THE IMPACTS OF NON-TARIFF BARRIERS ON THE EXPORT PRICE OF VIETNAMESE CATFISH

Khuu Thi Phuong Dong

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The Norwegian College of Fishery Science

University of Tromso, Norway

&

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ABSTRACT

The aims of this study to identify the impacts of non-tariff barriers (NTBs) on Vietnamese catfish export price in the international market. The time-series monthly data from 1999 to 2011 was used in our paper. Base on the demand and supply equilibrium theory, we constructed the function of Vietnamese catfish export price. The unit toot test results showed that our data was stationary at differenced level. Therefore, the econometric models, such as first-differenced model, Error correction model (ECM) and the lagged transformation model were employed to estimate the effects of NTBs on the Vietnamese catfish export price. The antidumping, the labeling law and the technical barriers were the most popular of NTBs used for Vietnamese catfish products. The NTBs were considered in our model under the dummy form with. Beside the NTBs, some other macroeconomic variables were added to the model as the demand and supply shifters, such as exchange rate, income per capita, the price of substitute goods (poultry, salmon, the US catfish), the price of input cost (fishmeal, fuel). The estimated of the econometric models showed that, in the short run, the US catfish price was the alternative goods of Vietnamese catfish. We found that the NTBs were not significant in the dynamics of Vietnamese catfish export price in the short run. However, in the long run, the antidumping had the negative effects on the Vietnamese catfish export price. The estimated ECMs model demonstrated that the Vietnamese catfish export price decreased about 9% after antidumping be effective. However, the labeling law and the imposed of HACCP standards did not have more significant in the change of Vietnamese catfish. The application of GLOBAL GAP in catfish producing process did not illustrated negative effects as our expected results. This could be argued that the application of GLOBAL GAP had the positive effects on the consumer's belief in the long run.

Key words: Catfish, NTBs, antidumping, Labeling law, GLOBAL GAP, HACCP

CHAPTER 1: INTRODUCTION

Vietnamese catfishes were divided into two genera, Pangasius and Pangasianodon. In this study, we called them with a general name Vietnamese catfish. They were the common fish species of aquaculture in Mekong Delta and were playing an important role in the Vietnamese aquaculture export sector. In this part, we briefly introduce about the Vietnamese catfish production and the globalization of Vietnamese catfish.

1.1. Vietnamese catfish production

Catfish became the crucial cultured-fish of Vietnam aquaculture and export. It was also one of the main income sources for the farmers in Mekong Delta of Vietnam (Binh, 2006). Figure 1.1 presents the culture area and the production of Vietnamese catfish from 1997 to 2011 where the blue line illustrates for the Vietnamese catfish production and the column demonstrates for the culture area. It shows that the catfish culture area in Vietnam fluctuated from more than 1,000 hectare to greater than 3,000 hectare between 1997 and 2005, then, it decrease to 2,000 hectare in 2006 and had a sudden increased from 2007 to 2009 (from 2,000 hectare in 2005 to 6000 hectare in 2009) and continued decreasing in 2010 and 2011. The increase in the culture area was the main reason for steady increase of catfish production from 1997 to 2005. Additional, the research of catfish seed under the cooperation between Vietnam and French succeed in 1998 and was applied to Vietnamese catfish producing in 2000 (Duc, 2010). As a result, Vietnamese catfish industry has expanded from small-scale to mass-scale and growth steadily. In 2005, the catfish production of Vietnam reached more than 600 thousand tones. However, the increase suddenly led to the surplus in supply for catfish (Chau, 2007). This was the reason of the rapid decreased of the catfish price between 2005 and 2006. The culture area decreased about 1,000 hectare from 2005 to 2006. The total catfish production was not changes in two years. However, the decrease in 2006 led to the shortage in the raw material for catfish processing industry (Chau, 2007). This shortage was causes the restore of Vietnamese catfish price.

Vietnam became WTO members in 2007 and the reduction of tariff barriers created more advantages for catfish export. As we can see in figure 1.1, the catfish culture area has increase suddenly from 2,000 hectare in 2006 to around 5,500 hectare in 2007. The catfish production also increased significantly from 400 thousand tones to more than 650 thousand tones between 2006 and 2007. The culture area did not increase, however, the catfish production had a sudden increased from 650 thousand tons to more than 1,100 thousand tons between 2007 and 2008. The world economic crisis created some problems for Vietnamese

catfish export, as well as the catfish industry. As a result of economic crisis, there was the rapid reduction in the catfish production in 2009. In 2010, the world economic seemed to the recovery, as a result of growing demand the catfish production increased again. In 2011, total catfish production in Vietnam reached nearly 1,300 thousand tones.

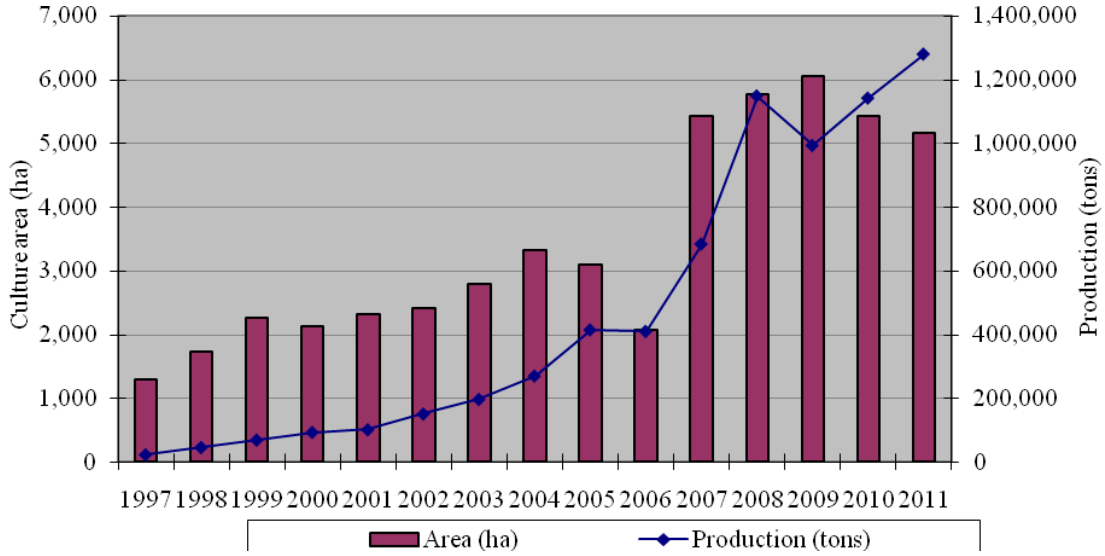

Figure 1.1. The catfish production in Vietnam from 1997 to 2011
(Source. VASEP, 2011 and Phan, L.T., Nguyen et al, 2010)

1.2. Vietnamese catfish export

Vietnam started to export catfish 1995s. However, it was only greatly developed after the success of artificial catfish propagation techniques in 1998 and the improvement of management techniques in feed, feedings and health management. in order to satisfy the requirements of the US and European Union (EU) consumers improvement in catfish meat quality, safety food requirements were gotten more attention. To satisfy these standards, Vietnamese catfish processors had to adopt new their technology to improve the quality control protocols of Hazard Analysis Critical Control Point (HACCP) and the Good Aquaculture Practice (GLOBAL GAP) recommended by the US Food and Drug Administration and the Food and Agriculture Organization in processing (Cohen & Hiebert, 2001).

The joining to the organization of economic cooperation oriented to reduce tariff and non-tariff barriers among its 21 members economies in the Asia–Pacific region, Asia-Pacific Economic Cooperation (APEC) in 1998 and the Bilateral Trade Agreement (BTA) signed between the US and Vietnam in 2001 created more opportunities to the Vietnam fisheries export. The catfish was exported to the US increased suddenly from less than 280 tones in

1998 to more than 7,700 tones in 2001 (Sengupta 2003) and reached 108,000 tones in 2011. It worthed 331.6 million USD in 2011, increased to 87.8% compared with in 2010 (Vietnam Association of Seafood Exporters and Producers-VASEP, 2011). In 2011, the US and EU were still the two biggest export markets of Vietnamese catfish with the market share 18% and 29.7%, respectively. However, the growth of Vietnamese catfish import had negative effects on the US catfish domestic industry because Vietnamese catfish has the similarly in taste but the price is cheaper (Duc, 2010; Walton, 2004). Therefore, the protectionists for the US domestic industries of catfish production countries tended to growth in the recent years (Thinh et al, 2011).

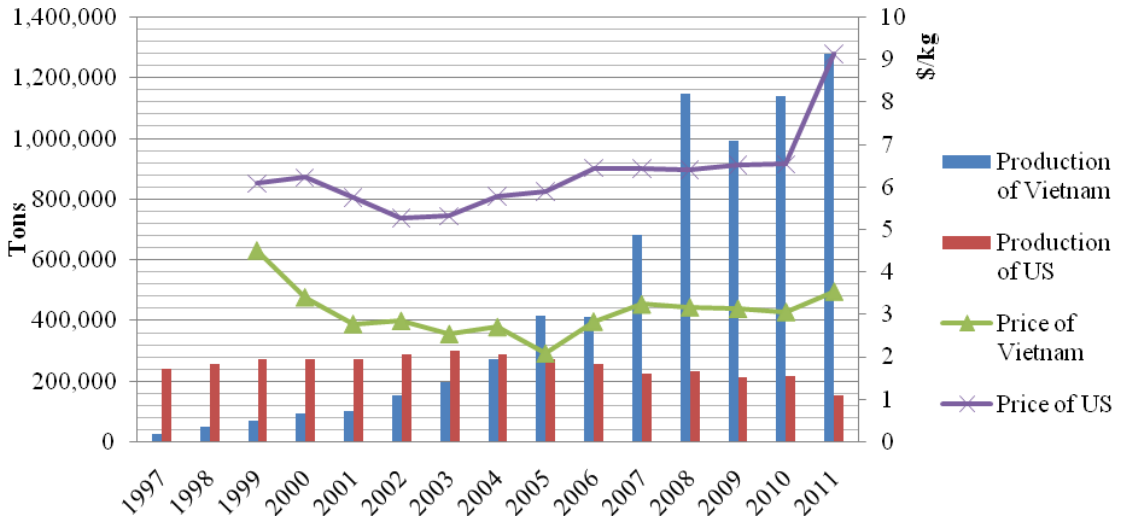

Figure 1.2. The US catfish and Vietnamese catfish production from 1997 to 2011
(Source. USDA and Vietnam General Custom, 2011)

The US catfish, *Ictalurus punctatus,* industry developed since the years of 1980s and held about a half of aquaculture production in 1995 (USDA, 1996 cited by Kouka and Carol, 1998) and 47% in 2011 (NOAA, 2011). In recent years, the import catfish from Vietnam, China and Thailand made a rapid decrease of US catfish industry. Their catfish farmed-industry was still facing with reducing market share, falling price and reducing profitability (Kinnucan, 2003; Abed et al, 2011). The figure 1.2 shows the price and the quantity production of the US and Vietnam Catfish from 1997 to 2011. From 1997, the US catfish production decreased while Vietnamese catfish increased year by year. In November 2002, the US started the first step of "catfish war" by the Labeling law to restrict the name of 'catfish' only varieties from the family *Ictalurus punctatus* farmed in the US (Narog 2003). Vietnamese catfish, then, was exported to the US market with the name of "tra" or "basa".

Labeling had been applied to use as a trade barrier to restrict imports. This restrict law was passed in July, 1991 by the US to limit the amount of fish imports from countries that permitted "large scale driftnet fishing" because of the killing of dolphins of the driftnet fishing system for tuna. This law, then, was taken by GATT. Since, the eco labeling of tuna was accepted by GATT and it is a better procedure because the consumer can have many choices and be happy to pay a premium." (Hogendorn, 1996)

The second step was the renegotiation the BTA to set the restriction for the catfish quantity imported from Vietnam to the US (Cooper, 2001, Kinnucan, 2003, Duc, 2010). The last step was the imposing of the antidumping tariff on Vietnamese catfish imported from Vietnam with the ranging from 44.66% to 63.88% (Duc, 2010).

The antidumping law has been developed by US from the years of 1970 (Beaulieu, 2005). After that, GATT established the antidumping regulations to encourage the free trade and globalization. GATT's antidumping laws stipulated a product that was sold at the price less than its domestic market and its normal value in the importing country. It is called 'dumping margin'. The normal price was defined as the price of a like product consumed in the exporting country. If a country was a non-market country, the normal value would be indentified equal to the highest price in the third exporting country or the production cost in the exporting country plus the costs for profit. The last rule of antidumping regulations, the importing country also has to prove that the domestic industry injured by the importing country and establish a causal relationship of the dumping or on the other hand, that country had to show the effects of the dumped import products on the domestic price and the impacts on the producers of like products. In the case of Vietnamese catfish, US Department of Commerce took the India as a proxy country to evaluate the 'dumping margin' because they considered that Vietnam was the 'non-market' country (Intrafish, 2003). Therefore, the 'dumping margin' in this case is the gap of the catfish price was sold in India and sold in the US market (Duc, 2010).

1.3. Problem Statement

Vietnamese aquaculture had been developed in the early 1960s (Phuong and Oanh, 2010). Aquaculture has contributed to economic growth, poverty reduction, equity and exports. According to the Vietnam General Statistic Office, between 1990s and 2010s, total aquaculture production increased from 162 thousand tones to more than 2.7 million tones (worth 85,000 billion VND in 2010). In 2010, Vietnam became one of ten largest countries in fishery export sector with total export value at $5.1 billion.

Mekong Delta (MD) is the biggest aquaculture production area in Vietnam. The favorable natural resource is the most important condition to success of aquaculture in MD with a large freshwater area of more than 640,000 hectare. 67.2% of this area is fresh water surface (Phuong and Oanh, 2010). The development of aquaculture in this delta has diversified local farmers livelihoods activities and greatly contributed to the increasing of national aquaculture production. Aquaculture, especially catfish, in MD becomes the essential resource for fish processing industry. Catfish farming began in the 1960s with mostly in small-scale (Binh, 2006; Khoi, 2009). Catfish includes two kinds of species, the *Pangasius bocourti* and *Pangasianodon hypophalmus* with local name *Basa* and *Tra*, respectively. However, the growth of large scale catfish culture really started in 1998 after the technical success of artificial propagation and the development of catfish seed breeding industry (Phuong and Oanh, 2010). According to the statistic of VASEP, Vietnamese frozen catfish cover 95% the world market as the fresh water surface of catfish culture increased five times. Vietnamese catfish was exported to 136 countries with value reached $1.4 billion in 2010 (35 times relative to that value in the year of 2000s).

Trade has proved its important role in economic growth of many countries (Hong and Duc, 2009). It created number of jobs and improved living standard in many developing countries. The globalization of catfish process has greatly contributed to Vietnam economic growth, poverty alleviation and social equity. The joining of Vietnam to World Trade Organization (WTO) was expected to create many opportunities for Vietnamese export, including Vietnamese catfish, due to a decrease of tariff barriers. However, non-tariff barriers still work and play a crucial role in trade policies of imported countries (Zanardi, 2004). Thus, the challenges facing Vietnamese catfish exports still remain since they are many non tariff barriers from the biggest markets such as the US and EU markets. Foremost amongst of them were the labeling law and antidumping that the U.S imposed on Vietnamese catfish. The purposes of these barriers were to increase domestic production of U.S catfish and decrease the export volume of Vietnamese catfish to U.S, simultaneously. However, after "catfish war", Vietnamese catfish could expand the trade flow to more other markets outside the U.S and in fact, the effects on price of labeling law on U.S catfish in domestic market was negative, not positive as expectation of U.S catfish processors (Duc, 2010).

Besides antidumping and labeling law, Vietnamese catfish industry also has to face the technical barriers from importing countries. Vietnamese catfish is one of the most important products to export of Vietnam fisheries industry. As mentioned above, the export

volume of Vietnamese catfish in the world market increase steadily year by year. It is the second important export products of Vietnam fisheries industry, after shrimp. However, following the report of VASEP in 2011, in the recent years, the export value of the Vietnamese catfish increased but the income of cultured-catfish farmers was still low. The reason is the unstable of catfish prices. The Vietnamese farmers could not decide the price for their products and they have to largely depend on the catfish processors or enterprises. Meanwhile, the non-tariff barriers made more difficulties for Vietnamese catfish processors and exporters.

Research objective:

The aim of the study is to evaluate the impacts of NTBs under the US restriction policies on the Vietnamese catfish prices from 1999s to 2011s. To employ the research objective, we hypothesize the set of NTBs by importing countries have the negative effects on Vietnamese catfish industry. This hypothesis will be tested by the econometric models. However, the forms of the econometric models depend on our data. We will present more detail in the data analysis part.

Research question

- How have non-tariff barriers of the US applied on Vietnamese catfish?
- How do these non-tariff barriers impact on the export price of Vietnamese catfish in short run and long run?

Limitation of the research

Although Vietnamese catfish products have to face with many NTBs from the import countries, however, our analysis just focus on the effects of NTBs that were imposed by the US market on the export price of Vietnamese frozen catfish fillets from 1999 to 2011 because of the limit of time and for simplification also.

1.4. Structure of thesis

The thesis consists four chapters: first is introduction part, the second for the literature review, the third for theoretical framework and methodology, the next chapter for the empirical results and discussion and the last chapter for the summary and conclusions.

CHAPTER 2: LITERATURE REVIEW

2.1. The definition of non-tariff barriers and their impacts

The development of multilateral trade negotiation in the world market made the reduction of tariff barriers in the years of 1940 and it led to the increasing rapidly of the non-tariff barriers as an important role of political protection in the world trade.

Walter (1971) discussed about the implications of nontariff measures, how were the NTBs applied to imports by the industrial countries and the prospects of developing countries export performance. The NTBs were defined as all the government policies and practices to restrict the volume, direction or production composition of the international trade. NTBs were divided into three mainly groups. The first group included the NTBs were used as the instrument of commercial policies, such as quotas, subsidies to import-competitors. The second described the NTBs played the role as trade restrictive intents, e.g. packaging and marking requirements, sanitary regulations, customs valuation and classification practices. The last group belongs to the NTBs non-trade policy objectives, e.g. certain types of consumption taxes and government monopolies. Walter also mentioned that the NTBs tended to effecting to the volume and pattern of trade of import countries just by limitations of quantitative or by affecting on relative cost and price directly. However, in the export side, the impacts of NTBs seemed that more difficult to identify than import side because NTBs, in the export side, not only effected to the importers directly by import volume limitations or by relative cost and price but also played as the tools to lobby for domestic industry that was called as implicit subsidization.

According to Sam and Yeats (1986), the inventories of NTBs had been built a Database for the most developed economy market and about 80 developing countries in the early of 1980s by UNCTAD. The Database contained the basic information about national tariff line level, the descriptions of NTBs to place their essences, the country that imposing them, and a briefly about the measures and identifications of the NTBs effects. However, the limitations remained in this Database because the indications in there were same for all countries and it did not have any index to measure the impact of NTBs if any changes in the intensity of application occurred.

Baldwin (1989) specified the various methods to measure the NTBs and the trade distorting effects of NTBs. Likely Walter, Baldwin also separated NTBs into three important groups. The first group was also the tools to restrict or limit the export or import volume, e.g. the quotas. The second group illustrated the supporting policies of government, e.g. subsidies,

direct financial assistant, etc. The last group, but not at least, represented the establishment of standards or regulations that relating health, food safety, packaging, labeling, etc. Therefore, it had some difference points from the content and the name in each groups of NTBs from Walter. Baldwin made more clearly the objectives in each group of NTBs. Baldwin denoted which NTBs were imposed with the support purposes, instead of just focused on the trade restrictions as Walter. Additional, Baldwin also discussed the relationship of price or quantity and non tariff barriers. Baldwin mentioned that the price-impacts were measured by the wedges between the price of domestic consumers willing to pay for their import and its substitute's goods and the differences between the prices of this goods or services with other markets in the world. Otherwise, the quantity-effects of NTBs were evaluated through the differences between the price of foreign and domestic producers received. However, all his ideas are based on the basically demand and supply equilibrium. Baldwin did not estimate these impacts directly.

The mainly ideas of paper of OCED Pilot Group's paper about NTBs were modified by Alan and Robert, 1997. Unlikely with the above papers, NTBs were reminded in the shortly, but not small, definition. Alan and Robert were described as all the trade barriers that distorted trade but were not tariff. NTBs were causes of the policies that alter the prices or the quantity. The typology of NTBs was also represented by five groups and they were divided by exist forms, instead of the basing on the imposed objectives as Walter or Baldwin. They were the quantitative restrictions (quotas, license, exchange and other financial controls, etc.), non-tariff charges (antidumping duties, border tax adjustments, etc.), government participation in trade (subsidies, immigration, research and development policies), the NTBs related to the customs procedures and the last type of NTBs in this study was technical barriers. These technical barriers designed for domestic objectives but which may discriminate against imports, such as the barriers belongs to the health, sanitary, safety, packaging, labeling and advertising regulations or quality standards. As Walter and Baldwin, they also concluded that the mainly impacts of NTBs were the reduction in quantity and the increase in price of imports, the change in the elasticity of demand for imports and the variability, the welfare costs and resources costs of NTBs. Alan and Robert also concluded all the NTBs could be thought as the factor that shifting the demand import and supply export curve. Thus, the measuring of these effects had to depart from the interaction of supply and demand, not only the possession of NTBs themselves. However, like the previous researchers, they did not contribute any modeling to evaluate the effects of NTBs quantitatively. The measurements of these impacts were so difficult.

To sum up this part, we will conclude some the main idea of the earlier researchers. It has many previous researches about the definitions of NTBs, as well as the classification and the measurement of NTBs. However, the same angles are NTBs including all the non-tariff policies of government to restrict and distort trade. The separation and typology of NTBs are diverse. They depend on the perspective of each researcher. In our paper, we define NTBs as the instruments were not tariff and distort trade. We base on the imposed objectives to divide the NTBs. The first, NTBs describe for the limitation of quantitative trade, e.g. quotas, license, border adjustment tax, imposing antidumping duties, etc. The second was the NTBs present for the government supporting and policies, such as subsidies, financial assistant, exchange rate policy, etc. The last, NTBs demonstrate for the standard or regulation relating the health and safety food with the sanitary, packaging, and labeling. We defined them as technical barriers. They also play as the factors for the shifting the demand and supply curve. The impacts of NTBs should be based on the basically equilibrium interaction of demand and supply. Thus, the NTBs will directly effect to the price or quantity of the products imposed in both demand side and supply side.

2.2. NTBs' researches in seafood trade

The report of DFID in 2008 illustrated that 38% of fisheries and aquaculture production were traded in the international market. One half of this trade came from developing countries (about 48% by value) and EU, Japan and USA markets held 72% in total trade value. The export revenue via fisheries sector plays an important role in developing countries. Fish trade also creates more employment and food security for these countries. However, the fish export of developing countries was limited by the import tariff and the demanding for hygiene and sanitary standards. For more detail, the controversial of fish trade in international market included the issues below: the first belonged to the tariff and quotas problems. High tariff in importing countries led to the lower in added value of fish trade in the exporting countries and the rapidly increasing of the export value had resulted from the increasing in export volume, instead of the increasing in value added benefits. Therefore, the tariff has played as the reasons of the decreasing in the purchasing power and lower demand. However, in the WTO negotiation, the reducing in the tariff barriers has been encouraged. The increase of the free trade agreements is causes of the increasing in the consumer purchasing in fish products. The remaining barriers in fish trade were non-tariff barriers, they were the group of barriers to limit the trade volume, including the hygiene and sanitary standards, labeling and certification, food security and livelihoods, illegal fishing. In

there, the illegal fishing effected to the capture fishery rather than aquaculture and in general, these barriers were greater to restrict trade than the tariff or duties and created the adversely effects on the fish trade of the importing countries. However, in general, the main purposes of NTBs are to limit the import or export trade volume, but in fact, their aims are to restrict trade for the protectionist respond the real conditions of each industry.

Antidumping should be the firstly discussion for NTBs in global seafood trade. The aims of antidumping policy were to assist the domestic producers by a tariff against the offending exporters. The manufactures, agricultural and fishery were the greatest sectors affected by antidumping (Kinnucan and Myrland, 2006).

Beaulieu (2005) discussed about the antidumping duties problem for importing shrimp to US. From 2000 to 2002, the shrimp industries of US faced to a rapid dropped because the importing shrimp from Thailand, Vietnam and India. The US domestic shrimper market share fell under 20% in 2005. This was the reason led to the contribution of a group of forty-two shrimp processors in US (Southern Shrimp Alliance-SSA) to save their shrimp industry. They offered an antidumping duty on import shrimp from Thailand, Vietnam, India, Ecuador and Brazil. To win in this battle, SSA had to prove US shrimp industry injured by importing with US Department of Commerce (DOC) for their acceptation. This case is similar to the Vietnamese catfish. The negative effects on the US catfish domestic industry of the import of Vietnamese catfish to US are causes of the antidumping imposing on Vietnamese catfish as we mentioned in the last chapter. The dumping product in SSA's petition consisted the frozen shrimp and canned warm water, including wild caught (fishery capture) or farm raised (produced by aquaculture), head on or head off, shell on or peeled, tail on or tail off, deveined or not deveined, cooked or raw, or otherwise processed in frozen or canned form. After the arguments from the related shrimp importing countries of US, the finally determination was the non-canned shrimp product imported from Brazil, China, Ecuador, India, Thailand and Vietnam had materially injured to US shrimp industry; otherwise, the caned shrimp form of China, Thailand and Vietnam was dumping negligibly. However, in the conclusion, Beaulieu recommended that although antidumping was still the most effective barriers for fish trade but it should be better if the application for the theory of competitive advantaged and the promotion for free trade instead of imposing the antidumping for the developing countries because the saving of the protecting expenses.

Kinnucan and Myrland (2006) has studied the effects of antidumping on the Atlantic salmon. The purpose of this previous study was to evaluate the efficiency of antidumping

policy imposed on the Atlantic salmon. Kinnucan and Myrland concluded that in the condition the products of export and import country was homogenous, any tariff imposed on the import products might act as an implicit subsidy for domestic producers. The crucial instrument of antidumping was a tax set for offending import product. Thus, it was an inefficiency barrier because of its domestic industry destruction. This also was the first time the impacts of antidumping imposed by the European Union on salmon evaluated by partial equilibrium model. The analysis results of EU tariff showed that the antidumping tariff set on exporting countries, e.g. Norway, Chile and Faroe Islands played as a subsidy for supply countries other. For more detail, when the antidumping tariff was viewed at 6% on the Atlantic salmon imported from Norway, Chile and Faroe Islands, the salmon prices in United Kingdom raised more than 6%. In general, the EU tariff incidence on Chilean and the Norwegian was 92% and 110%, respectively. Kinnhcan and Myrland also tested the effects of promotion policy (case of marketing fee), instead of protectionist. The results showed a "win-win" result. The promotion policy effected an increasing in demand and therefore, it had positive effects on the price at the import countries. For Norway, when the EU set 6% marketing fee on salmon, the increase in demand led to the raising in export price from 4.2% to 12.5%, instead of reduced 4.2% in the tariff case. The similar effects on Chile and Faroe Islands also. In the other supply countries that not imposed the antidumping tariff by EU, the increase in the export price was also greater than in the tariff case. For example, the export price of UK increased 7.8%, instead of 6% in the case that EU set the antidumping tariff on Norway, Chile and Faroe Islands. From all the results, they concluded that the promotion policy was better and more effective than the straight tariff policy.

The next of NTBs is hygiene and sanitary standards or in recent literature, they are called as sanitary, phytosanitary (SPS) and technical barriers for the detail. In the recent years, the problem of safety food, health, environment or animal protection was becoming an important issue. SPS and technical barriers were involved in OECD countries since 1997. Although, Jone and Bereau (2001) defined SPS and technical barriers as the sub-category of NTBs and they can be act as the barriers to trade. However, to limit use of SPS and technical barriers as NTBs protectionist, WTO established the regulations to require that any import countries had to proves the necessary of the imposing for the SPS standards to protect the human, animal, or plan health. The previous articles also accessed the SPS and technical barriers by two ways. Firstly, SPS and technical barriers set the standards for importing products and thus, it required the exporting countries had to make a good investment to adopt these standards. The consequences were the increasing in the value of their products in the

long run. Since, the SPS and technical barriers were the catalyst for trade and increased trade. That argument was considered by Jaffee and Heason (2004), Swann et al (1996) or Moenius (2004). However, in the opposite way, Anh (2009) has studeid the impacts of new impositions on three difference type of standards on three major markets, including Hazard Analysis Critical Control Points (HACCP) in the US (1997), Minimum Required Performance Limits (MRPLs) in the EU (2002), and the Food Safety Basic Law in Japan (2003). The results of gravity model showed that the safety regulations had a negative affected to the trade flows of seafood products, particularly shrimps and mollusks which products exported from developing countries. The similar idea had been found by Anders and Caswell (2009) when these authors conclude that the technical standards had a negative affected to both of volume and value of trade (cited by Kathy et al, 2012).

We now present more detail about the NTBs researches that relate to the case of catfish. Many previous studies has considered about the NTBs imposed on catfish industry, as well as the impacts of NTBs on the catfish industry, particularly the article related US and Vietnam catfish because of the popular of “catfish war” between US and Vietnam. The effects of non-tariff barriers from importing countries created the challenges for this industry (Phuong and Oanh, 2010).

An analysis market before and after “catfish war” were examined by Binh (2006). By the primary data and descriptive statistic method, he presented the situation of production, consumption and the trade policy of Vietnamese catfish before and after “catfish war”. The results showed that Vietnamese catfish industry had been shocked with the very bad consequences of “catfish war”. In the first year of the war, the Vietnam export of frozen catfish fillets into US dropped a half. The added of antidumping taxed and new technology barriers, instead of free trade and only the trade barriers, respectively, as before the “catfish war”, made much change in the production, consumption and market strategies of Vietnamese catfish industry as well. The most important changes in Vietnamese catfish production were the transfer from nature to artificial in fingerling to increase the quality of fingerling for adoption the technical standards of US market. The expansion in scale of catfish production also made the changes from the made self to the industrial feed. Moreover, the boosting in the catfish price because of antidumping tax led to the higher cost. Since, the Vietnamese exporters had to adjust their cost leadership into the differential products and diversification the market. Therefore, the mainly export market was only US before catfish war and after that war, the export markets of Vietnamese catfish were expanded to EU, US

and ASEAN. It is known as an opportunity for Vietnamese catfish. One of the greatest changes was Vietnamese catfish had to change in the name from “catfish” to “tra” or “basa” fish. This is a successive of USA in “catfish war”.

Kinnucan had done many research about the US catfish industry to determine the impacts of restriction policy of US on catfish industry. Kinnucan’s study in 2003 applied the equilibrium displacement model to examine the effects of targeted tariff (tariff that imposed on the enterprises of a special country) on the US catfish industry. Kinncan’s analysis mostly focused on frozen catfish fillets and the most important assumption was US be a “large nation” importer in the trade relationship between Vietnam and US. Thus, the changes in US import demand influence to Vietnamese catfish price. The results showed that the tariff, in general, was ineffectual because two reasons: firstly, the almost catfish supply source was homogenous, thus, a tariff imposed on one source should be an implicit for other supply source, that meant the protect purposes of imposed tariff were very hard to significant. Secondly, the import demand elasticity for catfish was large and influencing to the import supply elasticity. Therefore, almost the imposed tariff was borne by foreign producers but in fact the domestic consumers lost. The results were likely his research on salmon. For a specific case, the set at $0.50/lbs of tariff were considered. Then, the US catfish price increased $0.17/lbs in the short run and $0.11/lbs in the long run. Finally, Kinnucan also suggested a promotion policy as an alternative for tariff policy. However, stand in other level of the catfish production channel, Muhammad et al (2010) had another conclusion. Their analysis results were similar with Kinnucan but at wholesale and farmed levels, they concluded the higher prices could make a higher in the revenue and the benefit of processors. They also suggested that tariff was the modest gains and the greatest possible benefit for US catfish industry.

Duc and Kinnucan (2007) considered the effects of antidumping on frozen catfish of the US domestic market from January 1999 through December 2005. The antidumping was seen as a crucial tool for the protection. However, their evidence in the case of frozen catfish fillets proved that antidumping was a weak instrument for protecting the domestic catfish industry in US. To find this result, they applied the first-difference model to test for the antidumping duties effects on the trade flow and the price of domestic and importing frozen catfish fillets in US and the general model was built by starting from demand side of US consumers for frozen catfish fillets. The differentiation between the domestic and importing good was the antidumping duties. The variables in reduced-form model were presented by

first difference logarithm form to overcome the non-stationary of the variables. The coefficients of continuous variables interpreted for the elasticity and coefficients of dummies variables illustrated the relative changes. The affects of antidumping on both quantity and the price were described by two dummies variables with 1 (0 for otherwise) was the value of these variables for the period of investigation (June 2002 through July 2003) and implementation (August 2003 through December 2005) the duties, respectively. The price of some other variables were also consisted in the model to describe as the factors influence on the price of US and importing frozen catfish fillets products, e.g. the US income per capita, wage rate in US manufacture sector, real exchange rate, the price of substitute goods and energy price. The lag of catfish price was also modeled to illustrate the dynamic effects. The seasonal was also tested as the demand shifters. The effects of antidumping on quantity demand for catfish in US was contributed from the inverse demand function. They also used variables in the price function to test for the impacts on the quantity demand. However, the difference in this model was the addition of the price of US catfish and importing catfish. The lag of quantity also added to test the dynamics effects.

Duc (2010) also tested the price and trade flow effect of antidumping and labeling law imposed on Vietnamese catfish by the econometric models. Vietnamese catfish export, particularly the frozen catfish fillets, increased to US market since 1998 under the supporting of the agreement that signed in December, 2001 between Vietnam and US (Bilateral Trade Agreement-BTA). The Vietnamese catfish had the texture and taste almost similar with US catfish but sold in US market with lower price, the catfish imported from Vietnam created the difficulties for US catfish producers. To protect the domestic catfish industry, US imposed antidumping tariff and labeling laws on the Vietnamese catfish. The price and trade flow impacts of these policies were tested by the econometric models first difference model, ECMs, Equilibrium displacement model. The impacts of antidumping and labeling law in short run were evaluated by first differenced model and ECMs model. However, the results of ECMs in the short run were not expected. Therefore, based on the coefficient of ECMs model in the short run and spurious model, he derived to the ECMs in the long run. In our paper, we will also do this way to evaluate the impacts of NTBs on Vietnamese catfish export price. We will present the detail for the ECMs model in the next chapter. Duc's final results antidumping duties raised the domestic catfish price of processed catfish and reduced the price of Vietnamese catfish export price. The labeling law was reality harm the US catfish industry. This results coincided with the researches of Kinnucan (2003), Kinnucan and Myrland (2006), Kinnucan and Duc (2007), Muhammad et al (2010).

2.3. Econometric models used to measure NTBs impacts

Many previous studies applied econometric models to estimate the dynamics of prices or the factors effects to the changes of prices or the effects of trade policies on the international trade. The specification model based on the previous researches of Kinnucan (1995), Kinnucan and Myrland (2003 & 2005), Duc and Kinnucan (2007), Giap and Jolly (2010). Although the processing and the purposes to develop the model of each author are different, however, all of them started their work from the theory of demand and supply equilibrium. From the models, the effects of policies to the international trade in the short and long term by the econometric methods. In our knowledge, the most popular models were used such as Ordinary Least Square (OLS), first difference model. Duc (2010), Duc and Kinnucan (2007) applied these models in their papers to estimate the effects of trade policies to the volume and the price of catfish in US market.

Edward and Marc (1995) have tested the relationship between tariff and non-tariff barriers and the effects of preexisting tariff on the NTBs in the trade of US. The results showed that if the countries held a well group of protected tariff, the used of NTBs for protectionist could be easier, as well as the government resistance of these countries might be greater. Edward and Marc (1995) suggested two argument of the relationship between tariffs and non-tariff barriers. Firstly, they argued that tariff and NTBS were substitutes and NTBs were used to protect industries that lost the tariff protection because of the regulations of WTO. In the other view, they suggested that tariff and NTBs were complement and NTBs were often used in the cases of that country was also the beneficiaries of high tariff. To examine their arguments, they had used the ordinary least squares (OLS) model to test the effects of tariff on the NTBs. The dependent variable in this model was the proportion of imports to NTBs. The independent variables included the average tariff of the national post and others macroeconomic variables, e.g. the ratio of import to global import or the ratio of GDP to global GDP, the unemployment rate, real exchange rate, economic size and domestic institutions to indicate the impacts on NTBs.

Another known model as a tool to identify the dynamics of a variable in the long time was Autoregressive integrated moving average (ARIMA). Kwong et al (2002) had used the ARIMA models to test the movements of the wholesale prices of three cultured fish in Hong Kong. The average price of three species in the empirical model depended on the average prices and the nature logarithm of average price of each species and CPI in Hong Kong from the January, 1988 to July, 1992. The results showed that the ARIMA models could estimate

the price of red and green fish well, but the price series of yellow fish was found by the random walk of first differences. The ARIMA models were also used to test the time series data of seafood products by Wang et al (2000).

Some other studies evaluated the trade flow dynamics by another econometric model – gravity model. That model was first used to test the impacts of free trade agreements on international trade in 1962 by Tinbergen (Anh, 2005). This model was often used to estimate the effectiveness of trade agreement and organizations on trade flow or the pattern of international trade and it is also used to test the hypotheses root of purer theories of trade as well through the changes in GDP and the distances between two countries under time series data.

To sum up for this chapter, one can conclude that it has many researches on the non-tariff barriers and fish and catfish international trade. Almost all the previous papers conclude that, the non-tariff barriers can be used to protect the domestic industry in the short run but it seems that not effective in the long run. The previous authors evaluated the effects of non-tariff barriers by many methods from qualitative methods to quantitative methods. Some of popular econometric models were ARIMA, ECMs, Gravity model to evaluate the effects of trade policies in the long run. However, the same of their studies departed their analysis from the analysis in demand, supply and economics equilibrium theory. For the catfish industry, besides the most popular barriers in "catfish war" was antidumping and labeling law, we will also test the impacts of technical barriers on Vietnamese catfish export price. We will also start our model from the basic demand and supply function, likely the other previous authors have done. However, the differences of our paper are twofold:

The first, we will test the Vietnamese export price impacts under the US restriction policies, including antidumping, labeling and technical barriers in the international market at the same model. The equilibrium point in our model means the balance trade of Vietnamese catfish where total Vietnamese catfish exported equal to total Vietnamese catfish imported.

The second, we will use the non-tariff barriers identified by the dummy variables to analyze the impacts on the Vietnamese catfish before and after the barriers imposed. This method is supported by Duc and Kinnucan (2007), Duc (2010). However, different from our study, these studies just focused on antidumping and labeling law, not technical barriers.

The third, in our knowledge, it is the first time, the impacts of non-tariff barriers on the Vietnamese export price are evaluated by time-series data

CHAPTER 3. THEORETICAL FRAMEWORK AND METHODOLOGY

3.1. CONCEPTUAL THEORETICAL

As we mentioned in the last part, we start the analysis of NTBs impacts on Vietnamese catfish from the basic supply, demand and market equilibrium theory. We first started with the law of demand.

3.1.1. Law of demand

The law of demand was built when the inverse relationship between the price of a good and the quantity buyers are willing to purchase in the defined time period exists (Tucker, 2008; Varian, 2006). This relationship is shown in the graph by demand curve. "Under the law of demand, any decrease in price along the vertical axis will cause an increase in quantity demanded, measured along the horizontal axis if ceteris paribus" (Tucker, 2008).

However, when the other factors changes, instead of price, the change in demand is induced by an increase (rightward shift) or decrease (leftward shift) in the quantity demanded at each price that the consumers are willing to purchase. These factors are called "non-price factors". They include five factors (Tucker, 2008; Thomps, 2001), such as number of buyers, tastes and preferences, income, expectations of buyers and the prices of related goods. Tucker also affirmed that the distinction between the changes in the quantity demanded and changes in demand is necessary. The change in quantity demand comes from the changes in the price. In this case, the quantity demanded just moves along the demand curve. Otherwise, the change in demand is the results of the changes, at least, one of the "non-price" factors. The demand curve shifts to the rightward (or leftward). A new demand curve was existed with new quantity and price demand.

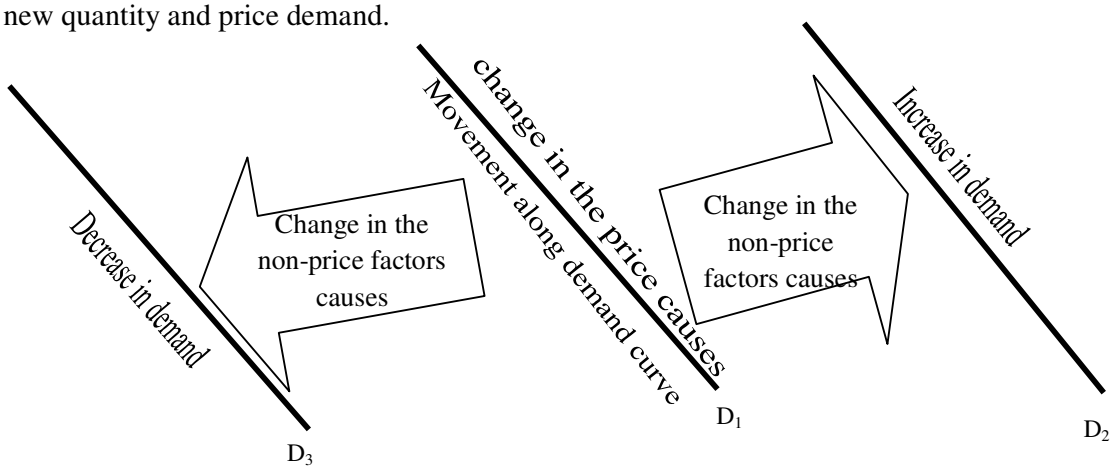

Figure 3.1. The changes in quantity demand causes versus the change in demand causes
(Modified from Tucker, 2008)

3.1.2. Law of supply:

If the definition of demand relates the consumers and the demand prices, the definitions of "supply" present for the relationship between the prices and the quantity supply. The law of supply, therefore, illustrates the relationship of quantity and the prices are willing to sell a product of the sellers at the defined time, ceteris paribus. "Supply is a curve or schedule showing the various quantities of a product sellers are willing to produce and offer for sale at possible prices during a specified period of time, ceteris paribus." (Tucker, 2008). The supply curve has the upward slopping. Any increase in the price will be causes of an increase in the supply quantity along the supply curves. Likely the demand, the change in supply was consequences of the changes in the non-price determinants. They are number of sellers, technology, resource prices, taxes and subsidies, expectation of producers, prices of relate goods (Tucker, 2008; Thomps, 2001).

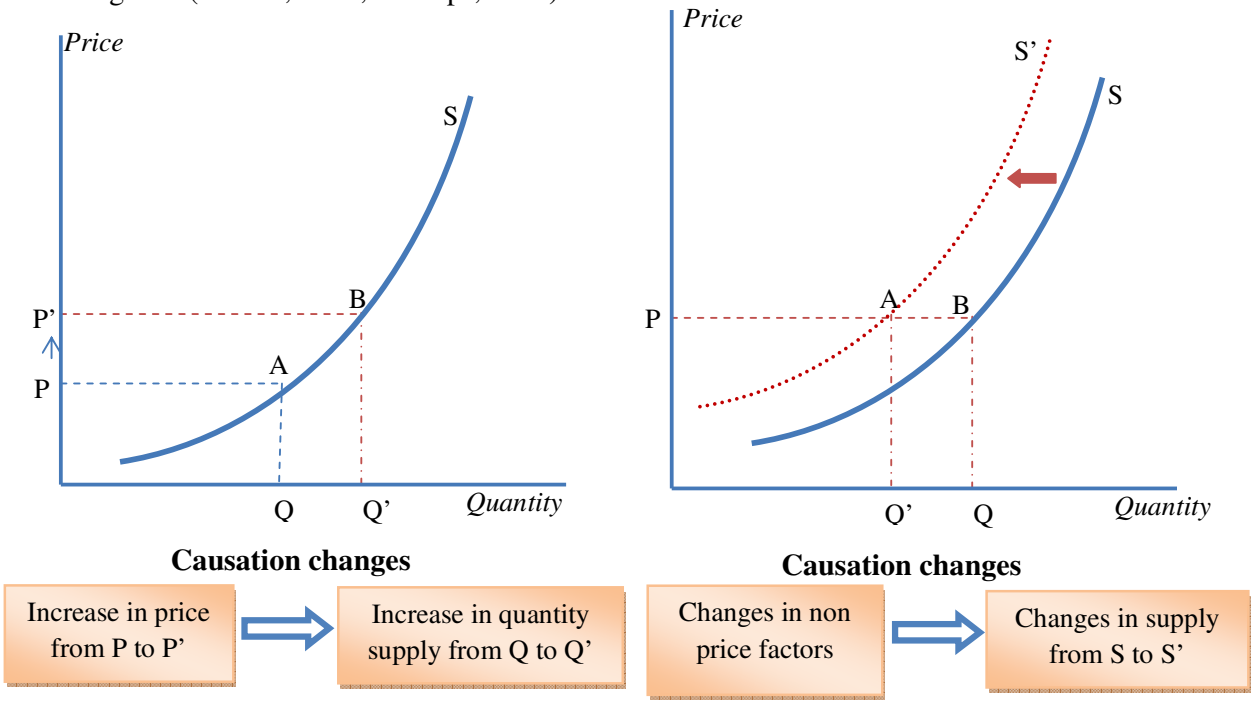

Figure 3.2. The changes in supply quantity causes versus the change in supply
(Source: Modified from Tucker, 2008)

3.1.3. The market equilibrium and effects of shift on demand and supply:

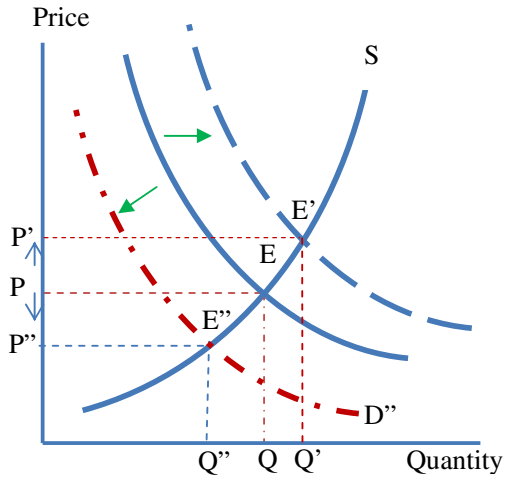

Figure 3.3.1

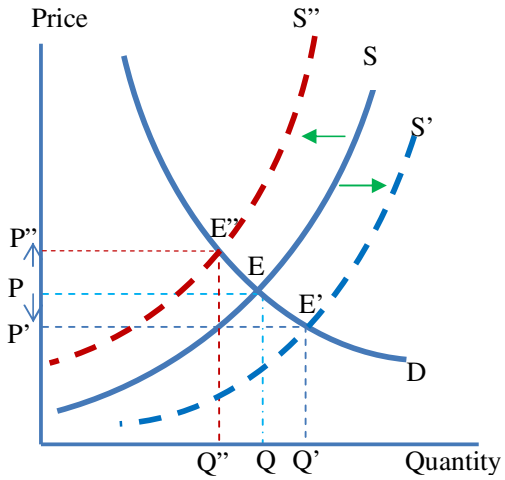

Figure 3.3.2

Figure 3.3. The effects of shift on demand and supply on the market equilibrium
(Source: Tucker, 2008)

Figure 3.3 illustrates the market equilibrium and the shifts of demand and supply curves. At any price and quantity where the quantity demanded equals to the quantity supplied (Varian, 2006; Tucker, 2008). The equilibrium point is shown in the graph as the intersection of demand curves and supply curves. Figure 3.3 presents the market equilibrium at point E. The equilibrium price and quantity are P and Q, respectively.

We also represent the effects of changes in demand and supply in figure 3.3. The shifts in demand are demonstrated in figure 3.3.1. From the figure, we show the changes in demand to both rightward and leftward of demand curves. If the supply is constant, an increase (or decrease) in demand makes the demand curves move from the D to D' (or D"). The shifts of demand curve lead to the changes in equilibrium price and quantity to create news equilibrium points. The increase (decrease) in demand causes the higher (lower) quantity and price (the supply is not change). The new equilibrium prices make to the movement of the equilibrium quantity along to the supply curve.

Figure 3.3.2 shows the effects of the changes in supply if the demand is not changes. In this case, any changes in supply are also causes the higher or lower equilibrium price and quantity. The supply increases from the curve S to S' lead to lower equilibrium price and the higher equilibrium quantity. The decreases in supply curve from S to S" are causes of the higher equilibrium price and lower equilibrium price. The new equilibrium points move along the demand curves, *ceteris paribus*.

All these theoretical can be illustrated by the figure below:

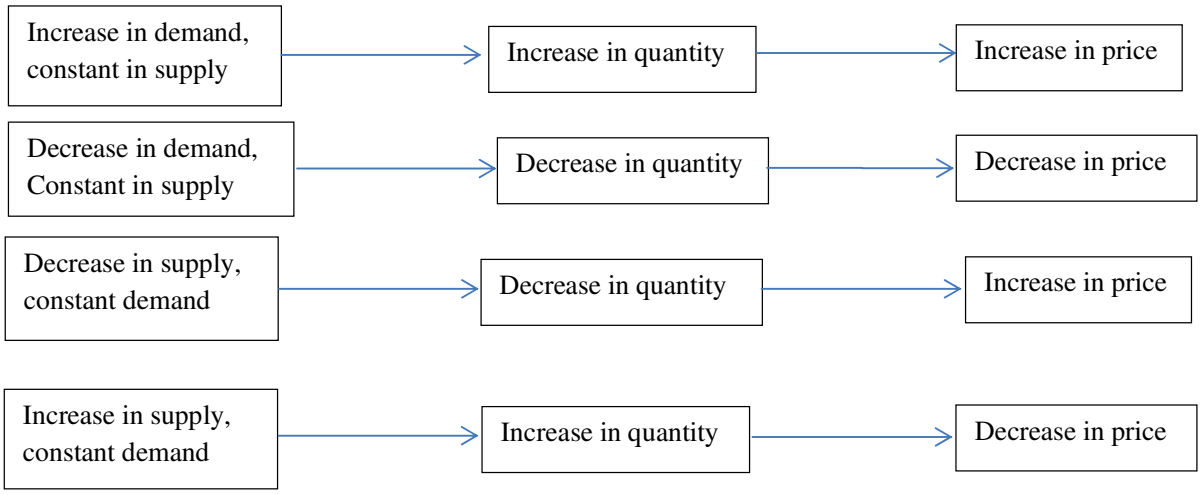

Figure 3.4. The modified of theoretical
(Source: Tucker, 2008)

3.2. THE HYPOTHESES OF THE RESEARCH

Based on the above theory, we constructed the framework to estimate the effects of NTBs imposed on Vietnamese catfish. The framework is contributed under the hypotheses which will be held through our paper:

Firstly, Vietnamese catfish has many forms. However, to make the research question addressable, we only chose frozen catfish fillet, which is the main product form exported. We aggregated the export markets. Therefore, Vietnamese catfish is exported only to two countries: US and the ROW.

Secondly, the Vietnam import catfish is negligible and it can be ignored. Thus, the total catfish supplied in Vietnam is the sum of the Vietnamese domestic demand and the total catfish is exported to US and the ROW.

Thirdly, the US is assumed as the "large market" (Kinnucan and Myrland, 2003) and any changes in the demand from US can effect to the quantity and the price of Vietnamese catfish.

Fourthly, Vietnam holds more than 95% in total import demand for catfish of the US and the catfish imported from other supply sources was insignificant.

Fifthly, law of one price is assumed. Therefore, the Vietnamese catfish export prices will be all the same to different importing countries.

Sixthly, non-tariff barriers implemented only in the US market, not in the ROW markets.

3.3. CONCEPTUAL FRAMEWORK

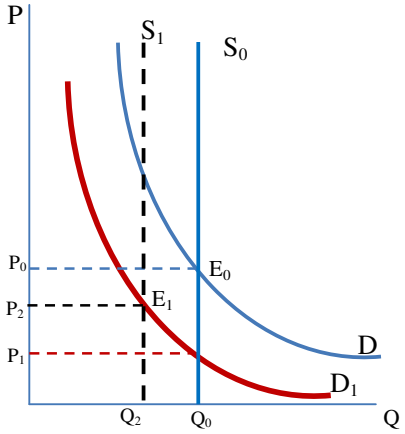

Figure 3.5.1

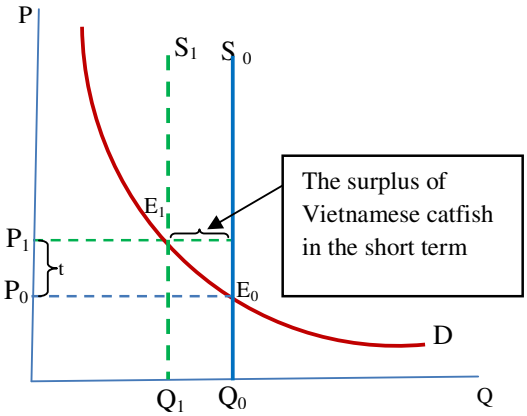

Figure 3.5.2

Figure 3.5. The changes in demand and supply for Vietnamese catfish in the US market under the restriction policies of the US

Figure 3.5.1 describes the demand and supply for Vietnamese catfish in the US market under the case of labeling law and technical barriers in the US. In free trade, the equilibrium quantity and the price for Vietnamese catfish in the US market are Q_0 and P_0, respectively. In this case, the change in demand is causes of the non-price determinant. Because of NTBs in the US market, the demand curve for Vietnamese catfish in the US market shifted from D to D_1. In the short run, or at least within a given year, the supply quantity is more or less fixed (Varian, 2006). The decrease in demand led to the reduction in the equilibrium Vietnamese catfish price in the US market from P_0 to P_1. In long run, Vietnam can adjust in the quantity catfish exported to the US market. The supply curve shifts from S_0 to S_1, we get the new equilibrium point E_2. The new equilibrium point is contributed with the lower quantity and higher price than that in the short run. However, how much decrease in demand and increase in the price will depend on the elasticity of demand and supply and the level of shifts (Thomps, 2001).

Figure 3.5.2 presents for the impacts of imposed the antidumping tariff on Vietnamese catfish in US market. The tariff leads to the increase in Vietnamese catfish price that is sold in the US market. The increase of the price is causes of decrease in the Vietnamese catfish quantity demanded and surplus in the Vietnamese catfish quantity supplied in the US market. The new equilibrium price P_1 is created where $P_1 = P_0 +$ tariff per unit. However, in the long term since Vietnam can change their catfish production, the supply curves changes from S_0 to S_1, the new market equilibrium point of Vietnamese catfish in the US is created with the equilibrium quantity (Q_1) and price P_1 ($P_1 = P_0 +$ tariff per unit). Hence, although the antidumping tariff is imposed on catfish import from Vietnam to limit the import volume, but

they also lead to the higher price of Vietnamese catfish that is sold in the US market. Thus, it also does harms to consumers. The decrease in catfish quantity imported of US forces Vietnam turns to other markets besides the US market (Binh, 2006; Duc, 2010).

Here is the summary for the framework of our study:

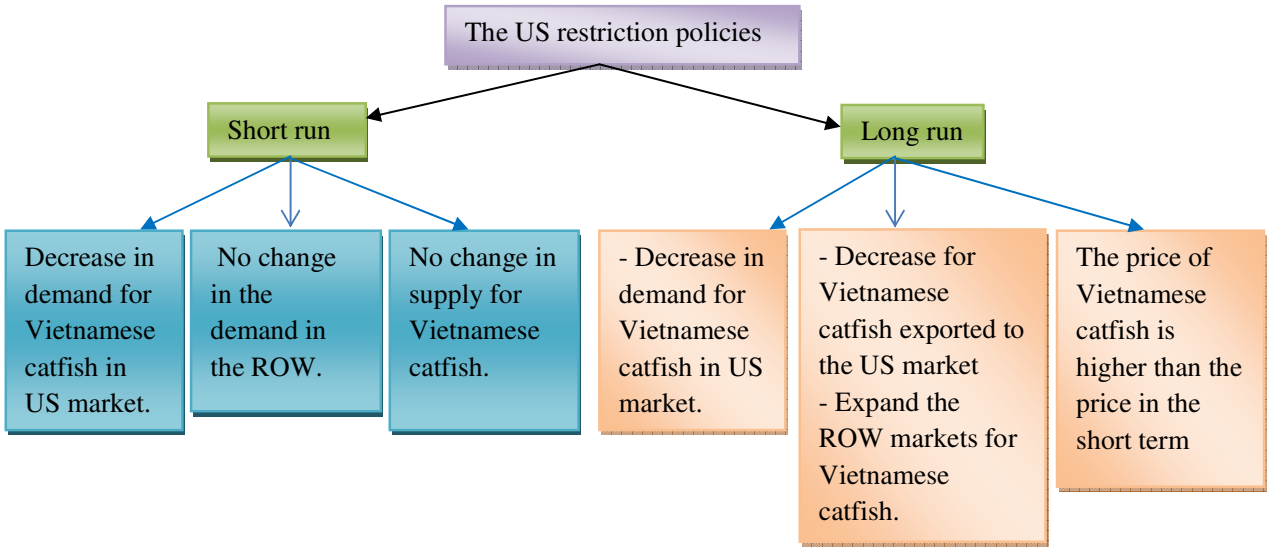

Figure 3.6: Theoretical framework
(Modified from the theoretical)

3.4. METHODOLOGY

3.4.1. Modeling identification

The demand (import) side:

This side will evaluate the factors impact on the Vietnam catfish imported to the world market. Follow these assumptions, the import catfish will depend on the consumer price and the some other factors shift demand curves (Duc, 2010). We have the import catfish model of the markets follow:

$I_{US} = I (P_{US}, Z_{US})$

$I_{ROW} = I (P_{ROW}, Z_{ROW})$

Where:

I_{US} is the import quantity of catfish in U.S

I_{ROW} is the import quantity of catfish in ROW

Z_i and P_i (i = US, ROW) are the demand shifters and consumer price (in USD) of the frozen catfish fillets in U.S and ROW, respectively.

If we call E as the exchange rate to change the currency from USD to VND

Then, $P_i = E \times P_V$

Additional, following the theory of the law of one price, $P_{US} = P_v + T$ (Duc, 2010; Myrland and Kinnucan, 2002)

Where T is the per unit tariff on the catfish import from Vietnam, with T/P_v is the ad valorem US tariff rate on the Vietnamese catfish.

Therefore, total import catfish in the world is described as:

$M = I_{US} + I_{ROW} = I (P_{us}, Z_{US}) + I (P_{ROW}, Z_{ROW}) = f (E, T, P_{US}, P_{ROW,} Z_{US}, Z_{ROW})$

The supply (export) side:

The factors effect on the export catfish of Vietnam is shown as below:

$X_V = f (P_v, Z_v)$

Where:

X_V is the Vietnamese export quantity of catfish

P_V is the export prices (FOB price) of Vietnamese catfish.

Z_V is the supply for export shifters of Vietnamese catfish.

The market is equilibrium when the total export for frozen catfish fillets equal to the total import for frozen catfish fillets.

We have, $X = M$ (3)

From (1), (2) and (3), we have the equilibrium price for Vietnamese frozen catfish fillet

$$P_V = f(E , T, P_{US}, P_{ROW}, Z_{US} , Z_{ROW}, Z_V) \qquad (4)$$

The reduced form model of the Vietnamese catfish's export price

Function (4) represents the general factors effect to the Vietnamese catfish in the logarithm form variables. In this model, besides the shifters of demand and supply, the Vietnamese catfish price depend on the exchange rate between USD and VND and the tariff imposed on Vietnamese catfish by US. The tariff is a tool of US antidumping process, thus, although this variable exists in the model with the name of 'antidumping tax", but, it is, in fact, a non tariff barrier. The imposed tariff is causes of the higher price. Unlike the previous paper, we will not measure the impacts of antidumping tariff on the price of Vietnamese catfish by quantify variable. After the antidumping tariff is imposed on catfish exported to the US, the price is expected higher to recover the tariff.

The antidumping imposed on Vietnamese catfish product exported to US from 2003. Before this regulation, the "labeling law" war also occurred between catfish industry of Vietnam and US in 2001. This regulation played as the first step for "catfish war" process (Duc, 2010). It is also a protectionism tools to limit the imported catfish from Vietnam of the

US. Therefore, the effect of these barriers on Vietnamese catfish price in our model is expected negative. However, in the long run, Vietnam turned to the outside market because the fall in the price of Vietnamese catfish in the US market (Duc, 2010). The consequence was boost the Vietnamese catfish export volume to the ROW markets. Therefore, we expected it is less significant effect on the Vietnamese catfish price in the long run.

The effects of labeling law and antidumping in the period time from 1997 to 2005 on the catfish price were tested by Duc et Kinnucan (2007), Duc (2010) by the dummy variables. In our paper, we referred the way they have done to test the impacts on Vietnamese exporting price in other period time from 1999 to 2011.

In recent year, the consumers make more attention in the safety of the products. It is also an important technical barrier for Vietnamese catfish industry. To satisfy with the food safety standards, the GLOBAL GAP and the HACCP standards were applied in the producing process of Vietnamese catfish industry. We will test the impacts of the application the GLOBAL GAP and HACCP standard in the producing on the price of Vietnamese catfish. The research of Linda and Barry (1998) with the case of the US apple imported to Japan concluded that technical barrier is causes of the decrease about 26% in the price of Fuji apple in the world trade. However, in the opposite way, Ander and Caswell (2008) argued that in the long run, the export countries are able to adjust their producing process to enhance the requirement from importing countries. In our paper, we assumed that although HACCP are the tools of technical barriers of the US to restrict the imported volume of Vietnamese catfish in their country. However, in the long run, the product is produced under HACCP standards can be sold at the higher price than the products are produced under the traditional process because they can make more believable to consumers about the traceability of the products that they are using. Therefore, the application of HACCP standard in the catfish producing not only can satisfy the restriction of the US market but also has the positive effects on the export price of Vietnamese catfish in the long run. The application of HACCP into the producing process plays as the "proxy" to satisfy the requirements of importing countries.

The EU is also the crucial market of Vietnamese catfish the international market. The imposed technical barriers of the EU market also tend to increase in recent year as we mentioned above. Therefore, we will test the application of GLOBAL GAP in Vietnamese catfish industry because it is certificate to be accepted in the EU market. Similar HACCP

standard, the set of GLOBAL GAP standard of the EU on Vietnamese catfish is to restrict the imported volume to the EU market. It plays as the factor of demand shifters in the ROW.

Besides that, we chose the group of factors to present for these variables for the shifters of supply and demand for Vietnamese catfish in Vietnam, the US and the ROW.

Any changes in the input cost will lead to the shifts in supply curves (Thomps, 2001). The increase in input cost is causes of increase in the price (Varian, 2006). In 1998, the research about the producing of catfish seed in the mass-scale succeeded. The development of this technology opened more advantages to develop the Vietnamese catfish industry. The seed material was sustainable and the input cost had a significant reduced (Phuong and Oanh, 2010). It plays as one of the factors in the group of shifter the catfish supply of Vietnam. Other important input cost is catfish feed. Thus, the price of fishmeal is also added in the model.

In 2007, Vietnam became a member of World Trade Organization (WTO). This made more demand for Vietnamese catfish in the international market because of the reducing of the tariff barriers for exporting. In our paper, we will test the effects of this variable to the export prices of Vietnamese catfish as a factor to shift demand curve for Vietnamese catfish.

The other demand shifters include the preference of consumers, consumers' income and substitute products. The US income per capita is concluded as the demand shift. It is expected to have a negative effect on the Vietnamese catfish export price because catfish is found as the inferior goods (Quagrainie, 2006; Duc, 2010).

The domestic industry in import countries has the great effects to the export country. Thereby, the domestic consumption price of US catfish was added in the model. The domestic catfish prices in China are also considered. It is the country playing an important role in the global catfish market. In the recent years, it is a big competitor of Vietnam catfish industry.

The relationship between exchange rate and net export of goods exist within a country. An increasing in the exchange rate will lead to the increasing in the relative price of domestic goods. Edward, 1974 concluded the exchange rate policy played an important role in changes of trade share. Xie et al., 2007 also suggested that the export prices of Salmon are sensitive with exchange rate. In our model, it was assumed that the price in catfish trade is calculated in USD. The changes in the exchange rate of VND/USD have a significant impact on the Vietnamese catfish export, thus, the testing of this relationship is necessary.

The demand shifters in the US and ROW market, prices of poultry and salmon play the role as the substitute goods for catfish. They should be added in the model.

For final, we have the reduced form model for Vietnamese catfish export price as follow, where P_V is the export price of Vietnamese frozen fillets catfish.

The reduced form model

$$P_V = n_0 + n_1 E + n_2 ANTI + n_3 Pfuel + n_4 WTO + n_5 SEED + n_6 HACCP + n_7 P_{China} + n_8 P_{meal} + n_9 LABEL + n_{10} Y_{US} + n_{11} P_{US} + n_{14} P_{Poul} + n_{15} P_{sal} + n_{15} GAP \quad (4)$$

The table below presents a briefly definitions and expectations of the variables in the reduced form model.

Table 3.1.The definitions and describes for the variables in the model

Name	Definition	Describe	Expected signs	Sources
Pv	Vietnamese Catfish export price	Dependent variable		Vietnam General Customs
Pfuel	Fuel price	Continuous variable.	+	IMF
Psal	Price of salmon	Continuous variable.	+	World bank
Ppoul	Price of poultry	Continuous variable.	+	World bank
Pchina	China catfish price	Continuous variable.	+	NMFS
Pmeal	Price of fishmeal	Continuous variable.	+	NMFS
Exchange	Exchange rate VND/USD	Continuous variable.	-	www.oanda.com
Yus	US Income per capita	Continuous variable.	_	BEA
Pus	US catfish price	Continuous variable.	+	USDA
LABEL	Labeling law	Dummy variable with the value get 1 from the period after the labeling law events was available (October, 2001) and 0 for otherwise.	-	dummy variable
WTO	WTO	Dummy variable. Its value gets 1 from the period after January, 2007 and 0 for the period before.	+	dummy variable
ANTI	Antidumping tariff	Dummy variable. The value of this variable get 0 for the period before the antidumping law of US took official effect (August, 2003) and 0 for otherwise.	-	dummy variable
SEED	Catfish seed research	Dummy variable with two values, 1 for the period after Vietnam produced seed with mass-scale (January, 2000) and 0 for otherwise.	-	dummy variable
HACCP	HACCP standard	Dummy variable. The value is 1 for the period after HACCP standard was imposed for Vietnamese catfish (January, 2000) and 0 for otherwise.	-	dummy variable
GAP	Global gap	Dummy variable. Its value is 1 if the period after Vietnamese catfish was applied the GLOBAL GAP in produce processing (September, 2007) and 0 for the otherwise.	-	dummy variable

Table 3.1 above briefly presented the descriptions of the factors in Vietnamese catfish export price model. We based on the theory of economics to build the reduced form model and the theoretical framework to show the expectation of variables in the model. In the variables influencing the Vietnamese catfish export price, antidumping and labeling law are the two most popular used non-tariff barriers in the Vietnamese catfish export. HACCP and GLOBAL GAP were considered as the main certificates to Vietnamese catfish products required by the US and the international market in the present study. The application of these certificates in producing process is expected as the factors to decrease the demand for the Vietnamese catfish, at least in the short run. Besides the non-tariff barriers variables, we also discuss the effect of other economic variables to Vietnamese catfish export price as the factors shift the demand and supply in Vietnam, the US and ROW.

3.4.2. DATA

3.4. 2.1. Data collection

The secondary monthly time series data from 1999s to 2011s was used in this analysis. The information about the Vietnamese catfish aquaculture, producing and exporting from 1999s to 2011s was obtained from the Vietnam General Statistic. The Vietnamese catfish export price is gotten from the Vietnam Customs and the VASEP. The fuel price and the US income per capita are collected from the statistic of IMF. The catfish price in China is collected from the data of World Bank. The US catfish price, the US catfish production, the price of poultry and salmon would be obtained from the USDA. The information about the non tariff barriers will be collected from the FAO, WTO.

3.4.2.2. Data analysis

The impacts of NTBs on the Vietnamese frozen catfish fillets are evaluated by the econometric models. In the reduced form model, the relationship of Vietnamese frozen catfish fillets and the independent variables is presented as a linear function. It has Ordinary least square (OLS) form in econometric with the dependent variables is the Vietnamese frozen catfish fillet export price P_v.

The general form of OLS model is $y_t = \alpha_0 + \alpha_1 X_t + \alpha_2 Z_t + \varepsilon_t^{ols}$, where $\alpha_1 = dy_t/dX_t$, $\alpha_2 = dy_t/dZ_t$ (Nam, 2008). The model is constructed under the assumption of normally distributed variables. A variable has normally distribution if its expected value is its mean and each observation is equal to its mean plus a "white noise" residual error term ε_t^{ols}. The "white noise" conditions, it means that the residual in OLS regression has zero mean, zero

covariance and constant variance. The data satisfied this condition also called as the stationary data (Duc et al, 2008). The OLS with the non-stationary data maybe leads to the unreliable estimation because the autocorrelation in the residual ε_t^{ols}. The results of autocorrelation are the spurious OLS regression with the inefficient coefficient estimates, biased and underestimated variances, inflated t-statistics, and an inflated in R-square (Carter et al, 2007). However, the time-series data, in normally, has the trend or the structural breaks (Duc et al, 2008). Therefore, they often are the non-stationary. A non-stationary series data might be stationary in the difference form (Robin, 2008; Suzanna, 2000; Nam, 2008; Hoai, 2009).

There are many options to correct the non-stationary variables, such as the mathematically transforming variables with logarithms, exponents, differences, inverse and lag. Duc et al (2008) proved that *"if the variables in the model are difference stationary, a difference model and lagged transformation model can be estimated, and under some conditions an error correction model ECM can be estimated"*.

Firstly, the stationary the variables is tested at the level form by the level form. If the variables at the level form are stationary, the OLS model is suitable for the estimation of model (4). Otherwise, the variables need the changes to the logarithm form to test the stationary because the variables are non-stationary in the level form but maybe not in logarithm form (Duc et al, 2008). The OLS model in this case is called as *"spurious model"*. *However, in our paper, we will ignore the unit root test at the level form for the simplification and we change the variables in equation (4) to logarithm form directly.*

The model (4) will be estimated by the regression of logarithm-logarithm form.

$$\ln P_{Vt} = \beta_0 + \beta_1 \ln E_t + \beta_2 ANTI + \beta_3 Pfuel_t + \beta_4 WTO + \beta_5 SEED + \beta_6 HACCP + \beta_7 \ln P_{Chinat} + \beta_8 \ln P_{mealt} + \beta_9 LABEL + \beta_{10} \ln Y_{USt} + \beta_{11} \ln P_{USt} + \beta_{12} \ln P_{Poult} + \beta_{13} \ln P_{salt} + \beta_{14} GAP + \varepsilon_t^s$$

If the variables in logarithm form are also non-stationary variables, the unit root test will be applied for the variables in the first differenced form. The regression of model (4) under logarithm-logarithm form is known as the *"spurious model"*. We called the sign of ε_t^s means that the residual of spurious model. This definition will be hold through of the last part of this paper. In this case, *a difference model or lagged transformation model* or *the error correction models (ECMs) with including the residual of the spurious OLS model in a difference form model* are the better solutions to avoid the non-stationary variables. We will present for these models in the follow.

Unit root test

We employ the Augmented Dickey-Fuller (ADF) test (unit root test) to check the stationary of the varibles. The general function of ADF test is $\Delta X_t = \alpha_t + \gamma X_{t-1} + \sum_{i=1}^{k} \beta_i \Delta X_{1t-i} + \varepsilon_t$ with the null hypothesis is the series data has a unit root ($\gamma = 0$). If the null hypothesis is rejected, it means that the data is stationary series.

To test the autocorrelation, we use the Durbin Watson statistic $DW \cong 2(1-\rho)$. If it does not have autocorrelation, DW is equal to 2 ($\rho = 0$). With the sample has at least 50 observations, there is negative autocorrelation if 4-DW<1.324, otherwise, the test is indecisive if 4-DW >1.403.

The test for residual's constant variance is the autoregressive condition heteroskedastic model: $\varepsilon_t^2 = \beta_0 + \beta_1 \varepsilon_{t-1}^2 + e_t$ (*) with null hypothesis is: β_1=0. We reject null hypothesis if the test statistic value of β_1 in model (*) is significant. Otherwise, we cannot reject the null hypothesis and there is no heteroskedastic residual.

Error correction models

"Error Correction Models (ECMs) are a category of multiple time series models that directly estimate the speed at which a dependent variable" (Robin, 2008). They are useful in estimating both of short run and long run effects of a time series data on another.

The basic structure of an ECM is:

$$\Delta y_t = \rho_0 + \rho_1 \Delta x_t + \rho_2 \Delta z_t + \rho_3 \varepsilon_{t-1}^s + e_t$$

Where the ε_{t-1}^s is the error correction component of the models and it measures the speeds at which prior deviations from equilibrium are corrected. It also includes $\rho_1 \Delta x_{t-1}, \rho_2 \Delta z_{t-1}$ if they are significant (Duc et al, 2008).

The ECMs can be used to estimate the short run effects of *x* on *y* ors long run effects of *x* on *y* in the case of multiplier when the speed at which of *y* returns to equilibrium after a deviations occurred (Robin, 2008).

The estimated for equation (4) by ECMs model is:

$$\Delta \ln P_{Vt} = \eta_0 + \eta_1 \Delta \ln E_t + \eta_2 ANTI + \eta_3 \Delta \ln Pfuel_t + \eta_4 WTO + \eta_5 SEED + \eta_6 HACCP$$
$$+ \eta_7 \Delta \ln P_{Chinat} + \eta_8 \Delta \ln P_{mealt} + \eta_9 LABEL + \eta_{10} \Delta \ln Y_{USt} + \eta_{11} \Delta \ln P_{USt} + \eta_{12} \Delta \ln P_{Poult} + \eta_{13} \Delta \ln P_{salt}$$
$$+ \eta_{14} GA + \eta_{15} \varepsilon_{t-1}^s + e_t$$

Therefore, ECMs are often used to test the effects of political and social processes because the testing the political impacts requires to have a critical statistic assumptions about the nature responsiveness of the political or social process time-series to new information (Suzanna, 2000) or in the cases of policy mood, support for social security, consumer confidence, economic expectations, health care cost containment, government spending, patronage spending, redistribution, interest rates and purchasing power parity, etc.

However, the requirement to estimate the ECM is the residual ε_t in spurious model is stationary in Dickey-Fuller test with no constant term in the Engle-Ganger regression below:

$$\Delta \varepsilon_t^s = a_1 \varepsilon_{t-1}^s + \phi_t$$

If the test results show $a_1<0$ and it is significant statistic, *the ε_t^s is stationary, otherwise, the ECMs model is unreliable estimation. The first differenced model or lagged transform model should be applied in this case.*

The ECM model in long run is derived from the ECM in the short-run. After the ECM in the short-run is identified, the ε_{t-1} is substituted by the equation: $\varepsilon_{t-1} = \ln y_{t-1} - \alpha_0 - \alpha_1 \ln X_{t-1} - \alpha_2 \ln Z_{t-1}$ into the estimated ECM model in the short term, where $\alpha_0, \alpha_1, \alpha_2$ are the estimated coefficient of the spurious model.

The first difference model

The basic structure of first-difference model is:

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta X_t + \alpha_2 \Delta Z_t + u_t$$

Where: $\Delta y_t = y_t - y_{t-1}$, $\Delta X_t = y_t - X_{t-1}$, $\Delta Z_t = Z_t - Z_{t-1}$, $u_t = \varepsilon_t^s - \varepsilon_{t-1}^s$

If the variables in spurious model are in logarithm form, the estimated coefficients interpret for the elasticity of y_t respect to X_t (ceteris paribus is assumed). In difference model, with the variables in logarithm form, estimated coefficient α_1 is the arc estimate of the elasticity of y_t respect to X_t if $\Delta Z_t = 0$.

The residual of spurious OLS is no autocorrelation in its difference and the estimation in difference model form may be a reliable statistic (Duc et al, 2008).

However, the differenced-model is just an estimate the short term dynamic adjustment process (Robin.B, 2008, Duc et al, 2008). Therefore, the error corrections model is applied because it can estimate the dynamic equilibrium adjustment in both short and long term.

The function (4) will be estimated by first differenced model:

$$\Delta \ln P_{Vt} = n_0 + n_1 \Delta \ln E_t + n_2 ANTI + n_3 \Delta \ln Pfuel_t + n_4 WTO + n_5 SEED + n_6 HACCP + n_7 \Delta \ln P_{Chinat}$$
$$+ n_8 \Delta \ln P_{mealt} + n_9 LABEL + n_{10} \Delta \ln Y_{USt} + n_{11} \Delta \ln P_{USt} + n_{12} LENT + n_{13} \Delta \ln P_{Poult} + n_{14} \Delta \ln P_{salt} + n_{15} GAP + u_t$$

The lagged transform model (LTM)

If the ECM cannot be applied because the result in Engle-Ganger regression illustrates the residual ε_t in spurious model is non-stationary, in this case, we will use the estimate of first differenced model and the lagged transform model.

The lagged model is contributed by separation of dependent and independent variables in the spurious model.

$$y_t - y_{t-1} = \alpha_0 + \alpha_1 X_1 + \alpha_1 X_{t-1} + \alpha_2 Z_t + \alpha_2 Z_{t-1} + \varepsilon_t$$
$$\Leftrightarrow y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 X_t + \beta_3 X_{t-1} + \beta_4 Z_t + \beta_5 Z_{t-1} + \varepsilon_t^{LTM}$$

The LTM model is derived from ECM model with lags of both dependent and independent variables. The effect of X_t and Z_t over two periods is $\beta_2+\beta_3$ and $\beta_4+\beta_5$, respectively (Duc et al, 2008).

The estimation of the equation (4) by LTM is:

$$\ln P_{Vt} = \lambda_0 + \lambda_1 \ln E_t + \lambda_2 \ln E_{t-1} + \lambda_3 ANTI + \lambda_4 \ln Pfuel_t + \lambda_5 \ln Pfuel_{t-1} + \lambda_6 WTO + \lambda_7 SEED$$
$$+ \lambda_8 HACCP + \lambda_9 \ln P_{Chinat} + \lambda_{10} \ln P_{Chinat-1} + \lambda_{11} \ln P_{mealt} + \lambda_{12} \ln P_{mealt-1} + \lambda_{13} LABEL + \lambda_{14} \ln Y_{USt}$$
$$+ \lambda_{15} \ln Y_{USt-1} + \lambda_{16} \ln P_{USt} + \lambda_{16} \ln P_{USt-1} + \lambda_{17} \ln P_{Poult} + \lambda_{18} \ln P_{Poult-1} + \lambda_{19} \ln P_{salt} + \lambda_{20} \ln P_{salt-1} + n_{21} GAP + e_t^{LTM}$$

All collected data were subjected to statistical analysis using the Excel, SPSS and Eview software.

CHAPTER 4: RESULTS AND DISSCUSSION

4.1. Data description statistics and the Unit root test to check the stationary of variables

Before we present the estimations of econometric models, we now illustrate the data description for all continuous variables in the reduced form model in the table below

Table 3.1. Data Descriptions

Name of variables	Explanation for variables		Minimum	Maximum	Mean	Std. Deviation
Pv	Vietnamese Catfish export price	$/kg	1.82	5.19	3.0708	0.62586
Pfuel	Fuel price	$/barrel	10.75	132.55	53.2885	29.51676
Psal	Price of salmon	$/kg	2	8	4.22	1.192
Ppoul	Price of poultry	$/kg	57	90	73.30	10.276
Pchina	China catfish price	$/kg	1.874	5.875	3.388	0.889
Pmeal	Price of fishmeal	$/metric ton	381	1,961	929.41	418.196
E	exchange rate VND/USD	VND	13,879	20,880	15,969.857	1,861.258
Yus	US Income per capita	USD	32,213	49,517	41,558.52	5,453.494
Pus	US catfish price	$/kg	5.2029	9.987	6.291	0.974

To check the stationary of the variables, we use the unit root test by Eviews software 6.0. The result shows that, the test value all variables are non-stationary (the significant level of the test-statistic value greater than 10%), except the Vietnamese catfish export price. We, thus, change the variables to the logarithm form and test the stationary at level. Unit root test presents the similar result. The variables are not stationary at zero order. These results make us change the variables to the logarithm first-differenced form. The results of unit root test show that all variable are stationary in the logarithm first-differenced form.

Unit root test results

Therefore, the function (4) will be estimated by the first difference form model or ECMs model or lagged transformation

Table 3.2. The result of unit root test

Variables	Normal form		Logarithm form			
	Level		Level		First differentiated	
	Test statistic value	Prob.	Test statistic value	Prob.	Test statistic value	Prob.
Pchina	-0.825	0.809	-0.783	0.821	-10.946	0.000
Fuel	-1.672	0.443	-2.180	0.215	-9.507	0.000
Psal	-1.143	0.698	-1.053	0.733	-7.516	0.000
Exchange rate	2.927	1.000	2.381	1.000	-10.258	0.000
Pus	-1.133	0.702	-0.820	0.810	-4.521	0.000
Yus	-0.971	0.763	-1.395	0.584	-14.222	0.000
Ppoul	-0.989	0.756	-1.153	0.694	-7.057	0.000
Pmeal	-1.052	0.734	-0.918	0.780	-9.083	0.000
Pv	-2.633	0.089	-2.608	0.094	-16.176	0.000

4.2. The impacts of NTBs on Vietnamese catfish export price in the short run

In this part, we have presented our econometric model results to evaluate the effects of NTBs that were imposed by the US on the Vietnamese catfish export price in the short run and long run. Since data are only stationary at differenced form, it makes us to employ the logarithm first differenced model, ECMs model to estimate these impacts. The Engel Granger test indicates the reliability of ECMs model. Thus, the application of the lagged transformation model is not necessary. However, we also present the LTM estimated results in the table 3.5.

After test the stationary of the variables in the empirical model, we now test the Engel-Granger test to check the reliable of model will be used. As we presented in the data analysis part, if the result of Engel Granger test shows that the coefficient a_1 of the regression: $\Delta \varepsilon_t^s = a_1 \varepsilon_{t-1}^s + \phi_t$ is less than 1 and it has statistic significant, the ECMs model will be employed to estimate the empirical model.

Table 3.3. The results of Engel Ganger test

Variable	Coefficients	t-value	Sig.
(Constant)	0.001	0.127	0.899
Lagged of residual	-0.648	-8.604	0.000
R-square	0.326	Durbin-Watson	2.043
Prob.	0.000		

Table 3.3 presents the results of Engel Granger test. The coefficient of lagged of residual is less than 1 and it has significant at 99% confident level. The Durbin Watson test value is 2.036. That means it has no autocorrelation in this regression model. The model's R-square is 34.6% with significant level 1%. Therefore, the application of ECMs model to evaluate the relationship of Vietnamese catfish price and all of independent variables is reliable.

Table 3.4. The effects of NTBs on Vietnamese catfish export price in the short run

Name of variables	Differenced model		ECMs in short run	
	Coefficient	t-value	Coefficient	t-value
Constant	-0.030	-.968	-.015	-.566
Catfish price in China	-0.005	-.107	.022	.519
Price of fishmeal	-0.007	-.036	-.047	-.297
Price of poultry	0.024	.040	.516	1.016
The US Income per capita	0.798	.747	-.472	-.511
The US catfish price	0.821***	1.801	.984**	2.538
Exchange rate	-0.108	-.098	.408	.434
Price of salmon	0.000	.002	.138	1.254
Fuel price	0.119	1.215	.102	1.219
LABEL	0.013	.431	.016	.622
WTO	0.009	.218	-.001	-.022
ANTI	-0.006	-.220	-.006	-.263
SEED	0.017	.429	.001	.031
HACCP	0.009	.176	-.030	-.662
GAP	-0.018	-.277	.024	.434
Error correction term			-.581	-7.431
R square	0.051		0.320	
Durbin-Watson	2.611		2.037	

All continuous variables in logarithm first differenced form
, **, * present the significant level at 1%, 5%, 10% respectively*

Table 3.4 indicates the results of ECM models to test the impacts of the independent variables on the Vietnamese catfish export price in the short run. The idea behind of ECMs model is that the residual in the spurious model affects the difference form of dependent variables in the spurious model (Duc et al, 2008). The R-squares of the model is 32.4%.. The Durbin Watson test result is nearly 2. The test for heteroskedasticity shows that the residual's variance is constant[1].

The coefficients of the variables, in the short run, indicated that the largest factor effect that affects the Vietnamese catfish price is the US catfish price. It is significant at 5% level. This result is supported by the finding of Quagrainie and Engel (2002). Quagrainie and Engel (2002) concluded that the US domestic frozen catfish fillets play a significant role in the dynamic price of imported catfish. The coefficient of the US catfish price variable in the result of the model present a positive effect on the Vietnamese catfish export price. In the condition that other factors are constant, if the US catfish price increase by 1%, the Vietnamese catfish price will increase by 0.984%. However, the less significant of NTBs variables and the significant of error correct term at 1% significant level in the short run ECM model derive us to calculate the effects in long run (Duc, 2010).

[1] *See appendix 2*

In the table 3.4, we also present the estimated results of first differenced model to compare with the results of ECMs model in the short run. The results of first differenced model give a similar result that in the short run, the US catfish price has an important role in the changes of Vietnamese catfish export price.

Based on the results of ECMs model in the short run, we have the given equation for the Vietnamese catfish export price: $\Delta \ln P_{Vt} = 0.984 \Delta \ln P_{USt} - 0.581 \varepsilon^{s}_{t-1} + e_t$

We now present the estimated equation of spurious model (see the estimated results in the appendix 2):

$$\ln P_{Vt} = 23.396 - 1.63 \ln E_t - 0.153 ANTI + 0.131 WTO - 0.202 SEED + 0.101 \ln P_{Chinat} + 0.268 \ln P_{mealt} - 1.058 \ln Y_{USt} + 1.119 \ln P_{USt} + 0.185 \ln P_{salt} + 0.172 GAP + \varepsilon^{s}_{t}$$

The estimated coefficient of ECMs model in long run is derived from spurious model and ECMs model in the short run. We substitute the ε^{s}_{t-1} in the short run ECM model by the equation below:

$$\varepsilon^{s}_{t-1} = \ln P_{Vt-1} - (23.396 - 1.63 \ln E_t - 0.153 ANTI + 0.131 WTO - 0.202 SEED + 0.101 \ln P_{Chinat} + 0.268 \ln P_{mealt} - 1.058 \ln Y_{USt} + 1.119 \ln P_{USt} + 0.185 \ln P_{salt} + 0.172 GAP)$$

Then, the estimated equation of ECMs models in the short run can be rewritten:

$$\ln P_{Vt} - \ln P_{Vt-1} = 0.984(\ln P_{USt} - \ln P_{USt-1}) - 0.581(\ln P_{Vt-1} - (23.396 - 1.63 \ln E_{t-1} - 0.153 ANTI + 0.131 WTO - 0.202 SEED + 0.101 \ln P_{Chinat-1} + 0.268 \ln P_{mealt-1} - 1.058 \ln Y_{USt-1} + 1.119 \ln P_{USt-1} + 0.185 \ln P_{salt-1} + 0.172 GAP)) + e_t$$

The results of ECM model in the long run is demonstrate with the insignificant variables are ignored.

The reduced equation of ECMs model in the long run is:

$$\ln P_{Vt} = 13.535 + 0.984 \ln P_{USt} - 0.334 \ln P_{USt-1} - 0.947 \ln E_{t-1} - 0.089 ANTI + 0.0761 WTO - 0.117 SEED + 0.059 \ln P_{Chinat-1} + 0.156 \ln P_{mealt-1} - 0.6147 \ln Y_{USt-1} + 0.108 \ln P_{salt-1} + 0.099 GAP + 0.419 \ln P_{Vt-1} + e_t$$

The coefficient of the independent variables is equal to the sum of coefficient of variables at the time t and t-1. The signs of the estimated results are expected. In the long run, an 1% increase in the price of fishmeal will lead to 0.156% increase of the Vietnamese catfish price. This means, the increase in the input cost leads to the higher price of Vietnamese catfish. The same explanation for variable "seed" in our model, after Vietnam applied the producing of artificial fingerling, the Vietnamese catfish export price decrease 11.7%.

An 1% increase in the US catfish price causes of 0.65% increase if the Vietnamese catfish price, instead of 0.984% in the short-term. It indicates that the Vietnamese catfish is an alternative for the US catfish. This result is almost the same with the conclusion of Duc (2010), Quagraine and Carole (2002).

The negative effects of the US income per capita indicates that catfish is the inferior goods as our expectation.

Exchange rate has a negative impact on the Vietnamese catfish export price. The coefficient in the result of the long run ECM model shows that when the exchange rate between Vietnam Dong and U dollar increase by 1%, the Vietnamese catfish export price decrease by 0.947%. The result is reasonable since the P_v used in our model is in US dollars. An appreciation of VND means the price in US dollar is lower or we also can say that the increase of exchange rate means the depreciation of VND. Then, it is cheaper for US consumers to buy Vietnamese catfish in US dollar. This conclusion was also found by Giap and Jolly (2010).

The positive effect of the price of salmon on the Vietnamese catfish export price present the salmon is the substitute good for Vietnamese catfish. The 1% increase in the salmon price can create the increase 0.108% in the Vietnamese catfish price.

After joining the WTO, the Vietnamese catfish export price increase 7.6%. It is resonable with our initial expectation.

Duc (2010) found that after antidumping tariff of the US became effective, in the long run, the Vietnamese catfish export price decrease 23.7%. Our results also indicates the negative effects of antidumping on Vietnamese catfish export price but with the lower level. The coefficient of the antidumping variable in the long run ECM model indicates that after antidumping tariff is imposed on Vietnamese catfish, the export price of this product decreases about 8.9%. This result is also supported by other related researches about the imposing of antidumping on shrimp (Beaulieu, 2005; Nigel, 2004; Kinnucan, 2003; Kinnucan and Myrland, 2006); tuna (Nigel, 2004). The results in the research of Nigel (2004) also found that a year after (from 2002 to 2003) antidumping tariff imposed by the US, the export price of Vietnamese catfish in the US market dropped 5% this product. In the comparison with the salmon case after antidumping tariff imposed by the EU, the Chilean salmon export price to the EU decrease 4.2% in the export price of imported salmon to EU market (Kinnucan and Myrland, 2006).

The labeling law is less significant on the export price of Vietnamese catfish in long run. It is different from the research of Duc (2010) with the negative effect on Vietnamese catfish export price to the US from 1999 to 2005. One reason for the different result is that we use the data from 1999 to 2011. The US is a large market, this "shock" will make the negative effects on the Vietnamese catfish in a short time. The suddenly changes of the name label in the short term make more difficulty in the identification of Vietnamese catfish in the US market. Vietnamese catfish under the labeling law has to change the name of "catfish" to "tra" or "basa" in the US market. After labeling law, Vietnamese catfish might become more well known in the ROW markets (Nigel, 2004). It creates more opportunities to expand their market share in the ROW market (Binh, 2006; Nigel, 2004; Duc, 2010). Additional, Quagrainie and Engel (2002) also found that the US consumers prefer to purchase the imported catfish because its lower price and in the long run, the Vietnamese catfish import continue increase. Thus, as a joint result, it is possible that the labeling law has not greatly impact on the price of Vietnamese catfish exported in the long run. Therefore, the labeling law is not an effective tool to protect the domestic US catfish industry.

The HACCP and GLOBAL GAP are the certificates which Vietnamese catfish producers have to obtain to be accepted in the US and other markets. In the estimation of ECMs model in the long run indicates the application of HACCP standard seems that less significant for the export price of Vietnamese catfish. This finding is difference with that given by previous researches of Anh (2009), Baier and Bergstrand (2007), Grant and Lambert (2008) which employed the Gravity model to estimates the effect of HACCP standard. The difference may come from the difference model identification.

Otherwise, the result of ECM model shows that the application of GLOBAL GAP in producing process can create a positive effect on the Vietnamese catfish export price in the long run. After the GLOBAL GAP starts to be applied in Vietnamese catfish industry, the export price of the frozen catfish fillet increases by 9.9%. It is not expected. This might be explained because in the long run, the Vietnamese catfish products that are produced under GLOBAL GAP standard can get the higher consumer's belief.

Table 3.5. The results of LTM model

Name of variables	Coefficient	t-value
Constant	14.239	2.812
Catfish price in China	0.042	0.756
Price of fishmeal	-0.013	-0.080
Price of poultry	0.458	0.850
The US Income per capita	0.293	0.299
The US catfish price	0.951**	2.143
Exchange rate	0.273	0.284
Price of salmon	0.220*	1.675
Fuel price	0.079	0.859
LABEL	0.008	0.166
WTO	0.010	0.193
ANTI	-0.128**	-2.406
SEED	-0.107**	-2.420
HACCP	-0.040	-0.750
GAP	0.138**	2.194
Lagged of dependent variable	0.402***	5.067
Lagged of catfish price in China	0.065	1.229
Lagged of price of fishmeal	0.249	1.427
Lagged of price of poultry	-0.231	-0.424
Lagged of the US Income per capita	-0.728	-0.787
Lagged of The US catfish price	-0.190	-0.418
Lagged of exchange rate	-1.591	-1.602
Lagged of price of salmon	-0.117	-0.933
Lagged of fuel price	-0.161**	-1.825
R-squares	0.852	
Durbin Watson	2.081	

All continuous variables in logarithm form

, **, * present the significant level at 1%, 5%, 10% respectively*

We present the LTM model for the comparison with the ECMs model in the long run. The results demonstrate that the results of NTBs variables are similar with ECMs in long run. The antidumping has negative effect on the Vietnamese catfish export price in the long run. The GLOBAL GAP variable is not expected also. The results show that the application of GLOBAL GAP has positive effects on Vietnamese catfish export price.

CHAPTER 5. SUMMARY AND CONCLUSION

5.1. Thesis summary

The aims of this research are to evaluate the effects of NTBs imposed by the US on Vietnamese catfish export price by the econometric models in the theoretical framework of demand and supply equilibrium. Time-series monthly data from 1999 to 2011 was used for the empirical purpose. Besides the NTBs, some other macroeconomic indicators were also added into the estimated models to identify their impact on the Vietnamese catfish export price. Vietnamese frozen catfish fillets form was chosen due to its dominant share in the exports. The global market of the Vietnamese catfish is aggregated to two markets: the US and the ROW.

The estimated results of econometric models indicate that in the short run, the NTBs (including technical barriers) are not significant on the changes of the export price of Vietnamese catfish. However, the NTBs, in a general, indicate a negative effect on the export price of Vietnamese catfish in the long run. GLOBAL GAP standard is set on Vietnamese catfish products as a technical barrier. It was expected to have a negative effects in the long run. However, the estimated results are not as our expectation. It indicates the application of GLOBAL GAP in producing process of Vietnamese catfish make the Vietnamese catfish export price increase.

In the macroeconomics were added into the models, the US catfish price has positive effects on the Vietnamese frozen catfish fillets both in the short and long run. It means that the Vietnamese catfish can play as the alternative for the US catfish. The joining of WTO and the price of salmon also indicate positive effects on the Vietnamese catfish price in the long run. The exchange rate has the negative effect on the Vietnamese catfish export price.

5.2. Conclusion remark

The main findings of our research are:

i) The aim of NTBs is to restrict the imported volume and protect the domestic industry. The lower demand for the imported goods as a result of NTBs causes negative effects on the price of imported products. This paper tested the case of NTBs in the world import of the Vietnamese catfish. The estimated results suggested the antidumping of the US have the negative effects on the export price of Vietnamese catfish in the long run. However, the limitation of the paper was that the effects of NTBs are less significant on the Vietnamese

catfish price in the short term. The reason may be depend on the data and the estimated models form.

ii) The estimated results indicated that the application of GLOBAL GAP has the positive effect to increase the Vietnamese catfish export price in the long run. It is not expected. We argued that the application of this standard might improve the belief of consumer for Vietnamese catfish products. In fact, the Pangasius (in this paper, we called "Vietnamese catfish) has been raised many countries of Mekong River. Meanwhile, the Vietnamese catfish was still young (Hanh, 2009). Therefore, if our argument is possible, the application of GLOBAL GAP standard may be a strong recommendation for the sustainable development of the Vietnamese catfish industry to improve the competitive advantages with other countries and in Asia. This suggestion is supported by Binh (2006), Phuong and Oanh (2010).

iii) The negative effect of exchange rate on the Vietnamese catfish export price is also an important suggestion to the Vietnam State managers in the decision making process of the finance policies to avoid the injury to Vietnamese catfish industry.

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APPENDIX 1

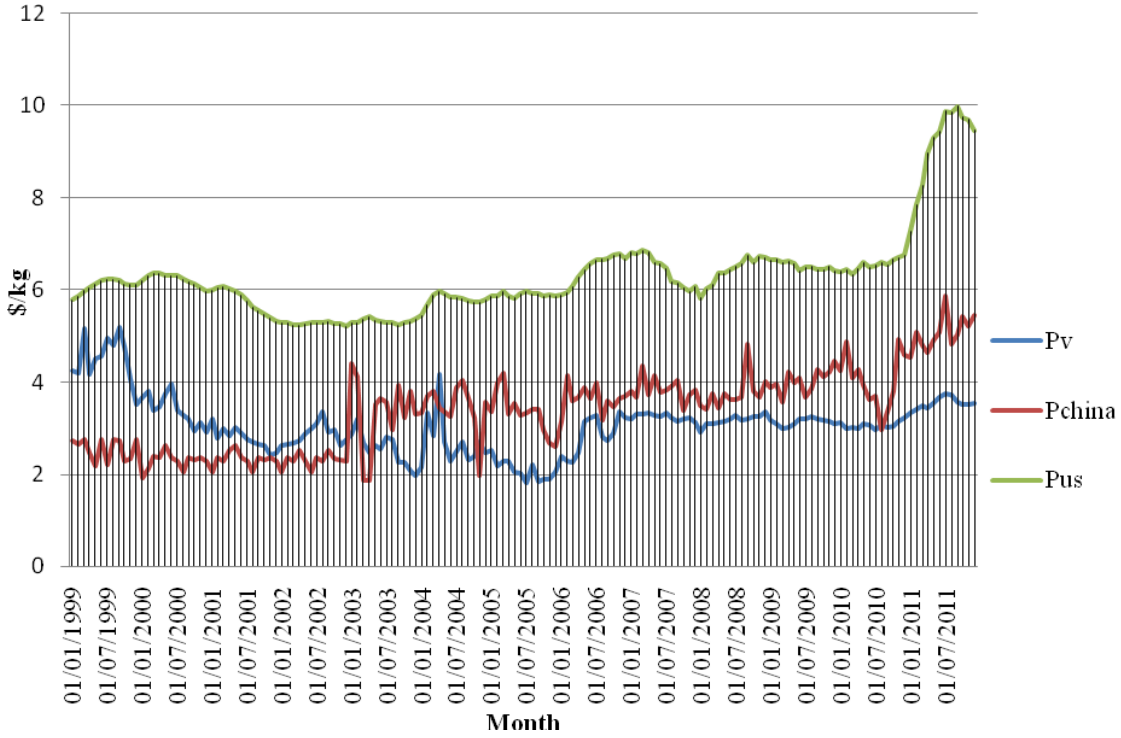

Figure 1. The catfish price of Vietnamese catfish, China and the US from 1999 to 2011

(Source: USDA, NMFS and Vietnam Custom)

APPENDIX 2. THE ESTIMATED RESULTS

SPURIOUS MODEL
Logarithm-logarithm model

Model Summary(b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.894(a)	.799	.779	.094320318969153	1.286

a Predictors: (Constant), GAP, SEED, lnPus, LABEL, lnPsal, lnPchina, ANTI, WTO, lnE, lnPFuel, HACCP, lnPmeal, lnPpoul, lnYus
b Dependent Variable: lnPv

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.987	14	.356	40.038	.000(a)
	Residual	1.254	141	.009		
	Total	6.241	155			

a Predictors: (Constant), GAP, SEED, lnPus, LABEL, lnPsal, lnPchina, ANTI, WTO, lnE, lnPFuel, HACCP, lnPmeal, lnPpoul, lnYus
b Dependent Variable: lnPv

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	23.296	4.729		4.926	.000		
	lnPchina	.101	.057	.136	1.754	.082	.237	4.213
	lnPmeal	.268	.078	.602	3.444	.001	.047	21.405
	lnPpoul	.239	.245	.168	.974	.331	.048	20.775
	lnYus	-1.058	.426	-.714	-2.486	.014	.017	57.872
	lnPus	1.119	.131	.764	8.542	.000	.178	5.610
	lnE	-1.630	.260	-.894	-6.271	.000	.070	14.251
	lnPsal	.185	.070	.251	2.634	.009	.157	6.377
	lnPFuel	-.072	.050	-.209	-1.433	.154	.067	14.964
	LABEL	.047	.049	.097	.975	.331	.145	6.914
	WTO	.131	.053	.318	2.442	.016	.084	11.877
	ANTI	-.153	.055	-.367	-2.785	.006	.082	12.170
	SEED	-.202	.044	-.269	-4.614	.000	.420	2.384
	HACCP	-.073	.058	-.169	-1.272	.205	.080	12.454
	GAP	.172	.064	.405	2.691	.008	.063	15.887

a Dependent Variable: lnPv

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.75177419	1.561737	1.1019169	.179366668	156
Residual	-.2440991	.448573	.00000000	.0899599008	156
Std. Predicted Value	-1.952	2.564	.000	1.000	156
Std. Residual	-2.588	4.756	.000	.954	156

a Dependent Variable: lnPv

ENGEL-GRANGER TEST
For the residual of spurious model

Model Summary(b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.571(a)	.326	.322	.08429	2.043

a Predictors: (Constant), lagreisd
b Dependent Variable: dresid

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.526	1	.526	74.029	.000(a)
	Residual	1.087	153	.007		
	Total	1.613	154			

a Predictors: (Constant), lagreisd
b Dependent Variable: dresid

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.001	.007		.127	.899		
	lagreisd	-.648	.075	-.571	-8.604	.000	1.000	1.000

a Dependent Variable: dresid

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.2900	.1591	.0011	.05844	155
Residual	-.22396	.41982	.00000	.08401	155
Std. Predicted Value	-4.981	2.704	.000	1.000	155
Std. Residual	-2.657	4.981	.000	.997	155

a Dependent Variable: dresid

ECM IN THE SHORT RUN

Model Summary(b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.566(a)	.320	.247	.082837657073443	2.037

a Predictors: (Constant), lagreisd, HACCP, dlnPmeal, dlnChina, dlnPpoul, dlnPFuel, dLnPus, dlnYus, dlnPsal, LABEL, dlnE, SEED, ANTI, WTO, GAP
b Dependent Variable: dlnPv

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.449	15	.030	4.362	.000(a)
	Residual	.954	139	.007		
	Total	1.403	154			

a Predictors: (Constant), lagreisd, HACCP, dlnPmeal, dlnChina, dlnPpoul, dlnPFuel, dLnPus, dlnYus, dlnPsal, LABEL, dlnE, SEED, ANTI, WTO, GAP
b Dependent Variable: dlnPv

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.015	.026		-.566	.572
	dlnChina	.022	.042	.037	.519	.605
	dlnPmeal	-.047	.158	-.022	-.297	.767
	dlnPpoul	.516	.508	.080	1.016	.311
	dlnYus	-.472	.924	-.039	-.511	.610
	dLnPus	.984	.388	.193	2.538	.012
	dlnE	.408	.941	.033	.434	.665
	dlnPsal	.138	.110	.094	1.254	.212
	dlnPFuel	.102	.083	.094	1.219	.225
	LABEL	.016	.025	.067	.622	.535
	WTO	-.001	.035	-.004	-.022	.982
	ANTI	-.006	.022	-.029	-.263	.793
	SEED	.001	.033	.003	.031	.976
	HACCP	-.030	.046	-.146	-.662	.509
	GAP	.024	.054	.117	.434	.665
	lagreisd	-.581	.078	-.549	-7.413	.000

a Dependent Variable: dlnPv

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.258269	.1244566	-.001168	.05399610	155
Residual	-.1965016	.4070056	.0000000	.07870005	155
Std. Predicted Value	-4.761	2.327	.000	1.000	155
Std. Residual	-2.372	4.913	.000	.950	155

a Dependent Variable: dlnPv

FIRST DIFFERENCED MODEL

Model Summary(b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.226(a)	.051	-.044	.097501391667596	2.611

a Predictors: (Constant), GAP, dlnChina, dlnPmeal, dlnPpoul, dlnPsal, dlnYus, dLnPus, dlnPFuel, dlnE, LABEL, SEED, ANTI, WTO, HACCP
b Dependent Variable: dlnPv

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.072	14	.005	.540	.905(a)
	Residual	1.331	140	.010		
	Total	1.403	154			

a Predictors: (Constant), GAP, dlnChina, dlnPmeal, dlnPpoul, dlnPsal, dlnYus, dLnPus, dlnPFuel, dlnE, LABEL, SEED, ANTI, WTO, HACCP
b Dependent Variable: dlnPv

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.030	.031		-.968	.335
	dlnChina	-.005	.049	-.009	-.107	.915
	dlnPmeal	-.007	.186	-.003	-.036	.972
	dlnPpoul	.024	.593	.004	.040	.968
	dlnYus	.798	1.068	.065	.747	.456
	dLnPus	.821	.456	.161	1.801	.074
	dlnE	-.108	1.105	-.009	-.098	.922
	dlnPsal	.000	.128	.000	.002	.998
	dlnPFuel	.119	.098	.110	1.215	.226
	LABEL	.013	.030	.054	.431	.667
	WTO	.009	.041	.046	.218	.828
	ANTI	-.006	.026	-.029	-.220	.826
	SEED	.017	.039	.045	.429	.669
	HACCP	.009	.053	.046	.176	.860
	GAP	-.018	.064	-.088	-.277	.782

a Dependent Variable: dlnPv

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.06652	.072752	-.00116798	.021609735	155
Residual	-.44412	.401714	.00000000	.092963929	155
Std. Predicted Value	-3.024	3.421	.000	1.000	155
Std. Residual	-4.555	4.120	.000	.953	155

a Dependent Variable: dlnPv

LAGGED TRANSFOMATION MODEL

Model Summary(b)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.923(a)	.852	.826	.083117456428745	2.081

a Predictors: (Constant), LagLnPFuel, laglnPv, SEED, LABEL, HACCP, lagLnPus, lagLnPchina, lnPsal, lnPchina, WTO, ANTI, lnE, GAP, lnPmeal, lagLnPpoul, lagLnPsal, lnPFuel, laglnYus, lnPus, lnPpoul, lagLnPmeal, lagLnE, lnYus

b Dependent Variable: lnPv

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.215	23	.227	32.818	.000(a)
	Residual	.905	131	.007		
	Total	6.120	154			

a Predictors: (Constant), LagLnPFuel, laglnPv, SEED, LABEL, HACCP, lagLnPus, lagLnPchina, lnPsal, lnPchina, WTO, ANTI, lnE, GAP, lnPmeal, lagLnPpoul, lagLnPsal, lnPFuel, laglnYus, lnPus, lnPpoul, lagLnPmeal, lagLnE, lnYus

b Dependent Variable: lnPv

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	14.239	5.063		2.812	.006		
	lnPchina	.042	.055	.057	.756	.451	.199	5.013
	lnPmeal	-.013	.167	-.030	-.080	.937	.008	127.165
	lnPpoul	.458	.540	.324	.850	.397	.008	128.709
	lnYus	.293	.982	.198	.299	.766	.003	388.450
	lnPus	.951	.444	.655	2.143**	**.034**	.012	82.724
	lnE	.273	.962	.150	.284	.777	.004	249.148
	lnPsal	.220	.132	.301	1.675*	**.096**	.035	28.648
	lnPFuel	.079	.092	.229	.859	.392	.016	62.949
	LABEL	.008	.046	.016	.166	.868	.128	7.811
	WTO	.010	.052	.025	.193	.847	.069	14.411
	ANTI	-.128	.053	-.308	-2.406**	**.018**	.069	14.496
	SEED	-.107	.044	-.138	-2.420**	**.017**	.346	2.887
	HACCP	-.040	.053	-.093	-.750	.454	.073	13.711
	GAP	.138	.063	.329	2.194**	**.030**	.050	19.890
	laglnPv	.402	.079	.405	5.067***	**.000**	.177	5.652
	lagLnPchina	.065	.053	.088	1.229	.221	.219	4.560
	lagLnPmeal	.249	.174	.563	1.427	.156	.007	137.841
	lagLnPpoul	-.231	.544	-.162	-.424	.672	.008	129.715
	laglnYus	-.728	.925	-.493	-.787	.433	.003	348.053
	lagLnPus	-.190	.456	-.127	-.418	.677	.012	82.085
	lagLnE	-1.591	.993	-.863	-1.602	.112	.004	256.975
	lagLnPsal	-.117	.126	-.160	-.933	.352	.038	26.175
	LagLnPFuel	-.161	.088	-.473	-1.825**	**.070**	.017	59.377

a Dependent Variable: lnPv

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.69334101676941	1.58571124076844	1.09967594603520	.18401469366 8060	155
Residual	-.18104285 0017548	.40275126 6956330	.00000000 0000003	.07665977351 3729	155
Std. Predicted Value	-2.208	2.641	.000	1.000	155
Std. Residual	-2.178	4.846	.000	.922	155

a Dependent Variable: lnPv