Thesis for the Degree of master in Food security and Agricultural Development

Effect of trade liberalization on food basket supply in HAITI

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THE GRADUATE SCHOOL OF KYUNGPOOK NATIONAL UNIVERSITY

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The Graduate School Council

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Dedication

This thesis is dedicated to my parents for their endlessly effort and endeavor to support my education. They are always there to encourage me and their trust in me is undeniable. Without them i am not sure that I would be in that stage of my life. Also I dedicate that work to my siblings, who also believe in my abilities, although we live far apart now, they always show their interest in my progress and knowing that all these beloved people believed in me is such a blessing for my career advancement.

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Abstract

Countries integration into the WTO has raised debates as whether to whom does free trade profit. Since the creation of this worldwide institution, certain authors have remained skeptical to its eventual positive incidence on developing and least developed countries. Agricultural sector is not an exception, it is one of the important economic sector that is directly concerned by the neoliberal economy. Likewise, it is ensued that many authors think that Haiti's integration to the WTO as having a negative impact on the agriculture. The present study has its focus on the food basket of the country which is composed of 6 products: rice, maize, beans, oil, sugar, and wheat flour. The thesis aims to explain whether and how trade liberalization affects the domestic supply and the import of the mentioned goods, it also highlights other factors that determine food basket supply. The main assumptions were that neoliberal policy has the consequence of reducing domestic supply of food and increasing the country's import in them. Time series data from 1975 to 2013 were used for analysis and the data were collected using FAO and World Bank and Knoema yearly data. The results don't show any significant evidence of neither positive nor negative effect of trade liberalization on rice, beans and wheat flour. However, maize import, raw sugar production and oil were affected by trade liberalization. The study reveals that trade liberalization has decreased the country's import in maize; however it is responsible for the drastic decrease of sugar production in the country. And when it comes to oil, it makes the country becomes more dependent of import.

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List of Abbreviations

ASEAN: Association of South-east Asian Nation

CARICOM: Carribean Common Market

CNSA: Conseil National de la Sécurité Alimentaire

ECOSOC: Economic and Social Council

FAO: Food and Agriculture Organization

GATT: General Agreement on Tariffs and Trade

ITO: International Trade Organization

KOICA : Korea international Cooperation agency

MARNDR: Ministère de l'Agriculture des Ressources Naturelles et Du Développement Rural

NAFTA: North American Free Trade Agreement

UN: United Nations

USAID: United States Agency for International Development

WTO: World Trade Organization

I- Introduction

The republic of Haiti is known as one of the most liberalized in the region of Latin America and also the most opened economy from all the least developed countries (Clapp, 2014; Gauthier & Moita, 2011). The country has been officially member of the WTO on January 1996; and since its adhesion to this organization, debates have been opened nationally in terms of the consequences of its membership to the domestic overall economy. Before its integration in the WTO, imports represented an important mean to fuel the government's tax base; however the state had to forego a large part of that tax since its membership. For instance, 60% of products imported that had a taxation rate between 0 and 10%, would have a zero tariff (Benjamin, 2016). In terms of its agricultural production, the country was self-sufficient in rice production 37 years ago and local farmers didn't have to compete with imported rice. Baptiste mentioned that tariff reduction on rice from 50% to 3%, had the consequence of opening the market for imported rice, with the negative consequence of discouraging the domestic farmers, not being able to support the cumbersome situation of rivaling the imported rice, which is subsidized by the US government. It is obvious that in such context where the population is growing at a high rate, our rice production wouldn't satisfy the growing demand in a country where only 2% of the land is irrigated (Mario Zappacosta, 2005). Market liberalization had a consequence on food substitute, where starch consumption rate was reduced and counterbalance by an increase of rice consumption. Actually, Haiti is ranked the 1st largest importing country of rice from the US in the Carribean region and one of the most in the world (Childs & Livezey, 2006). Rice import accounts for 28% of the national import value and is estimated at more than 200 million US dollars. Some authors think that the tariff cut also has the consequence of affecting the national food sovereignty and create a strong dependence to rice import and food aid to cover the excess of demand. As a matter of fact, the domestic food market is vulnerable to world price fluctuation; the food crisis of 2008 is a typical example of how precarious the agricultural sector is and how much dependent Haiti is via the world market (Mazzeo, 2009).

The reduction of taxes due to trade liberalization and the accession of many countries to the WTO are considered by more than one as an impediment to the food domestic production of developing ones. De Schutter (2011), a special rapporteur of the UN on right to food asserts that

putting some restrictions on importing food will facilitate the development of domestic food production and restricting unfair competition of exporting countries should be guaranteed to enable food self-sufficiency of importing countries. A major point that is also considered is that according to him, the WTO should give opportunities to developing countries to insulate their market for the volatility of prices of international markets. He also stated in his publication that any trade agreement shouldn't put restriction on a country to adopt any form a measure that could boost its national food security, and he pursues saying that a waiver to allow such measures should be taken into consideration.

Bhutta et al. (2008), Bloem and Pee (2010) are among authors whose interest was also to determine how food security could impact future income, he realized that when food security is not handled at the early age (first 3 years following birth), it could lead to health problems and also reduce future income of the affected ones. Another study in Guatemala was also conducted on girls between the age of 0-12 years old to see the effect of nutrition on their future offspring and as a result, those who received a good nutritional balance gave birth to healthier offspring, with higher weight-age and height-for-age than those who received a less nutritious and supplementary food. Food import has a consequence of reducing the dietary diversity scale as it is in the case of Haiti, the excessive rice import makes its price relatively lower comparing to the choice of combining different foods for a better diet and its easiness to be cooked gives it a predilection place in the food diet of the Haitians (Edelman et al., 2014).

Food aid also represents 8% of food availability in the country, it helps reducing hunger. Nevertheless, the condition in which aid is provided doesn't help boosting the development of the food system in the country and ensure food sovereignty (Raphy Favre, 2011). For hunger reduction with effectiveness and sustainability, the development of domestic food company is a better alternative than food aid supplied by the state and the latter is more efficient than international food assistance programs. Thus, it is important to prioritize policies that encourage domestic food system development; and international aid should be considered as the last resort to solve the problem of direct hunger (Lentz & Barrett, 2013). Indeed, beneficiaries seem to show preference to food aid produced locally over food imported as aid (Violette et al., 2013). For those authors like (Lesley Adams & Winahyu, 2006); Ninno and Dorosh (2003), the form of food aid is an important aspect impacting the level of food security. This latter, when given in

form of cash has a higher effect on dietetic value than the food assistance programs that give aid in nature. Moreover, a research conducted in Ethiopia concluded that local food aid could be 39 to 46% more cost effective than international aid and 6% more cost effective than local aid (L Adams & Kebede, 2005)

In Haiti, the food basket is constituted essentially with the rice, maize, corn, wheat flour, sugar and vegetal oil. Rice, maize and wheat represent 66% of the total kilocalories consumed per capita per day (1650 kilocalories). On a based on 1650kcal/capita/day, the share in energy provided is constituted as followed: Rice (32%), maize (17%), sugar (17%), wheat (17%), vegetal oil (11%) and beans (6%) (*Le panier alimentaire en Haiti*, 2012).

The region of "Vallée de l'Artibonite" in the country represents the main area of its production and accounts for 80% of the rice produced domestically. Rice sector faces different constraints in Haiti namely lack of financing, drought, the non-cleaning of the irrigation systems (McGuigan, 2006).

1.1- Problem statement

Haiti has a significant food dependence on international market today, its domestic supply only meets 43% of the population demand and the rest is imported with 52% purchased and 5% is given as food aid (Gauthier & Moita, 2011). Rice crops, staple food of the country, relies at 80% on import and the domestic market covers only 20% (Cohen, 2010). It is noteworthy to say that import tariff was an important source of income for Haiti to strengthen its economy more specifically the agricultural sector. However, this trend has completely changed ever since the integration of Haiti to the WTO (when it had to realize market liberalization for most of the products, and the tariff on rice which was at 50% before has since fallen at 3%); now Haiti depends on international financing at 60% for its national budget. From the 6 agricultural commodities composing the food basket, we expect to know which ones are impacted by trade liberalization so that better policy could be implemented to strengthen the domestic agriculture.

It is important to ask the following question, how does the reduction of import tariff affect the share of food basket produced domestically? Has trade liberalization contributed to increase the country's import for those commodities?

1.2- Purpose of the study

Trade liberalization is a very controversial topic in different countries and that is discussed by many scholars relating the overall effect on some countries. Through this study, Haitian food basket will be our sphere of interest to assess the post-hoc effect of the country's membership to the WTO. Through the study, we also aim to explain how tariff reduction affect the supply of the food basket, more specifically the overall effect on domestic production and import of the 6 agricultural commodities so that better agricultural policy could be implemented to either undertake negotiations to reduce it when causing a loss of currency by increasing import dependency or a tool to strengthen a commodity when increasing its domestic production. Besides this study will also show other factors that influence the supply of these 6 agricultural commodities.

1.3- General objective

The main objective of the research is to determine the effect of trade liberalization on food basket supply. For the present research, the focus will be on the following agricultural goods: rice, maize, sugar, beans, oil and wheat flour which constitute the food basket of Haiti.

Specific objectives

- Determine the change occurred in the production of the selected products mentioned above
- Determine the change in import consequent to trade liberalization
- Explore other factors that affect the food basket supply

1.4- Hypothesis

In the research framework, we will consider 2 hypotheses to appraise the effect of trade liberalization on the food basket.

1- Trade liberalization reduces domestic production of food basket
2- Trade liberalization increases the import of food basket

1.5- Theoretical framework

It is essential to consider both approaches regarding trade to understand the real effect of trade liberalization on the food basket in Haiti. The study period included the period of protectionism and the period of trade liberalization. We will consider 2 approaches, the first one which is pro-trade and the skepticism regarding free trade, more specifically protectionism.

1.5.1- Free trade theory

The classical theory of international trade comprises 3 main theories

1. The theory of mercantilism elaborated by William Petty, Thomas Mun and Antoine de Montchrétien model
2. The second one is the theory of Adam Smith which is called theory of absolute advantage
3. The theory of comparative advantage formulated by David Ricardo

1.5.1.1- The theory of mercantilism

This theory existed more than 300 years ago; it was based more on trade which was seen as a good mean to accumulate wealth. The goal was to develop states through trade development and growth. Their trade policy was export oriented (exception made for gold and other capital goods) while putting restrictions to import. They had a policy that subsidized export in the countries that they controlled and limited imports.

According to the theory of mercantilism, since the quantity of resources in the world is quite fixed, a country would be better off increasing its wealth needs by taking from another one; that is to say, a nation gain would entail another one's loss. And this wealth accumulation will be

done through increasing export to create trade margin and reduce import in exchange gold (Correa, 2001). That theory involved for instances:

1. Creating distortion to trade by imposing tariff barriers, quota and also non tariff barriers
2. Increasing disposal in silver and gold reserves at the expenses of other countries (bullionism). Note that at this period gold reserve was perceived as a way to increase wealth of a country.
3. Authorizing monopoly right to companies involved in shipping and trading
4. Supplying subsidies to industries involved in export and provide advantage for the overall markets.
5. Increasing investment in research and development to increase production and efficiency of domestic market.
6. Free-riding on intellectual property and copyright of foreign corporations.
7. Setting ceiling wage to reduce consumption but propel profits growth of merchant class.
8. Acquiring more colonies to exploit to create more wealth

1.5.1.2- Theory of absolute advantage

Developed on 1776 by the economist Adam Smith through his book the wealth of nations, that theory had also the intent to fill in the gap left by the theory of mercantilism. He stated that no nation can accumulate wealth through mercantilism because a country's import will be the other's export. According to that theory, a country should produce the good for which it has absolute advantage and export it, and import the one it doesn't have advantage. His theory fails to explain how a country that doesn't have absolute advantage could benefit from trade (Dima, 2010).

1.5.1.3- Theory of comparative advantage

Introduced by David Ricardo in 1817 and also known as the comparative cost theory, this latter stipulates that every country has the interest to produce the commodities for which it has the highest comparative advantage, considering its natural endowments such as capital, soil, transport just to name a few. Failling those endowments, a country has to produce the good and

services for which it has the lowest comparative disadvantage. And the excess should be imported from other countries when domestic demand is more than domestic supply. Unlike the theory of Adam Smith, both countries can mutually benefit from trade.

1.6- Limit of the study

One of our limits is the inaccessibility of historical import tariff data for each specific commodity. Hence, we had to use a dummy variable which would represent the situation before trade liberalization and with trade liberalization. We cannot tell at which level such tool should be fixed to be beneficial for the country, during the study; we will be able to evaluate how trade liberalization affects the food basket supply. Also the data were collected from some sources which presented some official and unofficial data which might contain some discrepancies.

II- Literature review

2.1- Trade organization

International trade has an important place in today's economy by bridging countries in goods and services exchange through trade since no country can operate within a vacuum especially to meet its citizen's needs. This form of exchange makes goods and services accessible at cheaper prices; however it creates unequal and unfair competition with domestic infant industries. In the world, trade is controlled by some regional organizations that are united with bilateral agreements namely CARICOM, NAFTA, ASEAN just to name a few; and finally, multilateral agreement like WTO, of which Haiti is a permanent member. Following are some historical information about its progress from GATT to Uruguay round and from this latter to WTO.

2.2- Trade rounds

After years of failures due to protectionism more specifically after world war II, leading developed countries in trade realized that it is no more efficient to support protectionism and decided to cancel trade distortion; thereby, UK and USA prepared a proposal on tariff and trade and submitted it to the ECOSOC regarding the settlement of an international trade body which name at this time was ITO. Then later on October 1947 in Geneva, with 21 countries that represented at this period 80 of the world trade, one text of GATT which objective was the reduction of tariffs on trade. An ITO Charter was prepared by a preparatory committee and later on the charter was voted in the capital of Cuba on 1948; as a reference to the place where it was voted, it was named Havana charter approved in 1948 at the conference in Havana, Cuba. That Charter was since referred to as the Havana Charter, also called the ITO Charter (Blank & Marceau, 1997).

2.2.1- GATT

From the period of April 1947 to September 1986, 8 rounds were already organized by GATT within this timeframe. In Geneva, was held the first round and 23 countries participated in it with the main objective of reducing tariff on trade. GATT was created during this time and countries made concessions that were estimated at 10 billion USD.

The second round was held in April 1949 and 13 countries were involved and thousands of concessions were made by the member countries on products to reduce tariffs. In the 3rd round, there were 38 countries.

In April 1949, in Torquay, England, 38 countries were involved in the third round of GATT. And from that round tariffs on different products were reduced to even lower than 25%. The 4th round of GATT had an outcome of tariff reduction that was estimated at more than 2 billion dollards. The 5th round held place in Geneva on 1960, and its outcome was even greater than the previous one, causing a reduction of more than 4.9 billion USD in tariff.

And for the 6th round, tariff reduction had a value that was 8 times greater than the reduction of the 5th one. The round was held in the same city and 62 countries participated. And it was during this round that the countries decided to put restriction and sanction on dumping. The penultimate round held place in Tokyo on 1972 with a hundred countries and achieved a reduction of tariffs with a value 60 times greater than the 5th round.

And finally, the 8th round was known as the Uruguay round because it was held in Uruguay, this round had treated additional issue on property rights like TRIMS and THRIPS. Its main outcomes can be highlighted as followed:

1. Agricultural subsidy reduction
2. Eliminate barriers on foreign investment
3. Include the protection of intellectual property

When it comes to agriculture, the result of the Uruguay round is remarkable; it reduces considerably distortion and trade barriers in market access, domestic support and export subsidies. The use of tariff-only as a policy is the best way to create market access if the level fixed is low, it is seen to be better than tariff-quota and this latter is less distorting than non-tariff barriers (Diakosavvas, 2001). The Uruguay round made noticeable change in 3 aspects:

Market access: distortions to trade were requested to eliminate and to be substituted by tariff ones and additionally countries were asked to decrease their current applied tariff.

Domestic support: Member countries were constrained to reduce their support to their domestic industries from the level in 1986-1989 base-periods. And the Uruguay round on agreement on agriculture provided a framework for determining which domestic policies distort trade and which should be reduced or eliminated (Knutson, Penn, & Boehm, 1995).

Export subsidies: another important point is that the countries were asked to reduce even forbid export subsidy for their domestic product so that fair trade could occur.

2.2.3- WTO

The world trade organization is an international was created on 1995 following the Uruguay round. It is constituted of 164 countries members and has as mission to regulate international trade, reduce tariffs and all distortions regarding trade. This organization is worldwide and controls 97% of international trade (Swiderska, Roe, Siegele, & Grieg-Gran, 2008).

WTO has since known strong critics by some opponents regarding its policies, it is said that there is lack of transparency during negotiations, and the real needs of developing countries are not taken into account. Some authors like Chang (2008) call it the club of the great.

2.3- Trade liberalization and economic growth

For many neoclassical economists, international trade is important to increase country efficiency. Adam Smith and David Ricardo opted for trade trough their respective theory of absolute and comparative advantage. Ricardo asserted that a country can involve in free trade because every country has at least an advantage comparative in one good for which it can exchange or failing to have comparative advantage in any good, the country can produce the good for which the disadvantage comparative is minimal. International trade is perceived as a mean to reduce food insecurity by supplying food in countries with limited capacity to cater for their domestic needs and it is perceived that protectionist measures on the market of good and services are always considered as inefficient for all actors (Clapp, 2014). According to WTO, protectionism inside a country is an impediment to food security and is not favorable to the farmer because it reduces their market size by losing the potential demand from international market. According to Manni and Afzal (2012) trade liberalization has the effect of bolstering economic growth by enabling countries to realize exchange with others.

However, some researchers have opposite opinions about trade liberalization. According to Chang (2008) Nobel Laureate in Economics, 2001, trade liberalization is a roadblock for economic development and doesn't propel economic growth in its early stage. He discussed that most of the actual developed countries were protectionist in the past. He advocated for the development and protection of infant domestic industries in developing countries because at their early stage, an industry cannot bear the harsh competition of the international producers which benefit from scale economies not to mention the support supplied by government to them in forms of subsidy. The author asserts in his book that the developed countries created organizations like WTO, OECD, World Bank, IMF just to name a few to fit and supply their needs and he considered them as bad Samaritans who kick the ladder they used to become the developed countries we know today. The development economist strongly believed that in the context of trade liberalization, it is extremely difficult for a country to develop and he argues that free trade hampers the economy of developing countries more than it propels. However, considering that some countries are already members of these organizations, enlightening the readers on how a country can proceed to strengthen their economy while still a member was not explained by the author, the author didn't tackle the problematic that would enable readers to know whether negotiating status is possible in such context. Also he doesn't explain how a country could develop in the context of WTO agreement.

Chang and Grabel (2004) are also authors who advocate for protectionist measures for developing countries. According to him, the theory of David Ricardo doesn't hold due to its unrealistic assumptions like immobility of labor and capital, which are not true due to the fact that in such globalized world, employees can travel and work abroad, transaction can be done online, capitals are mobile. Ricardo's theory also assumes that there is no externality, no cost of transportation which are also not true. Among other authors who were con to such theory is Daly (1993) who criticized that theory, and they don't think that trade liberalization is a good solution for developing countries.

2.4- Trade liberalization and domestic food market

Some studies prove that trade liberalization is good for the economy especially when domestic market fails to satisfy domestic demand; it is thought that a decrease in the import tariff has a positive impact on the economy, because it increases the GDP and investment (Elsheikh,

Elbushra, & Salih, 2015). Similarly, other authors like Martin and Anderson (2011) mention that when there are barriers to trade, that negatively affect the food market; for instance the food crisis from 2006 to 2008 had a consequence of increasing the price of rice to 45% and the price of wheat to 30%. De Silva, Malaga, and Johnson (2013) assessed the impact of trade liberalization on agriculture, and his finding proved that there is a positive correlation between trade openness and agricultural productivity.

Sayaka, Sumaryanto, and DiGiuseppe (2007) were also interested in studying the impact of import tariff policy changes on welfare of domestic rice farmers in Indonesia. As a result of the study, it was inferred that eliminating tariff on rice had the consequence of reducing domestic rice supply and reduce farmers' income. The scenario would be quite opposite, if the tariff was increased.

In Indonesia, Umboh, Hakim, Sinaga, and Kariyasa (2014) studied the impact of tariff reduction for maize on food production and consumption, he concluded that a single reduction of maize import tariff decreases both its domestic production and income resulting from that crop; besides a higher proportion of land becomes available for other competing crops like rice, and also the decrease in tariff has increased maize import, making more rice available at a lower price and increasing demand in maize for both consumption and feed industry. More maize was available for chicken meat and eggs, increasing their production. Such study proves that a decrease of tariff for a specific crop can have a multiplier effect to the wider economy.

Salarpour and Hasanpour (2009) wanted to test the consequence of the tariff reduction on the Iranian agriculture on short and long run. The CGE was used as economic model for analysis, and the researcher assumed that in the long run, foreign and domestic investors have enough time to respond to tariff reduction and tax reforms. As a result of his study, the tariff reduction decreases production cost in Iran and there was an increase of output in the directly affected economy. The production of rice increased 2.98% and 4.46% consecutively in the short and long run. By contrast and respectively, the production of wheat was decreased as well as the production of sugar. That study proves that the reduction of tariff could be beneficial or non-beneficial according to the crops.

Another research on the changes effect of sugar import tariff in Indonesia, using the computable general equilibrium model, the result of the research showed that the change or absence tariff

might have different consequences at the level of the sugar production, the welfare of the producers and consumers. The authors Pudjiastuti, Anindita, Hanani, and Kaluge (2013) considered 3 scenarios for the tariff on sugar to see its impact, the first one is considered with a tariff comprised in the range of 41.6% to 50%. With such tariff sugar output increases domestically but the production of some other agricultural crops decrease. However, with a tariff on sugar of 41.6%, the households' welfare in both agricultural and non-agricultural sector would increase while the income of the producers would decrease. And the last scenario consists of the tariffs cancellation on sugar; with such policy, the import volume of sugar and other related agricultural good would increase while domestic production would decrease and with no change in the welfare of the households.

2.5- Trade liberalization and food security

Trade liberalization is discussed to be essential to food security, and this report mentions that developing high propensity to trade openness have benefited by displaying higher production, export and lower price than those with aversion to it (*Food prices, nutrition and the millennium development goal*, 2012). Unlike the report finding, Abdullateef and Ijaiya (2010) conducted a research to see the impact of agricultural trade liberalization on food security in Nigeria, and they concluded that liberalization didn't help improving food security. The study mentions that the capacity of Nigeria to develop its structure for equitable production and distribution in the context of trade liberalization is weak. And the researchers recommend that if they want to benefit from trade liberalization, they need to engage in negotiations and require concessions.

In his study on Kenya's Agriculture, Nyangito (2003) explains that the low relative price of food import to domestic one hinder people who depend on farms for their livelihood from improving their income because farmers can't resist the harsh competition with foreign countries; as a result food price decreases, however farmers remain food insecure due to their low purchasing power. Bezuneh and Yeheyis (2012) also wanted to study the effect of trade liberalization on food security, to do so, he considered 11 developing countries in Africa, and dietary energy supply was used as a proxy for food security. Macro level data was used for the study, the result of the study revealed that trade liberalization doesn't improve food availability in the country. It is noteworthy to point that though there wasn't any improvement in the national level of food availability. But because the study was not realized in micro level by considering for instance

income categories, it is difficult to say if there was improvement for a specific category. The reduction of inequality could increase food security while national food availability could remain unchanged.

According to Lamy (2010), protectionist is not good for the food security inside of a country, a country cannot be self-sufficient in all agricultural goods, it has to rely on other countries and this is done through trade generally. And for Headey and Fan (2008), protectionism was one of the causes of the food crisis in the world on 2007-2008.

2.6- The role of food aid in the economy

It is incontestable that food aid plays a major role in ensuring food security in countries with limited access to food and low GDP. However the form of aid doesn't seem to solve the problem sustainably. Violette et al. (2013) conducted a research to see the effect of local food versus transoceanic food aid and realize that beneficiaries were more satisfied when the food aid is originated from domestic market; it is due to the familiarity with the domestic food.

Social assistance project has a great importance in any country in the world, it is a way to share wealth and create access to basic service to those who wouldn't acquire them due to handicaps, illness, low and high age to work. When it comes to food, access is created through food assistance projects, and ensuring that kids have access to food is not just a social right but it is interrelated to the rest of the social and economic system.

Behrman and Hoddinott (2005) did a research on the impact of food assistance programme on girls, and realized that girls who, between 0 and 15 years, received good and adequate food, in the future, have offspring with higher birth weight, more better height-for-age and weight-for-age in the future than those who received less nutritious food.

In many rural areas of developing, school attendance is low and pupils are not regular in their school. Researchers like Margolies and Hoddinott (2012) studied the positive impact of food on school attendance and education; and the result of his study prove that the existence of food assistance program in schools increase school attendance and improve academic performance. Generally, some pupils have limited access to food at home and going to school where such programs exist is a good opportunity for them and their parents to supply their nutritional needs with zero cost.

2.7- Tariff reduction and import

Import tariff is an important political tool used in trade policy to limit imports and also an asset to fuel national income; different scholars treated that topic, among them is Mohamad (2012) has conducted a study in Malaysia to see how tariff reductions affect real import in the concerned country. The author has considered 8 sectors of the economy and assessed separately the extent to which tariff reduction impacted them. Historical data from 1980 and 2010 were used to conduct the analysis. Following testing multicolinearity, the author used error correction model as method for data analysis. Based upon the results obtained, the author concluded that necessity goods are more sensitive to tariff reduction unlike the other goods. For sectors that involve intermediary goods, he found out that even when tariff is increasing, demands for these goods continue to increase. Same finding was valuable for sector like beverage and cigarettes.

2.8- Estimation of import demand function

The estimation of import demand, including any function implies the inclusion of variables which omissions would bias the model and obviously the results. Ward and Tang (1978) acknowledged the integration of exchange rate in import demand model after using the F.O.B price of both, U.S and the importing countries and see a discrepancy in the between them. They argued that exchange rate is relevant when estimating model for import demand.

2.9- Food basket in Haiti

The Haitian food basket is basically constituted of 6 basic goods: rice, maize, sugar, wheat flour and vegetal oil. The cereals represent 66% of the food basket which represent 1000 kilocalories from which rice represents 50% (500 kilocalories).

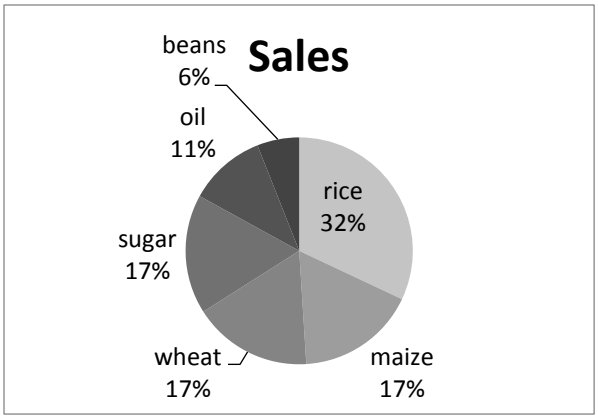

Figure 1: Food basket share in Haiti

52% of food is imported by the country to meet the domestic demand. And the country imports a

part of each agricultural commodity that constitutes the food basket. In a country where 59% live under the line of poverty and 24% are in extreme poverty of the population lives in poverty ("World Bank in Haiti," 2017). It remains a complicated task to meet the domestic demand. Ensuring the right to food to everyone still remains a challenge for the government of this country. As presented on the chart, the food mainly consumed in that country is rice, from which, 80% is imported mainly from the USA. The country remains strongly dependent on food import and is precarious to the change of price in the world market and also the seasonality of domestic food supply creates severe food insecurity period during the year (*Le panier alimentaire en Haiti*, 2012).

III- Methodology

In the perspective of reaching the objectives of the research, the steps below were followed successively:

1. Bibliographical research
2. Data Collection
3. Data processing and normalization
4. Data analysis

3.1- Bibliographical research

Different sources were used to set a topic of research, books, articles and scientific journals were also consulted to see problems that were not solved and those that were half solved regarding the topic of interest. After all the mentioned steps, a research topic was identified for studies. Once having a topic, other scientific papers related to international agricultural trade more specifically were considered as to see the influence of trade policy on the countries overall economy. And also were consulted papers regarding regulations of international organizations, as in how it can influence a member country. A literature review chapter was conceived from the synthesis made from these readings.

3.2- Data Collection

Secondary data were used for the research, and our sources for data collection were mainly FAO and world trade organization. Historical data for a period of 39 years starting from 1975 to 2013 were collected to assess the effect of trade liberalization on food basket. Data were originated from FAO year book for, World Bank data source and Knoema were also explored for additional data extraction. Food basket was our main concern for the study, hence, data for the 6 components were collected, namely rice, corn, beans, sugar, wheat flour and oil. 2 types of data were collected:

3.2.1- Quantitative data

The following data are used and held as quantitative data for our analysis, GDP per capita, agriculture added value, foreign direct investment, exchange rate and the 3 following variables namely the production, import quantity, domestic and import price of rice, maize, wheat flour, oil, sugar and beans were used as independent variable.

3.3- Data processing and normalization

The data of interest, once collected, were double-checked for their accuracy to detect any eventual errors, and input to the data in excel sheet and later on imported to the SPSS worksheet. All the data were normalized using log function in SPSS.

3.4- Data Analysis

Once having the data on SPSS, all the analysis were run namely quantitative and statistical results and at this stage the output were displayed on the worksheet.

3.4.1- Formula used

Regression model was mainly used for the time series data, and these latter were shared into 2 types of variables; independent variables and dependent variables. Import and production quantity were treated as independent variables, while GDP per capita, area harvested, exchange rate, dummy for trade liberalization, trend variable, domestic and import price were used as independent variable. The following models were used for each specific crop.

3.4.1.2- Model specification for rice production

Below is the simple model for rice production

$$RP_t = B_1 + B_2GDP_t + B_3TL_t + B_4R.A_t + B_5DPR_t + B_6FDI_t + U_t \quad \textbf{(1)}$$

RP_t: rice production in tons

GDP_t: Gross domestic product per capita (2005 base year)

TL_t: Dummy for trade liberalization, equal to 0 before trade liberalization and 1 after

$R.A_t$: cultivated area of rice

DPR_t: domestic price of local rice

FDI_t: Foreign direct investment in time t

u_t: Disturbance error term

Taking the logarithm of equation **(1)** while excluding dummy variables and with B_1 and U_t as constant $\ln B_1 = B'_1$ and $\ln U_t = U'_t$, we have that form below:

$$\ln RP_t = B'_1 + B_2 \ln GDP_t + B_3 \ln TL_t + B_4 \ln R.A_t + + B_5 \ln DPR_t + B_6 \ln FDI_t + U'_t \quad \textbf{(2)}$$

We assume that rice production depends on its explanatory variables in time t and also its previous value ($\ln RP_{t-1}$)

Now let's consider RP_t^* as the target value of rice import for the current year

$$\ln RP^*_t = B'_1 + B2 \ln GDP_t + B3 \ln TL_t + B4 \ln R.A_t + + B5 \ln DPR_t + B6 \ln FDI_t + U'_t \quad \textbf{(3)}$$

We assume that the increase in rice production from period t-1 to period t noted as $\ln RP_t - \ln RP_{t-1}$, is proportional to the discrepancy between the justified value and the previous one noted $\ln RP_t^* - \ln RP_{t-1}$

$\ln RP_t - \ln RP_{t-1} = \lambda (\ln RP_t^* - \ln RP_{t-1})$ $\quad 0 \leq \lambda \leq 1$ with λ represented the speed of adjustment

$$\ln RP_t = \lambda \ln RP_t^* + (1-\lambda) \ln RPt_{-1} \quad \textbf{(4)}$$

From equation **(4)**, one can understand that the import of rice is a function of the desired value and also the production of the current year, the greater the value of λ, the faster the speed of adjustment, when the value is equal to 1 there is a full adjustment to in one period, while a value of λ equal to 0 means there is no adjustment.

Replacing equation 3 in 4, one obtains:

$$\ln RP_t = \lambda (B'_1 + B_2 \ln GDP_t + B_3 \ln TL_t + B_4 \ln R.A_t + + B_5 \ln DPR_t + U'_t + B_6 \ln FDI_t) + (1-\lambda) \ln RP_{t-1} \quad \textbf{(5)}$$

$$\ln RP_t = \lambda B'_1 + B_2 \lambda GDP_t + B_3 \lambda \ln TL_t + B_4 \lambda \ln R.A_t + B_5 \lambda DPR_t + B_6 \lambda \ln FDI_t + (1-\lambda) \ln RP_{t-1} + \lambda U'_t \quad \textbf{(6)}$$

With: $\lambda B'1 = \alpha_1$, $B2\lambda = \alpha_2$, $B3\lambda = \alpha_3$, $B4\lambda = \alpha_4$, $B5\lambda = \alpha_5$, $B_6\lambda = \alpha_6$ and $\lambda U'_t = V_t$

We obtain the final for equation for the partial adjustment model

$$\mathbf{\ln RP_t = \alpha_1 + \alpha_2 GDP_t + \alpha_3 \ln TLt + \alpha_4 \ln R.A_t + \alpha_5 \ln DPR_t + \alpha_5 \ln DPR_t + \alpha_5 \ln DPR_t + (1-\lambda) \ln RP_{t-1} + V_t} \quad \textbf{(7)}$$

3.4.1.3- Model for rice import

The model of rice import is a function of the exchange rate, the relative price of rice, the population; we also consider a dummy variable for trade liberalization and finally a trend variable was added. The partial adjustment is used to explain how the other variables affect the latter.

$RI_t = B_1 + B_2GDPt + B_3TL_t + B_4TV_t + B_5ER_t + B_6P_t + B7RPR_t + U_t$ **(8)**

GDP_t: GDP per capita

RI_t: Quantity of rice imported

TL_t: dummy variable for trade liberalization, it is equal to 0 before trade liberalization and 1 after trade liberalization

TV_t: Trend variable

ER_t: Haitian gourde- US dollar exchange rate at time t (Gourde/ USD)

P_t: population of the country

RPR_t: relative price of rice

Taking the logarithm of equation **(4)** while excluding dummy variables and with B_1 and U_t as constant $\ln B_1 = B'_1$ and $\ln U_t = U'_t$, we have that form below:

$\text{Ln } RI_t = B'_1 + B2\ln GDP_t\ B_3TL_t + B_4TV_t + B_5\ln ER_t + B_6\ln P_t + B_7\ln PR_t + U'_t$ **(9)**

We consider that the rice import depends on its explanatory variables in time t and also its previous value ($\ln RI_{t-1}$)

Now let's consider RI_t^* as the target value of rice import for the current year

$\text{Ln } RI_t^* = B'_1 + B2\ln GDP_t\ B_3\ln TL_t + B_4\ln TV_t + B_5\ln ER_t + B_6\ln P_t + B_7\ln PR_t + U'_t$ **(10)**

We assume that the increase in rice import from period t-1 to period t noted as $\ln RI_t - \ln RI_{t-1}$, is proportional to the gap between the justified value and the previous one noted $\ln RI_t^* - \ln RI_{t-1}$

$\ln RI_t - \ln RI_{t-1} = \lambda (\ln RI_t^* - \ln RI_{t-1}) \quad 0 \leq \lambda \leq 1$ with λ represented the speed of adjustment

$\ln RI_t = \lambda \ln RI_t^* + (1-\lambda) \ln RIt_{-1}$ **(11)**

From equation **(11)**, one can understand that the import of rice is a function of the desired value and also the import of the current year. the greater the value of λ, the faster the speed of adjustment, when the value is equal to 1 there is a full adjustment to in one period, while a value of λ equal to 0 means there is no adjustment.

Replacing equation **(10)** in **(11)**, one obtains:

$lnRI_t = \lambda (B'_1 + B2lnGDP_t\ B_3lnTL_t + B_4lnTV_t + B_5lnER_t + B_6lnP_t + B_7lnPR_t + U'_t) + (1-\lambda)lnRI_{t-1}$ **(12)**

$lnRI_t = \lambda B'1 + B2\lambda lnTL_t + B3\lambda lnTV_t + B4\lambda lnER_t + B5\lambda lnP_t + B6\lambda lnPR_t + (1-\lambda)lnRI_{t-1} + \lambda U'_t$ **(13)**

With: $\lambda B'1 = \alpha_1$, $B2\lambda = \alpha_2$, $B3\lambda = \alpha_3$, $B4\lambda = \alpha_4$, $B5\lambda = \alpha_5$, $B6\lambda = \alpha 6$, $B6\lambda = \alpha_7$ and $\lambda U'_t = V_t$

We obtain the final for equation for the partial adjustment model **(14)**

$lnRI_t = \alpha_1 + \alpha 2GDP_t + \alpha_3 lnTLt + \alpha_4 lnTV_t + \alpha_5 lnER_t + \alpha_6 lnP_t + \alpha_7 lnPR_t + (1-\lambda)lnRI_{t-1} + V_t$ (11)

3.4.1.4- Model for maize production

In this model, production quantity is treated as independent variable

$MP_t = B_1 + B2TL_t + B3M.A_t + + B4DPM_t + U_t$ **(15)**

MP_t: rice production in tons

TL_t: Dummy for trade liberalization, equal to zero when trade is liberalized and 1 when not

$M.A_t$: cultivated area of maize

DPM_t: domestic price of local rice

U_t: Disturbance error term

Likewise, taking the logarithm of equation **(12),** exception is made for the dummy variable; we have the model for rice production. Knowing that B1 and Ut are constant, we can assume $lnB_1 = B'_1$ and $lnUt = U'_t$, we have that equation:

$lnMP_t = B'_1 + B_2TL_t + B_3lnM.A_t + + B_4lnDPM_t + U'_t$ **(16)**

Maize production, just like rice is, according to the model, determined by the current value of the current explanatory variables mentioned above, their lags and also the lag of maize production.

The autoregressive distributed lag ADL (1, 1) is used to analyze the effects of all these factors on rice production. Following all these considerations, the final equation below is obtained:

$$\mathbf{lnMP= B_1+ B_2lnMP_{t-1}+ B_3TL_t+ B_4M.A_{3t}+ B_5lnM.A_{3,\ t-1}+ B_6lnDPM_{4t}+ B_7DPM_{4,\ t-1}+ \sum U_t} \quad \mathbf{(17)}$$

3.4.1.5- Model for maize import

For maize import, the model is specified using a multiple regression linear, with the quantity of maize imported treated as dependent variable and 8 independent variables. According to the model, the quantity of maize imported is a function of the real GDP per capita (2005), the relative price of import of maize, the nominal exchange rate, the real food price index, the population size, the import price of rice, the agricultural value added and other variables that are not considered by the model.

$$MI_t= B_1 + B_2GDP_t+ B_3MRP_t+ B_4TL_t+B_5ER_t +B_6lnFPI_t+ B_7P_t + B_8RP_t + B_9AVA_t+ Ut \quad \mathbf{(18)}$$

MI_t: quantity of maize imported

GDP_t: real GDP per capita (2005)

MRP_t: relative price of maize

TL_t: dummy tariff for trade liberalization

ER_t: Haitian gourde- US dollar exchange rate at time t (Gourde/ USD)

FPI_t: real food price index

P_t: Population at time t

RP_t: imported price of rice

AVA_t: agricultural value added

Taking the logarithm of the equation, while excluding the dummy variable for trade liberalization, one obtains:

$$lnMI_t= lnB_1+ B2lnGDPt+ B3lnMRPt+ B_4TL_t+B5lnERt+ B_6lnFPI_t+ B_7lnPt+ B8lnRPt+ B9lnAVAt+ lnUt \quad \mathbf{(19)}$$

Posing $\ln B_1 = B'_1$, and $\ln U_{t=} V_t$, one can rewrite:

$\ln MI_t = B_1 + B2\ln GDPt + B3\ln MRPt + B_4 TL_t + B5\ln ERt + B_6 \ln FPI_t + B_7 \ln Pt + B8\ln RPt + B9\ln AVAt + \ln Vt$ **(20)**

3.4.1.6- Beans production model

$BP_t = B_1 + B2TL_t + B3B.A_t + + B4DPB_t + U_t$ **(21)**

MP_t: rice production in tons

TL_t: Dummy for trade liberalization, equal to zero when trade is liberalized and 1 when not

$B.A_t$: cultivated area of beans

DPB_t: domestic price of local beans

u_t: Disturbance error term

Similarly, taking the logarithm of equation **(21),** omitting only the dummy variable for trade liberalization; we have beans production in logarithmic function. Knowing that B1 and Ut are constant, we can assume $\ln B_1 = B'_1$ and $\ln Ut = U'_t$, we have that equation:

$\ln BP_t = B'_1 + B2TL_t + B3\ln B.A_t + + B4\ln DPB_t + U'_t$ **(22)**

Using ADL (1,1) model, again omitting the dummy variable, and posing $U'_{t=} V_t$ one obtains:

$\ln BP = B_1 + B_2 \ln BP_{t-1} + B_3 TL_{2t} + B_4 B.A_{3t} + B_5 \ln B.A_{3,\,t-1} + B_6 \ln DPB_{4t} + B_7 DPB_{4,\,t-1} + \sum V_t$

(23)

3.4.1.7- Model for beans import

$BI_t = B_1 + B_2 GDP_t + B_3 TV_t + B_4 TL_t + B_5 ER_t + B6RPB_t + U_t$ **(24)**

BI_t: Quantity of beans imported

GDP_t: Real GDP per capita (2005)

TV_t: trend variable

TL_t: dummy variable for trade liberalization, equal to 0 before trade liberalization and to 1 during trade liberalization period.

ER_t: Haitian gourde- US dollar exchange rate at time t (gourde/ USD)

RPB_t: imported price of beans during time t

Taking the logarithm of equation **(24)** while omitting the logarithm for the dummy variables and also with $\ln B1 = B'_1$ and $\ln Ut = U'_t$, one obtains:

$$\ln BI_t = B'_1 + B_2 \ln GDPt + B_3 TV_t + B_4 TLt + B_5 \ln ERt + B_6 RPB_t + U'_t \quad \textbf{(25)}$$

Considering $\ln BI^*_t$ as the desired level of beans import, we can rewrite:

$$\ln BI^*_t = B'_1 + B_2 \ln GDPt + B_3 \ln TV_t + B_4 \ln TLt + B_5 \ln ERt + B_6 RPB_t + U'_t \quad \textbf{(26)}$$

let's assume that the increase in beans import from period t-1 to period t noted as $\ln BI_t - \ln BI_{t-1}$, is proportional to the gap between the justified value and the previous one noted $\ln BI_t^* - \ln BI_{t-1}$

$\ln BI_t - \ln BI_{t-1} = \lambda (\ln BI_t^* - \ln BI_{t-1}) \quad 0 \leq \lambda \leq 1$ with λ represented the speed of adjustment

$$\ln BI_t = \lambda \ln BI_t^* + (1-\lambda) \ln BI_{t-1} \quad \textbf{(27)}$$

From this equation above, one can understand that the import of beans is a function of the desired value and also the import of the current year. the greater the value of λ, the faster the speed of adjustment, when the value is equal to 1 there is a full adjustment to in one period, while a value of λ equal to 0 means there is no adjustment.

Replacing equation **(26)** in **(27)**, one obtains:

$$\ln BI_t = \lambda (B'_1 + B_2 \ln GDPt + B_3 TV_t + B_4 TLt + B_5 \ln ERt + B_6 RPB_t + U'_t) + (1-\lambda) \ln RI_{t-1} \quad \textbf{(28)}$$

$$\ln BI_t = \lambda B'1 + B2\lambda \ln GDP_t + B3\lambda TV_t + B4\lambda TL_t + B5\lambda \ln ER_t + B6\lambda \ln RPB_t + (1-\lambda) \ln BI_{t-1} + \lambda U'_t \quad \textbf{(29)}$$

with: $\lambda B'1 = \alpha_1$, $B2\lambda = \alpha_2$, $B3\lambda = \alpha_3$, $B4\lambda = \alpha_4$, $B5\lambda = \alpha_5$, $B6\lambda = \alpha_6$ and $\lambda U'_t = V_t$

Replacing the coefficient in equation **(25)**, the final for equation for the partial adjustment model becomes:

$$\mathbf{\ln BI_t = \alpha_1 + \alpha_2 \ln GDP_t + \alpha_3 TV_t + \alpha_4 TL_t + B5\lambda \ln ER_t + B6\lambda \ln RPB_t + (1-\lambda) \ln BI_{t-1} + V_t} \quad \textbf{(30)}$$

3.4.1.8- Model for raw sugar production

The model for sugar production is specified using different variables, a dummy variable for trade liberalization, the real GDP per capita (2005), the cultivated area of sugar cane since the raw sugar produced are from sugar cane as main raw material.

$$SP_t = B_1 + B_2TL_t + B_3GDP_t + + B_4SA_t + U_t \quad \textbf{(31)}$$

SP_t: sugar production in tons

TL_t: Dummy for trade liberalization, equal to zero when trade is liberalized and 1 when not

GDP_t: real GDP per capita (2005)

$S.A_t$: cultivated area of sugar

u_t: Disturbance error term

By taking the logarithm of equation **(31)** and omitting only the dummy variable for trade liberalization; we have beans production in logarithmic function. At the same time, knowing that B1 and Ut are constant, we can assume $\ln B_1 = B'_1$ and $\ln Ut = U'_t$, we have that equation:

$$\ln SP_t = B'_1 + B2TL_t + B3\ln GDP_t + + B4\ln SA_t + U'_t \quad \textbf{(32)}$$

We assume that sugar production depends on its explanatory variables in time t and also its previous value ($\ln SP_{t-1}$)

Now let's consider SP_t^* as the target value of rice import for the current year

$$\ln SP^*_t = B'_1 + B2\ln TL_t + B3\ln GDP_t + B4\ln SA_t + U'_t \quad \textbf{(33)}$$

Now we assume that the increase in rice production from period t-1 to period t noted as $\ln RP_t - \ln RP_{t-1}$, is proportional to the dicrepancy between the justified value and the previous one noted $\ln RI_t^* - \ln RI_{t-1}$

$\ln SP_t - \ln SP_{t-1} = \lambda (\ln SP_t^* - \ln SP_{t-1})$ $\quad 0 \leq \lambda \leq 1$ with λ represented the speed of adjustment

$$\ln SP_t = \lambda \ln SP_t^* + (1-\lambda) \ln SPt_{-1} \quad \textbf{(34)}$$

From equation **(34)**, one can understand that the import of rice is a function of the desired value and also the production of the current year, the greater the value of λ, the faster the speed of

adjustment, when the value is equal to 1 there is a full adjustment to in one period, while a value of λ equal to 0 means there is no adjustment.

Replacing equation **(33)** in **(34)**, one obtains:

$lnSP_t = \lambda (B'_1 + B2lnTL_t + B3lnGDP_t + B4lnSA_t + U'_t) + (1-\lambda)lnSP_{t-1}$ **(35)**

$lnSP_t = \lambda B'_1 + B_2\lambda TL_t + B_3\lambda lnGDP_t + B_4\lambda\, lnSA_t + (1-\lambda)lnSP_{t-1} + \lambda\, U'_t$ **(36)**

With: $\lambda B'1 = \alpha_1$, $B_2\lambda = \alpha_2$, $B_3\lambda = \alpha_3$, $B_4\lambda = \alpha_4$, $1 - \lambda = \alpha_5$ and $\lambda\, U'_t = V_t$

We obtain the final for equation for the partial adjustment model

$$\mathbf{lnSP_t = \alpha_1 + \alpha_2\, TL_t + \alpha_3 lnGDPt + \alpha_4 lnSA_t + \alpha_5 lnSP_{t-1} + V_t} \quad \textbf{(37)}$$

3.4.1.9- Model for sugar import

$SI_t = B_1 + B_2GDP_t + B_3TL_t + B_4ER_t + B_5IPS_t + U_t$ **(38)**

SI_t: Quantity of sugar imported (tons)

GDP_t: Real GDP per capita (2005)

TL_t: dummy variable for trade liberalization, equal to 0 before trade liberalization and to 1 during trade liberalization period.

ER_t: Haitian gourde- US dollar exchange rate at time t (gourde/ USD)

IPS_t: imported price of sugar during time t

Taking the logarithm of equation **(38)** exception is made for dummy variable and with $lnB1 = B'_1$ and $lnUt = U'_t$, one obtains:

$lnSI_t = B'_1 + B_2lnGDPt + B_3TLt + B_4lnERt + B_5IPS_t + U'_t$ **(39)**

Considering the target value of sugar import as $lnSI^*_t$, one obtains:

$lnSI^*_t = B'_1 + B_2lnGDPt + B_3TLt + B_4lnERt + B_5IPS_t + U'_t$ **(40)**

Assuming that the increase in sugar import from period t-1 to period t noted as $lnSI_t - lnSI_{t-1}$, is proportional to the gap between the justified value and the previous one noted $lnSI_t^* - lnSI_{t-1}$

$lnSI_t - lnSI_{t-1} = \lambda (lnSI_t^* - lnSI_{t-1})$ $0 \leq \lambda \leq 1$ with λ represented the speed of adjustment

$lnSI_t = \lambda lnSI_t^* + (1-\lambda) lnSI_{t-1}$ **(41)**

From this equation, one can understand that the import of sugar is a function of the desired value and also the import of the current year. the greater the value of λ, the faster the speed of adjustment, when the value is equal to 1 there is a full adjustment to in one period, while a value of λ equal to 0 means there is no adjustment.

Replacing equation **(40)** in **(41),** one obtains:

$lnSI_t = \lambda (B'_1 + B_2 lnGDPt + B_3 TV_t + B_4 TLt + B_5 lnERt + B_6 IPS_t + U'_t) + (1-\lambda) lnSI_{t-1}$ **(42)**

$lnSI_t = \lambda B'_1 + B_2 \lambda lnGDP_t + B_3 \lambda lnER_t + B_4 \lambda lnIPB_t + (1-\lambda) lnBI_{t-1} + \lambda U'_t$ **(43)**

with: $\lambda B'1 = \alpha_1$, $B2\lambda = \alpha_2$, $B3\lambda = \alpha_3$, $B4\lambda = \alpha_4$, $(1-\lambda) = \alpha_5$ and $\lambda U'_t = V_t$

We obtain the final for equation for the partial adjustment model

$$\mathbf{lnSI_t = \alpha_1 + \alpha_2 lnGDP_t + \alpha_3 TL_t + \alpha_4 lnER_t + \alpha_5 lnIPB_t + \alpha_6 lnSI_{t-1} + V_t} \quad \textbf{(44)}$$

3.4.1.10- Model specification for oil production

Haiti is also a producer of vegetal oil, most of which is produced by HUHSA, the production of oil in the country is specified as a function of the income per capita, a dummy variable to assess the effect of trade liberalization on its production, the quantity of oil imported and its import price. The domestic price of oil was not used as independent variable due to a limited access of data, instead we used the import price of oil as a determinant of domestic production since it is expected that the international price can affect the production; Partial adjustment model is used to do analysis.

$OP_t = B_1 + B_2 GDP_t + B_3 TL_t + B_4 OI_t + B_5 IPO_t + U_t$ **(45)**

OP_t: Quantity of oil produced domestically (tons)

GDP_t: Real GDP per capita (2005)

TL_t: dummy variable for trade liberalization, equal to 0 before trade liberalization and to 1 during trade liberalization period.

OI_t: Quantity of oil imported (tons)

IPS_t: imported price of oil in time t

Ut: error term

Taking the logarithm of equation **(45)** with $lnB1= B'_1$ and $lnUt=U'_t$, one obtains:

$$lnOP_t= B'_1 + B_2lnGDPt +B_3TL_t +B_{4ln}OI_t+ B_{5ln}IPO_t+ U'_t \quad \textbf{(46)}$$

Considering the target value of sugar import as $lnSI^*_t$, one obtains:

$$lnOP'_t= B'_1 + B_{2ln}GDP_t +B_3TL_t +B_{4ln}OI_t+ B_{5ln}IPO_t+ U'_t \quad \textbf{(47)}$$

Assuming that the increase in sugar import from period t-1 to period t noted as $lnSI_t- lnSI_{t-1}$, is proportional to the gap between the justified value and the previous one noted $lnSI_t^*- lnSI_{t-1}$

$lnOP_t- lnOP_{t-1}= \lambda\ (lnOP_t^*- lnOP_{t-1})$ $\quad 0 \leq \lambda \leq 1$ with λ represented the speed of adjustment

$$lnOP_t= \lambda lnOP_t^*+ (1-\lambda)lnOP_{t-1} \quad \textbf{(48)}$$

From this equation, one can understand that oil production is a function of the expected value and also the effective production of the current year. the greater the value of λ, the faster the speed of adjustment, when the value is equal to 1 there is a full adjustment to in one period, while a value of λ equal to 0 means there is no adjustment.

Replacing equation **(47)** in **(48),** one obtains:

$$lnOP_t= \lambda\ (B'_1 + B_2lnGDPt + B_3lnTLt + B_4lnOIt + B_5IPO_t+ U'_t) + (1-\lambda)lnOP_{t-1} \quad \textbf{(49)}$$

$$lnOP_t= \lambda B'_1+ B_2\lambda lnGDP_t + B_3\lambda TL_t + B_4\lambda lnOI_t +B_5\lambda lnIPO_t + (1-\lambda)lnBI_{t-1} + \lambda\ U'_t \quad \textbf{(50)}$$

with: $\lambda B'1= \alpha_1$, $B2\lambda= \alpha_2$, $B3\lambda= \alpha_3$, $B4\lambda= \alpha_4$, $B5\lambda= \alpha_5$, $(1-\lambda)= \alpha_6$ and $\lambda\ U'_t= V_t$

We obtain the final for equation for the partial adjustment model

$$\mathbf{lnOP_t= \alpha_1+ \alpha_2 lnGDP_t+ \alpha_3 TL_t+ \alpha_4 lnOI_t + \alpha_5 lnIPO_t+ \alpha_6 lnOP_{t-1}+ V_t} \quad \textbf{(51)}$$

3.4.1.11- Model for oil import

For oil import model, real GDP per capita (2005), a dummy variable for trade liberalization, real exchange rate, and finally imported price of oil are used as independent variable. Relative price

of oil, though the most appropriate variable for import demand function was not used because of unavailability of data regarding domestic price of oil.

$OI_t = B_1 + B_2GDP_t + B_3TL_t + B_4ER_t + B_5IPO_t + U_t$ **(52)**

OI_t: Quantity of oil imported (tons)

GDP_t: Real GDP per capita (2005)

TL_t: dummy variable for trade liberalization, equal to 0 before trade liberalization and to 1 during trade liberalization period.

ER_t: Haitian gourde- US dollar exchange rate at time t (gourde/ USD)

IPO_t: imported price of oil during time t

Taking the logarithm of equation **(52)** exception made for dummy variable and with $lnB1 = B'_1$ and $lnUt = U'_t$, one obtains:

$lnOI_t = B'_1 + B_2lnGDPt + B_3TLt + B_4lnERt + B_5IPO_t + U'_t$ **(53)**

Considering the target value of sugar import as $lnSI^*_t$, one obtains:

$lnOI^*_t = B'_1 + B_2lnGDPt + B_3TLt + B_4lnERt + B_5IPO_t + U'_t$ **(54)**

Likewise, assuming that the increase in oil import from period t-1 to period t noted as $lnOI_t - lnOI_{t-1}$, is proportional to the discrepancy between the justified value and the previous one noted $lnOI_t^* - lnOI_{t-1}$

$lnOI_t - lnOI_{t-1} = \lambda (lnOI_t^* - lnOI_{t-1})$ $\quad 0 \leq \lambda \leq 1$ with λ represented the speed of adjustment

$lnOI_t = \lambda lnOI_t^* + (1-\lambda)lnOI_{t-1}$ **(55)**

the equation above puts in evidence that oil import is an average of the target import quantity and the previous value of import. the greater the value of λ, the faster will the speed of adjustment be, when the value is equal to 1 there is a full adjustment to in one period, while a value of λ equal to 0 means there is no adjustment.

Replacing equation **(54)** in **(55),** one obtains:

$lnOI_t = \lambda (B'_1 + B_2lnGDPt + B_3TLt + B_4lnERt + B_5IPO_t + U'_t) + (1-\lambda)lnOI_{t-1}$ **(56)**

$lnOI_t = \lambda B'_1 + B_2\lambda lnGDP_t + B_3\lambda lnER_t + B_4\lambda lnIPO_t + (1-\lambda)lnOI_{t-1} + \lambda U'_t$ **(57)**

with: $\lambda B'1 = \alpha_1$, $B2\lambda = \alpha_2$, $B3\lambda = \alpha_3$, $B4\lambda = \alpha_4$, $B5\lambda = \alpha_5$, $(1-\lambda) = \alpha_6$ and $\lambda U'_t = V_t$

We obtain the final for equation for the partial adjustment model

$$\mathbf{lnOI_t = \alpha_1 + \alpha_2 lnGDP_t + \alpha_3 TL_t + \alpha_4 lnER_t + \alpha_5 lnIPO_t + \alpha_6 lnOI_{t-1} + V_t} \quad \mathbf{(58)}$$

3.4.1.12- Model for wheat flour import

$WFI_t = B_1 + B_2GDP_t + B_3TL_t + B_4ER_t + B_5IPWF_t + U_t$ **(59)**

WFI_t: Quantity of wheat flour imported (tons)

GDP_t: Real GDP per capita (2005)

TL_t: dummy variable for trade liberalization, equal to 0 before trade liberalization and to 1 during trade liberalization period.

ER_t: Haitian gourde- US dollar exchange rate at time t (gourde/ USD)

$IPWF_t$: imported price of oil during time t

Taking the logarithm of equation **(59),** exception again made for dummy variable and with $lnB1 = B'_1$ and $lnUt = U'_t$, one obtains:

$lnWFI_t = B'_1 + B_2lnGDPt + B_3TLt + B_4lnERt + B_5IPWF_t + U'_t$ **(60)**

Considering the target value of sugar import as $lnSI^*_t$, one obtains:

$lnWFI^*_t = B'_1 + B_2lnGDPt + B_3TLt + B_4lnERt + B_5IPWF_t + U'_t$ **(61)**

Likewise, assuming that the increase in wheat flour import from period t-1 to period t noted as $lnWFI_t - lnWFI_{t-1}$, is proportional to the discrepancy between the justified value and the previous one noted $lnWFI_t^* - lnWFI_{t-1}$

$lnWFI_t - lnWFI_{t-1} = \lambda\ (lnWF_t^* - lnWFI_{t-1})$ $\quad 0 \leq \lambda \leq 1$ with λ represented the speed of adjustment

$lnWFI_t = \lambda lnWFI_t^* + (1-\lambda)lnWFI_{t-1}$ **(62)**

From this equation, one can understand that the import of wheat flour is an approximation of the justified value of import and the lag of its actual import. the greater the value of λ, the faster the speed of adjustment, a value of λ equal to 1 is synonym of full adjustment in one period, while a value that is equal to 0 is deducted as inexistence of adjustment.

Replacing equation **(61)** in **(62),** one obtains:

$\ln WFI_t = \lambda (B'_1 + B_2 \ln GDPt + B_3 TLt + B_4 \ln ERt + B_5 IPWF_t + U'_t) + (1-\lambda)\ln WFI_{t-1}$ **(63)**

$\ln WFI_t = \lambda B'_1 + B_2\lambda \ln GDP_t + B_3\lambda \ln ER_t + B_4\lambda \ln IPWF_t + (1-\lambda)\ln WFI_{t-1} + \lambda U'_t$ **(64)**

with: $\lambda B'1 = \alpha_1$, $B2\lambda = \alpha_2$, $B3\lambda = \alpha_3$, $B4\lambda = \alpha_4$, $B5\lambda = \alpha_5$, $(1-\lambda) = \alpha_6$ and $\lambda U'_t = V_t$

We obtain the final for equation for the partial adjustment model

$$\mathbf{\ln WFI_t = \alpha_1 + \alpha_2 \ln GDP_t + \alpha_3 TL_t + \alpha_4 \ln ER_t + \alpha_5 \ln IPWF_t + \alpha_6 \ln WFI_{t-1} + V_t} \quad \textbf{(65)}$$

N.B

Although Haiti produces flour wheat, there is no model of flour wheat production is specified due to the absence of data for that commodity.

3.5- Statistical test

To check for autocorrelation problem, the formula below was used:

$$d = \frac{\sum_{k=2}^{T} (e_t - e_{t-1})^2}{\sum_{k=1}^{T} et^2}$$

$d \rightarrow 2\text{-}2\rho$

in absence of autocorrelation $\rho = 0$ and d should be close to 2.

$-1 \leq \rho \leq 1$

Dl: Durbin-Watson lower limit

Du: Durbin-Watson upper limit

Decision:

1- If d is less than dL, one should reject the null hypothesis and conclude that there is positive autocorrelation.
2- If d is greater than dU, one should fail to reject the null hypothesis.
3- And finally is d is comprised between dL and dU, the result is inconclusive.

IV- Results

4.1- Rice production function

In this paper, rice production model is assessed using partial adjustment model. Historical data from 1975 to 2013 were used to appraise the effect of trade liberalization on the rice production. The latter was treated as independent variable while real GDP per capita (2005), domestic price of rice, area harvested of rice and a dummy variable for trade liberalization was used. And as we can see from the table below, 81.5% of the variation of the rice production is explained by the model and also from the value of Durbin-Watson, we can see that autocorrelation was avoided using such model.

Unlike the results of the research of De Silva et al. (2013) which proved that free trade was positively related to productivity, the result for rice production model doesn't show any positive relationship between the 2. According to the result, one cannot reject the null hypothesis of no effect of trade liberalization on rice production.

The area harvested is an important factor of rice production, as it improves this latter; we can see that every 1 % increase in area cultivated increases rice production to 46%. And we finally see that the price elasticity of production is the most determinant factor for rice production, the price elasticity for production is elastic, and an increase of 1% in the price of rice increases the production of rice to 13%. One can understand that information on price create a strong incentive for domestic farmers to intensify their production in that crop. Foreign direct investment doesn't show any effect on rice production quantity.

Table 1: Factors affecting domestic rice production

Variables	Rice production model
(Constant)	- 69*** (9.644)
TL	0.030 (0.047)
$lnGDP_t$	0.067 (0.120)
ln_RA_t	0.456*** (0.118)
lnDPR	13.16*** (1.830)
$lnRP_{t-1}$	0.14 (0.087)
$lnFDI_t$	0.04 (0.004)
Durbin-Watson	1.917
R^2	0.81

*, **, ***, significant at 10%, 5% and 1% levels

Values in parentheses are standard error

4.2- Rice import function

The specification of the rice import was estimated using the ADL (1, 1) model, considering that rice import is determined by the current and the previous factors of the following factors: exchange rate, real GDP per capita (2005), imported price of rice, a dummy variable for trade liberalization and a trend variable, all held as independent variables. The model of rice import is specified as followed:

$$\mathbf{lnRI_t = \alpha_1 + \alpha 2GDP_t + \alpha_3 lnTLt + \alpha_4 lnTV_t + \alpha_5 lnER_t + \alpha_6 lnP_t + \alpha_7 lnPR_t + (1-\lambda) lnRI_{t-1} + V_t}$$

According to the results obtained from SPSS, 92% of the results are explained by the model and also the model and autocorrelation was avoided. From table 2 below, one could remark that trade liberalization has no considerable effect on rice import, its presence or absence doesn't affect significantly the quantity imported, thereby one cannot reject the null hypothesis. However, we can see that the quantity of rice imported of the previous year is positively related to the import of rice for the current year. The time trend used in the analysis is also significant, and from this we can see that the quantity of rice imported decrease by 1.4% during the period of the study. And finally, we see that the growth of the population of the country has a strong effect on demand for rice import, to every increase of 1% growth rate of the population is associated a 7.76% growth of rice import demand. This result shows that the population growth is the most determinant factor to rice import and also that the population has a strong preference for rice crops, representing as mentioned in the literature review 32% of the food basket of the country. Unlike some other papers, that result shows that trade liberalization is not the factor that increases the demand in rice import substantially but the preference for it combined with the population growth rate, since the growth rate import demand for rice is substantially lower than the growth rate of the population. At least for rice, we remark effectively that the increase of agricultural import demand results of the growth of the urban population and the policy favorable to import (Pressoir, Freguin-Gresh, Lamure Tardieu, & Lançon, 2016).

Table 2: Factors affecting rice import

Variables	Rice import model
(Constant)	-91.828 (51.391)
TL	.010 (0.340)
$lnER_t$	-.626 (0.415)
$lnRI_{t-1}$	.583*** (0.131)
lnP_t	7.760** (3.109)
ln GDP_t	-2.654 (1.575)
$lnPR_t$	-3.637 (2.281)
$lnTV_t$	-1.434*** (0.493)
Durbin Watson	1.784
R^2	0.927

*, **, ***, significant at 10%, 5% and 1% levels

Values in parentheses are standard error

4.3- Maize production function

Corn is a seasonal crop that is produced in most of the part of the country; the tropical climate is favorable to its growth and development. The econometric model for maize production was used using the ADL (1, 1) model, assuming not only the current year could affect its production but also the previous year. As independent variables, were used a dummy variable for trade liberalization, area cultivated and the domestic price of corn, and also were used their lags as independent variables. The result from data analysis shows that the model is a good forecast explaining at 90.7% the variation of the production.

The results from the following table shows that from all the independent factors of the model, only the area cultivated affects maize production but the growth rate of maize production is less than proportional than the increase of cultivated area in maize. The domestic price of maize has no significant effect on maize production. We also see that the area cultivated has a significant effect on maize production, an increase of 1% of area cultivated in maize increases its production of 0.9%, same for the production of the lagged year where a 1% increase (decrease) of the production of the lag will increase (decrease) the production of the current year of 0.5%, the current year follows the same trend than its lag with the rate of the latter higher. Free trade also was not demonstrated a problem to maize production, the country is almost sufficient in maize production and sufficiency could be reached if there were enough agro-processing companies to transform it into products of good quality and highly preferred.

Table 3: Factors affecting maize production

Variables	Rice import model
(Constant)	3.137 (2.327)
TL	-0.008 (0.030)
$lnDPM_t$	-0.097 (0.38)
$lnMA_t$	0.891*** (0.089)
$lnMP_{t-1}$	0.5*** (0.16)
$LnMA_{t-1}$	-0.43 (0.16)
$lnDPM_{t-1}$	-0.44 (0.395)
Durbin Watson	1.735
R^2	0.907

*, **, ***, significant at 10%, 5% and 1% levels

Values in parentheses are standard error

4.4- Maize import function

For maize import, the result needs to be considered very carefully due to incoherence of the data, the data shows some awkward fluctuation, we realize that there is a lack of accuracy and for this reason, the result needs to be considered carefully. Maize import is very low in the country and the amount imported depends on different factors which we would try to explore during this study. More importantly, we aim to explore whether trade liberalization has affected the import of that crop in question. From all the models used in the thesis, maize import model has the lowest explanatory power (39%).

The result shows that trade liberalization has reduced maize import of 162% at a p-vaule of 10%, this may be due to the fact that the population preference has been shifted to other goods. The

result shows that exchange growth affects positively maize import at 10%. And finally we considered the cross-price elasticity of rice to import, and the result shows that when the price of imported rice increases of 1%, maize import will increase at 4.2%, maize import is elastic to price of imported rice. Hence, one can say that maize import is a competing good to rice import and maize

Table 4: Factors affecting maize import

Variables	maize import model
(Constant)	-35.311 (30.342)
TL	-1.63* (0.9)
ln_ ER_t	2.2* (1.2)
ln GDP_t	1.14 (3.5)
ln_ FPI_t	-3.1 (2)
ln_ AVA_t	8.5 (1.104)
ln MRP_t	-4.17 (2.81)
ln RP_t	4.27*** (1.54)
ln P_t	-2 (3.94)
Durbin Watson	2.08
R^2	0.39

*, **, ***, significant at 10%, 5% and 1% levels

Values in parentheses are standard error

4.5- Beans production function

The model for beans production was specified using ADL (1, 1) model, area planted, domestic price of rice and a dummy for trade liberalization were treated as independent variables while beans production was treated as dependent variable. The model is specified as shown below:

$$lnBP= lnB_1+ B_2lnBP_{t-1}+ B_3lnAPB_{2t}+ B_4lnAPB_{2,\,t-1}+ B_5lnBDP_{3t}+ B_6lnBDP_{3,\,t-1}+ B_7TL_{4t}+ B8TL_{4,\,t-1}+ \sum_t$$

The model has an explanatory power of 98% which is a good fit and also autocorrelation problem was avoided. According to the result of the table below, trade liberalization has no effect on beans production, one cannot reject the null hypothesis which assumed that trade liberalization has no effect on the production of rice. However we see that the variables that impact significantly beans production are the area planted of the current year and of the lag year, the production of the lag year and the domestic price of the current year. Increasing the area planted in beans is necessary to increase the production of that crop; every 1% increase of area planted of the current year corresponds to an approximate increase of the production. The area cultivated in beans of the lagged year shows significant effect on beans production, the result shows that when they are inversely proportional; when the area cultivated in beans of the lagged year increases (decreases), the production of beans for the current year will decrease (increase). Such result can be explained by to the Cobb-Web theorem since the area cultivated will determine the production and the price.

The production of beans for the lagged year also affects significantly the production of rice positively. And finally, we have "$lnDPB_t$" which represents the price elasticity of supply of beans, one can say that this latter is elastic and to every 1% increase in the price of the beans is associated a 1.53% increase in its production. The model shows that the price of this commodity is more crucial than the other factors to improve its production. Note that the country has 3 seasons for beans crops in a year and the price used in the data is the average price, hence we can see that only seasonal price of the current year affects its production because it sends more information to the farmers. The price of the lagged year has no significant effect on the production since the producers hold the most recent price as reference to plan the production; the more recent is the price information the more significant is its effect on production than its lag (price).

Table 5: Factors affecting beans production

Variables	Model for beans production
(Constant)	-13.9 (11.92)
TL	0.002 (0.024)
$lnB.A_t$	0.95*** (0.122)
$lnBP_{t-1}$	0.7*** (0.169)
$lnB.A_{t-1}$	-0.683*** (0.115)
$lnDPB_t$	1.53** (0.673)
$lnDPB_{t-1}$	1.203 (1.779)
Durbin Watson	1.863
R^2	0.980

*, **, ***, significant at 10, 5 and 1% levels.

Values in parentheses are standard error

4.6- Beans import function

According to the chart below we can see that 92% of the result is explained by the model and also autocorrelation was avoided during the study. It is clear according to the result table that trade liberalization doesn't have a significant effect on beans import. However, the GDP per capita is the one that has the strongest effect on beans import; according to the model, every 1% increase of the GDP corresponds to a decrease of 6.6% of decrease in the import; that result is a good indicator because it helps us understanding that domestic beans is more preferred than imported one, this latter is merely a way to cover the excess domestic demand for that crop, hence beans imported is an inferior good. Hence, an income growth would lead to a substantive drop of beans import, inducing an increase of the part of income allocated to invest or purchase

beans that is produced domestically or its substitute. The exchange rate is unitary elastic to beans import, when exchange rate increases people the aggregate import demand for beans decreases. The quantity of beans imported for the lagged year and the trend variable are positively linked correlated to beans import at 5% significance level. And finally, though less preferred than domestic beans, we see that the country is progressively becoming more dependent on beans import.

Table 6: Factors affecting beans import

Variables	Model for beans import
(Constant)	52.029*** (17.336)
TL	0.196 (0.411)
$lnGDP_t$	-6.634*** (2.307)
$lnRPB_t$	-3.930 (3.744)
$lnBI_{t-1}$	0.376** (0.172)
$lnER_t$	-1.06** (0.407)
TV_t	0.69** (0.32)
Durbin Watson	1.884
R^2	0.923

*, **, ***, significant at 10%, 5% and 1% levels

Values in parentheses are standard error

4.7- Raw Sugar production function

Haiti was reputed since the colonial period for sugar cane production, even after its independence, the production of sugar cane and raw sugar continued to remain an important economic activity in the country. Sugar cane industry has in the recent year faced bankruptcy and

was obliged to shut down. In this study, we will determine whether and how trade liberalization has affected the production of raw sugar in the country. ADL (1, 1) model was used to assess the effect of free trade on raw sugar production and other independent factors were considered in the model like the real GDP per capita, and the area planted in sugar cane in the country.
As we can see below the model is a good estimate with 93% of the result explained by the model and autocorrelation was not a problem as well.

The result proves that trade liberalization has significantly reduced raw production, and according to the model, it accounts for 46% of the total reduction of this commodity. Processing of sugar cane into raw sugar, an important activity back in the years is proved by our result to be ruined by trade liberalization, that policy has caused the agro-processing companies that used to transform sugar cane in raw cane to progressively downsize and most of them have later closed due to bankruptcy. The domestic companies couldn't compete with big size companies benefiting from the economy of scale. The result proves that free trade has damaged the production of raw sugar in the country, the raw domestic faces higher production cost compared to exporting countries, causing the relative price of import as related to domestic market to be much lower, as a consequence, the country imports at lower price. Among other significant variables affecting sugar production is the production of the lag year an increase (decrease) of this latter of 1% leads to an increase (decrease) of production at 0.15%. The area harvested is also a determinant factor for raw sugar production, an increase of 1% of the area cultivated leads to an increase of 0.8% in raw sugar production

Table 7: Factors affecting raw sugar production

Variables	Model for raw sugar production
(Constant)	-0.27 (2.35)
TL	-0.46*** (0.2)
$lnSP_{t-1}$	0.15*** (0.13)
$lnS.A_t$	0.81*** (0.28)
$lnGDP_t$	-0.12 (0.59)
Durbin-Watson	1.84
R^2	0.93

*, **, ***, significant at 10%, 5% and 1% levels

Values in parentheses are standard error

4.8- Sugar import function

Sugar is an important commodity in the country and unfortunately it is not produced in the country, the country remains dependent to foreign countries for its supply. Partial adjustment model is also used to determine the effect of independent variables like the imported price of sugar, the real GDP per capita, exchange rate and finally the lagged import of sugar; the quantity of sugar imported was treated as the dependent variable.

As appeared in the table below, the model explains the result at 69% and autocorrelation was not a problem for the model. According to the result, one cannot reject the null hypothesis, because trade liberalization doesn't have a significant effect on sugar import and also the imported price doesn't affect the quantity imported. Both results show that the country has always been a net importer of this product and the change in the policy has not induced any considerable effect on its import, the import of sugar can be said to be inelastic to the price. The only factor that influences sugar import is the import of the lagged year.

Table 8: Factors affecting raw sugar import

Variables	Model for raw sugar production
(Constant)	16.329* (8.42)
TL	-.475 (0.34)
$lnGDP_t$	-1.447 (1.14)
$lnIPS_t$	-0.224 (0.21)
$lnER_t$	0.181 (0.3)
$lnSI_{t-1}$	.418** (0.15)
Durbin-Watson	1.918
R^2	0.653

*, **, ***, significant at 10%, 5% and 1% levels

Values in parentheses are standard error

4.9- Oil production function

The domestic production of oil, referring to the model, shows that 76.7% of the result is explained by the specification, and autocorrelation was avoided. The table below shows that free trade has no significant effect on the production of domestic oil. the GDP per capita is the factor that affects oil production the most, and according to the result a rise of income of 1% would reduce oil domestic production to 3.7%, domestic oil is considered as an inferior good to the consumers, with income improvement, there is a substitution effect inducing consumers to consume imported oil instead of domestic one. It is also obvious that oil produced by domestic industries is consumed by poor households, which oil can be sold in very small amount unlike imported oil, retail sale is convenient to poor households due to their low purchasing power. However when income improves they tend to consume imported oil, which is less oily and has very good packaging condition. An improvement of the packaging of domestic oil seems

necessary to remain concurrent to the imported oil and also to reach middle and high income class of consumers. And we can see that imported oil is a competitive good to domestic one, at 10% level of significance, an increase in of oil import quantity of 1% would lead to a less proportionate decrease of domestic oil produced domestically; this value represents also the marginal rate of substitution. Though inelastic, an increase of 1% of the quantity of oil imported will decrease domestic production to 0.5%.

Table 9: Factors affecting oil production

Variables	Model for raw sugar production
(Constant)	31.465*** (9.719)
$lnOP_{t-1}$	0.130 (0.16)
TL_t	0.776 (0.6)
$lnIPO_t$	0.760 (0.48)
ln OI_t	-0.5* (0.24)
ln GDP_t	-3.756** (1.45)
Durbin-Watson	1.989
R^2	0.767

*, **, ***, significant at 10%, 5% and 1% levels

Values in parentheses are standard error

4.10- Oil import

The model for oil import is specified using the lag model and autocorrelation wasn't deemed to be a problem. Partial adjustment model was used with oil import treated as dependent variable, and real GDP per capita, imported price of oil and a dummy variable for trade liberalization and the lagged effect of oil imported as explanatory variables.

As we can see below, our model explains the result at 69.6% and autocorrelation was not a problem for the model. The results show that only 2 variables affect significantly the import of oil. One can see that trade liberalization has significantly increased oil import to 187%, thereby one should reject the null hypothesis at 1%, from this we can see that trade liberalization has drastically increased oil import.

Also, we can see that the GDP per capita is another factor affecting oil import significantly, the increase of real GDP per capita of 1%, has the consequence of increasing the oil import of 2.8%, that result proves that imported oil is a luxury good for most of the Haitians. We can understand that it is more preferred by the population and its consumption can increase with the increase of income and the households with average income are likely to consume imported oil while poor household consume more domestic oil which could bought in retails. Unlike domestic oil, imported oil has a lower financial accessibility and flexibility; one can access small amount of domestic oil with a low price to meet urgent needs while the other is available in bottle or galloon in bigger amount hence a higher price. In conclusion, domestic oil is a good alternative for poor households.

Table 10: Factors affecting oil import

Variables	Model for raw sugar production
(Constant)	-12.328 (7.7)
lnTL	1.874*** (0.58)
$lnIPO_t$	.174 (0.31)
$lnOI_{t-1}$	.162 (0.15)
$lnER_t$	.328 (0.303)
$lnGDP_t$	2.857** (1.196)
Durbin-Watson	1.8
R^2	0.7

*, **, ***, significant at 10%, 5% and 1% levels

Values in parentheses are standard error

4.11- Wheat flour import function

For wheat import, partial adjustment model is used and the model is fit to avoid autocorrelation. The result is explained at 63.8% by the model.

From the model, one can see that 2 factors affect significantly wheat flour import. The first one is the GDP per capita which shows a negative effect on wheat flour import because at a p-value of 0. 01, the increase of GDP per capita would decrease the import of wheat flour with even a lower proportion. From this, we can understand that when income is improved in the country there is a trend to substitute the wheat flour considerably by other commodities. A growth of income seems to lead to increase the process on income and hence increase the domestic production of wheat. And also it might lead a trend to consume less starchy resulting from imported wheat.

Table 11: Factors affecting wheat flour import

Variables	Model for wheat flour import
(Constant)	35** (16.705)
TL	0.105 (0.684)
ln_GDP_t	-4.122* (2.371)
ln_ER_t	-0.667 (0.607)
$lnIPWF_t$	-0.397 (0.541)
$lnWFI_{t-1}$	0.527*** (0.131)
Durbin-Watson	1.8
R^2	0.64

*, **, ***, significant at 10%, 5% and 1% levels

Values in parentheses are standard error

V- Conclusions and recommendations

Free trade has always been a controversial theory; its incidence on the economy is approached different ways by its proponents and the infant industry advocates. Different papers mentioned in that research paper are some instances that enlighten us on how free trade affects the economy. Free trade has some unquestionable benefits by making fluid the market of goods and services for all the actors of the economy. The debates on the issue is intense when it comes to ask as to who profits from free trade. In some specific conditions, some authors could see that free trade is profitable and for some others it is detrimental.

This paper aimed to see the effect of trade liberalization on production and import of food basket of Haiti, which is composed of 6 products namely rice, maize, beans, sugar, wheat flour, oil. We aimed to determine how trade liberalization has affected the domestic production and import of the good mentioned above. And our main assumptions were that trade liberalization reduced the domestic production of those goods and increase our dependency on their imports.

The analysis and assumptions were consecutively run and tested for each specific good. The results showed that from all the 6 commodities, 3 were significantly affected by trade liberalization; those are maize, sugar and oil. Maize import has decreased sharply with trade liberalization. Sugar production was proved to be severely reduced by such policy while its import is not directly determined by that policy. For oil, the result proves that this policy has increased the country's import in that commodity but had no significant effect on on its production.

According to the results, the most determinant factor that increase rice production is price of domestic rice, variable like cultivated area also improves rice production significantly. Maize production is determined more by the area cultivated, another factor that influences its production significantly, among them is maize production of the lagged year. Just like rice production, the most determinant factor for beans production is its domestic price, and then comes the area of the current year and the lagged year which has significant effect on it. It was shown that an improvement of GDP would reduce beans import and the result for beans import showed that the country is becoming more and more dependent on that crop. For the case of

sugar, its import is only significantly affected by its lagged import. For domestic vegetable oil, the result showed that this latter is an inferior good and less preferred than the imported and the imported oil is a luxury good to Haitian consumers because an income growth implies a higher relative growth of demand. And finally we can also see that wheat flour import decreases with the improvement of income, there seems to be an either an incentive to transform wheat locally instead of importing it or it may be an inferior good causing consumers to opt for other substitute.

It would be important for the agricultural policy makers to create access to more inputs (rice seeds, irrigation systems) and technology to fill in the productivity gaps that still exist for rice crops since it is the most preferred good among the food basket. The ministry should target other regions with favorable agro-climatic conditions to increase rice production to counterbalance its import. Promotion of rice substitute (maize, sorghum) should be considered in parallel to reduce rice import dependency. Increasing tariff on raw sugar import and develop agro-processing industry for sugar would have a positive effect on raw sugar production and the economy in a whole. Increasing the tariff on oil imported since it is more preferred than the domestic one would have an adverse effect on its demand while making effort to improve the quality of domestic oil of the country.

The paper explores the food basket commodities that are affected by trade liberalization and how they are affected and suggest what should be done to profit from trade when beneficial and to bypass when not. Nevertheless, due to the unavailability of data on import tariff regarding each commodity, it is not possible to determine the level to which tariff must be fixed to create gain for the country. Further studies need to be done in consequence especially for products like rice, sugar, wheat flour and oil which production or supply are affected by trade liberalization.

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