THESIS APPROVAL

GRADUATE SCHOOL, KASETSART UNIVERSITY

Master of Science (Agricultural Economics)

DEGREE

Agricultural Economics | Agricultural and Resource Economics

FIELD | **DEPARTMENT**

TITLE: An Analysis of Import Demand for Thai Tsnr in China

NAME: Miss Ketkamon Sunthornkaweekit

THIS THESIS HAS BEEN ACCEPTED BY

_____ **THESIS ADVISOR**

(Assistant Professor ApichartDaloonpate, Ph.D.)

_____ **THESIS CO-ADVISOR**

(Mr. NuttaponPhotchanaprasert, Ph.D.)

_____ **DEPARTMENT HEAD**

(Mr. DecharutSukkumnoed, Ph.D.)

APPROVED BY THE GRADUATE SCHOOL ON _____

_____ **DEAN**

(Associate Professor GunjanaTheeragool, D.Agr.)

THESIS

AN ANALYSIS OF IMPORT DEMAND FOR THAI TSNR IN CHINA

KETKAMON SUNTHORNKAWEEKIT

A Thesis Submitted in Partial Fulfillment of
the Requirements for the Degree of
Master of Science (Agricultural Economics)
Graduate School, Kasetsart University
2015

Ketkamon Sunthornkaweekit 2014: An Analysis of Import Demand for Thai Tsnr in China. Master of Science (Agricultural Economics), Major Field: Agricultural Economics, Department of Agricultural and Resources Economics. Thesis Advisor: Assistant Professor Apichart Daloonpate, Ph.D. 91 pages.

This research aimed to analyze the factors affecting import demand for technically specified natural rubber (Tsnr) exported from various countries to the Chinese market. The main exporting countries in terms of Chinese import value of Tsnr were Thailand, Indonesia, Malaysia, Vietnam, and Others. These five exporting countries were selected for this study. According to the analysis, the Linear Approximated Almost Ideal Demand system (LA/AIDS) was employed using the Restricted Seemingly Unrelated Regression (RSUR) method. Monthly time-series data from November 2003 to December 2013 were used in the analysis.

The results from the analysis showed that the factors that affected the Chinese demand for Tsnr from Thailand were own-prices, Malaysia prices, Vietnam prices, and total expenditure for the Tsnr. Own-price elasticity of demand for Thai Tsnr was elastic. Malaysian Tsnr was found to be a substitute for Thai Tsnr. Vietnamese Tsnr was a complementary good with Thai Tsnr. In addition, expenditure elasticity of demand for Thai Tsnr in the Chinese Market was inelastic, indicating that Thai Tsnr was a necessary good.

The problems exporters face normally relate to transportation and government documentation. If these problems were solved, it would clearly increase facilities to exporters.

_____ _____ ___ / ___ / ___

Student's signature Thesis Advisor's signature

ACKNOWLEDGEMENTS

First, I would like to express my inmost gratitude to Assistant Professor Dr. Apichart Daloonpate, my thesis advisor for his encouragement, valuable advice and worthy suggestions during my course and research. I could not say thank you enough for his extraordinary support and guidance. My gratitude also goes to Dr. Nuttapon Photchanaprasert, my thesis co-advisor, for his suggestions and helpful recommendations about my study. Moreover, I am also especially thankful to Associate Professor Dr. Vute Wangwacharakul for his beneficial guideline and practical comments on my thesis proposal. Special thanks also go to all mentors and entire staff of Agricultural Economics (English Program) at Kasetsart University.

Second, there were numerous Ph.D. and M.S. graduates giving their support, collaboration and consultation to me all along the M.S. study; Dr. Rattiya Suddeephong Lippe, Dr. Puttiphat Thaweevachiraphat, Ms. Benjawan Khongkhon, Ms. Thuntada Mawongwai, Mr. Pattanapong Tiwasing, Mr. Sutthiporn Poolsawas, Mr. Tanuwat Sirimarttayapan,, and Debt V' Monk group. I really want to show my appreciation to them all as well.

Last, I would like to special thanks to my parents and my family. Without their love and support, I cannot come this far. I also would like to thanks my sister and her husband, Ms. Ketkanok Sunthornkaweekit and Mr. Jiraprawat Khattiya for their heartening support.

Ketkamon Sunthornkaweekit

October 2014

TABLE OF CONTENTS

Page

TABLE OF CONTENTS (CONTINUED)

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (CONTINUED)

CHAPTER I

INTRODUCTION

Statement of the Problem

Thailand is one of the world's leading producers and exporters of Natural Rubber (hereafter called NR). With a production capacity of 3.1– 3.2 million tons per year, Thailand has become the top exporter, accounting for 44.39% of the global market, followed by Indonesia, and Malaysia, 34.92%, and 10.94%, respectively. 88-90 percent of its total production is exported to foreign markets (China about 44%, followed by Malaysia, Japan and South Korea, as shown in Appendix A; Table 1). The NR types that Thailand exports are Technically Specified Natural Rubber, Tsnr (Standard Thai Rubber) 42.79%, Latex 30.21%, Ribbed Smoked Sheet 23.54%, and others 3.46% (GTIS, 2014).

Figure 1 shows the world natural rubber imports by country in 2004 and 2013. China is the largest rubber importing country in the world and the share of NR consumption in China compared to the world market rose from 18% in 2004 to 32% in 2013.

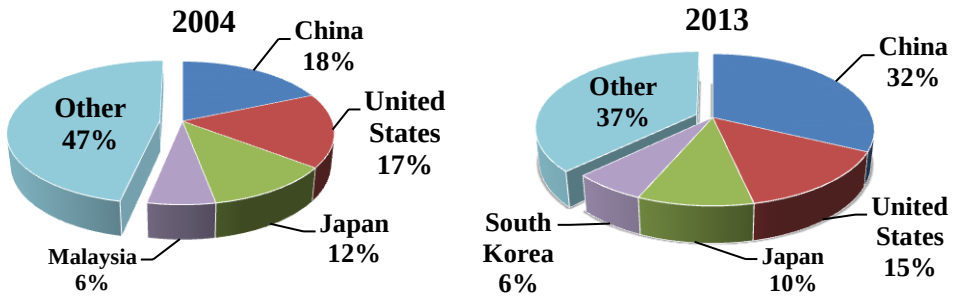


Figure 1 The world natural rubber imports 2004 and 2013
Source: Global Trade Atlas (2014)

GTIS reported that in 2013, Chinese demand for the NR is Natural Rubber Latex (Latex) 14%, Natural Rubber Smoked Sheets (RSS) 13%, Technically Specified Natural Rubber (Tsnr) 72% and Others 1%. The import trends of Tsnr

continue increasing because the standard of Tsnr is better than RSS. Manufacturers turned to use Tsnr as a raw material in the manufacture of tires. Tsnr is easier to process and to produce because it is more resistant to tears than RSS. Moreover, output is much higher quality when using Tsnr as a raw material and the average price of Tsnr is cheaper than RSS (AFET, 2014).

In 2013, China imports Tsnr from Thailand, Indonesia, Malaysia, and Vietnam which represented 96% of the total Tsnr in the Chinese market, as shown in Appendix A; Table 2. In the past decade, China has increased its demand for Tsnr continuously. Thailand had always been the leader in the market. However, after 2003, Thailand's market share has fluctuated. Thailand and other Tsnr exporters have each been the market leader at various times. While exports from Thailand and Vietnam decreased, Malaysia and Indonesia increased and overtook Thailand in terms of market share in 2006. It showed that Thailand's market share declined to its lowest share in the past 10 years. In 2008, the market share of Thailand has risen to be market leader again; meanwhile, Malaysia's market share has declined. In 2009, Thailand was the leader in the market; however, the market share of Indonesia has increased to almost equal Thailand's market share in the Chinese market. After that, 2010, the market share of Thailand increased while the shares of Indonesia and Malaysia declined. Until 2013, the market share has reversed and Thailand has dropped against the shares of Indonesia and Malaysia which have increased (Figure 2). It shows that Tsnr in the Chinese market is extremely volatile.

The figure 2 clearly reveals that China is the largest importer of NR, and the market is highly competitiveness. Moreover, Chinese imports of Tsnr have been continuous, as shown in Appendix A; Table 2. Thailand is the top exporter of natural rubber in the world. The major exporting product is Tsnr which generates high income to farmers in Thailand. Furthermore, Thailand is also the leader exporter of Tsnr to China. In the last decade, Thailand's Tsnr market share in the Chinese market has fluctuated, while the trend of Thai NR exports to China is increasing, as shown in Appendix A; Figure 1. Since 2008, China has increased imports of NR from Thailand while the value has decreasing which indicates that Tsnr is a main NR product to

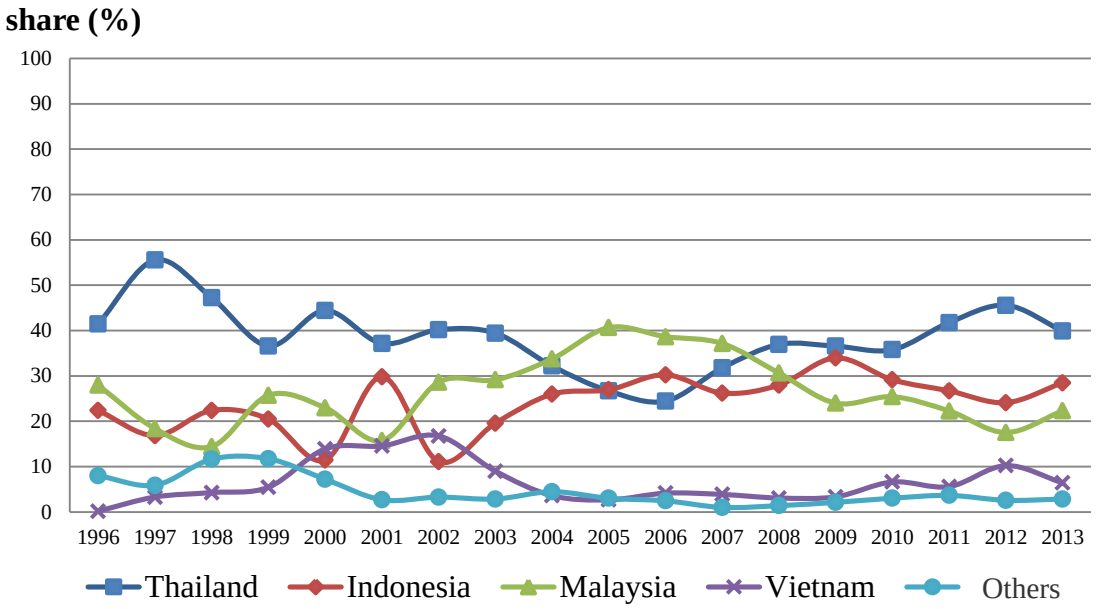


Figure 2 Import share of Tsnr in China

Source: Global Trade Atlas (2014)

generate income for Thailand, as shown in Appendix A; Figure 2. It can be seen that most NR export revenue from China depends on the volume of Tsnr. Therefore, if the volume of Tsnr fluctuates, it will affect the income that exporters receive. The more Thailand exports Tsnr to China, the more exporters generate income. This is the point of interest in the analysis about the import demand of Thai's Tsnr in the Chinese market including the problems and obstructions in Thai Tsnr exports to China. Therefore, this analysis includes the factors that affect import demand and studies the exporter's problems in the Chinese market. The result of this analysis will help the Department of International Trade Promotion or related organizations to create additional policies in order to raise export quantities and enhance the competitiveness of Thailand's Tsnr. Moreover, the results of this analysis can be applied to reduce the fluctuation of demand, create export market opportunities, and increase income for farmers and exporters of Tsnr to China and the rest of the world.

Objectives of the Study

The objectives of this study are:

1. To describe the general market situation for Thai Tsnr exports to China.

2. To identify the factors affecting import demand for Thai Tsnr in China.

3. To study the problems and obstacles of Tsnr exports facing Thai exporters.

Scope of the Study

To achieve the above objectives, the scope of this study is as follows:

Firstly, this study uses monthly data from November, 2003 to December, 2013 on harmonized commodity description and coding System (HS) of trade nomenclature at the 6-digit code level as used in the reporting of trade flows in the Rubber Statistical Bulletin following, 400122, technically specified natural rubber (Tsnr) from various countries exporting to the Chinese market. The main exporting countries in terms of Chinese import value of Tsnr are Thailand, Indonesia, Malaysia, Vietnam, and Others. These five exporting countries are selected for this study. Secondly, this paper studies problems and obstacles of Tsnr by using questionnaires to ask 25 Tsnr exporters in Thailand; however, only 5 voluntarily exporters give the interview.

Expected Benefit of the Study

The results of this study can present the market conditions in the exporting of rubber from Thailand to China, the factors that affect the demand for imports of rubber, and the problems and hurdles in exporting rubber to China. Moreover, the results of this study can also provide some guidelines to the government to help identify key policies to support exporters as well as producers in order to increase their products and the market share in the Chinese market. Lastly, the results of this study will suggest ways to improve the exporting of Tsnr to the government and exporters in order to increase the Tsnr export volume and to reduce the fluctuation of the demand in the Chinese market.

CHAPTER II

LITERATURE REVIEW AND RESEARCH METHODOLOGY

Review of Related Literatures

In order to apply the method for the empirical study model, the following section is divided into two parts; Part one is the review of literatures and Part two is the review of the theoretical framework which is related to this study.

1. Review of Related Literature

Review of Natural Rubber Studies

Udonsri (2001) studied an analysis of Thailand's NR export potential, utilizing Revealed Comparative Advantage (RCA) and Constant Market Share Model (CMS) in order to implement the appropriate export measures and policy to stimulate the export potential and recover the market share in the world market. The results of study indicated that the case of Latex, Thailand, Malaysia, and Indonesia benefited from revealed comparative advantages all period under the study. An increasing trend has been found in Thailand, meanwhile Malaysia and Indonesia continued in decreasing trend. Cases of RSS, all countries still continue in revealed comparative advantages, the similar trend for Thailand and Indonesia, which had gradually declined in the first of period following upturn trend in the second half. Case of the commodity Tsnr, only Malaysia and Indonesia substantial high in comparative advantage, meanwhile Thailand shown that it is no comparative advantage in such commodity. The analysis of constant market share model shown that the commodity Tsnr had maintain in the low compared to Malaysia and Indonesia. The rate of growth in export in the period of 1990-1992 shown in the moderately high compared to the period of 1993-1996 and 1997-1999. There was mainly reflected from the real competitive in the period of 1990-1992, especially in the Chinese market.

Wongmahan (2004) studied demand analysis of natural rubber especially Ribbed Smoked Sheet 3 (RSS3) and Standard Thai Rubber 20(STR20) imports from

Thailand to main importing countries: Japan, China and the U.S.A. by using an Ordinary-Least Squares Method (OLS). The results showed that the RSS3's Thai and Malaysia export prices have an influence on import demand in Japan. The Chinese RSS3 import demand depends on GDP deflated with CPI in China, RSS3export price from Thailand, SR from the U.S dollar price and monetary policy in the foreign exchange rate system in Thailand. In addition, the factors that affect STR20's import demand in the U.S.A. were own GDP deflated with CPI, STR20's Thai and Malaysia export prices and a dummy variable with elasticity values equal to 0.9397 -0.7642 0.6679 and 0.0194 respectively. For Thailand, this case might suggest the use of a non-price policy such as research and development in order to maintain quality. This paper's forecast of import demand found that Japan and the U.S.A. will increase import demand of RSS3 but China will not. Furthermore, China and the U.S.A.'s trends of STR20's import demand will increase while Japan's trend will decrease.

Sangpitak (2007) conducted an analysis of the U.S. import demand for rubber to analyze factors affecting import demand for Thai ribbed smoked sheet 3 (RSS3) and standard Thai rubber 20 (STR 20) in the U.S. The Linear Approximate Almost Ideal Demand System (LA/AIDS) was employed using the restricted seemingly unrelated regression (RSUR) method, using monthly time-series data from January 1989 to October 2006. The results showed the factors that affected the U.S. demand for Thai RSS 3 and STR 20 were their own prices, Malaysian prices and total expenditure for the rubber. The own-price elasticities of RSS 3 and STR 20 imply that they are necessary goods in the U.S. The cross-price elasticities of demand for both rubber types to Malaysian prices were positively inelastic, whereas the expenditure elasticities of demand for RSS 3 and STR 20 were positively elastic. The analytical results indicated that Thai RSS 3 and STR 20 were superior and good substitutes.

Panuwat (2007) studied the competitiveness of rubber industry in Thailand to analyze the capability of the competitiveness of international trading of Thai Para rubber and investigate the role of technology towards the trade competitiveness of Thailand in terms of Para rubber mainly compared with Indonesia and Malaysia as well as the crucial traders consisting of China, United State, European Union and Japan during the period of 1990-2006. The result indicated that the competitive

advantages of Thailand in the nation of competence and capability in exporting RSS and Latex are higher than competitors in the major markets. In contrast, Tsnr and others NR gained comparative disadvantages in United State, European Union markets, comparing with Indonesia and Malaysia for the determinants of competitiveness and found that average product plays an important to determine the competitiveness of Thailand and Malaysia. It was important to note that Thailand should support the R&D technology in the process of implementation in order to manage and control the quality of the product, especially in Tsnr and others NR. Thai government should encourage the exhibition and disseminate information about Thailand's NR for the major traders.

Phantamit (2008) studied "An Analysis of the Import Demand Levels for Thai Natural Rubber in some of the Major Trading Countries". The study aimed 1) to study the utilization status of natural rubber in the American, Japanese and Chinese industries and to study the import policies on natural rubber of the USA, Japan and China. 2) to analyze the import demand level of natural rubber in RSS, of Tsnr and of natural rubber latex in the USA, Japan and China by employing the Doublelog-linear model using the Seemingly Unrelated Regression (SUR) method. The data used in this paper were from 1990 to 2006, 1994 to 2006 and 1995 to 2006 for the USA, Japan and China, respectively. The results indicated that the USA and Japan have tended to decrease imports of natural rubber from Thailand. On the other hand, China has tended to import more from Thailand, with Tsnr having the highest imported demand, followed by natural rubber latex and natural rubber in RSS, respectively. In addition, the results showed that in Japan, rubber products processed from RSS were mostly for domestic consumption. In contrast, China and Japan imported natural rubber in RSS and Tsnr from Thailand to produce rubber products for export. With respect to natural rubber latex, all three countries imported and used it to produce rubber products for export globally. In the USA market, rubber in RSS from Thailand was considered as a normal good, whereas natural rubber latex was an inferior good. China defined Tsnr from Thailand as a normal good. Conversely, Japan considered Thai Tsnr as an inferior good.

Review of Import Demand for agricultural products

Vidyashankara *et al.* (1999) studied import demand for malt in European market using a Linear Approximate Almost Ideal Demand System (LA/AIDS) to estimate demand from four major malt importing countries: Japan, Brazil, the Philippines, and Venezuela. The elasticities of substitution for malt among different sources were computed. They found that malt imported from the EU was least substitutable with malt from other sources, and demand for EU malt was less responsive to changes in price. Expenditure elasticities indicated that the four importers spend proportionately more on malt imports from the EU compared to malt from other sources. This study concluded that price subsidy-based export expansion measures for non-EU malt might have had limited effects.

Won *et al.* (2001) studied Wheat demand in the Japanese flour milling industry using a production theory approach. This is mainly because (1) this study used a production theory approach by treating wheat as an input in the Japanese milling industry, while Wilson (1994) and Lee *et al.* (1994) used a translog demand system and the AIDS, respectively, by treating wheat as a consumer good and (2) this study focused on demand for different wheat classes in the Japanese milling industry, while the other studies analyzed Japanese import demand for different wheat classes from foreign sources. A production approach based on the translog cost function is used to analyze import demand for wheat differentiated by class and country of origin in the Japanese wheat flour milling industry. Results indicate that US wheat faces strong competition in the Japanese wheat market, but its multiple classes and end-use characteristics enable the US to preserve the largest market share in Japan.

The study of Feleke and Walters (2005) aimed at understanding the allocation of global import demand for green coffee among the world's largest economies using the differential production approach to the theory of the firm. The common approaches applied to import demand analysis of most agricultural products involve the use of consumer demand theory and production theory. Treating green coffee as an input because of the fact that it goes through some transformations before reaching consumers, they derive input demand functions from a cost minimization problem,

and estimate demand elasticities. Data for this study were the annual quantities of coffee (Mt) and value of imports ($ 1000) of green coffee were obtained from 1961 to 2003. The value of imports is on a cost, insurance, and freight (CIF) basis, which includes the costs of the product, insurance, and transportation. Unit imports values ($/kg), which proxy commodity prices, were obtained by dividing import values by import quantities. The method used to estimate the system of demand equations for coffee is Full Information Maximum Likelihood (FIML) in a Time Series Processor program (TSP4.4). The Likelihood Ratio test was used to test autocorrelation, symmetry and homogeneity. The demand for green coffee in the three largest world economies is perfectly price inelastic, implying that a fall in prices does not lead to an increase in coffee imports in these markets. Factors attributed to the decline in US demand include lifestyle changes and increased consumer awareness about the health effects of caffeine consumption. Results indicated that US demand is more sensitive than the Japanese and EU industries to changes in the global coffee economy. This implies that the US market share will increase with the expansion of the world coffee economy and decrease with the recession of the world coffee economy. These results imply that expansionary global trade policies (i.e. demand-side policies that will stimulate global coffee demand) may reverse the declining trend of the US coffee market shares.

Lee *et al.* (2008) studied under the assumption of block substitutability and partial aggregation, and a source differentiated AIDS model was used to estimate South Korean wine import demand. Empirical results indicated that South Korean wine consumers have a strong preference for high quality French wines. French wines are shown to be substitutes for wines from other countries in the South Korean wine market. Since the implementation of a free trade agreement between South Korea and Chile, Chilean wines have steadily increased their market share exhibiting strong price competitiveness in the South Korean wine market.

Uzunoz and Akcay (2009) analyzed the factors affecting import demand for wheat during the period 1984-2006 by using the double logarithmic-linear function. Turkey's import demand for wheat was specified as a function of domestic prices, gross national product per capita, the Turkish lira-US dollar exchange rate, and lagged

imports, the production value of wheat, domestic demand and trend factors. Data covering 1984-2006 periods were used to carry out the study. In the study, a Turkey import demand model was specified, the parameters were estimated, results were presented and conclusions were drawn. Time series data were used in the regression analysis. In estimating the import demand schedules of agricultural products, most works have followed a regression analysis by using a double logarithmic-linear function. The results have shown that a change in domestic wheat prices strongly affects wheat import demand, and Turkish consumers would rather purchase domestic wheat than import wheat gradually in Turkey, which has a small scale inefficient farm structure, fluctuating supplies, low productivity and quality of wheat and increasing wheat demand.

Boonjit (2009) studied the import situation of sugar in the Japan and analyzed the factors affecting import demand for sugar in Japan. According to the analysis, the linear approximated almost ideal demand system (LA/AIDS) was employed using the restricted seemingly unrelated regression (RSUR) method. Monthly time-series data from April 2000 to December 2007 were used in the analysis. The results have shown that factors that affected the Japanese demand for sugar were their own prices, Australian prices and the total expenditure for sugar. The own-price elasticity of demand for Thai sugar was inelastic, implying that it was a necessary good in Japan. Chinese sugar was found to be a substitute for Thai sugar. In addition, expenditure elasticity of demand for Thai sugar in Japan was inelastic, indicating that it was a necessity.

Review of the AIDS model

Blanciforti *et al.* (1986) estimated an LES and a linear-approximate AIDS using U.S. expenditure data over the period 1948–78 for 11 aggregate commodity groups: food, alcohol plus tobacco, clothing, housing, utilities, transportation, medical care, durable goods, other nondurable goods, other services, and other miscellaneous goods. Comparing results from the two models, expenditure elasticities tend to be lower for the AIDS model than the LES model, and the own-price elasticities tend to be higher. While all goods are by definition gross complements in the LES, the AIDS

estimates complementary and substitute goods in roughly equal numbers. The estimation of the flexibility of money also differs between the two models. The AIDS model implies a value of –1.0, which is closer to estimates for the United States than the LES of –3.0. The overall results suggest that the less restrictive functional form of the AIDS model allows more realistic estimates of expenditure elasticities, cross-price elasticities, and flexibility of money parameters. Estimation is also significantly easier for the AIDS model since linear estimation techniques can be employed.

The Linear Expenditure System (LES[1]) model of Stone (1954), because of the better econometric characteristics it has, such as linearity, transparency, and the parsimony of the estimated parameters, has been used by many researchers for quite some time. The Extended Linear Expenditure System (ELES[2])was applied in Lluch *et al.* (1997),. According to this summarized information, it was probably the dominant model used for consumer demand in Computable General Equilibrium models of developing countries. Nevertheless, the uneasiness with some of its strong restrictions like the proportionality between price and income elasticities, and necessity goods becoming luxury ones at higher incomes called for the development of new models. Accordingly, the Rotterdam[3] model of Theil (1965) and the Translog[4] model of Christensen *et al.* (1975) corrected some of these shortcomings. However, the latter models also have their own limitations. Understanding the shortcomings of the latter two models, Deaton and Muellbauer (1980) suggested an alternative modeling in

---

[1]LES (Linear Expenditure System)(Stone, 1954) $v_i=c_ip_i+b_i[x-\sum_j c_jp_j]$

where, v_i = value of expenditure i; x = total expenditure; p = price of product

[2]ELES(Extended Linear Expenditure System) $v_i=c_ip_i+b_i[y-\sum_j c_jp_j]$

(Lluch, Powell and William, 1977)

where, v_i = value of expenditure i; y = permanent income; p = price of product

[3]Rotterdam(Theil, 1965 and Barten, 1966) $w_i d\ln q_i = b_i d\ln Q + \sum_j c_{ij} d\ln p_j$

where, w_i = share of consumption i; Q = Division Volume Index; q_i = demand of I; p = price of product

[4]Translog (Indirect Translog Utility Function) $w_i=\frac{a_i+\sum_j b_{ij}\ln\left(\frac{p_j}{x}\right)}{\sum_j a_j+\sum_j\sum_i b_{ij}\ln\left(\frac{p_j}{x}\right)}$

(Christensen, Jorgenson and Lau, 1975)

where, w_i = share of consumption i; x = total expenditure; p = price of product

order to correct the limitations. To this effect, Deaton and Muellbauer (1980) proposed and estimated a new model which is of comparable generality to the Rotterdam and Translog models and has also considerable advantages over the latter two models. This model is known as the Almost Ideal Demand System (AIDS).

From previous studies, for the model, it showed that the performance of the AIDS model was equal to or better than other demand models such as the Rotterdam model, the Translog model, and the LES model. The advantage of the AIDS model could be interpreted in terms of economic models of consumer behavior by estimating with aggregated (macroeconomic) or disaggregated (household survey) data. It has a flexible functional form; it is easy to estimate demand restrictions such as Homogeneity and Symmetry, and it satisfies the axioms of choice exactly. The factors affecting import demand are price, GDP deflated with CPI, the exchange rate, total expenditure, and a dummy variable. In the past, the studies of Tsnr import demand in China did not include the time period in which Thailand had a share fluctuation problem. Therefore, for this study, we have focused on the Chinese demand for imported Tsnr by using the LA / AIDS model and also applying the Seemingly Unrelated Regression (SUR) method to analyze import demand. This study analyzed the Tsnr import demand of China by considering the top four competitors in the market. It is expected that the regressions of the Chinese Tsnr import demand of the four competitors are related.

2. Review of the Theoretical Framework

Trade Theory

The basic theory of trade shows that trade usually results from the interaction of competitive demand and supply (Pugel, 2011). A basic determinate of how much a consumer buys of a product is the person's taste, preferences, or opinions of the product. Given a person's tastes, the price of the product (relative to the price of other products) also has a major influence on how much of the product is purchased. Another major influence is the consumer's income. Hence, how much the consumer demands of the product depends on a number of influences: tastes, the price of

product, the prices of other products, and income. Employing the tools of demand and supply, trade theory assesses the effects of on trade and free trade on the economies of the countries involved.

Autarky (no-trade) Equilibrium

Under no-international trade, equilibrium in a certain country, country A, occurs at the price, P_A, at which the market clears domestically (Figure 3), with national quantity demanded equal to the national quantity supplied, Q_A (Pugel, 2011)

Free-trade Equilibrium

As international trade in a certain goods/service develops between two countries, it affects market prices in the countries: the additional supply into an importing country (country A), created by imports, reduces the market price in that country from P_A to P_W; the additional demand met by exports increases the market price in the rest of the world from P_R to P_W (Figure 3). Free trade equilibrium price is then determined by constructing the market demand for international trade. The importing country's demand for imports can be determined for each possible price at which the country might import. This demand for imports is the excess demand, D_M (quantity demanded minus quantity supplied domestically) for the goods. This excess demand is drawn as a demand curve for the international market for the goods traded. The export supply from the rest of the world can be determined in a similar manner. The supply of exports is excess supply, S_X (quantity supplied minus quantity demanded) of the goods in the rest-of-the world market. The free-trade equilibrium (E_I), then, occurs at the price that clears the international market (Figure 3). At this price, quantity demanded for imports equals quantity supplied of exports. This equilibrium can also be viewed as equating total world demand and supply for the product (Pugel, 2011).

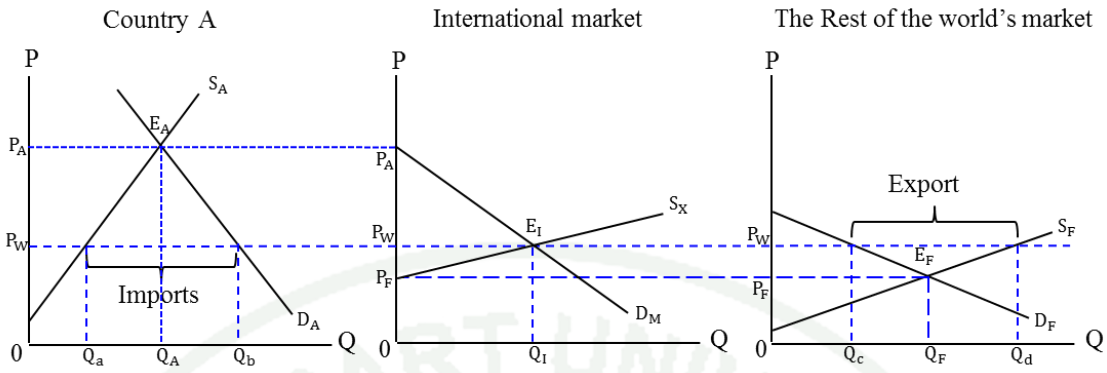


Figure 3 Effects of trade on production, consumption and price

Source: Pugel (2011)

where D_A = demand of country A S_A = supply of country A

P_A = price of country A in autarky Q_A= quantity of country A in autarky

D_F = demand of the rest of the world S_F = supply of the rest of the world

P_F = price of the rest of the world Q_F = quantity of the rest of the world

D_M = the excess demand of country A S_X = the excess supply of the rest of the world

P_W = world price Q_I = quantity of trade

Q_a-Q_b = country A import Q_c-Q_d = rest of the world export

Effects on the trading countries

Opening trade in a goods and service has effects on economic well-being (welfare) in both the importing country and the rest of the world. For the importing country, the shift from no-trade to free-trade lowers the market price. Domestic consumers of the product benefit from this change and increase their quantity consumed. With free trade, consumer surplus is the area below the demand curve and above the international price line. Thus, in comparison with no-trade, consumer surplus increases as a result of opening of trade. This gain is spread over many people who consume the imported product. The importing country's producers are hurt by the shift from no-trade to free-trade, as they receive a lower price for their product and

shrink production thereby decreasing producer's surplus. For the rest of the world (the exporting country), the analysis follows a similar path. Here, the shift from no-trade to free-trade increases the market price. This increase in market price benefits producers of the goods in the rest of the world as their producer's surplus increases. On the other hand, the increase in the market price hurts consumers of that goods, whose consumer surplus decreases. In the exporting country, producers of the product gain and the consumers lose (Pugel, 2011).

The analysis of the effects on trading countries shows that each country gains from international trade, so it is clear that the whole world gains from trade. Therefore, trade is a positive-sum-game activity though the gains to the countries are not equal. The country that experiences the larger price change has a larger value of the net gains from trade. The gains from opening trade are divided in direct proportion to the price change that trade brings to the two sides. Here, the side with the less elastic (steeper) trade curve (import demand curve or export supply curve) gains more (Pugel, 2011).

Demand theory

Demand is defined as the quantity of a good or service that consumers are willing and able to buy at a given price in a given time period. Each of us has an individual demand for particular goods and services and the level of demand at each market price reflects the value that consumers place on a product and their expected satisfaction gained from purchase and consumption. Demand theory forms the basis for the demand curve, which relates consumer desire to the amount of goods available. The Law of Demand establishes that when the price goes up people buy less, and when the price goes down, people buy more. Economists refer to this as the price effect.

Consumer Behavior

In principal, the demand function could be generalized for a consumer buying n goods as:

$$q_i = q_i (P_1, P_2,\ldots,P_n, I) \qquad i = 1, 2,\ldots,n \qquad (1)$$

where q is the quantity demanded, p is price and I is income. The n equations could be estimated by a single equation or by a system of equations. In microeconomic theory, the consumer demand could be derived from two approaches. Firstly, it is the primal solution in which individuals were assumed to maximize utility subject to budget constraints. The demand functions which are derived from the utility maximization approach or direct utility was the so-called Marshallian demand function. Secondly, it is a dual solution which concerns the allocation of income in such a way to achieve a given utility level with minimal expenditure. The derived demand from this approach or duality is so-called Compensated demand or the Hicksian demand function (Nicholson, 2004).

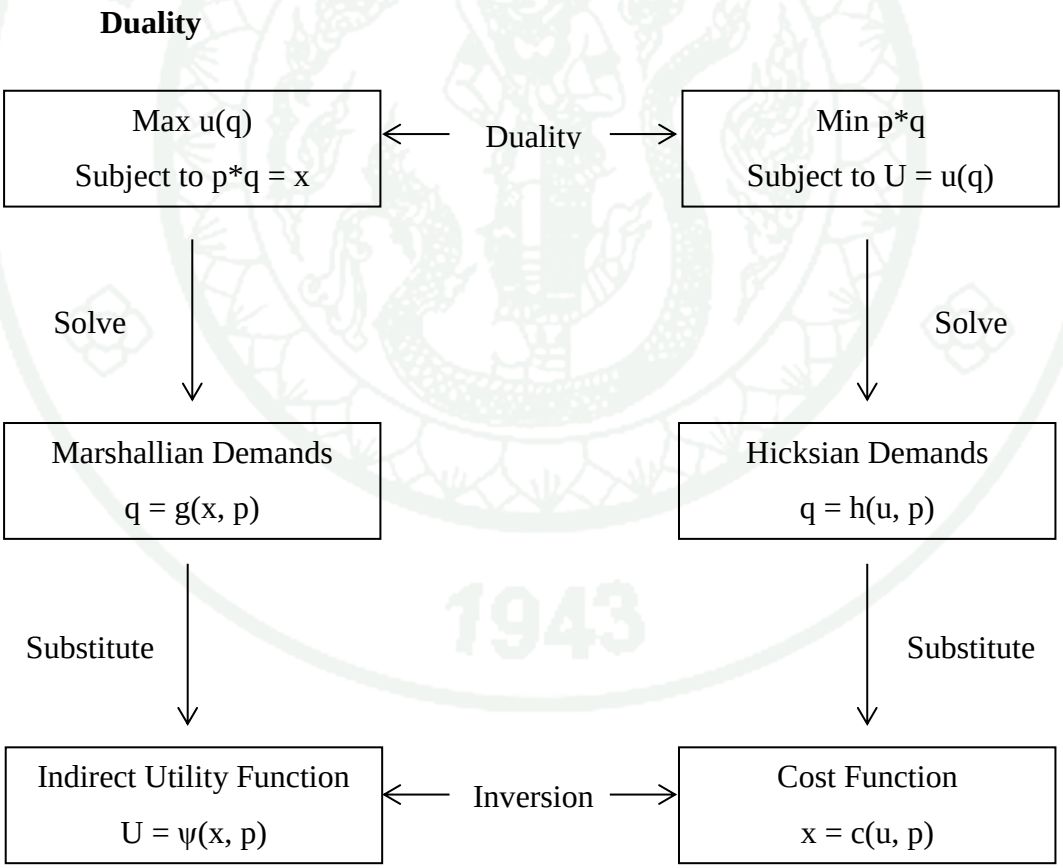


Figure 4 Utility maximization and cost minimization

Source: Nicholson (2004)

It is obvious that both the primary maximization approach and the dual expenditure minimization approach yield the same solution (x*, y*), meaning that they are simply alternative ways of viewing the same process. Often, the expenditure minimization approach is more useful; however, expenditures are directly observable, whereas utility is not (Nicholson, 2004).

Elasticity

Economists often summarize the way in which changes in one variable, say, A, affect another variable, say, B. For example, an economist might be interested in measuring how the change in the price of a good affects the quantity demanded or how a change in income affects total expenditure. One problem that arises in attempting to develop such summary measures is that quite often A and B are not measured in the same units. To solve such a problem, economists have developed the concept of elasticity. In demand analysis, there are three main types of elasticity: own-price elasticity, cross-price elasticity and income elasticity of demand. Among these elasticities, the first is the most important one in demand analysis (Nicholson, 2004).

Own-price Elasticity of demand

Although economists use many different applications of elasticity, the most important is the price elasticity of demand. Changes in p (the price of a good) will lead to changes in q (the quantity purchased), and the price elasticity of demand measures this relationship. Specifically, the price elasticity of demand (ε_{ii}) is defined as the percentage change in quantity in response to a 1 percent change in price (Nicholson, 2007). In mathematical terms,

$$\varepsilon_{ii} = \frac{\%\text{ change in } Q_i}{\%\text{ change in } P_i} = \frac{\partial q_i}{\partial p_i} \text{ x } \frac{p_i}{q_i} = \frac{\partial \ln q_i}{\partial \ln p_i} \qquad (2)$$

This elasticity records how q_i changes (in percentage terms) in response to a percentage change in p_i. As $\frac{\partial q_i}{\partial p_i}$ is usually negative (that is, p_i and q_i move in opposite directions, except in the case of Giffen's paradox), ε_{ii} usually will be negative. Here, a

distinction is made between values of ε_{ii} that are less, equal to, or greater than -1. For an elastic curve, $\varepsilon_{ii} < -1$, a price increase is met by a more than proportionate quantity decrease. And for an inelastic curve, $\varepsilon_{ii} > -1$, price increases proportionally more than quantity decreases. Identical proportional magnitudes are revealed in a unitary elastic curve.

Income Elasticity of demand

Income elasticity of demand records the relationship between income changes and quantity changes. It is defined as the ratio of percentage change in quantity of good i to the percentage change in income:

$$\varepsilon_{iI} = \frac{\%\text{ change in } Q_i}{\%\text{ change in I}} = \frac{\partial q_i}{\partial I} \text{x} \frac{I}{q_i} = \frac{\partial \ln q_i}{\partial \ln I} \quad (3)$$

For a normal good, ε_{iI} is positive because increases in income lead to increases in purchases of the good. On the other hand, ε_{iI} would be negative, implying that increases in income lead to decreases in the quantity purchased. Among normal goods, whether ε_{iI} is greater than or less than 1 is a matter of some interest. Goods for which $\varepsilon_{iI} > 1$ might be called luxury goods, in that the purchase of these goods increase more rapidly than income (Nicholson, 2007).

Cross-price Elasticity of demand

This concept of elasticity measures the reaction of quantity of good i purchased (q_i) to changes in the price of a related good, say good j. It is defined as the ratio of percentage change in the quantity of good i purchased to the percentage change in price of the related goods (p_j):

$$\varepsilon_{ij} = \frac{\%\text{ change in } Q_i}{\%\text{ change in } P_j} = \frac{\partial q_i}{\partial p_j} \text{x} \frac{p_j}{q_i} = \frac{\partial \ln q_i}{\partial \ln p_j} \quad (4)$$

If the goods i and j are substitutes, the cross-price elasticity of demand will be positive because the price of one good and the quantity demanded of the other good will move in the same direction (substitute goods).If the two goods in question are complements,

the cross-price elasticity will be negative, showing that the price of one good and the quantity of the other good move in opposite directions (complementary goods) (Nicholson, 2007).

Derivation of price elasticities

Price elasticities can either be derived from the Marshallian demand equation or the Hicksian demand equation. The Marshallian demand equation is obtained by maximizing utility subject to the budget constraint, while the Hicksian demand equation is derived from solving the dual problem of expenditure minimization at a certain utility level. The elasticities derived from Marshallian demand are called Marshallian or uncompensated elasticities, and the elasticities derived from Hicksian demand are called Hicksian or compensated elasticities. Marshallian elasticities can be transformed into Hicksian elasticities through the Slutsky equation,

$$E_{ij}^{c} = \varepsilon_{ij} + \varepsilon_{ix}(w_j) \tag{5}$$

where E_{ij}^{c} is compensated (Hicksian) price elasticities and w_j is the budget share of good j (Nicholson, 2007).

Properties of demands

1. Adding up

We know that demand must lie within the budget set. If consumer spending exhausts the total budget then this holds as an equality which is known as adding up.

$$\sum_{i=1}^{n} p_i g_i(x, p) = \sum_{i=1}^{n} p_i h_i(u, p) = x \tag{6}$$

The estimated total value of both the Hicksian and Marshallian demands is total expenditure. In other words, the sum of the estimated expenditure on the different goods equals the consumer's total expenditure at any given time period. This property of demand provides another reasonable restriction, the so-called adding-up

restriction. If we differentiate with respect to total expenditure then we get a property known as Engel aggregation. The adding-up restriction implies that

$$\sum_{i=1}^{n} p_i \frac{\partial q_i}{\partial x} = 1 \text{ and } \sum_{i=1}^{n} w_i \varepsilon_{ix} = 1 \quad (7)$$

Where w_i is the budget share of good i and ε_{ix} is total expenditure elasticity. This implies that the marginal propensities to consume should sum to one (Nicholson, 2007).

2. Homogeneity condition

The second property of demand is homogeneity of degree zero in prices for Hicksian and uncompensated demand and in total expenditure for uncompensated demand. If all prices and total expenditure are changed by an equal proportion, the quantity demanded must remain unchanged. This property is sometimes called "absence of money illusion". The homogeneity property provides the homogeneity restriction which implies that (Deaton & Muellbauer, 1993), for i=1, 2,…, n,

$$p_i \frac{\partial q_i}{\partial p_i} + \sum_{j=1}^{n} p_j \frac{\partial q_i}{\partial p_j} + x \frac{\partial q_i}{\partial x} = 0 \quad \text{and} \quad (8)$$

$$\varepsilon_{ii} + \sum_{j=1}^{n} \varepsilon_{ij} + \varepsilon_{ix} = 0 \quad (9)$$

where ε_{ii} is the own price elasticity of good i, ε_{ij} is the cross price elasticity of good i, and ε_{ix} is total expenditure elasticity of good i. The fact that the demand elasticities for q_i with respect to all prices and income sum to 0 is an alternative way of stating the homogeneity property of demand functions. An equal percentage change in all prices and income will leave the quantity of q_i demanded unchanged (Nicholson, 2007).

3. Symmetry condition

The third property of demand is the symmetry of the cross price derivatives of the Hicksian demands, that is,

$$\frac{\partial h_i(u,\ p)}{\partial p_j} = \frac{\partial h_j(u,\ p)}{\partial p_i} \qquad ;\forall\ i \neq j \qquad (10)$$

The symmetry expressed in equation (22) can be proved through Shephard's Lemma and Young's theorem: by Shephard's Lemma

$$h_i(u,\ p) = \frac{\partial c(u,\ p)}{\partial p_i} \quad , \quad h_j(u,\ p) = \frac{\partial c(u,\ p)}{\partial p_j}$$

$$\frac{\partial h_i(u,\ p)}{\partial p_j} = \frac{\partial^2 c(u,\ p)}{\partial p_j p_i} \quad , \quad \frac{\partial h_j(u,\ p)}{\partial p_i} = \frac{\partial^2 c(u,\ p)}{\partial p_i p_j}$$

and by Young's theorem, $\frac{\partial^2 c(u,\ p)}{\partial p_j p_i}$ equals $\frac{\partial^2 c(u,\ p)}{\partial p_i p_j}$ (Nicholson, 2007).

4. Negativity

The last property of demand is negativity, which implies downward sloping compensated demand functions (Nicholson, 2007).

The Almost Ideal Demand System (AIDS) Model

Alternatively, the Almost Ideal System (AIDS) model introduced by Deaton and Muellbauer (1980) was very popular in demand analysis, especially in the field of agricultural economics. The popularity of the AIDS model according to Deaton and Muellbauer (1980) could be ascribed to several reasons:

a) It is as flexible as other locally flexible functional forms but it has the added advantage of being compatible with aggregation over consumers. It could thus be interpreted in terms of economic models of consumer behavior for estimates with aggregated (macroeconomic) or disaggregated (household survey) data.

b) It is derived from a specific cost function and therefore corresponds with a well-defined preference structure, which is convenient for welfare analysis.

c) Homogeneity and symmetry restrictions depend only on the estimated parameters and are therefore easily tested and/or imposed.

d) The Linear approximate version of the AIDS (LA/AIDS) is relatively easy to estimate and interpret.

e) It satisfies the axioms of choice exactly.

f) It aggregates perfectly over consumers without invoking parallel linear Engel curves.

In reality, the Rotterdam or translog models possess many of these desirable properties. But unlike AIDS, neither possesses all of them simultaneously. Deaton and Muellbauer (1980) started their approach by setting a specific class of preferences, which represent exact aggregation over consumers, known as the price-independent, generalized-logarithmic (PIGLOG) consumer preferences. The PIGLOG is represented through the consumer cost or expenditure function, [C (u, p)], which is defined as the minimum expenditure necessary to attain a specific utility level at given prices:

$$\ln C(u, p) = (1-u)\ln[a(p)] + u\ln[b(p)] \quad (11)$$

where u = The utility lines between 0 and 1

p = price vector

a(p) = The cost of subsistence

b(p) = The cost of bliss

given; $$\ln[a(p)] = \alpha_0 + \sum_i \alpha_i \ln p_i + \frac{1}{2}\sum_i \sum_j \gamma_{ij}^{*} \ln p_i \ln p_j \quad (12)$$

and $$\ln[b(p)] = \ln a(p) + \beta_0 \prod_k p_k^{\beta_k} \quad (13)$$

The specific function forms of ln[a(p)] and ln[b(p)] were taken in (11), the AIDS cost function as equation (14)

$$\ln C(u,p) = \alpha_0 + \sum_i \alpha_i \ln p_i + \frac{1}{2}\sum_i \sum_j \gamma_{ij}^{*} \ln p_i \ln p_j + u\beta_0 \prod_k p_k^{\beta_k} \quad (14)$$

where α_i, β_k, and γ_{ij}^* are parameters. It can easily be checked that C(u,p) is linearly homogeneous in p (as it must be a valid representation of preferences) provided that $\sum_i \alpha_i = 1$, $\sum_i \gamma_{ij}^* = \sum_k \beta_k = 0$

The demand functions can be derived directly from equation (14). It is a fundamental property of the cost function by applying Shephard's Lemma that its price derivatives are the quantities demanded, Compensated or Hicksian demand functions : $\partial C(u, p)/\partial p_i = q_i$. Multiplying both sides by $p_i/C(u, p)$ we find

$$\frac{\partial \ln C(u,p)}{\partial \ln p_i} = \frac{p_i q_i}{C(u,p)} = w_i \tag{15}$$

where w_i is the budget share of good i. Hence, differentiation of equation (14) gives the budget shares as a function of prices and utility:

$$w_i = \alpha_i + \sum_j \gamma_{ij}^* \ln p_j + u\beta_0\beta_i \prod_k p_k^{\beta_k} \tag{16}$$

$$\text{where} \quad \gamma_{ij} = \frac{1}{2}\left(\gamma_{ij}^* + \gamma_{ji}^*\right) \tag{17}$$

For a utility-maximizing consumer, total expenditure (x) is equal to C(u,p) and this equality can be inverted to give u as a function of p and x, the indirect utility function. We have the budget shares as a function of p and x; and these are the AIDS demand functions in budget share form:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{x}{P}\right) \tag{18}$$

Where w_i represents the budget share of the i^{th} good, x is the total consumption on n goods in the system, p_j represents the price of the j^{th} good, and P is a price index defined by

$$\ln P = \alpha_0 + \sum_i \alpha_i \ln p_i + \frac{1}{2}\sum_i \sum_j \gamma_{ij} \ln p_i \ln p_j \tag{19}$$

From equation (19), the P is term of the Translog Price Index makes AIDS a non-linear model which results in a complicated non-linear estimation. However, in the

literature, empiricists have most commonly employed a linear approximation, which is known as the Stone price index, which is given by

$$\ln P^s = \sum_i w_i \ln p_i \quad (20)$$

when the substitute Stone price index is used in equation (18) it makes simplified AIDS calculations, allowing for straightforward application of Ordinary Least Squares: OLS. The model that uses Stone price index is called the "linear approximate AIDS" (LA/AIDS).

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{x}{P^s}\right) \quad (21)$$

The regularity conditions, imposed by budget constraints and utility maximization, imposed the following restrictions on the system:

Adding up: $\sum_i \alpha_i = 1,\ \sum_i \gamma_{ij} = 0,\ \sum_i \beta_i = 0$

Homogeneity: $\sum_j \gamma_{ij} = 0 \quad ; \forall_i$

Symmetry: $\gamma_{ij} = \gamma_{ji} \quad ; \forall_{i \neq j}$

Elasticity estimation for LA/AIDS model

Green and Alston (1990) showed that the usual formulas for uncompensated price elasticities in the Linear Approximate Almost Ideal Demand (LA/AIDS) model were incorrect because the Stone's price index (P^s) is a function of expenditure shares, $\ln P^s = \sum_i w_i \ln p_i$. A common approach was to treat expenditure shares as constant parameters in the Stone's index when taking derivatives for elasticities. They developed corrected formulas for price elasticities by using derivatives that take into account the effects of price changes on the shares in the price index as;

$$\varepsilon_{ij} = \frac{\partial \ln Q}{\partial \ln p_i} = \frac{\gamma_{ij}}{w_i} - \beta_i \frac{w_j}{w_i} - \delta_{ij}^k \quad (22)$$

The formulas for compensated elasticities (shown in Appendix B) were calculated by using the formulas reported by Wen (2003) as shown in equation (23)

$$\varepsilon_{ij}^{c} = \frac{\gamma_{ij}}{w_i} + w_j - \delta_{ij}^{k} \quad (23)$$

where δ_{ij}^{k}= Kronecker delta, $\delta_{ij}^{k}=1$ for i=j, and $\delta_{ij}^{k}=0$ for i≠j.

Expenditure and price elasticities (shown in Appendix B) can then be derived easily:

$$\text{Own-Price Elasticity:} \quad \varepsilon_{ii} = \frac{\gamma_{ij}}{w_i} - \beta_i - 1 \quad (24)$$

$$\text{Cross-Price Elasticity:} \quad \varepsilon_{ij} = \frac{\gamma_{ij}}{w_i} - \beta_i \frac{w_j}{w_i} \quad (25)$$

$$\text{Expenditure Elasticity:} \quad \varepsilon_{ix} = \frac{\beta_i}{w_i} + 1 \quad (26)$$

Provided equations (24), (25) and (26) hold, equation (18) represents a system of demand functions which adds up to total expenditure ($\sum w_i = 1$), are homogeneous of degree zero in prices and total expenditure taken together, and satisfy Slutsky symmetry. Given these, AIDS is simply interpreted: in the absence of changes in relative price and real expenditure (x/P), the budget shares are constant and this is the starting point for predictions using the model (Deaton and Muellbauer, 1980).

Research Methodology

1. Data Collection and data sources

This study uses primary and secondary data on Technically Specified Natural Rubber (HS code: 400122, Tsnr). The primary data are collected from exporters by using questionnaires asking 25 exporters randomly including small and large firms. However, there are 5 voluntarily give in cooperation. The secondary data are gathered from different sources which are the Global Trade Atlas, the Customs Department of China, the Customs Department of Thailand, the International Rubber Study Group, and the Rubber Research Institute of Thailand. However, the analysis of import demand is used monthly quantitative data collected between November, 2003 and December, 2013.

2. Data Analysis

Descriptive analysis is the study of general Thai Tsnr market exports to China. It also includes problems and obstacles that Thai exporters of Tsnr face based on the information collected from the narrative and statistical analyses of the percentage and the table to achieve objectives 1 and 3.

Quantitative analysis in this study uses the Linear Approximate Almost Ideal Demand System (LA/AIDS) Model and the Seemingly Unrelated Regression (SUR) method to estimate factors affecting import demand and to determine the price and expenditure elasticities of Technically Specified Natural Rubber (Tsnr).

3. Estimating the demand Equations

LA/AIDS model from equation (21), substitute stone's price index into equation

$$w_{it} = \alpha_i + \sum_j \gamma_{ij} \ln p_{jt} + \beta_i \left(\ln x_t - \sum_i w_{it} \ln p_{it} \right) + u_{it} \qquad (27)$$

where α_i, β_i, and γ_{ij}^* are parameters. w_{it} is the share of Chinese import value of Tsnr from country i in month t. p_{jt} is the price of Tsnr imported from country j in month t. p_{it} is the price of Tsnr imported from country i in month t. x_t is the total expenditure of China in month t. u_{it} is error term of country i in month t.

i and j = {1,2,…,5} , whereas

1 = Thailand (TH)

2 = Indonesia (IND)

3 = Malaysia (MA)

4 = Vietnam (VIET)

5 = Other Countries (O)

There are three sets of restrictions implied by economic theory imposed on the parameters of the estimation in the LA/AIDS:

Adding up: $\sum_{i=1}^{5} \alpha_i = 1, \ \sum_{i=1}^{5} \gamma_{ij} = 0, \ \sum_{i=1}^{5} \beta_i = 0$

Homogeneity: $\sum_{j=1}^{5} \gamma_{ij} = 0 \ ; \forall_i$

Symmetry: $\gamma_{ij} = \gamma_{ji} \ ; \forall_{i \neq j}$

The coefficients of estimating equation (27) show the relationship of the Tsnr price (lnp) of the top four countries from which China imports and the total expenditure that China spends on imports Tsnr (x_t) weighted with Stone's price index effect on the share of the market (w_t) or the proportion of Chinese Tsnr import expenditure. In sum, this study will emphasize mostly which factors of its competitors impact Thailand's market share of Tsnr in China in order to reduce the market fluctuation.

CHAPTER III

NATURAL RUBBER IN THAILAND AND THE MARKET SITUATION OF NATURAL RUBBER IN CHINA

The contents of this chapter are separated into four main sections. The first section describes the market of natural rubber in Thailand. The second section illustrates the ports of Thailand (PAT). The natural rubber market in China is the third section. After that, the overview of import situation in Chinese market is explained in the last section.

The Market of Natural Rubber in Thailand

The market for natural rubber in Thailand includes domestic and foreign consumers.

Domestic Market

Research on the domestic market structure showed that the system of the natural rubber market includes many middlemen. This happens because farmers nowadays are a minority. Thailand rubber producers manufacture ribbed smoked sheet 37%, technically specified natural rubber 42%, latex 18%, and crepe rubber and other rubber for the rest. 90 percent of them are exported and domestic consumption is only 10 percent (Figure 5). Thus, the government runs continuous campaigns to boost domestic consumption (Wongmahan, 2004).

According to the market structure above, it can be seen that natural rubber market channels are of 3 types as follows:

The first structure: Market flow starts from each farmer who sells latex to middlemen, who directly buy it locally. 93 percent of those middlemen will then sell the rubber to ribbed smoked sheet or technically specified natural rubber manufacturers. The final products of rubber will be sold for both domestic consumption and export.

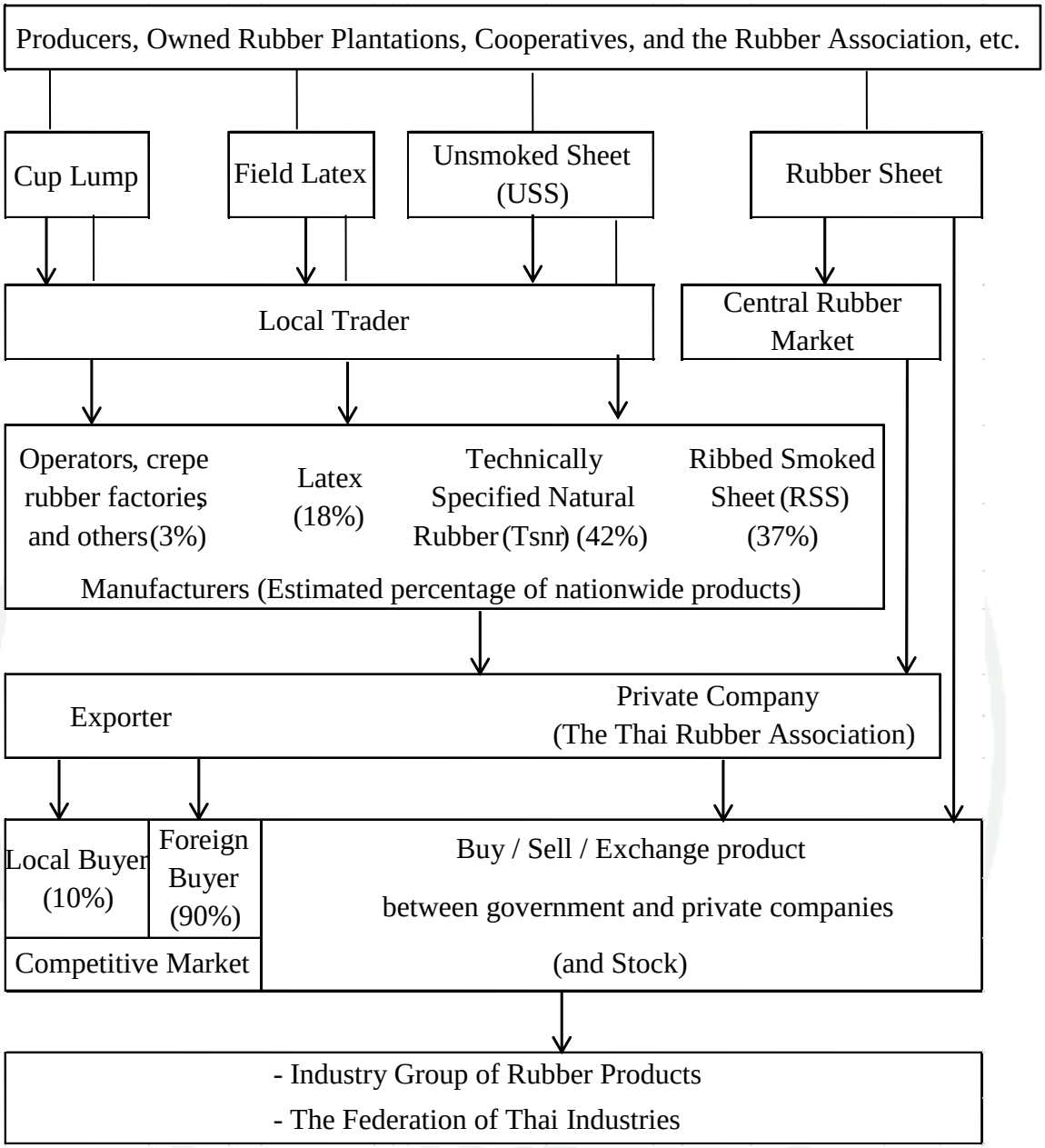


Figure 5 Market structure of NR in Thailand

Source: Rubber Research Institute of Thailand (2002)

The second structure: A more developed market flow from first structure is from the rubber farmers association so that they can collect and control the quality of latex and unsmoked sheets. After getting the expected quantity of rubber, it will be sold to the central rubber market. However, 6 percent is sold to manufacturers by auction. Then, after the auction, the manufacturer will take the rubber into an assembly line and the next step is to sell the final products for domestic consumption and export.

The third structure: This type of market flow shows how government will directly buy rubber from farmers in order to sell it to the governments of other countries. However, it represents only 1 percent.

Regarding the three types of market flow above, it shows that rubbers' famer prefer to sell through two ways, who are middlemen and the central market because most rubber farmers are small entrepreneurs, with a small scale of production. So, they have need support from market intermediaries to sell products to consumers more easily. Details of two market intermediaries are as follows;

Middlemen: Collect latex or ribbed smoked sheets from farmers and then sell it to manufacturers. Middlemen can be one of the famers in the neighbor or from other regions. To perform as middlemen, they firstly must register with manufacturers who will not buy from general tradesmen. After registration, a manufacturer will give a member ID to authorized middlemen.

Fundamentally, middlemen get benefits from transactions as listed below

1) Middlemen get revenue from collecting rubber from agriculturists and then selling it to manufacturers by charging 0.25 – 0.50 baht per kilogram of natural rubber taking into account the distance of transportation.

2) Middlemen get revenue from selling collected rubber to manufacturers. The benefit is in between 1.2 to 1.5 baht per kilogram of natural rubber taking into account the distance of transportation.

All of the above benefits motivate middlemen to try to buy as much natural rubber as possible from farmer daily because their revenue depends on the amount of rubber able to be collected. Middlemen select this career to generate high income.

Central market: This is the place to buy and sell natural rubber under regulations set by the central market. By trading in the central market, farmers get higher prices than outside central market by about 7 to 9 percent. Buyers who purchase from the central market can get lower cost raw material to produce ribbed smoked sheets. Thus, their cost of production can be reduced by around twenty one percent and they produce about seventy five percent of the ribbed smoked sheets grades one to three

Responsibilities of the central market

1) To research and develop the rubber market

2) To coordinate and process rubber not only for multinational organizations for instance IRSG, INRO, and ANRP but also for the main global markets such as the Singaporean and Japanese markets.

3) To broadcast marketing news and rubber prices for both domestic consumption and foreign markets.

4) To determine rubber prices and to announce official rubber prices

The steps of buying and selling unsmoked sheets through the central market

1) Buyers and sellers register before getting into the central market.

2) The seller provides good quality unsmoked sheets and packs 15 – 20 sheets for each batch.

3) The step of selling and buying through auction.

3.1) The central market collects rubber of same range of quality and sells them by auction.

3.2) The auction price does not include transportation and other expenses.

3.3) The bidder who offers the highest price is the winner. In cases where there are two winners offering same highest price, the one who bid earliest will win.

4) The auction runs from 10.00 to 10.30 am, bidders can self-bid, make phone calls or fax.

5) Unsmoked sheets being sold must meet the quality and standard as determined by the institution.

6) Staffs of the central market select the quality of rubber and the decision of the central market is final.

7) Payments to sellers are ine cash, cashier cheque, or transfer.

8) The central market provides standard scales and staffs of the central market are the only ones who perform and control scaling.

9) Bidders who win would get the rubber on the same day as the auction and immediately make the payment. They will then receive the rubber from the central market according to the weight of rubber latex at the agreed price.

10) In cases where there is no bidding, sellers can act as follows:

10.1) They can wait until next auction

10.2) They can leave the rubber in a warehouse at the central market

10.3) They can move the rubber from the central market

The Export of Thai Natural Rubber

Nowadays, the export situation for Thai natural rubber has a lot of problems because there are many new competitors. Moreover, the problem of the oversupply of natural rubber is the result of decreasing natural rubber prices in the world market. This situation can affect the natural rubber exports of major producers and exporters such as Malaysia, Indonesia, and Thailand. The natural rubber market is still controlled by buyers; therefore, only producers and exporters will be affected. This is the reason why the governments of Malaysia, Indonesia, and Thailand have tried to solve this problem by forming an organization called ITRO (International Tripartite Rubber Organization) and establishing NTRC (National Tripartite Rubber Cooperation). The main purposes are as follows.

1. To reduce production by 4%
2. To decrease the amount of export natural rubber by 10 %
3. To buy natural rubber when export prices decrease

The implementation of this policy succeeds in providing the price support of Tsnr20 within member countries. The price is between USD1.0 - USD1.20 per kilogram in order to create maximum revenues from producing natural rubber in terms of foreign currency. Moreover, the next policy is to increase domestic consumption of natural rubber. The establishment of ITRO, benefit natural rubber exporters. Therefore, in the future, there may be new exporters interested in this kind of business. The new exporters entering this business have to deeply understand all the processes. The natural rubber exporters need to ask for exporting permission from relevant government departments as shown in Figure 6.

1. Exporters need to ask for permission to be a rubber trader. (Details as shown in Figure 7)
2. Exporters need to ask for permission to be a rubber processor.

3. Exporters need to ask for permission to be a rubber exporter. (Details as shown in Figure 8)

4. Exporters need to get a customs verification document to export rubber. (Details as shown in Figure 9)

5. Exporters need to pay Cess to the Rubber Replanting Aid Fund.

For processes 1-4, natural rubber exporters need to complete the processes at the Rubber Research Institute. Then, for process 5, exporters need to complete the processes at the Rubber Replanting Aid Fund. The payment of Cess is to implement a rubber replanting scheme and to support smallholders with assistance in kind (high-yielding clonal varieties, fertilizers, and chemicals) and in cash (fixed grants for labor on the completion of specified tasks) before the trees come into production. After paying Cess, exporters need to complete the customs process to receive the customs verification document. In the past, it was a manual system which involved contacting customs officers directly. After that, there was a systematic development called EDI (Electronic Data Interchange) with which exporters can request the customs verification document through the computer system of Custom Department in 24 hours. Then, exporters can export the natural rubber after finishing all 5 processes.

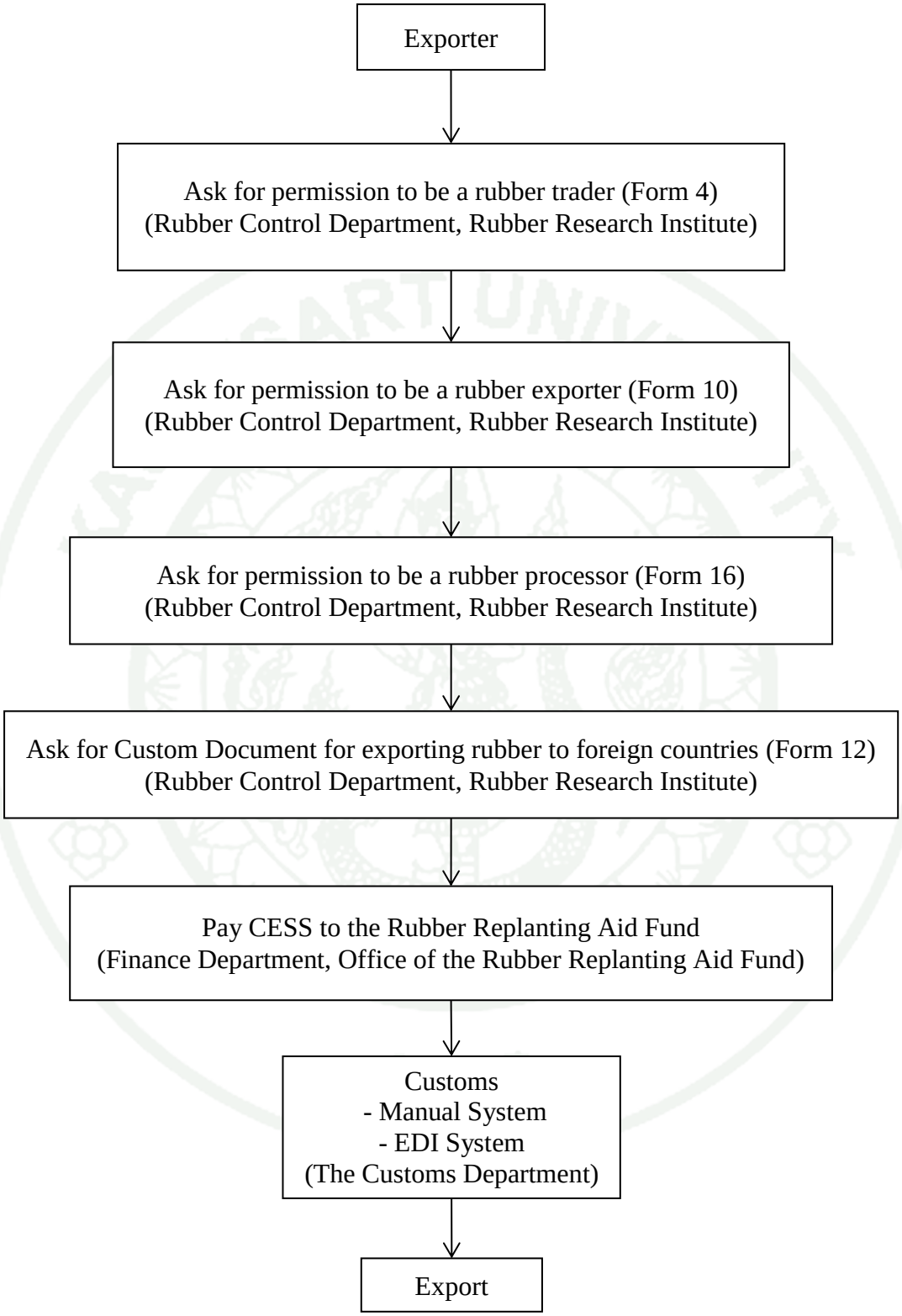


Figure 6 The exporting process of NR

Source: Department of International Trade Promotion (2005)

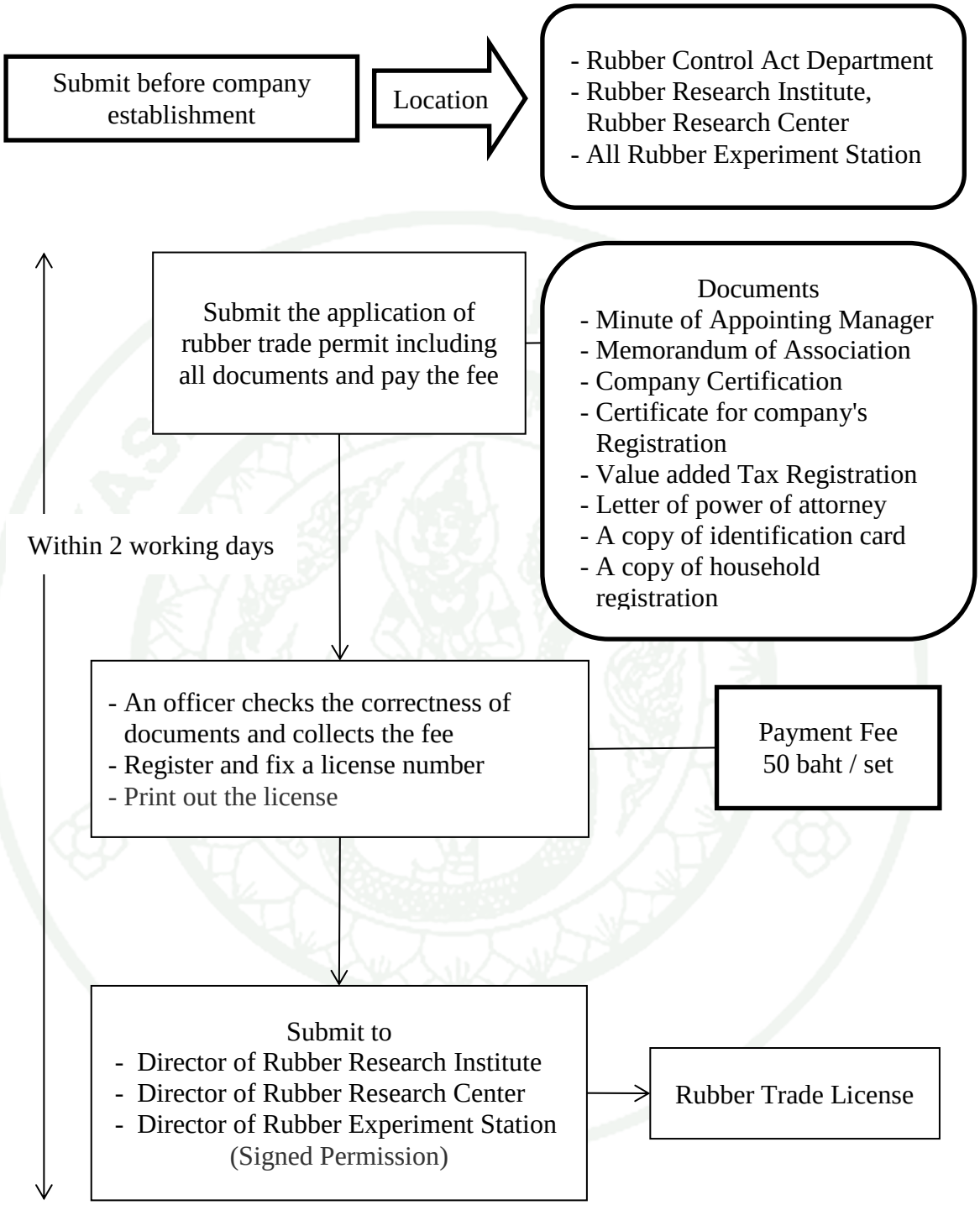


Figure 7 Process for rubber trader license

Source: Rubber Research Institute of Thailand (2010)

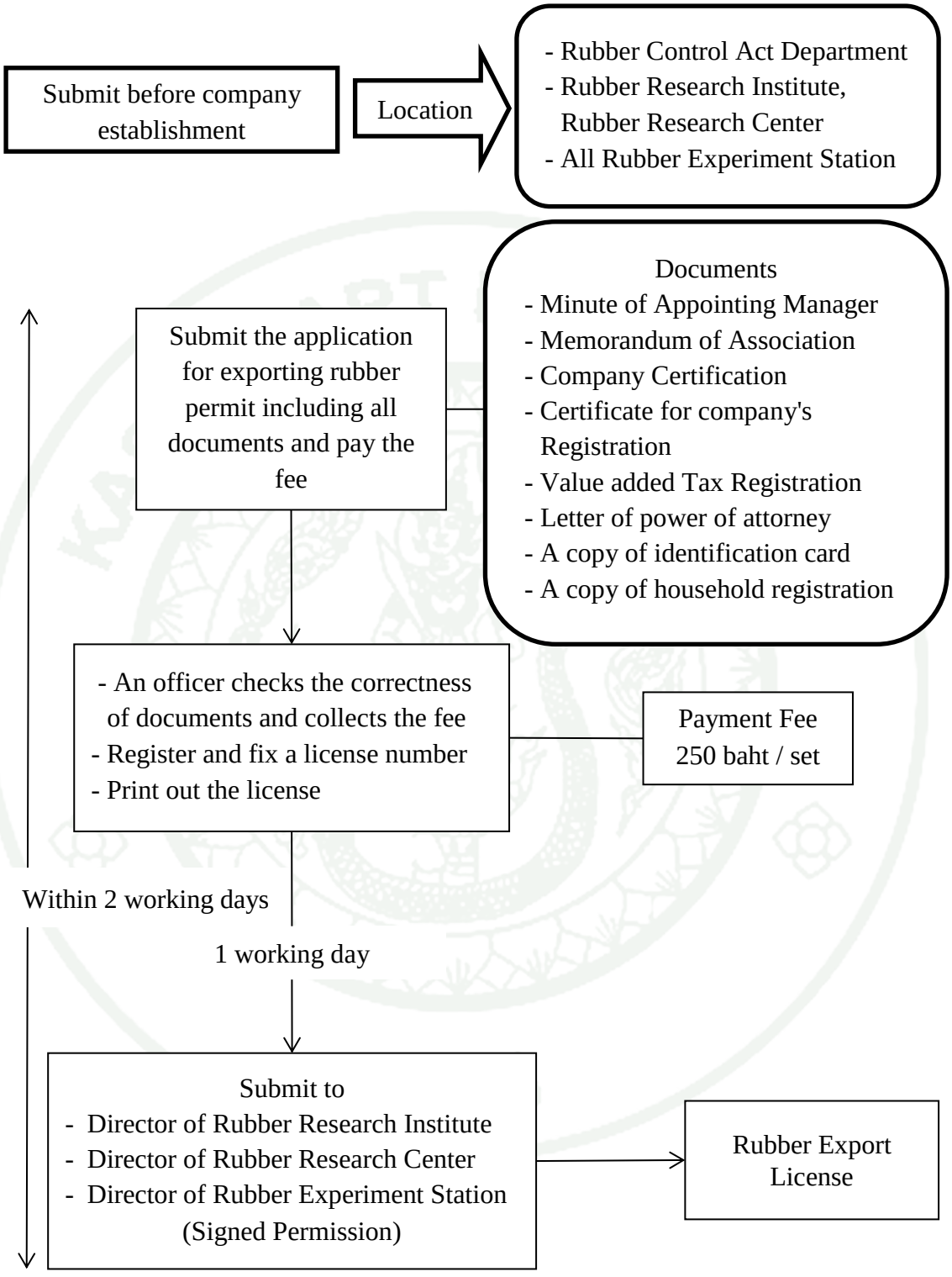


Figure 8 Process for rubber export license

Source: Rubber Research Institute of Thailand (2010)

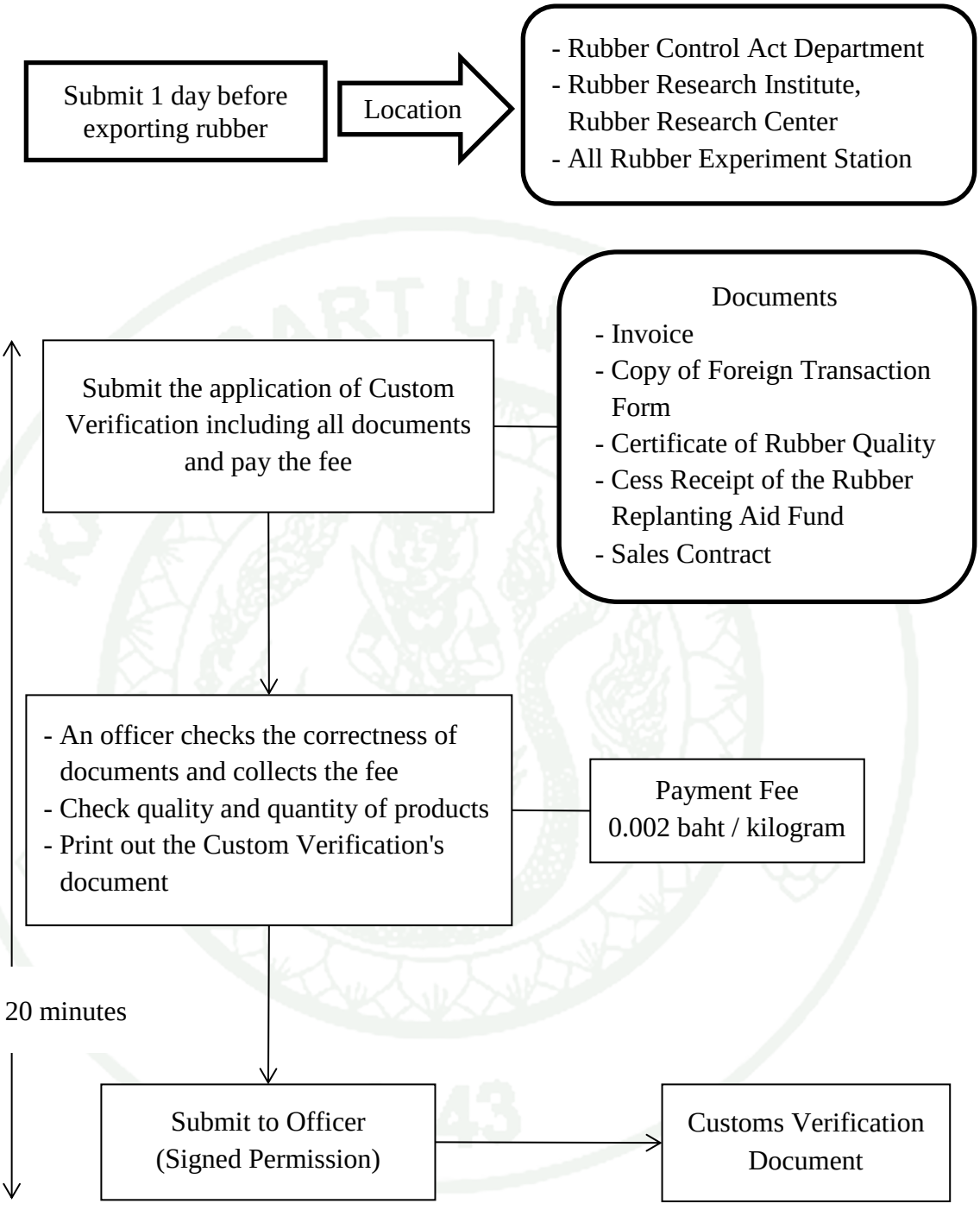


Figure 9 How to get the customs verification document

Source: Rubber Research Institute of Thailand (2010)

Foreign markets

Rubber's foreign market can be divided into two types as follows:

Primary market: The market set up to mainly focus on manufacturers. This primary market is generally located in countries with rubber production such as the Kuala Lumpur market and the Singapore market.

Terminal market: The market set up to mainly focus on consumers. This terminal market is normally located in countries with high rubber consumption such as the New York market, the London market, the Tokyo futures market and the Kobe futures market.

Marketing of natural rubber can be performed in two ways:

Open or official market is trading in a specific central location by providing useful facilities to create convenience for traders such as warehouses, grading product qualities, and arbitrating disagreements. This type of trading represents approximately thirty percent, which is very low compared to total trading of the rubber market.

Trading through market can be divided into two types as follows:

1. Physical Trade is buying/selling and exporting physical rubber after completing the deal. The contract will clearly specify the quality, the quantity, the price, and the delivery date.

2. The futures market is a financial instrument operating through paper or electronic trading to deliver products on future terms. To operate a futures market, there needs to be a clearing house. The clearing house is an in-house unit in the exchange with the function of ensuring the financial integrity of each trade for investors and hedgers. The clearing house takes on the role to oversee that all counter-parties abide by the terms and conditions once they enter into a futures contract. In practice, orders are 'cleared' by means of the clearing house acting as the buyer to all sellers and the seller to all buyers. The clearing house is divided into 3 divisions

which are the Clearing Division (clearing transactions between the market and broker members), the Risk Management Division, and the Delivery Division.

The process of rubbers trading through the futures market starts from manufacturers or consumers who have rubber on hand which they are willing to sell. They key in electronic trade submission by specifying types, quality grade, quantities, and price via a broker. After that, the broker matches the individuals who demand rubber with the sellers. After matching bids and offer, the agreed price is a market reference of the rubber's quality, which every member can perceive.

Direct Market is trading in which the buyer and seller directly contact each other outside the market. Contact involves personal meetings or other means of communication such as telephone, telex, and internet. This direct market represents around seventy percent of total trading. Price determination in this direct market is achieved by taking the prices from the official market and by consideration of future price trends to determine the direction of the trading price. In this type of trading, each exporter negotiates their own prices with buyers, which may be advantageous or disadvantageous to each party.

Currently, the important characteristics of the foreign market are that they are open and are the official markets, such as the Commodity Exchange of Tokyo (TOCOM), Nagoya (C-COM), Singapore (SICOM), and Shanghai, London, New York, and Hamburg. The markets that play the most vital roles in the rubbers market are the Tokyo Commodity Exchange (TOCOM) and the Singapore Commodity Exchange (SICOM). TOCOM trades in three types of rubber which are RSS 1, RSS 3, and TSR 20. The reason why the official market is called an "Open market" is because it open 24 hours starting from Shanghai, to Singapore, London, and New York. Trading through an open market (or official market) helps traders get the price from real trading, transparency, and being able to collect reference information.

Thailand's agricultural futures market is set up to be channel for agriculturists manufacturing agricultural products, relevant persons, and general investors in order to reduce the risk from price fluctuations. Currently, agricultural commodities traded

through futures market are Ribbed Smoked sheet No.3, RSS3 and block rubber, STR 20, Rice, Tapioca, and Pineapple. Most trade is RSS3 but there is still a low volume traded through agricultural futures markets. So, it does not play a role in determining rubber prices through the global market.

The Ports of Thailand (PAT)

PAT regulates and governs all of Thailand ports, focusing on the country's two major ports, the ports of Bangkok and Laem Chabang. The PAT runs the ports in cooperation with private companies like Hutchison Port Holdings and PSA International. PAT is headquartered in the Port of Bangkok.

PAT governs the activities and operations of the Port of Laem Chabang. The Port of Laem Chabang is Thailand's major deep-sea port handling international freight. The Port of Laem Chabang can accommodate extra-large super post Panamax vessels. PAT administers both the Port of Bangkok and the Port of Laem Chabang. With the growth in ocean-borne trade, the PAT has grown in both responsibility and size. Today, it is responsible for all port infrastructure supporting Thailand's increasing exports.

The Port of Bangkok is one of Asia's most an important centers for commerce and business in Southeast Asia. The Port Authority of Thailand has played an important role in developing the modern economy of the city and country. It plays a major role in developing Thailand's export industry and trade economy. It is a major producer of income for the country and recognized both nationally and internationally as a world-class port management organization. The ports and harbors that are located in Thailand are shown in Table 1.

Table 1 The ports and harbors located in Thailand

Type	Size	Name	Authority
Seaport	Large	Port of Laem Chabang	Port Authority of Thailand
	Medium	Port of Bangkok	Port Authority of Thailand
		Bangkok Modern Terminal	Chaiyaporn Group
		Port of Map Ta Phut	Thai Prosperity Terminal-Company, Ltd
		Sattahip Comercial Port	Royal Thai Navy
	Small	Port of Koh Si Chang	Thai Public Port (TPP)
		Port of Songkhla	Marine Department of Thailand
		Sriracha Harbour	Sriracha Harbour Plc
River Port	Small	Port of Chiang Khong	Port Authority of Thailand
		Port of Chiang Saen	Port Authority of Thailand
Pier, Jetty or Wharf	Small	Port of Kantang	Marine Department of Thailand
		Port of Khanom	Marine Department of Thailand
		Port of Krabi	Harbour Department of Thailand
		Port of Phrapradang	Thai Prosperity Terminal-Company, Ltd
		Port of Phuket	Harbour Department of Thailand
		Prachuap Port	Marine Department of Thailand
		Port of Ranong	Port Authority of Thailand
		Port of Rayong	Thai Petrochemical Industry-Public Co Ltd (TPI)
		Port of Samui	Marine Department of Thailand
Off-Shore Terminal	Very-Small	Erawan Terminal	Unocal Thailand Ltd

Source: World Port Source (2013)

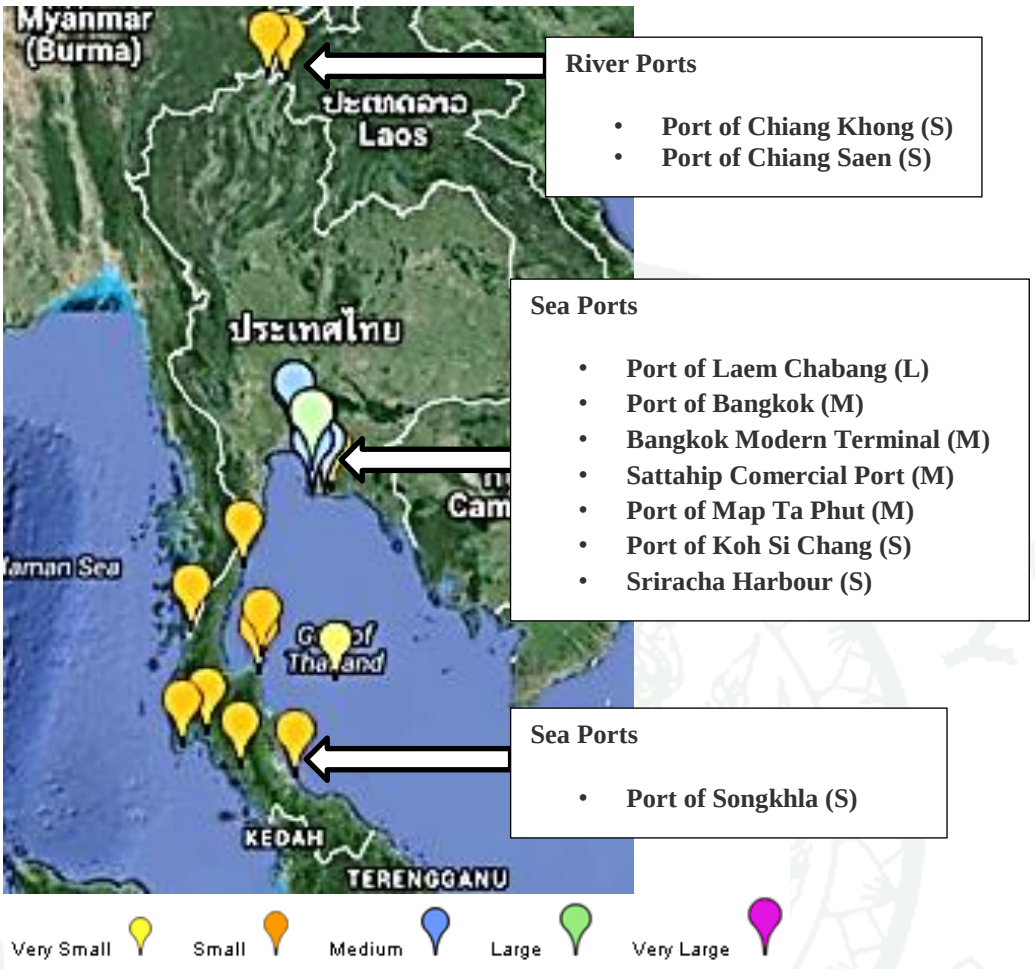


Figure 10 The sea and river ports in Thailand

Source: World Port Source (2013)

Classification criteria for the port size

Ports are categorized by sizes in order to classify the objectives or capacities of each port. The considerations are as follow:

1. The weight of total goods each port control yearly
2. The value of goods each port manages yearly
3. The number of cargo ships access to each port in one year
4. The number of berths to take advantage
5. The largest size of cargo ship that can use the facility of that port

The Natural Rubber Market in China

China is the largest tire manufacturer in the world and also has the highest usage of natural rubber in the world. However, the production of natural rubber in China is not enough for manufacturers to use in the tire industry while the economy is growing so fast. Therefore, manufacturers need to import rubber from other countries. At present, more than seventy percent of raw materials are imported from other countries while the planted area of natural rubber in China has increased. This is because the automobile industry is growing dramatically. The important planted areas in China are Hainan and Yunnan provinces. In 2011, the demand for natural rubber in China was around 5.53 million tons while China can produce only 0.78 million tons (around sixty percent from Hainan province) and about 4.75 million tons is imported from foreign countries of which thirty-two percent is imported from Thailand. In 2020, the market expects that the demand for natural rubber in China will be around one-third of the world's rubber production while it is about one-fourth at present.

Currently, China has 300 tire manufacturers and around seventy percent of them are small factories. These small plants can produce an average 400,000 pieces per year. There are 45 large factories in China where the production per year is more than 1,000,000 pieces. Moreover, only 3 manufacturers can produce more than 3,000,000 tires per year. In 2011, the total production of tires was 456,000,000 pieces. However, the tire industry in China is highly concentrated. The total production of top ten factories represents about seventy-seven percent of the total tire production and around seventy percent of the production in China is produced by international companies.

The overall rubber market in Guangdong province

The import of natural rubber in Guangdong is about 2.5% of the total natural rubber imports to China. The main state enterprise taking care of rubber is the Guangdong Agribusiness Group Corporation. Based on information from Guangdong customs in 2011, Guangdong imported 53,376 tons of natural rubber. When compared to year 2010, it has decreased by around 13.82% (with the value of USD168 million, a 15.31% increase). Overall, Guangdong imports less natural rubber because the export of goods in China has declined. Therefore, the demand for imported natural rubber used in the tire industry has also decreased. This affects natural rubber exporters because the price has fallen in almost all of the producing countries. Attempts have been made to control the natural rubber price by reducing the exporting quantity; therefore, the natural rubber price in 2012 rose. At the moment, China is trying to speed up investment in growing natural rubber in the neighboring countries of Thailand such as Laos, Cambodia, and Vietnam. The production of natural rubber in the north of Laos, invested in by China, started exporting to China in 2011. It has been estimated that in 2020 the demand for natural rubber in China will be around 11.5 million tons.

Regulation of rubber imports

Regulations in China about importing natural rubber have no limitation in terms of quantity, but importers have to be authorized by the government and obtain approval before importing. The import tariff rate for natural rubber, ribbed smoked sheets, and technically specified natural rubber is 20%, and latex concentrate is 7.5%. In addition, all types of rubber have to pay 17% Valued Added Tax (information from the Thailand rubber institution). Under the ASEAN-China free trade agreement, China classifies natural rubber as being price sensitive and will maintain import duty in this range until 2015. Thus, exporting rubber from Thailand to China gets no advantage from the ASEAN-China agreement. However, from checking the Chinese import duty, in 2009 there was a decrease in duty under the ASEAN free trade area to zero for HS 400211101 Latex: carboxylated Styrene-butadiene rubber.

List of major rubber firms

1. Guangzhou Rubber Industry I. & E. Co.
2. Sinochem Guangdong Import & Export Corporation
3. Guangzhou Wuhua Rubber & Chemicals Co.
4. Guangzhou Peal River Rubber Tyre Ltd.
5. South China Tire & Rubber Co., Ltd.
6. Guangzhou Rubber Enterprises Group Co.

Mostly, exporting rubber from Thailand to China is to the port of Shanghai and the port of Qingdao, which is the sea board transportation hub for Shandong Province for use in the motor vehicle industry. Additionally, there are also the ports of Jinzhou and Dalian, close to Goodyear manufacturing, and some rubber is shipped to the port of Xiamen (DITP, 2012).

Overview import situation in China

The trends of the market share and price of Tsnr in the Chinese Market from Thailand and its main competitors are analyzed and presented.

Import share trend of Tsnr

Figure 11, taking the yearly average market share of Tsnr from important exporter countries to China from 1999 to 2013 shows that the Tsnr market share in the Chinese market fluctuated for Thailand, with Indonesia and Malaysia having nearly the same market share. Five years ago, Chinese imports of Tsnr from Thailand the highest in the region. During 1999 – 2003, Thailand was the leader in the Chinese market followed by Malaysia, Indonesia, and Vietnam, respectively. Market leadership changed hands each year. Since 2003, Thailand's market share was declining until it reached its lowest level in 2006 with Malaysia as market leader followed by Indonesia, Thailand, and Vietnam, respectively. After 2006, Thailand's market share grew while Malaysia's market share was continually falling. Therefore,

currently Malaysia has the third largest market share as Thailand has the largest and Indonesia is second.

However, Tsnr rubber has to have sufficient quality to meet consumer needs. The import trends of Tsnr continue to increase because of the standard of Tsnr, and manufacturers have started to use Tsnr as a raw material in the manufacture of tires. Tsnr is easier to process and to produce because it is more resistant to tears than RSS. Moreover, output is much higher quality when using Tsnr as a raw material and the average price of Tsnr is cheaper than RSS (AFET, 2014).

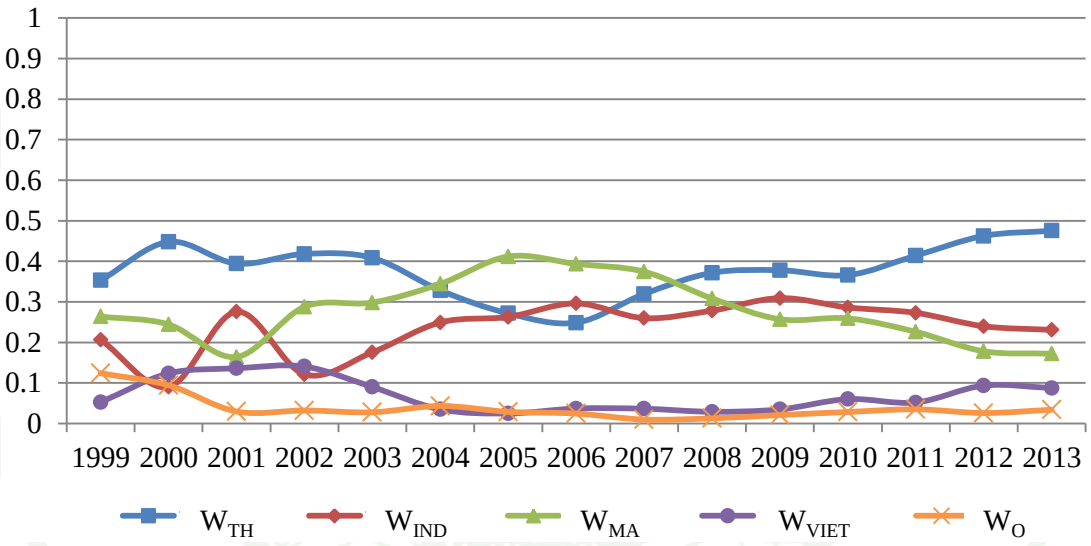


Figure 11 Trend of the yearly average market share of Tsnr between 1999 – 2013 from important export countries to the Chinese market

Figure 12 shows the trend of yearly average import prices of Tsnr between 1999 and 2013 from important export countries to the Chinese market. It was found that the Tsnr price often fluctuates because of market factors. Tsnr is graded the same quality for production in each country. The price of rubber in each country is also similar. Since 2001, the period of increasing oil-prices, natural rubber has been used instead of synthetic rubber. The rubber price during 2005 – 2013 fluctuated depending on the world's economic growth/decline. Since 2005, the rubber price has increased continuously from increased global demand. China is the world's biggest rubber importer, importing more than one million tons of natural rubber each year from many

countries for use in fast growing industries, especially for tires in the vehicle industry. Additionally, there have been increases in the price of synthetic rubber, and also speculation in futures market by mutual funds and other investors. Prices increased continually until mid of 2006. There were also negative factors in the last six months of 2006 including the slowing down of procurement from consumers, the appreciation of the Baht, and decreases in the oil price which led to rubber price reductions until the end of 2006. Then, at end of 2006, rubber prices rebounded in line with increased rubber consumption. In 2008, the world economy was affected by financial crises in many top industrial countries and rubber also faced negative factors from the decreasing oil price, the huge exercising of futures contracts, and the financial crises of top companies in the motor vehicle industry. These are the reasons why the rubber price dramatically decreased in the 4th quarter of 2008. In the economic crisis, many countries tried to stimulate the economy in order to increase consumption and the purchasing power of people in the countries. The world economy improved in the last six month of year 2009, which positively affected the rubber price between Thailand and the foreign futures markets. The reason for the rubber price's continuous reduction to reach the lowest point in mid 2012 was that Chinese GDP greatly decreased; therefore, overall consumption fell. Moreover, the trading rubber price in the Tokyo market dramatically dropped because investors lost confidence in the world's economic recovery. In addition, speculation in the futures market and exercising a lot of futures contracts strongly affected rubber price fluctuation and led to rapid rubber price falls. Because of these factors, the International Tripartite Rubber Council (ITRC) announced a reduction of approximately 300,000 tons in rubber exports from Thailand, Indonesia, and Malaysia from end of 2012 until early 2013. Also, 625,000 Rai of rubber trees were cut down to reduce production by 150,000 tons. From the regulations of the ITRC, and the procedures and efforts of world leaders, the rubber price started to recover. Additionally, China declared a reduction in import duty on rubber sticks from 2,000 CNY/ton to 1,200 CNY/ton starting from January 1, 2013, which is a good sign for rubber prices.

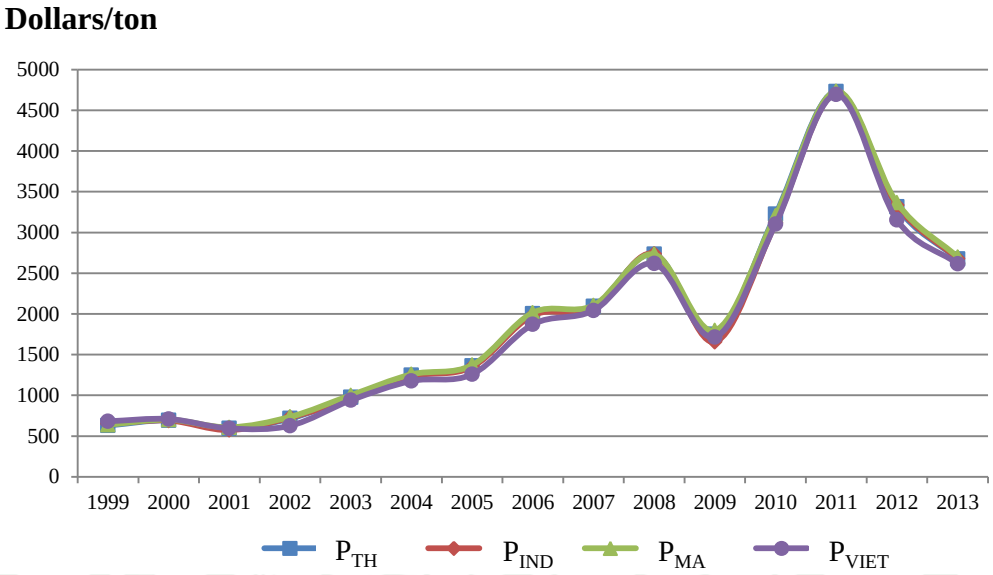


Figure 12 The trend of the yearly average import price of Tsnr between 1999 – 2013 from important export countries to the Chinese market

CHAPTER IV

RESULTS OF THE STUDY

This chapter comprises the result of the two parts of the objectives: the estimation of Tsnr import demand in the Chinese market from the main exporters and the problems and obstacles of Thai natural rubber exporters.

The Estimation of Tsnr Import Demand in the Chinese Market from the Main Exporters

The estimation of Tsnr import demand in the Chinese market represents the relationship between the budget share equation and the factors affecting the Tsnr price and the total expenditure on Tsnr in the Chinese market weighted with the Stone price index factors by using the LA/AIDS model and the Restricted Seemingly Unrelated Regression (RSUR) method.

Therefore, and firstly, the five budget share equations were estimated separately. For each equation, the serial correlation LM test was used to test for autocorrelation and the White test was used to test for heteroscedasticity. The test results showed that heteroscedasticity was not found, but autocorrelation was found in all five equations. Therefore, autocorrelation was remedied for each equation. Because the expenditure shares (w_i) of the five equations sum to one, estimating the demand system, composed of five share equations, would be singular. Therefore, the last equation (Others) was dropped to estimate the equation as a system using the SUR. The coefficients of the last equation can be calculated from the adding-up condition. The estimated parameters from the Tsnr import demand in the Chinese market from the LA/AIDS model are shown in Table 2.

From Table 2, 68.21% of the variation in the Tsnr import demand in the Chinese market could be explained by the price of Tsnr imported from Thailand, Indonesia, Malaysia, and Vietnam, and the average price of Tsnr imported from other countries, and also the Chinese expenditure on imported Tsnr. The import demand from Indonesia, Malaysia, and Vietnam could be explained by independent variables at 47.67%, 80.82%, and 60.3% of the variation in import demand accordingly.

For the import demand from Thailand, testing the statistical significance of coefficient for each independent variable with a t-statistic showed that price of Tsnr imported from Thailand, Malaysia, and Vietnam were significant at the 90%, 99%, and 99% confidence level respectively. The total expenditure in Tsnr the Chinese market weighted with the Stone's price index was significant at the 90% confidence level. The increase of Tsnr price imported from Thailand and Vietnam, and the total expenditure in the Chinese Tsnr market weighted with the Stone's price index were significant with a negative effect, and would lead to a reduction in Chinese imports of Tsnr from Thailand, while an increase of Tsnr price imported from Malaysia has a positive effect on Chinese Tsnr imports from Thailand, and would lead to a significant increase in imports from Thailand.

In case of import demand from Indonesia, the explanatory variable significant at the 90% confidence level was the price of Tsnr imported from Vietnam with a positive effect on Chinese imports of Tsnr from Indonesia. The increase in the price of Tsnr imported from Vietnam would lead to increased imports from Indonesia.

The import demand from Malaysia would have an impact when the price of Tsnr imported from Indonesia and Malaysia change at 95% and 99% confidence levels respectively. The price of Tsnr imported from Indonesia had positive effects. The increase in the price of Tsnr imported from Indonesia made China import more from Malaysia. While the price of Tsnr imported from Malaysia had negative effects, the increase in the price of Tsnr imported from Malaysia made China less import from Malaysia.

Table 2 Estimation of the LA/AIDS model

Coefficient	Export countries				
	Thailand (W_{TH})	**Indonesia (W_{IND})**	**Malaysia (W_{MA})**	**Vietnam (W_{VIET})**	**Other (W_O)**
C	-0.0098	0.0312	1.2850	-0.2490	-0.0574
	$(-0.0274)^{ns}$	$(0.0941)^{ns}$	$(4.1223)^{***}$	$(-1.7984)^{*}$	
$\ln P_{TH}$	-0.3648	0.1002	0.1805	-0.0426	0.1267
	$(-1.8578)^{*}$	$(0.5187)^{ns}$	$(1.1330)^{ns}$	$(-0.4651)^{ns}$	
$\ln P_{IND}$	-0.2419	-0.0390	0.3113	-0.0293	-0.0011
	$(-1.4834)^{ns}$	$(-0.2399)^{ns}$	$(2.2825)^{**}$	$(-0.3847)^{ns}$	
$\ln P_{MA}$	0.9861	-0.1965	-0.6953	0.1003	-0.1946
	$(3.8134)^{***}$	$(-0.7420)^{ns}$	$(-3.1156)^{***}$	$(0.7815)^{ns}$	
$\ln P_{VIET}$	-0.2230	0.1490	0.0725	-0.0034	0.0050
	$(-2.7337)^{***}$	$(1.6885)^{*}$	$(0.9546)^{ns}$	$(-0.0769)^{ns}$	
$\ln P_O$	-0.0573	0.0031	0.0009	-0.0071	0.0604
	$(-0.8635)^{ns}$	$(0.0470)^{ns}$	$(0.0163)^{ns}$	$(-0.2307)^{ns}$	
$\ln(x/P^s)$	-0.0354	0.0095	0.0020	0.0138	0.0101
	$(-1.6848)^{*}$	$(0.4530)^{ns}$	$(0.1130)^{ns}$	$(1.3785)^{ns}$	
R^2	0.682133	0.476696	0.808156	0.603025	
Adjusted R^2	0.659224	0.444279	0.796272	0.578434	
S.E. of regression	0.050742	0.048971	0.041067	0.022675	
D.W.-statistics	2.129963	1.893138	2.161481	1.644286	

Note: Values in parentheses are the t-statistics.

^{ns} not statistically significant

* = significance at 10% level,

** = significance at 5% level, and

*** = significance at 1% level

where W_{TH}, W_{IND}, W_{MA}, W_{VIET}, and W_O are the expenditure shares of Thailand, Indonesia, Malaysia, Vietnam, and Others respectively. $P_{TH,}$ $P_{IND,}$ $P_{MA,}$ $P_{VIET,}$ and P_O represent the price of Tsnr imported from Thailand, Indonesia, Malaysia, Vietnam, and Others respectively (dollars/ton). The x/P^s stands for the total expenditure in the Chinese Tsnr market weighted with the Stone's price index (dollar).

In addition, the adding up condition can conveniently be solved, and the homogeneity and symmetry conditions were also tested. The adding up given by the share of the Chinese import value of Tsnr ($\sum w_i = 1$) that made estimation only of 4 from 5 equations by estimating equation demand from Thailand, Indonesia, Malaysia, and Vietnam. The parameters from 'Other' countries depended on the adding up condition. Theoretically, homogeneity and symmetry should be imposed in the estimation to assure that the microeconomics behind the model will hold. Homogeneity (of degree zero in prices) all γ_{ij} summed up should equal zero for each equation. Finally, symmetry requires that $\gamma_{ij} = \gamma_{ji}$ for all i and j. The restrictions of homogeneity and symmetry conditions are tested using the Wald test. This test is based on the null hypothesis that the sample information is consistent with the imposed restrictions. In other words, if the null hypothesis cannot be rejected, it implies that the error structure of the respective unrestricted model does not differ from that of the restricted model. If the null hypothesis is rejected, it implies that the imposed restrictions are not supported by sample information. The computed Chi-squares of the imposed restrictions are presented in Table 3 and Table 4.

Table 3 Wald test statistics to test homogeneity restriction for the Chinese LA/AIDS Tsnr demand model

Homogeneity	**Chi-square**	**Probability**
$\sum_{j=1}^{5} \gamma_{THj} = 0$	5.092696**	0.0240
$\sum_{j=1}^{5} \gamma_{INDj} = 0$	0.172118	0.6782
$\sum_{j=1}^{5} \gamma_{MAj} = 0$	11.47438***	0.0007
$\sum_{j=1}^{5} \gamma_{VIETj} = 0$	1.164064	0.2806

Table 4 Wald test statistics to test symmetry restriction for the Chinese LA/AIDS Tsnr demand model

Symmetry	Chi-square	Probability
$\gamma_{TH.IND} = \gamma_{IND.TH}$	1.797448	0.1800
$\gamma_{TH.MA} = \gamma_{MA.TH}$	9.286413***	0.0023
$\gamma_{TH.VIET} = \gamma_{VIET.TH}$	2.273583	0.1316
$\gamma_{IND.MA} = \gamma_{MA.IND}$	3.605445*	0.0576
$\gamma_{IND.VIET} = \gamma_{VIET.IND}$	2.242629	0.1343
$\gamma_{MA.VIET} = \gamma_{VIET.MA}$	0.035464	0.8506

The computed Chi-square in Table 3 shows that the null hypotheses of the homogeneity restrictions on Thailand and Malaysia demand equations can be rejected at 5% and 1% respectively. This can illustrate that Thailand and Malaysia do not follow the rule of homogeneity. The null hypothesis of symmetry restriction between Thailand and Indonesia, Thailand and Vietnam, Indonesia and Vietnam, and Malaysia and Vietnam demand equations cannot be rejected at a 1% level of significance, as shown in Table 4. For the other two symmetry restrictions, the null hypotheses are rejected. The results imply that the data used in this dissertation seem to be consistent with the homogeneity restrictions; however the data support only four symmetry restrictions. Several studies of food demand have also rejected the symmetry restriction. A list of studies in food demand that imposed homogeneity and symmetry restrictions in the LA/AIDS is shown in Table 5, Deaton and Muellbauer (1980) estimated the LA/AIDS on eight nondurable goods using annual British data and found that symmetry restriction was rejected. Green, Carman, and McManus (1991) found that homogeneity and symmetry conditions were strongly rejected in the estimation of demand on dried fruits. Satyanarayana et al (1999) found rejection of symmetry in the estimation of demand for malt using the LA/AIDS. Vickner and Davies (1999) estimated the degree of market power in the spaghetti sauce industry and found that in their error-components 3SLS (EC3SLS) estimations of six of the ten

symmetry restrictions on the LA/AIDS were rejected. However, they used the parameter estimates from the model with the imposed restrictions. Since the results from testing the restrictions are consistent with those found in previous studies, the estimated results from the LA/AIDS in this study are reported with the restrictions imposed.

Table 5 Listing of research on food product that imposed restrictions on the LA/AIDS

Auther (Published year)	**Homogeneity**	**Symmetry**
Deaton and Muellbauer (1980)	Rejected	Rejected
Blanciforti and Green (1982)	Rejected	-
Blanciforti and Green (1983)	Rejected	-
Chalfant (1987)	Not reported	Not reported
Green, Carman, and McManus (1991)	Rejected	Rejected
Cotterill (1994)	Not reported	Not reported
Richards, Kagan, and Gao (1997)	Not reported	Not reported
Vickner and Davies (1999)	Rejected[a]	Rejected[a]
Cotterill, Putsis, and Dhar (2000)	Not reported	Not reported

Source: Daloonpate (2002)

Note: - means the restriction was not imposed.

[a] partially rejected in the EC3SLS

Calculation elasticity of demand

The Mashallian own-price and cross-price elasticities were calculated at their sample means and are shown in Table 6. For the import demand from Thailand, own-price elasticity is elastic. A one percent increase in the price of Tsnr imported from Thailand leads to a decrease in Chinese imports of 1.9712 percent from Thailand. The cross-price elasticity from Malaysia is elastic. A one percent increase in the price of Tsnr imported from Malaysia increases Chinese import from Thailand by 2.7497 percent. When the Tsnr price from Vietnam increases by one percent, the demand will

decrease from Thailand by 0.6105 percent, which is inelastic. The cross-price from Indonesia and Other countries are not statistically significant.

Table 6 Marshallian own and cross price, and expenditure elasticities for Tsnr demand in the Chinese market

Demand	Price of imported Tsnr from					Expenditure
	Thailand	Indonesia	Malaysia	Vietnam	Other	
Thailand	-1.9712	-0.6411^{ns}	2.7497	-0.6105	-0.1554^{ns}	0.9022
Indonesia	0.3609^{ns}	-1.1550^{ns}	-0.7431^{ns}	0.5537	0.0105^{ns}	1.0355^{ns}
Malaysia	0.6129^{ns}	1.0594	-3.3726	0.2468^{ns}	0.0028^{ns}	1.0068^{ns}
Vietnam	-0.9614^{ns}	-0.6669^{ns}	1.9432^{ns}	-1.0832^{ns}	-0.1513^{ns}	1.2788^{ns}
Other	4.6261	-0.1442	-7.4294	0.1698	1.2629	1.3808

Note: Elasticities are read from left to right.

For the import demand from Indonesia, the own-price and cross-price elasticities are not statistically significant except for the cross-price elasticity from Vietnam, which is inelastic. A one percentage change in the price of Tsnr imported from Vietnamese will make import demand from Indonesia change 0.5537 percent in the same direction.

For the import demand from Malaysia, own-price elasticity is the most elastic. A one percent change in the price of Tsnr imported from Malaysia will decrease Chinese demand by 3.3726 percent. The cross-price elasticity from Indonesia is elastic being 1.0594 implying that a one percent increases in the price of Tsnr imported from Indonesia will cause the demand from Malaysia to increase by 1.0594 percent.

Because of the own-price and cross-price elasticities of Vietnam being statistically insignificant, the price of Tsnr imported from those countries do not affect import demand from Vietnam.

The expenditure elasticity of Chinese import demand for Thai Tsnr is the lowest and inelastic, at 0.9022. The highest expenditure elasticity of Chinese import demand for Tsnr is Vietnam at 1.2788, followed by Indonesia and Malaysia but all of them are not statistically significant. A one percent increase in Chinese expenditure for Tsnr will increase the Chinese import demand for Tsnr from Thailand by 0.9022 percent. For the other countries, if Chinese expenditure increases at 1 percent, it will not affect import demand in each country.

From the above, import demand of Tsnr in China shows that the own-price elasticities of demand for Thailand and Malaysia are elastic. If price of Thai and Malaysian Tsnr change, will make import demand of Thai and Malaysian Tsnr change more effect than price change at the opposite direction. The results imply that Chinese consumers are responsive to the Thai and Malaysian Tsnr price but the demand for Tsnr from Thailand has a lesser effect than Malaysia. The cross-price elasticity of demand for Thai Tsnr on Vietnamese Tsnr prices has a negative sign, implying that Thai Tsnr behaves as a complement to Vietnamese Tsnr. Those with positive signs for cross-price elasticity are substitute goods, For example, Tsnr demand from Thailand is most affected by the Malaysian price (illustrate that Malaysia is Thailand's major competitors), the price from Indonesia affects the demand from Malaysia, and the demand from Indonesia is affected by the Vietnamese price. The expenditure elasticity of Thailand is inelastic which indicates that Thai Tsnr imported to the Chinese market is a necessity good.

Most of the Hicksian elasticities (Table 7) are found to be lesser in magnitude to their respective Mashallian elasticities as expected. However, there are some results which seem to have greater magnitude than their Marshallian sources. Furthermore, one of the cross-price elasticities changed their sign shifting from being complements in Marshallian elasticity results to substitutes in Hicksian elasticity.

Table 7 Hicksian own and cross price elasticities for Tsnr demand in the Chinese market

	Thailand	**Indonesia**	**Malaysia**	**Vietnam**	**Other**
Thailand	-1.6442	-0.3992	3.0143	-0.5658	-0.1314
Indonesia	0.7362	-0.8773	-0.4393	0.6050	0.0380
Malaysia	0.9778	1.3294	-3.0772	0.2966	0.0296
Vietnam	-0.4979	-0.3239	2.0065	-1.0199	-0.1173
Other	5.1266	0.2261	-7.3611	0.2065	1.2997

Note: Elasticities are read from left to right.

The Problems and Obstacles of Thai Natural Rubber Exporters

To analyze the problems and obstacles of Thai Tsnr, the researcher employs a questionnaire, asking 25 Tsnr exporters in Thailand including small and medium businesses. There are 5 companies to cooperate in the survey. From the answers in the questionnaires, the problems of Thai Tsnr exporters are as follows:

1. Customers' creditability: This problem normally happens with small Tsnr exporters. Customers may experience delayed payments. For example, a small exporter has already signed a contract with one new customer and then the exporter shipped the goods following that contract. However, the customer did not promptly clear the goods at the port in order to negotiate with the exporter to discount the price. On the other hand, large exporters usually have regular customers; therefore, they are not faced with this problem.

2. Exchange rate: The NR price usually fluctuates because there is a daily price established in international markets. If the exchange rate is fluctuating, it will make exporters miscalculate the costs. Moreover, if the market price is lower than the agreed price, some buyers may refuse to receive the goods in order to negotiate the price again.

3. Supply of NR: This problem also occurs with small and medium sized businesses because rubber is a seasonal product. If customers order Tsnr in the off season, it is possible for small and medium exporters not to find raw materials in time and prices are also high.

4. Delivering goods:

4.1 The transportation cost is very high because the distance between the factory and the port is great. The popular way to ship goods to port in Thailand is by using auto transportation. Rail freight is not popular in Thailand because it is a single track system. If there is a problem with some parts of the rail, the shipping will get stuck. Therefore, exporters prefer using auto transportation to rail freight. This causes higher cost because of the smaller quantity and high gas prices.

4.2 The exporting port is often very crowded with much traffic; therefore, it takes a long time to complete all procedures. Some equipment or machines are not good or modern enough to be processed within the time. Moreover, because the government policy is not clear, the development of ports is pretty slow and inefficient. Therefore, some exporters solve this problem by using Penang Port instead of Bangkok Port because of a more convenient, faster service, and a lower freight cost.

5. Delay in government sector documents: Because the export procedure is very long, cargos need to wait until they receive a license number in order to complete the Bill of Lading and other outbound freight documents. The long procedure starts with submission of the declaration, the checking and verification of the declaration, payment of duties and taxes, and inspection and release of cargo. Moreover, the exporter needs to use only original documents to contact or submit to each government agency; therefore, it takes quite a long time to get approval from each sector, which causes the delay of exports.

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

Conclusion of the study

China is the biggest natural rubber consumer because the world's tire production is located in China. Mostly, exports go to the European Union and the United States of America which have been facing financial crises, so China's exporting of tires has dropped Therefore, China's natural rubber imports are likely to slow down. In this study, the factors that determine the demand for imports of Tsnr comprising the price of Tsnr imported from Thailand, Indonesia, Malaysia, Vietnam, and Others (dollars/ton) and the total expenditure in the Chinese Tsnr market weighted with the Stone's price index (dollar) are presented. This study used monthly data from November, 2003 to December, 2013 on Harmonized Commodity Description and coding System (HS) of Trade Nomenclature at the 6-digit code level as used in the reporting of trade flows in the Rubber Statistical Bulletin following, 400122 Technically specified natural rubber (Tsnr) from various countries exporting to the Chinese market. The main exporting countries in terms of Chinese import value of Tsnr were Thailand, Indonesia, Malaysia, Vietnam, and Others. These five exporting countries were selected for this study. The factors affecting the import demand from Thailand are the price of Tsnr imported from Thailand, Vietnam, and Malaysia, and the total expenditure in the Chinese Tsnr market weighted with the Stone's price index. The price of Tsnr imported from Vietnam affected the import demand from Indonesia. The import demand from Malaysia is affected by factors that impact the price of Tsnr imported from Indonesia and Malaysia.

From the research, import demand of Tsnr in China shows that the own-price elasticities of demand for Thailand and Malaysia are elastic (-1.9712 and -3.3726, respectively). The results imply that Chinese consumers are responsive to the Thai and Malaysian Tsnr price but the demand for Tsnr from Thailand has a lesser effect than Malaysia. The cross-price elasticity of demand for Thai Tsnr on Vietnamese Tsnr prices has a negative sign, implying that Thai Tsnr behaves as a complement to

Vietnamese Tsnr. However, the cross-price elasticity of demand for Thai Tsnr on the Vietnamese Tsnr price is very small (-0.6105), indicating that they are only weak complements. Those with positive signs for cross-price elasticity are substitute goods, For example, Tsnr demand from Thailand is most affected by the Malaysian price (2.7497), the price from Indonesia affects the demand from Malaysia (1.0594), and the demand from Indonesia is affected by the Vietnamese price (0.5537). The expenditure elasticity of Thailand is inelastic (0.9022); which indicates that Tsnr exported from Thailand to the Chinese market is a necessity good.

Recommendations

Suggestion of the estimation of Tsnr import demand in the Chinese market

Based on the finding of the study, in order to improve the share of Tsnr market, Thailand has to give attention to pricing policy implications. From the study, Chinese consumption of Thai Tsnr demonstrated that its demand is price elastic. Hence, the market share and revenue can markedly be increase by pricing policies that make the Thai Tsnr more competitive in Chinese market. Furthermore, Tsnr from Malaysia is found to be substitution goods for Thai Tsnr. However, if Malaysia uses the pricing policy as well, the Thai's exporting will have more effect than Malaysia. Therefore, to use the pricing tactics should consider the combination of information because it affects to exporting quantities and income of agriculturists too.

Suggested solutions to solve the problems exporters face

1. Checking the reliability of traders before signing contracts such as checking traders' financial status is important. Government supports the organization of road shows so that Thailand's exporters can meet foreign traders directly. This will help to expand the market and increase the confidence of exporters.

2. To protect sellers from the refusal of buyers to pay, payment terms should be L/C (Letters of Credit) which can put specifications of products and all agreement between buyers and exporters into the contract of the L/C. Although opening an L/C may have higher cost, it is also beneficial to both buyers and exporters.

3. Sourcing raw materials needs to be planned by using statistics and forecasts in advance. Normally, this problem does not usually happen for large exporters because they can minimize risk by sourcing raw materials from many suppliers in various regions.

4. Supporting cooperation between people in the private sector within the country can decrease the problem of rubber price wars. Moreover, the government should be the center of the cooperation and develop the rubber trading system in order to set standard for every exporter to follow.

5. In order to solve the problem of goods delivery, Thailand should develop a dual gauge railway system around the country. The carriage of goods by train can deliver rubber in vast quantities more cheaply than delivery by truck. Furthermore, the advantage of a dual gauge is whenever one gauge is out of order, the other gauge can be used to transport goods. This will be more convenient, more efficient, and more effective for exporters to deliver rubber.

6. The government should provide a precise policy about sea ports by stimulating all involved parties to improve and develop deep water ports to be more efficient with higher standards that are suitable to the world. This is because Thailand currently exports rubber by ship at sea ports. Although exporters can directly ship goods to China at Laem Chabang Port, in the south of Thailand exporters like to deliver through Penang Port in Malaysia. This is because it is more convenient and cheaper. Moreover, the closest sea port to the south region is Songkha Port which is too shallow for cargo ships to dock. Consequently, exporters have to use small ships first in order to transfer rubber to cargo ships. This increases the transportation cost too.

7. The government should plan and facilitate information exchange between sea ports and customs in order to reduce the export procedure and to support exporters.

8. Another method to solve the export problem is to reduce the complexity of document submissions to the government sector. At present, the Rubber Research

Institute, at the Department of Agriculture is working on the development of a system to issue certificates of approval with an electronic system by using the National Single Windows Rubber program. This program can decrease the documentary process and be more convenient for exporters.

REFERENCES

Barten, A. P. 1964. "In Econometric Analysis for National Economic Planning". P. Hart, G. Mills, and J. Whitaker. (eds.). **Family composition, prices and expenditure patterns**. London: Butterworth.

Blanciforti, L. A., R.D. Green, and G.A. King. 1986. "U.S. Consumer Behavior Over the Postwar Period: An Almost Ideal Demand System Analysis". **Giannini Foundation Mono** 40: 66.

Boonjit, S. 2009. **An Analysis on Import Demand for Sugar in Japan**. Graduate School, Kasetsart University, (In Thai).

Christensen, L. R., D. W. Jorgenson, and L. J. Lau. 1975. "Transcendental Logarithmic Utility Functions". **American Economic Review** 65: 367-383.

Daloonpate, A. 2002. **Estimating the degree of market power and price response strategies in a product differentiated oligopoly: The case of the canned tuna industry in a local market**: **Knoxville.** Doctor of Economics Dissertation. The University of Tennessee.

Deaton, A. and J. Muellbauer. 1980. "An Almost Ideal Demand System". **American Economic Review** 70: 312-326.

_____. 1980. "Economic and Consumer Behavior". **Cambridge: Cambridge University Press**.

Department of International Trade Promotion (DITP) 2005. **The Exporting Process of Natural Rubber**. Ministry of Commerce, Royal Thai Government. (Online). http://www.ditp.go.th/, March 16, 2013.

Department of International Trade Promotion (DITP) 2012. **The Overview rubber market in China**. Ministry of Commerce, Royal Thai Government. (Online), http://112.121.130.150/index.php/market/, March 16, 2013.

Feleke, S. T. and L. M. Walters. 2005. **Allocation of Global Import Demand for Coffee among the World's Largest Economies: Implications for Developing Countries, February 6-8, 2005**. Selected paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting: Little Rock, Arkansas.

Global Trade Atlas. Global Trade Information Services. (GTIS). 2014. **GTA Navigator**. (Online), www.gtis.com/gta/, June 20, 2014.

Green, R. and J.M.Alston. 1990. "Elasticities in AIDS Models". **American Journal of Agricultural Economics** 72: 442-445.

International Rubber Study Group. 2010. **Rubber Statistical Bulletin** 65(1-3): 21-23.

Lee, Y., P. L. Kennedy, and B. Hilbun. 2008. **Import Demand System Analysis of the South Korean Wine Market with the source differentated AIDS Model, July 27-29, 2008**. Selected Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting: Orlando.

Lluch, C., A. A. Powell, and R. A. Williams. 1997. "Patterns in Household Demand and Saving". **Oxford University Press**.

Nicholson, W. 2004. **Microeconomic Theory: Basic Principles and Extensions**. Eighth Edition, South-Western Thomson Learning.

Nicholson, W. and M. S. Christopher. 2007. **Intermediate Microeconomics and Its Application**. Tenth Edition, South-Western Thomson Learning.

Panuwat, P.. 2007. **An Analysis of Competitiveness of Rubber Industry in Thailand**. Graduate School, Kasetsart University, (In Thai).

Phantamit, B. and V. Limsombunchai. 2010. "An Analysis of Japan Import Demand for Natural Rubber from Thailand". **Songklanakarin Journal of Social Sciences and Humanities** 16(1): 141–150., (In Thai).

Pugel, T. A.. 2011. **International Economics**. Fifteenth Edition, McGraw-Hill/Irwin.

Rubber Research Institute of Thailand (RRIT). 2000. **The Academic information of Rubber (2000)**. Department of Agriculture, Ministry of Agriculture and Cooperatives. ISBN 974-436-194-8., (In Thai).

Rubber Research Institute of Thailand (RRIT). 2010. **The Academic information of Rubber (2010)**. Department of Agriculture, Ministry of Agriculture and Cooperatives. ISBN 978-974-436-744-0., (In Thai).

Rubber Research Institute of Thailand (RRIT). 2011. **Statistic**. (Online). www.rubberthai.com/statistic/stat_index.htm, November 8, 2011.

Rubber Research Institute of Thailand (RRIT). 2011. **Para Rubber Electronic Bulletin**. Oct. – Dec., 2011. No. 7th: 41-45.

Rubber Research Institute of Thailand (RRIT). 2012. **Para Rubber Electronic Bulletin**. Oct. – Dec., 2012. No. 11st: 29-32.

Sadoulet, E. and A. D. Janvry. 1995. "Quantitative Development Policy Analysis". **The Johns Hopkins University press Baltimore and London**.

Sangpitak, T. 2007. **An Analysis of the U.S. Import Demand for Rubber**. Graduate School, Kasetsart University, (In Thai).

Stone, J. R. N. 1954. "Linear Expenditure Systems and Demand Analysis: An Application to the Pattern of British Demand". **Economic Journal** 64: 511-527.

The Agricultural Futures Exchange of Thailand (AFET). 2013. **Press Release**. (Online). http://www.afet.or.th/, June 12, 2014.

Theil, H. 1965. "The information approach to demand analysis". **Econometric** 33: 67-87.

Udomsri, C.. 2001. **An Analysis of Thailand's Natural Rubber Export Potential**. Graduate School, Kasetsart University, (In Thai).

Uzunoz, M. and Y. Akcay. 2009. “Factors Affecting The Import Demand of Wheat in TURKEY”. **Agricultural Academy, Bulgarian Journal of Agricultural Science** 15 (1): 60-66.

Vidyashankara, S. *et al*.. 1999. “Import Demand for Malt in Selected Countries: A Linear Approximation of AIDS”. **Canadian Journal of Agricultural Economics** 47: 137-149.

Wen, S. C. *et al.*. 2003. “Analysis of the food consumption of Japanese households”. **Food and Agricultural organization of the United Nations**: 18-21.

Won, W. K., W. Mao, and T. Sakurai. 2001. **Wheat demand in Japanese flour milling industry: a production theory approach**. Agricultural Economics. North Dakota State University.

Wongmahan, K. 2004. **Demand Analysis of Natural Rubber imports from Thailand to Main Importing Countries**. Graduate School, Kasetsart University, 108, (In Thai).

World Port Source. 2013. **The ports and harbors located in Thailand**. (Online), http://www.worldportsource.com/ports/index/THA.php. December 4, 2013.

APPENDICES

Appendix A

General Information of Rubber

Appendix Table 1 Exports of Thai NR by destination

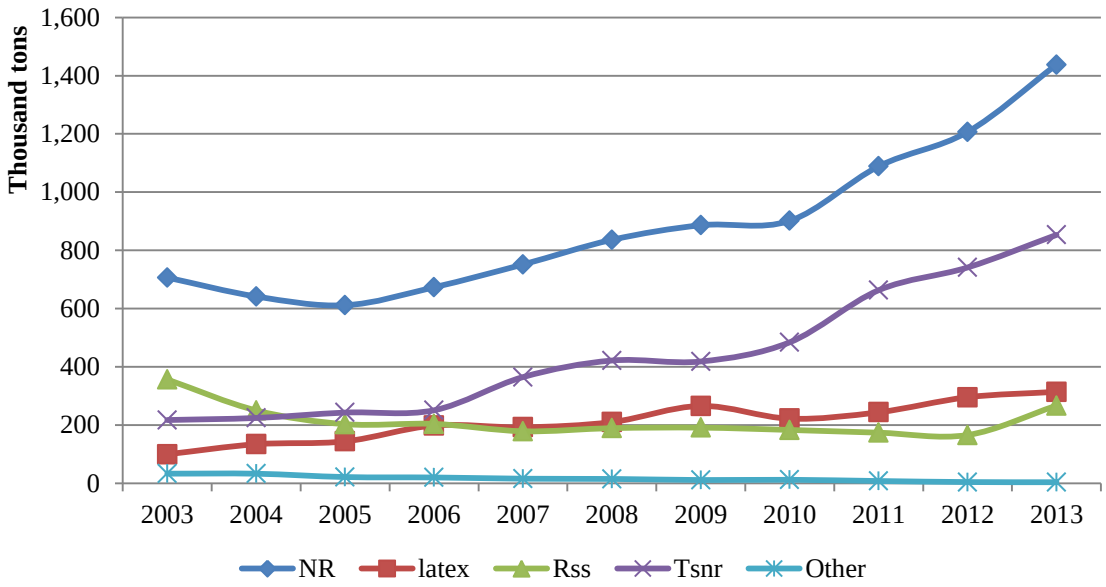
Country	quantity (tons)			value (million US $)		
	2011	**2012**	**2013**	**2011**	**2012**	**2013**
China	1,090,554	1,227,211	1,507,157	4,565.20	3,595.50	3,719.70
	(36.39)	(40.92)	(43.85)	(36.32)	(41.31)	(45.80)
Malaysia	519,900	547,363	661,516	1,505.45	1,161.36	1,092.82
	(17.35)	(18.25)	(19.25)	(11.98)	(13.34)	(13.46)
Japan	326,493	273,728	287,030	1,704.20	933.96	808.79
	(10.89)	(9.13)	(8.35)	(13.56)	(10.73)	(9.96)
South Korea	196,592	185,242	166,843	874.93	588.03	421.60
	(6.56)	(6.18)	(4.85)	(6.96)	(6.76)	(5.19)
United States	213,720	183,678	152,666	995.55	606.23	410.78
	(7.13)	(6.12)	(4.44)	(7.92)	(6.96)	(5.06)
Brazil	83,244	67,313	93,013	366.54	211.82	234.24
	(2.78)	(2.24)	(2.71)	(2.92)	(2.43)	(2.88)
India	69,244	73,203	83,866	286.36	243.50	213.31
	(2.31)	(2.44)	(2.44)	(2.28)	(2.80)	(2.63)
Turkey	38,153	37,149	41,498	168.78	117.24	105.45
	(1.27)	(1.24)	(1.21)	(1.34)	(1.35)	(1.30)
Taiwan	33,156	30,650	37,551	189.31	94.14	95.65
	(1.11)	(1.02)	(1.09)	(1.51)	(1.08)	(1.18)
Germany	38,273	31,116	34,700	170.30	95.04	81.28
	(1.28)	(1.04)	(1.01)	(1.35)	(1.09)	(1.00)
Other	387,691	342,243	371,197	1,744.41	1,057.87	937.29
	(12.94)	(11.41)	(10.80)	(13.88)	(12.15)	(11.54)

Source: Global Trade Atlas (2014)

Appendix Table 2 Volume of Tsnr imports in China

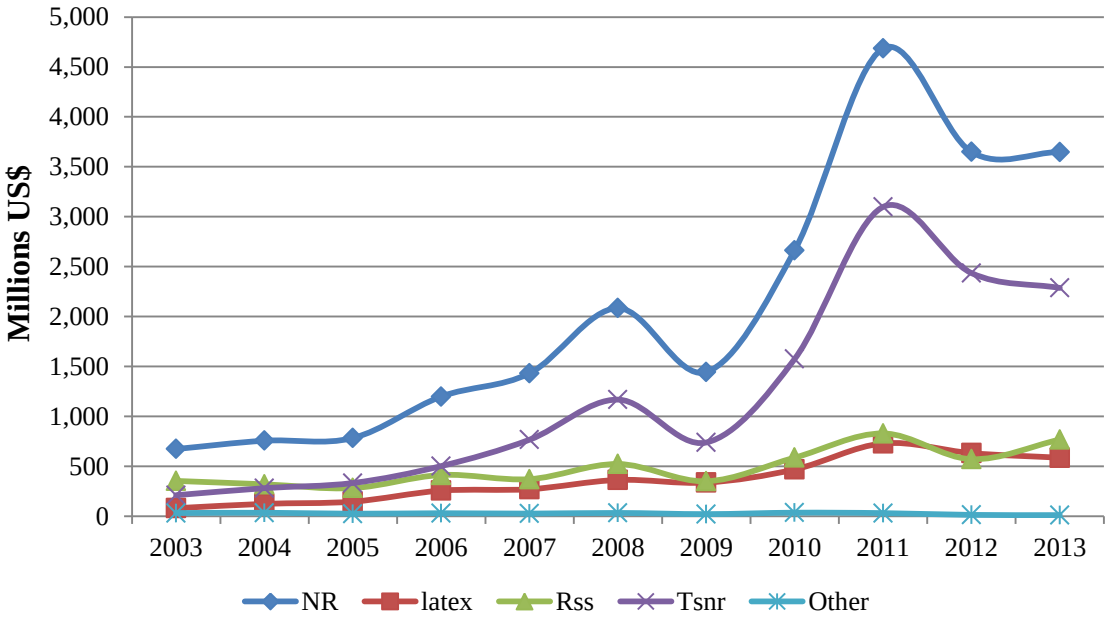
Country	Quantity (tonnes)															
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Thailand	44,639	61,383	142,235	163,820	154,813	217,268	224,376	242,938	250,828	364,767	421,685	418,343	484,279	663,161	741,240	853,189
	(47.25)	(36.61)	(44.42)	(37.17)	(40.19)	(39.43)	(32.18)	(26.69)	(24.44)	(31.77)	(36.93)	(36.56)	(35.78)	(41.76)	(45.57)	(47.54)
Indonesia	21,166	34,301	36,673	131,375	42,872	107,830	181,137	245,263	310,430	301,054	319,397	388,734	394,571	424,176	392,163	409,561
	(22.40)	(20.46)	(11.45)	(29.81)	(11.13)	(19.57)	(25.98)	(26.95)	(30.25)	(26.22)	(27.97)	(33.98)	(29.15)	(26.71)	(24.11)	(22.82)
Malaysia	13,639	43,144	73,617	69,427	110,226	160,573	235,350	370,060	396,759	426,552	349,708	274,484	343,971	353,869	284,974	305,644
	(14.44)	(25.73)	(22.99)	(15.75)	(28.62)	(29.14)	(33.75)	(40.66)	(38.66)	(37.15)	(30.63)	(23.99)	(25.41)	(22.28)	(17.52)	(17.03)
Vietnam	4,044	9,137	44,532	64,218	64,647	49,627	25,169	24,287	42,640	44,490	35,152	38,250	89,631	88,802	166,288	161,791
	(4.28)	(5.45)	(13.91)	(14.57)	(16.78)	(9.01)	(3.61)	(2.67)	(4.15)	(3.87)	(3.08)	(3.34)	(6.62)	(5.59)	(10.22)	(9.01)
Other	10,990	19,696	23,175	11,937	12,642	15,763	31,218	27,586	25,607	11,467	15,925	24,307	41,217	58,106	41,891	64,625
	(11.64)	(11.74)	(7.23)	(2.70)	(3.28)	(2.86)	(4.47)	(3.02)	(2.47)	(1.00)	(1.40)	(2.12)	(3.04)	(3.66)	(2.58)	(3.60)
Total	94,478	167,661	320,234	440,774	385,201	551,063	697,250	910,133	1,026,264	1,148,331	1,141,865	1,144,118	1,353,668	1,588,114	1,626,556	1,794,810
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

Source: Global Trade Atlas (2014)



Appendix Figure 1 Volume of China's import Thai NR by community

Source: Global Trade Atlas (2014)



Appendix Figure 2 Values of Thailand's export NR to China by community

Source: Global Trade Atlas (2014)

Appendix B

Calculation of Elasticity

The elasticities of LA/AIDS demand can be estimated from LA/AIDS demand equation by following:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \left(\ln x - \sum_i w_i \ln p_i \right)$$

Assume that have 2 products in the market will get

$$w_1 = \alpha_1 + \gamma_{11} \ln p_1 + \gamma_{12} \ln p_2 + \beta_1 \left(\ln x - w_1 \ln p_1 - w_2 \ln p_2 \right)$$

From $w_1 = \frac{p_1 q_1}{x}$, $q_1 = \frac{w_1 x}{p_1}$

$$q_1 = \left(\frac{x}{p_1}\right)\alpha_1 + \left(\frac{x}{p_1}\right)\gamma_{11} \ln p_1 + \left(\frac{x}{p_1}\right)\gamma_{12} \ln p_2 + \left(\frac{x}{p_1}\right)\beta_1 \ln x - \left(\frac{x}{p_1}\right)\beta_1 w_1 \ln p_1 - \left(\frac{x}{p_1}\right)\beta_1 w_2 \ln p_2$$

Own price elasticity; $\varepsilon_{11} = \frac{\partial q_1}{\partial p_1} * \frac{p_1}{q_1}$

$$\frac{\partial q_1}{\partial p_1} = \left(\frac{\partial \left(\frac{x\alpha_1}{p_1}\right)}{\partial p_1} \right) + \left(\frac{\partial \left(\frac{x}{p_1}\right)\gamma_{11} \ln p_1}{\partial p_1} \right) + \left(\frac{\partial \left(\frac{x}{p_1}\right)\gamma_{12} \ln p_2}{\partial p_1} \right) + \left(\frac{\partial \left(\frac{x}{p_1}\right)\beta_1 \ln x}{\partial p_1} \right)$$

$$- \left(\frac{\partial \left(\frac{x}{p_1}\right)\beta_1 w_1 \ln p_1}{\partial p_1} \right) - \left(\frac{\partial \left(\frac{x}{p_1}\right)\beta_1 w_2 \ln p_2}{\partial p_1} \right)$$

$$\frac{\partial q_1}{\partial p_1} = -\frac{x\alpha_1}{p_1^2} + \frac{x\gamma_{11}}{p_1^2} - \frac{x\gamma_{11} \ln p_1}{p_1^2} - \frac{x\gamma_{12} \ln p_2}{p_1^2} - \frac{x\beta_1 \ln x}{p_1^2} - \frac{x\beta_1 w_1}{p_1^2} + \frac{x\beta_1 w_1 \ln p_1}{p_1^2} + \frac{x\beta_1 w_2 \ln p_2}{p_1^2}$$

$$\frac{\partial q_1}{\partial p_1} * \frac{p_1}{q_1} = -\frac{x\alpha_1}{p_1 q_1} + \frac{x\gamma_{11}}{p_1 q_1} - \frac{x\gamma_{11} \ln p_1}{p_1 q_1} - \frac{x\gamma_{12} \ln p_2}{p_1 q_1} - \frac{x\beta_1 \ln x}{p_1 q_1} - \frac{x\beta_1 w_1}{p_1 q_1} + \frac{x\beta_1 w_1 \ln p_1}{p_1 q_1} + \frac{x\beta_1 w_2 \ln p_2}{p_1 q_1}$$

$$\varepsilon_{11} = -\frac{\alpha_1}{w_1} + \frac{\gamma_{11}}{w_1} - \frac{\gamma_{11} \ln p_1}{w_1} - \frac{\gamma_{12} \ln p_2}{w_1} - \frac{\beta_1 \ln x}{w_1} - \frac{\beta_1 w_1}{w_1} + \frac{\beta_1 w_1 \ln p_1}{w_1} + \frac{\beta_1 w_2 \ln p_2}{w_1}$$

$$\varepsilon_{11} = -\left[\frac{\alpha_1 + \gamma_{11} \ln p_1 + \gamma_{12} \ln p_2 + \beta_1 \left(\ln x - w_1 \ln p_1 - w_2 \ln p_2 \right)}{w_1} \right] + \frac{\gamma_{11}}{w_1} - \beta_1$$

From $w_1 = \alpha_1 + \gamma_{11} \ln p_1 + \gamma_{12} \ln p_2 + \beta_1(\ln x - w_1 \ln p_1 - w_2 \ln p_2)$

$$\varepsilon_{11}=-\left[\frac{w_1}{w_1}\right]+\frac{\gamma_{11}}{w_1}-\beta_1$$

$$\varepsilon_{11}=-1+\frac{\gamma_{11}}{w_1}-\beta_1$$

$$\varepsilon_{ii} = -1+\frac{\gamma_{ij}}{w_i}-\beta_i$$

Cross price elasticity; $\varepsilon_{12}= \frac{\partial q_1}{\partial p_2} * \frac{p_2}{q_1}$

$$\frac{\partial q_1}{\partial p_2}=\left(\frac{\partial\left(\frac{x\alpha_1}{p_1}\right)}{\partial p_2}\right)+\left(\frac{\partial\left(\frac{x}{p_1}\right)\gamma_{11}\ln p_1}{\partial p_2}\right)+\left(\frac{\partial\left(\frac{x}{p_1}\right)\gamma_{12}\ln p_2}{\partial p_2}\right)+\left(\frac{\partial\left(\frac{x}{p_1}\right)\beta_1\ln x}{\partial p_2}\right)$$

$$-\left(\frac{\partial\left(\frac{x}{p_1}\right)\beta_1 w_1\ln p_1}{\partial p_2}\right)-\left(\frac{\partial\left(\frac{x}{p_1}\right)\beta_1 w_2\ln p_2}{\partial p_2}\right)$$

$$\frac{\partial q_1}{\partial p_2}=\left(\frac{x\gamma_{12}}{p_1p_2}\right)-\left(\frac{x\beta_1 w_2}{p_1p_2}\right)$$

$$\frac{\partial q_1}{\partial p_2}*\frac{p_2}{q_1}=\left(\frac{x\gamma_{12}}{p_1q_1}\right)-\left(\frac{x\beta_1 w_2}{p_1q_1}\right)$$

$$\varepsilon_{12}=\frac{\gamma_{12}}{w_1}-\frac{\beta_1 w_2}{w_1}$$

$$\varepsilon_{ij}=\frac{\gamma_{ij}}{w_i}-\beta_i\frac{w_j}{w_i}$$

Expenditure elasticity; $\varepsilon_{ix}=\frac{\partial Y}{\partial x}*\frac{x}{Y}$, where Y is total expenditure: $Y_i=p_iq_i=w_1x$

$$Y_1=x\alpha_1+x\gamma_{11}\ln p_1+x\gamma_{12}\ln p_2+x\beta_1\left(\ln x-w_1\ln p_1-w_2\ln p_2\right)$$

$$\frac{\partial Y}{\partial x}*\frac{x}{Y}=\alpha_1\left(\frac{x}{Y}\right)+\gamma_{11}\ln p_1\left(\frac{x}{Y}\right)+\gamma_{12}\ln p_2\left(\frac{x}{Y}\right)+\beta_1\left(\frac{x}{Y}\right)+\beta_1\ln x\left(\frac{x}{Y}\right)-\beta_1w_1\ln p_1\left(\frac{x}{Y}\right)-\beta_1w_2\ln p_2\left(\frac{x}{Y}\right)$$

where $Y_i=p_iq_i$

$$\frac{\partial Y}{\partial x}*\frac{x}{Y}=\frac{\alpha_1}{w_1}+\frac{\gamma_{11}\ln p_1}{w_1}+\frac{\gamma_{12}\ln p_2}{w_1}+\frac{\beta_1\ln x}{w_1}-\frac{\beta_1w_1\ln p_1}{w_1}-\frac{\beta_1w_2\ln p_2}{w_1}+\frac{\beta_1}{w_1}$$

$$\frac{\partial Y}{\partial x}*\frac{x}{Y}=\frac{\alpha_1+\gamma_{11}\ln p_1+\gamma_{12}\ln p_2+\beta_1\left(\ln x-w_1\ln p_1-w_2\ln p_2\right)}{w_1}+\frac{\beta_1}{w_1}$$

From $w_1=\alpha_1+\gamma_{11}\ln p_1+\gamma_{12}\ln p_2+\beta_1\left(\ln x-w_1\ln p_1-w_2\ln p_2\right)$

$$\varepsilon_{1x}=\left[\frac{w_1}{w_1}\right]+\frac{\beta_1}{w_1}$$

$$\varepsilon_{1x}=1+\frac{\beta_1}{w_1}$$

$$\varepsilon_{ix}=1+\frac{\beta_i}{w_i}$$

Compensated price elasticities; ε_{ij}^{c}, can be derived by using ε_{ii}, $\varepsilon_{ij}$and ε_{ix} :

$$\varepsilon_{ij}^{c}=\varepsilon_{ij}+\varepsilon_{ix}(w_j)$$

$$\varepsilon_{ij}^{c}=\frac{\gamma_{ij}}{w_i}-\frac{\beta_iw_j}{w_i}-\delta_{ij}^{k}+\left[\frac{\beta_i}{w_i}+1\right](w_j)$$

$$\varepsilon_{ij}^{c}=\frac{\gamma_{ij}-\beta_iw_j+\beta_iw_j}{w_i}+w_j-\delta_{ij}^{k}$$

$$\varepsilon_{ij}^{c}=\frac{\gamma_{ij}}{w_i}+w_j-\delta_{ij}^{k}$$

Appendix C

Questionnaire

<u>คำชี้แจงในการตอบแบบสอบถาม</u>

แบบสอบถามนี้ประกอบไปด้วยคำถาม 2 ส่วน จำนวน 15 ข้อ ซึ่งเกี่ยวข้องกับปัญหาและอุปสรรค์ที่ท่านพบจากการส่งออกยางพารา โดยผู้วิจัยขอความอนุเคราะห์ในการตอบแบบสอบถามตามความคิดเห็นของท่านเพื่อประโยชน์ต่อการวิจัย โดยแบบสอบถามนี้เป็นส่วนหนึ่งของการวิจัยเรื่อง **"การวิเคราะห์อุปสงค์การนำเข้ายางแท่งของไทยไปประเทศจีน"** ซึ่งข้อมูลที่ได้จากการวิจัยครั้งนี้ถือเป็นความลับและใช้เพื่อประโยชน์ต่อการวิจัยครั้งนี้เท่านั้น

<u>ส่วนที่1</u> : ข้อมูลทั่วไป

1. ในปีที่ผ่านมา(2555) ท่านส่งออกยางพาราไปประเทศจีนคิดเป็นกี่เปอร์เซ็นต์ของการส่งออกทั้งหมดของท่าน(ถ้าไม่มี ข้ามไปทำส่วนที่2)

……..……%

2. ผลิตภัณฑ์ยางพาราที่ท่านส่งออกไปยังประเทศจีนในปีที่ผ่านมา (2555) ได้แก่อะไรบ้าง

……

……

……

……

3. การส่งออกในปีที่ผ่านมา (2555) ยางแท่งคิดเป็นกี่เปอร์เซ็นต์ของการส่งออกผลิตภัณฑ์ยางพาราไปยังประเทศจีนทั้งหมดของท่าน(ถ้าไม่มี ข้ามไปทำส่วนที่2)

……..……%

<u>ส่วนที่2</u> :

2.1 ปัญหาที่ท่านมักจะพบในการส่งออกสินค้ายางพาราทางด้านต่างๆ

1. การจัดหาผู้ซื้อในต่างประเทศ

ปัญหาและอุปสรรค์ที่ท่านพบ :

……

……

……

……

……

……

……

……

……

ข้อเสนอแนะและแนวทางการแก้ไขปัญหา :

……

……

……

……

……

……

……

……

……

……

2. การทำข้อตกลงเพื่อการซื้อขายสินค้า

ปัญหาและอุปสรรค์ที่ท่านพบ :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

ข้อเสนอแนะและแนวทางการแก้ไขปัญหา :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3. การทำธุรกรรมทางการเงินระหว่างประเทศ

ปัญหาและอุปสรรค์ที่ท่านพบ :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

ข้อเสนอแนะและแนวทางการแก้ไขปัญหา :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

4. การจัดหาสินค้าเพื่อการส่งออก

ปัญหาและอุปสรรค์ที่ท่านพบ :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

ข้อเสนอแนะและแนวทางการแก้ไขปัญหา :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5. การติดต่อขนส่งสินค้าเพื่อการส่งออก

ปัญหาและอุปสรรค์ที่ท่านพบ :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

ข้อเสนอแนะและแนวทางการแก้ไขปัญหา :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

6. การขอใบผ่านด่านศุลกากรในการส่งยางออกนอกราชอาณาจักร หรือแบบยาง 12

ปัญหาและอุปสรรค์ที่ท่านพบ :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

ข้อเสนอแนะและแนวทางการแก้ไขปัญหา :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

7. การชำระเงินสงเคราะห์กองทุนสงเคราะห์การทำสวนยาง

ปัญหาและอุปสรรค์ที่ท่านพบ :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

ข้อเสนอแนะและแนวทางการแก้ไขปัญหา :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

8. พิธีการทางศุลกากร (พิธีการตรวจเอกสาร และพิธีการตรวจสินค้า)

ปัญหาและอุปสรรค์ที่ท่านพบ :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

ข้อเสนอแนะและแนวทางการแก้ไขปัญหา :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

9. การส่งมอบสินค้าให้แก่ผู้ซื้อ

ปัญหาและอุปสรรค์ที่ท่านพบ :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

ข้อเสนอแนะและแนวทางการแก้ไขปัญหา :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

10. การเรียกเก็บเงินค่าสินค้า

ปัญหาและอุปสรรค์ที่ท่านพบ :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

ข้อเสนอแนะและแนวทางการแก้ไขปัญหา :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

2.2 จากปัญหาและอุปสรรคที่ท่านกล่าวมาข้างต้น ท่านคิดว่าปัญหาและ/หรืออุปสรรคในข้อใดส่งผลกระทบต่อธุรกิจของท่านมากที่สุด เพราะเหตุใด (เลือกตอบเพียง 1 ปัญหา)

O การจัดหาผู้ซื้อในต่างประเทศ O การทำข้อตกลงเพื่อการซื้อขายสินค้า

O การทำธุรกรรมทางการเงินระหว่างประเทศ O การจัดหาสินค้าเพื่อการส่งออก

O การติดต่อขนส่งสินค้าเพื่อการส่งออก

O การขอใบผ่านด่านศุลกากรในการส่งยางออกนอกราชอาณาจักร หรือแบบยาง 12

O การชำระเงินสงเคราะห์กองทุนสงเคราะห์การทำสวนยาง

O พิธีการทางศุลกากร (พิธีการตรวจเอกสาร และพิธีการตรวจสินค้า)

O การส่งมอบสินค้าให้แก่ผู้ซื้อ O การเรียกเก็บเงินค่าสินค้า

O อื่นๆ โปรดระบุ…….

……

……

……

……..……..

……

……

……

……

……

……

……

……

……

……

2.3 จากปัญหาและอุปสรรคที่ท่านกล่าวมาข้างต้น ท่านคิดว่าปัญหาและ/หรืออุปสรรคในข้อใด รัฐบาลควรเร่งดำเนินการแก้ไขมากที่สุด เพราะเหตุใด (เลือกตอบเพียง 1 ปัญหา)

O การจัดหาผู้ซื้อในต่างประเทศ O การทำข้อตกลงเพื่อการซื้อขายสินค้า

O การทำธุรกรรมทางการเงินระหว่างประเทศ O การจัดหาสินค้าเพื่อการส่งออก

O การติดต่อขนส่งสินค้าเพื่อการส่งออก

O การขอใบผ่านด่านศุลกากรในการส่งยางออกนอกราชอาณาจักร หรือแบบยาง 12

O การชำระเงินสงเคราะห์กองทุนสงเคราะห์การทำสวนยาง

O พิธีการทางศุลกากร (พิธีการตรวจเอกสาร และพิธีการตรวจสินค้า)

O การส่งมอบสินค้าให้แก่ผู้ซื้อ O การเรียกเก็บเงินค่าสินค้า

O อื่นๆ โปรดระบุ…….

……

……

……

……..……..

……

……

……

……

……

……

……

……

……

……

BIOGRAPHICAL DATA

NAME:	Miss Ketkamon Sunthornkaweekit
DATE OF BIRTH:	January 5, 1986
PLACE OF BIRTH:	Bangkok
EDUCATION:	2004-2007: Bachelor of Science (Agricultural Economics) Kasetsart University, Bangkok, Thailand.