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THESIS

FACTORS AFFECTING IMPORT DEMAND FOR PRERARED/PRESERVED SHRIMP IN JAPANESE MARKET

PATTANAPONG TIWASING

A Thesis Submitted in Partial Fulfillment of
the Requirements for the Degree of
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The objectives of this study were to describe Japanese import demand for prepared/preserved shrimp and to estimate import demand for prepared/preserved shrimp in Japanese market; including factors affecting import demand and the elasticity of import demand for Thai prepared/preserved shrimp as well as Thai competitors. Quarterly series data of relative prices and values of prepared/preserved shrimp in Japan during 1994-2009 were employed for Linear Approximately Almost Ideal Demand System (LA/AIDS) model, using restriction seemingly unrelated regression (RSUR) method.

For Thai shrimps and prawns simply boiled in water or in brine (HS160520011) factors affecting the demand were export prices from Thailand, China, Indonesia and Vietnam. Main competitors for Thai shrimps in Japan were China, Vietnam and Indonesia whose own price elasticities were higher than Thailand. Factors affecting import demand for shrimps and prawns smoked (HS160520019) were export prices from Thailand, China, Chinese Taipei and Vietnam. Cross price elasticities were inelastic for Chinese Taipei and China. The competitors of Thai shrimps were China and Chinese Taipei. For Thai shrimps and prawns, containing rice excluding smoked (HS160520021) factors affecting the demand were export prices from Thailand, Vietnam and Japanese expenditure The competitor of Thai shrimps was Vietnam with inelasticity cross price elasticity. Factors affecting import demand for shrimps and prawns prepared/preserved, not elsewhere specify (HS160520029) were export prices from Thailand, China, Indonesia, Vietnam and Japanese expenditure. Thai competitors of Thai shrimps were Vietnam, China and Indonesia in respective order whose own price elasticities were higher than Thailand.

Results of the study suggested that Thailand should maintain product quality using quality policy to maintain market share of Thai prepared/preserved shrimp in Japan.

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Student's signature Thesis Advisor's signature

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Pattanapong Tiwasing

March 2011

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CHAPTER I

INTRODUCTION

Statement of the Problem

Shrimp industry is an important sector of the Thai economy. Foreign exchange earning from shrimp export was US$ 5,174 million in year 2008 (Global Trade Atlas, 2009). Approximately 87% of total shrimp production was exported to oversea markets as fresh chilled and frozen shrimp. During 2000-2008, Thailand's export of prepared/preserved shrimp (boiled, dried, smoked, and cooked) to oversea markets increased substantially, from 104,421 metric ton in 2000 to 161,291 metric ton in 2008. In 2008, the export value of Thai prepared/preserved shrimp registered at US$ 1,230 million increased by 6.3% compared to 2007(Office of Agricultural Economics, 2009). The major markets for Thai shrimp export were the United States of America (USA), Japan and European Union (EU) respectively.

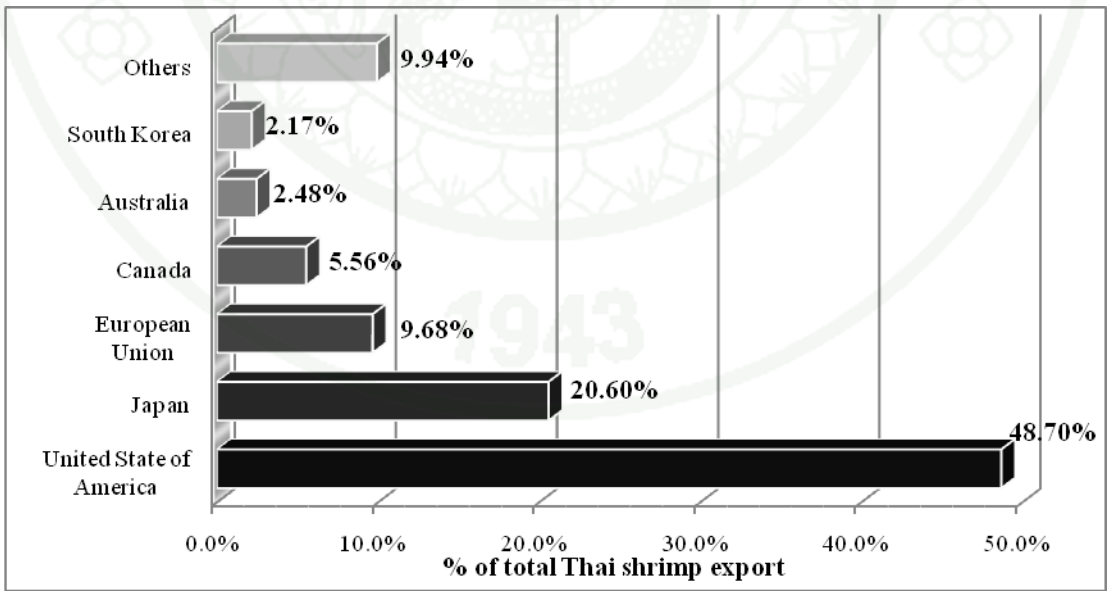

Figure 1.1 Export Shrimp of Thailand

Source: Thai Frozen Foods Association (2010)

Japan was the second major importer of Thai shrimp export, sharing 20.60% of the total export of Thai shrimp while the first importer shared 48.70% (Figure 1). There was a strong Japanese demand for shrimp. Annually, its demand was around 300,000 metric ton. Approximately 88% of Japan imported shrimp were fresh chilled and frozen shrimp. Recently fresh chilled and frozen shrimp imported by Japan tended to decrease from 244,954 metric ton in 2003 to 203,474 metric ton in 2008 a decrease by 17 percent while prepared/preserved shrimp increased from 47,834 metric ton in 2003 to 64,091 metric ton in 2008, an increase by 34 percent.

This information implied that through the years Japanese consumer preferred convenient products such as prepared and/or prepared shrimp (Table 1).

Table 1.1 Shrimp products import into Japan during 2003 – 2008

Product Form	**2003 (mt)**	**2004 (mt)**	**2005 (mt)**	**2006 (mt)**	**2007 (mt)**	**2008 (mt)**
Fresh chilled and frozen	244,954	253,276	242,808	239,296	229,952	203,474
Prepared/ Preserved shrimps	47,834	57,391	59,936	68,904	66,515	64,091

Source: Global Trade Atlas (2008)

Import of prepared/preserved shrimp in Japan had been increasing but market share of Thai prepared/preserved shrimp in Japanese market decreased from around 65 percent in 2001 to 51 percent in 2008 while market share of Thai competitors such as China and Vietnam had been increasing continuously (Figure 2).

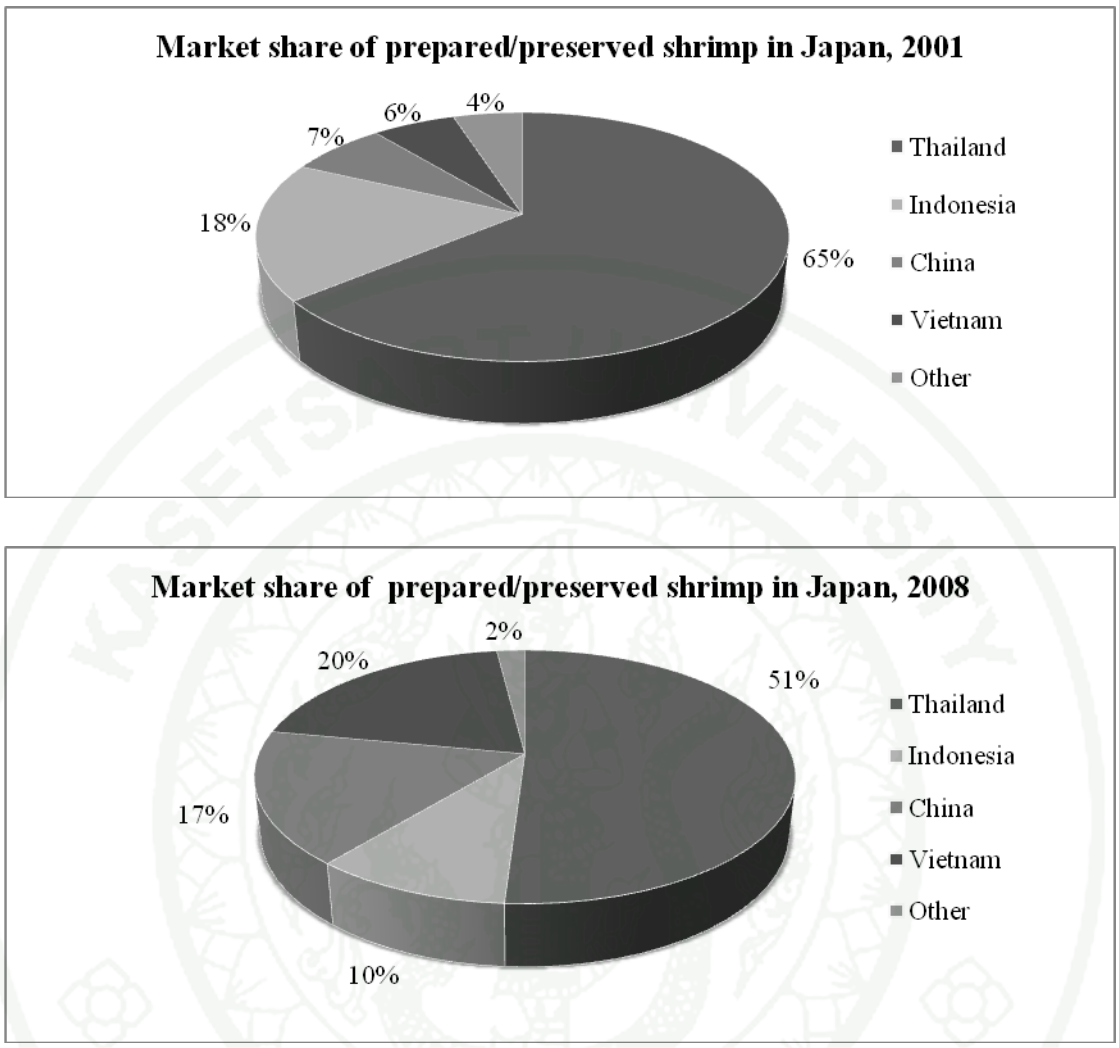

Figure 1.2 Market share of prepared/preserved shrimp in Japan.
Source: World Trade Atlas (2002 and 2008)

Therefore, this paper intended to describe demand for prepared/preserved shrimp and identify the factors affecting import demand for prepared/preserved shrimp in Japanese market from the important exporting countries. The target was on the study of import demand of prepared/preserved shrimp in Japanese market in order to find recommendation on increasing export and market share of Thai prepared/preserved shrimps in Japanese market.

Objectives of the Study

The objectives of this study are as followed:

1. To describe import of prepared/preserved shrimp in Japanese market.

2. To estimate import demand for prepared/preserved shrimp in Japanese market; including the factors affecting and the elasticity of import demand for prepared/preserved shrimp.

Expected Benefit of the Study

1. The results of this study can provide some guidelines for increasing market share of Thai prepared/preserved or value-added shrimp products in the Japanese market.

2. The government can use the study results to help identifying key policies to support exporters as well as producers in order to increase their competitiveness in Japanese market.

Scope of the Study

To achieve above objectives, the scopes of this study are as follow;

1. Scope of products

Prepared/preserved shrimps in this study were selected from Harmonized Commodity Description and Coding System (HS code) of Custom Department of Japan and Global Trade Atlas. Four commodities of prepared/preserved shrimp in this study included

HS160520011 – shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine,

HS160520019 – shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine,

HS160520021 – shrimps and prawns, containing rice, excluding smoked; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine, and

HS160520029 – shrimps and prawns prepared or preserved, not elsewhere specify (n.e.s.).

2. Scope of competing countries

There were many countries exporting prepared/preserved shrimp to Japan. The main exporting countries considering from Japanese import value of prepared/preserved shrimp were Thailand, Vietnam, China, Indonesia and Chinese Taipei. Exporting counties were separated into four commodities followed as

HS160520011: Thailand, China, Vietnam and Indonesia.

HS160520019: Thailand, China, Vietnam and Chinese Taipei.

HS160520021: Thailand and Vietnam

HS160520029: Thailand, China, Vietnam and Indonesia.

3. Scope of data

This study used quarterly series data from 1994-2009, 64 quarters in total. Sources of data included Global Trade Atlas, Custom Department of Japan and Custom Department of Thailand.

Outline of the Thesis

This thesis was divided into five chapters. This chapter introduced the study. The second chapter provided a review of literatures; review the related literatures and review the theoretical background of this study. The third chapter deal with research methodology and model specification. The fourth chapter showed the results of the study. The last chapter discussed research results, recommendations and the conclusion of the thesis.

CHAPTER II

LITERATURE REVIEW

Review of Related Literatures

The review of related literatures was divided into three parts. Part one reviewed the literatures related to import demand for agricultural products. Part two reviewed the studies related to import demand for shrimp products. Part three reviewed Almost Ideal Demand System (AIDS) model and the Linear Approximate of AIDS (LA/AIDS).

1. Review of import demand for agricultural products.

Yang and Koo (1994) employed a source differentiated AIDS model to estimate Japanese meat import demand. The results indicated that the United State (US) had the largest potential for beef exports to Japan. Taiwan was in a strong position in pork market, and Thailand and China were strong in the poultry market. The US competed with Canada and Taiwan in the pork market, but the competition between Taiwan and European countries was the strongest in the market. The US competed with Thailand in the poultry market.

Vidyashankara *et.al.* (1997) studied import demand for malt in European market using a Linear Approximate Almost Ideal Demand System (LA/AIDS) to estimate four major malt importing countries: Japan, Brazil, Philippines, and Venezuela. 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. The study

concluded that price subsidy-based export expansion measures for non-EU malt might had limited effects.

In South Korea, Lee (2008) used a source differentiated AIDS model to estimate wine import demand. Empirical results indicated that South Korean wine consumers had a strong preference for high quality French wines. French wines were 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 had steadily increased their market share exhibiting strong price competitiveness in the South Korean wine market.

2. Review of import demand for shrimp products.

Hudson (2003) used a Linear Expenditure System (LES) model to determine the own-price elasticities of demand for shrimp imports. The system of estimated equations was then solved for quantity levels under assumptions made about the trade restrictions, resulting in a set of prices for those import levels. These estimated prices were then used to estimate the compensating variation impact of the trade restrictions. Findings suggested that the environmental regulation would have a negative impact on the US consumers, but the magnitude of that effect depended on assumptions made regarding the distribution of the US imports after the trade restriction was imposed.

Lee *et. al.* (2008) studied the inverse demand equation of crawfish in logarithmic functional form using the ordinary least squares method to identify the linkage between imports and the domestic price of crawfish. The results showed a simultaneous increase in imports and domestic prices of crawfish while showing a negative relationship between domestic landings and price. Each model showed that there was a seasonal effect on the domestic price of crawfish. The study also showed that increases in the domestic supplies of shrimp, tilapia, and clams generated increases in the domestic crawfish price while increases in imported and domestic supplies of beef and imported supplies of pork decreased the domestic crawfish price.

Poudel and Keithly Jr. (2008) applied an almost ideal demand system framework to examined the US and EU, demand for imported shrimp, based on 1990-2004 quarterly data by alternative supply sources. For the US, supply sources included Central America, South America, and Asia. Supply sources for the European Union included Asia, South America, and rest of world. All own-price elasticities for the US system were found to be elastic while all own-price elasticities associated with the EU were found to be inelastic. With few notable exceptions, estimated cross-price elasticities suggested substitution among import sources. Finally, shrimp of Asian origin were found to be highly expenditure elastic in the US market while shrimp of South American origin were found to be the same in the European market.

Jones and Harvey, *et. al.* (2008) estimated price and scale elasticities for the US shrimp consumption using aggregate shrimp data differentiated by source country. Own price elasticities for all countries had the expected negative signs, were statistically significant, and inelastic. The scale elasticities for all countries were positive and statistically significant at the 1% level with only the US and Ecuador had scale elasticities of less than one. For the most part, the compensated demand effects showed that most of the cross-price effects were positive. The results also suggested that despite the countervailing duties imposed by the United States, shrimp demand was fairly stable.

Zhou and Shaik (2008) analyzed the demand for shrimp along with beef, pork, and chicken in the USA food market, which contributed much to predicting supply strategies, consumer preferences and policy making. It focused on the own and cross relationship between the expenditure share and price, income changes. An almost ideal demand system (AIDS) model and two alternative specifications were used to estimate a system of expenditure share equations for shrimp, beef, pork, and chicken. Empirical results indicated that some insignificant slope coefficients and inappropriate signs of them did not comply with microeconomic theory. These could be caused by heteroscedasticity, autocorrelation, a limitation in the data used, or shrimp being a commodity that was quite different.

In Thailand, Pattaro (2006) analyzed Japanese demand for Thai marine shrimps, broiler chickens, and canned pineapples. Descriptive statistics was employed to describe the conditions of production and export. The ordinary least squares were employed. Regarding the production and export of marine shrimps, broiler chickens and canned pineapples, the study indicated that there was a steady growth of marine shrimp production during 1972-1997 and broiler chicken production during 1988-1999 at the average rates of 33.18% and 6.43% a year respectively. There was an increase in canned pineapple production during 1983-1996 at the average rate of 8.54% a year. While there was a tendency for the productivity growth of Thai agricultural commodities, Japanese import demand for the three agriculture products likely decreased. In terms of Japanese demand for Thai agricultural commodities, the analysis of secondary data revealed that Japanese per capita national income was the major factor determining Japanese import demand for Thai marine shrimps. Relative prices between Thai and Indonesian marine shrimps, and the exchange rate of Thai currency to Japanese yen were less prominent. Japan's import demand for Thai marine shrimps with respect to the Japanese's per capita national income and Japan's import demand for Thai marine shrimps per relative prices between Thai and Indonesian marine shrimps was classified elastic, where as Japan's import demand for Thai marine shrimps with respect to the exchange rate of Thai currency to Japanese yen was inelastic. As for Thai broiler chickens, the findings showed that the currency to Japanese yen was inelastic. As for Thai broiler chickens, the findings showed that the Japanese's per capita national income was an only determining factor to the demand for Thai broiler chickens; Japan's demand with respect to the mentioned factor was also elastic. Moreover, the Japanese's per capita national income was the most significant in determining Japan's demand for Thai canned pineapples while relative prices between canned pineapples from Thailand and the Philippines were less crucial. Japan's import demand for Thai canned pineapples with respect to the Japanese's per capita national income and per relative prices between canned pineapples from Thailand and the Philippines was found elastic.

Another study related to import demand for shrimp product subject was of Chittamon (2005) and Thambumrung (2007). They applied linear approximate almost

ideal demand system to estimate demand for Thai frozen shrimp in the US and import demand for Thai frozen seafood in Japanese market respectively. Own price elasticites, cross price elasticites, and expenditure elasticites were calculated. Chittamon analyzed factors affecting import demand for Thai frozen shrimp in the USA. Import demands for the same products from Bangladesh, China, Ecuador, India, Indonesia, Mexico, and Vietnam were simultaneously estimated to compare with the import demands from Thailand. Three major frozen shrimp imports including large shell-on, medium shell-on and peeled frozen shrimp were included in this study. Results of his estimated demand functions indicated that the competitors of Thai large shell-on shrimp in the United States market were India and Ecuador. For medium shell-on frozen shrimp, Thailand had to compete with India, Indonesia, Vietnam, Ecuador and Bangladesh. Competitors for Thai peeled frozen shrimp in the United States were Bangladesh, Indonesia, India, Vietnam and Ecuador. Own price elasticites and income elasticities of demand for Thai frozen shrimp in the United States market were relatively higher than those of the competitors. To maintain Thai frozen shrimp market share in the United States market, product quality should be the key issue.

Thambumrung analyzed factors affecting the import demand for Thai frozen seafood in Japan as well as for other major exporting countries. Time-series data of import prices and values of frozen seafood in Japan during 1988-2004 for shrimp and cuttlefish and squid and 1990-2004 for crab, were employed for the model of almost ideal demand system (AIDS), using seemingly unrelated regression (SUR) method. Factors affecting import demand for Thai frozen shrimp in Japan were import prices from Thailand, Vietnam, Indonesia and other countries. Thailand competitor was Vietnam, whose own price elasticity of demand was higher than Thailand. Factors affecting import demand for Thai frozen cuttlefish and squid in Japan were import prices from China, other countries and total expenses. Expenditure elasticity of demand from Thailand was less than from Vietnam, where was exporter of quality frozen cuttlefish and squid as well as Thailand. Factors affecting import demand for Thai frozen crab in Japan were import prices from China, Indonesia, India and other countries. Main competitors of Thailand were India and other countries.

2. Review of the almost ideal demand system (AIDS) model and the linear approximate of AIDS (LA/AIDS).

Some recent studies used equation systems to estimate demand for food. One of these is the study by Eales *et al*. (1997) estimated Japanese demand for fish and concluded that the ordinary demand system was dominated by the inverse demand system in non-nested tests and forecasting performance. Another study by Alston and Chalfant (1993) compared two versions of the linear approximate almost ideal demand System (LA/AIDS) with the Rotterdam model. They found that LA/AIDS was dominant when it was applied to meats.

The almost ideal demand system (AIDS) had its origins in early work by Richard Stone (Deaton and Muellbauer, 1980). It gave an arbitrary first-order approximation to any demand system and a second-order local approximation to any cost function, permitted exact aggregation over consumers with different incomes, satisfied restrictions imposed by the consumer allocation problem, and permitted testing of the general restrictions of homogeneity and symmetry (Hong, 2008). Applications of the AIDS to studies on food and agricultural products included Lee and Pitt (1986), Green and Alston (1990), Kinnucan *et al*., (1997), and Fousekis and Revell (2000). Applications of the AIDS to studies on fishery products could be seen in those of Wellman (1992), Ligeon, Jolly and Jackson (1996), Eales, Durham and Wessells (1997), Salvanes and Devoretz (1997), and Holt and Bishop (2002). Green and Alston (1991) also discussed formulas and corrected formulas used to calculate price and expenditure elasticities for the LA/AIDS.

In sum, the information received from the review of related literature point out AIDS model could apply in an analysis of import demand and demand for agricultural product. In Thailand, research issues related to them were widespread as much as foreign research but there are no issue related directly to prepared/preserved or value added shrimp product using AIDS model.

CHAPTER III

RESEARCH METHODOLOGY

Conceptual Framework

Shrimp was an important item of Thai fishery exports. Japan had been one of the most important importers of Thai shrimp. The major products were chilled, frozen, prepared/preserved, and canned shrimp.

The changing lifestyle of Japanese consumer continued to influence overall imports of fishery products including shrimp. According to the Japan Fisheries Association (2006), there was a growing shift from home cooking to 'take-away food' or the so-called "home-meal replacement" among the urban Japanese. There had been an increasing trend in prepared or preserved shrimp product. This information implied that Japanese consumer preferred convenience product such as prepared or preserved product.

In the past, Thailand was the leader of exporting country in prepared/preserved shrimp in Japanese market. Recently, Thailand was still the leader but Thailand's market share decreased continuously. The major competitors of this commodity were China, Vietnam, and Indonesia. Figure 3.1 showed the conceptual framework for identifying what factors affected import demand for Thai prepared/preserved shrimp in Japanese market and outcomes of this study.

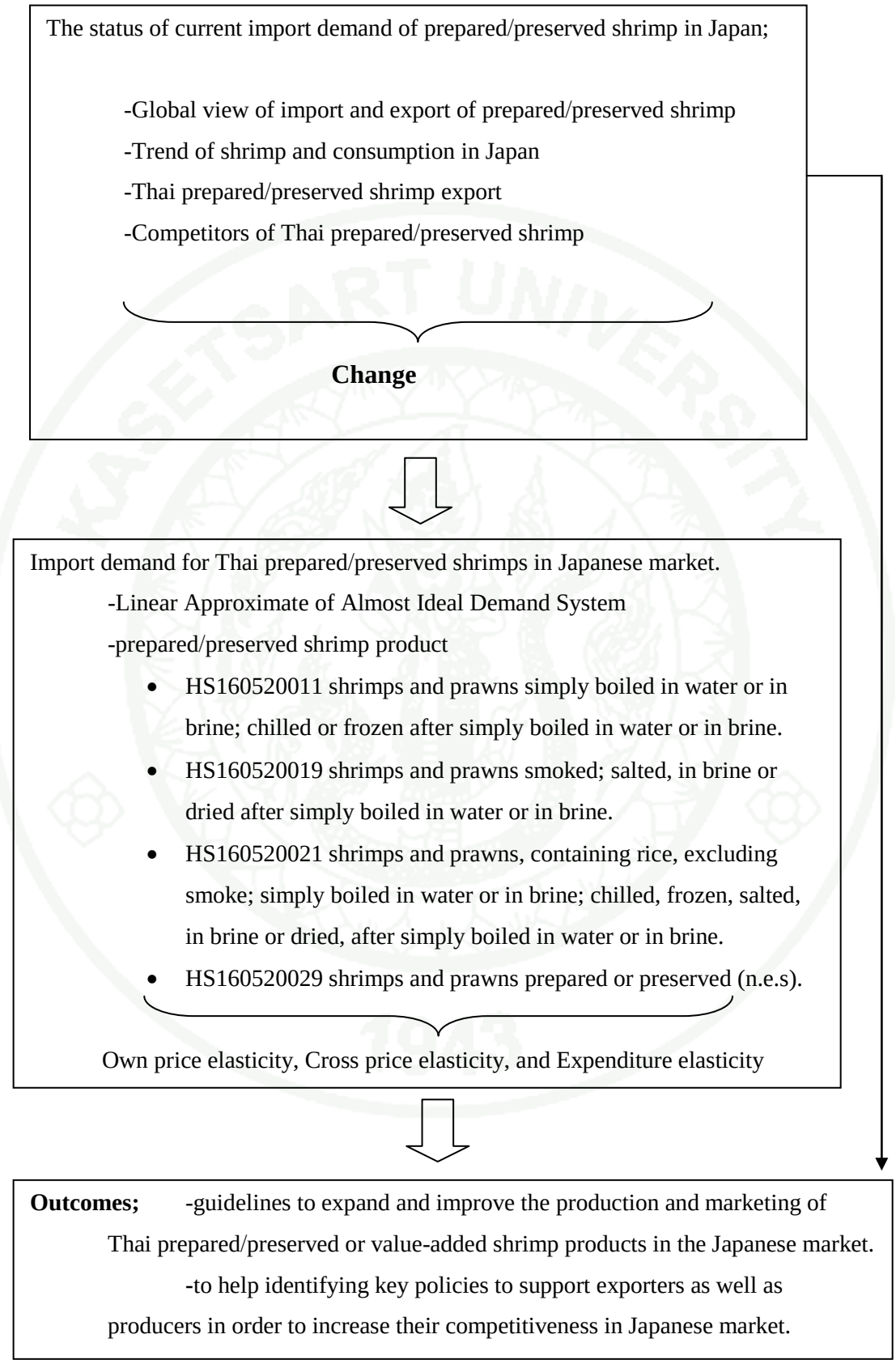

Figure 3.1 Conceptual Framework

Theoretical Framework

Consumer Demand Theory

In principal, the demand function could be generalized for a consumer buys 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 was quantity demand, p was price and I was income. The n equations could be estimated by single equation or by system of equations. In the microeconomic theory, the consumer's demand could be derived from two approaches. Firstly, it's the primal solution which individuals were assumed to behave as maximized utility subject to budget constraint. The demand function which derived from utility maximization approach or direct utility was so-called Marshallian demand function. Secondly, it's the dual solution which concerned allocation of income in such a way to achieve a given utility level with minimal expenditure. The derived demand from this approach or duality was so-called compensated demand or Hicksian demand function (Nicholson, 2004).

1. Utility maximization and consumer demand

Neoclassical economic demand theory assumed that consumer demand was derived from constrained utility maximization (Deaton and Muellbauer, 1980). The basic axiom of the utility maximization process was that a rational consumer would always choose a most preferred bundle of goods from the feasible set of consumption bundles allowed by his budget. The utility function was denoted by

$$U=U(q) \qquad (2)$$

where q was a vector of the n goods demanded, subject to a linear budget constraint,

$$\sum_{k=1}^{n} p_k q_k=X \qquad k=1,\ldots,n \qquad (3)$$

where q_k was the quantity demanded of the k good, p_k was the price of the k good, and x was income or total expenditure. Mathematically, the consumer demand for a good derived from utility maximization was found by the Lagrangian method

Primal problem

Maximizing

$$U=U(q) \tag{4}$$

Subject to $\sum_{k=1}^{n} p_k q_k = X$

$$L(q,\lambda)=U(q)+\lambda(x-\sum p_k q_k) \tag{5}$$

where λ is the Lagrangian multiplier interpreted as the marginal utility of income. Then, the first-order conditions of $\frac{\partial L}{\partial q_i}$, for i = 1, . . . ,n, and $\frac{\partial L}{\partial \lambda}$ yield

$$\frac{\partial U(q)}{\partial q_i}=\lambda p_i \tag{6}$$

$$x-\sum p_k q_k=0 \tag{7}$$

Solving equations (6) and (7) with respect to q_i,

$$q_i=g_i(x,p) \tag{8}$$

Equation 8 is a Marshallian or uncompensated demand function of good i. If equation 8 was substituted back into problem 4, it yielded the indirect utility function, which expresses the maximum attainable utility given prices p and outlay x, that was

$$U^*=\psi(x,p) \tag{9}$$

2. Cost minimization and consumer demand

The duality of utility maximization was cost (expenditure) minimization. In the primal problem, the objective function given by $U = U(q)$ was maximized subject to the budget constraint, $\sum p_k q_k = x$, and the optimal solution was U^*. In the dual problem setting, the objective of the problem was cost minimization. Thus, the objective function was given by

Dual problem

Minimizing $\sum p_k q_k = x$ (10)

Subject to the constraint $U = U(q)$ (11)

Utilizing the same procedure as in the primal problem solving, optimal values of q were obtained. In the dual problem, however, the determining variables are u and p, not x and p as in Marshallian demands. The dual problem setting provides the same solution of q, but was denoted by

$$q_i = h_i(u,p) \quad (12)$$

This was the income-compensated demand, or Hicksian demand function; it implies how q_i was influenced by prices with utility held constant. If equation 12 was plugged into the dual problem, $\sum_{k=1}^{n} p_k q_k = x$, then it provides a cost function which was the minimum cost of obtaining the given level of utility at prices p

$$X = c(u,p) \quad (13)$$

The cost function could be inverted to the indirect utility function that was a function of X:

$$X = c(u,p) \text{<---------- inversion ----------} > U^* = \psi(X,p).$$

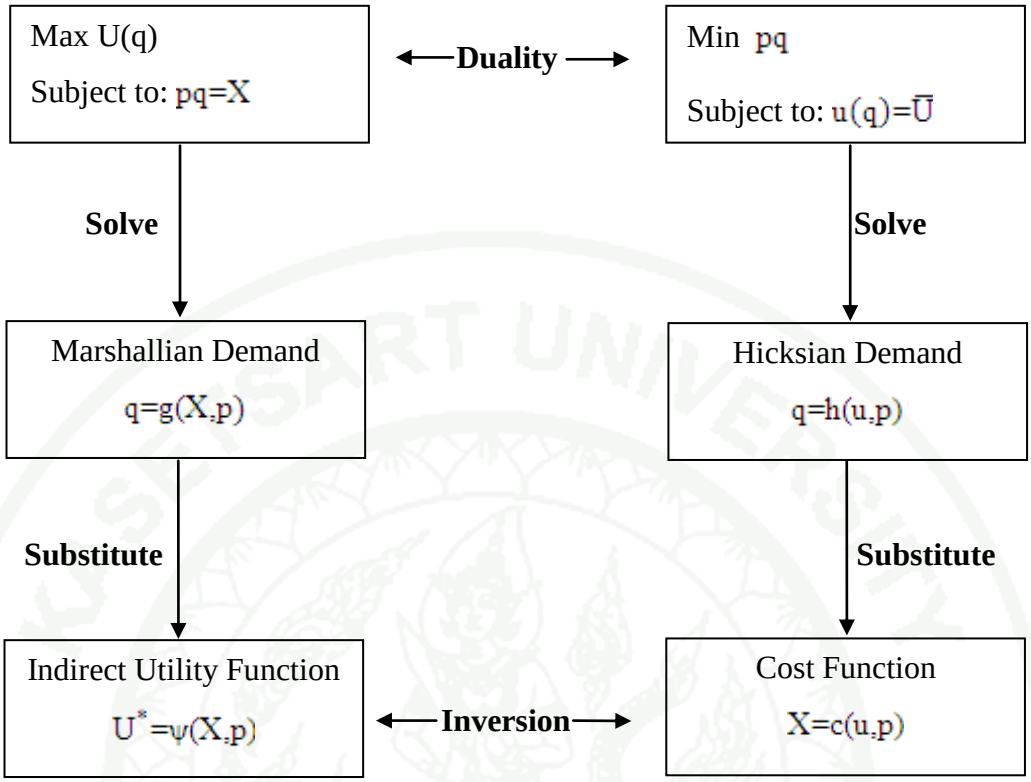

Figure 3.2 Utility maximization and cost minimization

Source: Deaton and Muellbauer (1980)

Properties of demand

Deaton and Muellbauer (1980) reviewed the properties of consumer demand which provided reasonable restrictions to demand models. In many empirical works, these restrictions had been tested to confirm the theoretical plausibility of estimated demand functions. One of the most important, though trivial, properties was adding up, that was,

$$\sum p_k h_k(u,p) = \sum p_x f_x(p,x) = X \qquad (14)$$

The estimated total value of both the Hicksian and Marshallian demands was total expenditures. In other words, the sum of the estimated expenditures on the different goods equaled the consumer's total expenditures at any given time period. This property of demand provided another reasonable restriction, the so-called adding-up restriction. The adding-up restriction implied that (Deaton and Muellbauer, 1980)

$$\sum_k p_k \frac{\partial q_k}{\partial x} = 1 \text{ and } \quad \sum_k w_k e_k = 1$$

where w_k was the budget share of good k and e_k was total expenditure elasticity. The second property of demand was homogeneity of degree zero in prices for Hicksian and uncompensated demand and in total expenditures for uncompensated demand. If all prices and total expenditures were changed by an equal proportion, the quantity demanded must remain unchanged. This property is sometimes called "absence of money illusion". The homogeneity property provided the homogeneity restriction which implies that (Deaton and Muellbauer, 1980), for i=1, . . ., n,

$$\sum_k p_k \frac{\partial q_i}{\partial p_k} + x \frac{\partial q_i}{\partial x} = 0 \text{ and} \qquad (15)$$

$$\sum_k e_{ik} + e_i = 0 \qquad (16)$$

where $\sum_k e_{ik}$ was the sum of the own price elasticity and cross price elasticities of good i, and e_i was total expenditure elasticity of good i. The third property of demand was symmetry of the cross price derivatives of the Hicksian demands, that was,

$$\frac{\partial h_i(u,p)}{\partial p_j} = \frac{\partial h_j(u,p)}{\partial p_k} \qquad \text{for all } i \neq j \tag{17}$$

The symmetry expressed in equation 16 could be proved through Shephard's Lemma and Young's theorem: by Shephard's Lemma

$$h_k(u,p) = \frac{\partial c(u,p)}{\partial p_k} \qquad h_j = \frac{\partial c(u,p)}{\partial p_j} \tag{18}$$

$$\frac{\partial h_k(u,p)}{\partial p_j} = \frac{\partial^2 C}{\partial p_k p_j} \qquad \frac{\partial h_k(u,p)}{\partial p_k} = \frac{\partial^2 C}{\partial p_j p_k} \tag{19}$$

and by Young's theorem, $\frac{\partial^2 C}{\partial p_k p_j}$ equal $\frac{\partial^2 C}{\partial p_j p_k}$ .The last property of demand was negativity, which implied downward sloping compensated demand functions.

The almost ideal demand system (AIDS) model

In the literature, relatively few models were used for demand and import demand analyses. The Stone (1954)'s Linear Expenditure System (LES) model was used to study demand analysis. The most frequently used this system in empirical analyses of demand because its linearity, transparency, and the parsimony of the estimated parameters. The disadvantage of LES model was that the Engel curves, describing the relationship between expenditure on a certain commodity and total expenditure, were straight lines. Moreover, the LES did not allow for the existence of inferior goods, elastic demand and gross substitution.

Next, the Rotterdam model was the model that has most frequently been used to test the demand theory was first proposed by Theil (1965) and Barten (1966). In

many ways, the approach was very similar to Stone's (1954) method, but instead of working in level of logarithms, it worked in differentials (Deaton and Muellbauer, 1980). The Rotterdam model could not be considered as an exact representation of preferences unless restrictive conditions were imposed.

The Armington model was theoretically consistent and had been widely used to study import demand of commodities in a country, or internationally (Yang and W. Koo, 1994; Pawan Pundel, 2008). One advantage of the Armington model was that it differentiated goods by sources. In other words, the Armington model allowed imperfect substitutions among goods from different origins. However, this model suffered from restrictive assumptions of homotheticity and single constant elasticity of substitution (Alston *et. al.*,1993; Yang and Koo, 1994).

Alternatively, the Almost Ideal Demand System (AIDS) model introduced by Deaton and Muellbuer (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), Alston and Chalfant(1993), Eales and Unevehr(1994), P.R. Taljaard *et. al.*(2003), and Pawan Poudel and Walter Keithly Jr. (2008), could be ascribed to several reasons:

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

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

(c) Homogeneity and symmetry restrictions depended only on the estimated parameters and were therefore easily tested and/or imposed.

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

(e) The AIDS could give an arbitrary first-order approximation to any demand

system;

(f) It satisfied the axioms of choice exactly;

(g) It aggregated perfectly across consumers without invoking parallel linear Engel curves;

(h) It had a functional form which is consistent with known household-budget data.

Wang (1996) and Jabarin (2005) explained that the relative illustrative power, consistency with economic theory and simplicity of estimation were important criteria for selecting a demand model. There were various demand systems which had received considerable attention. The AIDS model is the one of the demand systems which balances requirements from economic theory with illustrative power and simplicity in estimation. The demand system was derived by use of duality concepts from a particular cost function. The PIGLOG class were represented via cost or expenditure function as equation (20)

$$\ln C(u,p) = (1-u)\ln\{a(p)\} + u\ln\{b(p)\} \quad (20)$$

Where u = The utility lines between 0 and 1

p = price vector

a(p) = The cost of subsistence

b(p) = The cost of bliss

$$\ln[a(p)] = \alpha_0 + \sum_i \alpha_i \ln p_i + \frac{1}{2}\sum_i \sum_j \gamma_{ij} \ln p_i \ln p_j \quad (21)$$

$$\ln[b(p)] = \ln[a(p)] + u\beta_0 \prod_k p_k^{\beta_k} \quad (22)$$

The specific function form of ln a(p) and ln b(p) were taken in (20), the AIDS cost function as equation (23)

$$\ln C(u,p) = \alpha_i + \sum_i \alpha_i \ln p_i + {}^1/_2 \sum_i \sum_j \gamma_{ij}^* \ln p_i \ln p_j + u\beta_o \prod_i p_i^{\beta_i} \quad (23)$$

The demand functions could be derived directly from equation (23) by multiplying both sides with ${}^{p_i}/_{C(u,p)}$ therefore, the budget share as a function of prices and utility developed in equation (24)

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i u\beta_0 \prod p_i^{\beta_i} \quad (24)$$

$$\gamma_{ij} = {}^1/_2 (\gamma_{ij}^* + \gamma_{ji}^*)$$

Where w_i was a budget share for i^{th} good category. For the maximum utility of consumer, which was total expenditure$(X)=C(u,p)$, equation (23) had to be inverted to give u as a function of p and x (Indirect utility function). By using the Shepherd Lemma, the AIDS demand functions in budget share form as following in equation (25);

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \ln \left(\frac{x}{p}\right) \quad (25)$$

Where P = an aggregate price index (equation 26)

$\frac{x}{p}$ = was the real total expenditure

P_j = the price of j-th good

$$\ln P = \alpha_0 + \sum_i \alpha_i \ln p_i + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \ln p_i \ln p_j \quad (26)$$

From the equation (26), α_0 and α_i were the parameters to be estimated. It shown that the relationship between index price and prices of individual good was non-linear which resulted in a “complicated” non-linear estimation. In order to overcome this problem of non- linearity, Deaton and Muellbauer (1980) suggested using another

linear price index. The process of linear approximately of AIDS was discussed in the following section.

The linear approximatetion of almost ideal demand system (LA/AIDS) model

Using the price index from equation (26) often raised empirical difficulties, especially when aggregate annual time-series data were used, and it was common to use Stone's price index instead of price index (Green and Alston, 1990):

$$\ln \mathbf{P}_t^s = \sum_i w_{it} \ln p_{it} \tag{27}$$

The model that used Stone's price index was called the "linear approximate of AIDS" (LA/AIDS) following Blanciforti and Green (1983a) as;

$$w_{it} = \alpha_i + \sum_j \gamma_{jt} \ln\left(p_{jt}\right) + \beta_i \ln\left(\frac{x_t}{\mathbf{P}_t^s}\right) \tag{28}$$

By considering above, the only difference between the AIDS model and its linear approximation (LA/AIDS) was functional form in the specification of the price index. Several authors including Green and Alston (1990); Alston *et al.*, (1994); Moschini, Moro and Green (1994); Moschini (1995); Asche and Wessels (1997); P.R. Taljaard *at. al.*(2003) discussed the relationship between the linear and nonlinear specifications. In many of these studies, Monte Calro experiments were used to show the use of differential functional forms of the index in the LA/AIDS provided results that more or less well to the AIDS model, (Asche and Wessels, 1997).

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

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

Homogeneity: $\sum_j \gamma_{ij} = 0$

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

Elasticity estimation for LA/AIDS model

There were several approaches found in the literature for calculating the elasticities for LA/AIDS models. 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) was a function of expenditure shares (i.e., $\ln P = \sum_i w_i \ln p_i$). 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 took into account the effects of price changes on the shares in the price index as;

$$\varepsilon_{ij} = \frac{\gamma_{ij}}{W_i} - \beta_i \frac{W_i}{W_j} - \delta_{ij}^k \qquad (29)$$

The formula for compensated elasticities were calculated by using the formulas reported by Jung (2000) as shown in equation (30)

$$\varepsilon_{ij} = \frac{\gamma_{ij}}{W_i} + W_j - \delta_{ij}^k \qquad i,j=1,2,\ldots,N \qquad (30)$$

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

The formula used to calculate the expenditure elasticity was specified as

$$\eta = \frac{\beta_i}{w_{i,t}} + 1 \qquad (31)$$

Model Specification

This study used secondary data collected by Custom Department of Japan, Custom Department of Thailand, Global Trade Atlas, and Fisheries department of Thailand during 1994 – 2009.

The selected products as specified by Harmonized Commodity Description and Coding System (HS code) of Custom Department of Japan were as follows

HS160520011 Shrimps and prawns (simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine).

HS160520019 Shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine.

HS160520021 Shrimps and prawns, containing rice, excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine.

HS160520029 Shrimps and prawns prepared or preserved, not elsewhere specify (n.e.s).

Competitors for Thai prepared/preserved shrimp in Japanese market were China, Vietnam, Indonesia, and Chinese Taipei. We could separate Thai competitors for each HS code commodities as

HS160520011: China, Vietnam, Indonesia and others.

HS160520019: China, Vietnam, Chinese Taipei and others.

HS160520021[1]: Vietnam, and others.

HS160520029: China, Vietnam, Indonesia and oth

[1] This HS code not include China and the US to estimate Japanese import demand due to data very fluctuation and data not enough respectively, caused these estimated equation not according to the demand theory.

From equation (28), due to Japan was the price taker of import prepared/preserved shrimp from Thailand and other competitors. Thus, the estimation of import demand for prepared/preserved shrimp could apply the assumption with import behavior would not lead to the equilibrium in Japanese market immediately but the equilibrium would be occurred by using partial adjustment mechanism followed assumption as Japanese Import demand of prepared/preserved shrimp from each exporting country would be adjustment between the forecast import price of demand for prepared/preserved shrimp in the current time (p_{jt}*) and the control variables of Japanese import demand for prepared/preserved shrimp from each exporting country. Therefore the adjustment mechanism under assumption was the forecast import price (p_{jt}*) not equaled to the current imported price (p_{jt}) at the same time as

$$p_{jt} - \mu = \delta_j \left(p_{jt}^* - \mu \right) \quad ; 0<\mu<1 \tag{32}$$

where p_{jt} = current imported price in time t

μ = control variable of Japanese import demand for prepared/preserved shrimp from each exporting countries.

p_{jt}^* = forecast import price in time t

δ_j = coefficient of adjustment

From equation (32), LA/AIDS model could be written as the Japanese import demand equation for prepared/preserved shrimp from each exporting country in term of forecast import price;

$$w_{it} = \alpha_i + \sum_j \gamma_{jt} \ln \left(p_{jt}^* \right) + \beta_i \ln \left(\frac{x_t}{P_t^s} \right) + \mu_{it} \tag{33}$$

When substituted p_{jt}^{*} from equation (32) into equation (33) would got Japanese import demand equation for prepared/preserved shrimp as

$$w_{it} = \alpha_i + \sum_j \gamma_{jt} \ln \left\{ \frac{1}{\delta_j} \left[p_{jt} - (1 - \delta_j)\mu \right] \right\} + \beta_i \ln \left(\frac{x_t}{P_t^s} \right) + e_{it} \quad (34)$$

$$w_{it} = \alpha_i + \sum_j \gamma_{jt} \ln \left(\frac{1}{\delta_j (1 - \delta_j)} \right) + \sum_j \gamma_{jt} \left\{ \ln p_{jt} - \ln \mu \right\} + \beta_i \ln \left(\frac{x_t}{P_t^s} \right) + e_{it} \quad (35)$$

Where $\mu_{it} = e_{it} + \sum_j \gamma_{jt} \ln \left(\frac{1}{\delta_j (1 - \delta_j)} \right)$ thus equation (35) was LA/AIDS model with showed adjustment of import demand for prepared/preserved shrimp from Thailand and other exporting countries in Japanese market;

$$w_{it} = \alpha_i + \sum_j \gamma_{jt} \left\{ \ln p_{jt} - \ln \mu \right\} + \beta_i \ln \left(\frac{x_t}{P_t^s} \right) \quad (36)$$

From assumption of the study, price of prepared/preserved shrimp from each exporting country was relative price with proportional to import value of prepared/preserved shrimp from those countries that as relative price to the proportion of lagged import value of prepared/preserved shrimp by one period.(let $\mu = w_{i,t-1}$). Therefore equation (36) showed that price of prepared/preserved shrimp from each exporting country was price in term of the relation between the current imported price and lagged import value of prepared/preserved shrimp by one period followed as;

$$w_{it} = \alpha_i + \sum_j \gamma_{jt} \ln \left(\frac{p_{jt}}{w_{i,t-1}} \right) + \beta_i \ln \left(\frac{x_t}{P_t^s} \right) \quad (37)$$

From equation (37), Japanese import demand for prepared/preserved shrimp could explain according to demand theory. An increase in price of prepared/preserved shrimp in term of relative price $\left(\frac{p_{jt}}{w_{j,t-1}} \right)$ which current imported price (p_{jt}) increased

more than lagged import value of prepared/preserved shrimp ($w_{i,t-1}$) would lead to decrease in Japanese import demand.

The substitution of the Stone's price index into equation (37) caused a simultaneity problem because the dependent variable (w_{it}), also appeared on the right hand side of the LA/AIDS. Eales and Unnevehr (1988) suggested using the lagged share ($w_{i,t-1}$) for equation (37). Replacement of equation (27) with the lagged shares ($\sum_i w_{i,t-1} \ln p_{it}$), into equation (37) yields the LA/AIDS, given by:

$$w_{it} = \alpha_i + \sum_j \gamma_{jt} \ln\left(p_{jt}\right) + \beta_i \left(\ln x_t - \sum_i w_{i,t-1} \ln p_{it}\right) + \mu_{it} \qquad (38)$$

where μ_{it} was error term of country i in time t

Therefore, the model specification in this study was defined the following,

$$w_{it} = \alpha_i + \sum_j \gamma_{jt} \ln\left(\frac{p_{jt}}{w_{j,t-1}}\right) + \beta_i \left(\ln x_t - \sum_i w_{i,t-1} \ln p_{it}\right) \qquad (39)$$

w_{it} = share of Japan import value of selected prepared/preserved shrimp from country i in quarter t

$w_{i,t-1}$ = share of Japan import value of selected prepared/preserved shrimp from country i in quarter t-1

p_{jt} = price of selected prepared/preserved shrimp imported from country j in quarter t

p_{it} = price of selected prepared/preserved shrimp imported from country i in quarter t

x_{ti} = Japan total expense on imported selected prepared/preserved shrimp in quarter t

The equations were estimated for Japanese expenditure shares on import from Thailand as well as the other main exporters to Japanese market. For each commodity

of prepared/preserved shrimp, the equation would be estimated for main exporting country of that commodity. The four commodities included shrimp and prawn simply boiled in water or in brine chilled or frozen after simply boiled in water or in brine, smoked salted, in brine or dried after simply boiled in water or in brine, containing rice, excluding smoked simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine and prepared/preserved, not elsewhere specify (n.e.s). Quarterly series data from 1994 – 2009, 64 quarters in total were collected from Global Trade Atlas and Custom department of Japan. Restricted seeming unrelated regression (RSUR) technique would be employed for the estimation.

From the 14 estimated equations, own price elasticites, cross price elasticites, and expenditure elasticites were calculated[2] (Greene and Alston, 1990).

Own price elasticity; $$\varepsilon_{ii} = \frac{\gamma_{ii}}{w_{i,t-1}} - \beta_i - 1$$

Cross price elasticity; $$\varepsilon_{ij} = \frac{\gamma_{ij}}{w_{i,t-1}} - \beta_i \frac{w_{j,t-1}}{w_{i,t-1}}$$

Expenditure elasticity; $$\eta = \frac{\beta_i}{w_{i,t-1}} + 1.$$

[2] Elasticities were calculated in Appendix A.

CHAPTER IV

RESULTS OF THE STUDY

Import of Prepared/Preserved Shrimp in Japanese Market

On value basis, shrimp represented the leading imported fishery product in Japan. Due to the annually declining trend of domestic shrimp production, Japan depended heavily on shrimp import, consisting 90% share of the domestic shrimp market (Japan External Trade Organization (JETRO), 2004).

1) Import trends

Imported shrimps in Japan were in various product forms such as frozen, fresh/chilled, prepared/preserved (dried/salted/in brine, cooked, smoked, containing rice etc.), and lived. In 2008, shrimp imports totaled 203,474 metric ton, of which more than 90% were frozen. Focusing on the import figure of frozen shrimp over the period 1994 and 2008 as shown in Table 4.1, annual import volume and unit value averaged at around 247,970 metric ton and 9,722.39 million US dollars, respectively. Economic recession occurred around 1997 (Tom Yum Kung crisis) and during end year 2007 (Hamburger crisis) and escalating prices of shrimp resulted in a steadily declining trend of Japan shrimp import volume from 302,975 metric ton in 1994 to 238,906 in 1998. Since 1999, the import trend remained stable; however, total import of shrimp on quantity in 2003 fell by 6.30% compared to 2002 and declined continuously to 196,626 metric ton in 2008, as a result of the decrease in both import volume and unit value.

Table 4.1 Import volume and unit value of chilled and/or frozen shrimp in Japan, 1994-2008

year	Quantity (metric ton)	Growth (%)	Value (million US dollars)	Growth (%)	Unit Value (US dollars)	Growth (%)
1994	302,975		3,322		10962	
1995	292,910	-3.32	3,528	6.22	12045	9.88
1996	288,763	-1.42	3,119	-11.42	10801	-10.33
1997	267,247	-7.45	2,951	-5.38	11043	2.24
1998	238,906	-10.60	2,574	-12.78	10774	-2.44
1999	247,314	3.52	2,498	-2.95	10101	-6.25
2000	246,627	-0.28	2,760	10.48	11191	10.79
2001	245,048	-0.64	2,271	-17.70	9269	-17.17
2002	248,868	1.56	2,171	-4.40	8725	-5.87
2003	233,195	-6.30	1,957	-9.88	8391	-3.83
2004	241,443	3.54	2,010	2.75	8326	-0.76
2005	232,435	-3.88	1,933	-3.83	8318	-0.10
2006	229,948	-1.07	1,952	0.99	8491	2.08
2007	207,243	-9.87	1,746	-10.55	8427	-0.75
2008	196,626	-5.12	1,765	1.05	8975	6.50
Average	**247,970**		**2,321**		**9722**	

Source: Japan Customs and Global Trade Atlas (2008)

Changing lifestyle of Japanese consumer influenced overall import of shrimp products in this market. They preferred convenient products such as cooked, dried/salted/in brine, smoked and containing rice. There had been an increasing trend in prepared/preserved shrimp product. Since 1994, import volume of prepared/preserved shrimp increased continuously from 13,604 metric ton to 68,904

metric ton in 2006 increased by 14.97% compared to 2005. From 2006 to 2008, the import trend remained stable. (Table 4.2)

Table 4.2 Import volume and unit value of prepared/preserved shrimp in Japan, 1994-2008

year	Quantity (metric ton)	Growth (%)	Value (million US dollars)	Growth (%)	Unit Value (US dollars)	Growth (%)
1994	13,604		3,685		12486	
1995	18,894	38.89	3,950	7.20	13880	11.16
1996	21,370	13.11	3,479	-11.94	12575	-9.40
1997	22,962	7.45	3,269	-6.02	12540	-0.28
1998	24,750	7.79	2,801	-14.33	12134	-3.24
1999	27,567	11.38	2,722	-2.80	11051	-8.92
2000	32,405	17.55	3,044	11.82	11237	1.68
2001	38,700	19.43	2,493	-18.12	9791	-12.87
2002	42,277	9.24	2,403	-3.59	8940	-8.70
2003	47,834	13.14	2,160	-10.12	8637	-3.38
2004	57,391	19.98	2,215	2.53	8326	-3.61
2005	59,930	4.42	2,125	-4.05	7837	-5.86
2006	68,904	14.97	2,132	0.31	7661	-2.25
2007	66,515	-3.47	1,928	-9.54	7616	-0.59
2008	64,091	-3.64	1,920	-0.44	8296	8.94
Average	**40,480**		**2,688**		**10,200**	

Source: Japan Customs and Global Trade Atlas (2008)

2) Exporting country in Japanese market

Table 4.3 summarized Japanese prepared/preserved shrimp import according to main exporting countries over the period 2000-2008. Prepared/preserved shrimps in Japanese market were classified into four commodities by Harmonized Commodity Description and Coding System (HS code) of Custom Department of Japan. First, shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine (HS160520011). Second, Shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine (HS160520019). Third, shrimps and prawns, containing rice, excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine (HS160520021) and finally, shrimps and prawns prepared or preserved, not elsewhere specify (HS160520029).

There were several main exporting countries for each group commodities. For HS160520011 shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine, the main exporters of this commodity were Thailand, China, Indonesia and Vietnam. From Table 4.4 Thailand was the leading exporter but the market share of Thailand had been decreasing continuously from 75.01 percent in 2000 decreased to 59.23 percent in 2008. Follow by Vietnam, the market share of Vietnam increased from 4.15 percent in 2000 increased to 18.73 percent in 2008. Market share of China also increased from 2.17 percent in 2000 to 13.28 percent in 2008. For Indonesia, market share decreased from 14.47 percent in 2000 to 5.74 percent in 2008.

Table 4.3 Import volume and unit value of prepared/preserved shrimp by exporting country in Japan, 2000-2008

	Thailand	**China**	**Vietnam**	**Indonesia**	**Chinese Taipei**	**Other**	**Total**
				Import volume (metric ton)			
2000	20,392	3,312	1,489	5,556	134	1,522	32,405
2001	24,364	3,517	2,380	6,580	140	1719	38,700
2002	23,044	5,318	4,730	7,357	133	1,695	42,277
2003	22,713	7,219	6,924	9,304	153	1,521	47,834
2004	25,698	10,368	9,281	9,231	136	2,677	57,391
2005	26,206	11,743	11,480	8,264	169	2,068	59,930
2006	31,234	13,958	14,016	8,216	210	1,270	68,904
2007	29,982	14,659	12,786	7,522	177	1,389	66,515
2008	32,123	11,327	12,521	6,875	154	1,091	64,091
Mean	**26,195**	**9,047**	**8,401**	**7,656**	**156**	**1,661**	**53,116**
SD	**1,314**	**4,090**	**6,125**	**2,040**	**24**	**446**	**12,455**
				Unit Value (million US Dollar)			
2000	11,541	8,010	10,113	11,676	9,680	11,845	11,237
2001	10,122	7,318	9,678	10,109	9,013	11,730	9,791
2002	9,318	6,821	9,337	8,841	9,394	11,460	8,940
2003	8,795	7,604	9,088	8,669	9,577	10,623	8,637
2004	8,445	7,285	9,536	7,998	10,144	10,724	8,326
2005	7,796	7,287	8,470	7,666	8,791	10,170	7,837
2006	7,364	7,048	8,783	7,464	8,723	12,472	7,661
2007	7,338	7,192	8,366	7,653	9,084	12,344	7,616
2008	8,361	7,679	8,406	8,082	1,1574	11,694	8,296
Mean	**8,787**	**7,360**	**9,086**	**8,684**	**9,553**	**11,451**	**8,708**
SD	**1,293**	**1,442**	**589**	**1,369**	**834**	**744**	**1,105.**

Source: Global Trade Atlas (2008)

Table 4.4 Import value and market share of the main exporting countries for shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine (HS160520011) in Japanese market during 1998-2008.

Year	Thailand		China		Indonesia		Vietnam	
	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)
1998	122,379,917	71.84	6,148,884	3.61	34,847,552	20.46	3,576,577	2.10
1999	119,951,292	74.70	2,074,841	1.29	30,511,413	19.00	2,684,882	1.67
2000	136,190,602	75.01	3,943,979	2.17	26,264,211	14.47	7,531,581	4.15
2001	140,825,025	74.68	3,439,502	1.82	24,804,940	13.15	12,431,277	6.59
2002	116,399,008	68.28	4,740,720	2.78	18,477,822	10.84	23,627,566	13.86
2003	101,468,345	61.03	9,078,438	5.46	18,940,499	11.39	29,601,616	17.80
2004	106,067,286	55.27	12,866,821	6.70	14,839,216	7.73	48,966,382	25.51
2005	99,786,375	56.12	14,110,489	7.94	11,260,109	6.33	43,841,450	24.66
2006	102,464,217	52.39	16,788,439	8.58	8,635,746	4.42	61,626,765	31.51
2007	96,751,534	52.33	31,509,634	17.04	7,413,208	4.01	42,498,221	22.99
2008	131,362,645	59.23	29,447,428	13.28	12,726,554	5.74	41,527,300	18.73
Average	**109,167,926**		**9,684,206**		**23,847,085**		**21,388,634**	

Source: Calculated from Global Trade Atlas data (2008)

For HS160520019 shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine, the three major exporters namely Thailand, China and Chinese Taipei largely dominated to Japanese market. From Table 4.5, China was the leading exporter and the market share of China remained relatively stable from 2000 until to 2007, from 66.66 percent to 64.82 percent and decreased suddenly in 2008 decreased to 43.33 percent. The second leading of exporter was Chinese Taipei. The market share of Chinese Taipei had an increasing trend from 18.40 percent in 2000 to 36.25 percent in 2008. Followed by Thailand with a decreasing market share from 11.08 percent in 2000 to 6.48 percent in 2008. The import from Vietnam fluctuated and market share was smaller than three major exporters above with lowest at 0.20 percent in 2007 and highest at 12.14 percent in 2004.

For HS160520021, shrimps and prawns, containing rice, excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine, from Table 4.6; in the past the main exporters of these commodities were the USA, Thailand and China. Recently, Japan decreased import of these commodities from the USA, the market share of the USA decreased from 61.29 percent in 2004 to 8.08 percent in 2008. As the market share of China fluctuated since 1995 until 2008.For Thailand, the market share of Thailand had been decreasing from 37.40 percent in 2000 to 4.55 percent in 2007. In the past five years, Japan increased import of these commodities from Vietnam lead Vietnam to be the leader exporter of these commodities in Japanese market with average value of 281,562 US dollars. The market share of Vietnam increased from 6.58 percent in 2000 increased to 81.46 percent in 2008.

Table 4.5 Import value and market share of the main exporting countries for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine (HS160520019) in Japanese market during 1998-2008.

Year	Thailand		China		Chinese Taipei		Vietnam	
	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)
1998	486,207	10.35	2,976,307	63.39	968,117	20.62	261,383	5.67
1999	1,457,449	18.70	4,307,503	55.27	1,140,198	14.63	294,472	3.78
2000	780,129	11.08	4,691,994	66.66	1,294,954	18.40	182,621	2.59
2001	776,618	12.28	3,989,095	63.07	1,233,004	19.49	253,220	4.00
2002	649,711	11.85	3,505,248	63.91	1,047,502	19.10	104,716	1.91
2003	623,651	11.48	3,354,238	61.73	1,335,131	24.57	103,050	1.90
2004	1,327,778	18.51	3,506,812	48.89	1,259,417	17.56	870,765	12.14
2005	514,628	9.76	3,410,740	64.71	1,056,101	20.04	96,424	1.83
2006	348,584	7.01	3,235,863	65.03	1,300,684	26.14	91,188	1.83
2007	113,538	2.92	2,524,608	64.82	1,050,995	26.98	7,772	0.20
2008	249,043	6.48	1,665,063	43.33	1,393,048	36.25	66,581	1.73
Average	**719,656**		**3,656,736**		**1,082,228**		**207,008**	

Source: Calculated from Global Trade Atlas data (2008)

Table 4.6 Import value and market share of the main exporting countries for shrimps and prawns containing rice, excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine (HS160520021) in Japanese market during 1998-2008.

Year	Thailand		China		USA		Vietnam	
	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)
1998	155,801	37.20	22,923	5.47	210,794	50.33	29,298	7.00
1999	203,167	38.29	104,218	19.64	30,210	5.69	8,797	1.66
2000	230,764	37.40	159,907	25.91	61,413	9.95	40,578	6.58
2001	197,776	27.78	442,029	62.10	0	0	64,358	9.04
2002	44,978	4.52	246,205	24.75	69,083	6.95	628,674	63.21
2003	118,138	21.46	96,622	17.55	45,509	8.27	284,957	51.76
2004	379,904	13.45	96,819	3.43	1,731,047	61.29	616,370	21.83
2005	260,663	13.87	198,225	10.54	909,120	48.36	511,971	27.23
2006	174,515	16.17	219,955	20.38	29,161	2.70	649,121	60.13
2007	37,098	4.55	189,465	23.24	81,745	10.03	506,848	62.18
2008	0	0	77,167	10.46	59,583	8.08	600,895	81.46
Average	**204,272**		**167,836**		**245,463**		**281,562**	

Source: Calculated from Global Trade Atlas data (2008)

For HS160520029 shrimps and prawns prepared or preserved not elsewhere specify, the four major exporters namely Thailand, China, Indonesia and Vietnam largely dominated exports of these commodities to the Japanese market. From Table 4.7 the market share of Thailand decreased from 56.12 percent in 2000 to 44.85 percent in 2008 but Thailand remained the leading exporter of these commodities in Japanese market. The market share of China and Vietnam increased from 10.14 percent and 4.17 percent in 2000 increased to 18.27 percent and 20.65 percent in 2008 accordingly. On the other hand, the market share of Indonesia decreased from 22.03 percent in 2000 to 14.03 percent in 2008.

Table 4.7 Import value and market share of the main exporting countries for shrimps and prawns prepared or preserved, not elsewhere specify (n.e.s.) (HS160520029) in Japanese market during 1998-2008.

Year	Thailand		China		Indonesia		Vietnam	
	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)	Value (Us dollars)	Market share (%)
1998	82,134,066	65.79	5,510,970	4.41	23,687,385	18.97	6,648,906	5.33
1999	86,373,485	63.63	7,612,182	5.61	30,273,902	22.30	5,932,343	4.37
2000	98,157,285	56.12	17,735,283	10.14	38,525,422	22.03	7,298,040	4.17
2001	104,819,507	57.18	17,869,579	9.75	41,716,637	22.76	10,288,710	5.61
2002	97,627,282	48.58	27,784,039	13.83	46,554,816	23.17	19,8056,83	9.86
2003	97,544,639	40.49	42,362,767	17.59	61,698,003	25.61	32,931,964	13.67
2004	109,239,883	39.59	59,063,454	21.41	58,958,518	21.37	38,046,667	13.79
2005	103,734,138	36.43	67,853,785	23.83	52,093,236	18.29	52,782,198	18.54
2006	127,028,711	38.94	78,126,933	23.95	52,687,872	16.15	60,740,906	18.62
2007	123,106,249	38.84	71,207,166	22.47	50,150889	15.82	63,961,174	20.18
2008	136,963,815	44.85	55,782,573	18.27	42,836,838	14.03	63,053,819	20.65
Average	**100,769,704**		**31,487,618**		**37,702,326**		**26,680,180**	

Source: Calculated from Global Trade Atlas data (2008)

3) Marketing channels of shrimp products in Japanese market

Shrimp were mainly imported by shrimp-trading companies from foreign shrimp packers (or exporters) or oversea joint ventures shrimp firms. There were two marketing channels for most of shrimp distribution from foreign producers to Japanese consumers, as shown in Figure 4.2. First, shrimp could be sent to the central wholesale market and then shrimp buying and selling transactions were carried out by two types of middlemen that were primary wholesalers or large scale wholesalers and secondary wholesalers or medium scale wholesalers who had registered in the central market.

The second channel was handled by specialized primary wholesalers who operated outside the central market. Since the international standards were well established for prepared/preserved or frozen shrimp, primary wholesalers specializing in shrimp usually imported and then distributed shrimp directly to the retail outlets without any trading transactions in the central market such as supermarkets, retail stores and food service institutions. Specialized primary wholesalers not registered in the central markets were considered significant players in distributing foreign shrimp in Japan (Ling, 2004)

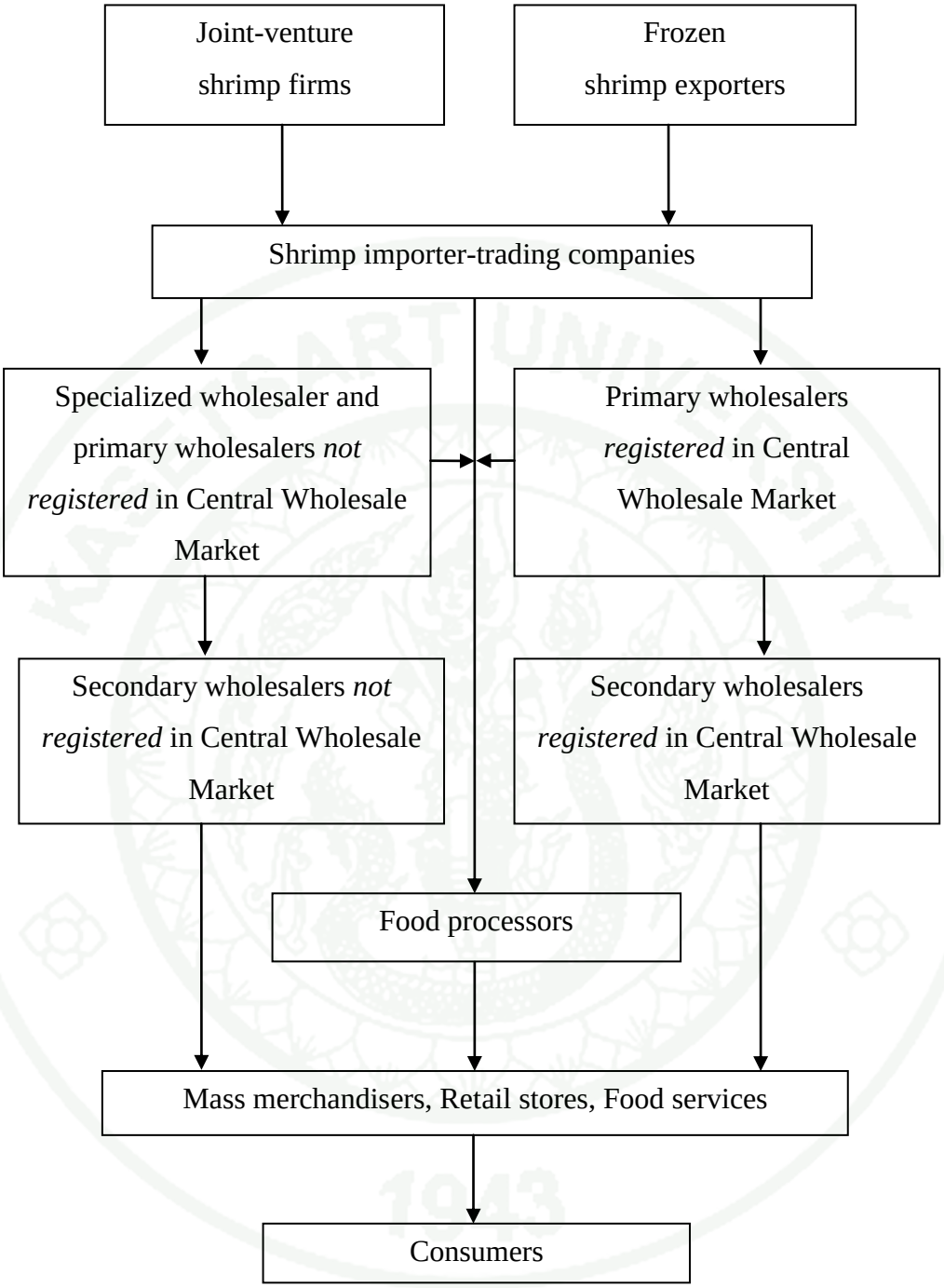

Figure 4.1 Marketing channels of imported shrimp in Japan

Source: Ling and JETRO (2004)

4) Import regulations

Japan was the important export market for fishery products especially shrimp products. Annually, Japanese demand totaled approximately 300,000 metric tons. Furthermore Japan was a country that was highly characterized by high standard of measures on food quality and safety. There were several regulations and procedures that were required to assure the quality security of imported shrimp (INFOFISH, 2004). Therefore, Thai shrimp exporters to Japanese market had to know and understand Japan's import regulations in order to set the guidelines for export to Japan and make Japanese consumers more confident in Thai shrimp products.

4.1) Import tariffs

Customs tariffs on shrimp products in Japan were summarized in Table 4.8. The Custom Department of Japan classified imports of shrimp under three tariff headings HS 030613, which covered frozen shrimp; HS 030623, which covered non frozen shrimp including live, fresh, or chilled; and HS 160520, which encompassed prepared or preserved shrimp that were smoked; boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine and not elsewhere specify.

Imports of frozen, lived, fresh and chilled shrimp in Japan should be imposed an ad valorem duty of 1 percent for World Trade Organization (WTO) member countries for which most-favored-nation principle was applied, 4 percent for other WTO members and tariff-free access for least developed countries. The ad valorem duty on prepared or preserved shrimp in Japan had 4.8 percent for both WTO and non- WTO member countries, 3.2 percent for countries under the preferential rate scheme and free access for least developed countries (Bith-Hong Ling, 2004). Thailand became a WTO member since 1995, ranking 59th and also was a country under the preferential rate scheme (UNCTAD, 2006). With these reasons Thai prepared or preserved shrimp could exported more (Thai Custom Department, 2011).

Table 4.8 Import tariffs for shrimp products in Japan.

Tariff heading	Description	Unit	General	WTO	Preferential rate
030613	Frozen shrimp	kg	4%	1%	Free*
030623	Non-frozen shrimp,				
	Live, fresh or chilled,	kg	4%	1%	Free*
	other	kg	6%	5%	Free/4%*
160520	Prepared or preserved shrimp				
	smoked; boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply	kg	4.8%	4.8%	Free/3.2%*
	boiled in water or in brine	kg	6%	5.3%	Free*
	Other				

Source: APEC Tariff Database and Ling (2004)

Note * Free was applicable only for the least developed countries (LDC).

Japan had economic partnership agreement with Thailand, Indonesia and Vietnam entered into forced on 1 November 2007, 31 July 2008 and 1 October 2009 respectively (MFOA, 2010). Under Japan's free trade area with Thailand or Japan-Thailand Economic Partnership Agreement (JTEPA), import tariffs on Thai shrimp would be eliminated in November 2007 (MFA, 2007).

4.2) Import inspections

The growing expansion of aquaculture products attracted more attentions on the issues of food safety and quality. As the harmonized safety mechanisms and controls at international levels, the Hazard Analysis Critical Control Point (HACCP) approach was considered to be the most important methodology for assuring safety of global food trade. In recent years, greater attentions were focused on the regulations of traceability system alongside quality controls and safety management in cultured fishery products (Josupeit et al. 2000 and Dallimore 2004).

In Japan, strict safety inspections on imported shrimp were subject to provisions of the Food Sanitation Law. The procedural requirements at the time of importation under the Food Sanitation Law could be divided into three stages. First, before importing, some advanced consultation services on product information acquisition and inspections were carried out. Shrimp importers might send a sample of shrimp for a forthcoming import shipment to official laboratories for pre-import testing. These laboratories were designated by the Minister of Health, Labor and Welfare in Japan or in exporting countries. The inspection at the time of importation at the port of entry might be exempted once this pre-import test was passed. Second, the "Notification Form for Importation of Foods, etc." provided by the Food Automated Import Notification and Inspection Network System (FAINS) must be submitted to the Quarantine Station by shrimp importers at the port of entry. Third, according to the Standards of Frozen Fresh Fisheries for Raw Consumption, imported shrimp based on the import notification given by the FAINS (the second procedure mentioned earlier) would be inspected. The inspection included detecting the presence of residual antibiotics and antibacterial (Ling and JETRO, 2004).

For Thailand, in response to the increasingly strict safety inspections on imported shrimp of Japan led Thai Ministry of Agriculture and Cooperatives through the Department of Fisheries to implement a voluntary HACCP fishery inspection program in 1991 for the first time which was finally became mandatory in fishery establishments in 1996. All Thai seafood processors and exporters had to implement

CoC (Code of Conduct), GMP (Good Manufacturing Practices) and HACCP to produce quality shrimp. Fisheries Department of Thailand, as a competent authority for fishery products exported from Thailand, monitored the establishments and their products regularly, administers several programs and activities to ensure that seafood safety was maintained properly through farm-to-table approach (Figure 4.2). To ensure credible inspection and controls throughout the value chain, competent authority covered all relevant aspects of hygiene, public health and, also animal health. In order to sustain the Thai shrimp industry and to maintain consumer confidence in product safety, it applied standard practices to all sectors of the value chain from primary production to the market place and to apply a single standard for products whether the products were destined for domestic or Japanese market (Uddin, 2008).

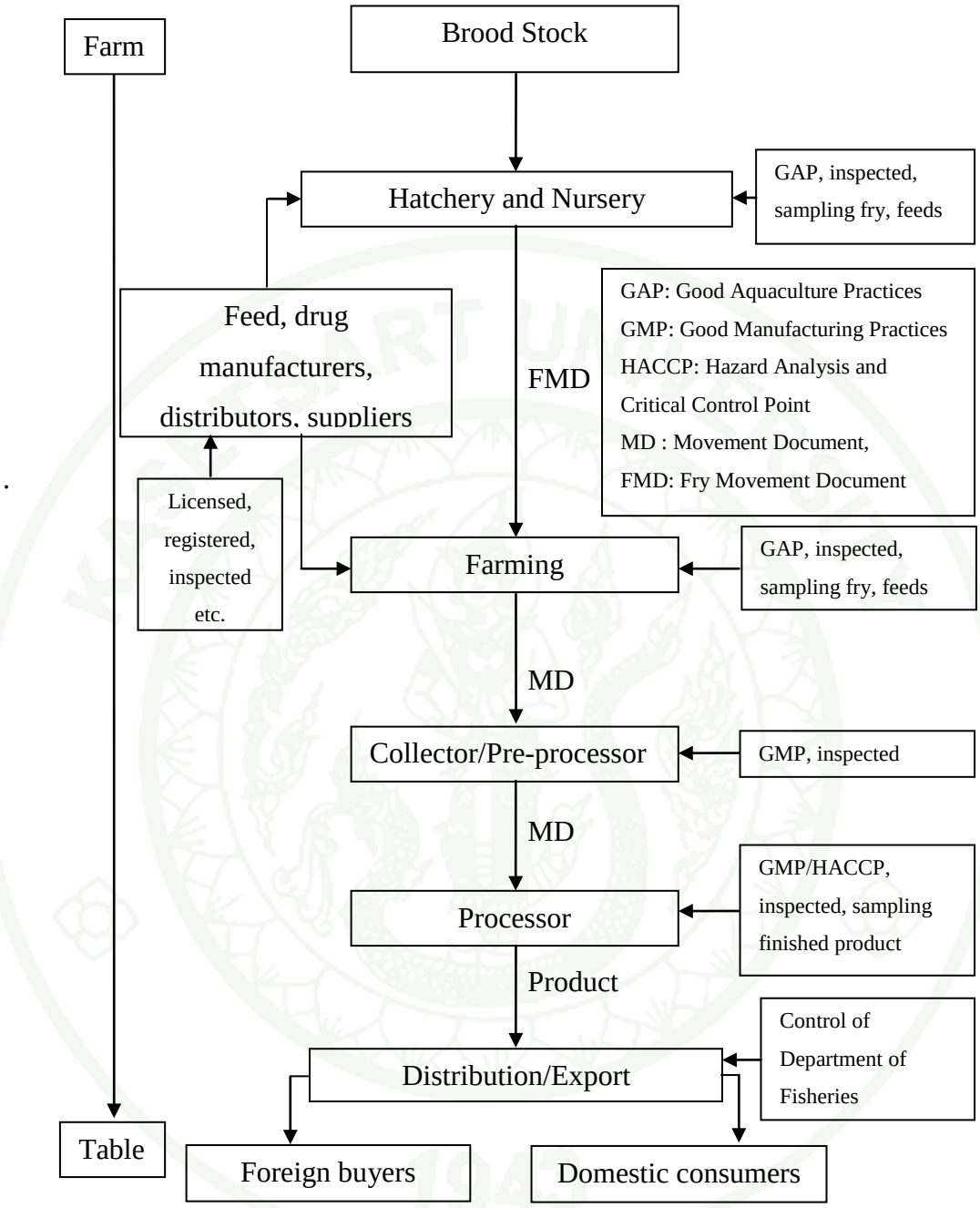

Figure 4.2 Value chain of shrimp, Thailand

Source: Fisheries Department of Thailand and and Uddin (2008)

In addition to simple frozen product, Thailand also produced higher value added products liked smoked shrimp, containing rice, prepared or preserved shrimp not elsewhere specifies such as Sushi-Ebi (Butterfly-open for Sushi), breaded torpedo & butterfly, battered shrimp, shrimp roll, shrimp barbecue (BBQ) and shrimp cake (TFFA, 2009). These latter products were classified in HS 160520.

The production process for shrimp products was shown in Figure 4.3. The process started from cleaning, quality checking, and sorting shrimp size. Next the cleaned shrimp would be beheaded, de-skinned or de-shelled and cut in the desired form. In case of fresh frozen shrimp, this prepared shrimp went directly into the freezer at temperatures of - 20 to -40 C° in the individual quick frozen (IQF) system. In the case of cooked shrimps, the prepared raw material would be boiled at temperature 80-100 C° and frozen afterwards (Anuwat and Suttirat, 2007).

For prepared or preserved shrimps, there were additional processes before the frozen shrimp stage. After the shrimp was cleaned, it went through a cooking process which differed from product to product. The shrimp might be grounded, battered, seasoned, breaded, smoked, dried, boiled or fried. After this cooking stage, the finished product would also be frozen and packed liked the regular frozen shrimp product and then stored for export.

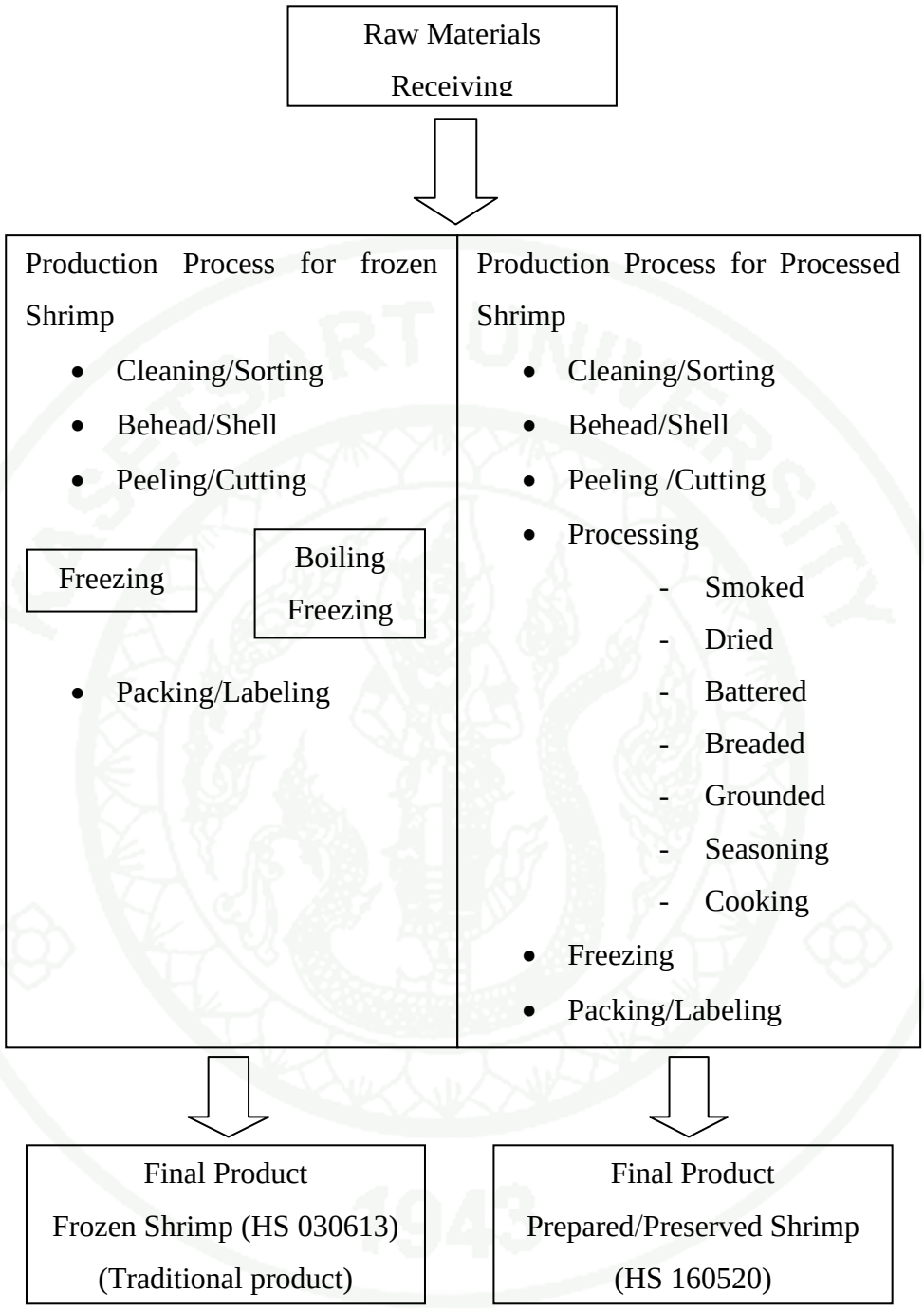

Figure 4.3 Production Process of Thai Shrimp Products

Source: Julintron and Chalatarawat (2007)

Results from Statistical Models

1) Import demand for prepared/preserved shrimp in Japanese market

The LA/AIDS equations or equation (32) in chapter III were estimated by using restricted seeming unrelated regression (RSUR) technique. The estimated equations were in Tables 4.9, 4.11, 4.13 and 4.15 for each type of prepared/preserved shrimp and the calculated elasticities in Tables 4.10, 4.12, 4.14 and 4.16.

1.1) Shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine (HS 160520011)

From Table 4.9, 72.95% of variation in Japanese import demand for shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine from Thailand could be explained by relative prices of exports from Thailand, China, Indonesia and Vietnam as well as the average relative prices of exports from other countries, and the Japanese expenditure on imported this product. The variation of import from China, Indonesia and Vietnam could be explained by same set of explanatory variables at 57.33%, 93.05% and 76.92% accordingly.

For import from Thailand, the explanatory variables significant at the 99% level were relative prices of export from Thailand (ln_pt) with a negative sign. The relative prices of export from China (ln_pc) and Vietnam (ln_pv) were significant at the 99% level with a positive sign. The relative price of export from Indonesia (ln_pi) was significant at the 90% level with a positive sign. The increase in relative prices of export from Thailand would lead to reduction in Japanese import from Thailand as expected. The higher relative price from China, Vietnam and Indonesia would increase in import from Thailand, significantly.

In case of import from China, the explanatory variables significant at the 99% level were relative prices of export from China (ln_pc) with a negative sign and relative prices of export from Thailand (ln_pt) with a positive sign. The increase in

relative price of export from China would significantly lead to decrease in import demand from China while increase in relative price of export from Thailand would turn Japan to import more from China.

In case of import from Indonesia, the explanatory variables significant at the 99% level were relative prices of export from Indonesia (ln_pi) with a negative sign and relative prices of export from Vietnam (ln_pv) with a positive sign. The relative price of export from Thailand (ln_pt) was significant at the 90% level with a positive sign. The increase in relative prices of export from Indonesia would significantly lead to decrease in import from Indonesia while increase in relative price of export from Vietnam and Thailand would turn Japan to import more from Indonesia.

In case of import from Vietnam, the explanatory variables significant at the 99% level were relative prices of export from Vietnam (ln_pv) with a negative sign and the relative price of export from Thailand (ln_pt) and Indonesia (ln_pi) were significant at the 99% level with a positive sign. The increase in relative prices of export from Vietnam would significantly lead to decrease in import from Vietnam while increase in relative price of export from Indonesia and Thailand would turn Japan to import more from Vietnam.

As total expense on import (Ex) of shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine (HS 160520011) increased, Japan would import significantly less from Indonesia and total expenditure on import of this item increased, Japan would import significantly more from China.

Table 4.9 The estimated Japanese import demand for shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine (HS160520011)

Explanatory variable	Japanese import demand for prepared/preserved (HS160520011) shrimp from			
	Thailand	**China**	**Indonesia**	**Vietnam**
Const.	0.4898^{ns} (0.108)	-0.2900* (0.058)	0.5809*** (0.000)	-0.1251^{ns} (0.598)
ln_pt	-0.0984*** (0.000)	0.0206*** (0.007)	0.0205* (0.080)	0.0268*** (0.007)
ln_pc	0.0206*** (0.007)	-0.0194*** (0.001)	0.0032^{ns} (0.479)	-0.0014^{ns} (0.727)
ln_pi	0.0205* (0.080)	0.0032^{ns} (0.479)	-0.0460*** (0.000)	0.0234*** (0.000)
ln_pv	0.0268*** (0.007)	-0.0014^{ns} (0.727)	0.0234*** (0.000)	-0.0384*** (0.000)
ln_poth	0.0305^{ns} (0.260)	-0.0031^{ns} (0.394)	-0.0075^{ns} (0.234)	-0.0041^{ns} (0.213)
Ex	-0.0082 ^{ns} (0.820)	0.0497*** (0.006)	-0.0508*** (0.003)	0.0388^{ns} (0.167)
R-square	0.7295	0.5733	0.9305	0.7692
χ^2	43.15	84.84	609.79	242.68
NO. of observations	63	63	63	63

Note: Values in parentheses are the P-value

*** statistically significant at 99% confidence interval

** statistically significant at 95% confidence interval

* statistically significant at 90% confidence interval

^{ns} not statistically significant

In Table 4.10 own price, cross price and expenditure elasticities were given. For own price elasticity, relative price of export from China had the highest elasticity (-1.4054), higher than own price elasticity from Vietnam (-1.3721), followed by Indonesia (-1.2602) and Thailand (-1.1455) respectively. The change in relative price of export from Thailand would lead to a lower change in Japanese import demand for shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine from Thailand compared with competitors.

For import demand of shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine from Thailand, own price elasticity was the most elastic. One percent increase in relative price of export from Thailand would lead to 1.1455 percent decrease in import from Thailand.

Table 4.10 Own price, cross price, and expenditure elasticity of Japan import demand for shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine (HS160520011)

Japanese Import Demand for HS160520011 commodity from	**Price of imported HS160520011 commodity from**					**Expenditure**
	Thailand	**China**	**Indonesia**	**Vietnam**	**Others**	
Thailand	-1.1455	0.0315	0.0301	0.0404	0.0471^{ns}	0.9872^{ns}
China	-0.2057	-1.4054	-0.0761^{ns}	-0.1307^{ns}	-0.0953^{ns}	1.9114
Indonesia	0.3585	0.0404^{ns}	-1.2602	0.1978	0.0362^{ns}	0.6565
Vietnam	0.0170	-0.0122^{ns}	0.1533	-1.3721	-0.0498^{ns}	1.3368^{ns}

Note: ^{ns} not statistically significant

Source: Calculated from Table 4.9

One percent increase in import price from China, Indonesia and Vietnam would lead to an increase of 0.0315, 0.0301 and 0.0404 percent increase in import from Thailand while a one percent increase in relative price of export from Thailand would lead to 0.0315.

For import demand of shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine from Thailand, own price elasticity was the most elastic. One percent increase in relative price of export from Thailand would lead to 1.1455 percent decrease in import from Thailand. One percent increase in import price from China, Indonesia and Vietnam would lead to an increase of 0.0315, 0.0301 and 0.0404 percent increase in import from Thailand while a one percent increase in relative price of export from Thailand would lead to 0.0315 percent, 0.0301 percent and 0.0404 percent increase in import from China, Indonesia and Vietnam respectively indicating their being competitors in Japanese market.
For import demand of this item from China, own price elasticity was the most elastic. One percent increase in relative price of exporting from Thailand would lead to a decrease in Japanese import demand from China by 0.2057 percent, inelastic cross price elasticity of Japanese import demand from China. Cross price elasticity from Indonesia, Vietnam and other countries were not statistically significant.

For import demand of this item from Indonesia, own price elasticity was elastic. The important competitors in Japanese market were Thailand with elastic cross price elasticity of 0.3585. For other competitor was Vietnam with inelastic cross price elasticity of 0.1978.

For import demand of this item from Vietnam, own price elasticity was elastic. The competitors in Japanese market were Indonesia and Thailand with inelastic cross price elasticity of 0.1533 and 0.0170 respectively. One percent in increase in relative price of exporting from Indonesia and Thailand would lead to an increase of 0.1533 and 0.0170 percent in Japanese import demand from Vietnam respectively.

For expenditure elasticity of Japanese import demand for shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine from Thailand and Vietnam were not statistically significant. Expenditure elasticity of China was the highest, being 1.9114 with elastic and followed by Indonesia being 0.6565 with inelastic expenditure elasticity. The change in Japanese expenditure for imported shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine from China would lead to a high change in Japanese import demand for shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine from China. The change in Japanese expenditure for imported shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine from Indonesia would not lead to a high change in Japanese import demand for shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine from Indonesia. For Thailand and Vietnam, a change in Japanese expenditure for imported shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine from Thailand and Vietnam would not effected for both countries.

1.2) Shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine (HS160520019)

From Table 4.11, 57.09% of variation in Japanese import demand for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine from Thailand could be explained by relative prices of export from Thailand, China, Chinese Taipei and Vietnam as well as the average relative prices of export from other countries, and the Japanese expenditure on this product. The variation of import from China, Chinese Taipei and Vietnam could be explained by same set of explanatory variables at 73.35%, 79.20% and 45.92% accordingly.

Table 4.11 The estimated Japanese import demand for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine (HS160520019)

Explanatory variable	Japanese import demand for prepared/preserved shrimp (HS160520019) from			
	Thailand	**China**	**Chinese Taipei**	**Vietnam**
Const.	0.2625^{ns} (0.180)	-0.4747* (0.058)	0.0180** (0.020)	1.0600*** (0.000)
ln_pt	-0.0069*** (0.000)	0.0050*** (0.000)	-0.0024*** (0.007)	-0.0086^{ns} (0.227)
ln_pc	0.0050*** (0.000)	-0.0351*** (0.000)	-0.0029*** (0.009)	0.0308^{ns} (0.727)
ln_pe	-0.0024*** (0.007)	-0.0029*** (0.009)	-0.0568*** (0.000)	0.0354^{ns} (0.727)
ln_pv	-0.0086^{ns} (0.227)	0.0308^{ns} (0.727)	0.0354^{ns} (0.727)	-0.0127*** (0.000)
ln_poth	0.0129 ^{ns} (0.358)	-0.0022^{ns} (0.394)	-0.0111^{ns} (0.234)	-0.0069^{ns} (0.213)
Ex	-0.0212^{ns} (0.662)	0.2060* (0.020)	0.0167*** (0.000)	-0.1851^{ns} (0.641)
R-square	0.5709	0.7335	0.7920	0.4592
χ^2	47.50	47.23	54.76	38.80
NO. of observations	34	34	34	34

Note: Values in parentheses are the P-value

*** statistically significant at 99% confidence interval

** statistically significant at 95% confidence interval

* statistically significant at 90% confidence interval

^{ns} not statistically significant

For import from Thailand, the explanatory variables significant at the 99% level were relative prices of export from Thailand (ln_pt) and Chinese Taipei (ln_pe) with a negative sign and China with a positive sign. The increase in relative prices of exporting from Thailand would lead to reduction in Japanese import from Thailand as expected. As the relative price from Chinese Taipei increased, Japan would significantly decrease in import from Thailand. But if the relative price from China increased Japan would increase import from Thailand.

In case of import from China, the explanatory variables significant at the 99% level were relative prices of exportfrom Thailand (ln_pt) and Chinese Taipei (ln_pe) with a positive sign and China (ln_pc) with a positive sign. The increase in relative prices of export from China would lead to reduction in Japanese import from China. As the relative price from Chinese Taipei and Thailand increased, Japan would significantly decrease import from China.

In case of import from Chinese Taipei, the explanatory variables significant at the 99% level were relative prices of export from China (ln_pt) and Chinese Taipei (ln_pe) with a negative sign. The explanatory variable significant at the 95% level was relative prices of export from Thailand (ln_pt) also with a negative sign. The increase in relative prices of export from Chinese Taipei would lead to reduction in Japanese import from Chinese Taipei. As the relative price from China and Thailand increased, Japan would significantly decrease in import from Chinese Taipei.

In case of import from Vietnam, the explanatory variables significant at the 99% level were relative prices of export from Thailand (ln_pt) and Vietnam (ln_pv) with a negative sign, and relative prices of export from China (ln_pc) with a positive sign. The increase in relative prices of export from Vietnam would lead to reduction in Japanese import from Vietnam as expect. As the relative price from Thailand increased, Japan would significantly decrease in import from Vietnam. But

if in relative prices of export from China increased Japan would increase import from Vietnam.

For total expenditure on Japan import of shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine (Ex), the explanatory variable significant at the 99% level was total expenditure on import from Chinese Taipei and at the 90% level was total expenditure on import from China indicated that as expenditure on import of this item increased, Japan would still import more from Chinese Taipei and China

In Table 4.12 revealed the own price, cross price and expenditure elasticity of Japanese import demand for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine. For own price elasticity, own price elasticity of China was the highest elastic being -1.2675. Followed by Chinese Taipei being -1.2637, Vietnam being -1.0943 and Thailand being -1.0286, it was lowest in magnitude from export countries. One percent increase in relative price from Thailand would induce lower decrease in import of Thai shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine than those of China, Chinese Taipei and Vietnam. Therefore, more sensitive to change in price were China, Chinese Taipei and Vietnam accordingly. In case of price competition, the importer was less responsive to change in price of Thailand.

For import demand from Thailand, own price elasticity was the most elastic. One percent increase in relative price of export from Thailand would lead to 1.0284 percent decrease in import from Thailand. Cross price elasticity from China and Chinese Taipei was inelastic being 0.1238 and 0.0179 respectively implied that one percent increase in relative price of export from China and Chinese Taipei would lead to an increase of 0.1238 percent and 0.0179 percent increase in Japanese import demand from Thailand. Cross price elasticity from Vietnam and other countries were not statistically significant. The competitor exporters of these commodities were China and Chinese Taipei.

Table 4.12 Own price, cross price, and expenditure elasticity of Japan import demand for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine (HS160520019)

Japan Import Demand for HS160520019 commodity from	Price of imported HS160520019 commodity from					Expenditure
	Thailand	China	Chinese Taipei	Vietnam	Others	
Thailand	-1.0286	0.1238	0.0179	-0.0552^{ns}	0.1026^{ns}	0.8469^{ns}
China	-0.0412	-1.2675	-0.0881	0.0376^{ns}	-0.0346^{ns}	1.3609
Chinese Taipei	-0.0205	-0.0541	-1.2637	0.1506^{ns}	-0.0528^{ns}	1.0726
Vietnam	0.3746	3.0014^{ns}	1.7149^{ns}	-1.0943	-0.1264^{ns}	-3.0718^{ns}

Note: ^{ns} not statistically significant

Source: Calculated from Table 4.12

For import demand from China, own price elasticity was the most elastic. One percent increase in relative price of export from China would lead to 1.2675 percent decrease in import from China. Cross price elasticity of Thailand and Chinese Taipei were inelastic being -0.0412 and -0.0881 respectively implied that one percent increase in relative price of export from Thailand and Chinese Taipei would lead to a decrease of -0.0412 and -0.0881 percent in Japanese import demand from China. These exporters were not competitor of this commodity for China.

For import demand from Chinese Taipei, own price elasticity was the most elastic. One percent increase in relative price of export from Chinese Taipei would lead to 1.2637 percent decrease in import from Chinese Taipei. Cross price elasticity of Thailand and China was inelastic being -0.0205 and -0.0541 respectively implied

that one percent increase in relative price of export from Thailand and China would lead to a decrease of 0.0205 and 0.0541 percent in Japanese import demand from China. These exporters were not competitor of this commodity for Chinese Taipei.

For import demand from Vietnam, own price elasticity was the most elastic. One percent increase in relative price of export from Vietnam would lead to 1.0943 percent decrease in import from Vietnam. Cross price elasticity of Thailand was inelastic being 0.3746 indicated that one percent increase in relative price of export from Thailand would lead to an increase of 0.3746 percent in import demand from Vietnam. Main competitor of this commodity from Vietnam was Thailand.

For expenditure elasticity of Japanese import demand for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine from Thailand and Vietnam were not statistically significant. Expenditure elasticity of China was the highest being 1.3609 and expenditure elasticity of Chinese Taipei was also elastic being 1.0726. The change in Japanese expenditure for imported shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine from China would lead to a highest change in Japanese import demand for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine from China. One percent increased in Japanese expenditure for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine from China and Chinese Taipei would lead to an increase of 1.3609 percent and 1.0726 percent in import from China and Chinese Taipei accordingly.

1.3) Shrimps and prawns, containing rice, excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine (HS160520021)

In case of shrimps and prawns, containing rice, excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine, the demand functions were estimated for Japanese import demand from the two main exporters to this market including Thailand and Vietnam. The

variation of Japanese import demand for shrimps and prawns, containing rice, excluding smoke from Thailand could be explained by relative prices of export from Thailand, Vietnam, and other countries, and Japanese total expenses on import of this item at 38.71% while these explanatory variables could explain the variation in Japanese import by 64.42% (Table 4.13).

For import from Thailand, the explanatory variables significant at the 99% level were relative prices of export from Thailand (ln_pt) and Vietnam (ln_pv) with negative sign. The increase of relative prices of export from Thailand would lead to reduction in Japanese import demand from Thailand as expected. As the relative price from Vietnam increased, Japan would also significantly decrease in import from Thailand.

For import from Vietnam, the explanatory variable significant at the 99% level was relative prices of export from Vietnam (ln_pv) with negative sign and Thailand (ln_pt) with positive sign The relative prices of export from Vietnam increased Japan would reduce import from Vietnam. However if relative prices of export from Thailand increased, Japan would turn to import more from Vietnam.

For total expenditure on Japan import of shrimps and prawns containing rice, excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine (Ex), the explanatory variable significant at the 90% level was total expense on import from Thailand, indicated that as expenses on import of this item increased, Japan would still import more from Thailand.

Table 4.13 The estimated Japanese import demand for shrimps and prawns containing rice, excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine (HS160520021)

Explanatory variable	**Japanese import demand for prepared/preserved shrimp (HS160520021) from**	
	Thailand	**Vietnam**
Const.	0.2810* (0.057)	0.5761*** (0.000)
ln_pt	-0.0771*** (0.009)	0.0634*** (0.008)
ln_pv	-0.0634*** (0.008)	-0.0884*** (0.002)
ln_poth	0.0136ns (0.539)	0.0250ns (0.275)
Ex	-0.0076* (0.081)	-0.0503ns (0.150)
R-square	0.3871	0.6442
χ^2	14.54	42.67
NO. of observations	38	38

Note: Values in parentheses are the P-value

*** statistically significant at 99% confidence interval

** statistically significant at 95% confidence interval

ns not statistically significant

Table 4.14 revealed the own price, cross price and expenditure elasticity of Japanese import demand for shrimps and prawns containing rice, excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine. For own price elasticity, relative prices of

exporting from Thailand was the highest elasticity, being -1.2596 and followed by Vietnam being -1.1537. The change in relative prices of exporting from Thailand would lead to a high change in Japanese import demand for shrimps and prawns containing rice, excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine from Thailand.

For import demand from Thailand, own price elasticity was the most elastic. One percent increase in relative price of export from Thailand would lead to 1.2596 percent decrease in import from Thailand. Cross price elasticity of Vietnam was inelastic being 0.2154 implied that one percent increase in relative price of exporting from Vietnam would lead to an increase of 0.2154 percent increase in Japanese import demand from Thailand. Vietnam was competitor for import from Thailand.

In case of import demand from Vietnam, own price elasticity was the most elastic. One percent increase in relative price of export from Vietnam would lead to 1.1537 percent decrease in import from Vietnam. Cross price elasticity of Thailand was inelastic being 0.1807 indicated that one percent increase in relative price of export from Thailand would lead to an increase of 0.1807 percent increase in import from Vietnam. Thailand was competitor for import from Vietnam.

For expenditure elasticity of Japanese import demand for Thai shrimps and prawns containing rice excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine was closely to unitary elastic being 0.9974. The increase in Japanese expenditure for imported shrimps and prawns containing rice excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine from Thailand would lead to increase in Japanese import demand from Thailand. For shrimps and prawns containing rice and expenditure elasticity of Vietnam was not statistically significant.

Table 4.14 Own price, cross price, and expenditure elasticity of Japan import demand for shrimps and prawns containing rice, excluding smoke; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine (HS160520021)

Japan Import Demand for HS160520021 commodity from	Price of imported HS160520021commodity from			Expenditure
	Thailand	Vietnam	Others	
Thailand	-1.2596	0.2154	0.0473^{ns}	0.9974
Vietnam	0.1807	-1.1537	0.1132^{ns}	0.7960^{ns}

Note: ^{ns} not statistically significant

Source: Calculated from Table 4.13

1.4) Shrimps and prawns prepared or preserved, not elsewhere specify, (n.e.s.) (HS160520029)

Japanese import demand for Shrimps and prawns prepared or preserved from Thailand, China, Vietnam and Indonesia had been estimated. From Table 4.15, 93.49% of variation in Japanese import demand for Shrimps and prawns prepared or preserved shrimp from Thailand could be explained by relative prices of export from Thailand, China, Indonesia and Vietnam as well as the average relative prices of export from other countries, and the Japanese expanses on imported this item. The variation of import from China, Indonesia and Vietnam could be explained by same set of explanatory variables at 92.16%, 61.69% and 87.16% accordingly.

For import from Thailand, the explanatory variables significant at the 99% level were relative prices of export from Thailand (ln_pt) with negative sign and

relative prices of export from China (ln_pc) with positive sign. The relative price of export from Indonesia (ln_pi) and Vietnam (ln_pv) were significant at the 95% level with positive sign. The increase in relative prices of export from Thailand would lead to reduction in Japanese import from Thailand as expected. The increase relative price from China, Indonesia and Vietnam, Japan would lead to increased in import from Thailand, significantly.

In case of import from China, the explanatory variables significant at the 99% level were relative prices of export from Thailand (ln_pt), Indonesia (ln_pi) with positive sign and China (ln_pc) with negative sign. The explanatory variable significant at the 95% level was relative prices of export from other countries (ln_poth) with negative sign. The increase in relative prices of export from China would lead to reduction in Japanese import from China as expected. The higher relative prices of export from other countries than Thailand and Indonesia would lead to decrease in import from China, significantly. Nevertheless if relative prices of export from other countries Thailand and Indonesia increased, Japan would significantly import more from China.

In case of import from Indonesia, the explanatory variables significant at the 99% level were relative prices of export from China (ln_pc), Vietnam (ln_pv) and other countries (ln_poth) with positive sign and Indonesia (ln_pi) with negative sign. The explanatory variables significant at the 95% level were relative prices of export from Thailand with positive sign. The increase in relative prices of export from Indonesia would lead to reduction in Japanese import from Indonesia as expected. The increase relative price from Thailand, China, Vietnam and other countries, Japan would lead to increased in import from Indonesia, significantly.

In case of import from Vietnam, the explanatory variables significant at the 99% level were relative prices of export from Vietnam (ln_pv) with negative sign and Indonesia (ln_pi) with positive sign. The explanatory variable significant at the 95% level was relative prices of export from (ln_pt) Thailand with positive sign. The increase in relative prices of export from Vietnam would lead to reduction in Japanese

import from Vietnam as expected. The increase relative price from Indonesia and Thailand, Japan would lead to increased in import from Vietnam, significantly.

Table 4.15 The estimated Japanese import demand for shrimps and prawns prepared or preserved, not elsewhere specify (n.e.s.) (HS160520029)

Explanatory variable	**Japanese import demand for prepared/preserved shrimp (HS160520029) from**			
	Thailand	**China**	**Indonesia**	**Vietnam**
Const.	1.283*** (0.000)	-0.314** (0.016)	0.0432ns (0.688)	-0.3760*** (0.001)
ln_pt	-0.0979*** (0.000)	0.0561*** (0.000)	0.0126** (0.044)	0.0201** (0.020)
ln_pc	0.0561*** (0.000)	-0.0539*** (0.000)	0.0098*** (0.000)	-0.0034ns (0.547)
ln_pi	0.0126** (0.044)	0.0098*** (0.007)	-0.0502*** (0.000)	0.0164*** (0.000)
ln_pv	0.0201** (0.020)	-0.0034ns (0.547)	0.0164*** (0.000)	-0.0378*** (0.000)
ln_poth	0.0091ns (0.184)	-0.0086** (0.030)	0.0114*** (0.001)	0.0047ns (0.204)
Ex	-0.1062*** (0.000)	0.0634*** (0.000)	0.0124ns (0.290)	0.0605*** (0.000)
R-square	0.9349	0.9216	0.6169	0.8716
χ^2	914.03	707.87	113.77	448.62
NO. of observations	63	63	63	63

Note: Values in parentheses are the P-value

*** statistically significant at 99% confidence interval

** statistically significant at 95% confidence interval

ns not statistically significant

As total expenditure on import of Japanese import demand for Shrimps and prawns prepared or preserved (Ex), the explanatory variables significant at the 99% level were total expenditure on import from Indonesia and Vietnam with positive sign and Thailand with negative sign. As expenditure on import of this item increased, Japan would still import more from Indonesia and Vietnam but import significantly less from Thailand.

From Table 4.16 revealed the own price, cross price and expenditure elasticity of Japanese import demand for shrimps and prawns prepared or preserved, not elsewhere specify. For own price elasticity, own price elasticity of China was highest elastic being -1.4928, followed by Vietnam being -1.4258, Indonesia being -1.3202 and Thailand being -1.0721, it was lowest in magnitude from export countries. One percent increase in relative price from Thailand would induce lower decrease in import of Thai shrimps and prawns prepared or preserved than those of China, Vietnam and Indonesia. Therefore, more sensitive to change in price were China, Vietnam and Indonesia accordingly. In case of price competition, the importer was less responsive to change in price of Thailand.

For import demand from Thailand, own price elasticity was the most elastic. One percent increase in relative price of export from Thailand would lead to 1.1676 percent decrease in import from Thailand. Cross price elasticity from China, Indonesia and Vietnam was inelastic being 0.1265, 0.0545 and 0.0566 respectively implied that one percent increase in relative price of export from China, Indonesia and Vietnam would lead to an increase of 0.1265 percent, 0.0545 percent and 0.0566 percent increase in Japanese import demand from Thailand. These exporters were competitor of import these commodities from Thailand.

For import demand from China, own price elasticity was the most elastic. One percent increase in relative price of export from Thailand would lead to 1.4931 percent decrease in import from China. Cross price elasticity from Indonesia and other countries was inelastic being -0.0043 and -0.0983 accordingly indicated that one percent increase in relative price of export from Indonesia and other countries would

Table 4.16 Own price, cross price, and expenditure elasticity of Japan import demand for shrimps and prawns prepared or preserved, not elsewhere specify (n.e.s) (HS160520029)

Japan Import Demand for HS160520029 commodity from	Price of imported HS160520029 commodity from					Expenditure
	Thailand	China	Indonesia	Vietnam	Others	
Thailand	-1.0721	0.1265	0.0545	0.0566	0.0280^{ns}	0.8066
China	0.1696	-1.4928	-0.0043	-0.0794^{ns}	-0.0983	1.5051
Indonesia	0.0355	0.0505	-1.3202	0.0927	0.0654	1.0760^{ns}
Vietnam	-0.1267	-0.1062^{ns}	0.0631	-1.4258	0.0110^{ns}	1.5846

Note: ^{ns} not statistically significant

Source: Calculated from Table 4.15

lead to a decrease of 0.0043 percent and 0.0983 percent in Japanese import demand from China. Cross price elasticity from Thailand was inelastic being 0.1696 implied that one percent increase in relative price of export from Thailand, would lead to an increase of 0.1696 percent increase in Japanese import demand from China implying that Thailand was competitor of China for this commodity in Japanese market.

For import demand from Indonesia, own price elasticity was the most elastic. One percent increase in relative price of export from Indonesia would led to 1.3202 percent decrease in Japanese import demand from Indonesia. Cross price elasticity from China, Thailand, Vietnam and other countries was inelastic being 0.0505, 0.0355, 0.0927 and 0.0654 respectively implied that one percent increase in relative prices of exporting from China, Thailand, Vietnam and other countries would lead to an increase of 0.0505 percent 0.0355 percent, 0.0927 percent and 0.0654

percent increase in Japanese import demand from Indonesia. These exporters were competitors of import this commodity from Indonesia.

For import demand from Vietnam, own price elasticity was the most elastic. One percent increase in relative price of export from Vietnam would lead to 1.4253 percent decrease in Japanese import demand from Vietnam. Cross price elasticity from Thailand was inelastic being -0.1267 indicated that one percent increase in relative price of export from Thailand would lead to a decrease of 0.1267 percent in Japanese import demand from Vietnam. Cross price elasticity from Indonesia was also inelastic being 0.0631 implied that one percent increase in relative price of export from Indonesia, would lead to an increase of 0.0631 percent increase in Japanese import demand from Vietnam, indicating that Indonesia was competitors of import this commodity from Vietnam.

For expenditure elasticity of Japanese import demand for Thai shrimps and prawns prepared or preserved, not elsewhere specify was lowest and inelastic, being 0.8066. The highest expenditure elasticity of Japanese import demand for this commodity was Vietnam being 1.5846, followed by China being 1.5051 all of them were elastic. For expenditure elasticity of Indonesia was not statistically significant. The change in Japanese expenditure for imported shrimps and prawns prepared or preserved, not elsewhere specify from Thailand would not lead to a high change in Japanese import demand for shrimps and prawns prepared or preserved, not elsewhere specify from Thailand. The change in Japanese expenditure for imported shrimps and prawns prepared or preserved, not elsewhere specify from Vietnam would lead to the highest change in Japanese import demand for shrimps and prawns prepared or preserved, not elsewhere specify from Vietnam. For Indonesia, a change in Japanese expenditure for shrimps and prawns prepared or preserved, not elsewhere specify would not effected for import from Indonesia.

Table 4.17, Table 4.18, Table 4.19 and Table 4.20 summarized the rank of own price elasticity, cross price elasticity and expenditure elasticity of prepared/preserved shrimp in Japanese market by each HS code

Table 4.17 Rank of own price elasticity, cross price elasticity and expenditure elasticity for shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine (HS160520011) in Japanese market.

HS160520011					
Own price elasticity	**Expenditure elasticity**	**Cross price elasticity for Thailand**	**Cross price elasticity for China**	**Cross price elasticity for Indonesia**	**Cross price elasticity for Vietnam**
China	China	Indonesia	Thailand	Thailand	Vietnam
-4.6009	1.9116	0.0438	-0.2057*	2.0346	-1.3720^{ns}
Vietnam	Vietnam	China	Vietnam	Indonesia	Indonesia
-1.3720	1.3364^{ns}	0.0323	-0.1310^{ns}	-1.2601^{ns}	0.1535
Indonesia	Thailand	Others	Others	Vietnam	Others
-1.2601	0.9873^{ns}	0.0201	-0.0945^{ns}	0.1979	-0.0496^{ns}
Thailand	Indonesia	Vietnam	Indonesia	Others	Thailand
-1.1456	0.6564	0.0146	-0.0756^{ns}	0.0134^{ns}	-0.0377*

Note: * not competitor

^{ns} not statistically significant

Table 4.18 Rank of own price elasticity, cross price elasticity and expenditure elasticity of Japan import demand for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine (HS160520019) in Japanese market.

HS 160520019					
Own price elasticity	**Expenditure elasticity**	**Cross price elasticity for Thailand**	**Cross price elasticity for China**	**Cross price elasticity for Chinese Taipei**	**Cross price elasticity for Vietnam**
Chinese Taipei -1.2967	Chinese Taipei 1.3679	China 0.1238	Thailand 0.0380	Others -2.4663^{ns}	Chinese Taipei 0.6933
Vietnam -1.2675	China 1.3609	Others 0.1026^{ns}	Chinese Taipei -0.0290*	China -0.2733*	China 0.5934
Indonesia -1.0622	Thailand 0.8467^{ns}	Vietnam -0.0555^{ns}	Vietnam -0.0215*	Thailand -0.2410*	Others 0.0201^{ns}
Thailand -1.0248	Vietnam 0.1951^{ns}	Chinese Taipei 0.0179	Others -0.0187^{ns}	Vietnam 0.1904^{ns}	Thailand 0.0017

Note: * not competitor

^{ns} not statistically significant

Table 4.19 Rank of own price elasticity, cross price elasticity and expenditure elasticity of Japan import demand for shrimps and prawns, containing rice, excluding smoke; simply boiled in water or in brine(HS160520021) in Japanese market.

HS160520021			
Own price elasticity	**Expenditure elasticity**	**Cross price elasticity for Thailand**	**Cross price elasticity for Vietnam**
Thailand	Thailand	Vietnam	Thailand
-1.0248	0.9974	0.2154	0.1807
Vietnam	Vietnam	Others	Others
-1.1537	0.7960^{ns}	0.0473^{ns}	0.1132^{ns}

Note: * not competitor

^{ns} not statistically significant

Table 4.20 Rank of own price elasticity, cross price elasticity and expenditure elasticity of Japan import demand for shrimps and prawns prepared or preserved, not elsewhere specify (n.e.s.)(HS160520029) in Japanese market.

HS160520029					
Own price elasticity	**Expenditure elasticity**	**Cross price elasticity for Thailand**	**Cross price elasticity for China**	**Cross price elasticity for Indonesia**	**Cross price elasticity for Vietnam**
China	Vietnam	Vietnam	Thailand	Vietnam	Thailand
-1.4931	1.5843	0.0566	0.1700	0.0922	-0.1266*
Vietnam	China	China	Others	Others	China
-1.4253	1.5048	0.0551	-0.0984*	0.0655	0.1060*
Indonesia	Indonesia	Indonesia	Vietnam	China	Indonesia
-1.3205	1.0781^{ns}	0.0545	-0.0792^{ns}	0.0504	0.0628
Thailand	Thailand	Others	Indonesia	Thailand	Others
-1.1676	0.8066	0.0280^{ns}	-0.0041*	0.0343	0.0108*

Note: * not competitor

^{ns} not statistically significant

CHAPTER V

CONCLUSION AND RECOMMENDATION

Conclusion of the Study

Japan was one major importer of Thai shrimp next to the USA. Annually, total demand was around 300,000 metric ton. Japan imported approximately 90 percent of its demand while less than 10 percent was from its local production. Nowadays, the changing lifestyle of Japanese consumer continued to influence overall imports of fishery products including shrimp that was the important product. There was a growing shift from home cooking to 'take-away food' or the so-called "home-meal replacement" among the urban Japanese. According to this information indicated that Japanese consumer preferred convenient products such as cooked, smoked and prepared or preserved shrimp more than traditional shrimp products.

Prepared/preserved shrimp in Japanese market tended to increase from 38,700 metric ton in 2001 to 64,535 metric ton in 2008, increased by 66.76 percent. Thailand was a leading exporter of prepared/preserved shrimp in Japanese market. In recent years, the market share of Thailand in this market had been decreasing from 65.08 percent in 2001 decreased to 50.51 percent in 2008, decreased by 28.85 percent due to high price competition, inadequate supply and product quality. In addition, Thai exporters and producers faced some problems with trade restriction and import inspections. In Japan, besides price competition and quality problem, strict safety inspection on imported shrimp was still very important. Thai exporters and producers should be aware of these issues in order to maintain the confidence of consumers and remained the leader of market share in Japanese market.

From the estimation of factors affecting import demand for prepared/preserved shrimp in Japanese market, the relative price and Japanese expenditure on import of prepared/preserved shrimp from exporting countries were used to estimate Japanese

import demand for four commodities of prepared/preserved shrimp from exporters by using the Linear Approximate Almost Ideal Demand System framework, under restriction seemingly unrelated regression (RSUR) technique. Resulting parameter estimates were used to determine the expenditure elasticities, own price elasticites and cross price elasticities.

For analysis of Japanese import demand for Thai shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine (HS160520011), the factors affecting Japanese import demand for Thai shrimps and prawns simply boiled in water or in brine were relative price from Thailand, relative price from China, relative price from Indonesia, relative price from Vietnam and relative price from other countries. Own price elasticity was elastic for China, Vietnam, Indonesia and Thailand in respective order. Main competitors for Thai shrimps and prawns simply boiled in water or in brine in Japanese market were China, Vietnam and Indonesia whose own price elasticities were higher than Thailand. The relative change in relative price from China led to greater change in import from China, also the same with Vietnam and Indonesia. Thus, price policy was relatively more restricted for Thailand. Beside the price was determined by the importer rather than Thai exporter. Nevertheless as relative price from China, Vietnam and Indonesia change by one percent the change in Japanese demand for Thai shrimps and prawns simply boiled in water or in brine, chilled or frozen after simply boiled in water or in brine was still inelastic i.e. would change by 0.0323 percent, 0.0146 percent and 0.0438 percent in the same direction. Expenditure elasticity was elastic for Japanese import demand for shrimps and prawns simply boiled in water or in brine from every countries. Expenditure elasticity of China was the highest (-4.6009), follow by expenditure elasticity of Vietnam (-1.3720), Indonesia (-1.2601) and Thailand (-1.1456), respectively, indicated that one percent increase in Japanese expenditure on shrimps and prawns simply boiled in water or in brine, chilled or frozen after simply boiled in water or in brine from China, Vietnam and Indonesia would lead to more than one percent increase in expenditure share on Thai shrimps and prawns simply boiled in water or in brine, chilled or frozen after simply boiled in water or in brine. Quality preference on this shrimps and prawns commodity explained the elastic

expenditure elasticity. To maintain the Japanese market, quality was the key (Chidhamon, 2005).

For analysis of Japanese import demand for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine (HS160520019) found that the factors impacted for Japanese import demand for Thai shrimps and prawns smoked were relative price from Thailand, relative price from China and relative price from Chinese Taipei. Own price elasticity, if the relative price from Thailand increased by one percent, Japanese import demand for Thai shrimps and prawns smoked would decreased by 1.0284 percent. Own price elasticity was also elastic for import from Chinese Taipei and China. The relative change in relative price from Chinese Taipei and China led to greater change in import from Chinese Taipei and China, respectively. The relative change in relative price from Thailand led to smallest change in Japan import demand from exporting countries. Thailand could use price policy to compete with other competitors. However the price was determined by the Japanese importer rather than Thai exporter like above commodity, indicated that price policy had small impacted on Thai shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine export. Cross price elasticities were inelastic for Chinese Taipei, China in the same direction. The main competitors of Thai shrimps and prawns smoked were Chinese Taipei and China. Expenditure elasticity of Thai shrimps and prawns simply boiled in water or in brine was not statistically significant implied that a change in Japanese expenditure not effective for Japanese import demand for Thai shrimps and prawns simply boiled in water or in brine but expenditure elasticities of Chinese Taipei and China shrimps and prawns simply boiled in water or in brine were elastic, one percent increase in Japanese expenditure would lead to increase 1.3679 percent and 1.3609 percent in Japanese import demand respectively. From this result implied that these commodities were imported by making order from Japanese importer, not depended on the quality (Thumbumrung, 2007).

For analysis of Japanese import demand for shrimps and prawns, containing rice, excluding smoked; simply boiled in water or in brine; chilled, frozen, salted, in brine or dried, after simply boiled in water or in brine (HS160520021) found that the factors affecting Japanese import demand for Thai Shrimps and prawns, containing rice, excluding smoke were relative price from Thailand, relative price from Vietnam and Japanese expenditure on import of Thai shrimps and prawns, containing rice, excluding smoked. Own price elasticity was elastic for import from Thailand and Vietnam in respective order, change in relative price from Thailand led to relatively greater change in Japanese import demand than Vietnam. Therefore, Thailand could not use price policy to compete with Vietnam. Thailand should controlled and monitored trend of price policy for shrimps and prawns, containing rice, excluding smoked export although the price was given by Japanese importer. Expenditure elasticity was nearly unitary for Thailand and not significant for Vietnam. Cross price elasticity was inelastic for Vietnam. The competitor of Thai Shrimps and prawns, containing rice, excluding smoked was Vietnam.

For analysis of Japanese import demand for shrimps and prawns prepared or preserved, not elsewhere specify (HS160520029) found that the factors affecting Japanese import demand for Thai shrimps and prawns prepared or preserved, not elsewhere specify were relative price from Thailand, relative price from China, relative price from Indonesia, relative price from Vietnam and Japanese expenditure on import of Thai shrimps and prawns prepared or preserved, not elsewhere specify. Own price elasticity was still elastic for China, Vietnam, Indonesia and Thailand in respective order. The change in relative price from China, Vietnam and Indonesia led to relatively greater change in Japanese import demand than Thailand. Thus, price policy was relatively more restricted for Thailand. Expenditure elasticities were elastic for Vietnam, China and inelastic for Thailand, implied that one percent increase in Japanese expenditure on shrimps and prawns prepared or preserved from Vietnam and China would lead to more than one percent increase in Japan expenditure share on Thai shrimps and prawns prepared or preserved, not elsewhere specify. The Thai shrimps and prawns prepared or preserved, not elsewhere specify to exports were high quality product but when Japanese expenditure increased, Japan

import shrimps and prawns prepared or preserved from Thailand decreased, on the other hand, when Japanese expenditure increased, Japan import this commodity from Vietnam and China more. Due to these commodities were ordered by Japanese importers and Vietnam and China had been improving quality of their export. In Vietnam, shrimp industries were invested by Japanese importer in collaboration with Vietnam Government focused on expansion of prepared or preserved shrimp export to Japan more (NFI,2002). Cross price elasticities were inelastic for Vietnam, China and Indonesia in the same direction. Main competitors of Thai shrimps and prawns prepared or preserved, not elsewhere specify were Vietnam, China and Indonesia in respective order.

Recommendations

The recommendations from this study were as followed;

1. Own price elasticities of Thai shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine (HS160520011), Thai shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine (HS160520019) and Thai shrimps and prawns prepared or preserved, not elsewhere specify (HS160520029) were lowest, thus price policy was relatively more restricted for Thailand. Major competitors for HS160520011 were Indonesia, China, other countries, and Vietnam. Major competitors for HS160520019 were Chinese Taipei and China. Main competitors of HS160520029 were Vietnam, China and Indonesia in respective order. Thailand could use price policy to compete with competitors in Japanese market but price was determined by Japanese importers rather than Thai exporters. Price was not controlled by Thai exporters. If Thailand would like to maintain the market share of prepared/preserved shrimps in Japanese market, Thailand should use quality policy to remain quality of Thai prepared/preserved shrimps and should study trend of Japanese import for characteristics of these commodities to expand Thai prepared/preserved shrimps in this market.

2. Own price elasticity of Thai shrimps and prawns, containing rice, excluding smoke; simply boiled in water or in brine (HS160520021) was higher than Vietnam which was strong competitor of these commodities. The change in price from Thailand led to greater change in Japanese import demand than Vietnam. Thailand could not use price policy to compete with Vietnam in addition to price of these commodities being determined by Japanese importers. If Thailand would like to maintain and expand the market share of HS160520021 in Japanese market, quality policy was the key.

3. Thai producers should developed quality of prepared/preserved shrimp following the Japan import regulation included food safety and food sanitation laws to ensure Japanese importers and consumers confidence in Thai prepared/preserved shrimp product.

4. The market for prepared/preserved shrimp products in Japan had been increasing, thus Thailand should emphasize on product quality of Thai prepared/preserved shrimp to meet Japanese demand in order to maintain and/or expand Thai market share in Japanese market.

Further study

1. There should be studies on import demand for specific types of commodity prepared/preserved shrimp products in order to understand in characteristics and import trends of each commodity in Japanese market.

2. There should be studies on new markets to expand prepared/preserved shrimp export and reduce the risk of concentration in Japanese market.

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APPENDICES

Appendix A

Calculation of Elasticity

The expenditure elasticity, own price elasticity and cross price elasticity can be estimated from equation (39) in Chapter 3 by

$$w_{i,t} = \alpha_i + \sum_j \gamma_{jt} \ln(p_{jt}/w_{j,t-1}) + \beta_i(\ln x_t - \sum_i w_{i,t-1} \ln p_{it})$$

$$w_{1,t-1} = \alpha_1 + \gamma_{11}\ln(p_1/w_{1,t-1}) + \gamma_{11}\ln(p_2/w_{2,t-1}) + \beta_1 \ln x - \beta_1 w_{1,t-1} \ln p_1 - \beta_1 w_{2,t-1} \ln p_2$$

$$q_1 = (x/p_1)\alpha_1 + (x/p_1)\gamma_{11}\ln(p_1/w_{1,t-1}) + (x/p_1)\gamma_{12}\ln(p_2/w_{2,t-1}) + (x/p_1)\beta_1 \ln x - (x/p_1)\beta_1 w_{1,t-1} \ln p_1 - (x/p1)\,\beta_1 w_{2,t-1} \ln p_2$$

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

$$\begin{aligned}\partial q_1/\partial p_1 &= x\alpha_1 dp^{-1}/dp_1 + (x/p_1)\,\gamma_{11} d\ln(p_1/w_{1,t-1})/dp_1 + x\,\gamma_{11}\ln(p_1/w_{1,t-1})dp^{-1}/dp_1 \\ &+ x\gamma_{12}\ln(p_2/w_{2,t-1})dp^{-1}/dp_1 + x\beta_1 \ln x dp^{-1}/dp_1 - (x/p_1)\beta_1 w_{1,t-1}\ln x dp_1/dp_1 \\ &- x\beta_1 w_{1,t-1}\ln p_1 dp^{-1}/dp_1 - x\beta_1 w_{2,t-1}\ln p_2 dp^{-1}/dp_1 \\ &= -x\alpha_1/p_1^2 + x\gamma_{11}/p_1^2 - x\gamma_{11}\ln(p_1/w_{1,t-1})/p_1^2 + x\gamma_{12}\ln(p_2/w_{2,t-1})/p_1^2 \\ &- x\beta_1 \ln x/p_1^2 - x\beta_1 w_{1,t-1}/p_1^2 + x\beta_1 w_{1,t-1}\ln p_1/p_1^2 + x\beta_1 w_{2,t-1}\ln p_2/p_1^2\end{aligned}$$

$$\begin{aligned}\partial q_1/\partial p_1 * p_1/q_1 &= -x\alpha_1/p_1 q_1 + x\gamma_{11}/p_1 q_1 - x\gamma_{11}\ln(p_1/w_{1,t-1})/p_1 q_1 + x\gamma_{12}\ln(p_2/w_{2,t-1})/p_1 q_1 \\ &- x\beta_1 \ln x/p_1 q_1 - x\beta_1 w_{1,t-1}/p_1 q_1 + x\beta_1 w_{1,t-1}\ln p_1/p_1 q_1 \\ &+ x\beta_1 w_{2,t-1}\ln p_2/p_1 q_1 \\ &= -\alpha_1/w_{1,t-1} + \gamma_{11}/w_{1,t-1} - \gamma_{11}\ln(p_1/w_{1,t-1})/w_{1,t-1} - \gamma_{12}\ln(p_2/w_{2,t-1})/w_{1,t-1} \\ &- \beta_1 \ln x/w_{1,t-1} - \beta_1 + \beta_1 w_{1,t-1}\ln p_1/w_{1,t-1} + \beta_1 w_{2,t-1}\ln p_2/w_{1,t-1} \\ &= -(\alpha_1 + \gamma_{11}\ln(p_1/w_{1,t-1}) + \gamma_{12}\ln(p_2/w_{2,t-1}) + \beta_1 \ln x - \beta_1 w_{1,t-1}\ln p_1 \\ &- \beta_1 w_{2,t-1}\ln p_2)/w_{1,t-1} + \gamma_{11}/w_{1,t-1} - \beta_1 \\ &= -w_{1,t-1}/w_{1,t-1} + \gamma_{11}/w_{1,t-1} - \beta_1\end{aligned}$$

$$\varepsilon_{11} = -1 + \gamma_{11}/w_{1,t-1} - \beta_1$$

$$\varepsilon_{ii} = -1 + \gamma_{ij}/w_{i,t-1} - \beta_i$$

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

$$\begin{aligned}\partial q_1/\partial p_2 &= (x/p_1)\gamma_{12} d\ln(p_2/w_{2,t-1}) - (x/p_1)\beta_1 w_{2,t-1} d\ln p_2/\, d\ln p_2 \\ &= x\gamma_{12}/p_1 p_2 - x\beta_1 w_{2,t-1}/p_1 p_2\end{aligned}$$

$$\partial q_1/\partial p_2 * p_2/q_1 = x\gamma_{12}/p_1 q_1 - x\beta_1 w_{2,t-1}/p_1 q_1$$

$\varepsilon_{12} = \gamma_{12}/w_{1,t-1} - \beta_1 w_{2,t-1}/w_{1,t-1}$

$\varepsilon_{ij} = \gamma_{ij}/w_i - \beta_i w_{j,t-1}/w_{i,t-1}$

Expenditure elasticity; $\eta = \partial Y_i/\partial x^* x/Y_i$

Y_i = expenditure of prepared/preserved shrimp from country

$= p_i q_i = w_{i,t-1} x$

Therefore $Y_i = x\alpha_1 + x\gamma_{11}\ln(p_1/w_{1,t-1}) + x\gamma_{12}\ln(p_2/w_{2,t-1}) + x\beta_1 \ln x - x\beta_1 w_1 \ln p_1 - x\beta_1 w_2 \ln p_2$

$\partial Y_1/\partial x^* x/Y_1 = x\alpha_1/Y_1 + x\gamma_{11}\ln(p_1/w_{1,t-1})/Y_1 + x\gamma_{12}\ln(p_2/w_{2,t-1})/Y_1 + x\beta_1 \ln x/Y_1 - x\beta_1 w_1 \ln p_1/Y_1 - x\beta_1 w_2 \ln p_2/Y_1$

From $Y_1 = p_i q_i$ will get;

$\partial(p_1 q_1)/\partial x^* x/(p_1 q_1) = (\alpha_1/w_{1,t-1} + \gamma_{11}\ln(p_1/w_{1,t-1})/w_{1,t-1} + \gamma_{12}\ln(p_2/w_{2,t-1})/w_{1,t-1} + \beta_1 \ln x/w_{1,t-1} - \beta_1 w_1 \ln p_1/w_{1,t-1} - \beta_1 w_2 \ln p_2/w_{1,t-1}) + \beta_1/w_1,t\text{-}1$

$\eta_1 = w_{1,t-1}/w_{1,t-1} + \beta_1/w_{1,t-1}$

$\eta_i = 1 + \beta_i/w_{i,t-1}$

Appendix B

Descriptive Statistics of Import Demand for

Prepared/Preserved Shrimp

Appendix Table B1 Descriptive statistics of import demand for shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine (HS160520011) in Japanese market.

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
w1	63	5	0.0662077	0.3295	43.15	0.0000
w2	63	5	0.0327735	0.5733	84.85	0.0000
w3	63	5	0.0227163	0.9305	609.79	0.0000
w4	63	5	0.0507624	0.7692	242.68	0.0000

	Coef	Std. Err.	Z	P>|z|	[95% Conf.	Interval]
w1						
ln_xx	-0.008146	0.0364429	-0.22	0.823	-0.0795727	0.0632807
ln_pt	-0.0984262	0.0231638	-4.25	0.000	-0.1438265	-0.0530259
ln_pc	0.0206071	0.007592	2.71	0.007	0.005727	0.0354872
ln_pi	0.0204701	0.0153285	1.75	0.080	-0.0032046	0.0568819
ln_pv	0.0268386	0.007592	2.71	0.007	0.005727	0.0354872
ln_po	0.0305104	0.0086684	0.72	0.260	0.0135206	0.0475001
cons	0.4898058	0.3046616	1.61	0.108	-0.10732	1.086932
w2						
ln_xx	0.0497148	0.0180959	2.75	0.006	0.0142475	0.0851821
ln_pt	0.0206071	0.007592	2.71	0.007	0.005727	0.0354872
ln_pc	-0.0193658	0.0055861	-3.47	0.001	-0.0303143	-0.0084172
ln_pi	0.0032348	0.0045656	0.71	0.479	-0.0057135	0.0121832
ln_pv	-0.0014177	0.0040665	-0.35	0.727	-0.0093878	0.0065525
ln_po	-0.0030585	0.0035891	-0.85	0.394	-0.0100931	0.0039761
cons	-0.2900191	0.1527736	-1.90	0.058	-0.58945	0.0094117

Source: Calculated from Global Trade Atlas data (2009)

Appendix Table B1 Descriptive statistics of import demand for shrimps and prawns simply boiled in water or in brine; chilled or frozen after simply boiled in water or in brine (HS160520011) in Japanese market (continued).

	Coef	**Std. Err.**	**Z**	**P>|z|**	**[95% Conf. Interval]**
w3					
ln_xx	-0.0508158	0.0168973	-3.01	0.003	-0.0839338 -0.0176978
ln_pt	0.0204701	0.0153285	1.75	0.080	-0.0032046 0.0568819
ln_pc	0.0032348	0.0045656	0.71	0.479	-0.0057135 0.0121832
ln_pi	-0.0459816	0.012485	-3.68	0.000	-0.0704517 -0.0215116
ln_pv	0.023414	0.0041701	5.61	0.000	0.0152407 0.0315872
ln_po	-0.0075058	0.00631	-1.19	0.234	-0.0198732 0.0048616
cons	0.5809055	0.1338618	4.34	0.000	0.3185411 0.8432698
w4					
ln_xx	0.0387573	0.0280282	1.38	0.167	-0.016177 0.0936917
ln_pt	0.0268386	0.007592	2.71	0.007	0.005727 0.0354872
ln_pc	-0.0014177	0.0040665	-0.35	0.727	-0.0093878 0.0065525
ln_pi	0.023414	0.0041701	5.61	0.000	0.0152407 0.0315872
ln_pv	-0.0383871	0.0061082	-6.28	0.000	-0.050359 -0.0264152
ln_po	-0.0040793	0.0032768	-1.24	0.213	-0.0105017 0.0023432
cons	-0.125093	0.2371664	-0.53	0.598	-0.5899305 0.3397446

Source: Calculated from Global Trade Atlas data (2009)

Appendix Table B2 Descriptive statistics of import demand for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine (HS160520019) in Japanese market.

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
w1	34	5	0.0920309	0.5709	47.50	0.0000
w2	34	5	0.1737085	0.7335	47.23	0.0000
w3	34	5	0.0431062	0.7920	54.76	0.0000
w4	34	5	0.0634821	0.4592	38.80	0.0007

	Coef	Std. Err.	Z	P>|z|	[95% Conf.	Interval]
w1						
ln_xx	-0.0212291	0.0485244	-0.44	0.180	-0.0795727	0.0632807
ln_pt	-0.0068653	0.0250599	-3.27	0.000	-0.1438265	-0.0530259
ln_pc	0.0050187	0.0355649	3.14	0.000	0.005727	0.0354872
ln_pe	-0.0023973	0.0167808	-2.14	0.007	-0.0032046	0.0568819
ln_pv	-0.0086424	0.0202246	-1.43	0.227	0.0055368	0.0354033
ln_po	0.0128862	0.0140186	0.92	0.358	0.0135206	0.0475001
cons	0.2624945	0.2553105	1.03	0.108	-0.10732	1.086932
w2						
ln_xx	0.0497148	0.2059947	2.33	0.020	0.0142475	0.0851821
ln_pt	0.0050187	0.0355649	3.14	0.000	0.005727	0.0354872
ln_pc	-0.0351136	0.0055861	-4.45	0.000	-0.0303143	-0.0084172
ln_pe	-0.0028788	0.0324913	-2.78	0.009	-0.0665606	0.0608031
ln_pv	0.0308163	0.0040665	-0.35	0.727	-0.0093878	0.0065525
ln_po	-0.0030585	0.0035891	-0.85	0.394	-0.0100931	0.0039761
cons	-0.4747095	0.1527736	1.59	0.058	-0.58945	0.0094117

Source: Calculated from Global Trade Atlas data (2009)

Appendix Table B2 Descriptive statistics of import demand for shrimps and prawns smoked; salted, in brine or dried after simply boiled in water or in brine (HS160520019) in Japanese market (continued).

	Coef	**Std. Err.**	**Z**	**P>|z|**	**[95% Conf.**	**Interval]**
w3						
ln_xx	0.016724	0.0359137	4.44	0.000	-0.0536657	0.0871136
ln_pt	-0.0023973	0.0167808	-2.14	0.007	-0.0032046	0.0568819
ln_pc	-0.0028788	0.0324913	-2.78	0.009	-0.0665606	0.0608031
ln_pe	-0.0568456	0.021042	-2.14	0.000	-0.0058838	0.0765992
ln_pv	0.0353577	0.0364834	0.43	0.727	-0.0842354	0.058777
ln_po	-0.0111073	0.0142558	-0.62	0.234	-0.0390481	0.0168335
cons	0.0179632	0.1994544	7.65	0.020	-0.3729603	0.4088866
w4						
ln_xx	-0.185065	0.0262954	0.43	0.641	-0.2366029	-0.133527
ln_pt	-0.0086424	0.0202246	-1.43	0.227	0.0055368	0.0354033
ln_pc	0.0308163	0.0040665	-0.35	0.727	-0.0093878	0.0065525
ln_pe	-0.0568456	0.021042	-2.14	0.000	-0.0058838	0.0765992
ln_pv	-0.0127292	0.021042	3.25	0.000	-0.0058838	0.0765992
ln_po	-0.0069311	0.0100201	-1.05	0.213	-0.0265701	0.0127079
cons	1.060006	0.1385735	4.59	0.000	0.7884073	1.331605

Source: Calculated from Global Trade Atlas data (2009)

Appendix Table B3 Descriptive statistics of import demand for shrimps and prawns, containing rice, excluding smoke; simply boiled in water or in brine (HS160520021) in Japanese market.

Equation	**Obs**	**Parms**	**RMSE**	**"R-sq"**	**chi2**	**P**
w1	38	3	0.1576453	0.3871	14.54	0.0002
w2	38	3	0.1345919	0.6442	42.67	0.0000

	Coef	**Std. Err.**	**Z**	**P>|z|**	**[95% Conf.**	**Interval]**
w1						
ln_xx	-0.0007648	0.0327235	-1.24	0.081	-0.0649016	0.0633719
ln_pt	-0.0770759	0.0293519	-2.63	0.009	-0.1346045	-0.0195472
ln_pv	0.0634304	0.0238035	2.66	0.008	0.0167764	0.1100845
ln_po	0.0136454	0.022236	0.61	0.539	-0.0299363	0.0572272
cons	0.2810244	0.14766	1.90	0.057	-0.0083839	0.5704327
w2						
ln_xx	-0.0503041	0.0262954	-1.44	0.150	-0.1188508	0.0182426
ln_pt	0.0634304	0.0238035	2.66	0.008	0.0167764	0.1100845
ln_pv	-0.0884163	0.021042	3.07	0.002	-0.144829	-0.0320036
ln_po	-0.0069311	0.0100201	1.09	0.275	-0.0198783	0.06985
cons	0.5761071	0.1385735	3.70	0.000	0.2712293	0.8809848

Source: Calculated from Global Trade Atlas data (2009)

Appendix Table B4 Descriptive statistics of import demand for shrimps and prawns prepared or preserved, not elsewhere specify (HS160520029) in Japanese market.

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
w1	63	5	0.0362435	0.9349	914.03	0.0000
w2	63	5	0.0217523	0.9216	707.87	0.0000
w3	63	5	0.0431996	0.6169	113.77	0.0000
w4	63	5	0.0270827	0.8716	448.62	0.0000

	Coef	Std. Err.	Z	P>|z|	[95% Conf.	Interval]
w1						
ln_xx	-0.1061863	.0220553	-4.81	0.000	-0.0795727	0.0632807
ln_pt	-0.0978571	.0199737	-4.90	0.000	-0.1438265	-0.0530259
ln_pc	0.0561206	.0108604	5.17	0.000	0.005727	0.0354872
ln_pi	0.0125869	.0062626	2.01	0.044	-0.0032046	0.0568819
ln_pv	00200901	.0086568	2.32	0.020	0.0055368	0.0354033
ln_po	0.0090595	.0068225	1.33	0.184	0.0135206	0.0475001
cons	1.282809	.2223624	5.77	0.000	-0.10732	1.086932
w2						
ln_xx	0.0633538	0.0134724	4.70	0.000	0.0142475	0.0851821
ln_pt	0.0561206	0.0108604	5.17	0.000	0.005727	0.0354872
ln_pc	-0.053942	0.0094758	-5.69	0.000	-0.0303143	-0.0084172
ln_pi	0.0098166	0.0036245	2.71	0.007	-0.0057135	0.0121832
ln_pv	-0.0033798	0.005608	-0.60	0.547	-0.0093878	0.0065525
ln_po	-0.0086154	0.0039803	-2.16	0.030	-0.0100931	0.0039761
cons	-0.3141862	0.1309409	-2.40	0.016	-0.58945	0.0094117

Source: Calculated from Global Trade Atlas data (2009)

Appendix Table B4 Descriptive statistics of import demand for shrimps and prawns prepared or preserved, not elsewhere specify (HS160520029) in Japanese market (continued).

	Coef	**Std. Err.**	**Z**	**P>|z|**	**[95% Conf.**	**Interval]**
w3						
ln_xx	0.0127417	0.012045	1.06	0.290	-0.010866	0.0363494
ln_pt	0.0125869	0.0062626	2.01	0.044	0.0003124	0.0248613
ln_pc	0.0098166	0.0036245	2.71	0.007	0.0027126	0.0169205
ln_pi	-0.0502013	0.0059616	-8.42	0.000	-0.0618859	-0.0385168
ln_pv	0.0163642	0.0040432	4.05	0.000	0.0084397	0.0242887
ln_po	0.0114337	0.0033954	3.37	0.001	0.0047789	0.0180886
cons	0.0431543	0.107576	0.40	0.688	-0.1676908	0.2539994
w4						
ln_xx	0.060463	0.0123087	4.91	0.000	0.0363384	0.0845876
ln_pt	0.0200901	0.0086568	2.32	0.020	0.0031231	0.0370571
ln_pc	-0.0033798	0.005608	-0.60	0.547	-0.0143713	0.0076116
ln_pi	0.0163642	0.0040432	4.05	0.000	0.0084397	0.0242887
ln_pv	-0.0377536	0.0063508	-5.94	0.000	-0.0502008	-0.0253063
ln_po	0.0046791	0.0036853	1.27	0.204	-0.0025439	0.0119021
cons	-0.3760086	0.1173774	-3.20	0.001	-0.6060641	-0.1459532

Source: Calculated from Global Trade Atlas data (2009)

BIOGRAPHICAL DATA

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