

# AN ANALYSIS OF U.S. CHICKEN EXPORTS TO MEXICO

by

SONIA VELÁSQUEZ GUERRERO

(Under the Direction of Lewell F. Gunter)

## ABSTRACT

Mexico is an important market for U.S. chicken product exports, but it is also a complex market due to changing sanitary restrictions and multiple domestic and trade policies. Mexico's demand for chicken has outpaced its domestic production, and poultry meat imports increased at an average rate of 8% a year from 2000 to 2005. More than 90% these imports come from the U.S. In this study, we examined impacts of tariff rate quotas from NAFTA and from a Voluntary Safeguard Agreement on U.S. chicken exports to Mexico. Excess supply and demand equations were estimated using three stage least squares. The results indicate that the level of above-quota tariff rates had a significant impact on U.S. prices of chicken exports to Mexico. We also found that U.S. chicken imports increased significantly in response to rising middle-class incomes in Mexico, and that there may be a significant potential for domestic Mexican production to displace some of the U.S. imports if domestic producers can expand output.

INDEX WORDS: Voluntary Safeguard Agreement, NAFTA, Chicken Meat, Exports, U.S. Mexico, Import Policy, Excess Supply, Excess Demand.

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*Dedicada a mi madre por ser un ejemplo  
de amor y fortaleza*

*Dedicated to my mother for being an example  
of love and strength*

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 Purpose of the Study**

This research topic came about from my interest in the trade patterns and factors that influence the dynamic commerce between Mexico and the United States (U.S.). Mexico is definitely a promising market for U.S. chicken products; at the same time, it is a complex market due to multiple domestic and trade policies and sanitary regulations. The Mexican poultry market is unique, due to its complex consumption patterns, with domestic production having not only to deal with high feed grain prices, but also an increased demand for poultry. In 2007 annual per capita consumption reached an average of 57 pounds. Lately, Mexico's demand has outpaced its domestic production, resulting in Mexico's poultry imports, increasing from 49,233 MT in 1990 to 547,100 MT in 2005, of which 360,750 MT are from chicken meat imports. Mexico imports poultry products from a variety of countries, such as Chile, Denmark, Hungary and Spain. However, none of these countries compete with the amount that is imported from the United States of America.

The importance of the United States in the world poultry industry can be seen in a variety of ways. First and probably the most obvious is the fact that the U.S. is the world's largest poultry producer with over 16 million MT in 2007. Not only is the U.S. the largest poultry producing nation, but it is also the world's second largest exporter of broiler behind Brazil. The total annual farm value of the poultry production in the U.S. is massive, exceeding \$20 billion (USDA 2008).

After the NAFTA trade liberalization, Mexican poultry producers were concerned with the volume of imports from the U.S. which could injure the domestic industry. The Mexican Poultry Producers Association (UNA) presented a safeguard request for protection to the Mexican Secretary of Economy (SE) on September 10, 2002. Based on NAFTA article 801, UNA requested that a bilateral safeguard with a 98.8 percent tariff be applied to imports of chicken leg quarters above 100,1000 MT from the United States. This safeguard quota was in place until December 31, 2007. The UNA indicated that such a level of protection was required to enable the poultry industry to further develop and better compete with imports of U.S. chicken (USDA 2002). This study will thus pay special interest to the voluntary safeguard agreement that the U.S. and Mexico signed in July of 2003.

## **1.2 Problem Statement**

International trade in poultry products introduces competitive factors in domestic production in both the import and export markets, trade policy, and sanitary and phytosanitary regulations. The North American Free Trade Agreement (NAFTA) opened up trade opportunities between the U.S. and Mexico in poultry products. Mexico agreed to reduce tariffs on agricultural products over the adjustment period and eliminate non-tariff barriers. Safeguard measures were instituted to protect producers and consumers. Producers on both sides wanted protection from dumping or surges in imports that would harm farmers. Sanitary and phytosanitary measures were put in place to protect producers and consumers from unsafe foods.

Under NAFTA, the tariff-free quota for chicken meat imports increased from 26,574 MT in 1994 to 31,232 MT in 2002. Over this time the above quota tariff decreased from 258 percent in 1994 to zero in 2003. Poultry meat exports to Mexico surged, resulting in a new annual

safeguard TRQ on chicken leg quarters from 2003 through 2007. Under the safeguard agreement, the tariff-free quota for U.S. chicken leg quarters increased 3% annually, up to 2007. While above-quota tariff rate decreased from 98.8 percent in 2003 to zero in 2008. In recent years, concerns over the presence of Low and High Pathogenic Avian Influenza in the U.S. resulted in Mexican Secretariat of Agriculture (SAGARPA) imposing import restrictions on poultry products from several states and counties from 2003 through 2007.

### **1.3 Objectives**

The primary objectives of this study are to:

- a. Examine the Mexican market for the U.S. chicken products;
- b. Describe the different consumption preferences between the U.S. and Mexico and assess the potential of the MEX-U.S. market;
- c. Identify the issues that affect the domestic Mexican poultry market which could be used or changed by poultry producers and policy makers;
- d. Build an econometric model that estimates the excess demand and supply equations for the main chicken parts that are exported from the U.S. to Mexico;  
and
- e. Analyze the impact of the NAFTA and Safeguard tariff rate quota on prices and quantities of the three major poultry products in Mexican-U.S. trade.



## **1.4 Organization**

The present study is divided into six chapters. Chapter 2 describes the international market for poultry, U.S. poultry exports to Mexico, and the different factors that shape the markets of each country. Chapter 3 describes the Mexican production, consumption and policy issues. Chapter 4 introduces the theoretical framework and econometric model for U.S. chicken exports to Mexico. Chapter 5 discusses the models, data description, and the estimation results of the econometric models. The final chapter gives the conclusions and a review of the study; including a section on the limitations of the study and suggestions for future research.

This study is limited to an analysis of chicken meat trade between Mexico and the United States. The primary products are chicken cuts fresh and frozen and chicken leg quarters frozen. These three chicken parts are the major U.S. poultry exports to Mexico from 1997 to 2007. Turkey meat, eggs and other poultry products are outside the scope of this study.

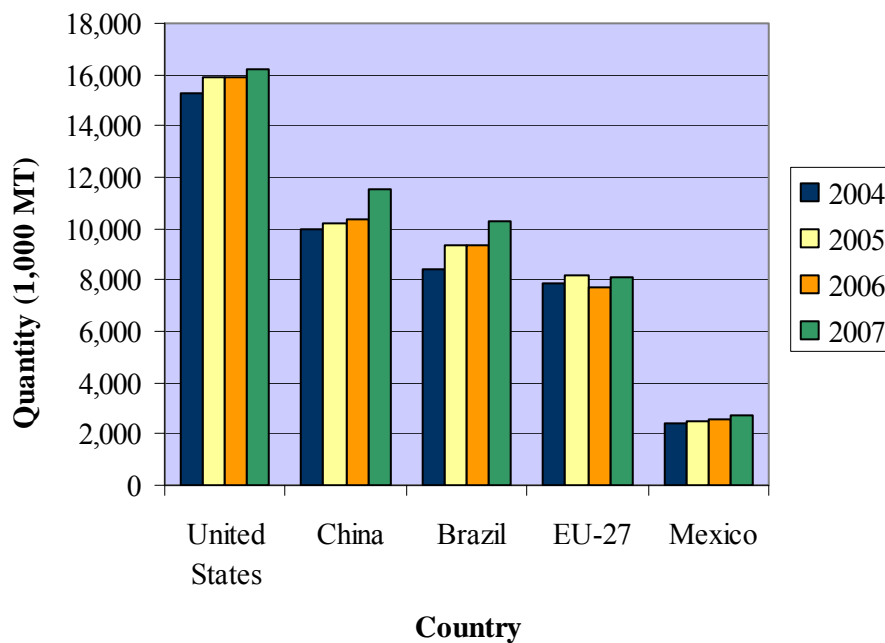
**CHAPTER 2**  
**THE INTERNATIONAL MARKET FOR POULTRY AND**  
**U.S. POULTRY EXPORTS TO MEXICO**

**2.1 World Poultry Production, Consumption, and Trade**

The poultry industry is one of the fastest growing segments of the animal industry. Worldwide the poultry industry has been increasing its production and consumption of poultry products. The forecast for broiler production for 2008 is 71 million tons. In 2007 the major producers in the world were the United States, China and Brazil, producing 16.2, 11.5 and 10.3 million MT, respectively. These three countries account for 53% of the world's poultry production.

The U.S. was the biggest poultry producer during the last four years according to the *Livestock and Poultry: World Markets and Trade* (USDA 2008). In 2007 U.S. production reached 16.2 million tons while China raised 11.5 million tons due to strong demand for cheaper protein as pork prices increased. Brazil produced 10.3 million tons. Brazilian producers are expected to expand poultry output as local feed supplies are raised to record levels. The fourth major producer of poultry products is the EU-27 which account for 8.1 million tons. The fifth most important poultry producer is Mexico with 2.7 million tons. The Mexican industry has the main function of supplying the domestic markets but does not generate excess production for exports. The top five world broiler producers, which accounted for 72 percent of world production in 2007, are illustrated in Figure 2.1 (USDA 2008).

The production and processing activities of the poultry industry in the last decades have been under a process of concentration, vertical integration and better management, allowing the prices of poultry to be lower than competing meats (UNA 2007). Meat exporting areas tend to be located near large feed supplies to minimize costs of transporting bulky feeds. Feed production requires large areas of land suited for grain and oilseed production (ERS/USDA 2000).

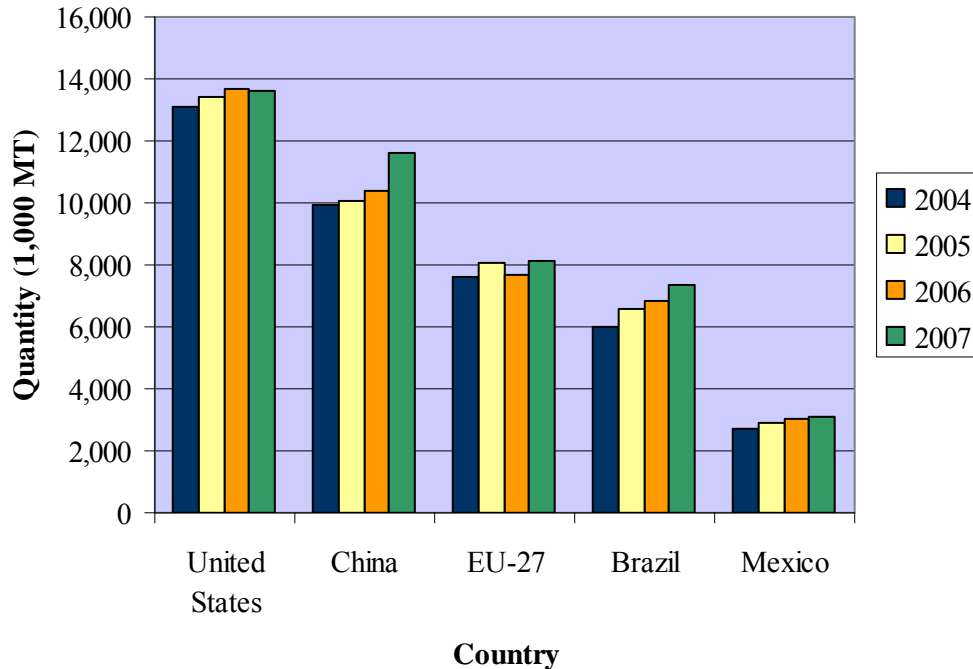


**Figure 2.1 Top Five World Broiler Producing Countries, 2004-2007**

Source: “Livestock and Poultry: World Markets and Trade” Foreign Agricultural Service, USDA (April 2008).

The 2008 forecast of world broiler consumption is 70 million tons. The major consumers of poultry products are the U.S., China, EU-27, Brazil, and Mexico. These countries account for 65 percent of world broiler consumption in 2007. The increase of consumption has been

especially strong in China, Mexico and Russia. The present trend on this matter is illustrated in Figure 2.2.



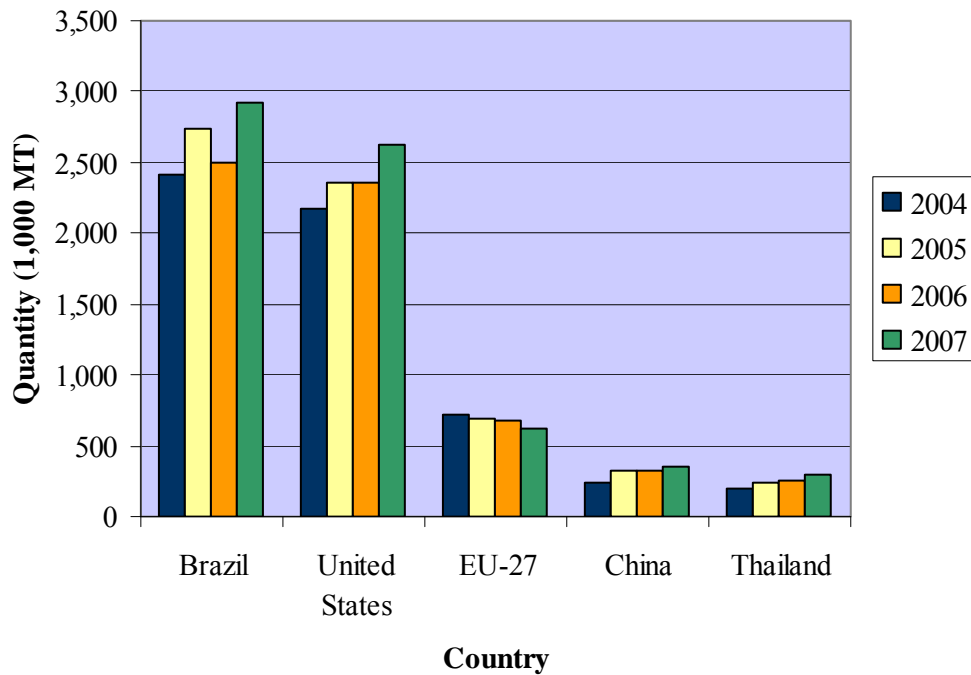
**Figure 2.2 Top Five World Broiler Consuming Countries, 2004-2007**

Source: “Livestock and Poultry: World Markets and Trade” Foreign Agricultural Service, USDA (April 2008)

The leading exporters of poultry products are the U.S. and Brazil, which account for nearly 80 percent of the world total; both markets are forecast to grow by 4 percent in 2008 (Livestock and Poultry, USDA). The U.S. has had a steady increase in exports to China, Russia and Mexican markets, which represents the foreign demand for “low-value” poultry products like chicken leg quarters, thighs and offal, due to strong demand and favorable exchange rates.

Brazil has increased its exports year to year in recent years, except for a decline in 2006. Brazil’s major export destinations are the EU-27, Saudi Arabia, Japan, Hong Kong and the United Arab Emirates. The EU-27 is the third largest exporter with 623 thousand MT in 2007

but it is expected to reduce its export market in 2008, since EU poultry products are becoming less competitive due to the rising euro (Livestock and Poultry, USDA). In 2007, the EU-27 exports to major markets like Russia and Ukraine were down. The European Union is expected to be a net importer by 2008 with Brazil as its major supplier. Market trends in the world poultry exports of the last few years are illustrated in Figure 2.3 (USDA 2008).



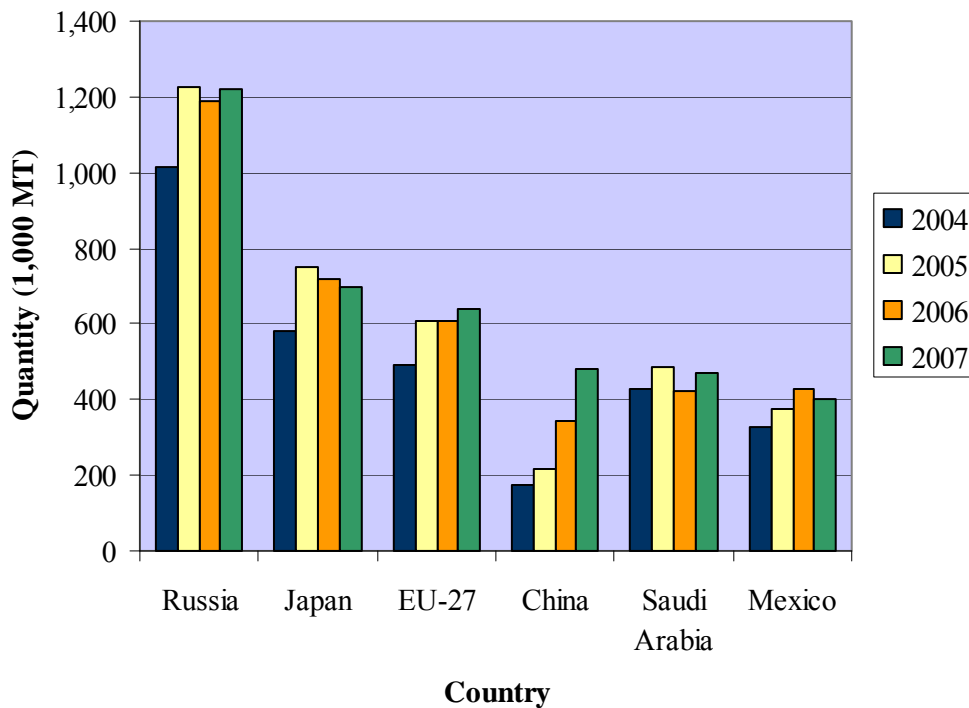
**Figure 2.3 Top Five World Poultry Exporters**

Source: “Livestock and Poultry: World Markets and Trade” Foreign Agricultural Service, USDA (April 2008)

The major world importers of poultry are Russia, Japan, EU-27, China, Saudi Arabia, and Mexico. Russia accounts for 17.5 percent of world imports, placing it as the biggest poultry importer with the U.S. as its primary supplier (Figure 2.4). In 2007 Russia imported 1.2 million MT; some of the reasons for Russian high imports are the continued shortage of supplies of red

meats, favorable broiler prices and increased consumer demand due to growing incomes (USDA 2008).

Factors that affect the demand of poultry include tastes and preferences, which can be divided as “high-value” (mostly white meat) and “low-value” (mostly dark meat) poultry products. This difference of preferences provides a marketing opportunity for poultry exports. For example, U.S. firms export wings, feet and other dark meat and offal to China and Hong Kong, and drumsticks and dark meat products to Mexico. Chinese and Mexican markets pay more for such cuts than U.S. consumers. These differences in poultry meat preference among countries can lead to complementary trade flows (ERS/USDA 2000).



**Figure 2.4 Main World Poultry Importers**

Source: “Livestock and Poultry: World Markets and Trade” Foreign Agricultural Service, USDA (April 2008).

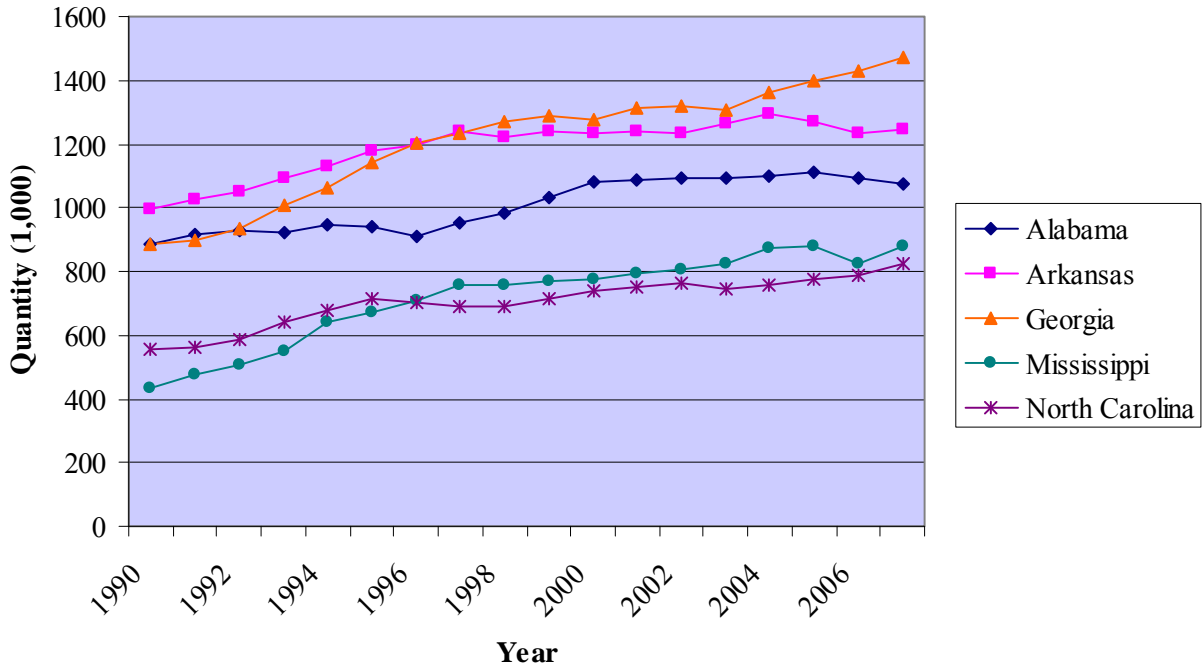
Other factors influencing broiler meat production are exchange rates, energy prices, feed production, population growth, increasing incomes, and responses to food safety issues. Safety issues have a major impact on the global poultry industry. One of the most recent outbreaks that affected the global poultry industry was the highly pathogenic H5N1 avian influenza virus (HPAI, H5N1) of November 2003, affecting both HPAI-infected and uninfected countries around the world. Many countries banned poultry imports from HPAI H5N1-infected countries to minimize the risk to uninfected flocks and human population. The import bans caused a 23-percent decline in global uncooked and cooked poultry meat exports from the fourth-quarter 2003 to first-quarter 2004 (ERS/USDA 2007).

Poultry markets are subject to a complex mix of national and international sanitary regulations, together with nontechnical barriers in the form of tariffs and tariff-rate quotas (TRQs). The 1995 World Trade Organization (WTO) Agreement on Agriculture and on the Application of Sanitary and Phytosanitary (SPS) Measures has affected this mix, reducing levels of nontechnical border protection while tightening the rules for sanitary measures (Peterson and Orden 2005).

## **2.2 U.S. Poultry Production and Exports**

The United States is the world's largest poultry producer with over 16 million MT produced in 2007. The combined value of production from broiler, eggs, turkey and the value of sales from chicken in 2007 was \$31.9 billion, up 24 percent from \$25.8 billion in 2006. Of the combined total, 67 percent was from broilers, 21 percent from eggs, 12 percent from turkey and less than 1 percent from chicken meat. The broiler industry is concentrated in the southern states such as Georgia, Alabama, Mississippi, Arkansas, and North Carolina. The top broiler-producing

states are Georgia, Arkansas, Alabama, Mississippi, and North Carolina which account for 70 percent of the US broiler production (Poultry Production and Value 2007 Summary/USDA April 2008).



**Figure 2.5 U.S. Broiler Production by State**

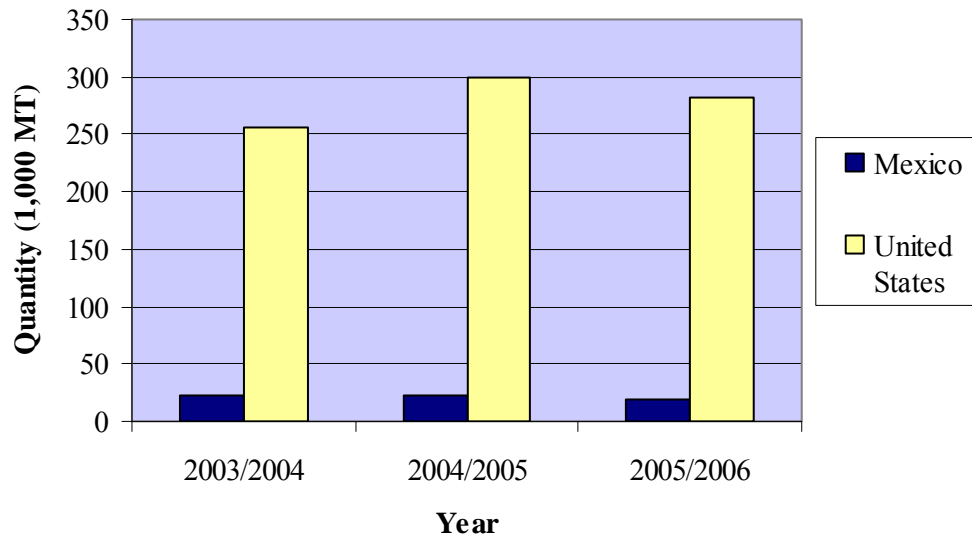
Source: “Poultry- Production” National Agricultural Statistics Service, USDA, Various issues, (1990-2007).

The U.S. is the world’s second largest exporter of broilers behind Brazil. Annual broiler exports average between 5 and 6 billion pounds, which is about 15 percent of U.S. production. The poultry industry is heavily influenced by currency fluctuations, trade liberalizations and sanitary regulations. The largest importers of U.S. broiler products are Russia, China (including Hong Kong), and Mexico. Together these markets account for over half of U.S. broiler product exports, on a quantity basis (USDA 2008).



### 2.3 Characteristics of U.S. Poultry and Egg Production System

The broiler industry is the major consumer of feed grains, accounting for approximately 100 billion pounds of feed yearly. The U.S. has one of the most efficient production systems for feed grains like corn. Some of the reasons are the amount of arable land, good irrigation systems, and the government's support of farmers (). In 2005, the yield of corn for feed in the U.S. was of 2.87 tons per hectare while in Mexico it was of 1.6 tons per hectare, giving the U.S. poultry industry an advantage in access to cheaper feed grains. The production of corn in the U.S. and Mexico is illustrated in Figure 2.6.



**Figure 2.6 Corn Productions in Mexico and The U.S.**

Source: "Statistics of Grain and Feed" Foreign Agricultural Service, Grain and Feed Division USDA (2007).

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**Table 2.1 Comparison of U.S. and Mexican corn sectors, 2005**

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Item	Mexico	United States
Production (million metric tons)	22.05	299.92
Area (million hectares)	7.69	29.80
Yield (tons per hectare)	2.87	1.6

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**Source: “Statistics of Grain and Feed” Foreign Agricultural Service, Grain and Feed Division USDA (2007)**

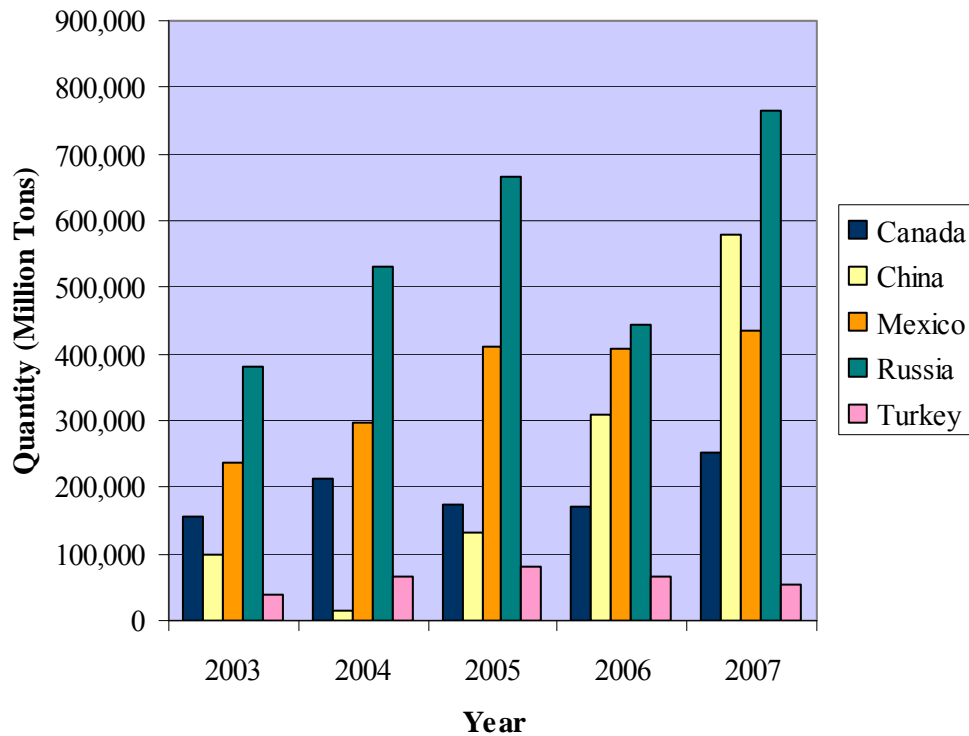
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There are some federal programs designated for U.S. poultry producers. Federal legislation provides assistance for livestock and poultry farmers with emergency feed grain programs, drought assistance, and conservation and environmental programs. Some of the incentives are technical, educational, and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmental beneficial and cost effective manner.

Part of the rise in poultry productivity and consumption, particularly chicken, results from the chicken industry’s catering to consumers’ and foodservice operators’ demand for value-added, brand-name, and convenience products (Buzby et al., 2006). Between 1970 and 2005, per capita poultry availability more than doubled, from 34 pounds per person to 74 pounds per person in the U.S.

### **2.3.1 U.S. Poultry Broiler Exports**

The top three export destinations for U.S. poultry meat in 2007 were Russia 765,574 MT, China 578,412 MT, and Mexico 433,996 MT (see Figure 2.7).



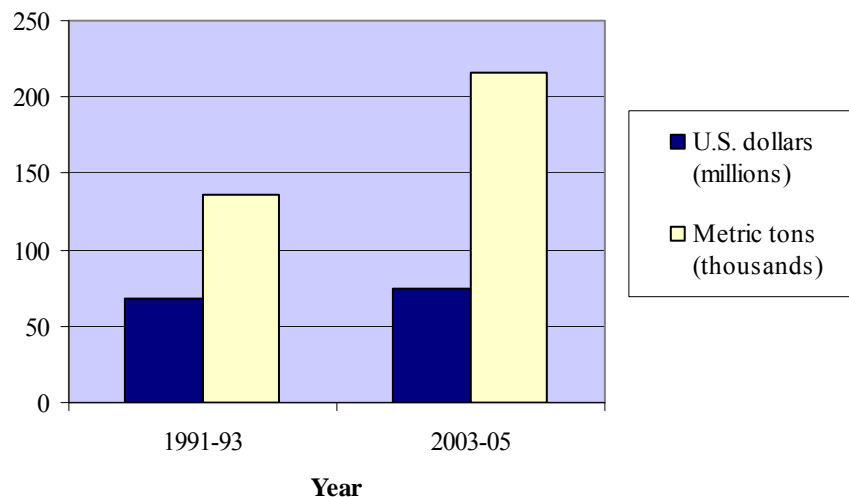
**Figure 2.7 Major Destinations for U.S. Poultry Meat Exports, 2003-2007.**

Source: United States Department of Agriculture, FAS/ USDA

HS 4-Digit Exports, July 2008

### 2.3.2 Trade Liberalization with Mexico

Although the quantity of poultry imported in Mexico from the U.S. has increased in the last few years especially in items like mechanically deboned chicken meat, chicken leg quarters (CLQ) and turkey meat parts; the low prices that the industry has experienced have kept the monetary gains at a relatively low level as we can see in Figure 2.8.



**Figure 2.8 U.S Chicken, Fresh or Frozen Exports to Mexico by Quantity and Price**

Source: Source: USDA, Foreign Agricultural Trade of the United States database

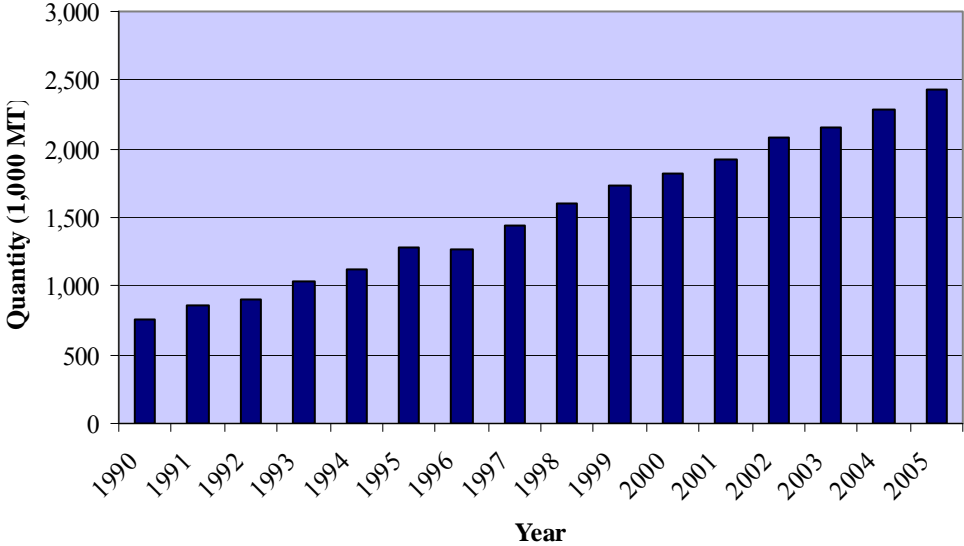
## 2.4 Overview of Mexican Poultry Production and Consumption

The Mexican poultry industry has been the fastest growing sector of Mexico’s livestock industry. The domestic production is highly concentrated, with the top three producers -Bachoco, Pilgrim’s Pride, and Tyson- accounting for 60 percent of the market. In 2005 the poultry industry accounted for 0.76 percent of the nation’s GDP. In 2005, the Mexican poultry industry produced around 2.5 million tons of chicken meat, egg production was 2.3 million tons, and turkey production was 13,840 tons.

According to the National Poultry Industry in Mexico, this industry has generated 1,072,000 jobs, of which 178,000 are direct and 872,000 indirect jobs. From these employment statistics, 60 percent of these jobs are created by the chicken industry, 38 percent by the egg industry and 2 percent by the turkey industry.

From 1994 to 2005, the Mexican poultry Industry has been increasing 5.5 percent annually. Fifty-one percent of Mexican production of chicken in 2005 was concentrated in 5

states: Veracruz, Querétaro, Aguascalientes, Jalisco and the region known as Comarca Lagunera (located between the states of Coahuila and Durango), See Figure 2.9. The main distribution centers are located around these center states.



**Figure 2.9 Mexican Production of Chicken Meat**

Source: UNA (National Poultry Union)

Poultry consumption in the last years has been increasing steadily (Table 2.2). Consumers see in poultry products a good source of protein at low prices in comparison to alternative products like beef or pork.

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**Table 2.2 Mexican Per Capita Consumption of Poultry Products**

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Product	2004	2005	2006*
	Pounds		
Eggs	47.35	48.90	49.28
Chicken Meat	51.54	53.28	55.06
Turkey Meat	3.21	4.09	4.77

---

**Source: UNA (National Poultry Association).**

\*Note: 2006 is forecast

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In Mexico, the importation of chicken meat from 1994 to 2005 increased at an annual rate of 7 percent, going from 239,000 tons in 1994 to 503,000 tons in 2005. The per capita consumption of chicken meat has increased from 19.9 kg in 2000 to 55 kg in 2005, which represent an increase of 276%. Some of the factors that favor the consumption of chicken meat in Mexico are:

- An increase in points of product sale closer to the consumer,
- Quality of the product (freshness),
- Increase of fast food restaurants ,
- Product of high quality at a reasonable price, and
- Tendency of consumers to lower their consumption of fat content in foods, and variety of preparation. (National Poultry Association, UNA 2007).

The commercialization of chicken meat is made through channels. Currently, the Mexican consumers prefer the wet market as a major supplier of chicken meat since they are considered to have the freshest products. Commercialization through commercial centers like Wal-Mart or popular retailers like Comercial Mexicana, Superama and Aurrera, account for 7%

of the consumption. The rest of the distribution is done by live selling chicken products 28%, roasted 26%, public markets 25%, in parts 10% and with a value added 4%.

## **2.5 Mexican Poultry Imports**

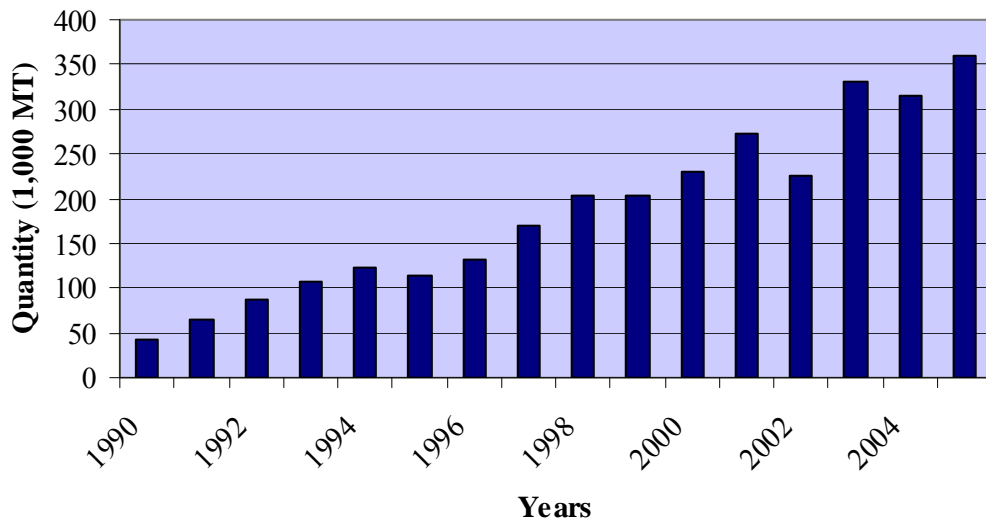
The Mexican market is supplied by its domestic production and imported poultry products. The main exporter of poultry products to Mexico are U.S. producers, especially in mechanically deboned chicken (MDC) meat and chicken leg quarters (CLQ). Other countries that export poultry products to Mexico such as chicks, frozen whole poultry, and MDC are Chile, Denmark, Hungary and Spain although none of them represent significant competition for U.S. imports to the Mexican market.

At the end of 2005 Mexico imported 502,956 tons of chicken meat and other chicken products. Forty percent of the imports correspond to the mechanically deboned chicken meat (partly consumed by the sausage and cold meat industry), 30% turkey meat, 25% chicken leg quarters and thighs, and 4% other processed poultry meat.

From 2000 to 2005, the average annual increase of poultry meat imports was 8%. This increase can be attributed to high consumption industries like sausage and cold meat processors. Some of the factors that made Mexico a potential major player in the demand for poultry products are its growing middle class and young population. Fifty percent of Mexico's population is below 25 years of age; and this factor favors Mexico's trend towards more imports because younger generations are more willing to try imported products. In addition, the Mexican government has been active in eliminating agricultural tariffs and quotas under NAFTA and signing free trade agreements with China and Japan (Barrett and Fabiosa 1998).

In 2005 the imports of chicken meat (chicken leg quarters and thighs) coming from the U.S. accounted for 93% of Mexico's total imports and the rest from Chile (mostly frozen chicken breast). In 2000, the U.S. poultry exports to Mexico represented 66% of the Mexican market share of chicken meat and by 2005 reached an 82%, of the country's import market. Mechanically deboned chicken meat went from 120,797 imported tons in 2000 to 202,230 imported tons in 2005. Turkey meat imports increased from 94,325 tons to 150,219 tons in the same period.

Mexico's demand has outpaced its domestic production, however, causing Mexico's broiler imports to increase from 41,529 thousand MT in 1990 to 360,750 thousand MT in 2005. This rapid increase is seen in Figure 2.10.



**Figure 2.10 Mexican Imports of Chicken Meat**

Source: UNA (National Poultry Association)

Another aspect that affects the volume of imports is the international situation both in the commercial and sanitary field. In the Mexican market, there are mostly products from Mexico and the U.S. The U.S. does not have significant competition from other countries, like Brazil or



Chile. Thus, any trade agreement between the U.S. and Mexico regarding poultry imports is expected to have an impact on prices and consumption. Mexico's poultry production, consumption and policy issues will be discussed in the next chapter.

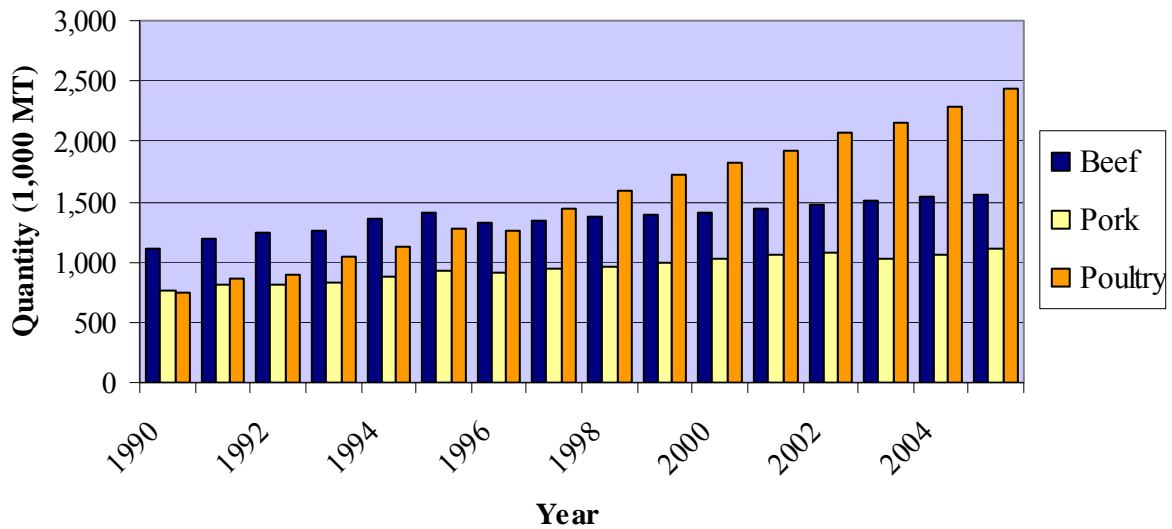
## **CHAPTER 3**

### **MEXICAN PRODUCTION, CONSUMPTION, AND POLICY ISSUES**

#### **3.1 Mexican Production**

Since 1997 poultry production has surpassed the production of red meats, like beef and pork, making it not only the fastest growing industry, but also the leader in meat production for the past ten years. The development of the poultry industry has been accelerated in the last decade by different factors such as increased consumer preferences for white meat, the low cost of dark meat poultry products, the expansion of large poultry companies, the use of idle infrastructure by these companies, and shorter production cycles (UNA, 2008). From 1994 to 2005 the domestic production of poultry products has increased at an annual rate of 5.5%. In 2005 the domestic chicken industry produced 2,436,534 MT of chicken meat, of which 21.8 MT were exported while 360,750 MT were imported in this same year (UNA 2008).

The primary meats produced in Mexico in the last 15 years are illustrated in Figure 3.1. Poultry production surpassed the production of beef and pork in 1997 when poultry generated 1,441,905 MT, beef 1,340,071 MT and pork 939,245 MT. Since 1997 poultry has been the largest volume of meat produced in Mexico.

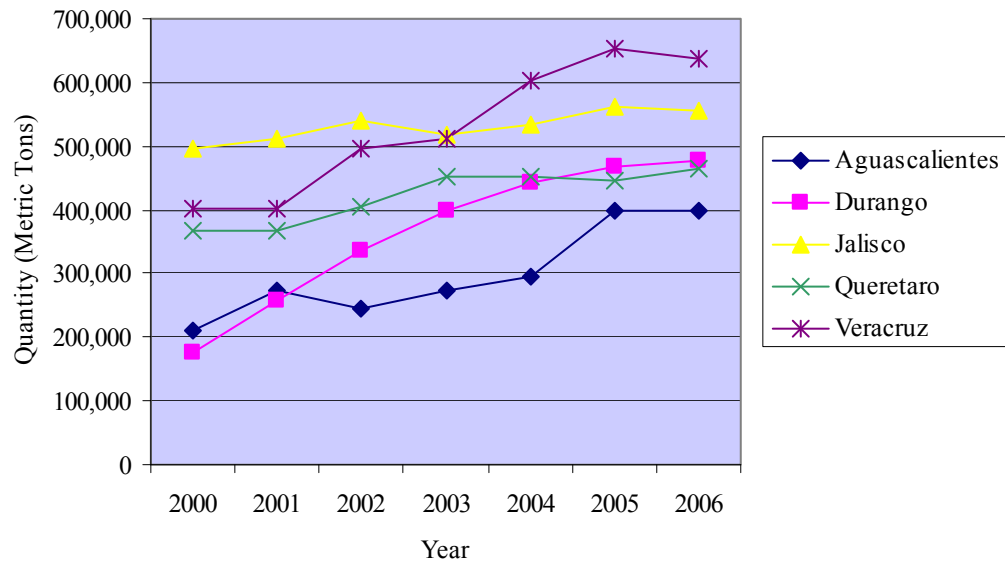


**Figure 3.1 Principal Meats Produced in Mexico, 2000-2005**

Source: Agro-Alimentary and Fisheries Statistical Information Service, SAGARPA.

The Mexican production of chicken in 2005 was concentrated in ten states of the nation, mostly in the center states where the main distribution networks are located. The main producer states for poultry are: Veracruz, Jalisco, Querétaro, Aguascalientes and the region known as Comarca Lagunera, located between the states of Coahuila y Durango, (Figure 3.2).

In the last five years there has not been a significant change in the geography of poultry production. The participation of the five principal producers' entities increased slightly, increasing from 40.16% in 2000 to 45.4% of the national total in 2006. This variation arises from expansion and consolidation of big entrepreneur groups and the adhesion of small and medium poultry producers to these consolidated companies. This increase of production does not mean the opening of new areas of production, but a better use of existing infrastructure. According to Agro-Alimentary and Fisheries Statistical Information Service, SAGARPA, the incorporation of new slaughter plants for poultry is not an easy step for producers due to high cost of equipment, construction, and the prevailing high interest rates (SAGARPA 2004).



**Figure 3.2 Mexican Main Broiler Producers by State, 2000-2006**

Source: SIACON (Statistics and Information System of Agricultural Products and Fisheries)/ SAGARPA (Agro-Alimentary and Fisheries Statistical Information Service)

**Table 3.1 Chicken Farm Composition**

	1996	2006	1996	2006
	Companies Number		Participation in Production %	
Large	2	3	33	55
Medium	27	30	40	41
Small	181	170	27	4

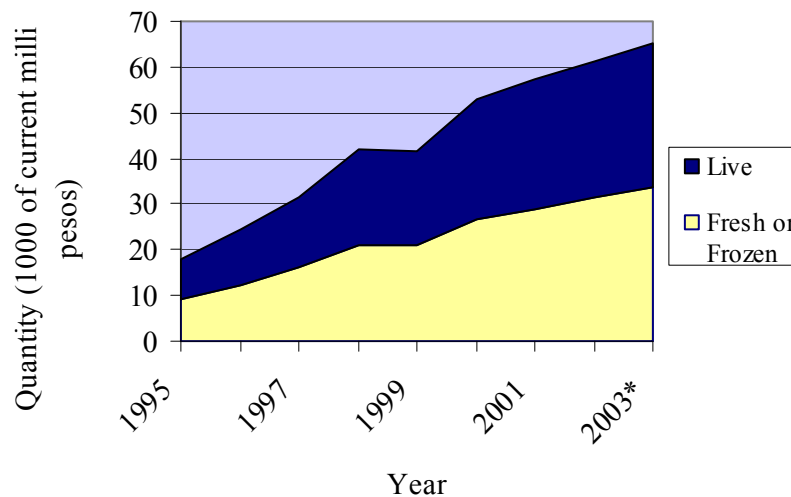
**Source: UNA (National Poultry Association)**

The poultry industry consolidation in the last ten years is illustrated in table 3.1. Some of the main producer groups are: Bachoco, Pilgrim's Pride, and Tyson, which account for 60 percent of the total domestic production. These companies are expected to keep growing in the medium term, but the expansion of large, vertically integrated companies will slow down due to the implementation of provisions contained in Mexico's Federal Economic Competition Law (Ley Federal de Competencia Economica). The objective of this law is to restrict monopolistic practices. Medium-size companies' will likely merge into cooperatives and associations, while smaller players will become contract producers (GAIN REPORT 2007/USDA).

Modern technology is widely used by the domestic poultry producers with at least sixty percent of the industry being mechanized. Around 80% of all Mexican chicken meat is produced in large vertically integrated companies. In 2007, 97% of Mexican poultry lines (Genetics) were imported from *ROSS BREEDERS* and *HYBRO* (GAIN REPORT 2003, USDA).

### 3.1.1 Characteristics of Mexican Chicken Production

According to the annual report of 2007, the development of the Mexican market has produced significant changes in seasonal demand. Consequently, the poultry industry adjusted its production cycles to achieve the demand for fresh products (SAGARPA). The average bird grow-out period depends mostly on how the bird will be sold. For live birds and whole chickens, including offal, which are commonly sold in street markets, the average grow-out period is 49-56 days. Birds for the broiler market (whole chickens without offal) have an average grow-out period of 40-44 days. The birds' grown to be sold in supermarkets are typically fed for 44-49 days. The average daily gain is 36 to 44 grams per bird and the average bird weight when marketed is 2.2 Kg<sup>1</sup>. The production value of live and fresh or frozen broiler products in Mexican pesos from 1995 to 2003 is illustrated in Figure 3.3.



**Figure 3.3 Production Value for Broiler Live and Fresh or Frozen, 1995-2003**

Source: Livestock General Coordination, with information from Agro-Alimentary and Fisheries Statistical Information Service, SAGARPA.

\*2003 Preliminary

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<sup>1</sup> 1 kg is equivalent to 2.2 pounds

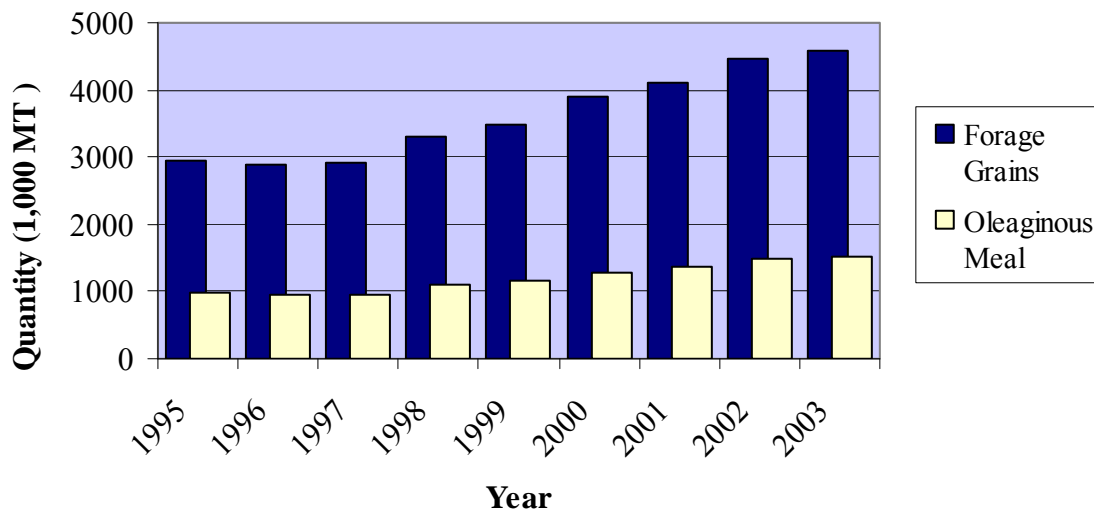
### **3.1.2 Cost of Production**

#### Grain Supplies

The poultry industry is not just important for the production of meat, but it is additionally the main consumer of feed grains such as sorghum and corn meal, which are a fundamental part of the bird's diets. According to Agro-Alimentary and Fisheries Statistical Information Service data, feed costs represent around 53 percent of the total cost of production. Since 1991 the domestic production of forage grains has not been able to supply the demand for feedstuffs that the poultry industry requires. The Mexican grain production sector has not improved its levels of production, technology, and quality in the last 20 years; this is one of the reasons why domestic poultry producers are major users of imported feedstuffs from the U.S. (Coleman 2003).

A priority for Mexican poultry producers is to lock in secure sources of feed stuffs and find low inputs prices of for feed, such as forage and oleaginous grains. The Mexican Agricultural sector has higher cost of production and tends to focus on grains for human consumption like white corn. On the other hand the Mexican poultry industry imports its grains from the U.S., which is comprised primarily of yellow corn over sorghum since yellow corn has greater nutrition value and because of the color it gives to the birds' skins.

In 2003 the poultry industry had an approximate consumption of 6,000 MT of which 4,500 MT was feed grains; and 1,500 MT was oilseeds and protein meals (Figure 3.4).



**Figure 3.4 Inputs of Feed Grains and Oleaginous Meal Demand by the Poultry Industry, 1990-2005**

Source: Agro-Alimentary and Fisheries Statistical Information Service, SAGARPA

#### Genetics

The genetic stock for broilers and layers are usually sourced from the United States. The main broiler breeding flocks in Mexico are Arbor Acres, Avian Farm, and Hydro, which together represent about 60 percent of the total broiler breeding stock.



The costs, which a producer of poultry products can incur, vary according to the farm size, integration, technology level, and the geographical location. The direct and indirect costs of production by the poultry industry by percentage composition of costs are reported in table 3.2. The factor that has the highest impact on total costs is feed, which accounts for 52% of the total cost of broiler production.

**Table 3.2 Analytic Approach Using Percentage from Cost of Production in Broiler**

Cost	Cost Category	Cost Percentage
Direct	Feed	52.6
	New born chick	14.1
	Miscellaneous and other expenses	8.3
	Salaries and benefits	5.2
	Medications and drugs	4.7
	Subtotal	84.9
	Marketing and transport	6.5
Indirect	Management and other fees	2.9
	Maintenance and depreciation	2.9
	Operating interest change	2.8
	Subtotal	15.1
	Total	100.0

**Source: UNA (National Poultry Association).**

### 3.2 Mexican Consumption Patterns

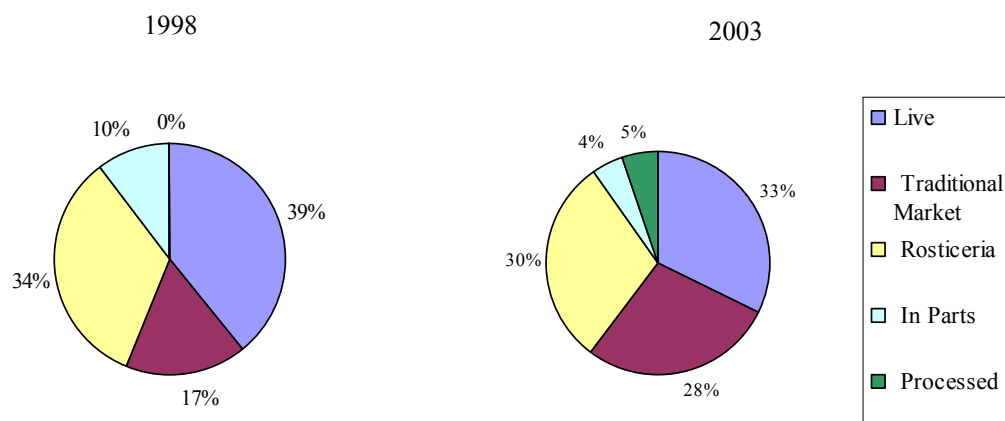
Mexican consumers prefer to buy uncooked fresh chicken meat, preferably with yellow-skin, and low-value poultry products which are mainly dark meat (drumsticks and thighs). Conversely awareness of cholesterol problems is resulting in greater marketing opportunities for high-value products that include white meat (breasts) which is consumed primarily by median and high income households.

Consumer preferences in Mexico have changed from 1998 to 2003 (Table 3.4). In 2003, live chickens represented more than 30 percent of the chicken meat consumption; the reason is that this type of product is re-sold in the wet markets which are places located close to the consumers and are considered to have fresh quality products (Table 3.4). The second most prevalent meat sold was the roasted chicken with 28 percent of the chicken meat consumption. The third most common outlet for poultry products are traditional markets which account for 26 percent of chicken consumption: traditional markets can be seen in two types. One is *Mercados* that cover neighborhoods and supply other kind of goods like meats, cheese, fruits, and vegetables. The other is *Tianguis*, which are outdoor markets that move from one neighborhood to another on designated days of the week selling a variety of food and non-food products. The supermarkets sector is an important player in the increase of commercialization of chicken, especially in higher socio-economic classes with the income availability to consume processed products (GAIN 2000).

**Table 3.3 Chicken Consumption According to Presentation**

Presentation	Volume (Tons)		Participation (%)	
	1988	2003	1998	2003
Live	671,558	646,974	42	30
Traditional Markets and supermarkets	287,810	560,711	18	26
Rosticeria (shop selling roast chicken)	575,619	603,842	36	28
Fresh in Parts	175,884	86,263	11	4
Processed Products	0	107,829	0	5

**Source: UNA (National Poultry Association).**



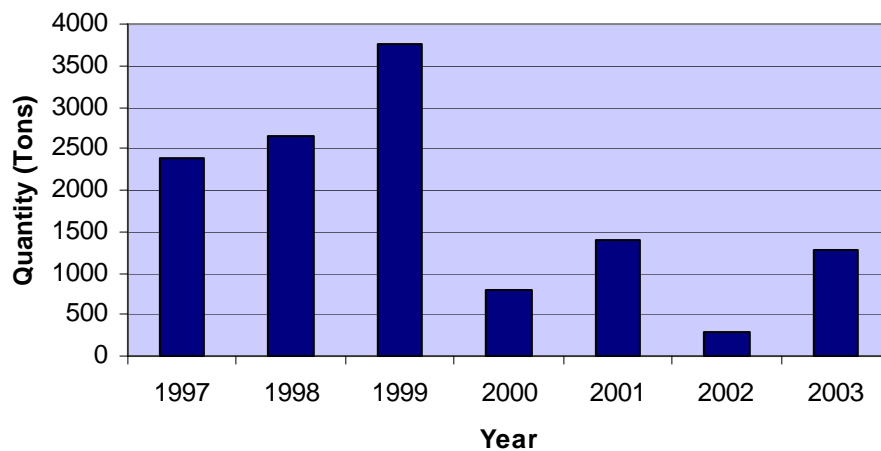
**Figure 3.5 Chicken Consumption According to Presentation**

Source: UNA (National Poultry Association).

### 3.3 Mexican Trade Patterns

#### Exports

Mexico is not considered a competitive exporter of poultry products. Some of the factors for this are the levels of production relative to domestic demand, the lack of feedstuffs produced domestically, and limited plant inspections (there are 8 federal plant inspection sites in the country) which are required by imported countries. The main export markets for Mexican poultry products are the U.S, Japan, Guatemala, Germany, and El Salvador. The export quantity of chicken meat is illustrated in Figure 3.5. Ninety-eight percent of the exports correspond to mechanically deboned chicken meat during 1997 to 2003.



**Figure 3.6 Mexican Exports of Fresh, Refrigerated or Frozen chicken meat, 1997-2003**

Source: Commercial Information System- Mexico/ Secretary of Economy (SE).

## Imports

The major commercial partner for poultry product imports is the U.S, primarily in products like mechanically deboned chicken meat (MDC), chicken leg quarters (CLQ) and turkey meat in parts and frozen. The main consumers of U.S. imports are *border companies*<sup>2</sup> and meat processors. Tariffs on chicken and poultry meat have declined since NAFTA was signed in 1994 (Table 3.6).

Chile is the second largest exporter of poultry products to the Mexican market with a zero tariff rate since 1998. However, Chile does not represent a strong competitor for the U.S due to its' higher transportation costs (USDA/GAIN Report 2007). The main products exported by Chile are whole frozen turkey and mechanically frozen deboned chicken meat. The commercialization with Chile is seen as a way to diversify the supply in case of the presence of disease conditions in the United States. In 2006, the imports of MDC frozen meat accounted for 26.7% of the total product imported by Mexico.

A future commercial partner could be the EU which has an agreement with Mexico since 2000; however it hasn't brought an attractive opportunity for either party. The EU is supplied by its domestic production and imports from Brazil and Thailand. The EU granted WTO quotas on egg products and on chicken meat to Mexico for 15,000 MT, as well as of turkey meat for 2,500 MT.

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<sup>2</sup> This area comprises the territory between the international zone with the United States and a 20 Km parallel line from the international limit, including a portion of Sonora and the Gulf of Mexico, and the municipality (county) of Cananea, Sonora. This region includes major cities such as Tijuana, Mexicali, Ensenada, San Luis Rio Colorado, and La Paz.

The Mexican government has granted tariff reductions to U.S. producers under the NAFTA agreement from 1994 to 2003, when U.S. products reached a 0% tariff.

**Table 3.4 Tariff Rate Quotas for U.S. Chicken Meat Imports**

	Year	Quota MT	Above-Quota Tariff Rate
NAFTA	1994	26,574	249.6%
	1995	25,800	239.2%
	1996	26,574	228.8%
	1997	27,371	218.4%
	1998	28,192	208.0%
	1999	29,040	197.6%
	2000	29,911	148.2%
	2001	30,808	98.80%
	2002	31,732	49.40%
	January-June 2003	No quota	0%
Voluntary Safeguard Agreement	July-December 2003	46,950	98.8%
	2004	101,000	79.0%
	2005	102,000	59.3%
	2006	103,030	39.5%
	2007	104,0600	19.8%
	2008	0	0

**Source: Agro-Alimentary and Fisheries Statistical Information Service, SAGARPA.**

### **3.4 Mexican Policy**

The North American Free Trade Area (NAFTA) began January 1, 1994, comprised of the United States, Canada and Mexico. The major objective was to reduce trade barriers among the participating countries. A timeline of Mexican regulations for U.S. poultry imports from 1997 to 2007 is given as follow:

#### **3.4.1 Health and Safety Policies**

In 1998, Final modifications were made to the Mexican standards for Avian Influenza (AI) affecting live poultry, poultry products and poultry by product. After the AI requirements changed the U.S. poultry industry was not prepare to comply with the new rules which slowed trade in poultry meat. The most significant changes to the standards were as follow:

**18.1** This section states that imported poultry, poultry products and by-products must comply with official Norms NOM-005-ZOO-1993 (National Campaign against Avian Salmonellosis), and NOM-013-ZOO- 1994 (National Campaign against Newcastle Disease). Additionally, imported products must comply with Chapter 15 of the original NOM-044, as well as with whatever dispositions published by the Animal Health National Emergency Organization (DINESA).

**18.2** This section recognizes that there are countries where there is no campaign against the low pathogenic strain of AI similar to that in place in Mexico, but that they have other activities to control AI. Therefore, SAGAR indicates that it can determine equivalency of countries or zones according to the different phases of the AI Campaign established in NOM-044-ZOO-1995. This recognition opens a door for third countries to ask for recognition of equivalence to the Mexican system.

**18.3** This section states that imported poultry products must be accompanied by AI-free certification, in accordance with Chapter 15 of the original NOM-044, but that SAGAR will allow for equivalence consisting of a document signed by an official veterinarian of the country of origin certifying that there is a monitoring program for AI and negative laboratory results have been obtained, in accordance with Chapter 8 of the original NOM-044. Chapter 8 is a verification process where companies that are not under an AI vaccination program must comply with a series of laboratory tests. Commercial farms and flocks of layers and broilers will be exempt from Chapter 8 when they provide negative results from 35 random blood serum tests from all chicken houses. SAGAR specifies that the process to be used be the hemagglutination and/or agar gel precipitation tests for negative AI results.

**18.4** As previously reported, in this section SAGAR modifies the original proposed requirements and describes requirements for U.S. further processed poultry products (MDM and paste) which should not interfere with trade.

**18.5** This section states that for imports of other birds such as ostriches and emus, SAGAR requires compliance with section 18.3 and that negative laboratory result of each bird must have been within the previous 30 days.

In 2000, Mexico activated emergency measures to control and eradicate an outbreak of Newcastle disease. Those included the control of mobilization of birds and products that can represent a risk to the poultry industry; recall and discarding of birds and products, and biological, chemical, drugs and feed products for use or consumed by birds than can cause an outbreak of the Newcastle disease; quarantine and isolation; sanitary practices of disinfection,



sterilization, use of germicides and pesticides in animals, in establishments and transports; depopulation operations of sick birds, and other regulations to control and eradicate the disease. This announcement is summoning Region II Emergency Group (Durango, Coahuila, Nuevo Leon, y Tamaulipas) to immediately implement the measures designed to eradicate the disease.

In 2001, the Mexican Secretary of Economy and SAGARPA extended duty-free quotas to U.S. MDM and turkey cuts under NAFTA. The reason was the insufficient Mexican production to supply the needs of local meet processors.

In October 2002, the Animal Health Office from the Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) announced the need of the (AI) test to import raw poultry meat for direct human consumption beyond the northern border zone. It's required to have a negative result from the hemagglutination Inhibition (HI) test from the AI virus type "A."

In November 2002, SAGARPA rescinded the HI test for raw poultry meat to be sold in the Southern Border area of Cancun. This measure was taken due to the shortage of this product after the area was affected by hurricane Isidore. The poultry exports still need to come from a flock that has been tested for AI.

Mexico established Listeria testing requirements. The Mexican government implemented a testing program for Listeria as a response of detections of Listeria in the U.S. This test is for chicken products ready for consumption like nuggets, hamburgers, cold cuts, etc. This was a temporary procedure.

In January 2003, Mexican government banned the importation of poultry from California due to the detection of an outbreak of Newcastle disease. In addition there is a new requirement

for shipments of uncooked poultry meat will have to be accompanied by a SAGARPA certified veterinarian from the border crossing point to an approved meat processing plant.

In September 2003, Mexico cancelled the ban for imports of U.S. poultry products from Utah, Idaho, Oregon, Colorado and New Mexico

In August 2003, SAGARPA announced the modification of the NOM-044-ZOO-1995-National Campaign against Avian Influenza. The requirement for the U.S. poultry products are two test for Low Pathogenic Avian Influenza (LPAI), the Agar Gel Immunodifusion (AGID) procedure and the Hemagglutination Inhibition Test (HI).

In February 2004, Delaware banned poultry products exports due to the AI outbreak in that state. In April 2005, the Secretariat of Treasury and Public Credit (SHCP) established a reference price of \$0.667/kg (\$0.3032/lb), for imports that do not have a duty-free import certificate to be imported under the current TRQ. This measure was taken under the concern of “leakage” following the signing of the July 2003 safeguard agreement.

In January 2006, the Mexican government published the modifications to NOM-044-ZOO-1995 “National Campaign against Avian Influenza” with the purpose of implementing zoo sanitary measures to maintain the current zoo-sanitary status that Mexico holds regarding the presence of LPAI variety of the virus, and to keep the Mexican poultry sector free of High Pathogenic Avian Influenza HPAI (GAIN REPORTS 1990, 2000, 2001, 2002, 2003, 2004, 2005, 2006 /USDA).

### **3.5 Voluntary Safeguard Agreement**

The Mexican Secretary of Economy (SE) accepted the request from the Mexican Poultry Association based on NAFTA article 801, and began the investigation of a bilateral safeguard measure on imported U.S. chicken leg quarters. The HTS classified products are 0207.13.99 and 0407.14.99. In July 2003, the Secretary of Economy accepted a decree imposing a bilateral safeguard measures on imported U.S. chicken leg quarters classified under tariffs 0207.13.03 and 0207.14.04. The Voluntary safeguard agreement was signed between the U.S. and Mexico in July of 2003, which established a tariff-rate quota (TRQ) on imports of U.S. Chicken Leg Quarters (CLQs). The safeguard was in place from July 2003 to December 2007, when it converts to a zero tariff in the product lines specified by the agreement.

When NAFTA tariffs reached the base zero tariffs, domestic producers complained that the U.S. poultry producers had an unfair advantage since they get access to feed grains at a lower cost than Mexican poultry products since they are subsidized by government programs. Mexican farms perceive this as an unfair advantage. As a result to this issue, producers requested that the Mexican government either treat poultry meat in brine or under a different category subject to tariff rate quotas (TRQ), or to modify the current specification of the product in order to make brine process technically different. The Mexican Poultry Producers Association (UNA) presented the safeguard request to the Secretary of Economy (SE) on September 10, 2002; and based on NAFTA, article 801, requested that a bilateral tariff rate safeguard of 98.8 percent be applied to imports of chicken leg quarters from the United States that exceed the annual quota of 100,000 tons. UNA indicated that such a level of protection was required to enable the poultry industry to further develop and better compete with imports of U.S. chicken. The SE indicates that as a result of the analysis done, along with the resolution, there is enough evidence to

presume that the lifting of current poultry tariffs without the imposition of safeguards will result in a significant increase in poultry imports that could cause serious damage to domestic production levels. Consequently, SE considered it necessary to initiate an investigation to evaluate the imposition of bilateral safeguard measures for imported chicken leg quarters.

The Secretariat of Economy (SE) published on July 25, 2003 in the *Diario Oficial* (Federal Register) a decree imposing bilateral safeguard measures on imported U.S. chicken leg quarters (CLQs), which was classified under tariffs 0207.13.03 and 0207.14.04. The SE announced that for the period between July 25, 2003 to December 31, 2003 Mexico would issue half year import licenses providing duty free access for 46,950 MT of CLQs to the *northern border line*<sup>3</sup> and the *border region*<sup>4</sup>. This tariff-rate quota (TRQ) was administered as in the past by direct allocation. The SE established a 98.8 percent duty for all other U.S. CLQs exports to Mexico. This safeguard was in place for 5 years and the tariff phased out to zero in 2008. As an exchange for the safeguard, Mexico did not impose, nor apply any other requirements or restrictions from U.S imported products. The safeguard and the TRQ were established with the objective of maintaining a degree of protection for the Mexican domestic industry (GAIN 2003).

The Secretariat of Economy (SE) published on December 31, 2003, in the *Diario Oficial* (Federal Register), issued an announcement creating new tariff lines for chicken leg quarters as follows:

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<sup>3</sup> Is defined as--the Mexican territory between the international line with the United States and a 20 km parallel line from the International limit, including a portion of the state of Sonora and the Gulf of Mexico.

<sup>4</sup> Is defined as-- Includes the states of Baja California Norte, Baja California Sur, Quintana Roo (Puerto Norelos-Cancun). And a portion of the states of Sonora; the southern border region along with Guatemala and the municipalities of Comitán de Domínguez, Chiapas and Salina Cruz, Oaxaca.

**Table 3.5 Tariff Lines for U.S. Chicken Leg Quarters Imports**

Code	Description	Unit of Measure	Ad-valorem Import	Ad-valorem Export
0207.13.03	Chicken Leg Quarter, fresh/chilled	Kg	240	Ex
0207.14.04	Chicken Leg Quarters, Frozen	Kg	240	Ex

**Source: Source: Agro Alimentary and Fisheries Statistical Information Service, SAGARPA.**

**Table 3.6 Tariff schedule for voluntary safeguard on U.S, Chicken Leg Quarters**

Year	TRQ(MT)	In Quota Tariff	High-Rate-Tariff
2003	46,950	0	98.8
2004	101,000	0	79.0
2005	102,000	0	59.3
2006	103,030	0	39.5
2007	104,060	0	19.8
2008	0	0	0

**Source: Agro Alimentary and Fisheries Statistical Information Service, SAGARPA.**

**CHAPTER 4**  
**ECONOMETRIC MODEL FOR U.S. CHICKEN EXPORTS**  
**TO MEXICO**

**4.1 Theoretical framework**

Markets are driven by the selling and buying of goods and services among producers and consumers. These two sides of market transactions are called supply and demand. Demand is the ability and willingness to buy specific quantities of a good at alternative prices in a given time period, *ceteris paribus* (Schiller, 1999). The willingness and ability consumers to buy a product depends on many variables, such as price, income (of the consumer), taste (desire of the consumer for this or an alternative product), and the possible substitutes for a product (their prices and availability compared with other products).

A simple demand function can be specified as:

$$(4.1) \quad Q_d = F(P, P_{alt}, In, T)$$

where  $Q_d$  is the quantity of a good demanded,  $P$  is the own price of the good,  $P_{alt}$  is the price of an alternative good,  $In$  is income, and  $T$  is tastes and preferences of the consumer.

The inverse demand function expresses own price as a function of quantity demanded and the other variables cited above. That is, for each level of demand for good  $I$ , the inverse demand function measures what the price of good  $I$  would have to be in order for the consumer to choose that level of consumption (Varian, 1999).

Supply is the ability and willingness to produce specific quantities of a good at alternative prices in a given period, *ceteris paribus* (Schiller, 1999). Factors that influence market supply include the own price of the good, input prices, and technology. A simple supply function can be specified as:

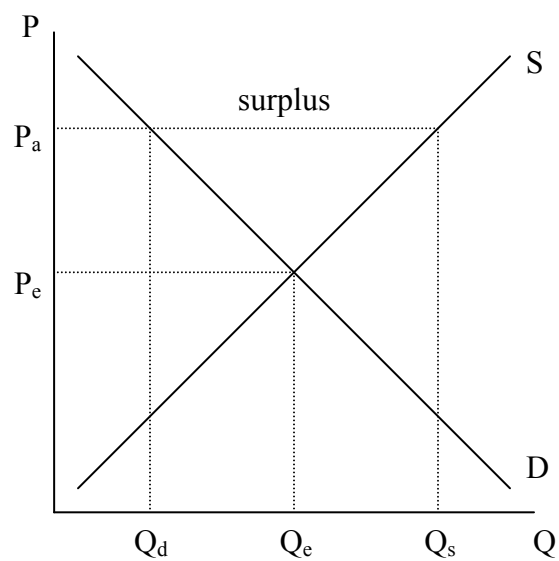
$$(4.2) \quad Q_s = f(P, P_i, \text{Tech})$$

where  $Q_s$  is quantity supplied,  $P$  is the own price of the good,  $P_i$  is the set of input prices, and Tech is technology.

## 4.2 General Theory of Excess Supply and Excess Demand

Excess supply and excess demand are tools that simplify the analysis of international markets. The difference between the quantity supplied and the quantity demanded at prices above the autarky equilibrium price is called excess supply (ES).

To exemplify the ES phenomenon, suppose that  $P_a$  is a price offered in a market that is higher than the equilibrium price  $P_e$ . At price  $P_a$  the quantity supplied,  $Q_s$ , is greater than the quantity demanded,  $Q_d$ , which creates a surplus or excess supply that is equal to  $Q_s - Q_d$  (See figure 4.1).



**Figure 4.1 Excess Supply of Hypothetical Commodity**



The difference between the quantity supplied and the quantity demanded below the autarky price is called the excess demand(ED); it takes its shape from the response consumers and producers have to new prices. Consider the price  $P_1$ , which is where the quantity demanded exceeds the quantity supplied below the equilibrium price  $P_e$ . At this point, the quantity demanded would be greater than the quantity supplied ( $Q_d > Q_s$ ). For lower prices, quantity demanded is higher, but producers are less willing to provide goods to the market, thus creating a shortage (See figure 4.2).

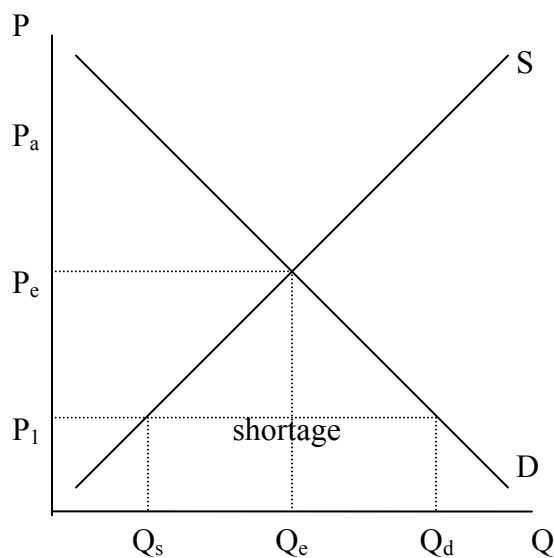
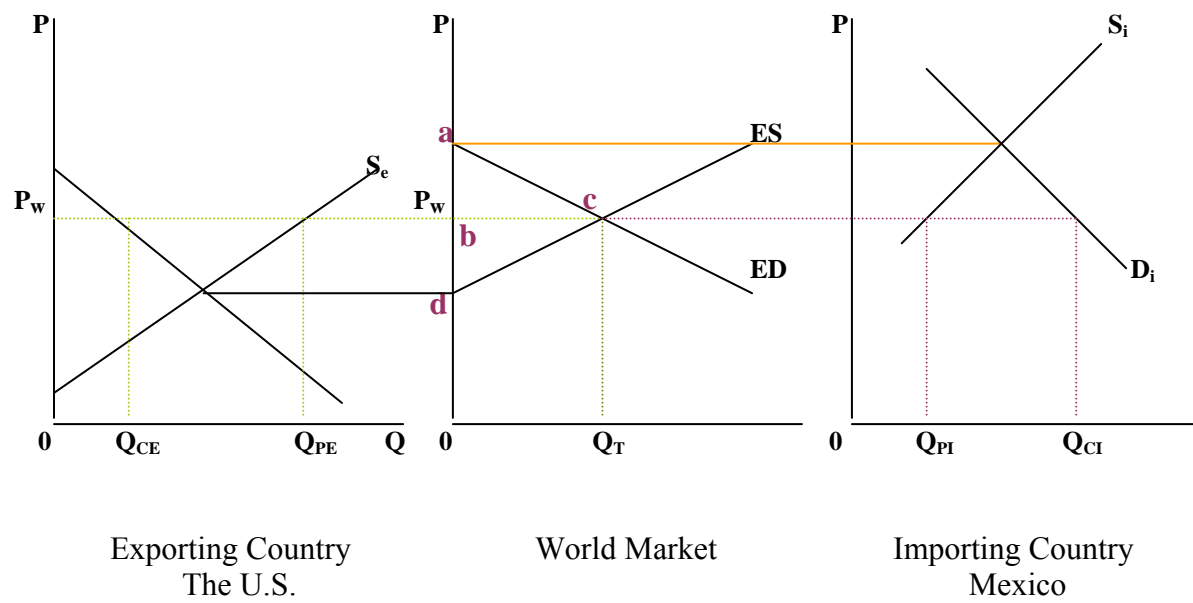


Figure 4.2 Excess Demand of a Hypothetical Commodity

### 4.3 International Trade

International trade can be defined as the exchange across national borders of goods, services, and factors; and the impact of this trade on domestic and global economies. According to economic theory, a country can gain from trade under competitive equilibrium forces (due to exchange or specialization), which is where the economy maximizes the value of production at equilibrium prices (Markusen, Melvin, Kaempfer, and Maskus, 1995). Under the competitive equilibrium for two countries the equilibrium price lies between the autarky prices of these countries. When two countries are combined through trade, the good becomes relatively less scarce in the country with the initially high price because that country can now obtain the good through trade. Producers in the country who initially had a low price for the good can now find additional buyers of their good through exports.

A partial equilibrium framework for a two-country world with one good is illustrated in Figure 4.3. The left figure depicts the domestic supply and demand in the exporting country. The middle figure is the excess supply and excess demand in the world market. The excess supply function in the middle figure is derived from the exporting country graph, whereas the excess demand function is derived from the importing country graph.  $P_w$  is the world market equilibrium price and  $Q_T$  is the equilibrium level of trade. With no trade barriers or transportation costs, price  $P_w$  will prevail in both countries and the excess supply in the exporting country ( $Q_{PE} - Q_{CE}$ ) will exactly equal excess demand in the importing country ( $Q_{CI} - Q_{PI}$ ). The world welfare gain from trade is maximized at area **acd** in the middle figure, with **abc** going to importers, and area **bcd** to exporters.



**Figure 4.3 Trade Equilibrium for two countries and one good.**

Source:

where:

$S_e$  = supply of exporting country

$D_e$  = demand of exporting country

$S_i$  = supply of importing country

$D_i$  = demand of importing country

$Q_{CE}$  = quantity consumed in the exporting country

$Q_{PE}$  = quantity produced in the exporting country

$Q_{CI}$  = quantity consumed in the importing country

$Q_{PI}$  = quantity produced in the importing country

$P_w$  = world prices

#### 4.4 Empirical Model

The following econometric model is used to analyze the impact of trade on domestic and global economies, in this case Mexico and the U.S. The present analysis focuses on the excess supply and excess demand for U.S. chicken parts in the Mexican market.

The excess supply and demand model incorporates variables related to the underlying supply and demand conditions in the U.S. and Mexico: the quantity of chicken produced in the U.S. and Mexico, rest of the world (ROW) Prices, Mexican income, exchange rates, and quota and over-quota tariff rates.

The empirical model will be used to analyze U.S.- Mexican trade of three different chicken parts: frozen leg quarters (0207.1400.10), frozen chicken cuts (0207.1400.90) (excluding livers, leg quarters, feet and offal), and fresh chicken cuts (excluding livers, leg quarters, feet and offal) (0207.1300.00). As mentioned in Chapter 2, these products are the highest valued chicken products imported by Mexico.

An important factor in the trade between U.S. and Mexico is the difference in consumer preferences. Consumers in Mexico and the U.S. differ in their preferences for chicken parts, with U.S. consumers preferring white meat and Mexican consumers' preferring dark meat. Since chicken parts are produced in fixed proportions per bird, the low-value chicken parts like feet, offal, legs, and wings are considered in surplus in the U.S. because domestic market consumers prefer primarily high-value chicken products such as chicken breast meat. The U.S. poultry industry has found an ideal market for these "by-products" in foreign countries, such as China, Russia and Mexico (Zhang 2002).

#### 4.5 Excess Supply and Excess Demand Functions

U.S. chicken meat is distributed to the U.S. domestic market, Mexico, and the ROW, and Mexican consumption of chicken is supplied by its domestic production, imports from U.S. and imports from ROW. The Mexican market for U.S. chicken is very small relative to total U.S. production, and Mexican imports are thus not expected to have a significant impact in U.S. total supply and demand of chicken. The excess supply of chicken part  $j$  to Mexico is therefore modeled as a function of U.S. total production of chicken and the prices of chicken part  $j$  in the export markets. The model analyzes monthly data from 1997 to 2007. This data period includes the phase-out of NAFTA TRQ between 1997 to 2002, and the voluntary safeguard agreement that started in July of 2003. The excess supply model was specified as:

$$(4.3 \text{ U.S. ES}) \quad Q_{\text{US-MEX}, t}^{\text{sj}} = f(P_{\text{US-MEX}, t}^j, Q_{\text{US}, t}, P_{\text{US-ROW}, t}^j)$$

where:

$j$  = frozen CLQ, chicken cuts fresh, and chicken cuts frozen,

$t$  = month, March 1997 to December 2007,

$Q_{\text{US-MEX}, t}^{\text{sj}}$  = monthly quantity of U.S chicken part  $j$  exported to Mexico in period  $t$ ,

$P_{\text{US-MEX}, t}^j$  = value per unit of U.S. chicken part  $j$  exported to Mexico in period  $t$ ,

$Q_{\text{US}, t}$  = number of chickens slaughtered in the U.S. in period  $t$ , and

$P_{\text{US-ROW}, t}^j$  = value per unit of U.S. chicken part  $j$  exported to ROW in period  $t$ .

The inverse excess demand for U.S. chicken parts  $j$  in Mexico is specified with import price as a function of own quantity, the level of chicken produced in Mexico, Mexican income, the exchange rate and prices of an alternative product. Three different policy variables are included in the ED equation; they represent the tariff-free quota, the over-quota tariff rate, and an interaction term of the quota and rate policy variables.

$$(4.4 \text{ U.S. Inverse ED}) \quad P_{\text{US-MEX},t}^j = f(Q_{\text{US-MEX},t}^j, P_{\text{MEX},t}^{\text{alt}}, Q_{\text{MEX},t}, \text{Inc}_{\text{MEX},t}, \text{Ex}_{\text{MEX-US},t}, Q_{\text{TRQ},t}, R_{\text{TRQ},t}, \text{QR}_{\text{TRQ},t})$$

where:

$Q_{\text{US-MEX},t}^j$  = quantity of chicken part  $j$  imported by Mexico in period  $t$ ,

$P_{\text{US-MEX},t}^j$  = price of U.S. chicken part  $j$  imported by Mexico in period  $t$ ,

$P_{\text{MEX},t}^{\text{alt}}$  = price of alternative product (beef) in Mexico in period  $t$ ,

$Q_{\text{MEX},t}$  = quantity of chicken produced in Mexico in period  $t$ ,

$\text{Inc}_{\text{MEX},t}$  = Mexican income of middle class consumers in period  $t$ ,

$P_{\text{ROW-MEX},t}^j$  = price of ROW chicken part  $j$  imported by Mexico in period  $t$ ,

$\text{Ex}_{\text{MEX-US},t}$  = exchange rate of pesos per dollar in period  $t$ ,

$Q_{\text{TRQ},t}$  = quota for CLQ allowed under zero tariff rate in period  $t$ ,

$R_{\text{TRQ},t}$  = over quota tariff rate for CLQ in period  $t$ , and

$\text{QR}_{\text{TRQ},t}$  = interaction term of policy variable  $Q_{\text{TRQ},t}$  and  $R_{\text{TRQ},t}$ .

By definition, the excess supply of U.S. chicken part  $j$  exported to Mexico in period  $t$  equals the excess demand for Mexican imports of U.S. chicken part  $j$  in period  $t$ .

$$(4.5) \quad Q_{US-MEX, t}^{sj} = Q_{US-MEX, t}^{dj} = Q_{US-MEX, t}^j$$

$$(4.6) \quad ES_{U.S.} = ED_{MEX}$$

#### 4.6 Econometric Considerations

A simultaneous equation model determines the value of one set of variables, the endogenous variables, in terms of another set of variables, the predetermined variables or exogenous variables (Intriligator, Bodkin, and Hsiao, 1996). In the present study, the interdependent equations (4.3) and (4.4) have two endogenous variables,  $P_{US-MEX}^j$  and  $Q_{US-MEX}^j$ .

The following equations represent the structural form of the model. Since they are derived from economic theory, each element is supposed to describe a particular aspect of the economy.

$$(4.7 \text{ ES}) \quad Q_{US-MEX, t}^j = a_0 + a_1 P_{US-MEX, t}^j + a_2 Q_{US, t} + a_3 P_{US-ROW, t}^j + \varepsilon_{1jt}$$

$$(4.8 \text{ ED}) \quad P_{US-MEX, t}^j = b_0 + b_1 Q_{US-MEX, t}^j + b_2 Q_{MEX, t} + b_3 P_{MEX, t}^{alt} + b_4 Inc_{MEX, t} + b_5 EX + b_6 Q_{TRQ} + b_7 R_{TRQ} + b_8 QR_{TRQ} + \varepsilon_{2jt}$$

where ES represents the excess supply and ED represents the inverse excess demand equation with the  $a$ 's and  $b$ 's as parameter coefficients and  $\varepsilon$ 's are random disturbances. Each disturbance is characterized by the assumption of the classical normal linear regression model (Kmenta, 1986).

#### **4.6.1 Two Stage Least Squares (2SLS) and Three Stage Least Squares (3SLS)**

The present study will make use of the 3SLS method, as have previous studies on the analysis of excess demand and excess supply. A short summary of these tools is presented as follows.

Two stage least squares is a technique used to estimate either an over-identified or an identified equation from a system of simultaneous equations (Intriligator, Bodkin, and Hsiao, 1996). What this method attempts to produce is a set of estimated coefficients for each of the structural equations.

The first stage estimates the coefficients of the reduced form, and the second stage uses least squares to estimate the structural-form equations. Even though the 2SLS estimator will be consistent, it is found in general not asymptotically efficient, due to the disregard of correlation of the disturbances across equations.

An extension of 2SLS technique is the three stage least square (3SLS) method, whose two first stages are the same as those in 2SLS. The third stage is the generalized least square estimation of all of the structural coefficients of the system, using a covariance matrix for the stochastic disturbance terms of the structural equation that is estimated from the second stage residuals. Using the information contained in this covariance matrix has the effect of improving efficiency. At the end of these stages, the 3SLQ is asymptotically more efficient than the 2SLQ, taking into account cross-equation correlation (Intriligator, Bodkin, and Hsiao, 1996).



## 4.7 Hypothesis

This study attempts to examine the factors that impact the U.S. - Mexican market from 1997 to 2007, analyzing the deregulation of the market through the reduction of TRQ in NAFTA and the posterior implementation of the voluntary safeguard agreement between both markets.

$$(4.7) \quad Q_{US-MEX}^j = a_0 + a_1 P_{US-MEX}^j + a_2 Q_{US} + a_3 P_{US}^j + a_4 P_{US-ROW}^j + \varepsilon_{1jt}$$

$$(4.8) \quad P_{US-MEX}^j = b_0 + b_1 Q_{US-MEX}^j + b_2 Q_{MEX} + b_3 P_{MEX}^j + b_4 P_{MEX}^{alt} + b_5 Inc_{MEX} + b_6 EX_{MEX-US} + b_7 Q_{TRQ} + b_8 R_{TRQ} + b_9 QR_{TRQ} + \varepsilon_{2jt}$$

The excess supply equation assumes that U.S. production of broilers and the prices of part j in the U.S. and the ROW are exogenously determined due to the small size of the Mexican market relative to the U.S. and the ROW. The export price of part j from the U.S. to Mexico is endogenous and simultaneously determined with the export quantity.

We hypothesize a positive sign for  $Q_{US}$  in the excess supply equation based on the supposition that greater U.S. broiler production, influenced by increasing U.S. demand for breast meat, will result in greater amounts of dark meat production and an increased supply of dark meat available for export to Mexico, *ceteris paribus*. We also expect the quantity of part j exports to Mexico to be positively impacted by increases in the price of part j exports to Mexico and negatively influenced by increases in the price of part j in the alternative markets in the ROW.

In the excess demand equation, we expect the price of U.S. exports to Mexico to be inversely related to the quantity of those exports, reflecting the negatively sloped excess demand curve. Hypotheses for the exogenous variables in the excess demand equation are complicated

somewhat by the use of inverse excess demand. To simplify the interpretation of these hypotheses, we will interpret their expected impacts as demand shifters, with impacts that increase demand and shift the curve to the right (left) expected to increase (decrease) the price of U.S. exports.

$Q_{MEX}$  refers to the average monthly production of chicken in Mexico for each year in the study. Monthly data on Mexican chicken production were not available. Annual chicken production in Mexico is influenced by many factors, including feed production and costs that are beyond the scope of our analysis. For that reason, annual Mexican chicken production is treated as exogenous to the demand for chicken from the U.S. Increased Mexican chicken production is expected to reduce demand for imports of part  $j$  from the U.S. and thus the price of those imports.

$P_{MEX}^j$  refers to the price of domestic chicken in Mexico, and  $P_{MEX}^{alt}$  is the price of beef in Mexico. Domestically produced chicken and beef are alternative products to U.S. chicken for Mexican consumers, and increases in the price of substitutes for U.S. chicken are expected to increase demand for and the price of U.S. chicken.

U.S. chicken is hypothesized to be a normal good in Mexico, so a positive coefficient is hypothesized for  $Inc_{MEX}$ . The exchange rate between the U.S. and Mexico,  $EX_{MEX-US}$ , is expressed as pesos per dollar, so an increase in the exchange rate represents a weakening in the peso relative to the dollar. A weaker peso will make U.S. chicken more expensive to purchase in Mexico, so the exchange rate is expected to be inversely related to the price of U.S. chicken expressed in U.S. dollars.

The policy variables,  $Q_{TRQ}$  and  $R_{TRQ}$ , and their interaction term,  $QR_{TRQ}$ , model the components of the two tariff rate quota policies in effect during the data period. The NAFTA

TRQ was in effect from the implementation of NAFTA until December of 2002. Over this period the quantity of imports allowed without a tariff were increased, and the tariff rate for over-quota imports were decreased on an annual basis. The voluntary safeguard TRQ on U.S. leg quarter imports took effect in July 2003, and continued during the data period. As was true for the NAFTA TRQ, the TRQ safeguard quantity was gradually increased and the over-quota tariff rate was gradually decreased on an annual basis over the life of the agreement. Our policy variables include the TRQ quota levels and tariff rates from both of these agreements.

Considered separately, both quotas and tariffs create a difference in prices between the two countries involved in a trade. Both policies lower the price in the exporting country and raise the price in the importing country relative to the prices that would exist under free trade.

Liberalization of a quota by increasing the quota, or a tariff by decreasing the tariff rate, would therefore be expected to increase the price in the exporting country and decrease the price in the importing country. Since we use the U.S. price of leg quarter exports to Mexico in both equations, we therefore expect an increase in a TRQ quota or a decrease in a TRQ tariff rate to have a positive effect on the U.S. export price, so we expect a positive coefficient for  $Q_{TRQ}$  and a negative coefficient for  $R_{TRQ}$ . The interaction term between the quota level and tariff rate allow for the impact of each component to be influenced by the other.

## **CHAPTER 5**

### **DATA, ESTIMATED MODELS, AND RESULTS**

#### **5.1 Data**

The estimated models in this study employed monthly data from January 1997 through December 2007. Trade data was obtained from the United States International Trade Commission (USITC). U.S. chicken meat production for chicken leg quarters was from the National Agriculture Statistics Service of USDA. Mexican income and the exchange rate of Mexican pesos for dollars were obtained from the Bank of Mexico statistics section, [www.banxico.org.mx](http://www.banxico.org.mx). Monthly data for Mexican production of chicken were not available; instead, the annual data for Mexican production of chicken meat were obtained from SAGARPA and used as monthly data by taking the monthly average for each year.

The most popular non-chicken meat product for Mexican consumers is beef meat, with 29%, closely followed by pork meat consumption with 27%. Monthly beef prices were available in the GAIN Reports (USDA, FAS) and used here.

Monthly data for U.S. chicken exports to Mexico and the ROW were highly variable from month-to-month. To reduce the noise associated with this variability, and to relax the assumption that all responses occurred within the current month, all data were smoothed by using three-month moving averages for the current month and the two preceding months.

## 5.2 Data Classification

Although both Mexico and the U.S. base their tariff schedule in accordance to the International Harmonized Commodity Description and Coding System (HS), administered by the World Customs Organization in Brussels, there is a significant difference in the reporting of data for different poultry parts. Both countries use the same four HS digit system, in this case 0207, which describes meat and edible offal of poultry that is fresh, chilled, or frozen. The six digits codes are also the same for Mexico and the U.S., and they are 0207.13 for cuts and offal that are fresh or chilled and 0207.14 for cuts and offal that are frozen. The difference in the classification is in the 8 digit HS, where Mexico classifies fresh or chilled chicken cuts as 0207.13.01 (mechanically deboned fresh), 0207.13.02 (remains fresh), 0207.13.03 (chicken leg quarters fresh) and 0207.13.99 (the rest fresh), while the U.S. only has 0207.13.00.

We analyzed the most significant chicken parts exported to Mexico in terms of value and quantity and parts included under the Voluntary Safeguard Agreement (chapter 3). Mexico established a TRQ on two lines of chicken leg quarters using Mexican classifications: 0207.13.03 (chicken leg quarter, fresh/chilled) and 0207.14.04 (chicken leg quarters, frozen) for the months of July 2003 to December 2007. Even though we couldn't match these categories using USITC data, the categories we included are: 0207.13.0000 (chicken cuts and edible offal fresh or chilled), 0207.14.0010 (chicken Cuts and edible offal frozen legs quarters) and 0207.1400.90 (chicken cuts and edible others frozen). These HTS categories represent 90% of the value of all chicken part exports from the U.S. to Mexico over this data period.

### 5.3 Model Specification

The supply of exports was specified as a function of U.S. chicken production, the price of U.S. exports to Mexico, and the price of U.S. exports to the ROW. The equation for the U.S. chicken part j is specified as:

$$(5.1) \quad Q_{US-MEX,t}^j = a_0 + a_1 Q_{US,t} + a_2 P_{US-MEX,t}^j + a_3 P_{US-ROW,t}^j + \varepsilon_{1jt}$$

where all variable are as defined in Table 5.1.

The Mexican inverse excess demand equation was specified as a function of Mexican production, quantity exported of product j to Mexico, price of alternative product, Mexican income, exchange rate pesos/dollar, monthly average quota under NAFTA and Voluntary Safeguard Agreement, overquota tariff rate for NAFTA and Voluntary Safeguard Agreement, and an interaction term between the quota and overquota tariff rate.

$$(5.2) \quad P_{US-MEX,t}^j = b_0 + b_1 Q_{MEX,t} + b_2 Q_{US-MEX,t}^j + b_3 P_{MEX,t}^{alt} + b_4 Inc_{MEX,t} + b_5 EX_{MEX-US,t} + \\ b_6 Q_{TRQ,t} + b_7 R_{TRQ,t} + b_8 QR_{TRQ,t} + \varepsilon_{2jt}$$

where all variables are as defined in table 5.1.

The price and quantities of Mexican imports from the ROW could potentially be an important factor that affects Mexican demand for U.S. chicken. However this variable is not included in the model, since the import quantities from ROW to Mexico do not represent a significant portion of the market (Table B, Appendix).

The endogenous variables in the model are:  $Q_{US-MEX}^i$  and  $P_{US-MEX}^j$ . The exogenous variables are:  $Q_{MEX}$ ,  $Q_{US}$ ,  $P_{US-ROW}^i$ ,  $P_{MEX}^j$ ,  $P_{MEX}^{alt}$ ,  $Inc_{MEX}$ ,  $EX_{MEX-US}$ ,  $Q_{TRQ}$ ,  $R_{TRQ}$ ,  $QR_{TRQ}$ .

The model was estimated with SAS using three-stage least squares.

**Table 5.1 Variable Definitions**

Variable	Definition
$Q_{US-MEX}^{CLQo}$	Quantity of U.S. total exports <sup>5</sup> of frozen chicken leg quarters to Mexico. (MT)
$Q_{US-MEX}^{CUTSe}$	Quantity of U.S. total exports of fresh chicken cuts to Mexico. (MT)
$Q_{US-MEX}^{CUTSo}$	Quantity of U.S. total exports of frozen chicken cuts to Mexico. (MT)
$P_{US-MEX}^{CLQo}$	Price <sup>6</sup> of the U.S. total exports of frozen chicken leg quarters to Mexico. (U.S. dollars/MT)
$P_{US-MEX}^{CUTSe}$	Price of the U.S. total exports of fresh chicken cuts to Mexico. (U.S. dollars/MT)
$P_{US-MEX}^{CUTSo}$	Price of the U.S. total exports of frozen chicken cuts to Mexico. (U.S. dollars/MT)
$Q_{US}$	Quantity of chicken slaughtered in the US. (MT)
$Q_{MEX}$	Quantity of chicken slaughtered in Mexico. (MT)
$P_{US-ROW}^{CLQo}$	Price of the U.S total exports of frozen chicken leg quarters to ROW. (U.S. dollars/MT)
$P_{US-ROW}^{CUTSe}$	Price of the U.S total exports of fresh chicken cuts to ROW. (U.S. dollars/MT)
$P_{US-ROW}^{CUTSo}$	Price of the U.S total exports of frozen chicken cuts to ROW. (U.S. dollars/MT)
$P_{MEX}^{alt}$	Mexican domestic price of alternative product (beef meat). (Mexican pesos/kg)
$Inc_{MEX}$	Mexican income of middle class consumers (Mexican pesos per day)
$Ex_{MEX-US}$	Exchange rate of Mexican pesos per dollar.
$Q_{TRQ}$	Monthly average quota (MT) with zero tariff during NAFTA and the Voluntary Safe Agreement.
$R_{TRQ}$	Tariff percentage for product exported over quota during NAFTA and Voluntary Safeguard Agreement.
$QR_{TRQ}$	Interaction term between $Q_{TRQ}$ and $R_{TRQ}$

<sup>5</sup> Total exports for all parts represent both domestic and foreign exports. Foreign exports, also referred to as re-exports, are goods that have entered the United States, but are exported as substantially the same product. (Source: USITC Data Web)

<sup>6</sup> FAS domestic exports value / domestic exports quantity (Source: USITC Data Web). FAS (Free Alongside Ship) is the value of exports at the U.S. port, based on transaction price, including inland freight, insurance, and other charges.



## 5.4 Results

Parameter estimates and their probability levels are reported in table 5.2. Elasticity estimates for significant non-policy variables are shown in table 5.3, and policy variable impacts are reported in table 5.4.

Generally, estimation results were better across products for the excess demand equations than for the excess supply equations in terms of parameter significance and expected signs. Second-stage adjusted  $R^2$ 's were highest for fresh chicken cut excess supply (0.813) and excess demand (0.913), and lowest for frozen chicken leg quarter excess demand (0.314) and frozen chicken cuts excess supply (0.439). Specific results for each chicken product are discussed below.

### 5.4.1 Leg quarters, frozen

In the excess supply equations for frozen leg quarters, the supply of leg quarters to Mexico was positively related to the quantity of U.S. chicken production and the price of leg quarters exported to markets other than Mexico, but not significantly related to the price of exports to Mexico. The impact of U.S. chicken production on exports was as expected, but the signs of both price variables were inconsistent with theory. Excess supply equation results were similarly poor for other frozen chicken cuts. These results may be due to the very small share of the Mexican market for U.S. chicken relative to the domestic market and rest of the world exports. The elasticity of frozen leg quarter supply to Mexico with respect to U.S. broiler production was 5.064, indicating that a one percent increase in the number of U.S. broilers slaughtered is associated with a five percent increase in frozen leg quarter exports to Mexico, *ceteris paribus*.

**Table 5.2 Estimation Results for U.S. Chicken Exports to Mexico, 3SLS 1997-2007**

Variable	CLQ frozen	Chicken Cuts fresh	Chicken Cuts frozen
<b>Excess Supply: <math>Q_{US-MEX}^j</math></b>			
Constant	-7844.25*** (0.0001)	-2226.1 (0.1911)	10870*** (0.0001)
$P_{US-MEX}^j$	-681.88 (0.1641)	3073.9*** (0.0047)	-4388*** (0.0001)
$Q_{US}$	0.0078*** (0.0001)	0.0125*** (0.001)	-0.0025*** (0.0005)
$P_{US-ROW}^j$	624.37*** (0.0002)	-7649.7*** (0.0001)	741.62 (0.3372)
Adj-R <sup>2</sup>	0.606	0.813	0.439
<b>Excess Demand: <math>P_{US-MEX}^j</math></b>			
Constant	0.7312 (0.1799)	0.2517 (0.5946)	2.5*** (0.0001)
$Q_{US-MEX}^j$	-0.00049*** (0.0001)	-0.00012*** (0.0001)	-0.00019*** (0.0001)
$Q_{MEX}$	-0.00003*** (0.0001)	-0.000009** (0.05)	-0.000007** (0.066)
$P_{MEX}^{alt}$	0.0049 (0.5828)	0.011 (0.2233)	0.0021 (0.75)
$Inc_{MEX}$	0.03568*** (0.0001)	0.014*** (0.0003)	0.0058* (0.0637)
$EX_{MEX-US}$	-0.095*** (0.002)	-0.031 (0.2181)	-0.072*** (0.0073)
$Q_{TRQ}$	0.000273*** (0.0001)	0.00015*** (0.0001)	0.000064** (0.0320)
$R_{TRQ}$	0.01164*** (0.0001)	0.006*** (0.0001)	0.002295*** (0.0079)
$QR_{TRQ}$	-0.000003*** (0.0001)	-0.0000001*** (0.0001)	-0.00000057* (0.0567)
Adj-R <sup>2</sup>	0.3135	0.913	0.571

Note: Numbers in parentheses are the p-values of the parameters estimators.

Adj-R<sup>2</sup>s were calculated at the 2sls stage.

\*\*\*Significant at the 1% level, \*\*significant at the 5% level, and \* at 10% level.

**Table 5.3 Estimated Elasticities for U.S. Chicken Exports to Mexico**

<b>Independent Variable:</b>	CLQ frozen	Chicken Cuts fresh	Chicken Cuts frozen
	<b>Dependent Variable: <math>Q_{US-MEX}^j</math></b>		
$P_{US-MEX}^j$	---	0.35	---
$Q_{US}$	5.064	2.62	---
$P_{US-ROW}^j$	---	-1.59	---
<b>Independent Variable:</b>	<b>Dependent Variable: <math>P_{US-MEX}^j</math></b>		
$Q_{US-MEX}^j$	-1.20	-1.03	-1.28
$Q_{MEX}$	-6.77	-2.56	-1.78
$P_{MEX}^{alt}$	---	---	---
$Inc_{MEX}^*$	7.03	3.14	1.18
$EX_{MEX-US}$	-1.23	---	-0.96

\* Income of the Mexican middle class consumers as reported by the Bank of Mexico (BANXICO)

**Table 5.4 Average Estimated Impacts of Policy Variables, 1997-2007**

<b>Independent Variable</b>	CLQ frozen	Chicken Cuts fresh	Chicken Cuts frozen
	<b>Dependent Variable: <math>P_{US-MEX}^j</math></b>		
$Q_{TRQ}$	-0.00004855	-0.00001408	0.00000438
$R_{TRQ}$	-0.00366055	-0.00192306	-0.00054193

Note: Average estimated impact results of policy variables were calculated through 5.4 formula.

Coefficient estimates for four of the five non-policy variables in the inverse excess demand equation for frozen leg quarters were statistically significant and of the expected sign. The own-quantity coefficient was significant and negative, and its elasticity, which can be interpreted as the price-flexibility coefficient, was -1.2. The inverse of the price-flexibility coefficient approximates the own price elasticity of excess demand, which is -0.833 in this case.

The price of frozen leg quarter imports was also found to be negatively related to the level of Mexican chicken production and the exchange rate (pesos/dollar), and positively related to the level of Mexican income. The elasticity of import price with respect to Mexican chicken production was estimated as -6.77, indicating a relatively strong response of imports to domestic production. The exchange rate elasticity was -1.23, and the income elasticity of demand for the import price was 7.03, indicating a strong price response to changes in Mexican middle class consumers income.

The policy variables represent the tariff rate quota impacts from both NAFTA and the voluntary safeguard agreement, and include separate variables for the quota and the above-quota tariff rate, and an interaction term for these variables. The impacts of the policy variables are thus calculated as follows:

$$(5.3) \quad \frac{dP_{US-MEX}^j}{dQ_{TRQ}} = b_7 + b_9 R_{TRQ}, \text{ and, } \frac{dP_{US-MEX}^j}{dR_{TRQ}} = b_8 + b_9 Q_{TRQ}$$

We expected an increase in the quota level to have a positive impact on the U.S. export price of each chicken part, and an increase in the above-quota tariff rate to have a negative impact on the U.S. price. The impacts of the quota and the above-quota tariff rate were evaluated for each observation for the observed combinations of quota and tariff rates, and the average of

these impacts across all observations are reported in table 5.4. For frozen leg quarters, all three policy variables were significant at the one percent level. The average impact of the quota variable, calculated as described above, was negative but had no economically significant impact on the price of imports. With respect to the impact of the above-quota tariff rate, a 10 percent decrease in the above-quota rate is estimated to increase the U.S. price of CLQ's export to Mexico by 3.67 cents per kilogram (1.67 cents per pound).

#### **5.4.2 Chicken cuts, fresh/chilled**

Results for the fresh chicken cuts category differed strongly from those for both frozen cuts categories. Better fits were obtained for both the excess supply and demand equations for fresh cuts, and the excess supply equation results were superior with regard to theoretical expectations for impacts of the independent variables. Coefficients of all three variables in the excess supply equation were significant at the one percent level and have the expected sign. The own-price supply elasticity for U.S. exports of fresh cuts to Mexico was estimated as 0.35, and a one percent increase in the price of U.S. fresh cuts exports to other countries was estimated to reduce exports to Mexico by 1.59 percent. Exports of fresh cuts to Mexico were also found to increase by an estimated 2.62 percent in response to a one percent increase in U.S. broiler production.

Coefficients of three of the five independent variables in the excess demand equation for fresh cuts were significant, and all were of the expected sign. The price flexibility coefficient estimate was -1.03, indicating that the approximate own-price excess demand elasticity was also near -1. The price of fresh cut imports was also found to be negatively related to the level of Mexican chicken production and positively related to the level of Mexican middle class

consumers income. The elasticity of import price with respect to Mexican chicken production was estimated as -2.56, indicating a substantive response of import demand to domestic production. The income elasticity of demand for U.S. fresh cut price was 3.14, indicating a substantial economic, as well as statistical increase in the demand for U.S. fresh chicken cuts in response to increases in Mexican middle class consumers income.

Impacts of the policy variables on the demand for U.S. fresh cuts were similar to those estimated for frozen leg quarters. Coefficients of all three policy variables were significant in the excess demand equation. The impact of the changes in tariff-free quota levels on U.S. export prices during the period studied, however appeared to be negligible economically. A 10 percent decrease in the above-quota tariff rate was estimated to increase the U.S. price of fresh cut exports to Mexico by 1.9 cents per kilogram (0.87 cents per pound).

### **5.4.3 Other cuts, frozen**

Estimation results for other cuts, frozen were poor for the excess supply equation, but excess demand results were similar to those for the other two parts examined here. Coefficients of the own-price and U.S. production variables in the excess supply equation were both significant and but neither had the expected sign.

Coefficients of four of the five independent variables in the excess demand equation for frozen cuts were significant at the 10, 5 or 1 percent level and all coefficients had the expected sign. The price flexibility coefficient estimate was -1.28 indicating that the approximate own-price excess demand elasticity was near -1, but lower than what was found for CLQ frozen or cuts fresh. The price of frozen cut imports was also found to be negatively related to the level of Mexican chicken production and the exchange rate (pesos/dollar) and positively related to the

level of Mexican middle class income consumers. The elasticity of import price with respect to Mexican chicken production was estimated as -1.78, indicating a significant response of import demand to domestic production. The income elasticity of demand for U.S. frozen cut price was the lowest of the three parts at 1.18, indicating an increase of 11.8% in the demand for U.S. frozen chicken cuts in response to a 10% increase in Mexican middle class income.

Coefficients of all three policy variables were significant in the excess demand equation. The average impact of the quota variable was positive and statistically significant but had little economic impact on the price of imports. Frozen chicken cuts had the lowest impact from the different chicken parts; a 10 percent decrease in the above-quota tariff rate was estimated to increase the U.S. price of frozen cut exports to Mexico by 0.54 cents per kilogram (0.25 cents per pound).

## **CHAPTER 6**

### **SUMMARY AND CONCLUSIONS**

#### **6.1 Study Summary**

This study started with a broad overview of the poultry industry from an international perspective. The U.S. is the major producer and second largest exporter of poultry products, with a highly efficient industry. From the other side, Mexico's poultry industry is in development and has a disadvantage in terms of cost of production. Mexico offers a market of 109 million people, with an increasing middle class and annual per capita consumption of 57 pounds of chicken meat. The difference in consumption preferences in the U.S. and Mexican market, with U.S. consumers preferring white meat and Mexican consumers dark meat products, enhances the opportunities to generate gains from trade. This research analyzes fundamental variables in the market with respect to their impact on prices and quantities of U.S. chicken products exported to Mexico. This study period covers two important trade policies, NAFTA and the Voluntary Safeguard Agreement between the U.S. and Mexico.

#### **6.2 Conclusions**

Overall estimation results were better in terms of goodness of fit and the significance and signs of coefficients for fresh chicken cuts than for the two frozen products, but excess supply coefficient estimates were strong only for the fresh product. Weaker excess supply results for the frozen products may result from the greater storability of frozen parts which



breaks the link between current production and export sales and also allows for more complex relationships between prices and quantities temporally as well as spatially.

Excess demand coefficients were consistently significant and of the expected sign for all three products. The quantity of exports to Mexico, Mexican chicken production, Mexican income levels, the exchange rate, and the NAFTA and safeguard agreement TRQ's were all found to impact the U.S. price of exports to Mexico.

Calculations from the excess supply estimates for fresh chicken cuts yielded an own-price supply elasticity of 0.35 for this product, indicating that the supply of exports of this part to Mexico is only somewhat responsive to the change in the Mexican export price. Exports to Mexico also responded to changes in the export price of fresh parts to other countries, with a 1 percent increase in the average price of fresh parts to all other countries resulting in a decrease in exports to Mexico of 1.59 percent, *ceteris paribus*. A 1 percent increase in U.S. broiler production resulted in an estimated 2.62 percent increase in exports of fresh parts to Mexico. All of the excess supply results should be considered with reference to the fact that white and dark meat chicken parts are joint products in production and that the supply of dark meat for exports is at least partially driven by the demand for white meat for U.S. domestic consumption. The Mexican export market for U.S. chicken is also small relative to the total export market for U.S. chicken, so relatively large percentage changes in exports to Mexico may result from relatively small percentage changes in U.S. production or prices in other export markets.

The inverse excess demand equations revealed some differences in the response of export prices of the different parts to various factors affecting excess demand. The own-quantity price flexibility was estimated to be -1.03 for fresh cuts and around -1.2 for the frozen parts. These results are consistent with the expected inverse relationship between quantity and price in

demand, with a 1 percent increase in quantity demanded associated with a 1.03 percent decrease in price for fresh cuts and a 1.2 percent decrease in the price of frozen chicken imports. If the inverse of the own-quantity price flexibilities are taken as an approximations of the own-price demand elasticities, the excess demand elasticity is approximately -1.0 for fresh cuts and -0.83 for the frozen parts.

Prices of all three parts were found to be affected by chicken production in Mexico. Increases in Mexican production were found to decrease excess demand for U.S. chicken and put downward pressure on the price of U.S. exports to Mexico. Increased Mexican chicken production had a larger affect on imported frozen leg quarter prices than on the other two products. A 1 percent increase in Mexican production was estimated to decrease the price of U.S. to Mexico exports of frozen leg quarters by 6.77 percent, while this same production increase is associated with a 2.56 percent decrease in the fresh cuts price and 1.78 percent decrease in the U.S. export price of frozen cuts to Mexico. The large price response of frozen leg quarters to Mexican production may be a source of some concern to U.S. chicken producers.

Mexican income in the excess demand equations refers to average middle-class incomes. Demand for all three parts responded to changes in Mexican middle-class income, and the response was especially strong for frozen leg quarters. A 1 percent increase in the average level of Mexican middle-class income was associated with a 7.03 percent increase in the U.S. price of frozen leg quarters exported to Mexico. This strong response indicates that middle-class Mexican consumers significantly increase their consumption of chicken, especially leg quarters, when their incomes rise. This is consistent with the increase in per capita consumption of chicken meat in Mexico from 19.9 kg in 2000 to 55 kg in 2005. The price of fresh chicken cuts imports also responded quite strongly to an increase in Mexican middle-class income, with a

3.14 percent increase in price associated with a 1 percent increase in income. The price of frozen cuts was least responsive to an income increase among the three parts, with a price flexibility coefficient of 1.18 percent for a 1 percent increase in income.

The exchange rate impacted the prices of the frozen parts, but the exchange rate impact on fresh cuts price was not statistically significant. A 1 percent increase in the pesos per dollar exchange rate was associated with a 1.23 percent decrease in the U.S. price of frozen leg quarters, while a similar weakening of the Mexican currency decreased the U.S. frozen cuts export price to Mexico by .96 percent.

With regard to the NAFTA and Safeguard agreement TRQ's, the level of the zero-tariff quota was found to have a minimal impact on U.S. export prices of all three products. During the study period, the NAFTA tariff-free quota was almost constant during the NAFTA TRQ phase out period from 1997 to 2002, and the safeguard tariff-free quota was similarly almost constant from 2004 until the final year of its phase-out in 2007. Chicken imports from the U.S. exceeded the tariff-free quota in all years of both programs.

In contrast, the above-quota tariff rates declined annually over the lives of both the NAFTA and Safeguard TRQ's. During the data period of this study, the NAFTA above-quota tariff rate declined from 218 percent in 1997 to zero in 2003, and the Safeguard above-quota tariff rate declined from 98.8 percent in 2003 to 19.8 percent in 2007 and zero in 2008. We evaluated the impact of the change in the above-tariff rate on export prices, using the coefficients of the tariff rate and the quantity-rate interaction, for all observations on combinations of rates and quotas in the sample and took the average of the rate impacts. Using this calculation method, liberalizing trade with a 10 point decrease in the tariff rate resulted in a 3.7 cent/ kg price increase in the U.S. price of frozen leg quarter exports to Mexico, a 1.9 cent/kg increase in the

fresh cut U.S. price, and a 0.54 cent/kg increase in the U.S. price of frozen cuts. Although the rate estimates are best interpreted as impacts of marginal effects, applying these impacts to the full liberalization of above-quota tariffs observed during the study (from 218 percent to zero) would result in a 0.36 \$/lb. increase in the U.S.-to-Mexico frozen leg quarter price, a 0.19 \$/lb. increase in the fresh cuts price, and a 0.05 \$/lb. increase in the U.S. price of frozen cuts exported to Mexico.

The Safeguard agreement helped Mexican producers compete by raising the price of imported chicken in Mexico while reducing the U.S. price of exports to Mexico. The near 100 percent tariff rate in the initial year decreased the U.S. price of exported leg quarters by about 37 cents per kg using the above calculations. Since the U.S. export price was around \$ 0.80 in the first year of the Safeguard, the U.S. export price without the tariff would therefore have been about \$1.17 per kg. Applying the 100 percent tariff to the observed U.S. price of 0.80 per kg resulted in a Mexican price of \$1.60 per kg with the Safeguard agreement instead of \$1.17 per kg without the safeguard tariff. This price impact from the Safeguard Agreement produced benefits for the Mexican poultry industry, as the National Poultry Association has recognized, and has allowed the Mexican industry to continue to develop with some temporary relief of the pressure from U.S. imports

Although increased production of chicken in Mexico had relatively strong negative impacts on the demand for U.S. chicken imports, increased middle class income in Mexico had strong positive impacts on the demand for U.S. chicken. Given constraints of feed production in Mexico, the potential for future growth in the U.S. exports to Mexico looks favorable.

### **6.3 Limitations and Future Research**

The major limitations of this study were the data availability and the differences in HTS classification for each country. Differences in classifications made it particularly difficult to model the safeguard agreement accurately. The difference in the HS classification of chicken products is a problem that would be appropriate to be addressed by the U.S. trade representative and its Mexican counterpart.

Due to the nature of the poultry industry, sanitary requirements are constantly a part of the dynamic of this market. Future studies could account for the impact of sanitary barriers on the market. The phyto-sanitary barriers were intended to be captured by the present study, but the availability of accurate information on dates and places that each sanitary restriction took effect were not available throughout the study period.

The U. S.-Mexico trade is a broad area for market analysis. The close relationship of U.S. and Mexican markets and the evolving deregulation of trade barriers give a new perspective and dynamic to gains from trade.

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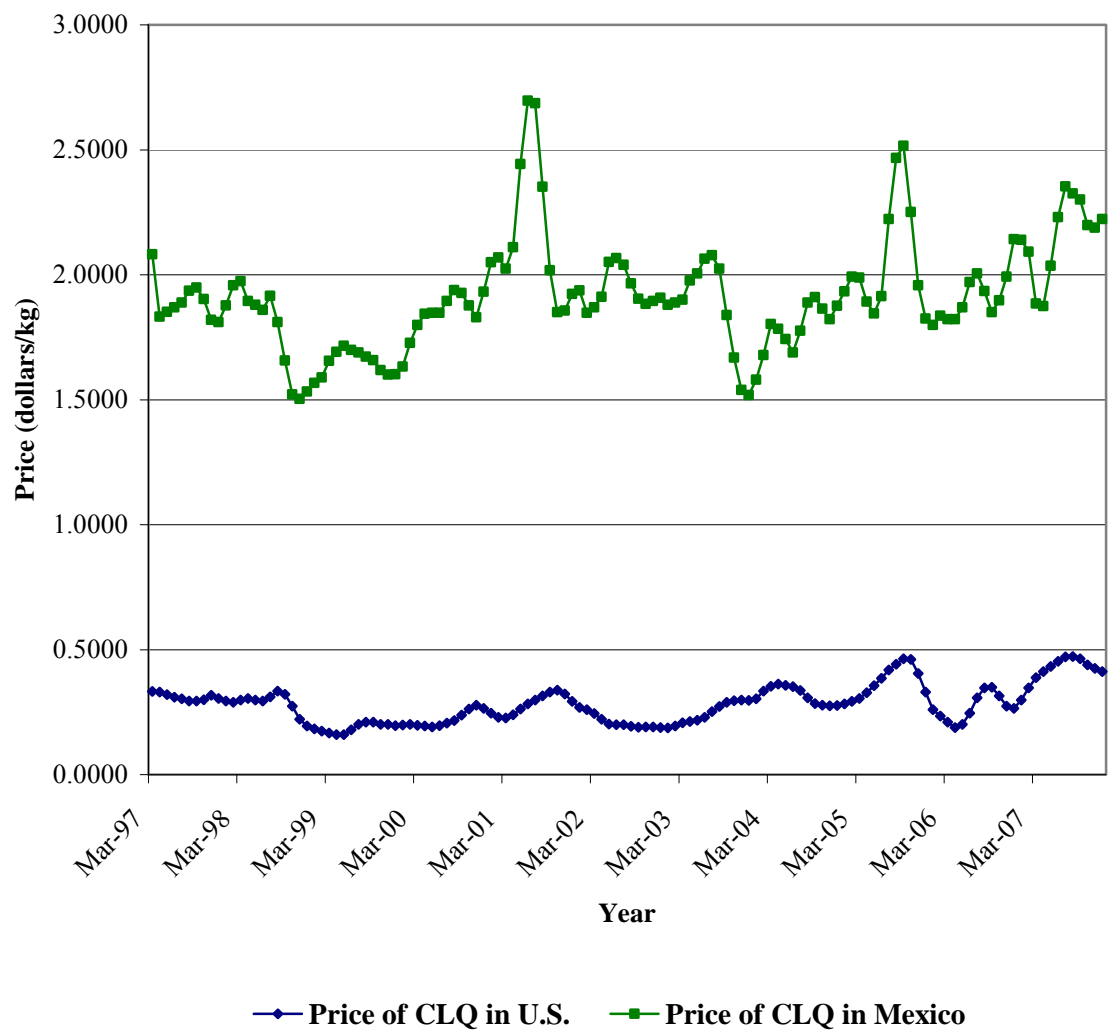
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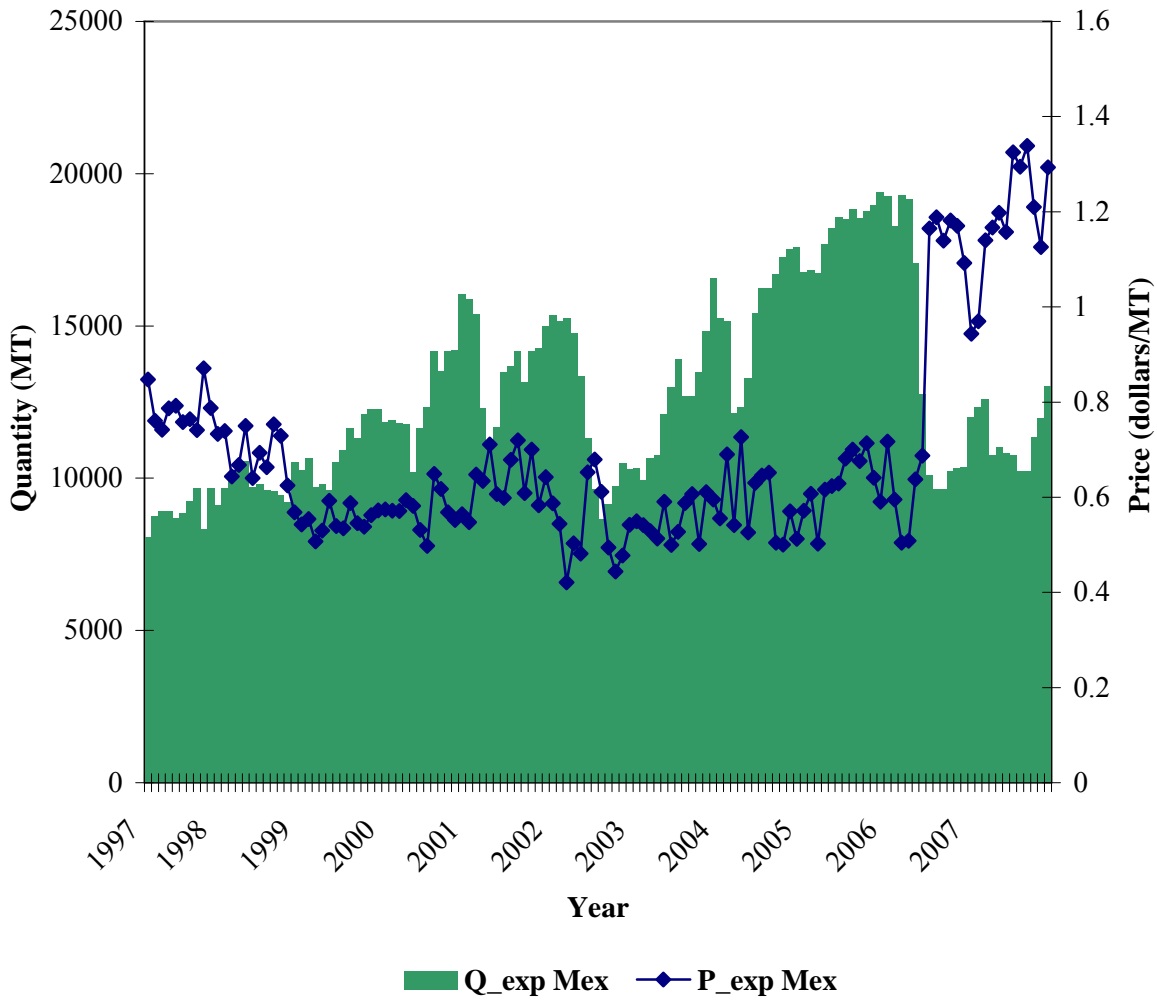
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## **APPENDIX**



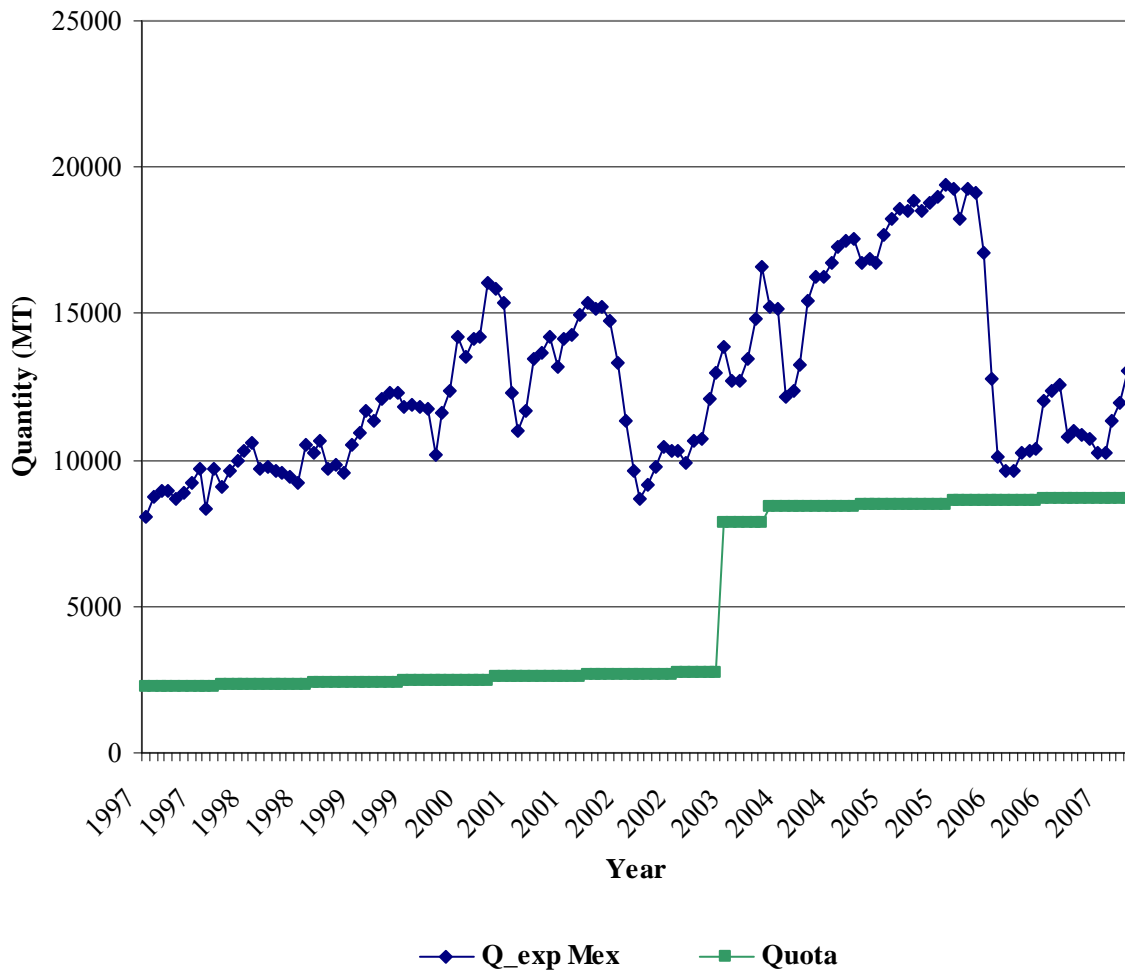
**Figure 6.1 Price of CLQ in Mexico and U.S. 1997-2007**

Source: Mexican prices: U.S. Department of Agriculture various GAIN Report (various). U.S. prices: National Agriculture Statistics Service of USDA



**Figure 6.2 Quantity and Price of CLQ frozen, cuts fresh and frozen exported to Mexico, 1997-2007**

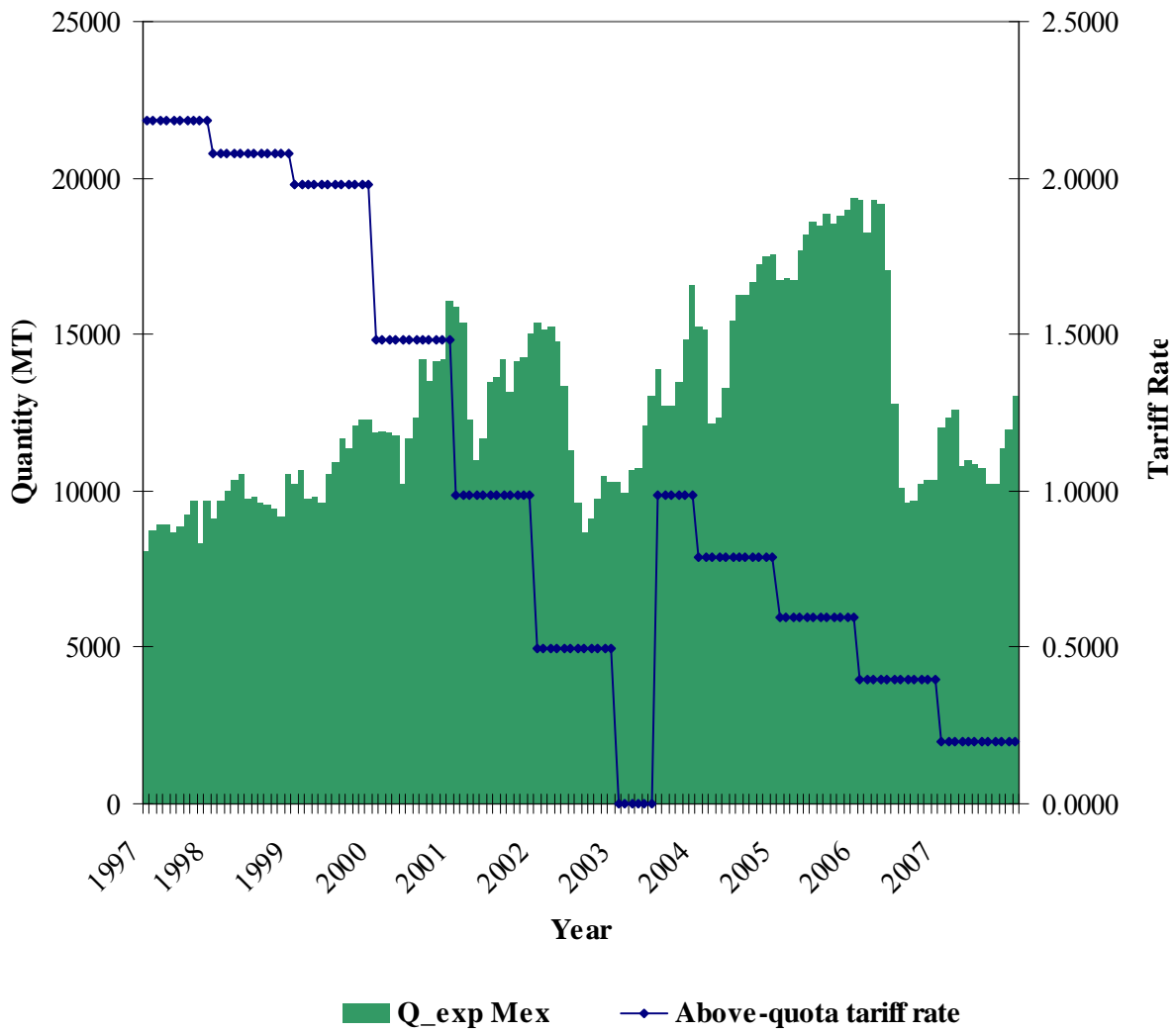
Source: United States International Trade Commission, USITC.



**Figure 6.3 Quantity and Quota of CLQ frozen, cuts fresh and frozen exported to Mexico, 1997-2007**

Source: United States International Trade Commission, USITC and Agro alimentary and Fishing Statistical Information Service, SAGARPA.





**Figure 6.4 Quantity and above-quota tariff rate of CLQ frozen, cuts fresh and frozen exported to Mexico, 1997-2007**

Source: United States International Trade Commission, USITC and Agro alimentary and Fishing Statistical Information Service, SAGARPA.

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**A) Mexico: Poultry Production Numbers**

Type of Bird	Thousand of Head 2006	Thousand of Head 2005	Thousand of Head 2004	Thousand of Head 2003	Thousand of Head 2002	Thousand of Head 2001	Thousand of Head 2000
Laying Hens in production*	132,464,112	130,704,095	124,196,390	110,528,305	115,287	113,590	109,871
Pullets in grow out	39,739,234	39,211,228	37,258,917	33,158,492	34,586	34,077	32,851
Light Breeding Hens in production	942,250	912,161	909,034	832,194	872	825	710
Light Breeding Hens in grow out	277,161	380,486	382,773	375,571	340	376	382
Heavy Breeder Hens in production	9,186,000	9,022,000	9,157,000	9,227,000	8,955	8,659	8,039
Heavy Breeder Hens in grow out	6,429,000	6,123,000	5,989,000	5,956,000	6,102	5,722	5,415
Heavy Progenitor Hens in production	175,579	171,941	161,368	156,331	159	165	170
Heavy Progenitor Hens in grow out	114,850	113,090	100,432	113,265	107	113	115
Broilers (Per cycle)	248,060,826	243,384,207	240,549,554	237,737,853	225,593	216,561	202,761
Turkeys (Per cycle)	900,000	865,000	810,459	875,000	821	801	777
Total Poultry Flock	438,289,012	430,888,208	419,514,927	398,960,011	392,822	380,889	361,092

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**Source: UNA (National Poultry Association).**

\* There are an estimated 34 million laying hens in the second cycle

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**B) Mexican Imports for Selected Poultry Products**

H.S. Tariff Number	Description and Country of Origin	Volume MT 2006	Volume MT 2005	Volume MT 2004	Volume MT 2003	Volume MT 2002	Volume MT 2001	Volume MT 2000	Volume MT 1999	Volume MT 1998
0207.11.01	Other fresh or chilled whole poultry						Data not available			
0207.26.01	U.S. and Subtotal Mechanically deboned turkey meat	29,170	10,552	0	3,338	1,474		8,044	2,383	3,079
0207.26.99	U.S. and subtotal Fresh and chilled turkey parts	6,432	12,874	3,442	2,034	3,411	Data not available	18	2,040	226
	U.S. Other	112,651 0	104,436 0	73,775 0	83,693 0	67,213 19	Data not available	49,337 0	33,570 110	24,447 0
0207.13.01	Subtotal Mechanically deboned chicken meat fresh or chilled	112,651	104,436	73,775	83,693	67,232		49,337	33,680	24,447
0207.14.01	U.S. and Subtotal Mechanically deboned chicken meat frozen	123,404	112,582	89,572	80,081	68,089	Data not available	67,924	52,787	42,285
	U.S. Chile	42,885 15,635	39,575 12,665	41,160 32,160	43,370 1,894	44,388 0	Data not available	49,083 547	50,050 0	58,828 0
0207.14.99	Subtotal Frozen Poultry Parts	58,520	54,240	73,320	45,264	46,507		49,630	50,050	58,828
	U.S. Other	11,512 9,733	3,665 31,572	1,334 4,154	60,424 582	77,877 0	Data not available	46,920 858	43,286 44	41,525 19
	Subtotal	21,245	35,237	5,488	61,006	79,643		47,778	43,330	41,544

<b>Continuation B) Mexican Imports For Selected Poultry Products</b>										
H.S. Tariff Number	Description and Country of Origin	Volume MT 2006	Volume MT 2005	Volume MT 2004	Volume MT 2003	Volume MT 2002	Volume MT 2001	Volume MT 2000	Volume MT 1999	Volume MT 1998
0207.13.03	Chicken Leg Quarter, Fresh/chilled									
	U.S.	78,369	56,228	32,157	30,175	0		0	0	0
	Other	1,198	0	0	0	0	Data not available	0	0	0
	Subtotal	79,567	56,228	5,488	30,175	0		0	0	0
0207.14.04	Chicken Leg Quarter, Frozen									
	U.S.	70,744	69,552	91,685	81,476	0		0	0	0
	Other	1,162	1,485	721	0	0	Data not available	0	0	0
	Subtotal	71,706	71,037	92,406	81,476	0		0	0	0
0207.27.01	Mechanically deboned turkey meat, frozen									
	U.S.	11,655	9,581	8,624	15,877	15,220		17,397	17,283	17,502
	Other	2,657	4,188	4,461	314	0	Data not available	103	128	48
	Subtotal	14,312	13,769	13,085	16,191	16,391		17,500	17,411	17,550
0207.27.99	Frozen turkey parts									
	U.S.	33,377	36,790	39,422	40,551	47,991		61,573	61,328	58,437
	Other	5,524	1,861	168	59	0	Data not available	613	384	57
	Subtotal	38,901	38,651	39,590	40,610	48,455		62,186	61,712	58,494
1601.00.01	Sausages of broiler or turkey									
	U.S.	17,214	14,684	14,848	0	0		0	0	0
	Other	166	20	24	0	0	Data not available	0	0	0
	Subtotal	17,380	14,704	14,872	0	0		0	0	0
1602.32.01	Prepared or preserved chicken meat or offal									
	U.S.	5,755	5,479	4,702	4,924	6,372	Data not available	0	0	0
	Other	1,578	1,428	235	365	421		0	0	0
	Subtotal	8,333	6,907	4,937	5,289	6,793		0	0	0
0207.13.02	Chicken Carcasses									
	U.S. & Subtotal	13,273	13,014	10,618	19,697	18,317	Data not available	4,786	0	0

Source: Global Trade Information Service, INC. "World Trade Atlas" Mexico Edition, September 2007.

**C1) NAFTA Poultry Tariff Rate Quotas 1998**

<b>Product</b>	<b>H.S. Tariff Number</b>	<b>Original MT TRQ</b>	<b>Allocation Description</b>	<b>Total Imports(MT)</b>	<b>%Filled</b>
Whole fresh, chilled & frozen turkey	0207.24.01 0207.25.01	2,251.00	Direct allocation to the border region and northern line	1,508.46	61.01%
Other whole Poultry (Broilers or hens, fresh, chilled or frozen)	0207.11.01 0207.12.01	14,631.60	Direct allocation to the border region and the northern line	3,079.33 748.81 3,828.14	26.16%
Total Mechanically deboned meat	0207.13.01 0207.14.01 0207.26.01 0207.27.01	30,388.70	Direct allocation to sausage companies and cold meat producers nationwide	42,284.80 53,826.21 226.46 17,550.20 113,887.67	374.77%
Total Fresh or chilled turkey parts Frozen turkey parts	0207.26.99 0207.27.99	32,459.37	Direct allocation to border region and the northern border line Direct allocation to sausage companies	24,447.01 58,493.87 82,940.8	255.52%
Total Poultry cuts (broilers or hens) Fresh, chilled or frozen	0207.13.99 0207.14.99	28,137.70	Direct allocation to border region and the northern border line	33,943.17 41,544.49 75,487.66	268.28%
Total					

Source: UNA (Based on data from General Customs Administration-Treasury Minister, SHCP).

a/ Border region: Includes states of Baja California, Baja California Sur, Quintana Roo and a portion of the state of Sonora; the southern border region along with Guatemala and the municipalities (counties) of Comitán de Domínguez, Chiapas and Salina Cruz, Oaxaca. This region included former free-trade border areas.

b/ Northern border line: The Mexican territory between the International line with the US. and a 20 km parallel line from the international limit, including a portion of the state of Sonora and the Gulf of Mexico, and the municipality (county) of Cananea, Sonora.

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**C2) NAFTA Poultry Tariff Rate Quotas 1999**


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Product	H.S. Tariff Number	Original MT TRQ	Allocation Description	Total Imports(MT)	%Filled
Whole fresh, chilled & frozen turkey	0207.24.01 0207.25.01	2,318.53	Direct allocation to the border region and northern line	1,415.21	61.04%
Other whole Poultry (Broilers or hens, fresh, chilled or frozen)	0207.11.01 0207.12.01	15,070.54	Direct allocation to the border region and the northern line	2,382.56 403.93	18.49%
Total Mechanically deboned meat	0207.13.01 0207.14.01 0207.26.01 0207.27.01	31,300.36	Direct allocation to sausage companies and cold meat producers nationwide	2,786.49 52,787.49 50,050.55 2,040.00 17,283.39	390.29%
Total Fresh or chilled turkey parts Frozen turkey parts	0207.26.99 0207.27.99	32,459.37	Direct allocation to border region and the northern border line Direct allocation to sausage companies	122,161.43 33,570.52 61,328.30	292.36%
Total Poultry cuts (broilers or hens) Fresh, chilled or frozen	0207.13.99 0207.14.99	28,981.83	Direct allocation to border region and the northern border line	94,898.82 33816.89 43,286.08	266.04%
<b>Total</b>				<b>7,102.97</b>	

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Source: UNA (Based on data from General Customs Administration-Treasury Minister, SHCP).

a/ Border region: Includes states of Baja California, Baja California Sur, Quintana Roo and a portion of the state of Sonora; the southern border region along with Guatemala and the municipalities (counties) of Comitán de Domínguez, Chiapas and Salina Cruz, Oaxaca. This region included former free-trade border areas.

b/ Northern border line: The Mexican territory between the International line with the US. and a 20 km parallel line from the international limit, including a portion of the state of Sonora and the Gulf of Mexico, and the municipality (county) of Cananea, Sonora.

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**C3) NAFTA Poultry Tariff Rate Quotas 2000**

Product	H.S. Tariff Number	Original MT TRQ	Allocation Description	Total Imports(MT)	%Filled
Whole fresh, chilled & frozen turkey	0207.24.01 0207.25.01		Direct allocation to the border region and northern line	1,588.43	66.51%
		2,388.10			
Other whole Poultry (Broilers or hens, fresh, chilled or frozen)	0207.11.01 0207.12.01	15,522.6 0	Direct allocation to the border region and the northern line	8,044.74 1,043.38	52.94%
Total				9,088.12	
Mechanically deboned meat	0207.13.01 0207.14.01 0207.26.01 0207.27.01	32,239.3 0	Direct allocation to sausage companies and cold meat producers nationwide	67,924.07 49,083.36 18.49 17,396.93	416.95%
Total				134,422.85	
Fresh or chilled turkey parts	0207.26.99 0207.27.99	33,433.4 0	Direct allocation to border region and the northern border line	49,301.07 61,573.39	331.63%
Frozen turkey parts			Direct allocation to sausage companies		
Total				110,874.46	
Poultry cuts (broilers or hens) Fresh, chilled or frozen	0207.13.99 0207.14.99	29,851.3 0	Direct allocation to border region and the northern border line	32,046.99 46,920.01	273.70%
Total				78,967.00	

Source: UNA (Based on data from General Customs Administration-Treasury Minister, SHCP).

a/ Border region: Includes states of Baja California, Baja California Sur, Quintana Roo and a portion of the state of Sonora; the southern border region along with Guatemala and the municipalities (counties) of Comitán de Domínguez, Chiapas and Salina Cruz, Oaxaca. This region included former free-trade border areas.

b/ Northern border line: The Mexican territory between the International line with the US. and a 20 km parallel line from the international limit, including a portion of the state of Sonora and the Gulf of Mexico, and the municipality (county) of Cananea, Sonora.

**C4) NAFTA Poultry Tariff Rate Quotas 2001**

Product	H.S. Tariff Number	Original MT TRQ	Allocation Description	Total Imports(MT)	%Filled
Whole fresh, chilled & frozen turkey	0207.24.01 0207.25.01	2,459.74	Direct allocation to the border region and northern line	1,629.54	66.25%
Other whole Poultry (Broilers or hens, fresh, chilled or frozen)	0207.11.01 0207.12.01	15,988.27	Direct allocation to the border region and the northern line	2,307.96 451.27	17.26%
Total				2,759.23	
Mechanically deboned meat	0207.13.01 0207.14.01 0207.26.01 0207.27.01	33,206.47	Direct allocation to sausage companies and cold meat producers nationwide	65,526.81 46,269.65 1,799.06 17,761.17	395.58%
Total				131,356.69	
Fresh or chilled turkey parts	0207.26.99 0207.27.99	34,436.40	Direct allocation to border region and the northern border line	58,305.08 57,524.13	336.36%
Frozen turkey parts			Direct allocation to sausage companies		
Total				115,829.21	
Poultry cuts (broilers or hens)	0207.13.99 0207.14.99	29,851.30	Direct allocation to border region and the northern border line	34,902.40 58,526.40	303.86%
Fresh, chilled or frozen					
Total				93,428.80	

Source: UNA (Based on data from General Customs Administration-Treasury Minister, SHCP).

a/ Border region: Includes states of Baja California, Baja California Sur, Quintana Roo and a portion of the state of Sonora; the southern border region along with Guatemala and the municipalities (counties) of Comitán de Domínguez, Chiapas and Salina Cruz, Oaxaca. This region included former free-trade border areas.

b/ Northern border line: The Mexican territory between the International line with the US. and a 20 km parallel line from the international limit, including a portion of the state of Sonora and the Gulf of Mexico, and the municipality (county) of Cananea, Sonora.