 in 2001 but rose sharply to 0.082 in 2006 only to decrease to 0.037 in 2014 gradually after a rise in 2009. The Laos export TSCI has changed significantly to stay at the high level, especially when compared with import TSCI.

Export TSCI could reflect the product competitiveness to some extent. With superior product competitiveness, which could be high technology, unique resources, high quality, special design, or impeccable service, a country should not be easily affected by the international trade market as their products are special and difficult to substitute. In this case, comparatively stable demand of each product and general export trade structure could be formed and results in the lower export TSCI. While the export TSCI of Laos changes a lot and remains at the high level, there remains unsteady export trade structure and comparatively weak product competitiveness. The

most significant product competitiveness of Laos could be cheap labour and primary materials, contributing to the high proportion of primary goods export.

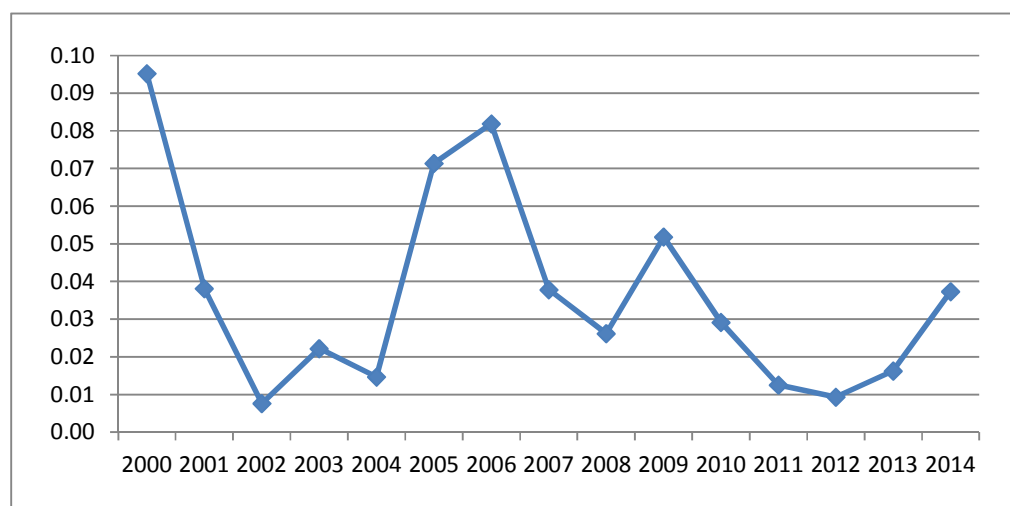


Figure.3 The export trade structure change index of Laos, 2000-2014

As is shown in Figure 4, among the four categories, primary goods, intermediate goods and consumer goods apparently have higher proportions than capital goods. The average proportion of primary goods, intermediate goods, capital goods, and consumer goods in 2000-2014 is 51.51%, 20.27%, 3.92%, and 23.41% respectively.

Generally, there are plenty of agricultural primary products such as crude vegetable materials, plants, and seeds in Laos, however, an underdeveloped economy and not up-to-date technology hinders Laos from producing competitive products with high value-addition. As a result, the proportion of primary goods remains much higher than other goods. Prior to 2007, major export products were low value-added products such as wood, mining and agriculture products leading to the proportion of primary goods remaining as high as 40-50%. But at the same time, the proportion of intermediate goods kept going up and even higher than primary goods in 2007 and 2008, whereas the rising proportion decreased, the proportion of primary goods ranked first again in 2008 when the subprime mortgage crisis broke out. This is because the crisis led to the breaking up of many domestic enterprises capital chain and its negative impact on the intermediate goods with longer supply chain and larger fund demand being much larger than the primary goods. In this case, the proportion of intermediate goods decreased and that of primary goods increased after 2008. Until 2014, the proportion of primary goods reached the maximum of 72.14%.

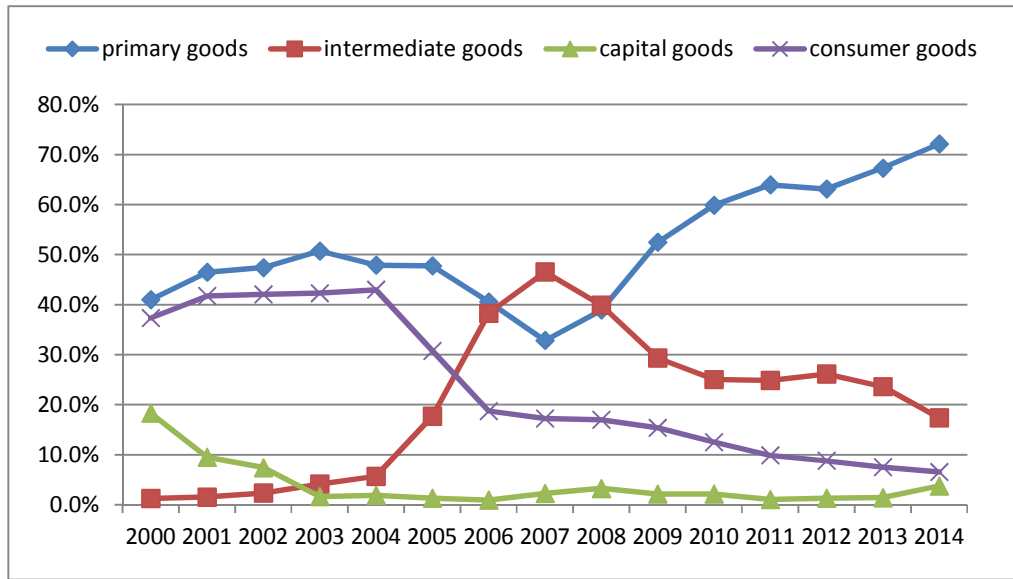


Figure.4 The export product composition in Laos, 2000- 2014

IV. The determinants of international trade structure change in Laos

1. Panel data regression model

Regression analysis is a statistical process for estimating the relationships among variables. Regression analysis helps understand how the typical value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held fixed. In all cases, the estimation target is a function of the independent variables called the regression function. In regression analysis, it is also of interest to characterize the variation of the dependent variable around the regression function which can be described by a probability distribution. Panel data refers to multi-dimensional data frequently involving measurements over time. Panel data contain observations of multiple phenomena obtained over multiple time periods for the same firms or individuals. A panel data has the form of X_{ij} , $i=1,\dots,N$; $t=1,\dots,T$, where i is the individual dimension and t is the time dimension.

A general panel data regression model is written as:

$$y_{it} = \alpha + \beta'X_{it} + \mu_{it} \quad (2)$$

Different assumptions can be made on the precise structure of this general model and two important models are fixed effects model and random effects model. The fixed effects model is donated as:

$$\begin{aligned} y_{it} &= \alpha + \beta'X_{it} + u_{it} \\ u_{it} &= \mu_{it} + v_{it} \end{aligned} \quad (3)$$

μ_{it} are individual-specific, time-invariant effects.

The random effects model assumes in addition that:

$$\begin{aligned}\mu_{it} &\square i.i.d.N(0, \sigma_{\mu}^2) \\ \nu_{it} &\square i.i.d.N(0, \sigma_{\nu}^2)\end{aligned}\tag{4}$$

The two error components are independent from each other.

Fixed or random effects are econometric methods to estimate a model. The Hausman test enables to determine if it is the fixed or the random model that is the appropriate method for the model. It also checks a more efficient model against a less efficient but consistent model to ensure that the more efficient model also gives consistent results. Usually, the null hypothesis is random effects model while the alternative hypothesis is fixed effect. If the test rejects null hypothesis, then random effects is biased and fixed effects is the correct estimation procedure.

To conclude, panel data regression model could estimate the relationships among variables and the Hausman test could assess whether fixed effects or random effects is appropriate. This paper uses panel data regression model and Hausman test to estimate the determinants of international trade structure change in Laos.

2. Variables and data

According to relevant researches mentioned above, GDP, domestic capacity, income level, factor endowments and trading costs are all important factors that could influence the international trade volume of a country. But the impact factors of international trade structure change could be somehow different. With reference to relevant researches, the impact factors of international trade structure change of Laos could be classified into two categories generally.

The first category consists of general factors such as GDP, FDI, market scale, income level, international trade that could reflect the economic dynamism of Laos. Countries with economic dynamism usually have higher requirement on the quantity and variety of various products, which leads to insufficient domestic supply to a certain extent, and increases the change degree of import trade structure. The more dynamic the economy is, the more frequent the import trade structure change would be. Thus, GDP, GDP per capita, FDI inflows, and international trade volume are selected to be the general factors that could reflect the economic dynamism of Laos and influence the international trade structure change of the country.

The second category includes special factors such as FTA and the economic structure. Since joining AFTA on 23 July 1997, Laos has increased its international trade volume significantly. AFTA has significant effect on the international trade volume of Laos (Keochaiyom, 2015). It is assumed that AFTA may influence the international trade structure change of Laos deeply, due to the fact that expanded international trade volume could increase the export of competitive products like primary goods and raise the import of uncompetitive products like capital goods in the country. Besides, the economic structure similarity between Laos and other trading countries could be another special factor that influences the international trade structure change of Laos. It is a unique impact factor that influences the trade structure change rather than trade volume. Countries having similar industrial structure could easily find substitute products domestically once their trading products were influenced by the international trading market. They are not greatly dependent on each other and could change their trading structure comparatively easier than those with lower economic structure similarity. Thus, AFTA and economic structure similarity are selected to be the special factors that influence the international trade structure change of Laos.

The econometric models are:

$$\ln TSCI_{IMlit} = \alpha_0 + \alpha_1 \ln GDP_{lit} + \alpha_2 \ln GDP_{it} + \alpha_3 \ln GDPP_{lit} + \alpha_4 \ln GDPP_{it} + \alpha_5 \ln FDI_{it} + \alpha_6 ESS_{lit} + \alpha_7 D_{lit} + \alpha_8 \ln SEA_{it} + \alpha_9 \ln TRADE_{lit} + \mu_{lit} \quad (5)$$

$$\ln TSCI_{EXlit} = \alpha_0 + \alpha_1 \ln GDP_{lit} + \alpha_2 \ln GDP_{it} + \alpha_3 \ln GDPP_{lit} + \alpha_4 \ln GDPP_{it} + \alpha_5 \ln FDI_{it} + \alpha_6 ESS_{lit} + \alpha_7 D_{lit} + \alpha_8 \ln SEA_{it} + \alpha_9 \ln TRADE_{lit} + \mu_{lit} \quad (6)$$

Where $TSCI_{IMlit}$ is the import TSCI between Laos and each trading countries^②, $TSCI_{EXlit}$ is the export TSCI between Laos and each trading countries, l is Laos, t is time period (year), i is 27 trade partner countries, μ_{lit} is error terms.

(1) GDP_{lt} , GDP_{it} , $GDPPER_{lt}$, $GDPPER_{it}$ is the GDP of Laos, GDP of country i , GDP per capita of Laos, GDP per capita of country i in year t respectively. These variables are the general economic factors that reflect the economic power, market scales and potential purchasing power of Laos and trading countries.

(2) FDI_{it} denotes the FDI inflow into Laos in year t . The relationship between

^② 27 trading countries that has established international trade relationship with Laos are selected, that is, Australia, Belgium, Cambodia, Canada, China, Denmark, France, Germany, Hong Kong SAR, China, India, Indonesia, Italy, Japan, Korea, Rep., Malaysia, Netherlands, New Zealand, Norway, Philippines, Russian Federation, Singapore, Switzerland, Taiwan, Thailand, United Kingdom, United States, Vietnam. All data comes from COMTRADE and World Bank database.

FDI and trade is not a new topic for discussion among the international trade researches, Mundell (1975) proved that FDI was able to substitute import and import would decrease if FDI increased. Later, Krugman (1991) pointed out that FDI and trade have a substituted relationship.

(3) ESS_{lit} denotes the economic structure similarity between Laos and country i in the year t . According to the United Nations Industrial Development Organization (UNIDO) in 1979, the formula of ESS_{lit} is:

$$ESS_{lit} = \frac{\sum_{m=1}^k x_{lmt} x_{imt}}{\sqrt{\sum_{m=1}^k x_{lmt}^2 \sum_{m=1}^k x_{imt}^2}} \quad (0 \leq ESS_{lit} \leq 1) \quad (7)$$

Where ESS_{lit} refers to the economic structure similarity between Laos and country i , x_{lm} refers to the proportion of GDP sector composition m in Laos, x_{im} represents the proportion of GDP sector composition m in i country. The value of ESS_{lit} is between 0 and 1. If $ESS_{lit} = 0$, it means that the economic structure similarity in Laos and i country is totally different, if $ESS_{lit} = 1$, it means that the economic structure similarity in Laos and i country is totally the same.

(4)AFTA. The impact of AFTA on the international trade in Laos has been demonstrated by Keochaiyom (2015). The impact of AFTA can be measure by two variables. The first one is dummy variable D_{lit} , a binary variable that is given 1 when country i has established AFTA membership with Laos or otherwise given 0. The other variable is SEA_{it} which denotes the size of economy of AFTA in the year t . Neo-classical trade theory predicts that large countries tend to be net exporters in scale-intensive industries (Krugman and Helpman,1985; Krugman and Anthony,1995). Large-size economy of FTA reflects plenty of memberships, wide variety of commodity, strong purchasing power, large market demand and supply which could certainly benefit each membership within the free trade zone. The calculation of this variable is to sum all the real GDP of all membership and the other AFTA trade dialogue partner countries in the year t , excluding Laos.

(5) $TRADE_{lit}$. $TRADE_{lit}$ refers to the trade volume between Laos and country i . Trade volume could reflect the trade status between two countries. In regression model, $TRADE_{lit}$ is the import trade volume and the export trade volume when the dependent variable is the import trade structure change index and the export trade structure change index respectively.

3. Regression results analysis

3.1 The results of import trade structure change

According to equation (5), the dependent variable is $TSCI_{IMit}$, which refers to the import TSCI between Laos and 27 other trading countries^③. This calculation could include more information than the import TSCI of Laos's total import. The Hausman test results and regression results of equation (5) are shown in Table 1 and Table 2.

Table 1 the Hausman test results of the import trade structure change

	Coefficients			
	(b) fixed	(b) random	(b-B) Difference	Sqrt(diag(v_b-v_B)) S.E.
$GDPP_{lit}$	0.0137506	0.0095860	0.0041646	0.1361874
D_{lit}	0.0010319	-0.0109335	0.0119655	0.0141674
SEA_{lit}	0.0034441	0.0059710	-0.0025269	0.0036666
$TRADE_{lit}$	-0.0044694	-0.0161181	0.0116487	0.0036766
GDP_{lit}	0.0463001	0.0025844	0.0437157	0.1281878
GDP_{lt}	3.7251620	3.3948530	0.3303092	0.2091899
$GDPP_{lt}$	-4.6925650	-4.2342660	-0.4582993	0.2796004
FDI_{lt}	0.0133742	0.0128143	0.0005599	0.0000000
ESS_{lit}	0.2988592	0.2798996	0.0189596	0.0946077

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$\chi^2(1) = (b-B)'[(V_b-V_B)^{-1}](b-B) = 17.44$

Prob> $\chi^2 = 0.0423$

The results in Table 1, show the probability value is 0.0423 and less than the significant level (at the 0.05 level), meaning that the null hypothesis is rejected and the alternative hypothesis is accepted. It means that fixed effect is the most appropriate model, and therefore the fixed effects model is chosen to estimate the determinants of import trade structure change.

Table2 Regression results of the import trade structure change

Variable	(1)	(2)	(3)	(4)	(5)
$GDPP_{lit}$	0.014 (0.10)				

^③ Results are not listed in the paper, if needed, readers could ask for the calculation results from the author.

D_{lit}	0.001 (0.05)	0.001 (0.07)			
SEA_{it}	0.003 (0.20)	0.004 (0.21)	0.004 (0.21)		
$TRADE_{lit}$	-0.004 (-0.95)	-0.004 (-0.95)	-0.004 (-0.96)	-0.004 (-0.95)	
GDP_{lit}	0.046 (0.36)	0.059 * (1.88)	0.059 * (1.93)	0.060 * (1.96)	0.061 ** (2.02)
GDP_{lt}	3.725** (2.02)	3.713 ** (2.03)	3.726 ** (2.04)	3.646 ** (2.05)	3.583 ** (2.01)
$GDPP_{lt}$	-4.693** (-2.07)	-4.679 ** (-2.07)	-4.695 ** (-2.09)	-4.588 ** (-2.1)	-4.519 ** (-2.07)
FDI_{lt}	0.013* (1.72)	0.013* (1.72)	0.013* (1.72)	0.014 ** (2.04)	0.014 ** (1.99)
ESS_{lit}	0.299* (1.84)	0.300* (1.86)	0.301 * (1.86)	0.286 * (1.96)	0.277 * (1.91)

Note: ***, ** and * indicates significant at 1 %, 5% and 10 % respectively, none means insignificant. Values in “()” are t-value.

The effects of GDP_{lit} , and, GDP_{lt} on the import trade structure of Laos are significant and positive, especially the country's GDP. This is because larger GDP of Laos reflects larger domestic demand and places a higher requirement on the variety, quantity and quality of products. This could result in the insufficient and diversified domestic supply to a certain extent, and the import trade products would need to be changed constantly to meet insufficient domestic needs. In this case, the larger the GDP is, the larger the import trade structure change would be. However, the coefficient of $GDPP_{lt}$ is negative and that of $GDPP_{lit}$ is insignificant. Both are inconsistent with the expectations and theoretical analysis. It may be caused by the huge regional difference in Laos. There are still several minorities living in the mountains and staying away from the modern society. It weakens the explanatory power of GDP per capita and makes its effect on the import trade structure change unreasonable and incorrect.

As for the effect of FDI on the import trade structure, the coefficient is significant and positive. It is due to the larger amount of FDI inflow leading to

increased products produced domestically both in quantity and category. This could increase the domestic needs of diversified complementary products and intermediate products, which would result in insufficient domestic supply and affect the import structure. In such scenario, the larger the FDI is, the larger the import trade structure change would be.

Also, the coefficient of ESS_{lit} is significant and positive. It stays consistent with expectation. Similar industrial structure may result in large trade structure change due to the fact that countries having similar product structure could easily find substitute products within their own boundaries once their trading products were influenced by the international trading market. They are not greatly dependent on each other in international trade, and can change their trading structure comparatively easier than that with lower economic structure similarity.

Additionally, the effects of D_{lit} and SEA_{lit} that reflect AFTA are both insignificant. However, according to Keochaiyom (2015), AFTA has significant effect on both the import trade volume and the export trade volume of Laos. The difference may find out that the impact of AFTA on the international trade of Laos needs to be intensified, since its effect remains at the primary stage an which can only increase or decrease the trade volume of Laos. The insignificant effect reveals that the effect of AFTA has not developed to the higher stage which could deeply change the trade pattern of Laos. Joining AFTA certainly plays a critical role in the international trade of Laos, whereas, Laos still has a long way to go to make AFTA benefit from the international trade competitiveness and improve the trade structure.

To conclude, the determinants of the import trade structure of Laos are GDP, FDI and the economic structure similarity with other countries.

3.2 The results of export trade structure change

According to equation (6), the dependent variable is $TSCI_{EXlit}$, which refers to the export TSCI between Laos and other 27 trading countries^④. This calculation could include more information than export TSCI of Laos total export. The Hausman test results and regression results of equation (6) are shown in Table 3 and Table 4.

Table 3 the Hausman test results of the export trade structure change

	Coefficients			
	(b)	(b)	(b-B)	Sqrt(diag(v_b-v_B))

^④ Results are not listed in the paper, if needed, readers could ask for the calculation results from the author.

	fixed	random	Difference	S.E.
$GDPP_{lit}$	0.0555595	-0.0221531	0.0777127	0.1702239
FDI_{lt}	-0.0026025	-0.0021995	-0.000403	0.0000000
$GDPP_{lt}$	2.445537	3.874296	-1.428758	0.2617403
GDP_{lt}	-2.014312	-3.134582	1.12027	0.1831495
$TRADE_{lit}$	-0.0042756	-0.0133619	0.0090863	0.0027979
ESS_{lit}	0.1999391	-0.1083249	0.308264	0.1190713
GDP_{lit}	-0.1236492	-0.0074181	-0.1162311	0.1616331
D_{lit}	-0.0350254	0.0189623	-0.0539877	0.0183516
SEA_{lit}	0.019577	0.0007263	0.0188508	0.0050286

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$\chi^2(1) = (b-B)'[(V_b - V_B)^{-1}](b-B) = 17.80$

Prob> $\chi^2 = 0.0375$

450 The results in Table 3 show the probability value is 0.0375 and less than the
451 significant level (at the 0.05 level), meaning that the null hypothesis is rejected and
452 the alternative hypothesis is accepted. It means that fixed effect is the most
453 appropriate model, and therefore the fixed effects model is chosen to estimate the
454 determinants of export trade structure change.

455 Table4 Regression results of the export trade structure change

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$GDPP_{lit}$	0.056 (0.33)						
FDI_{lt}	-0.003 (-0.27)	-0.003 (-0.27)					
$GDPP_{lt}$	2.446 (0.86)	2.503 (0.89)	2.098 (0.88)				
GDP_{lt}	-2.014 (-0.88)	-2.065 (-0.90)	-1.733 (-0.90)	-0.038 (-0.73)			
$TRADE_{lit}$	-0.004 (-1.10)	-0.004 (-1.12)	-0.004 (-1.13)	-0.004 (-1.08)	-0.005 (-1.20)		
ESS_{lit}	0.200 (0.96)	0.205 (0.99)	0.208 (1.00)	0.276 (1.44)	0.194 (1.25)	0.227 (1.49)	
GDP_{lit}	-0.124	-0.073*	-0.072*	-0.068*	-0.074*	-0.093**	-0.073**

	(-0.76)	(-1.76)	(-1.74)	(-1.65)	(-1.84)	(-2.54)	(-2.14)
D_{lit}	-0.035 (-1.35)	-0.033 (-1.31)	-0.033 (-1.31)	-0.036 (-1.45)	-0.035 (-1.39)	-0.044* (-1.86)	-0.045* (-1.91)
SEA_{it}	0.020 (-0.91)	0.020 (0.92)	0.017 (0.90)	0.028* (1.85)	0.019* (2.24)	0.019** (2.26)	0.021*** (2.62)

Note: ***, ** and * indicates significant at 1 %, 5% and 10 % respectively, none means insignificant. Values in “()” are t-value.

As is shown in Table 4, none of the nine variables is always significant, while after stepwise regression, there are finally three variables significant. This could be the result of Laos's serious trade deficit problem and small export trade volume. Panel data analysis requires large and stable source data, but compared with the large and stable data of import, that of export in Laos is insufficient. Source data shows, the export trade volume of Laos accounts for only 50% of the export trade volume during 2000-2014, and the missing data of export is also more than import. Although we have filled the missing data and modified some outliers, the insufficient source data problem still exists and it indeed stays consistent with Laos actual export trade status. According to the data obtained from the Ministry of Industry and Commerce of Laos, in the past decade, the major export products of Laos are wood, mining, and agriculture products. But in recent years, the government reduced or quit the export quotas of wood and mining, possibly leading to the decreasing export trade volume when compared with the import. In this case, the smaller and unsteady database weakened the explanatory power of the export model and the result is somewhat not as good as the import model.

To conclude, the determinants of the export trade structure of Laos are GDP and AFTA, but the explanatory power remains uncertain.

V. Conclusions and recommendations

In According with the Standard International Trade Classification (SITC), we further classified the goods into primary goods, intermediate goods, capital goods and consumer goods, and used the Trade Structure Change Index (TSCI) to analyse the trade structure change of Laos in 2000-2014. This was followed by the panel data regression analysis with fixed effects model used to discuss the determinants of trade structure change of Laos both in import and export. This paper presents a comparatively new and complete research framework for relevant studies about the

international trade structure, which could not only be used for a study on Laos, but also on least developing, developing, and developed countries such as Cambodia, Vietnam, India, China Singapore, Japan and other economic regions of the world. It could help to analyse the current status, explain the reasons, and give suggestions to improve the international trade structure for all countries in the international trade market. This could be one of the important contributions of the paper. Another important contribution is the conclusions and suggestions for the Laos government, which are:

(1) The import TSCI of Laos fluctuates within a narrow range and remains at the low level of 0.006-0.025 during 2000-2014, showing inadequate economic vitality and slow economic growth domestically. The government should endeavour to encourage domestic investment, enlarge domestic demand and boost economy; Among the four categories, apparently primary goods, intermediate goods and capital goods have higher proportions than consumer goods and their average proportion in 2000-2014 is 31.02%, 27.61%, 35.15% and 4.95% respectively; The ever-rising import of capital goods has become an important phenomena globally since capital goods import is an important driver to boost economy, but the proportion of capital goods in Laos has not always been the largest, it could possibly explain the slow economic growth domestically.

(2) The export TSCI of Laos has changed greatly and stays at the high level mostly during 2000-2014, showing the unsteady export trade structure and comparatively weak product competitiveness; Among the four categories, apparently primary goods, intermediate goods and consumer goods have higher proportions than capital goods and their average proportion in 2000-2014 is 51.51%, 20.27%, 3.92% and 23.41% respectively; The major export products of Laos are still low value-added products like agriculture products making the proportion of primary goods as high as 72.14% in 2014. This conclusion stays consistent with Vixathep (2011). Governments should endeavour to promote technical progress and improve product competitiveness.

(3) The determinants of import trade structure of Laos are GDP, FDI and the economic structure similarity with other countries, but the effect of AFTA still stays at the primary stage that only increase or decrease the trade volume (Keochaiyom, 2015). It has not developed to the higher stage that could change the trade pattern of Laos deeply. Governments should grasp this opportunity and make AFTA benefit the

518 international trade competitiveness and improve the trade structure.

519 (4) The determinants of export trade structure of Laos are GDP and AFTA, but
520 the explanatory power remains uncertain. None of the nine variables is always
521 significant and there are only three variables significant after stepwise regression.
522 This is because the imperfect export database. Laos has serious trade deficit problem
523 and very small export trade volume, which makes the data of export not as perfect as
524 the import. Although we have filled the missing data and modified some outliers, the
525 smaller and unsteady database weakened the explanatory power of export model.

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