ABSTRACT

LIU, XUEJING. Analysis and Costing of Imports of T-shirts and Jeans into the United States. (Under the direction of Dr. Kristin Thoney-Barletta.)

The purpose of this study was to examine the impact of costs in making sourcing decisions for knit T-shirts and denim jeans. Trade data involving the top 6 major U.S. import players from 1995 to 2011 was analyzed. This study used three types of trade data: import quantity, customer value, and total landed cost. Then the result of Fiallos' cost model was compared to data from the Office of Textile and Apparel (OTEXA) to see how well the cost model could forecast the FOB value from OTEXA. In addition, VB.net software was developed to provide a way to more easily calculate the total landed cost for many countries over many years.

Results indicated that total landed cost had a significant impact on T-shirts but not on denim jeans imports. Additionally, the correspondence of the result of the cost model and the OTEXA data was not good for most countries selected. The cost model could forecast the FOB value better for countries with a larger market share.

Analysis and Costing of Imports of T-Shirts and Jeans into the United States

by
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A thesis submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Master of Science

Textiles

Raleigh, North Carolina

2012

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BIOGRAPHY

The author, Xuejing Liu, was born in Xiamen, Fujian, China in May, 1988. She started her undergraduate study in the College of Textiles at Dong Hua University in September, 2006. After she received her dual Bachelors degree, she went to North Carolina State University for further study in the textile field. She focused on textile design and textile supply chain management in her graduate study.

ACKNOWLEDGMENTS

I would like to express my first gratitude to Dr. Kristin Thoney-Barletta, my advisor, for her consistent, patient and generous supervision and guidance through the whole research process. Her serious work attitude for revising and modifying my thesis are deeply appreciated.

Also, I would like to thank Dr. Jeff Joines and Dr. George Hodge for their support. Especially, I would like to thank Dr. Jeff Joines for his support in developing the software.

Finally, I am grateful to my family for their support and encouragement.

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1 INTRODUCTION

Sourcing is a difficult task for apparel companies because it requires the consideration of a large number of different factors. These factors include different types of costs, lead time, product quality, production capacity, and risk of nature disasters and political instability. Sourcing costs are composed of such values as manufacturing costs, transportation costs, tariffs, inventory costs, management costs, and hidden costs. Further complicating matters is that many of the factors to be considered in making sourcing decision are constantly changing. Policy changes within an individual country affect the cost of labor and currency valuation for that country. The stability of an individual country affects the reliability of being able to get a product produced in that country. Transportation costs change due to fluctuations in the price of oil, as well as changes in the demand and supply of transportation along shipping routes. Changes in trade laws affect tariffs and quotas. Therefore, a sourcing decision that makes sense one year will not necessarily make sense in a subsequent year.

Many companies have developed quantitative models to help them compute the costs of manufacturing their products in different countries throughout the world at a specific time. This helps them to negotiate good deals, since it aids them in understanding when the price offered is too high or too low (indicating an introductory price that cannot be offered long-term by the manufacturer). These cost models also help companies forecast landed costs into the future and devise possible future sourcing strategies. Unfortunately, very few such detailed cost models exist in the apparel costing literature.

This thesis investigates the impact of costs on sourcing decisions. Two basic apparel products are the focus of the study, cotton knit T-shirts and denim jeans. There are three specific objectives of research. First, U.S. import data over the last 21 years is examined to understand the countries that are major players in the market. These major players are also investigated with respect to the total average value incurred to purchase and bring the goods into the U.S. to better understand the role of cost in sourcing decisions. These total average values are computed using trade data by adding the free on board (FOB) value to the tariff (if applicable) to the insurance and freight value. Second, a model developed by Fiallos (2009) to calculate the landed cost of importing T-shirts and denim jeans for 2008 from a number of different countries is extended to compute the landed costs of selected years during the past for several countries. These landed costs are compared to import trade data FOB values to determine the relationship between the results of the Fiallos model and the actual FOB values reported, taking into account that the Fiallos model does not include manufacturing markups. Third, to make the process of calculating the costs easier, software written in VB.net was developed based on the Fiallos cost model.

This thesis is structured in the following manner. Chapter 2 presents the literature review. In Chapter 3 trade data for T-shirts and denim jeans is analyzed. Chapter 4 describes the costing software developed, and Chapter 5 compares results from the costing software to import trade value data. Chapter 6 presents the conclusions and future work.

2 LITERATURE REVIEW

This section reviews literature related to apparel sourcing. First, literature that uses import data to analyze trade patterns is presented. Then, literature on computing costs of sourcing apparel is examined. Finally, the sourcing cost model developed by Fiallos (2009) that is used in this study is discussed.

2.1 Analysis of Apparel Import Data

This section is divided into the following three parts to review the literature on United States apparel import data analysis: general apparel import data analysis, T-shirts import data analysis, and denim jeans import data analysis.

2.1.1 General Apparel Import Data Analysis

2.1.1.1 Non-gravity Regression Approaches

Shippen (1999) used ordinary least squares and two-stage least squares models to analyze U.S. textile and apparel import competition effects on employment and wages in the U.S. textile and apparel industries. After analyzing data from the National Bureau of Economic Research's database from 1977 to 1991, he found that import prices had a more significant effect on the U.S. apparel industry than on the U.S. textile industry, in terms of number of employees, number of hours employees worked, and average wages.

Zhang and Hathcote (2008) examined the influence of quota elimination on U.S. apparel imports from China after 2005. They created a log linear regression model to analyze quota prices, tariff rates, labor costs and freight rates from 1998 to 2000 by using data from various governmental websites. They found that quota prices and tariff rates had a significant effect on trade, and thus quota elimination would likely increase U.S. apparel imports from China.

Jin, Hathcote and Kim (2006) analyzed the impact of economic factors, labor costs, capital factors, infrastructure, and political factors on cotton products imports from the top ten import countries from 1974 to 2000. They found that the following four environmental factors were significant after analyzing trade data from the United States International Trade Commission (USITC): GNP, tariff rates, exchange rates, and roads.

2.1.1.2 Gravity Models

Chi and Kilduff (2010) examined economic and political factors related to U.S. apparel import trade patterns by using a gravity model. From analyzing data from the USITC database for 15 major import countries between 1995 and 2006, they concluded that U.S. apparel imports were based on various costs, economic conditions, governmental policy and infrastructure.

Datta and Kouliavtsev (2009) used a partial-equilibrium gravity model to analyze the influence of North American Free Trade Agreement (NAFTA) on U.S. apparel trade. They examined factors, including prevailing wages, currency exchange rates, and trade barriers, based on trade data from Standard Industrial Classification 4 (SIC4) from 1987 to 2001. They found that NAFTA does not seem to cause trade diversion, but instead results in trade creation.

2.1.1.3 Cluster Analysis

Su, Gargeya and Richter (2005) used cluster analysis to study U.S. apparel imports from China, Hong Kong, CBI countries and Mexico from 1993 to 2002 by using Office for Textile and Apparel (OTEXA) trade data. They found that there was a shift in sourcing patterns to Mexico and CBI countries.

2.1.1.4 Other Analysis

Chan and Ross (2003) analyzed the influence of NAFTA on U.S. apparel imports from China and Mexico between 1980 and 2000 by using data from OTEXA. They found that trade agreements and lack of quotas really affect imports, and deciding factors will involve labor wages and geographic location.

2.1.2 T-shirts Import Data Analysis

Abernathy, Volpe and Weil (2005) did research focused on the trade patterns of U.S. T-shirt imports between 1989 and 2004. They analyzed the influence of total landed cost and inventory-related costs on U.S. T-shirt imports from Mexico, Nicaragua and Coastal China by using OTEXA trade data. They found that Asian countries would have a growing market share of U.S. T-shirts imports after quota elimination, and Latin American countries retained their competitiveness by participating in U.S. trade agreements.

2.1.3 Denim Jeans Trade

Not only did Abernathy, Volpe and Weil (2005) research T-shirts, they also examined the denim jeans trade pattern for the same period 1989 to 2004. Although Asian countries had increasing market share, Latin American countries still occupied the most denim jeans market share.

Allen and Huffman (2005) also analyzed major trade patterns for U.S. denim jeans import. They used data between 1997 and 2004 from OTEXA. They found that in 2004 Mexico had the largest market share of cotton bottom imports into the United States.

2.2 Apparel Costing

The literature on apparel sourcing costs can be divided into the following three parts: costing methods, dyeing cost models, and hidden/true costs of sourcing.

2.2.1 Costing Methods

Hergeth (1996) described the standard costs in the textile and apparel industry. He described conventional methods, activity-based costing, and strategic cost management.

Rendall, Hergeth, Chen and Zuckerman (1990) used a field study and a survey to examine the types of product costing systems in the textile industry. They found that most companies used traditional costing systems. The authors believed that by using more contemporary systems such as activity-based costing, textile companies could better manage their overhead.

Camargo, Rabenasolo, Jolly-Desodt, and Castelain (2003) compared three different cost methods. They believe that the parametric cost method is particularly useful to estimate the costs of different designs for textile products. They used wool fabric as an example to develop and test the Cost Estimation Relationship (CER).

2.2.2 Dyeing Cost Models

Yeh and Yang (2003) created two cost models for dyeing, an original dyeing strategy cost model and a postponement dyeing strategy cost model. After comparing these two models, they found that the postponement dyeing strategy would work better than the original dyeing strategy under certain conditions, such as large production quantities.

2.2.3 Hidden/True Costs of Sourcing

Hergeth (2002) discussed hidden and invisible costs of offshore textile and apparel manufacturing. The hidden and invisible costs discussed include transportation and travel costs, training and expatriate management costs, quality costs, marketing and sale costs, and corporate management costs. Hergeth (2002) explained that many of these costs are assigned to overall company overhead and are not correctly allocated to the offshore activities that generate them.

Hines (2002) developed a theoretical model to analyze the total cost for apparel overseas sourcing. He called his model the iceberg theory and explained that many companies make decisions based on costs that are above the water line of the iceberg and hence transparent, without considering those hidden costs that are below the water line.

Lowson (2002) did a research on comparing domestic and offshore apparel sourcing. He found that there are hidden costs in offshore sourcing. So he (Lowson, 2003) created a total acquisition cost model to quantify the true cost of importing apparel from low wage countries. He quantified the relationships between lead time, inventory, customer service level, and supplier performance.

Platts and Song (2010) developed a total apparel cost framework for sourcing from China. They compared the results of actual costs incurred in case studies to perceptions of costs through using surveys. In general, respondents to the survey underestimated costs of sourcing from China.

Holweg, Reichhart and Hong (2011) created a total cost model of apparel sourcing which includes statics costs, dynamic costs, and hidden costs. They applied this model to three case studies, two of which were apparel-related.

Lead time is one of the main hidden costs in apparel sourcing. The literature below looked at quantifying the value of shorter lead times, and then reducing sourcing cost.

Hunter, King, and Nuttle (Nuttle, King, & Hunter, 1991; 1992; 1996) developed a stochastic computer-estimation model, which later became known as the Sourcing Simulator, to evaluate traditional and quick-response (QR) retailing performances for seasonal and fashion apparel. They found that a QR strategy could increase gross margin, over the traditional retailing process.

Hartman (2012) analyzed the effect of hidden costs for sourcing basic and seasonal apparel by using Sourcing Simulator and a survey for retailers and manufacturers. She found that in some instances shorter lead times justified using suppliers that charged more per garment.

2.3 Fiallos Cost Model

Fiallos (2009) developed a detailed landed cost model for sourcing knit cotton T-shirts and denim jeans from different countries to be sold in the U.S. market. He then calculated and compared the landed cost for six countries for 2008. These six countries were the United States, China, India, Colombia, Guatemala, and Vietnam.

The landed cost contains the cost incurred in the entire supply chain from fiber to delivery at retail. The landed cost of producing a garment in countries other than the U.S. includes transportation costs and duties paid upon entry to the United States, as well as any rebate paid by foreign governments upon exporting goods to other countries, if such rebate exists.

Equation 2.1 shows the exit-factory cost, which contains fabric costs, trim costs, labor costs, energy costs, and garment finishing costs. The garment finishing cost term was only used for denim jean. An off-quality cost was applied to the entire apparel producing process. In Fiallos' (2009) study, the off-quality factor was set to 2 percent for all countries. The capital cost focuses on short term financing expenses related to working capital. The capital cost was obtained from CIT Group (Tabb, 2009). Equation 2.2 shows the FOB value, which is equal to the exit-factory cost minus any rebate the manufacturer receives. Several countries have rebates for exporting products. For example, both the government of China and India offer export rebates. Equation 2.3 shows the total landed cost. The landed cost is the sum of FOB value, maritime transportation cost, and tariff. Apparel produced in the United States does not have a rebate, maritime transportation cost, and tariff.

Equation 2.1 Exit-Factory Cost

$$\frac{\$_{exit-factory}}{garment} = \left[\left(\frac{\$_{fabric}}{garment} + \frac{\$_{trim}}{garment} + \frac{\$_{labor}}{garment} + \frac{\$_{energy}}{garment} + \frac{\$_{garment\ finishing}}{garment}\right) \times \left(1 + factor_{off-quality}\right)\right] \times (1 + Capital_{rate})$$

Equation 2.2 FOB Value

$$\frac{\$_{FOB}}{garment} = \frac{\$_{exit-factory}}{garment} - \frac{\$_{rebate}}{garment}$$

Equation 2.3 Landed Costs

$$\frac{\$}{garment} = \frac{\$_{FOB}}{garment} + \frac{\$_{transportation}}{garment} + \frac{\$_{duty}}{garment}$$

2.3.1 Trim Cost

In order to manufacture an apparel product, secondary materials are added during the production process, as well as floor-ready packaging. These costs make up the trims cost shown in Equation 2.4. As trim costs tend to be similar for apparel companies and because of a lack of country specific trim data, trim cost was set to be equal for all countries. Fiallos (2009) obtained trim data for T-shirts from a procurement manager in the knit goods industry.

Equation 2.4 Trim Cost

$$\frac{\$_{trims}}{garment} = \sum_{i=1}^{n} \left(\frac{\$}{trim_i} x \frac{trim_i}{garment}\right)$$

2.3.2 Labor Cost

The labor cost for a garment was separated into two parts, direct labor cost and indirect labor cost. Fiallos (2009) defined direct labor as skilled labor and indirect labor as unskilled labor. For direct labor, the standard allowed minutes (SAMs) of the sewing process was determined. Fiallos (2009) assumed that the T-shirt assembly process required 7 SAMs, and the denim jeans assembly process required 21 SAMs. The operator efficiency and time on-standard were set to 85 and 90 percent, respectively. The direct labor cost calculation is shown in Equation 2.5. For indirect labor, he used industry benchmarks obtained from a production manager. The indirect to direct personnel ratio was set to 1/5 for all countries. In addition, he assumed that the unskilled labor wage was 80 percent of skilled labor. Equation 2.6 shows the indirect labor cost calculation. The labor wage for all countries except the U.S. was obtained from O'Rourke (2008). The labor wage for the U.S. was obtained from the 2008 International Textile Manufacturers Federation International Production Cost Comparison (ITMF IPCC) report (2008).

Equation 2.5 Apparel Conversion Direct Labor Cost

$$\frac{\$_{direct\ sew\ labor}}{garment} = \frac{\$_{labor}}{hr}\ x\ Efficiency\ x\ Time_{on-standard}\ x\ \frac{1\ hr}{60\ min}\ x\ \frac{SAM}{garment}$$

Equation 2.6 Apparel Conversion Indirect Labor Cost

$$\frac{\$_{indirect\ sew\ labor}}{garment} = \frac{\$_{direct\ sew\ labor}}{garment} \times Ratio_{direct\ to\ indirect}$$

2.3.3 Energy Cost

The energy cost during the cutting and sewing process is shown in Equation 2.7. This consumption not only includes the cutting and sewing machines, but also includes lights and supporting equipment. Fiallos (2009) allocated these costs to a garment based on its total SAMs. The energy price for each country was obtained from different resources. The data for China, India, and the United States was obtained from the 2008 ITMF IPCC report. Data for

Colombia, Guatemala, and Vietnam was obtained from the Latin American Energy Organization (OLADE) (Segura, 2008), the Empresa Nacional de Energia Electrica (ENEE) (2009), and the Associated Press (2009), respectively.

Equation 2.7 Apparel Conversion Energy Cost

$$\frac{\$_{energy}}{garment} = \frac{\$}{kWh} \times \left(kWh_{sewing\ machine} + kWh_{support} + \left(\frac{kWh_{lighting}}{m^2_{floorspace}} x \frac{m^2_{floorspace}}{work\ station} \right) \right) \times \frac{SAM}{garment} \times \frac{1}{60}$$

2.3.4 Garment Finishing Cost

Recall that the garment finishing process only applied to the production of jeans and not the T-shirts. In the garment finishing process, two steps were considered, washing and dry processing. In dry processing, Fiallos (2009) included the costs of sanding, spraying, and grinding. The final garment finishing cost shown in Equation 2.8 was calculated as the sum of dry processing and washing costs. The calculation for the dry processing cost only includes the labor required since that is the dominant cost. Similarly, the calculation for washing costs only includes the water costs. The labor cost for dry processing is shown in Equation 2.9 and the water cost for washing is shown in Equation 2.10. Fiallos (2009) obtained washing data and dry processing data from a denim laundry facility manager in Latin America.

Equation 2.8 Garment Finishing Cost for Denim Jeans

$$\frac{\$_{garment\ finishing}}{garment} = \frac{\$_{dry\ processing}}{garment} + \frac{\$_{washing}}{garment}$$

Equation 2.9 Labor Cost for Denim Jeans Dry Processing

$$\frac{\$_{dry\ processing}}{garment} = \frac{\$_{labor}}{hr} \times \left(\frac{hr}{garment_{sanded}} + \frac{hr}{garment_{sprayed}} + \frac{hr}{garment_{ground}}\right)$$

Equation 2.10 Water Cost for Denim Jeans Washing

$$\frac{\$_{washing}}{garment} = \frac{\$}{gln_{water}} \times \frac{gln_{water}}{load} \times \frac{load}{garments}$$

2.3.5 Fabric Cost

Greige fabric data for the United States, China and India was obtained from the 2008 ITMF IPCC report (2008). Fiallos (2009) assumed that when making knit T-shirts, tubular fabric was used. Since the width of the knit fabric in the ITMF report was of a different width than that required for T-shirt production, the ITMF cost was scaled, reflecting the T-shirt fabric width. This scaling assumed that different widths do not affect the production cost structure. The denim jeans did not use tubular fabric. Therefore, the width was not scaled. The cost of fabric loss during the cutting process was taken into consideration. Fiallos (2009) assumed that the spread loss rate was 8 percent. Equation 2.11 shows the calculation for the average fabric cost per garment for the T-shirt and denim jeans.

Equation 2.11 Fabric Cost

$$\frac{\$_{fabric}}{garment} = \frac{\$}{m_{fabric}}\ x\ \frac{m_{fabric}}{garment}\ x\ \left(1 + loss_{spread}\right)\ x\ \frac{width_{new}}{width_{original}}$$

The fabric price per meter is calculated by adding the greige fabric cost, the costs of dyeing the greige fabric, and the finishing costs. The next three sections explain these costs in detail.

2.3.5.1 Greige Fabric Cost

The greige fabric cost contains labor costs, power costs, auxiliary material costs, capital costs, and raw material costs. Equation 2.12 shows the total greige fabric cost. The data of the United States, China and India was obtained from ITMF IPCC report. Fiallos (2009) chose single knit jersey fabric using ring yarn for the T-shirt and printed woven fabric using rotor yarn for the jeans from this report. Fiallos (2009) assumed that the greige fabric that would be cut and sew in Guatemala and Colombia was produced in the U.S., while the greige fabric that would be cut and sewn in Vietnam would be produced in China. Therefore, greige fabric costs for Guatemala and Colombia were set equal to the U.S.'s greige fabric manufacturing costs plus transportation costs from the U.S. Similarly, the greige fabric costs for Vietnam were set equal to China's greige fabric manufacturing costs plus transportation costs from China. Due to a lack of data, auxiliary materials and capital costs for Guatemala, Colombia, and Vietnam were assumed equal to the average of the United States, China, and India, and labor and power costs for Guatemala, Colombia, and Vietnam were set equal to average of scaled values against the United States, China, and India. Equation 2.13 shows scaled greige auxiliary material cost for Guatemala, Colombia, and Vietnam. Equation 2.14 shows scaled greige labor cost.

Equation 2.12 Total Greige Fabric Cost

$$\frac{\$}{m_{greige\ fabric\ cost}} = \frac{\$}{m_{labor}} + \frac{\$}{m_{energy}} + \frac{\$}{m_{auxiltary\ material}} + \frac{\$}{m_{capital}} + \frac{\$}{m_{raw\ material}}$$

Equation 2.13 Scaled Auxiliary Material Cost for non-ITMF Countries for Greige Fabric

$$\frac{\$}{\mathrm{m_{greige\ auxiliary\ material\ cost}}} = \frac{\sum \text{auxiliary material cost}_{\text{ITMF country i}}}{3}, \text{for all countries i}$$

Equation 2.14 Scaled Labor Cost Calculation for non-ITMF Countries for Greige fabric

$$\frac{\$_{cost\ component}}{m} = \left(\sum \frac{labor\ rate_{non-ITMF\ country}}{labor\ rate_{ITMF\ country\ i}} \times \frac{\$_{cost\ component}}{m_{ITMF\ country}}\right) \div 3, for\ all\ countries\ i$$

2.3.5.2 Fabric Dyeing Cost

The cost of dyeing the fabric is computed by adding the labor cost, energy cost, steam cost, water cost, and chemical and dyes cost. The dyeing method used for knit fabric is piece dyeing and that used for woven fabric is rope dyeing. Calculations for piece dyeing and rope dyeing have differences in energy, steam and water costs. Piece dyeing data was obtained from the Gaston County Dyeing Machine Company. The machine selected was a 2-strand Millennium Dyeing Machine with Charge Tank. Rope dyeing data was obtained from Morrison Textile Machinery Co., American Monforts LLC, and DyStar Textilfarben GmbH. Equation 2.15 shows the total fabric cost for dyeing. Equation 2.16 shows the labor cost for knit fabric and woven fabric. Equation 2.17, Equation 2.19, and Equation 2.21 show energy cost, steam cost, and water cost for piece dyeing for knit fabric. Equation 2.18, Equation 2.20, and Equation 2.22 show energy cost, steam cost, and water cost for rope dyeing for woven fabric. Equation 2.23 shows chemical and dye cost for knit fabric and woven fabric.

Equation 2.15 Fabric Cost for Dyeing in $ Per Pound

$$\frac{\$}{lb_{fabric}} = \frac{\$}{lb_{labor}} + \frac{\$}{lb_{energy}} + \frac{\$}{lb_{steam}} + \frac{\$}{lb_{water}} + \frac{\$}{lb_{chemical\&dye}}$$

Equation 2.16 Labor Cost for Dyeing in $ Per Pound

$$\frac{\$}{lb_{fabric}} = \frac{\$}{hr}\ x\ \frac{operator}{machine}\ x\ \frac{hr}{lbs_{output}}$$

Equation 2.17 Energy Cost for Piece Dyeing in $ Per Pound of Knit Fabric

$$\frac{\$}{lb_{fabric}} = \frac{kWh}{lb_{fabric}} \times \frac{\$}{kWh}$$

Equation 2.18 Energy Cost for Rope Dyeing in \$ Per Pound of Dyed Warp Yarn

$$\frac{\$}{lb_{fabric}} = \frac{\$}{kWh} \times kWh \times \frac{hr}{lbs_{output}}$$

Equation 2.19 Steam Cost for Piece Dyeing in \$ Per Pound of Knit Fabric

$$\frac{\$}{lb_{fabric}} = \frac{lb_{steam}}{lb_{fabric}}\ x \frac{\$}{lb_{steam}}$$

Equation 2.20 Steam Cost for Rope Dyeing in \$ Per Pound of Dyed Warp Yarn

$$\frac{\$}{lb_{fabric}} = \frac{\$}{kg_{steam}} \times \frac{kg_{steam}}{hr} \times \frac{hr}{lbs_{output}}$$

Equation 2.21 Water Cost for Piece Dyeing in \$ Per Pound of Knit Fabric

$$\frac{\$}{lb_{fabric}} = \frac{gln_{water}}{lb_{fabric}} x \frac{\$}{gln_{water}}$$

Equation 2.22 Water Cost for Rope Dyeing in \$ Per Pound of Dyed Warp Yarn

$$\frac{\$}{lb_{fabric}} = \frac{\$}{m^3_{water}} \times \frac{m^3_{water}}{hr} \times \frac{hr}{lbs_{output}}$$

Equation 2.23 Chemical and Dye Cost for Dyeing in \$ Per Pound

$$\frac{\$}{lb_{fabric}} = \frac{\$_{chemicals}}{lb_{fabric}} + \frac{\$_{dyes}}{lb_{fabric}}$$

2.3.5.3 Fabric Finishing Cost

The finishing cost contains labor cost, energy costs, steam costs, water costs, chemicals costs and capital costs. Equation 2.24 shows total finishing cost. For knit fabric, the finishing process is drying and compacting. It just contains labor cost, energy cost and steam cost. Drying and compacting data was obtained from Biancalani Company. The machine selected was Biancalani Spyra 10. Finishing data for woven fabric was obtained from American

Monforts LLC. Equation 2.25 - Equation 2.27 show the labor cost, energy cost, and steam cost for the drying and compacting process, and the finishing process. Equation 2.28 shows the water cost for denim fabric finishing process.

Equation 2.24 Total Finishing Cost in $ Per Meter

$$\frac{\$}{m_{fabric}} = \frac{\$}{m_{labor}} + \frac{\$}{m_{energy}} + \frac{\$}{m_{steam}} + \frac{\$}{m_{water}} + \frac{\$}{m_{chemical}} + \frac{\$}{m_{capital}}$$

Equation 2.25 Labor Cost in $ Per Meter

$$\frac{\$}{m_{fabric}} = \frac{man}{machine} x \frac{\$}{hr} x \frac{hr}{m_{output}}$$

Equation 2.26 Energy Cost in $ Per Meter

$$\frac{\$}{m_{fabric}} = \frac{hr}{m_{output}} x\ kW\ x \frac{\$}{kWh}$$

Equation 2.27 Steam Cost in $ Per Meter

$$\frac{\$}{m_{fabric}} = \frac{hr}{m_{output}} x \frac{kg_{steam}}{hr}\ x \frac{\$}{kg_{steam}}$$

Equation 2.28 Water Cost for Finishing Denim Fabric in $ Per Meter

$$\frac{\$}{m_{fabric}} = \frac{\$}{m^3_{water}} \times \frac{m^3_{water}}{hr} \times \frac{hr}{m_{output}}$$

2.3.6 Export Tax Rebates and FOB Price

The export tax rebate rate is based on a foreign government's export policy. In this study, Fiallos only provided the China tax rebate rate. He obtained this data from Xinhua News Agency (2009). The tax rebate is applied to the exit-factory price.

Equation 2.29 Export Tax Rebate

$$\frac{\$_{rebate}}{garment} = \frac{\$_{exit-factory}}{garment} \times Rate_{rebate}$$

2.3.7 Transportation Cost

In Fiallos' (2009) study, he considered only maritime transportation costs. The calculation used to compute transportation cost is shown in Equation 2.30. He assumed that garments were transported from all countries outside the United States using 40-foot containers. The insurance rate applied to freight cost during shipping was set equal to all countries. Fiallos added capital cost to transportation cost. The data for Latin America was obtained from Seaboard Marine (2008). The data for Asia was obtained from Orient Overseas Container Line (2008) and Yang Ming Marine Transport Corp (2008).

Equation 2.30 Transportation Cost

$$\frac{\$_{transportation}}{garment} = \left[\left(\frac{\$}{container}\, x\, \frac{container}{garments}\right) + \left(Insurance\ Rate_{shipping}\ x\, \frac{\$_{FOB}}{garment}\right)\right] x\ (1 + Capital_{Rate})$$

2.3.8 Tariff Cost

Tariff rates from the Harmonized Tariff Schedule were obtained from the United States International Trade Commission (2008). They are applied to the FOB value of the garment. Tariff cost calculation is shown in Equation 2.31.

Equation 2.31 Duty Cost

$$\frac{\$_{duty}}{garment} = FOB_{value}\ x\ Duty_{Rate}$$

2.3.9 Fiallos' Conclusions

Based on his calculations, Fiallos (2009) found that the landed cost rankings for T-shirts and denim jeans were similar. Then he analyzed the landed cost in separated aspects. First, labor rates are higher in developed country than developing or under-developed country.

When comparing the six countries, labor wages of India and Vietnam were more competitive. Second, energy rates depend on oil prices. Vietnam and the United States offer more competitive energy rates. Third, steam costs of all countries are similar although water rates are different. Fourth, cotton price affect yarn price. When comparing the United States, China and India, the United States has the most competitive yarn prices based on a lower cotton price. Last, other costs which include maritime transportation cost, tariff cost and rebate cost have an important influence on landed cost. The free trade agreement between the United States and Colombia really gave Colombia an advantage on landed cost.

3 ANALYSIS OF IMPORTS OF T-SHIRTS AND JEANS FROM 1991-2011

The purpose of this section is to analyze U.S. import trade patterns from 1991 to 2011 for T-shirts and denim jeans. Trade data in this section was obtained from the Office of Textiles and Apparel (OTEXA) (2012) and the United States International Trade Commissions (USITC) (2012). To better understand overall U.S. apparel imports during that time period, U.S. production, consumption and imports of apparel products from 1991 to 2008 are shown in Figure 3.1. This data was obtained from the American Apparel and Footwear Association (AAFA) (2011) (Before 2005, the AAFA calculated U.S. consumption as shown in Equation 3.1. Imports included imports for consumption and imports not for consumption. Exports were U.S. production not for domestic consumption. After 2005, the AAFA calculated U.S. consumption as shown in Equation 3.2. Imports only included imports for consumption). Total U.S. apparel import quantities are affected by U.S. apparel production and consumption. Figure 3.1 shows that the mostly increasing trend of apparel imports from 1991 to 2008 is not only due to the decrease of U.S. apparel production but also due to the increase in apparel consumption. Figure 3.2 and Figure 3.3 shows U.S. T-shirt and denim jeans imports from 1991 to 2011. The data was obtained from OTEXA (2012). Imports of T-shirts and denim jeans had an overall increasing trend from 1991 to 2011, similar to the trend of total U.S. apparel imports.

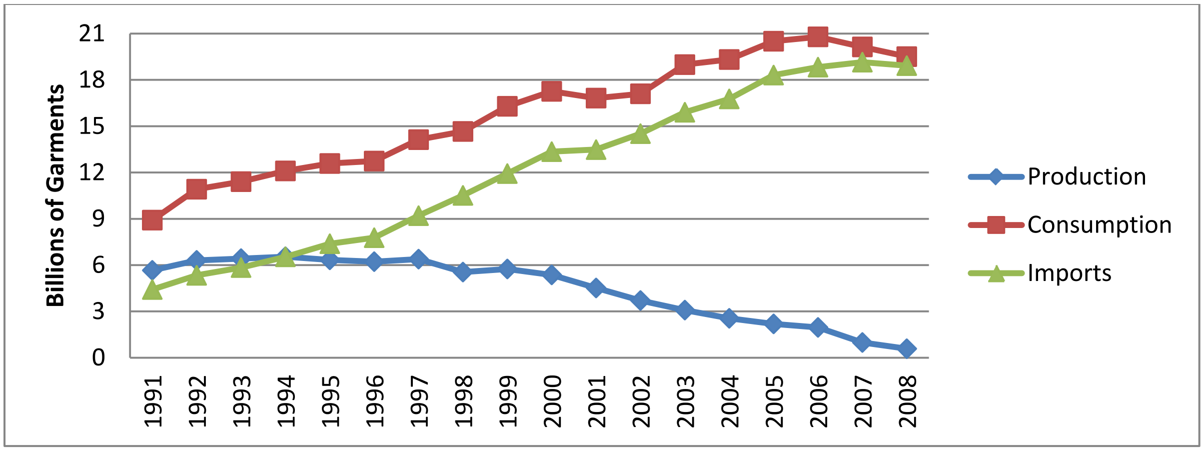


Figure 3.1 US Production, Consumption and Imports in Billions of Garments

Equation 3.1 AAFA Calculation for US Consumption before 2005

$$\text{US Consumption} = \text{US Production} + \text{US Imports} - \text{US Exports (not including exports of cut parts)}$$

Equation 3.2 AAFA Calculation for US Consumption 2005-2008

$$\text{US Consumption} = \text{US Production} + \text{US Imports for Consumption}$$

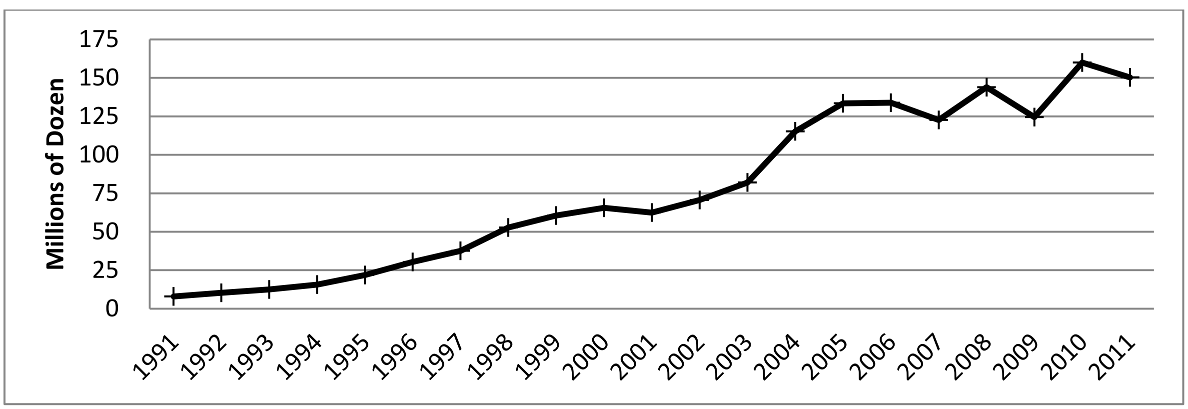


Figure 3.2 U.S. T-shirt Imports in Millions of Dozen

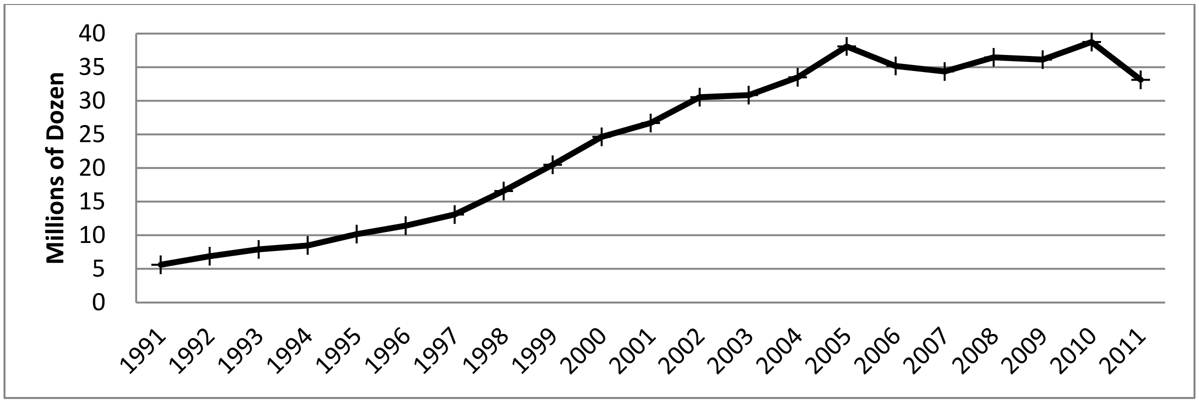


Figure 3.3 U.S. Denim Jeans Imports in Millions of Dozen

Trade agreements between the U.S. and other countries are important factors in making sourcing decisions because they can affect cost. There are several significant trade agreements that affected the cost of importing T-shirts and denim jeans. The first is the North American Free Trade Agreement (NAFTA), the free trade agreement signed in 1994 between the U.S., Mexico, and Canada. NAFTA allowed duty-free apparel imports from Mexico and Canada. Second is the Caribbean Basin Trade Partnership Act (CBTPA), which was signed in 2000. Under this trade agreement, apparel can be imported into the U.S. from twenty-five Caribbean countries with no tariff provided that some specific conditions are met, such as using U.S. yarns, and fabrics. CBTPA beneficiary countries in this study include Haiti, Guatemala, Nicaragua, Honduras, El Salvador, Costa Rica, and the Dominican Republic. Third is the Multi-Fiber Agreement (MFA) phase-out from 1995 to 2005. In 2005, the MFA was replaced by the General Agreement on Tariffs and Trade (GATT). GATT is regulated by World Trade Organization (WTO). The main purpose of the MFA phase-out was to eliminate quotas for world trade. Fourth is the Dominican Republic – Central America Free Trade Agreement (DR-CAFTA) signed in 2006. Due to this agreement, there is no tariff for qualifying apparel product imports from DR-CAFTA countries with yarns produced in the U.S. or DR-CAFTA region. DR-CAFTA countries included Dominican Republic, Costa Rica, Honduras, El Salvador, Nicaragua, and Guatemala. As these five countries joined DR-CAFTA, they were no longer in CBTPA beneficiary countries. Last is the Haitian Hemispheric Opportunity through Partnership Encouragement (HOPE) Act of 2006. This trade agreement allows unlimited duty-free apparel imports from Haiti, for apparel products that use fiber, yarn and fabric from beneficiary countries listed in the HOPE Act.

In addition, quota limitations may have also had a big impact on making sourcing decisions before 2005. The function of quotas was to restrict import quantities to protect domestic industry. There are three types of quotas: absolute quotas, tariff-rate quotas, and tariff preference levels. Tariff-rate quotas and tariff preference levels are related to different trade agreements and programs. This section only considered absolute quotas, which were determined by the MFA. MFA categories are used in applying absolute quotas. MFA categories of knit cotton T-shirts are 338 and 339. MFA categories for absolute quotas of denim jeans are 437 and 438. Absolute quotas are obtained from Customer Border Protection (CBP) website (2012). Table B.1 and Table B.2 in Appendix B shows quota limitations, actual quota usage, and quota filled percentage.

3.1 T-shirts

Although there are various types of cotton T-shirts, this study is limited to basic cotton T-shirts and does not include art cotton T-shirts because art T-shirts may have different characteristics than basic T-shirts. The mixture of product types imported from each country could vary, although they were in the basic T-shirt categories. Imports from some countries could contain a higher percentage of high quality products, or more fashion-oriented products. This study assumes the product mixture is similar for all countries in the basic T-shirt categories. The following sections explain the specific categories of cotton T-shirts considered and analyzes the major players from 1991 to 2011.

3.1.1 Selection of Categories for Analysis

Import trade data of knit cotton T-shirts can be found on the OTEXA website (2012). This study uses five Harmonized Tariff Schedule (HTS) categories to analyze knit cotton T-shirts import. The five HTS categories are as follows:

(1) 6109100004 Men's or Boy's T-shirts, all white, short hemmed sleeves, hemmed bottom, crew or round neckline, or V-neck with a mitered seam at the center of the V, without pockets, trim or embroidery.

(2) 6109100012 Men's T-shirts, knitted or crocheted, of cotton

(3) 6109100014 Boy's T-shirts, knitted or crocheted, of cotton

(4) 6109100040 Women's T-shirts, knitted or crocheted, of cotton

(5) 6109100045 Girl's T-shirts, knitted or crocheted, of cotton

There are three additional categories involving T-shirts. These categories are art T-shirts and not basic T-shirts. Therefore, these three categories will not be included in this analysis.

3.1.2 Analysis of Major Players over Time

For this study, the major players are defined to be the top 6 countries that the United States imports the greatest quantity from each year. Figure 3.4 - Figure 3.8 show the knit T-shirt import market share between 1991 and 2011 for every five years for the top six major player countries in that year. The market share for the top six countries for all of the rest of the years from 1991 to 2011 are shown in Appendix A from Figure A.1 to Figure A.16. In 1991, the total market share of the top six countries is 48%. In 1996, the top six countries had a total of 78% market, and in 2001, the total market share went up again to 87%. Though the total market shares of top six countries dropped down to 73% in 2006 and again to 71% in 2011, the top six countries still dominated more than two-thirds of the T-shirt import market.

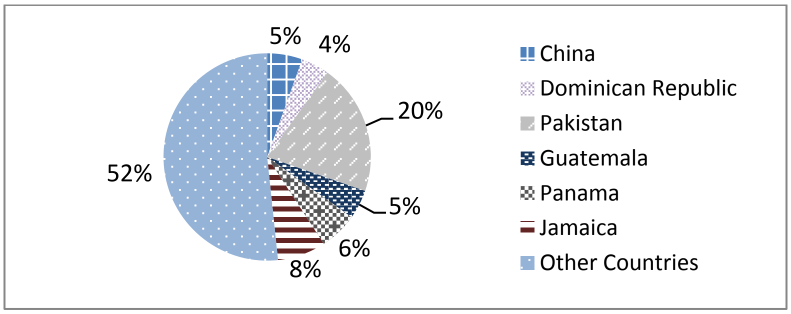


Figure 3.4 Market Share of Top Six Knit T-shirt Import Countries for 1991

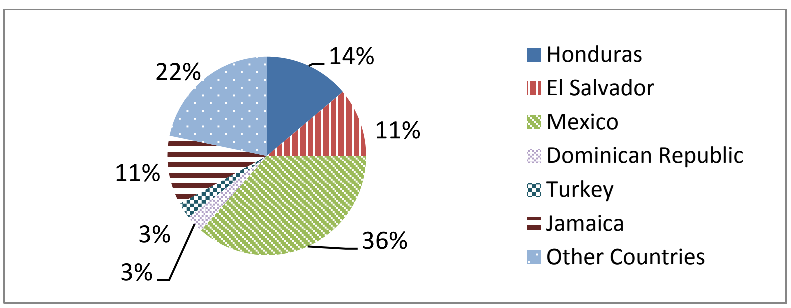


Figure 3.5 Market Share of Top Six Knit T-shirt Import Countries for 1996

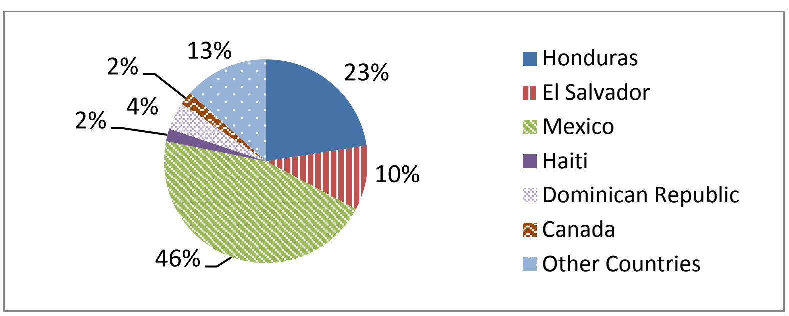


Figure 3.6 Market Share of Top Six Knit T-shirt Import Countries for 2001

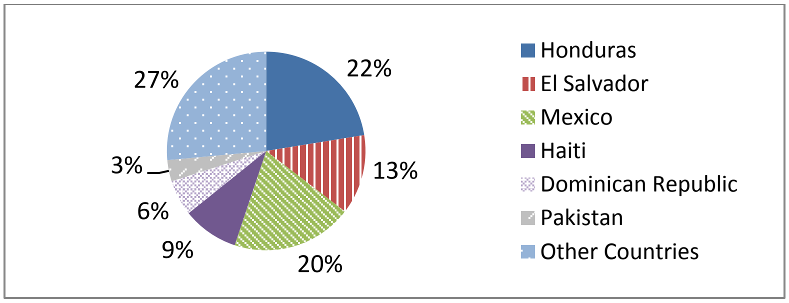


Figure 3.7 Market Share of Top Six Knit T-shirt Import Countries for 2006

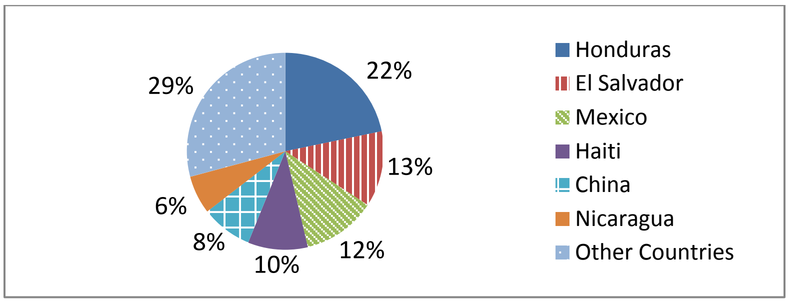


Figure 3.8 Market Share of Top Six Knit T-shirt Import Countries for 2011

Pakistan was in the top 6 T-shirt import countries from 1991 to 1995, and the market share of Pakistan decreased from 20.44% in 1991 to 3.69% in 1995. Jamaica had the second largest market share in 1991 and 1992. Then the market share of Jamaica mostly increased but its ranking dropped from second place in 1992 to fifth place in 1998. Jamaica disappeared from the top 6 in 1999. The Dominican Republic was in the top 6 import countries in 1991, reentered into the top 6 import countries in 1996, and left the top 6 import countries in 2007. Mexico had the largest market share of the top 6 import countries from 1993 to 2003. The market share of Mexico mostly increased from 11.67% in 1993 to 44.68% in 2000. Honduras became the number one importer of knit T-shirts in 2004 and remained in that position until 2011. The largest market share of Honduras was 29.79% in 2004. In general, El Salvador and Haiti had more market share in 2011 when compared with the year they first entered into top 6 import countries, El Salvador in 1992, and Haiti in 1999.

Table 3.1 shows the countries that were in the top six from 1991 to 2011, the number of times they were in the top six, and the years they were in the top six. Countries in the Western hemisphere occupied the top 5 places. El Salvador and Honduras appeared in the top 6 import countries since 1992. Mexico started in the top 6 in 1993. These three countries remained in the top 6 through 2011.

Table 3.1 Top Six Knit T-shirts Import Countries for 1991 -2011

Country	Times in Top 6	Years in Top 6
El Salvador	20	1992-2011
Honduras	20	1992-2011
Mexico	19	1993-2011
Dominican Republic	12	1991, 1996-2006
Haiti	11	1999-2002, 2004-2011
Pakistan	9	1991-1995, 2006-2008, 2010
Jamaica	8	1991-1998
Canada	6	1997-2001, 2003
China	5	1991, 1992, 2005, 2009, 2011
Guatemala	5	1991, 1992, 2002-2004
India	3	1993, 1995, 2007
Bangladesh	2	2008, 2009
Turkey	2	1994, 1996
Panama	1	1991
Nicaragua	1	2011

The fifteen countries in Table 3.1 were sorted from largest to smallest based on 2011 import quantities. The top 6 import countries in 2011 were Honduras, El Salvador, Mexico, Haiti, China, and Nicaragua. Figure 3.9 shows the quantity imported of these top 6 countries in millions of dozen from 1991 to 2011, and Figure 3.10 shows their import market share. Figure 3.11 shows the quantity imported for those countries ranked 7 – 10 and 12 in 2011. In 2011, Vietnam was the 11th largest import country. Because Vietnam did not appear in the top 6 countries during the time period of 1991 to 2011, this study did not analyze Vietnam. Guatemala was the 12th largest import country in 2011. The Dominican Republic, Pakistan, India, and Bangladesh, respectively, were ranked 7th to 10th. Figure 3.12 and Figure 3.13 show the import market share of these five countries. Figure 3.14 and Figure 3.15 show the import quantity and market share, respectively, of the remaining 4 countries.

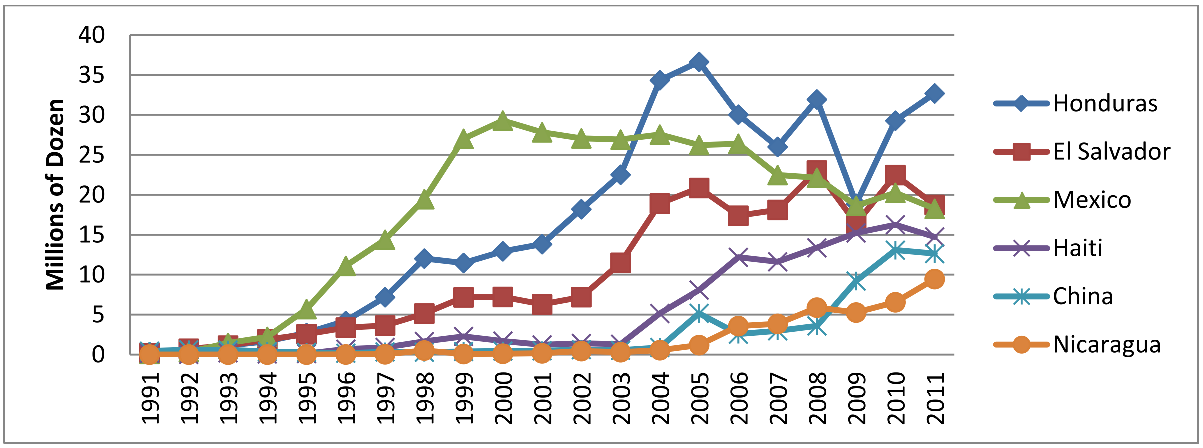


Figure 3.9 Import Quantities of Top 6 Knit T-shirt Import Countries in 2011

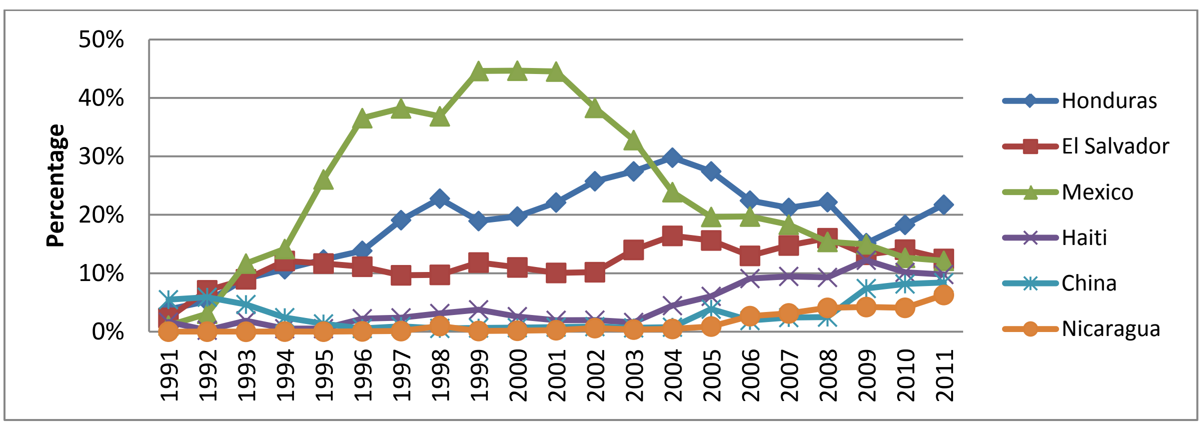


Figure 3.10 Market Share of Top 6 T-shirt Import Countries in 2011

As can be seen in Figure 3.9, imports from Honduras mostly increased from 1991 to 36.6 million dozen in 2005. After 2005, Honduras decreased three times. The fact that import quantities from Honduras dropped down to 18.9 million dozen in 2009 seems to be the result of the political crisis in Honduras that year (Meyer, 2010). Market share of Honduras in Figure 3.10 had a similar trend as import quantities from 1991 to 2011. El Salvador had a mostly increasing trend of import quantities from 1991 to 2005, and then import quantities fluctuated around 20 million dozen. Market share of El Salvador increased from 1991 to 1994, and kept stable around 10% between 1994 and 2002. After 2002, market share El Salvador fluctuated around 15%. Imports increased for Mexico until 2000 when they were 29.3 million dozen and then mostly decreased to 18.2 million dozen in 2011. Correspondingly, the market share of Mexico had a mostly increasing trend from 1.06% in 1991 to 44.68% in 2000, and then decreased to 12.14% in 2011. Haiti had a slight increase between 1996 and 1999, and then mostly increased after 2003. The market share of Haiti as seen in Figure 3.10 mostly increased from 1.59% in 2003 to 12.23% in 2009, and decreased to 9.8% in 2011. Import quantities of China increased between 2004 and 2005, and then decreased in 2006. This might due to the 2005 quota elimination and Chinese safeguards in 2006. After 2008, China had an overall increasing trend of import quantities. This might be because of the phase out of Chinese safeguards in 2008. The market share of China had a similar trend as import quantities. Nicaragua did not start an obvious increasing trend until 2006. Nicaragua suffered a long time period of political instability and internal conflict until 2006 (Central Intelligence Agency, 2012). Nicaragua mostly increased from 2005, and finally entered into the top 6 import countries in 2011.

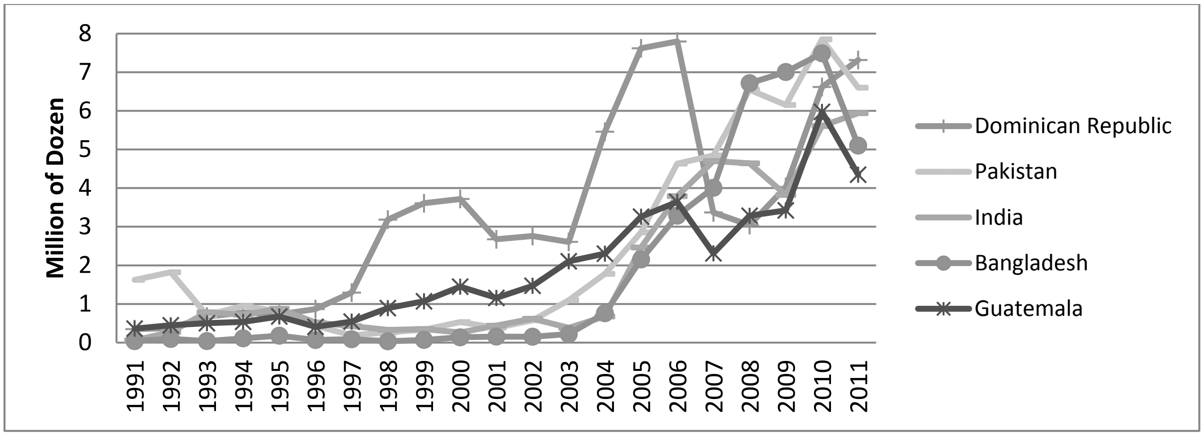


Figure 3.11 Import Quantities of Middle 6 Knit T-shirt Import Countries in 2011 of 15 Countries Considered in the Analysis

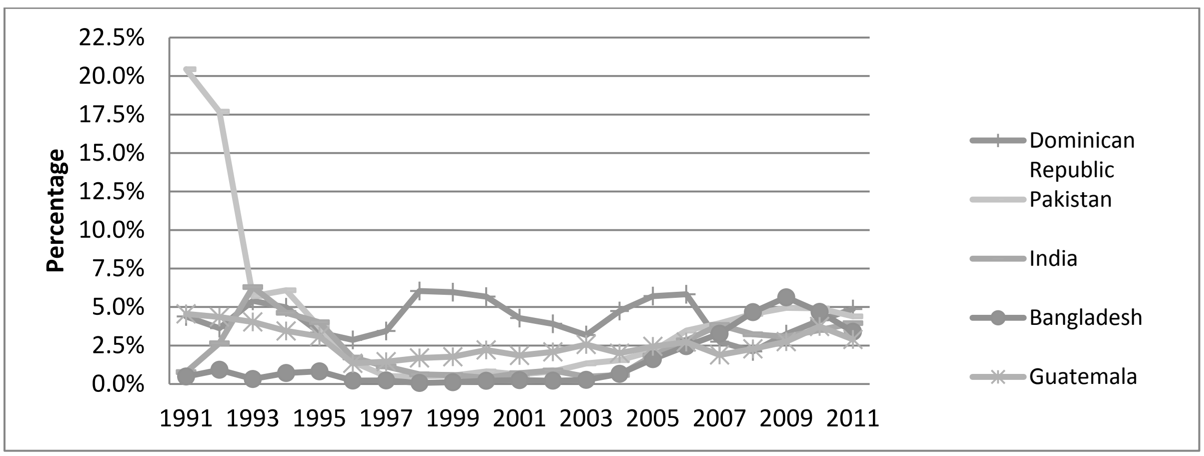


Figure 3.12 Market Share of Middle 6 Knit T-shirt Import Countries in 2011 of 15 Countries Considered in the Analysis

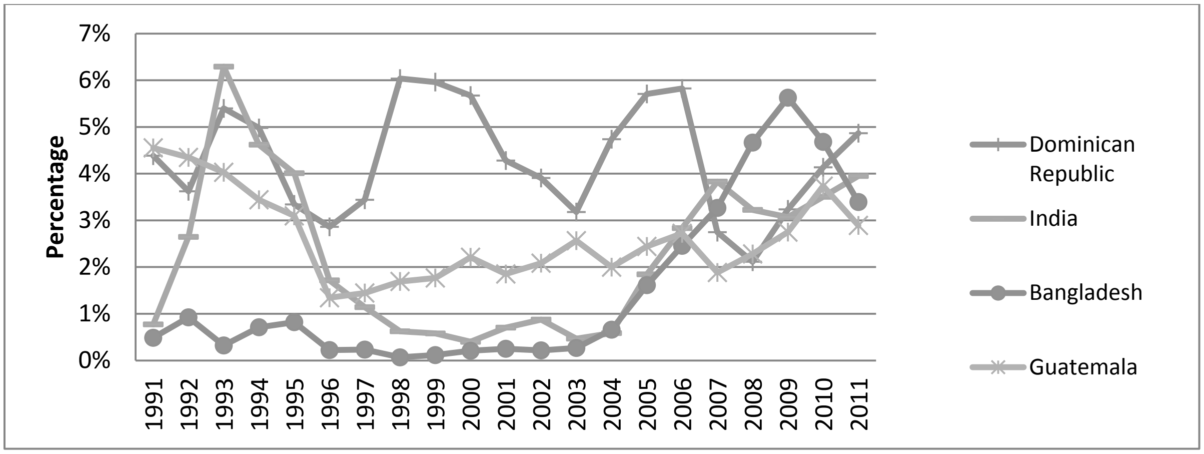


Figure 3.13 Market Share of Middle 6 Knit T-shirt Import Countries without Pakistan in 2011 of 15 Countries Considered in the Analysis

Looking at the overall picture in Figure 3.11, import quantities of the Dominican Republic generally increased from 1991 to 2006, and they increased again from 3 million dozen in 2008 to 7.3 million dozen in 2011. The market share of the Dominican Republic fluctuated between 2% and 6% from 1991 to 2011. Import quantities of Pakistan mostly decreased from 1.8 million dozen in 1992 to 0.2 million dozen in 1997. Then they mostly increased from 0.3 million dozen in 1998 to 7.9 million dozen in 2010, and decreased in 2011. The market share of Pakistan as seen in Figure 3.12 sharply dropped down from 20% in 1991 to 0.5% in 1998, and it mostly increased to 4.94% until 2009. After 2009, the market share of Pakistan decreased a little bit. Import quantities from India mostly increased from 1991 to 1995, and then fluctuated around 0.5 million dozen until 2003. After 2003, import quantities from India mostly increased to 5.9 million dozen in 2011. The market share of India reached its highest point of 6.29% in 1993, and then dropped down from 1993 to 0.4% in 2000. From 2000 to 2011, the market share of India mostly increased. Import quantities of Bangladesh before 2003 fluctuated between 0 and 0.2 million dozen. Bangladesh started a great increase from 2003 to 7.5 million dozen in 2010. Correspondingly, the market share of Bangladesh had a big increase between 2003 and 2009, and then decreased in 2010 and 2011. Import quantities from Guatemala generally increased from 0.4 million dozen in 1991 to 3.6 million dozen in 2006, and increased again from 2.3 million dozen in 2007 to 6 million dozen in 2010. The market share of Guatemala decreased from 1991 to 1996, and then mostly increased from 1996 to 2010.

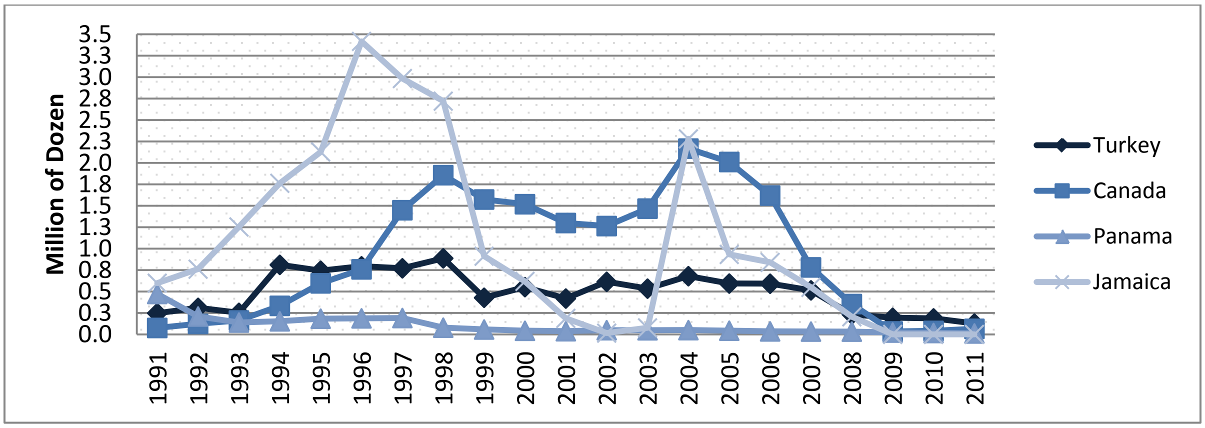


Figure 3.14 Import Quantities of Remaining Knit T-shirt Import Countries in Fifteen Top 6 Countries

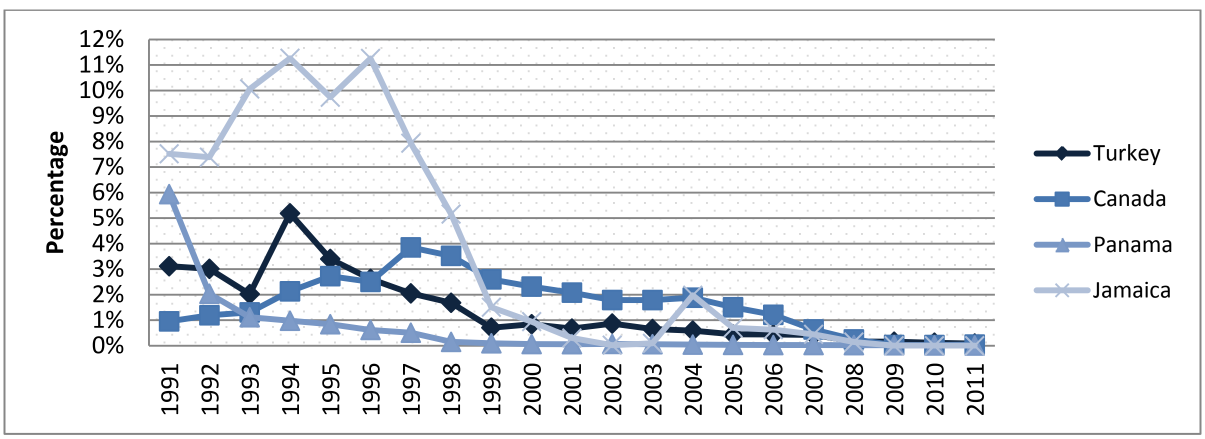


Figure 3.15 Market Share of Remaining Knit T-shirt Import Countries in Fifteen Top 6 Countries

Import quantities from Turkey in Figure 3.14 were stable during the following three time periods, 1991 to 1993 (around 0.3 million dozen), 1994 to 1998 (around 0.8 million dozen), and 1999 to 2007 (around 0.5 million dozen). After 2007, import quantities from Turkey decreased. The market share of Turkey decreased from 1991 to 1993, and from 1994 to 1999. After 1999, market share of Turkey most slightly decreased to 0.08% in 2011. Import quantities from Canada increased between 1991 and 1998, and between 2002 and 2004. Canada had a big decrease from 2.2 million dozen in 2004 to 0.1 million dozen in 2011. The market share of Canada mostly increased from 1991 to 1997, and then mostly decreased to 2011. Panama had a mostly decreasing trend in import quantities from 0.5 million dozen in 1991 to near zero in 1999, and then it was stable after 1999. Correspondingly, the market share of Panama as seen in Figure 3.15 decreased from 6% in 1991 to nearly zero in 1999. Panama was only in the top 6 import countries in 1991. Import quantities from Jamaica increased from 0.6 million dozen in 1991 to 3.4 million dozen in 1996, and then increased again from 0.1 million dozen in 2003 to 2.3 million dozen in 2004. The market share of Jamaica increased from 7.39% in 1992 to 11.27% in 1994, and then decreased from 1996 to 2003. After 2004, the market share of Jamaica decreased again.

3.1.3 Average T-shirt Values for Major Players over Time

3.1.3.1 Average FOB Value

To get the average value per T-shirt, the total value of imports was divided by the total quantity of imports. The total value data is also obtained from the OTEXA website. This value is called the ‘Customer Import Value’ which is equal to the FOB value, which is the value excluding the logistics costs, insurance, and tariff. Table 3.2 shows the average T-shirt value of the fifteen countries in $/garment. It is sorted based on 2011 import quantities.

Table 3.2 T-shirt Value Data in $ Per Garment of Fifteen T-shirt Import Countries

	1991	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Honduras	2.18	2.17	1.80	1.68	2.00	1.90	1.87	1.66	1.59	1.54	1.51
El Salvador	1.74	2.05	1.46	1.50	1.70	1.58	1.69	1.60	1.54	1.51	1.64
Mexico	1.93	2.08	2.12	2.06	2.11	2.10	1.91	1.91	1.94	2.05	2.14
Haiti	1.43	1.78	1.62	1.71	1.63	1.53	1.49	1.56	1.41	1.52	1.74
China	2.12	2.01	1.53	1.91	2.36	2.60	2.06	2.07	1.92	1.95	1.93
Nicaragua	0.81	1.78		2.27	1.35	2.54	2.52	1.48	2.00	2.51	2.08
Dominican Republic	1.75	1.75	1.85	1.58	1.47	1.69	1.77	1.71	1.91	1.89	2.06
Pakistan	1.73	1.83	2.44	2.23	2.38	2.88	3.04	3.42	2.69	2.74	3.10
India	5.04	3.06	2.90	3.70	4.08	4.58	5.45	4.82	4.59	5.25	4.85
Bangladesh	2.71	2.64	3.04	1.71	2.26	2.93	2.72	2.99	2.12	2.73	2.50
Guatemala	1.59	2.05	1.50	1.46	1.62	1.76	2.24	2.89	2.90	2.33	2.51
Turkey	4.36	3.80	3.27	2.92	2.77	2.60	2.83	2.57	2.66	2.84	3.10
Canada	3.53	4.63	5.43	4.07	3.66	3.88	3.10	3.07	4.05	4.76	4.48
Panama	1.75	2.30	2.27	1.38	1.62	1.27	1.20	1.55	2.27	3.31	3.44
Jamaica	2.30	1.82	1.75	1.71	1.81	1.84	1.81	1.77	1.69	1.85	1.98
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	
Honduras	1.45	1.34	1.31	1.26	1.28	1.27	1.29	1.42	1.34	1.58	
El Salvador	1.56	1.37	1.20	1.11	1.22	1.18	1.19	1.38	1.33	1.43	
Mexico	2.01	1.84	1.73	1.62	1.62	1.64	1.69	1.67	1.64	1.74	
Haiti	1.51	1.47	1.24	1.17	1.10	1.03	0.97	1.08	1.09	1.43	
China	2.30	2.52	2.32	1.46	2.32	2.87	2.84	1.97	1.97	2.10	
Nicaragua	2.39	2.34	1.93	1.30	1.27	1.15	1.13	1.20	1.24	1.40	
Dominican Republic	2.52	2.29	1.83	1.67	1.65	2.12	2.06	1.83	1.53	1.63	
Pakistan	2.40	2.33	2.12	1.78	1.59	1.59	1.58	1.44	1.59	1.88	
India	4.24	5.63	4.20	2.36	2.31	2.34	2.36	2.01	1.83	2.28	
Bangladesh	2.11	2.46	1.17	1.17	1.38	1.27	1.23	1.15	1.30	1.68	
Guatemala	2.32	2.11	2.19	2.00	2.15	2.14	2.30	2.40	1.82	2.11	
Turkey	3.07	3.18	3.14	2.80	2.78	3.25	4.78	3.81	4.55	5.92	
Canada	4.46	3.56	3.12	2.86	2.72	3.16	3.22	9.37	8.38	8.47	
Panama	3.40	3.19	3.14	2.76	2.50	2.67	2.69	2.71	2.90	3.06	
Jamaica	3.50	2.42	1.19	1.73	1.86	2.08	1.84	2.25	7.23	3.42	

Figure A.17 to Figure A.19 in Appendix A show the overall FOB value pattern for these fifteen countries. There was a large decrease in the average value for China in 2005. This change in average T-shirt value for China might be due to the quota on Chinese imports to the U.S. The Chinese government sold quota to apparel exporters when there was MFA quota before 2005 and also when there was safeguard quota between 2006 and 2008. Nicaragua had a bad internal conflict in 1993. There was no import from Nicaragua at that year. After the FOB value was more expensive from 1999-2004 as seen in Table 3.2, Nicaragua became competitive with Honduras and El Salvador starting in 2005. Also, Bangladesh was competitive with countries in the Western Hemisphere after 2004. This competitiveness might come from Bangladesh had doubled exports in 2004 as shown in Figure 3.11. After 2008, the average value of T-shirt imports from Canada jumped from \$3.22 in 2008 to \$9.37 in 2009. This might because imports from Canada were of a different quality or a higher fashion contents than those of other countries.

3.1.3.2 Average Total Landed Cost

This section calculates the average total landed cost for the fifteen countries. Countries that joined an FTA with the U.S. do not have tariffs on their imports. Also countries located in closer proximity to the U.S. tend to have less transportation costs. Table 3.3 shows the tariff rate in percentage of value from 1991 to 2011 for all fifteen countries. Transportation costs include freight rate and insurance. It was calculated as the difference between the CIF (Customer Insurance, Freight) value and the FOB value, which is shown in Equation 3.3, by using data from USITC. Table 3.4 shows the transportation cost per garment for these fifteen countries from 1991 to 2011.

Table 3.3 Tariff of T-shirt for Fifteen Import Countries in Percentage

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Honduras	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	18.3	0.0
El Salvador	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	18.3	0.0
Mexico	21.0	21.0	21.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haiti	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	0.0	0.0
China	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	18.3	17.8
Nicaragua	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	18.3	0.0
Dominican Republic	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	18.3	0.0
Pakistan	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	18.3	17.8
India	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	18.3	17.8
Bangladesh	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	18.3	17.8
Guatemala	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	18.3	0.0
Turkey	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	18.3	17.8
Canada	14.7	10.5	10.5	8.4	6.3	4.2	2.1	0.0	0.0	0.0	0.0
Panama	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	0.0	0.0
Jamaica	21.0	21.0	21.0	21.0	20.6	20.1	19.6	19.2	18.8	0.0	0.0
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	
Honduras	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
El Salvador	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Haiti	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
China	17.4	17.0	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	
Nicaragua	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Dominican Republic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Pakistan	17.4	17.0	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	
India	17.4	17.0	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	
Bangladesh	17.4	17.0	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	
Guatemala	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Turkey	17.4	17.0	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	
Canada	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Panama	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Jamaica	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Equation 3.3 Calculation of Transportation Cost

$$\frac{\$_{transportation\ cost}}{garment} = (\$_{CIF\ value} - \$_{FOB\ value}) \div Import\ Garment\ Quantities$$

Table 3.4 Cost Insurance and Freight for T-shirts in $ Per Garment

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Honduras	0.0750	0.0624	0.0525	0.0557	0.0492	0.0466	0.0455	0.0386	0.0445	0.0380	0.0361
El Salvador	0.0786	0.0506	0.0485	0.0511	0.0515	0.0396	0.0477	0.0441	0.0389	0.0390	0.0410
Mexico	0.0341	0.0270	0.0169	0.0130	0.0149	0.0160	0.0122	0.0115	0.0124	0.0121	0.0111
Haiti	0.0673	0.0590	0.0452	0.0671	0.0430	0.0381	0.0231	0.0241	0.0300	0.0386	0.0543
China	0.1496	0.1374	0.0818	0.1142	0.1656	0.1367	0.0978	0.1209	0.1171	0.1137	0.1199
Nicaragua	0.0990	0.1454		0.2270	0.1009	0.3235	0.1081	0.0447	0.0578	0.1050	0.0677
Dominican Republic	0.0490	0.0624	0.0402	0.0362	0.0484	0.0464	0.0513	0.0647	0.0584	0.0421	0.0538
Pakistan	0.1348	0.1425	0.1749	0.1830	0.2074	0.3032	0.1977	0.2308	0.2546	0.2876	0.2330
India	0.5989	0.4674	0.3874	0.4259	0.4021	0.4642	0.4778	0.4092	0.4592	0.4534	0.4245
Bangladesh	0.2930	0.1596	0.2244	0.1352	0.1521	0.1927	0.1922	0.1621	0.1457	0.2103	0.1674
Guatemala	0.0919	0.0788	0.0680	0.0706	0.0732	0.0728	0.0776	0.0921	0.0944	0.0888	0.0860
Turkey	0.4231	0.3986	0.3050	0.2069	0.1730	0.1476	0.1863	0.1546	0.1290	0.1571	0.1648
Canada	0.0492	0.0544	0.1012	0.0766	0.0400	0.0525	0.0335	0.0275	0.0491	0.0676	0.0531
Panama	0.0599	0.0855	0.0852	0.0545	0.0805	0.0435	0.0378	0.0440	0.0379	0.1594	0.1198
Jamaica	0.0471	0.0323	0.0516	0.0302	0.0335	0.0363	0.0365	0.0382	0.0289	0.0235	0.0347
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	
Honduras	0.0338	0.0326	0.0306	0.0308	0.0317	0.0343	0.0330	0.0351	0.0361	0.0347	
El Salvador	0.0400	0.0323	0.0280	0.0271	0.0365	0.0358	0.0349	0.0374	0.0330	0.0338	
Mexico	0.0117	0.0096	0.0136	0.0117	0.0102	0.0128	0.0264	0.0132	0.0142	0.0160	
Haiti	0.0330	0.0399	0.0205	0.0154	0.0160	0.0176	0.0186	0.0189	0.0234	0.0278	
China	0.1553	0.1901	0.1844	0.0984	0.1534	0.1756	0.1432	0.1033	0.0996	0.0834	
Nicaragua	0.0960	0.0761	0.0846	0.0440	0.0375	0.0359	0.0409	0.0407	0.0471	0.0391	
Dominican Republic	0.0660	0.0651	0.0392	0.0302	0.0334	0.0349	0.0354	0.0272	0.0291	0.0827	
Pakistan	0.2602	0.2057	0.1806	0.1359	0.1416	0.1231	0.1052	0.0885	0.1046	0.0890	
India	0.3874	0.4320	0.3810	0.2174	0.1826	0.1499	0.1538	0.1412	0.1223	0.1019	
Bangladesh	0.1711	0.1750	0.0748	0.0995	0.1184	0.0953	0.0960	0.0903	0.0842	0.0764	
Guatemala	0.0660	0.0256	0.0786	0.0863	0.0416	0.0391	0.0558		0.0546	0.0566	
Turkey	0.2407	0.1943	0.2075	0.2102	0.1740	0.1967	0.2297	0.1643	0.2019	0.2898	
Canada	0.0521	0.0398	0.0348	0.0225	0.0185	0.0273	0.0450	0.3427	0.2102	0.1223	
Panama	0.0803	0.0665	0.0746	0.1054	0.1122	0.1021	0.1164	0.1327	0.2309	0.1932	
Jamaica	0.1119	0.0515	0.0153	0.0282	0.0339	0.0331	0.0481	0.1413	1.9594	1.1600	

After Mexico and Canada signed NAFTA in 1994, T-shirt imports from Mexico had no tariff starting in 1994, and imports from Canada had no tariff for T-shirts beginning in 1998. The CBTPA was signed in 2000, and Honduras, El Salvador, Nicaragua, Dominican Republic, and Guatemala became CBTPA beneficiary countries in 2001. There is no tariff for these five countries from 2001. All other countries have tariff from 1991 to 2011. Table 3.4 shows that generally countries in Western Hemisphere had lower transportation costs than Asian countries.

Table 3.5 to Table 3.8 show the average total landed cost of the fifteen top 6 countries from 1991 to 2011. The total landed costs of these fifteen countries were sorted each year from lowest to highest, and those highlighted in red are the top 6 countries in terms of import quantities for each year. Table 3.9 shows the annualized correlation between import quantities and total landed cost for these fifteen countries from 1991 to 2011.

Table 3.5 Average Total Landed Cost of Fifteen Top 6 Countries from 1991 to 1995

	1991		1992		1993		1994		1995
Nicaragua	1.08	Dominican Republic	2.18	El Salvador	1.81	Panama	1.73	Nicaragua	1.72
Haiti	1.80	Haiti	2.21	Guatemala	1.88	Guatemala	1.84	Dominican Republic	1.82
Guatemala	2.02	Jamaica	2.23	China	1.93	El Salvador	1.86	Haiti	2.01
Dominican Republic	2.16	Nicaragua	2.30	Haiti	2.01	Dominican Republic	1.95	Guatemala	2.03
Panama	2.17	Pakistan	2.36	Jamaica	2.16	Mexico	2.07	Panama	2.04
El Salvador	2.19	El Salvador	2.54	Honduras	2.24	Honduras	2.09	El Salvador	2.11
Pakistan	2.23	Mexico	2.55	Dominican Republic	2.27	Jamaica	2.10	Mexico	2.13
Mexico	2.37	Guatemala	2.55	Mexico	2.58	Haiti	2.13	Jamaica	2.21
Honduras	2.72	China	2.57	Panama	2.83	Bangladesh	2.20	Honduras	2.47
China	2.72	Honduras	2.68	Pakistan	3.13	China	2.42	Bangladesh	2.88
Jamaica	2.83	Panama	2.87	India	3.90	Pakistan	2.88	China	3.01
Bangladesh	3.57	Bangladesh	3.35	Bangladesh	3.91	Nicaragua	2.97	Pakistan	3.07
Canada	4.09	India	4.17	Turkey	4.26	Turkey	3.73	Turkey	3.51
Turkey	5.70	Turkey	4.99	Canada	6.10	Canada	4.49	Canada	3.93
India	6.69	Canada	5.17	Nicaragua		India	4.90	India	5.32

Table 3.6 Average Total Landed Cost of Fifteen Top 6 Countries from 1996 to 2000

	1996		1997		1998		1999		2000
Panama	1.57	**Panama**	1.47	**Nicaragua**	1.81	**Haiti**	1.70	**Haiti**	1.56
Haiti	1.88	**Haiti**	1.81	**Haiti**	1.88	**El Salvador**	1.87	**El Salvador**	1.82
El Salvador	1.93	**Mexico**	1.93	**Panama**	1.89	**Honduras**	1.94	**Honduras**	1.86
Dominican Republic	2.07	**El Salvador**	2.07	**Mexico**	1.93	**Mexico**	1.95	**Jamaica**	1.87
Mexico	2.12	**Dominican Republic**	2.17	**El Salvador**	1.95	**Jamaica**	2.04	**Mexico**	2.06
Guatemala	2.19	**Jamaica**	2.20	**Honduras**	2.01	**Dominican Republic**	2.32	**Dominican Republic**	2.28
Jamaica	2.24	**Honduras**	2.28	**Dominican Republic**	2.10	**China**	2.39	**China**	2.42
Honduras	2.33	**China**	2.57	**Jamaica**	2.14	**Nicaragua**	2.44	**Guatemala**	2.84
China	3.26	**Guatemala**	2.76	**China**	2.59	**Bangladesh**	2.67	**Nicaragua**	3.08
Turkey	3.27	**Nicaragua**	3.13	**Canada**	3.09	**Panama**	2.73	**Bangladesh**	3.43
Nicaragua	3.38	**Canada**	3.19	**Turkey**	3.22	**Turkey**	3.29	**Panama**	3.47
Bangladesh	3.71	**Bangladesh**	3.44	**Guatemala**	3.54	**Pakistan**	3.45	**Turkey**	3.51
Pakistan	3.76	**Turkey**	3.58	**Bangladesh**	3.72	**Guatemala**	3.53	**Pakistan**	3.52
Canada	4.09	**Pakistan**	3.83	**Pakistan**	4.30	**Canada**	4.10	**Canada**	4.83
India	5.97	**India**	7.00	**India**	6.16	**India**	5.91	**India**	6.66

Table 3.7 Average Total Landed Cost of Fifteen Top 6 Countries from 2001 to 2005

	2001		2002		2003		2004		2005
Haiti	1.80	**Haiti**	1.54	**Haiti**	1.51	**Jamaica**	1.21	**Haiti**	1.18
Honduras	1.82	**Honduras**	1.73	**Honduras**	1.60	**Haiti**	1.26	**El Salvador**	1.32
El Salvador	1.97	**El Salvador**	1.88	**El Salvador**	1.64	**El Salvador**	1.43	**Bangladesh**	1.46
Jamaica	2.02	**Mexico**	2.02	**Mexico**	1.85	**Bangladesh**	1.44	**Honduras**	1.50
Mexico	2.15	**Bangladesh**	2.65	**Jamaica**	2.47	**Honduras**	1.56	**Nicaragua**	1.56
China	2.40	**Guatemala**	2.79	**Guatemala**	2.50	**Mexico**	1.75	**Mexico**	1.63
Dominican Republic	2.48	**China**	2.86	**Dominican Republic**	2.74	**Dominican Republic**	2.17	**Jamaica**	1.76
Nicaragua	2.52	**Nicaragua**	2.91	**Nicaragua**	2.81	**Nicaragua**	2.34	**China**	1.80
Guatemala	3.04	**Dominican Republic**	3.02	**Pakistan**	2.94	**Guatemala**	2.63	**Dominican Republic**	1.97
Bangladesh	3.11	**Pakistan**	3.08	**Bangladesh**	3.05	**Pakistan**	2.65	**Pakistan**	2.21
Panama	3.56	**Panama**	3.48	**China**	3.14	**China**	2.88	**Guatemala**	2.42
Turkey	3.81	**Jamaica**	3.61	**Panama**	3.25	**Canada**	3.16	**Panama**	2.87
Pakistan	3.88	**Turkey**	3.85	**Canada**	3.60	**Panama**	3.21	**Canada**	2.88
Canada	4.53	**Canada**	4.51	**Turkey**	3.91	**Turkey**	3.86	**India**	2.97
India	6.14	**India**	5.36	**India**	7.02	**India**	5.28	**Turkey**	3.47

Table 3.8 Average Total Landed Cost of Fifteen Top 6 Countries from 2006 to 2011

	2006		2007		2008		2009		2010
Haiti	1.12	**Haiti**	1.05	**Haiti**	0.98	**Haiti**	1.10	**Haiti**	1.12
El Salvador	1.25	**Nicaragua**	1.18	**Nicaragua**	1.17	**Nicaragua**	1.24	**Nicaragua**	1.29
Honduras	1.31	**El Salvador**	1.21	**El Salvador**	1.23	**El Salvador**	1.41	**El Salvador**	1.36
Nicaragua	1.31	**Honduras**	1.30	**Honduras**	1.32	**Bangladesh**	1.43	**Honduras**	1.37
Mexico	1.63	**Bangladesh**	1.58	**Bangladesh**	1.53	**Honduras**	1.46	**Dominican Republic**	1.56
Dominican Republic	1.69	**Mexico**	1.65	**Mexico**	1.72	**Mexico**	1.68	**Bangladesh**	1.60
Bangladesh	1.73	**Pakistan**	1.98	**Jamaica**	1.88	**Pakistan**	1.76	**Mexico**	1.65
Jamaica	1.90	**Jamaica**	2.11	**Pakistan**	1.94	**Dominican Republic**	1.85	**Guatemala**	1.87
Pakistan	1.99	**Dominican Republic**	2.15	**Dominican Republic**	2.10	**Jamaica**	2.39	**Pakistan**	1.96
Guatemala	2.19	**Guatemala**	2.18	**Guatemala**	2.36	**Guatemala**	2.40	**India**	2.25
Panama	2.62	**Panama**	2.78	**Panama**	2.80	**China**	2.40	**China**	2.39
Canada	2.74	**India**	2.87	**India**	2.91	**India**	2.48	**Panama**	3.13
China	2.85	**Canada**	3.19	**Canada**	3.26	**Panama**	2.84	**Turkey**	5.51
India	2.88	**China**	3.52	**China**	3.45	**Turkey**	4.60	**Canada**	8.59
Turkey	3.41	**Turkey**	3.98	**Turkey**	5.80	**Canada**	9.72	**Jamaica**	9.19

	2011
Nicaragua	1.44
Haiti	1.45
El Salvador	1.46
Honduras	1.61
Dominican Republic	1.72
Mexico	1.76
Bangladesh	2.04
Guatemala	2.17
Pakistan	2.28
China	2.53
India	2.76
Panama	3.25
Jamaica	4.58
Turkey	7.18
Canada	8.60

Table 3.9 Annualized Correlation between Import Quantities and Average Total Landed Cost from 1991 to 2011

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Correlation	-0.2075	-0.2972	-0.4776	-0.2288	-0.1642	-0.3313	-0.3175	-0.3765	-0.3735	-0.3627	-0.3383
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	
Correlation	-0.4647	-0.4358	-0.4170	-0.4593	-0.6027	-0.5968	-0.5426	-0.5055	-0.5970	-0.5844	

From Table 3.9, the absolute value of the correlation between import quantities and total landed cost mostly increased from 0.2075 in 1991 to 0.6027 in 2006, and then remained between 0.5 and 0.6 through 2011. From Table 3.5 to Table 3.8, about half of the top 6 import countries were always in the top 6 least expensive countries in 1990's, and in 2000's most of the top 6 import countries were in the top 6 least expensive countries.

Table 3.10 lists countries in both the top 6 import countries and the top 6 least expensive countries. Table 3.11 shows countries in the top 6 least expensive countries but not in the top 6 import countries. Table 3.12 lists countries in the top 6 import countries but not in the top 6 least expensive countries.

Table 3.10 Countries in Both Top 6 Import and Top 6 Least Expensive

Country	Times in Top 6	Years in Top 6
El Salvador	20	1992-2011
Honduras	16	1993, 1994, 1998-2011
Mexico	16	1994, 1996-2009, 2011
Haiti	13	1999-2002, 2004-2011
Dominican Republic	6	1991, 1996, 1997, 1999, 2000, 2006
Guatemala	3	1991, 2002, 2003
Jamaica	3	1992, 1993, 1997
Bangladesh	2	2008, 2009
Nicaragua	1	2011
Pakistan	1	1992
Panama	1	1991

Table 3.11 Countries in Top 6 Least Expensive but Not in Top 6 Import Countries

Country	Times in Top 6	Years in Top 6
Nicaragua	11	1991-1993, 1995, 1998, 2005-2010
Haiti	7	1991, 1992, 1995-1998, 2003
Dominican Republic	5	1992, 1994, 1995, 2010, 2011
Bangladesh	5	2002, 2004, 2005, 2007, 2010
Panama	5	1994-1998
Guatemala	4	1993-1996
Jamaica	4	1999-2001, 2004
China	2	1993, 2001
El Salvador	1	1991

Table 3.12 Countries in Top 6 Import Countries but Not in Top 6 Least Expensive Countries

Country	Times in Top 6	Years in Top 6
Pakistan	8	1991, 1993-1995, 2006-2008, 2010
China	7	1991, 1992, 2005, 2008-2011
Dominican Republic	6	1998, 2001-2005
Canada	6	1997-2001, 2003
Jamaica	5	1991, 1994-1996, 1998
Honduras	4	1992, 1995-1997
Mexico	3	1993, 1995, 2010
India	3	1993, 1995, 2007
Guatemala	2	1992, 2004
Turkey	2	1994, 1996

El Salvador was in the top 6 least expensive countries from 1991 to 2011, and El Salvador became a top 6 import countries in 1992. It seems that the low total landed cost affected sourcing decisions from El Salvador. Honduras was in the top 6 import countries from 1992, but Honduras was not in the top 6 least expensive countries in 1992, and from 1995 to 1997. Mexico became in the top 6 import countries from 1993, and Mexico was not in the top 6 least expensive countries only in 1993, 1995, and 2010. Haiti stayed in the top 6 least expensive countries from 1991 to 2011 except 1993 and 1994. But the first time Haiti had been in top 6 import countries was 1999. This might be due to the instable political environment in Haiti in 1990's. In the 1990's, Nicaragua had been in the top 6 least expensive countries 5 times. After 2004, Nicaragua stayed in the top 6 least expensive countries, and entered into the top 6 import countries in 2011. During the 2005 to 2010 time period, Nicaragua was not in the top 6 import countries. This might be due to lack of production capacity. The Dominican Republic as seen in Table 3.10 and Table 3.12 was in the top 6 import countries 12 times, which includes 6 times in the top 6 least expensive countries and 6 times not in top 6 least expensive countries. Also, Guatemala and Jamaica had a similar situation as Dominican Republic. Bangladesh was in the top 6 least expensive countries 7 times in 2000's, but it only entered into the top 6 import countries in 2008 and 2009. From Table 3.10 and Table 3.12, Pakistan was in the top 6 import countries 9 times, but only once was Pakistan in both the top 6 least expensive countries and top 6 import countries. China, similar as Pakistan, was not in the top 6 least expensive countries when it was in the top 6 import countries. When China was in the top 6 least expensive countries, it was not in the top 6 import countries.

When considering Tables 3.5 to 3.12 together, it seems that for T-shirts, companies will generally source from the lowest cost countries provided that the political environment is not too bad and there is sufficient capacity, unless their quality expectation are not met or their product specifications cannot be produced in the lowest cost countries. For example, countries in the Western Hemisphere, such as Honduras, El Salvador, Haiti, Mexico, and Nicaragua, were in the top 6 least expensive countries for most times when they were in the top 6 import countries. Pakistan and China were rarely in the top 6 least expensive countries, but still in the top 6 import countries several times.

3.2 Denim Jeans

There are various types of denim jeans, and this study analyzes cotton denim jeans in general. Categories for denim jeans include products with different quality and fashion levels. This study assumes that the import product mixture is similar for all countries, as there is no data of product mixture for each country. The following sections explain the specific categories of denim jeans considered and analyze the major players from 1991 to 2011.

3.2.1 Selection of Categories for Analysis

The Harmonized Tariff Schedule (HTS) for the denim jeans categories changed in 2006. Therefore, there are old HTS codes and new HTS codes for denim jeans. The old HTS codes for denim jeans are shown below:

(1) 6203424010 Men's Blue Denim Jeans

(2) 6203424030 Boy's Blue Denim Jeans

(3) 6204624010 Women's Blue Denim Jeans

(4) 6204624035 Girl's Blue Denim Jeans

After 2006, the new HTS codes for denim jeans were used which are shown as follows:

(1) 6203424011 Men's Blue Denim Jeans

(2) 6203424031 Boy's Blue Denim Jeans

(3) 6204624011 Women's Blue Denim Jeans

(4) 6204624036 Girl's Blue Denim Jeans

These categories are for general denim jeans. These categories do not include the denim play suits.

3.2.2 Analysis of Major Players over Time

Just like for T-shirts, the major players for denim jeans are defined to be the top 6 countries that the United States imports the greatest quantity from each year. Figure 3.16 to Figure 3.20 show the denim jeans import market share of the top six players for every five years between 1991 and 2011. The market share for the top six countries for all of the rest of the years are shown in Appendix A, from Figure A.20 to Figure A.35. In 1991, the total market share of the top 6 import countries was 77%. The total market share of top import countries decreased to 73% in 1996. In 2001, the total market share went up to 76%, and in 2011, the top six countries had a total of 80% market. Though total market share dropped down to 62% in 2006, top 6 denim jeans import countries made up over 60% of denim jeans market from 1995.

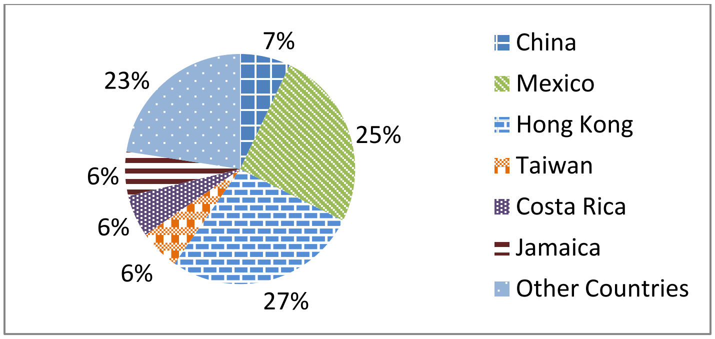


Figure 3.16 1991 Top 6 Denim Jeans Import Countries Market Share

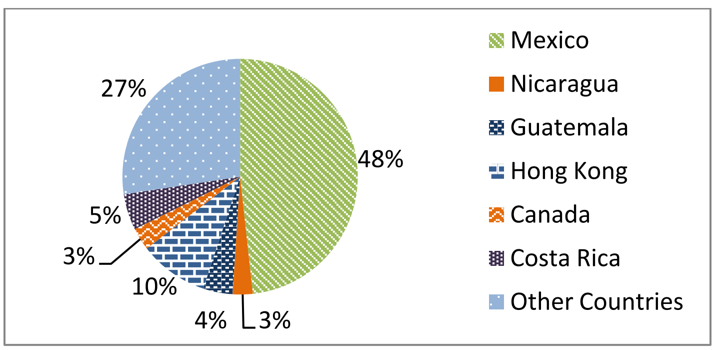


Figure 3.17 1996 Top 6 Denim Jeans Import Countries Market Share

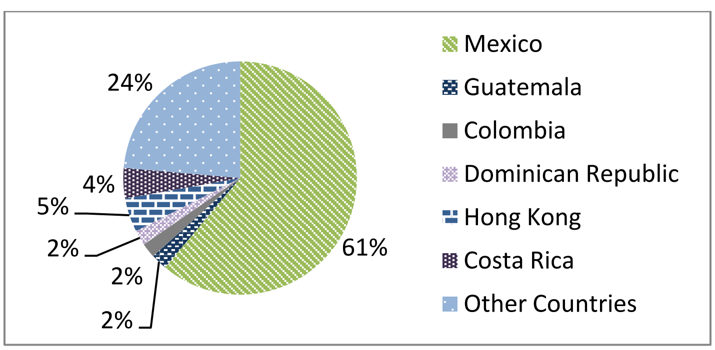


Figure 3.18 2001 Top 6 Denim Jeans Import Countries Market Share

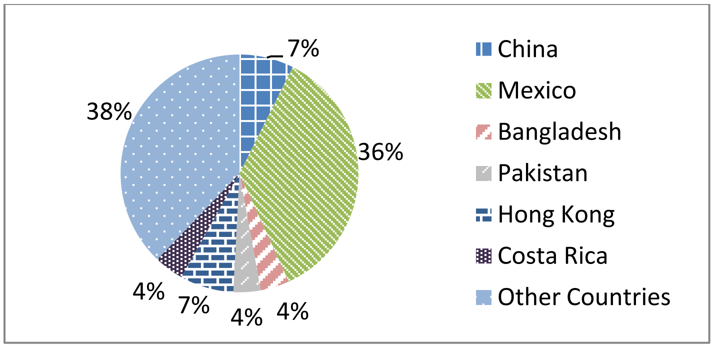


Figure 3.19 2006 Top 6 Denim Jeans Import Countries Market Share

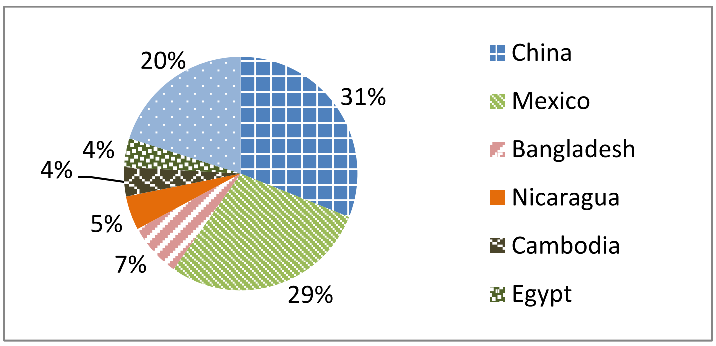


Figure 3.20 2011 Top 6 Denim Jeans Import Countries Market Share

Hong Kong had the largest market share of 27.25% in 1991, and then decreased to 3.48% in 2000. After 2001, the market share of Hong Kong mostly increased to 7.3% in 2006, and decreased again to 5.74% in 2008. When comparing with Hong Kong between 1991 and 2000, Mexico had an opposite trend, increasing from 25.3% in 1991 to 67.29% in 2000. Between 1997 and 2002, Mexico dominated over half of the denim jeans import market. After 2000, the market share of Mexico mostly decreased to 28.67% in 2011. Mexico was the top importer of denim jeans from 1991 to 2008 and was replaced by China in 2009. The market share of China decreased from 7.1% in 1991 to 2.59% in 1995, and then mostly increased from 6.52% in 2005 to 31.06% in 2011. From 2009, Mexico and China dominated over half the denim jeans import market.

Table 3.13 shows the countries that were in the top six from 1991 to 2011, the number of times they were in the top six, and the years they were in the top six. There are two countries in the Western Hemisphere and two Asian countries in the top 4 places. Mexico is the only one country which has been in the top 6 for twenty one years. Hong Kong had been in the top 6 import countries from 1991 to 2008, and Costa Rica was in the top 6 from 1991 to 2006. China was in top six before 1995 and was in the top six again after 2005.

Table 3.13 Top 6 Denim Jeans Import Countries for 1991-2011

Country	Times in Top 6	Years in Top 6
Mexico	21	1991-2011
Hong Kong	18	1991-2008
Costa Rica	16	1991-2006
China	13	1991-1995, 2002, 2005-2011
Dominican Republic	7	1993, 1995, 1997-1999, 2001, 2004
Guatemala	7	1997, 2000-2005
Bangladesh	6	2006-2011
Cambodia	6	2002-2005, 2010 ,2011
Nicaragua	6	1996-2000 , 2011
Canada	5	1995, 1996, 1998-2000
Egypt	5	2007-2011
Colombia	3	1996, 2001, 2003
Pakistan	3	2007-2009
Jamaica	2	1991, 1992
Philippines	2	1993, 1994
Taiwan	2	1991, 1992
Vietnam	2	2009, 2010
Brazil	1	1994
Indonesia	1	2006

The nineteen import countries in Table 3.13 were sorted from largest to smallest based on 2011 import quantities (which is the same as the T-shirts). The top six import countries in 2011 were China, Mexico, Bangladesh, Nicaragua, Cambodia, and Egypt. Figure 3.21 and Figure 3.22 show the quantity imported of these top 6 countries in millions of dozen, and Figure 3.23 and Figure 3.24 show their import market share. Figure 3.25 shows the quantity imported for the 6 countries in the middle of nineteen countries in 2011 in terms of quantity imported, and Figure 3.26 shows the market share of these 6 countries. In 2011, Vietnam and Pakistan were the 7th and 8th largest import countries. Lesotho, Jordan, and Sri Lanka occupied the 9th to 11st places. Indonesia was the 12nd one, and Guatemala was the 13rd one. Kenya and India were followed Guatemala. Colombia was in the 16th place. Haiti was in the 17th place, and the Philippines was in the 18th place. As Lesotho, Jordan, Sri Lanka, Kenya, India, and Haiti were not in the top 6 import countries from 1991 to 2011, this study did not analyze these six countries. Figure 3.27 and Figure 3.28 show the quantity imported and market share of the remaining 7 countries. The Dominican Republic and Hong Kong were the 21st and 22nd largest import countries. The other 5 remaining countries did not appeared in the top 25 import countries.

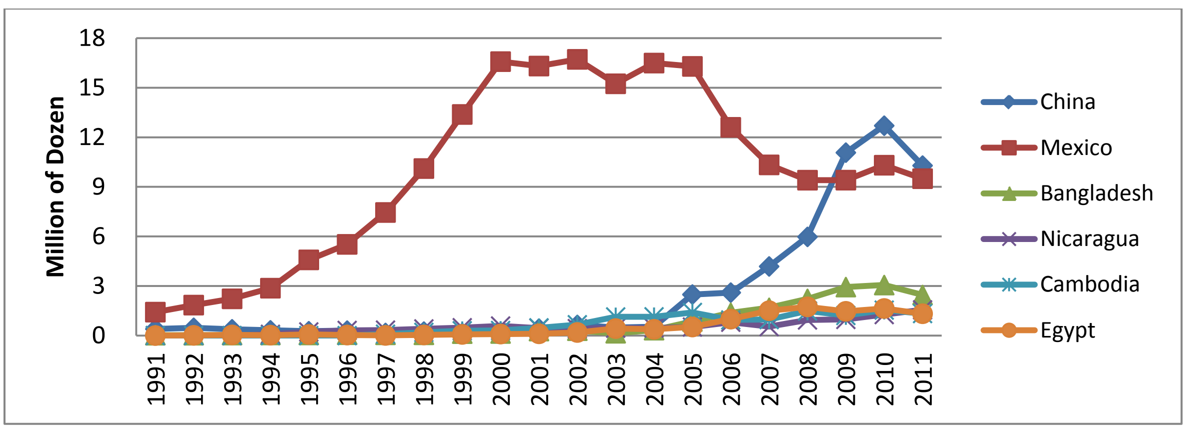


Figure 3.21 Import Quantities of Top 6 Denim Jeans Import Countries in 2011

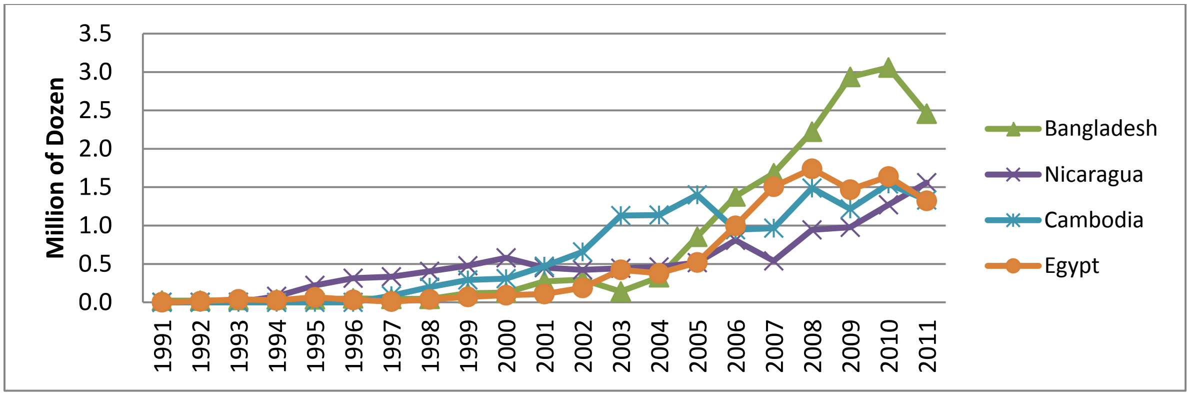


Figure 3.22 Import Quantities of Top 6 Denim Jeans Import Countries in 2011 without Mexico and China

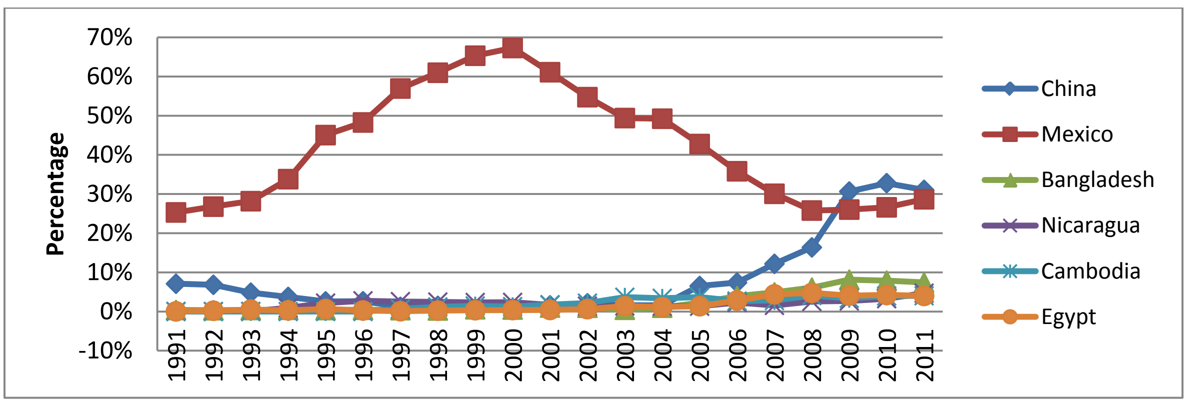


Figure 3.23 Market Share of Top 6 Denim Jeans Import Countries in 2011

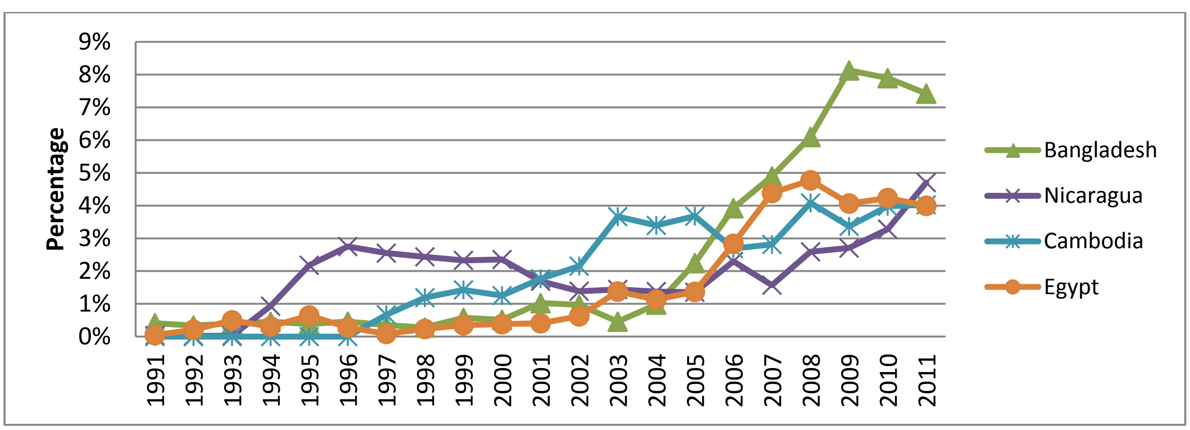


Figure 3.24 Market Share of Top 6 Denim Jeans Import Countries without Mexico and China in 2011

From Figure 3.21, imports from China started a big increase from 0.5 million dozen in 2004 to 12.7 million dozen in 2010, and they dropped down to 10.3 million dozen in 2011. The market share of China decreased from 1991 to 1995, and increased from 2004 to 2010. Imports from Mexico as seen in Figure 3.21 increased from 1991 to 16.6 million dozen in 2000. Between 2000 and 2005, import quantities of Mexico remained around 16.5 million dozen, except in 2003. Imports from Mexico decreased from 2005 to 9.4 million dozen in 2008, and then fluctuated between 9 million dozen and 10.5 million dozen. Correspondingly, the market share of Mexico increased from 1991 to 2000, and mostly decreased until 2008. From Figure 3.22, imports from Bangladesh increased from 2003 to 2010. As seen in Figure 3.24, the market share of Bangladesh increased at a faster pace from 2003 to 2009 than from 1998 to 2001. Imports from Nicaragua mostly increased from 1993 to 1.6 million dozen in 2011. The market share of Nicaragua increased from 1993 to 1996, and mostly increased again from 2005 to 2011. Import quantities from Cambodia gradually increased from 1997 to 2005, and then fluctuated between 0.9 million dozen and 1.5 million dozen. Correspondingly, the market share of Cambodia mostly increased from 0.67% in 1997 to 3.68% in 2005, and fluctuated between 3% and 4% after 2007. Imports from Egypt gradually increased from 0.1 million dozen in 1999 to 1.7 million dozen in 2008, and then mostly decreased to 1.3 million dozen in 2011. The market share of Egypt mostly increased from 0.35% in 1999 to 4.77% in 2008.

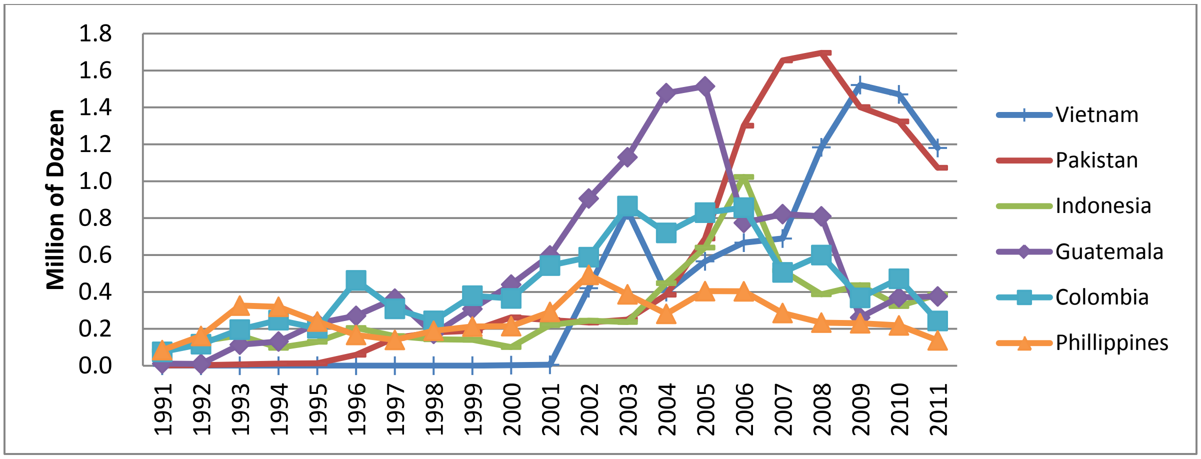


Figure 3.25 Import Quantities of Middle 6 Denim Jeans Import Countries in 2011 of 19 Countries Considered in this Analysis

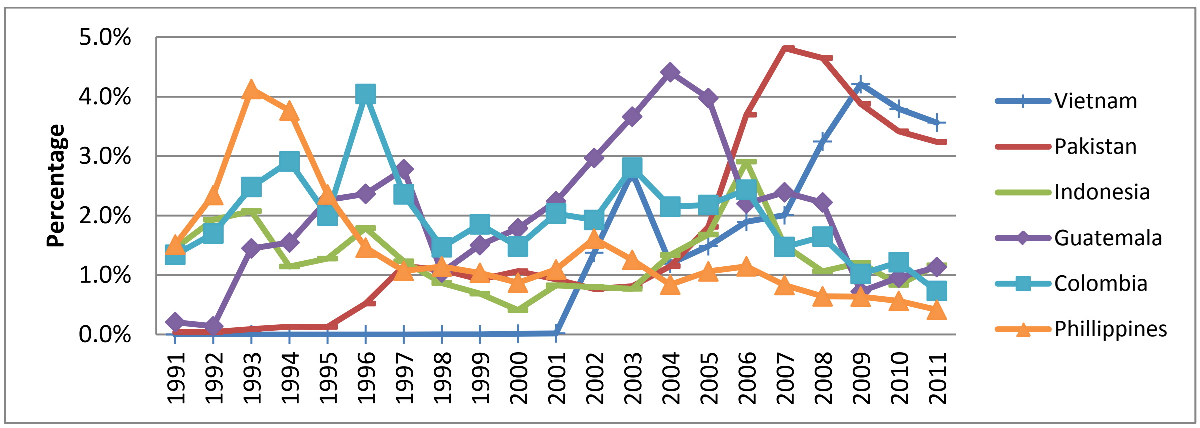


Figure 3.26 Market Share of Middle 6 Denim Jeans Import Countries in 2011 of 19 Countries Considered in this Analysis

Before 2002, there are no denim jeans imports from Vietnam. As seen in Figure 3.25, imports from Vietnam increased between 2002 and 2003, and increased again from 0.4 million dozen in 2004 to 1.5 million dozen in 2009. After 2009, import quantities of Vietnam decreased to 1.2 million dozen in 2011. The market share of Vietnam had almost the same trend as the import quantities. Pakistan had a mostly increasing trend of import quantities from 1995 to 1.7 million dozen in 2008, and then decreased to 1.1 million dozen in 2011.

The market share of Pakistan as seen in Figure 3.24 increased from 1995 to 1.15% in 1997, and then stayed around 1% until 2001. After 2003, the market share of Pakistan sharply increased from 1.15% in 2004 to 4.82% in 2007, and it decreased after 2008. Imports from Indonesia fluctuated between 0.1 million dozen to just over 0.2 million dozen from 1991 to 2003. They increased to 1 million dozen in 2006, and then mostly decreased after 2006. The market share of Indonesia mostly decreased from 1993 to 2000, and it mostly decreased again from 2006 to 2011. Import quantities from Guatemala mostly increased from 1992 to 2005, and then mostly decreased until 2009. The market share of Guatemala had a similar trend as the import quantities. Guatemala had 4.41% market share in 2004 which is its highest point from 1991 to 2011. Imports from the Philippines fluctuated between 0.1 million dozen and 0.5 million dozen from 1991 to 2011. The market share of the Philippines increased from 1.51% in 1991 to 4.13% in 1993, and mostly decreased from 1993 to 0.42% in 2011.

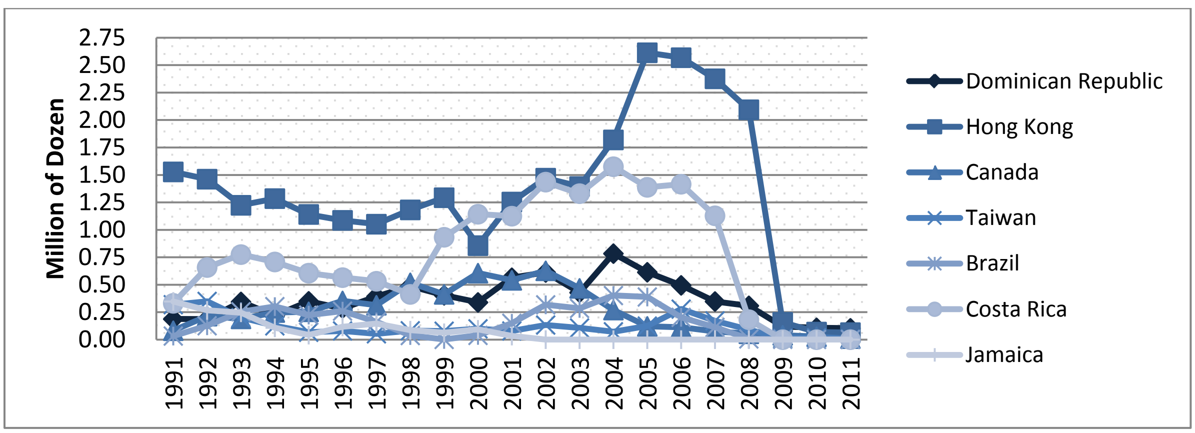


Figure 3.27 Import Quantities of Remaining 7 Denim Jeans Import Countries in 2011 of 19 Countries Considered in this Analysis

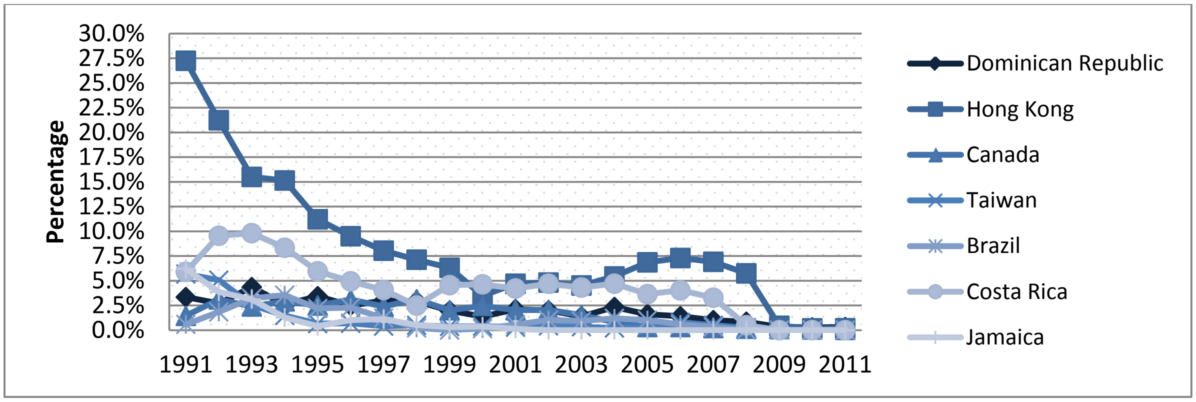


Figure 3.28 Market Share of Remaining 7 Denim Jeans Import Countries in 2011 of 19 Countries Considered in this Analysis

Imports from the Dominican Republic mostly increased from 1991 to 0.8 million dozen in 2004, and they decreased to 0.1 million dozen in 2011. The market share of the Dominican Republic generally decreased from 3.34% in 1991 to 0.31% in 2011. From Figure 3.27, imports from Hong Kong mostly decreased from 1991 to 1997, and then they mostly increased to 2.6 million dozen in 2005. After 2005, imports from Hong Kong decreased, and they sharply dropped down between 2008 and 2009. The market share of Hong Kong decreased from 27.5% in 1991 to 3.48% in 2000, and then it gradually increased to 7.3% in 2006. Import quantities from Canada mostly increased from 1991 to 2002 and then kept decreasing. The market share of Canada fluctuated between 1.4% and 3.2% from 1991 to 2002, and it decreased as import quantities decreased. Imports from Taiwan fluctuated between 0.1 million dozen and 0.3 million dozen from 1991 to 2011. The market share of Taiwan mostly went down from 5.68% in 1991 to 0.02% in 2011. Imports from Brazil fluctuated between 0.1 million dozen and 0.4 million dozen between 1991 and 2011. The market share of Brazil had a similar trend as import quantities. The highest market share of Brazil was 3.55% in 1994. Imports from Costa Rica increased from 1991 to 1993, and they mostly increased from 1998 to 2004. After 2005, imports from Costa Rica mostly decreased and became zero in 2009. The market share of Costa Rica increased from 5.9% in 1991 to 9.81% in 1993, and then it decreased to 2.49% in 1998. Between 1999 and 2007, the market share of Costa Rica fluctuated between 3% and 5%. Imports from Jamaica mostly decreased from 1991, and there were zero import in 2004. The market share of Jamaica mostly decreased from 6.52% in 1991 to 0% in 2003.

3.2.3 Average Values for Major Players over Time

3.2.3.1 Average FOB Value

FOB value data for denim jeans was also obtained from OTEXA, just as for T-shirts. Table 3.14 shows the average denim jeans value of nineteen countries in $/garment, sorted from largest to smallest import quantities in 2011.

Table 3.14 Average Denim Jeans Value Data in $ per garment of Nineteen Denim Jeans Import Countries

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
China	5.65	5.75	6.80	6.34	5.53	6.49	7.76	9.58	10.19	10.09	10.48
Mexico	6.01	6.41	6.70	6.76	7.27	7.67	7.60	7.99	7.93	7.83	7.99
Bangladesh	4.73	6.06	6.36	6.66	6.52	6.02	5.75	7.23	6.64	7.31	6.96
Nicaragua	3.98	5.31	4.66	6.84	5.90	6.70	7.05	7.26	7.42	7.46	6.67
Cambodia							6.79	6.37	6.07	7.30	7.62
Egypt	11.49	9.87	7.24	9.70	7.66	9.42	23.40	21.17	18.60	19.26	16.60
Vietnam						7.71	3.05	6.00	5.45	2.77	2.32
Pakistan	6.62	7.88	6.34	6.56	6.26	6.19	6.44	6.55	5.53	6.30	6.12
Indonesia	8.03	7.89	8.10	8.63	8.15	8.06	8.27	8.73	9.22	8.71	8.37
Guatemala	7.57	6.97	6.41	7.32	6.90	7.92	8.75	8.27	8.95	8.60	8.97
Colombia	7.38	6.90	7.82	7.67	8.28	8.71	8.68	8.49	8.32	7.98	7.23
Philippines	7.86	7.74	7.82	7.12	7.83	7.50	8.20	8.61	9.42	8.86	8.75
Dominican Republic	5.98	6.46	6.67	6.85	6.95	6.93	6.83	6.72	7.38	6.96	8.10
Hong Kong	8.85	8.17	8.87	8.04	8.03	7.91	8.46	8.84	8.47	9.66	9.63
Canada	11.36	11.76	11.39	12.50	12.62	12.50	14.45	12.58	13.59	13.21	13.18
Taiwan	8.53	7.93	7.95	6.61	6.96	6.81	6.60	6.63	6.64	7.18	7.45
Brazil	7.34	7.05	6.98	7.55	8.49	9.46	9.79	10.27	5.15	6.81	6.65
Costa Rica	5.14	5.43	5.62	5.66	5.81	6.38	6.06	6.08	5.66	5.33	5.24
Jamaica	5.69	5.98	5.10	5.64	7.01	7.58	8.19	8.26	7.70	7.02	7.33

Table 3.14 Continued

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
China	10.51	10.10	9.21	7.15	8.38	9.05	8.79	8.15	8.00	8.74	
Mexico	8.18	8.65	8.86	8.98	9.25	9.08	9.30	8.92	8.18	9.03	
Bangladesh	7.23	6.82	6.51	6.41	8.86	8.55	9.03	8.43	9.03	7.62	
Nicaragua	6.77	7.09	6.74	6.50	7.75	8.81	7.12	5.86	5.83	6.61	
Cambodia	7.64	8.73	8.48	7.80	9.74	11.83	10.32	10.02	8.81	9.07	
Egypt	15.25	11.23	11.33	12.18	14.12	8.15	8.43	9.72	9.06	9.20	
Vietnam	5.11	5.46	6.44	6.85	7.79	6.45	7.12	7.02	7.72	8.74	
Pakistan	5.46	5.94	6.43	6.29	6.73	7.10	6.74	6.72	7.76	8.16	
Indonesia	7.75	9.00	9.00	8.36	8.50	9.58	10.53	10.35	12.45	10.46	
Guatemala	10.48	9.57	10.00	11.21	11.10	11.00	13.74	13.29	14.09	14.40	
Colombia	7.01	7.68	7.84	9.03	10.00	11.31	10.23	11.45	12.60	12.35	
Philippines	9.01	9.73	9.46	9.89	15.20	14.99	14.63	14.17	15.26	11.40	
Dominican Republic	7.51	7.98	7.44	7.70	8.08	8.81	9.32	9.39	9.41	10.95	
Hong Kong	9.92	10.39	10.11	10.71	10.14	9.84	9.39	7.94	7.80	6.28	
Canada	13.95	16.43	18.68	20.04	23.93	22.17	25.71	27.98	28.19	25.76	
Taiwan	6.40	6.54	6.33	5.90	5.02	4.84	5.86	11.38	8.49	12.36	
Brazil	6.86	6.98	7.32	8.48	8.69	9.13	8.95	11.94	11.36	14.29	
Costa Rica	5.07	5.01	4.88	4.78	4.97	5.57	6.10				
Jamaica	2.89	3.61									

Figure A.36 to Figure A.39 in Appendix A show the overall FOB value pattern for these nineteen countries. Most of the FOB values of China between 1995 and 2008 were higher than the FOB values before 1995 and after 2008. This might be caused by the quota selling price in China. The Chinese government sold quota and gave rebates to Chinese apparel exporters at the same time, but the quota selling price was higher than rebate rate. So the FOB value of China between 1995 and 2008 was higher. The FOB value of Nicaragua became competitive to the other eighteen countries starting in 2005, just like for the T-shirts. In 1997, the average FOB value of Egypt jumped from \$9.42 in 1996 to \$ 23.40. Egypt entered into the top 6 import countries after the FOB value dropped down under \$10 in 2007. The FOB value of Canada was above \$10 starting in 1991, and over \$20 starting in 2005. It seems that denim jeans from Canada competed in a different quality or fashion market.

3.2.3.2 Average Total Landed Cost

Average total landed cost of denim jeans includes the average FOB value, tariff, and transportation costs. Tariffs are applied to countries which do not have a free trade agreement with the United States. The transportation cost is calculated as Equation 3.3 in the T-shirts section. Table 3.15 shows the tariffs for denim jeans for the nineteen import countries considered in this analysis from 1991 to 2011. Table 3.16 shows the transportation cost per garment for these countries.

Table 3.15 Tariff of Denim Jeans for Nineteen Import Countries in percentage

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
China	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Mexico	17.7	17.7	17.7	17.7	11.6	8.7	5.8	2.9	0.0	0.0	0.0
Bangladesh	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Nicaragua	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	0.0
Cambodia	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Egypt	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Vietnam	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Pakistan	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Indonesia	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Guatemala	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	0.0
Colombia	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Philippines	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Dominican Republic	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	0.0
Hong Kong	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Canada	12.3	12.3	8.8	7.0	5.3	3.5	1.7	0.0	0.0	0.0	0.0
Taiwan	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Brazil	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	16.9
Costa Rica	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	17.0	0.0
Jamaica	17.7	17.7	17.7	17.7	17.6	17.5	17.4	17.3	17.2	0.0	0.0
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	
China	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Bangladesh	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Nicaragua	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Cambodia	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Egypt	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Vietnam	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Pakistan	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Indonesia	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Guatemala	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Colombia	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Philippines	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Dominican Republic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Table 3.15 Continued

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
Hong Kong	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Canada	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Taiwan	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Brazil	16.8	16.7	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.8	
Costa Rica	16.8	16.7	16.6	16.6	0.0	0.0	0.0	0.0	0.0	0.0	
Jamaica	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Table 3.16 Cost Insurance and Freight for Denim Jeans in $ per garment

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
China	0.3186	0.3247	0.3391	0.3077	0.3168	0.3372	0.4343	0.4042	0.6415	0.7775	0.5272
Mexico	0.0659	0.0641	0.0683	0.0759	0.0569	0.0605	0.0584	0.0547	0.0667	0.0648	0.0623
Bangladesh	0.4104	0.3495	0.3171	0.3375	0.4305	0.3365	0.2924	0.3463	0.4450	0.4388	0.4018
Nicaragua	0.3793	0.5390	0.4994	0.2278	0.1670	0.1827	0.1663	0.1782	0.1517	0.1717	0.1702
Cambodia							0.3534	0.4817	0.4218	0.3992	0.3703
Egypt	0.2391	1.3114	0.4062	0.7309	0.3127	0.4241	0.2792	0.3132	0.3022	0.3721	0.3162
Vietnam						1.7292	0.8293	0.9712	1.2711	0.9425	0.3344
Pakistan	0.8358	0.4918	0.5101	0.6787	0.4402	0.4407	0.3170	0.2980	0.3414	0.6623	0.8968
Indonesia	0.4349	0.6691	0.5860	0.6852	0.4655	0.4956	0.7586	0.8176	0.6673	0.6764	0.4567
Guatemala	0.4412	0.4696	0.1720	0.2227	0.1588	0.1354	0.1295	0.1704	0.1940	0.1703	0.1320
Colombia	0.4231	0.3564	0.3954	0.2879	0.4441	0.4693	0.4436	0.4235	0.4520	0.2630	0.1019
Philippines	0.4067	0.3249	0.3367	0.3424	0.3976	0.3905	0.4530	0.5391	0.5003	0.4806	0.4277
Dominican Republic	0.1248	0.1562	0.1446	0.0973	0.0970	0.1118	0.1255	0.1030	0.1815	0.1322	0.1443
Hong Kong	0.4576	0.4627	0.4432	0.3457	0.4056	0.4243	0.3733	0.4510	0.4314	0.5116	0.4504
Canada	0.0196	0.0137	0.0157	0.0165	0.0172	0.0253	0.0460	0.0365	0.2863	0.1563	0.1325
Taiwan	0.4178	0.3075	0.2819	0.2169	0.2547	0.2662	0.2575	0.2912	0.2760	0.3805	0.1963
Brazil	0.6705	0.4988	0.3701	0.3526	0.2689	0.1958	0.1289	0.1038	0.3980	0.4052	0.4884
Costa Rica	0.1383	0.2177	0.1546	0.1369	0.1524	0.1839	0.1725	0.0960	0.0968	0.0755	0.0683
Jamaica	0.0996	0.1067	0.1221	0.1479	0.1473						
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	
China	0.7259	0.4507	0.4963	0.4548	0.4709	0.4272	0.4197	0.2954	0.2887	0.2506	
Mexico	0.0593	0.0578	0.0587	0.0607	0.0687	0.0555	0.0463	0.0457	0.0555	0.0742	
Bangladesh	0.9443	0.3673	0.4919	0.4777	0.4946	0.3100	0.3777	0.2978	0.2725	0.2513	
Nicaragua	0.2001	0.1808	0.1920	0.1990	0.1412	0.1440	0.1445	0.1501	0.1856	0.2156	
Cambodia	0.4185	0.4155	0.5251	0.3963	0.4936	0.4705	0.4123	0.2658	0.2475	0.2100	
Egypt	0.4635	0.3507	0.4704	0.4250	0.4638	0.2804	0.2491	0.1950	0.2066	0.1789	
Vietnam	0.4811	0.3937	0.4763	0.6174	0.5170	0.3714	0.4422	0.2358	0.3213	0.2825	
Pakistan	0.5151	0.3889	0.9445	0.3009	0.3644	0.3561	0.3532	0.3214	0.3066	0.3397	
Indonesia	0.6353	0.6169	0.5132	0.4431	0.3868	0.3556	0.5511	0.3950	0.3834	0.3667	
Guatemala	0.1893	0.1757	0.1929	0.2633	0.1575	0.1953	0.2210	0.2528	0.2006	0.2634	
Colombia	0.1328	0.1024	0.3432	0.1745	0.1477	0.1214	0.2157	0.1506	0.1588	0.1692	
Philippines	0.6496	0.5283	0.5409	0.5410	0.3904	0.3370	0.4973	0.4163	0.2893	0.2735	
Dominican Republic	0.1905	0.0958	0.1164	0.1183	0.1477	0.1389	0.1705	0.1069	0.0892	0.1385	
Hong Kong	0.5995	0.5390	0.5100	0.5731	0.4320	0.3885	0.3241	0.2032	0.2790	0.3066	
Canada	0.1442	0.1436	0.1939	0.3976	0.1666	0.1127	0.1284	0.1486	0.1132	0.2267	
Taiwan	0.2463	0.4015	0.5364	0.3911	0.2336	0.2152	0.3415	0.3272	0.2388	0.2316	
Brazil	0.6039	0.6494	0.7041	0.5962	0.4308	0.5385	1.2043	1.1345	1.3667	1.3122	
Costa Rica	0.0817	0.0774	0.0815	0.0955	0.1140	0.1239	0.1142				
Jamaica											

As seen in Table 3.15, there is no tariff for denim jeans imported from Mexico starting in 1999, and no tariff for denim jeans imported from Canada beginning in 1998. Jamaica joined the CBTPA in 2000, and there was no tariff for Jamaica starting in 2000. Nicaragua, Dominican Republic, Guatemala and Costa Rica are countries who are beneficiary countries in CBTPA beginning in 2001. There is no tariff for these four countries starting in 2001. All other countries have tariffs from 1991 to 2011. In Table 3.16, Jamaica did not have transportation costs from 1996 because there is no import data from USITC from 1996. Therefore, the total landed cost for Jamaica between 1996 and 2003 was not as accurate as other countries.

Table 3.17 to Table 3.20 show the average total landed cost of the nineteen top 6 denim jeans import countries from 1991 to 2011. The total landed costs of nineteen countries were sorted each year from lowest to highest. The countries in red are the top 6 countries in terms of import quantities for each year. Table 3.21 shows the annualized correlation between the import quantities and the total average landed cost for these nineteen countries from 1991 to 2011.

Table 3.17 Average Total Landed Cost of Nineteen Top 6 Countries from 1991 to 1995

	1991		1992		1993		1994		1995
Nicaragua	5.07	Costa Rica	6.61	Nicaragua	5.99	Jamaica	6.79	China	6.82
Bangladesh	5.98	Nicaragua	6.79	Jamaica	6.13	Costa Rica	6.80	Costa Rica	6.99
Costa Rica	6.19	China	7.09	Costa Rica	6.78	China	7.78	Nicaragua	7.11
Jamaica	6.80	Jamaica	7.14	Guatemala	7.72	Taiwan	8.00	Pakistan	7.81
China	6.97	Bangladesh	7.49	Bangladesh	7.80	Mexico	8.03	Bangladesh	8.10
Mexico	7.14	Mexico	7.61	Mexico	7.95	Dominican Republic	8.16	Mexico	8.16
Dominican Republic	7.17	Dominican Republic	7.76	Pakistan	7.98	Bangladesh	8.17	Dominican Republic	8.27
Pakistan	8.63	Colombia	8.48	Dominican Republic	7.99	Nicaragua	8.27	Guatemala	8.28
Colombia	9.11	Guatemala	8.67	China	8.35	Pakistan	8.40	Jamaica	8.39
Brazil	9.32	Brazil	8.80	Brazil	8.59	Philippines	8.72	Taiwan	8.44
Guatemala	9.36	Philippines	9.43	Egypt	8.92	Guatemala	8.84	Egypt	9.32

Table 3.17 Continued

	1991		1992		1993		1994		1995
Philippines	9.66	**Taiwan**	9.64	**Philippines**	9.54	**Brazil**	9.24	**Philippines**	9.60
Indonesia	9.89	**Pakistan**	9.77	**Colombia**	9.60	**Colombia**	9.31	**Hong Kong**	9.85
Taiwan	10.46	**Indonesia**	9.95	**Taiwan**	9.64	**Hong Kong**	9.81	**Indonesia**	10.05
Hong Kong	10.87	**Hong Kong**	10.07	**Indonesia**	10.12	**Indonesia**	10.84	**Colombia**	10.18
Canada	12.78	**Egypt**	12.93	**Hong Kong**	10.88	**Egypt**	12.15	**Brazil**	10.26
Egypt	13.76	**Canada**	13.22	**Canada**	12.41	**Canada**	13.39	**Canada**	13.30
Cambodia		**Cambodia**		**Cambodia**		**Cambodia**		**Cambodia**	
Vietnam		**Vietnam**		**Vietnam**		**Vietnam**		**Vietnam**	

Table 3.18 Average Total Landed Cost of Nineteen Top 6 Countries from 1996 to 2000

	1996		1997		1998		1999		2000
Bangladesh	7.41	**Vietnam**	4.41	**Costa Rica**	7.22	**Brazil**	6.44	**Vietnam**	4.18
Costa Rica	7.69	**Banglades h**	7.04	**Cambodia**	7.95	**Costa Rica**	6.73	**Costa Rica**	6.31
Pakistan	7.71	**Costa Rica**	7.29	**Pakistan**	7.98	**Pakistan**	6.82	**Jamaica**	7.02
China	7.96	**Pakistan**	7.88	**Dominican Republic**	7.98	**Cambodia**	7.54	**Mexico**	7.89
Nicaragua	8.06	**Taiwan**	8.01	**Vietnam**	8.01	**Vietnam**	7.66	**Pakistan**	8.03
Dominican Republic	8.26	**Mexico**	8.10	**Taiwan**	8.06	**Mexico**	8.00	**Dominican Republic**	8.27
Taiwan	8.26	**Dominica n Republic**	8.14	**Mexico**	8.27	**Taiwan**	8.06	**Brazil**	8.37
Mexico	8.40	**Cambodia**	8.32	**Nicaragua**	8.70	**Banglades h**	8.22	**Taiwan**	8.78
Jamaica	8.90	**Nicaragua**	8.45	**Bangladesh**	8.83	**Dominican Republic**	8.83	**Nicaragua**	8.90
Philippines	9.20	**China**	9.55	**Jamaica**	9.69	**Nicaragua**	8.85	**Cambodia**	8.94
Guatemala	9.44	**Philippine s**	10.09	**Guatemala**	9.88	**Jamaica**	9.02	**Banglades h**	9.00
Hong Kong	9.72	**Hong Kong**	10.30	**Colombia**	10.39	**Colombia**	10.20	**Colombia**	9.60
Indonesia	9.96	**Guatemal a**	10.40	**Philippines**	10.64	**Hong Kong**	10.36	**Guatemala**	10.23
Colombia	10.70	**Indonesia**	10.46	**Hong Kong**	10.82	**Guatemala**	10.69	**Philippines**	10.85
Vietnam	10.79	**Colombia**	10.63	**Indonesia**	11.06	**Indonesia**	11.48	**Indonesia**	10.86
Brazil	11.31	**Brazil**	11.63	**China**	11.64	**Philippines**	11.54	**Hong Kong**	11.82
Egypt	11.49	**Canada**	14.74	**Brazil**	12.15	**China**	12.58	**China**	12.59
Canada	12.96	**Egypt**	27.75	**Canada**	12.62	**Canada**	13.87	**Canada**	13.37
Cambodia		**Jamaica**	9.61	**Egypt**	25.14	**Egypt**	22.10	**Egypt**	22.90

Table 3.19 Average Total Landed Cost of Nineteen Top 6 Countries from 2001 to 2005

	2001		2002		2003		2004		2005
Vietnam	3.05	Jamaica	2.89	Jamaica	3.61	Costa Rica	4.96	Costa Rica	4.87
Costa Rica	5.31	Costa Rica	5.15	Costa Rica	5.09	Nicaragua	6.93	Nicaragua	6.70
Nicaragua	6.84	Vietnam	6.45	Vietnam	6.76	Dominican Republic	7.55	Taiwan	7.27
Jamaica	7.33	Pakistan	6.89	Nicaragua	7.27	Taiwan	7.92	Pakistan	7.64
Pakistan	8.05	Nicaragua	6.97	Pakistan	7.32	Vietnam	7.98	Dominican Republic	7.81
Mexico	8.05	Dominican Republic	7.70	Taiwan	8.03	Banglades h	8.09	Banglades h	7.96
Dominican Republic	8.25	Taiwan	7.72	Dominican Republic	8.08	Pakistan	8.44	Vietnam	8.60
Brazil	8.26	Mexico	8.24	Banglades h	8.33	Mexico	8.92	China	8.79
Bangladesh	8.54	Colombia	8.33	Mexico	8.71	Brazil	9.23	Mexico	9.04
Colombia	8.55	Brazil	8.61	Brazil	8.80	Colombia	9.49	Cambodia	9.49
Taiwan	8.90	Cambodia	9.34	Colombia	9.06	Guatemala	10.19	Indonesia	10.19
Guatemala	9.10	Bangladesh	9.38	Guatemala	9.75	Cambodia	10.41	Brazil	10.48
Cambodia	9.28	Indonesia	9.69	Cambodia	10.61	Indonesia	11.01	Colombia	10.70
Indonesia	10.25	Guatemala	10.67	Indonesia	11.12	China	11.24	Guatemala	11.47
Philippines	10.66	Philippines	11.18	Philippines	11.89	Philippines	11.57	Philippines	12.08
Hong Kong	11.70	Hong Kong	12.19	China	12.24	Hong Kong	12.29	Hong Kong	13.07
China	12.78	China	13.00	Hong Kong	12.66	Egypt	13.68	Egypt	14.63
Canada	13.32	Canada	14.09	Egypt	13.46	Canada	18.87	Canada	20.44
Egypt	19.72	Egypt	18.28	Canada	16.58	Jamaica		Jamaica	

Table 3.20 Average Total Landed Cost of Nineteen Top 6 Countries from 2006 to 2011

	2006		2007		2008		2009		2010
Costa Rica	5.08	Costa Rica	5.70	Costa Rica	6.22	Nicaragua	6.01	Nicaragua	6.02
Taiwan	6.08	Taiwan	5.86	Taiwan	7.17	Pakistan	8.16	Mexico	8.24
Nicaragua	7.89	Vietnam	7.89	Nicaragua	7.27	Vietnam	8.42	Vietnam	9.32
Pakistan	8.21	Pakistan	8.64	Pakistan	8.21	Mexico	8.96	Pakistan	9.35
Dominican Republic	8.23	Dominican Republic	8.95	Vietnam	8.74	Hong Kong	9.47	Hong Kong	9.37
Mexico	9.31	Nicaragua	8.96	Mexico	9.34	Dominican Republic	9.50	Dominican Republic	9.50
Vietnam	9.60	Mexico	9.14	Dominican Republic	9.49	China	9.80	China	9.62
China	10.24	Egypt	9.79	Egypt	10.08	Bangladesh	10.13	Taiwan	10.14
Indonesia	10.30	Bangladesh	10.27	China	10.67	Egypt	11.53	Cambodia	10.52
Brazil	10.57	China	10.98	Bangladesh	10.91	Cambodia	11.95	Egypt	10.77
Bangladesh	10.83	Brazil	11.19	Hong Kong	11.28	Indonesia	12.46	Bangladesh	10.80
Guatemala	11.26	Guatemala	11.20	Brazil	11.64	Colombia	13.50	Guatemala	14.29
Colombia	11.81	Indonesia	11.52	Colombia	12.15	Guatemala	13.54	Brazil	14.61
Cambodia	11.85	Hong Kong	11.86	Cambodia	12.44	Taiwan	13.59	Colombia	14.85
Hong Kong	12.25	Colombia	13.31	Indonesia	12.83	Brazil	15.06	Indonesia	14.90
Egypt	16.92	Cambodia	14.27	Guatemala	13.96	Philippines	16.93	Philippines	18.08
Philippines	18.11	Philippines	17.81	Philippines	17.55	Canada	28.13	Canada	28.30
Canada	24.10	Canada	22.29	Canada	25.84	Costa Rica		Costa Rica	
Jamaica		Jamaica		Jamaica		Jamaica		Jamaica	

Table 3.20 Continued

	2011
Nicaragua	6.83
Hong Kong	7.63
Mexico	9.10
Bangladesh	9.14
Pakistan	9.86
China	10.44
Vietnam	10.47
Cambodia	10.79
Egypt	10.91
Dominican Republic	11.09
Indonesia	12.56
Philippines	13.56
Colombia	14.57
Taiwan	14.65
Guatemala	14.66
Brazil	17.97
Canada	25.98
Costa Rica	
Jamaica	

Table 3.21 Annualized Correlation between Import Quantities and Average Total Landed Cost from 1991 to 2011

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Correlation	-0.0364	-0.1468	-0.0339	-0.1436	-0.0954	-0.1369	-0.1170	-0.1421	-0.1405	-0.1311	-0.0919
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	
Correlation	-0.0637	-0.0436	-0.0206	-0.0137	-0.0686	-0.0690	-0.0838	-0.1138	-0.1324	-0.1144	

From Table 3.21, the absolute value of the correlation between import quantities and the total landed cost fluctuated between 0.03 and 0.15 from 1991 to 2011. There is not a strong correlation between import quantities and total landed cost for denim jeans, when compared to the correlation of T-shirts. Also Table 3.17 to Table 3.20 show most of the top 6 import countries were not always in the top 6 least expensive countries.

Table 3.22 shows countries in both the top 6 import countries and the top 6 least expensive countries. Table 3.23 shows countries in the top 6 least expensive countries but not in top 6 import countries. Table 3.24 shows countries in the top 6 import countries but not in the top 6 least expensive countries.

Table 3.22 Countries in Both Top 6 Import and Top 6 Least Expensive

Country	Times in Top 6	Years in Top 6
Costa Rica	16	1991-2006
Mexico	14	1991-1995, 1997, 1999-2001, 2006, 2008-2011
China	5	1991, 1992, 1994, 1995, 2011
Pakistan	3	2007-2009
Nicaragua	2	1996, 2011
Vietnam	2	2009, 2010
Dominican Republic	2	1998, 2004
Jamaica	2	1991, 1992
Bangladesh	1	2011

Table 3.23 Countries in Top 6 Least Expensive but Not in Top 6 Import Countries

Country	Times in Top 6	Years in Top 6
Nicaragua	14	1991-1993, 1995, 2001-2010
Pakistan	13	1995-2003, 2005, 2006, 2010, 2011
Vietnam	10	1997-2004, 2007, 2008
Dominican Republic	9	1994, 1996, 2000, 2002, 2005-2007, 2009, 2010
Taiwan	9	1994, 1997, 1998, 2003-2008,
Bangladesh	8	1991-1993, 1995-1997, 2004, 2005
Jamaica	6	1993, 1994, 2000-2003
Hong Kong	3	2009-2011
Cambodia	2	1998, 1999
Costa Rica	2	2007, 2008
China	1	1996
Guatemala	1	1993
Brazil	1	1999

Table 3.24 Countries in Top 6 Import Countries but Not in Top 6 Least Expensive

Country	Times in Top 6	Years in Top 6
Hong Kong	18	1991-2008
China	7	1993, 2005-2010
Mexico	7	1996, 1998, 2002-2005, 2007
Guatemala	7	1997, 2000-2005
Cambodia	6	2002-2005, 2010, 2011
Bangladesh	5	2006-2010
Egypt	5	2007-2011
Dominican Republic	5	1993, 1995, 1997, 1999, 2001
Canada	5	1995, 1996, 1998-2000
Nicaragua	4	1997-2000
Colombia	3	1996, 2001, 2003
Phillippines	2	1993, 1994
Taiwan	2	1991, 1992
Indonesia	1	2006
Brazil	1	1994

When Costa Rica was in the top 6 import countries, it was in the top 6 least expensive countries. It seems sourcing from Costa Rica was most affected by low landed cost. Mexico was in both the top 6 import countries and the top 6 least expensive countries 14 times, which is double the number of times that Mexico was in the top 6 import countries but not in the top 6 least expensive countries. Low landed cost might be an important factor for making decisions of sourcing from Mexico. China was in the top 6 import countries and top 6 least expensive countries from 1991 to 1995 except 1993, and in 2011. From 2005 to 2010, China was in the top 6 import countries but not in the top 6 least expensive countries. Nicaragua was in the top 6 least expensive countries before 1996 except 1994, and from 2001 to 2010. From 1996 to 2000, Nicaragua was in the top 6 import countries from 1996 to 2000 but not in the top 6 least expensive countries except 1996. Pakistan, similar as Costa Rica, was in top 6 import countries when it was in top 6 least expensive countries. But Pakistan was not in top 6 import countries when it was in top 6 least expensive countries 14 times.

From Table 3.17 to Table 3.24, it seems that sourcing for denim jeans was less cost focused when compared to T-shirts. The reason for this is perhaps a result of denim jeans being more fashion oriented products. For sourcing denim jeans, companies seem to be making decisions by types of products they need more than low cost.

4 T-SHIRT AND JEANS LANDED COST COMPUTER PROGRAM

Fiallos calculated landed costs for T-shirts and denim jeans by using an Excel workbook, with many worksheets, each representing different parts of the calculation. Data for each country considered is located in each of the worksheets. All data was for 2008. In the Excel workbook, adding and deleting countries and different years is difficult because it requires modifying all worksheets within the workbook. Alternatively, copies of the workbook could be made and data for a different year or different countries could be added in place of the existing countries in the new workbook. Each of these options is cumbersome and makes comparing data for a large number of countries over a large number of years difficult. Consequently, a VB.net program with an Access database was developed, to make adding and comparing large number of countries and years easier. The following sections introduce the database design for this program and the software capabilities.

4.1 Database Design

The database design of this program is shown in Figure 4.1. It includes two sets of data tables, T-shirt tables, and denim jeans tables. To distinguish the same type of process information for the T-shirt and the denim jeans, the tables representing T-shirt information are denoted by the word, 'knit' at the end of the table name, and the tables representing jeans information are denoted by the word, 'woven' at the end of table name. For example, there is both a table named tblCutknit and a table name tblCutwoven. The primary keys of this database are the country name and year. All data tables relate to the main table, which only includes the primary keys. The relationship of the database is a one to one relationship.

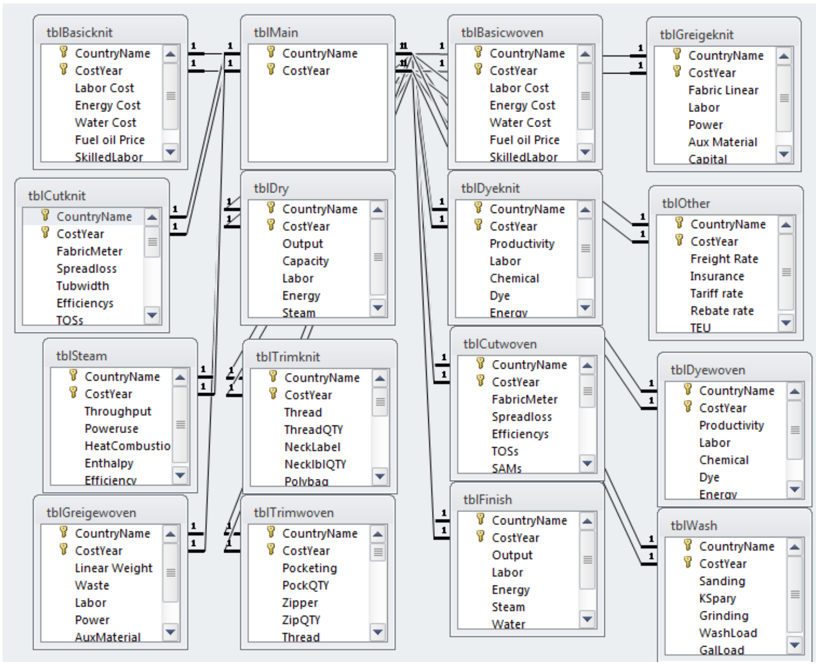


Figure 4.1 Database Design for Software

4.2 Software Capabilities

This section describes the functions of the software. Figure 4.2 shows the interface of the software. The 'File' menu includes 'Open Database', 'Choose Product', and 'Exit'. If there is no database opened, the 'Choose Product' function is disabled. Figure 4.3 shows the two products. 'Knit' represents the knit cotton T-shirts, and 'Woven' represents the denim jeans.

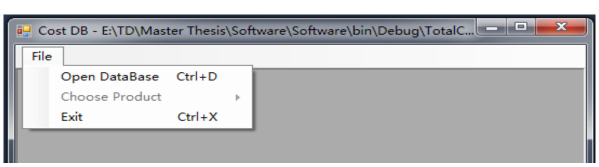


Figure 4.2 File Open

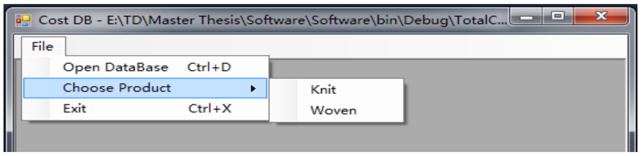


Figure 4.3 Choose Product

4.2.1 Knit Product

After choosing the 'knit' product, the menu shown in Figure 4.4 appears with the following three additional functions: 'Records', 'Knit Data', and 'Calculate'. The functions will be explained in the following sections.

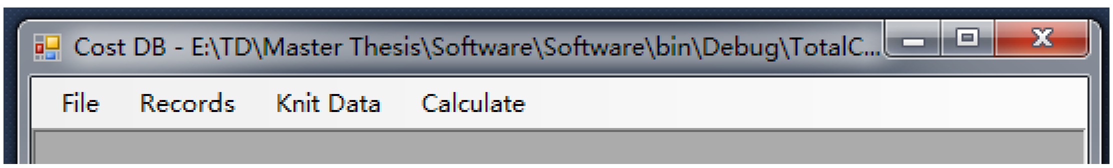


Figure 4.4 Knit Menu

4.2.1.1 Records Function

Figure 4.5 shows the 'Records' function of the knit menu. The 'Records' function allows the user to add new country/year records and delete country/year records, and either action will affect all tables in the database. The data grid view shows all the countries and years currently in tblMain. The two text boxes for country and year can be used for adding a new record into the database. If the user does not enter both a country and a year and clicks the 'Add New Record' button, the error message shown in Figure 4.6 will displayed. Two combo boxes are used for deleting old record. When the user chooses a country, the years corresponding to this country that are in the database will be shown in the year combo box. After the user adds or deletes a record, the data grid view will update.

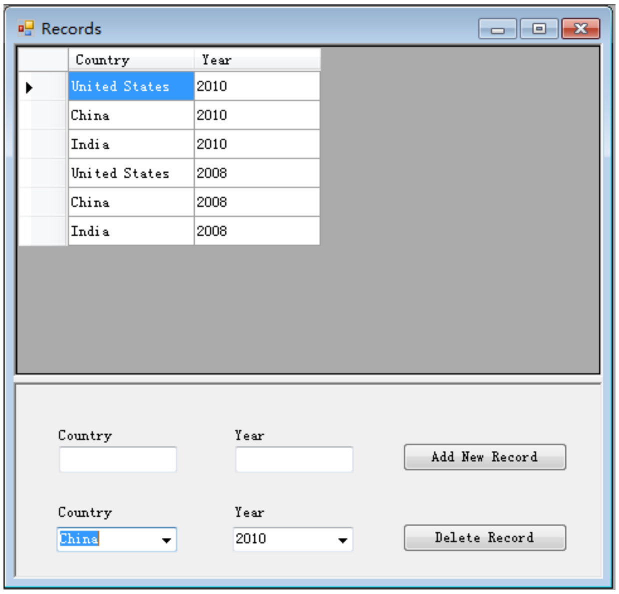


Figure 4.5 Records Form

Figure 4.6 Add Error Message Box

4.2.1.2 Knit Data Function

The 'Knit Data' function allows the user to select an input table and enter in the corresponding information which can be recorded in the database. There are five forms for entering all knit data. Figure 4.7 shows the list of these five forms. Figure 4.8 and Figure 4.9 allow the user to input the basic manufacturing data for a country, which includes labor, energy, water, fuel oil, and steam. Figure 4.10 to Figure 4.12 show the separate three parts of total fabric cost: greige fabric, dyeing and scouring, and drying and compacting. Figure 4.13 allows the user to input the trims data for knit cotton T-shirts. Figure 4.14 enables data about the cutting and sewing process to be input. Figure 4.15 allows the entering of the freight rate, insurance, tariff, and rebate rate.

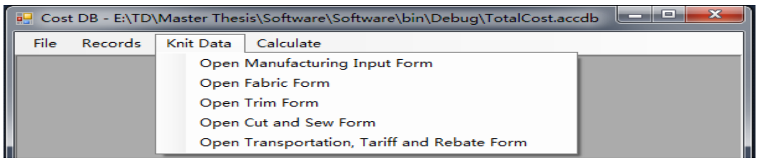


Figure 4.7 Knit Data Menu List

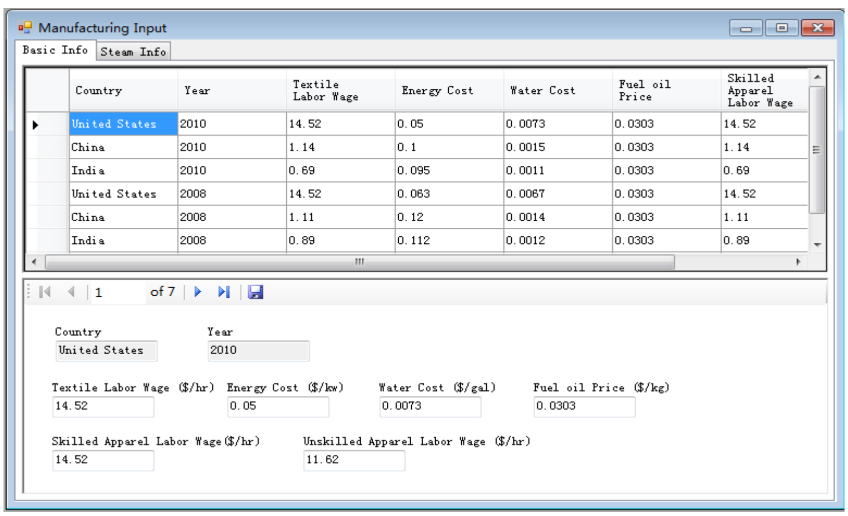


Figure 4.8 Manufacturing Input Form for Knit Product: Basic Information

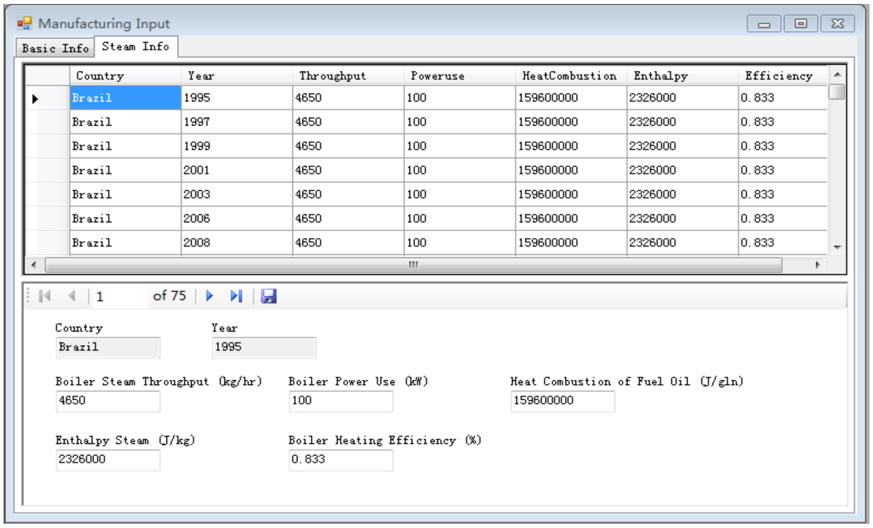


Figure 4.9 Manufacturing Input Form for Knit Product: Steam Information

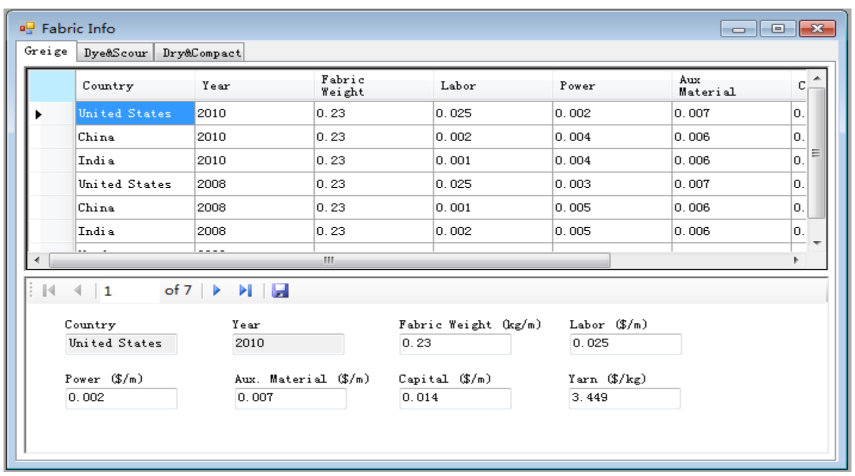


Figure 4.10 Fabric Form for Knit Product: Greige

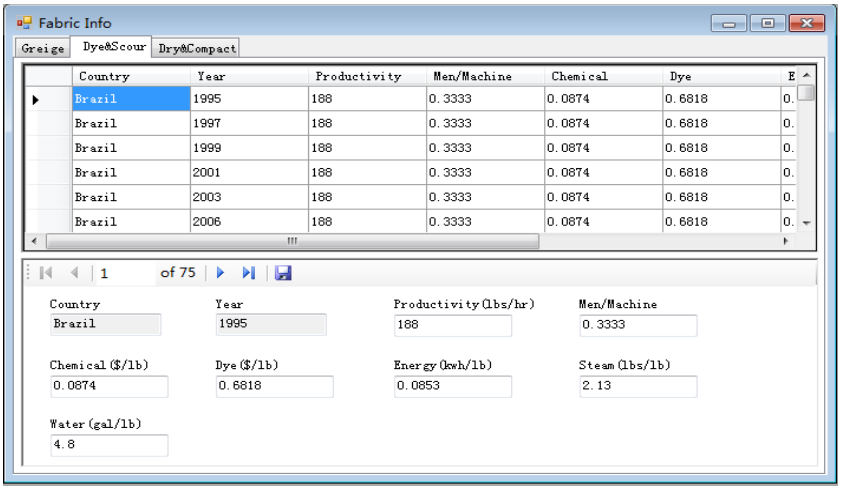


Figure 4.11 Fabric Form for Knit Product: Dyeing and Scouring

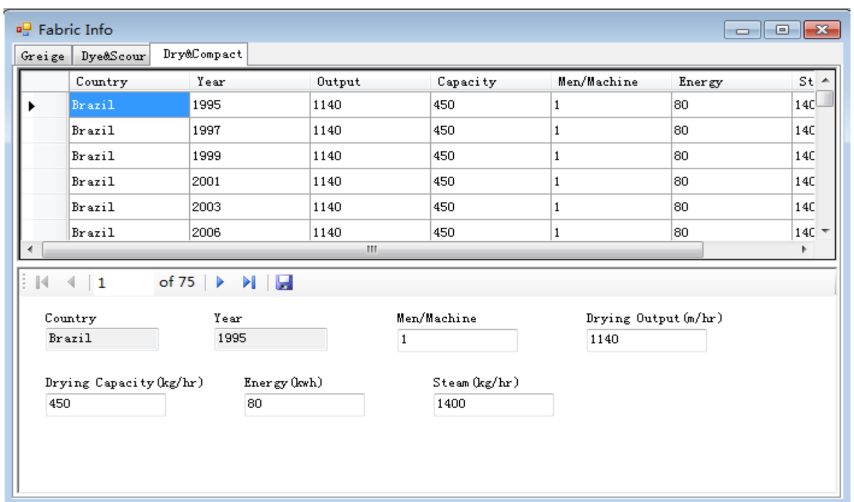


Figure 4.12 Fabric Form for Knit Product: Drying and Compacting

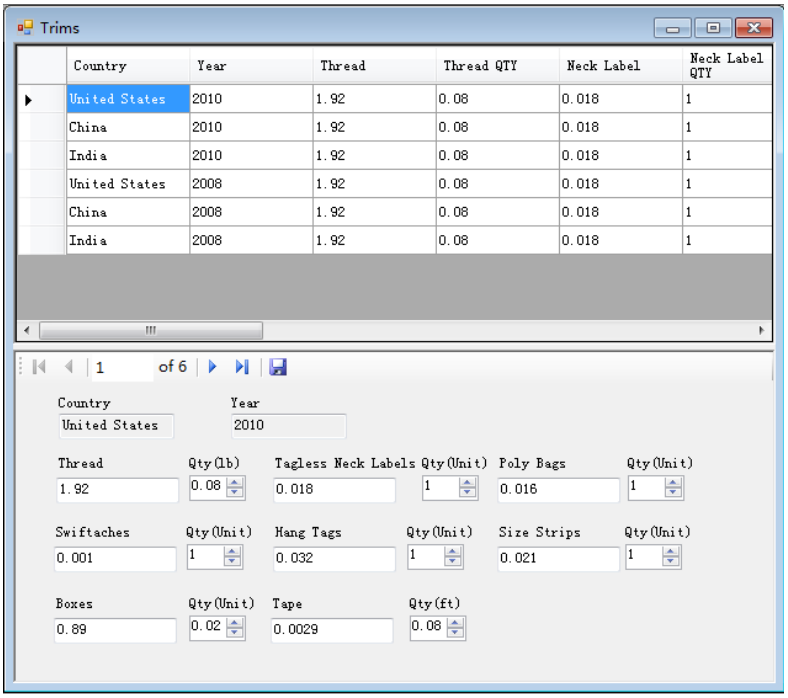


Figure 4.13 Trims Form for Knit Product

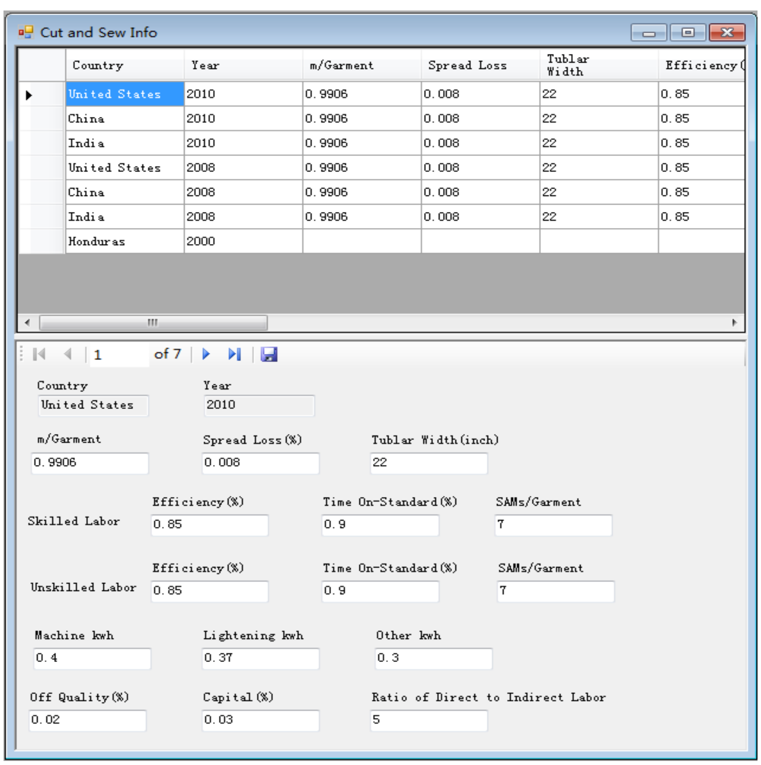


Figure 4.14 Cut and Sew Form for Knit Product

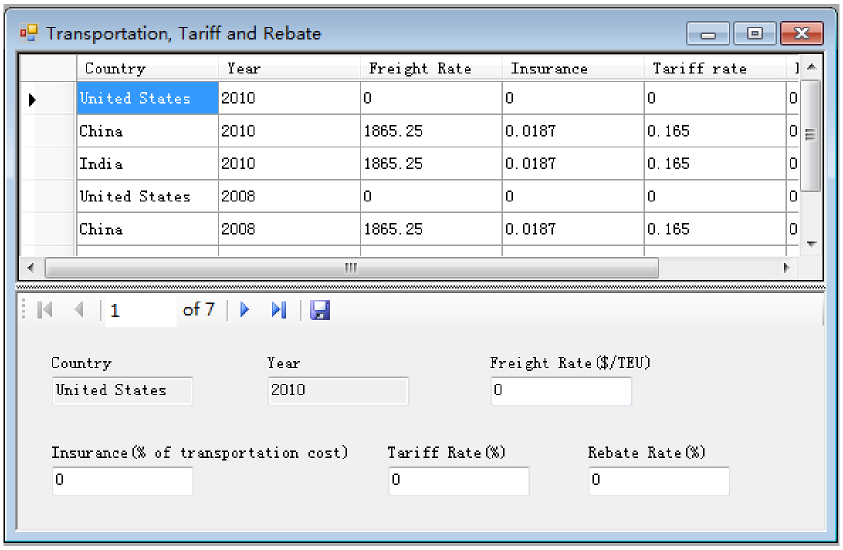


Figure 4.15 Transportation, Tariff and Rebate Form for Knit Product

4.2.1.3 Calculate Function for Knit Product

Figure 4.16 shows the calculate form. The user has the option to calculate the landed cost for one country for a specific year or calculate the landed cost for all countries for all years for which records have been added. If the user chooses to calculate the landed cost for one country for a specific year, then the resulting costs will be displayed at the bottom of the form shown in Figure 4.16. When 'Calculate All Countries and Years' is checked, the results will be shown in the form displayed in Figure 4.17. 'Fabric' shows the total cost of fabric, which includes the greige fabric cost, dyeing fabric cost, and drying and compacting fabric cost. 'Direct Labor' and 'Indirect Labor' are the labor costs of the cutting and sewing process. 'Energy' is the total cost of all energy consumption in the whole manufacturing process. The 'Exit Factory Cost' is the sum of 'Fabric', 'Direct Labor', 'Indirect labor', 'Energy', and 'Trims'. The 'FOB Value' of some countries is different from the 'Exit Factory Cost', because of export rebate for these countries. The ‘Total Landed Cost’ is the sum of the ‘FOB Value’, ‘Tariff’, and ‘Transportation’.

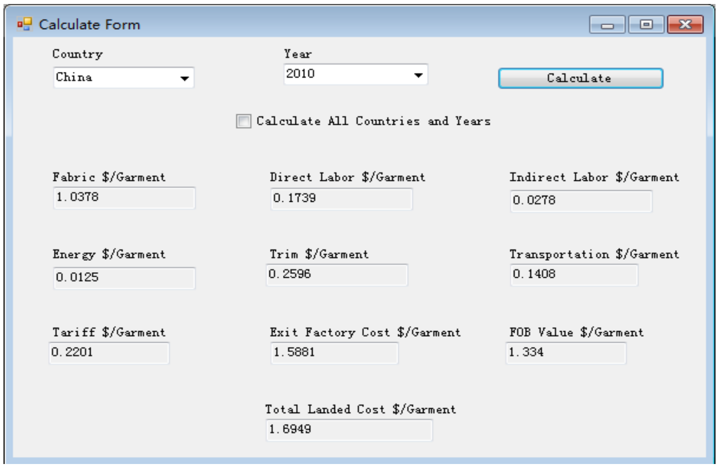
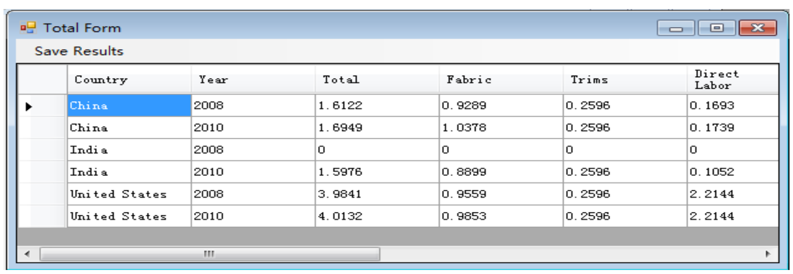


Figure 4.16 Calculate Form


Total Form

Save Results

Country	Year	Total	Fabric	Trims	Direct Labor
China	2008	1.6122	0.9289	0.2596	0.1693
China	2010	1.6949	1.0378	0.2596	0.1739
India	2008	0	0	0	0
India	2010	1.5976	0.8899	0.2596	0.1052
United States	2008	3.9841	0.9559	0.2596	2.2144
United States	2010	4.0132	0.9853	0.2596	2.2144

Figure 4.17 Results for All Countries and Years

4.2.2 Woven Product

For the woven part of the software, all functions are analogous to the knit part. There are six forms for the woven data shown as Figure 4.18. These include five forms that are similar to those for the knit data, plus a form for garment washing. Figure 4.19 shows the garment wash form. The ‘Calculate’ function for the woven is shown in Figure 4.20. It incorporates the garment wash cost.

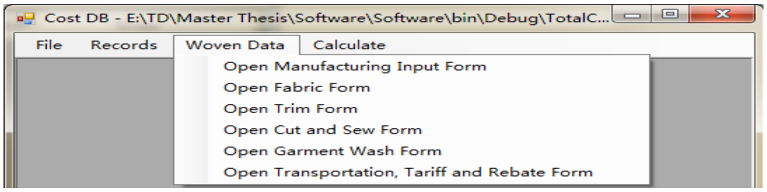


Figure 4.18 Woven Data Menu List

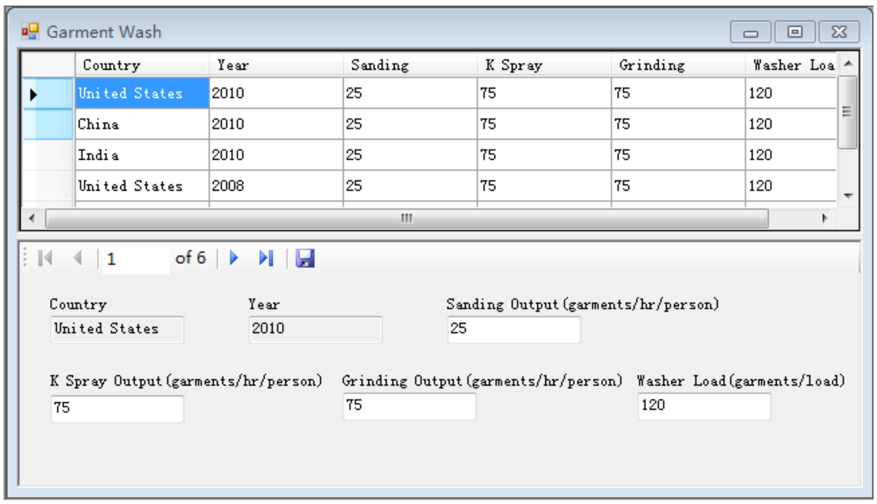


Figure 4.19 Garment Wash Form for Woven Product

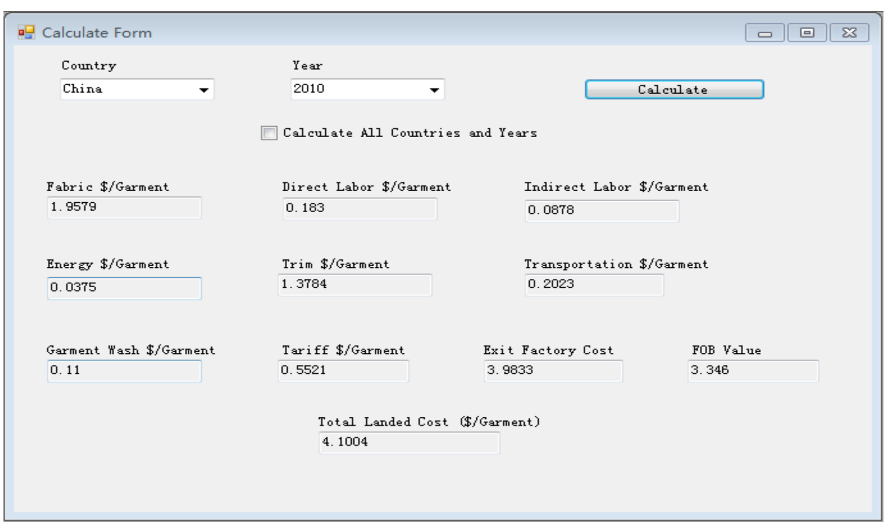


Figure 4.20 Calculate Form for Woven Product

5 COMPARING RESULTS OF COST MODEL TO TRADE VALUE DATA

Fiallos developed a total landed cost model for sourcing and used 2008 for his example calculations. This section uses data from the International Textile Manufacturers Federation International Production Cost Comparison (ITMF IPCC) report to calculate FOB values using Fiallo's model for the years in which the report was published from 1995 to 2010. Then, results from the cost model are compared to the average FOB values from the Office of Textiles and Apparel (OTEXA).

5.1 Data for Selected Countries

5.1.1 Countries Selected for Analysis

The ITMF IPCC report shows international textile manufacturing data. This study uses ITMF manufacturing data from 1995, 1997, 1999, 2001, 2003, 2006, 2008 and 2010. Table 5.1 shows the countries that appeared in the ITMF IPCC report from 1995 to 2010. From Table 5.1, Egypt, Indonesia, Japan and Thailand appeared in the ITMF report no more than three times. Therefore, this study chose Brazil, China, India, Italy, Korea, and Turkey for analysis.

Table 5.1 Countries in ITMF IPCC Report

Year	Brazil	China	Egypt	India	Italy	Korea	Turkey	U.S.	Indonesia	Japan	Thailand
1995	√			√	√	√		√		√	√
1997	√			√	√	√	√	√	√		
1999	√			√	√	√	√	√	√		
2001	√			√	√	√	√	√	√		
2003	√	√		√	√	√	√	√			
2006	√	√		√	√	√	√	√			
2008	√	√	√	√	√	√	√	√			
2010	√	√	√	√	√	√	√	√			

Also this study investigated three non-ITMF countries in the Western hemisphere, Mexico, Nicaragua, and Guatemala, because with the exception of China, the countries in the ITMF IPCC report are not major top 6 import players in the T-shirts and denim jeans markets. In addition, much of the data for these non-ITMF countries was available if the assumption was made that they used U.S. fabrics to assemble T-shirts and denim jeans. The following section shows the data that was used in the calculations. It is presented in a manner which corresponds to the software description in Chapter 4.

5.1.2 Manufacturing Input

5.1.2.1 Basic Information

In Fiallos' model, the labor cost for 2008 was obtained from O'Rourke, except that for the United States which was obtained from the ITMF IPCC 2008. Fiallos also assumed that the labor cost was the same in the textile manufacturing processes and the cutting and sewing process. This study assumes labor cost is different in the textile manufacturing processes, and the cutting and sewing process. For ITMF countries, this study uses average ITMF knitting or weaving labor cost data for the textile processes, and it uses ITMF data for the year being considered that is scaled based on the relationship between the 2008 ITMF data and the 2008 O'Rourke data for the cutting and sewing process. For non-ITMF countries, this study uses apparel labor wages or combined textile and apparel labor wages for the cutting and sewing process. No textile processing labor data was needed as it is assumed that these countries import U.S. fabric. Data for textile and apparel labor wages for non-ITMF countries was obtained from the International Labor Organization (ILO) (2012).

Equation 5.1 calculates the average ITMF knitting labor cost, and the average ITMF weaving labor cost. Equation 5.2 calculates the average ITMF textile processing labor cost. Equation 5.3 calculates the estimated apparel labor cost using the average ITMF textile processing labor cost for the year being considered that is scaled based on the relationship between the 2008 ITMF data and the 2008 O'Rourke data. Table 5.2 and Table 5.3 show the average ITMF knitting labor costs and the average weaving labor costs. Table 5.4 shows the average ITMF labor costs, and Table 5.5 shows the scaled apparel labor costs. Apparel labor costs for non-ITMF countries are shown in Table 5.6.

Equation 5.1 Average ITMF Knitting and Weaving Labor Cost

$$\frac{\$_{average\ labor\ cost}}{hr} = \left(\frac{\$_{skilled\ personnel}}{hr} + \frac{\$_{machine\ tender}}{hr} + \frac{\$_{unskilled\ personnel}}{hr}\right) \div 3$$

$$ex.)\ \frac{\$_{Brazil\ 2008\ weaving\ labor\ cost}}{hr} = \left(\frac{\$3.61}{hr} + \frac{\$2.14}{hr} + \frac{\$1.52}{hr}\right) \div 3 = \frac{\$2.42}{hr}$$

$$\frac{\$_{Brazil\ 2008\ knitting\ labor\ cost}}{hr} = \left(\frac{\$5.21}{hr} + \frac{\$1.88}{hr} + \frac{\$1.49}{hr}\right) \div 3 = \frac{\$2.86}{hr}$$

Equation 5.2 Average ITMF Textile Processing Labor Cost

$$\frac{\$_{average\ ITMF\ labor\ cost}}{hr} = \left(\frac{\$_{knit\ labor}}{hr} + \frac{\$_{woven\ labor}}{hr}\right) \div 2$$

$$ex.)\ \frac{\$_{Brazil\ 2008\ ITMF\ labor\ cost}}{hr} = \left(\frac{\$2.86_{knitting\ labor\ cost}}{hr} + \frac{\$2.42_{weaving\ labor\ cost}}{hr}\right) \div 2 = \frac{\$2.64}{hr}$$

Equation 5.3 Scaled Apparel Labor Cost

$$Scaled\ Labor\ Cost_{year\ i\ \&\ country\ j} =$$
$$\frac{O'\ Rourke\ Labor\ Cost_{2008\ \&\ country\ j}}{ITMF\ Labor\ Cost_{2008\ \&\ country\ j}} \times\ ITMF\ Labor\ Cost_{year\ i\ \&\ country\ j}, for\ year\ i, country\ i$$

$$ex.)\ Scaled\ Labor\ Cost_{2006\ China} = \frac{\$\ 1.08/hr_{2008\ China}}{\$\ 1.11/hr_{2008\ China}} \times \$\ 0.95/hr_{2006\ China} = \$\ 0.92/hr_{2006\ China}$$

Table 5.2 Average ITMF Knitting Labor Costs in $ Per Hour

Year	Brazil	China	India	Italy	Korea	Turkey
1995	4.98		0.75	19.21	3.78	
1997	4.85		0.86	20.48	5.63	2.59
1999	2.47		0.82	13.9	3.98	2.22
2001	2.47		0.80	13.25	4.71	3.2
2003	0.97	1.17	0.77	16.35	5.01	2.55
2006	2.47	0.95	0.73	24.69	4.88	3.06
2008	2.86	1.11	0.89	22.85	5.61	3.61
2010	3.22	1.14	0.69	22.51	8.99	3.69

Table 5.3 Average ITMF Weaving Labor Costs in $ Per Hour

Year	Brazil	China	India	Italy	Korea	Turkey
1995	5.25		1.10	17.74	3.78	
1997	5.59		0.95	18.89	5.63	1.86
1999	2.50		0.92	16.84	4.11	2.22
2001	2.61		0.87	15.81	2.27	3.23
2003	1.22	0.96	0.90	19.50	5.19	2.63
2006	2.01	0.65	0.92	24.17	7.74	4.21
2008	2.42	0.89	1.15	24.27	7.58	6.78
2010	2.80	1.20	0.92	23.97	8.99	5.85

Table 5.4 Average ITMF Textile Processing Labor Costs in $ Per Hour

Year	Brazil	China	India	Italy	Korea	Turkey
1995	5.12		0.93	18.48	3.78	
1997	5.22		0.91	19.69	5.63	2.23
1999	2.49		0.87	15.37	4.05	2.22
2001	2.54		0.84	14.53	3.49	3.22
2003	1.10	1.07	0.84	17.93	5.10	2.59
2006	2.24	0.80	0.83	24.43	6.31	3.64
2008	2.64	1.00	1.02	23.56	6.60	5.20
2010	3.01	1.17	0.81	23.24	8.99	4.77

Table 5.5 Scaled Labor Costs for Cutting and Sewing in $ Per Hour

Year	Brazil	China	India	Italy	Korea	Turkey
1995	4.98		0.46	18.48	2.41	
1997	5.36		1.81	19.69	8.84	4.74
1999	2.42		0.44	15.37	2.58	1.04
2001	2.61		1.67	14.53	5.48	6.85
2003	1.07	1.15	0.42	17.93	3.25	1.22
2006	2.30	0.74	1.65	24.43	9.91	7.74
2008	2.57	1.08	0.51	23.56	4.20	2.44
2010	3.09	1.08	1.61	23.24	14.12	10.16

Table 5.6 Labor Costs in $ Per Hour for Non-ITMF Countries from 1995 to 2010

Year	Mexico		Guatemala		Nicaragua	
	Textile	Apparel	Textile	Apparel	Textile	Apparel
1995	0.75	0.53	0.81	0.81	0.79	0.79
1997	0.83	0.61	0.98	0.98	0.72	0.72
1999	0.92	0.74	0.91	0.91	0.60	0.60
2001	1.16	1.02	0.93	0.93	0.58	0.58
2003	1.34	1.01	1.03	1.03	0.56	0.56
2006	1.45	1.20	1.41	1.41	0.57	0.57
2008	1.59	1.44	1.54	1.54	0.49	0.49
2010	1.39	1.26	1.44	1.44	0.45	0.45

Energy data and water data in Fiallos' study are obtained from different resources other than the ITMF IPCC report. As some resources used in Fiallos' study were no longer available, this study uses energy data and water data from the ITMF IPCC report. Energy data for ITMF countries was different in the knitting and weaving process as shown in Table 5.7 and Table 5.8. Energy data for Mexico from 2001 to 2008 and 2008 energy data for Nicaragua were obtained from U.S. Energy Information Administration (EIA) (2010). Data of Guatemala was obtained from Fiallos' study. Since there was no energy data for Mexico from 1995 to 1999 and for 2010, this study assumed that the energy costs of Mexico from 1995 to 1999 was the same as the 2001 cost, and the 2010 energy cost of Mexico was the same as that in 2008. As there was no energy data available for Nicaragua and Guatemala except in 2008, the 2008 energy cost data was used from 1995 to 2010. Table 5.9 shows the energy costs for non-ITMF countries. As the water costs for Mexico, Nicaragua, and Guatemala could not be found, this study estimated the water cost of these three countries. The water cost of Guatemala and Mexico in 2008 was obtained from Fiallos' study, and this study used 2008 data for Guatemala and Mexico for all years. This study assumes the water cost of Nicaragua was the same as Guatemala because no data for Nicaragua could be found. Table 5.10 and Table 5.11 show the water costs for the ITMF countries and non-ITMF countries, respectively, from 1995 to 2010.

Table 5.7 Energy Costs in $ Per kwh for Knitting for ITMF Countries from 1995 to 2010

Year	Brazil	China	India	Italy	Korea	Turkey
1995	0.061		0.094	0.067	0.056	
1997	0.057		0.099	0.080	0.053	0.070
1999	0.031		0.081	0.082	0.040	0.055
2001	0.039		0.086	0.091	0.042	0.076
2003	0.031	0.066	0.084	0.105	0.047	0.070
2006	0.050	0.080	0.095	0.100	0.060	0.084
2008	0.090	0.120	0.112	0.187	0.062	0.110
2010	0.130	0.100	0.095	0.194	0.062	0.108

Table 5.8 Energy Costs in $ Per kwh for Weaving for ITMF Countries from 1995 to 2010

Year	Brazil	China	India	Italy	Korea	Turkey
1995	0.0612		0.0830	0.0912	0.0563	
1997	0.0578		0.0990	0.0981	0.0533	0.0572
1999	0.0308		0.0870	0.0818	0.0404	0.0555
2001	0.0388		0.0860	0.0908	0.0422	0.0761
2003	0.0300	0.0700	0.0800	0.1000	0.0500	0.0700
2006	0.0500	0.0800	0.0950	0.1000	0.0600	0.0840
2008	0.0900	0.1000	0.1120	0.1870	0.0620	0.1100
2010	0.1300	0.1000	0.1000	0.1900	0.0600	0.1080

Table 5.9 Energy Costs in $ Per kwh for Non-ITMF Countries from 1995 to 2010

Year	Mexico	Guatemala	Nicaragua
1995	0.053	0.160	0.186
1997	0.053	0.160	0.186
1999	0.053	0.160	0.186
2001	0.053	0.160	0.186
2003	0.062	0.160	0.186
2006	0.099	0.160	0.186
2008	0.126	0.160	0.186
2010	0.126	0.160	0.186

Table 5.10 Water Costs in $ Per m^3 for ITMF Countries from 1995 to 2010

Year	Brazil	China	India	Italy	Korea	Turkey
1995	0.1235		0.6050	0.2922	0.3520	
1997	0.2414		0.9330	0.2973	0.3996	0.2368
1999	0.1791		0.7101	0.2640	0.4362	0.2932
2001	0.1980		0.7101	0.2870	0.8260	0.4660
2003	0.1400	0.1800	0.7900	0.3700	0.8500	0.5000
2006	0.2300	0.3000	0.2500	0.3900	0.8900	0.3700
2008	0.7600	0.3600	0.3200	0.6700	1.3800	0.4400
2010	0.7900	0.4000	0.2800	0.6900	1.2700	0.7100

Table 5.11 Water Costs in $ Per m^3 for Non-ITMF Countries from 1995 to 2010

Year	Mexico	Guatemala	Nicaragua
1995	0.6604	0.2496	0.2496
1997	0.6604	0.2496	0.2496
1999	0.6604	0.2496	0.2496
2001	0.6604	0.2496	0.2496
2003	0.6604	0.2496	0.2496
2006	0.6604	0.2496	0.2496
2008	0.6604	0.2496	0.2496
2010	0.6604	0.2496	0.2496

5.1.2.2 Steam Information

In Fiallos' cost model, he used No. 6 fuel oil data and energy data to compute the steam cost. The resource of No. 6 fuel oil used in Fiallos' study is no longer available. The EIA (2012) only currently provides the No. 6 fuel oil price for the U.S. and no other resource could be found that provided No. 6 fuel oil information for other countries. Therefore, this study assumes that the No. 6 fuel oil price was the same for all selected countries, and Table 5.12 shows the No. 6 fuel oil price of the United States. There were some manufacturing assumptions for calculating steam price in Fiallos' study. This study assumes that the manufacturing assumptions for steam shown in Table 5.13 are applicable for all years in this analysis.

Table 5.12 No.6 Residual Fuel Oil Price of the United States

Year	$/Gal
1995	0.397
1997	0.429
1999	0.378
2001	0.533
2003	0.696
2006	1.212
2008	1.944
2010	1.729

Table 5.13 Steam Assumptions

Boiler steam throughput (kg/hr)	4650
Boiler power use (kW)	100
Heat Combustion of Fuel Oil (J/gln)	159600000
Enthalpy Steam (J/kg)	2326000
Boiler Heating Efficiency	0.833

5.1.3 Fabric Input

5.1.3.1 Greige Information

Greige fabric data was obtained from the ITMF IPCC report. This study assumes that non-ITMF countries imported finished fabric from the U.S. to assemble T-shirts and denim jeans. So, greige fabric data for non-ITMF countries used the data of the U.S. from the ITMF IPCC report. This study assumes that all countries selected used the same type of greige knitted fabric for T-shirts and the same type of woven fabric for denim jeans. The basic greige fabric information for knitting and weaving is shown in Table 5.14 and Table 5.15. Table 5.16 shows the greige knitting fabric factors for all selected ITMF countries and the United States, and Table 5.17 shows the greige weaving fabric factors for all ITMF countries and the United States.

Table 5.14 Knitting Fabric Information from ITMF

	Linear			Area
Width (m)	**g/m**	**kg/m**	**lb/m**	**g/m^2**
1.92	230	0.23	0.50706	119.79

Table 5.15 Weaving Fabric Information from ITMF

	Linear		Area	
Width (m)	**g/m**	**kg/m**	**g/m^2**	**oz/yd^2**
1.68	713	0.712	423.81	12.5

Table 5.16 Greige Knitting Factors in $ Per m for ITMF Countries

Year	China				
	Labor	**Power**	**Aux. Material**	**Capital**	**RS Yarn**
2003	0.025	0.113	0.060	0.198	2.760
2006	0.001	0.004	0.005	0.017	2.890
2008	0.001	0.005	0.006	0.015	3.338
2010	0.002	0.004	0.006	0.015	4.164
Year	**India**				
	Labor	**Power**	**Aux. Material**	**Capital**	**RS Yarn**
1995	0.017	0.110	0.044	0.439	4.290
1997	0.030	0.164	0.060	0.478	3.240
1999	0.028	0.146	0.053	0.514	2.960
2001	0.027	0.152	0.051	0.430	2.690
2003	0.027	0.144	0.061	0.306	2.450
2006	0.001	0.004	0.005	0.010	2.130
2008	0.002	0.005	0.006	0.012	2.957
2010	0.001	0.004	0.006	0.014	3.084
Year	**Brazil**				
	Labor	**Power**	**Aux. Material**	**Capital**	**RS Yarn**
1995	0.021	0.012	0.012	0.086	4.760
1997	0.038	0.016	0.016	0.077	3.730
1999	0.018	0.009	0.015	0.068	2.640
2001	0.018	0.011	0.015	0.064	2.510
2003	0.010	0.010	0.020	0.100	2.610
2006	0.003	0.002	0.007	0.021	2.650
2008	0.003	0.004	0.008	0.019	3.276
2010	0.005	0.006	0.006	0.014	3.663
Year	**Italy**				
	Labor	**Power**	**Aux. Material**	**Capital**	**RS Yarn**
1995	0.097	0.013	0.012	0.061	5.270
1997	0.143	0.023	0.015	0.065	4.260
1999	0.118	0.023	0.015	0.051	3.280
2001	0.111	0.026	0.017	0.055	3.140
2003	0.130	0.030	0.020	0.060	3.590
2006	0.037	0.004	0.010	0.019	3.200
2008	0.047	0.008	0.013	0.028	4.248
2010	0.046	0.009	0.013	0.025	4.636
Year	**Korea**				
	Labor	**Power**	**Aux. Material**	**Capital**	**RS Yarn**
1995	0.020	0.011	0.011	0.059	4.550
1997	0.047	0.015	0.015	0.068	3.650
1999	0.033	0.011	0.014	0.058	2.700
2001	0.041	0.012	0.014	0.050	2.410
2003	0.040	0.010	0.020	0.050	2.680
2006	0.007	0.003	0.006	0.013	2.540
2008	0.011	0.003	0.007	0.015	3.233
2010	0.015	0.003	0.007	0.015	3.558

Table 5.16 Continued

Year	Turkey				
	Labor	Power	Aux. Material	Capital	RS Yarn
1997	0.021	0.020	0.017	0.070	3.730
1999	0.019	0.016	0.016	0.075	3.180
2001	0.027	0.022	0.015	0.039	2.880
2003	0.020	0.020	0.010	0.070	2.850
2006	0.005	0.004	0.005	0.010	2.610
2008	0.007	0.005	0.006	0.011	3.046
2010	0.006	0.005	0.006	0.007	3.878
Year	United States				
	Labor	Power	Aux. Material	Capital	RS Yarn
1995	0.208	0.060	0.052	0.497	4.960
1997	0.297	0.083	0.065	0.429	3.600
1999	0.316	0.083	0.060	0.360	3.110
2001	0.331	0.078	0.055	0.349	2.670
2003	0.335	0.077	0.067	0.302	2.860
2006	0.025	0.002	0.005	0.013	2.810
2008	0.025	0.003	0.007	0.015	3.224
2010	0.025	0.002	0.007	0.014	3.449

Table 5.17 Greige Weaving Factors in $ Per m for China from 2003 to 2010

Year	China					
	Waste	Labor	Power	Aux. Material	Capital	OE Yarn
2003	0.005	0.010	0.040	0.040	0.090	2.510
2006	0.005	0.010	0.040	0.040	0.090	2.280
2008	0.005	0.013	0.073	0.040	0.078	2.568
2010	0.006	0.018	0.074	0.042	0.079	3.240
Year	India					
	Waste	Labor	Power	Aux. Material	Capital	OE Yarn
1995	0.005	0.017	0.110	0.044	0.439	3.820
1997	0.005	0.030	0.164	0.060	0.478	2.990
1999	0.005	0.028	0.146	0.053	0.514	2.700
2001	0.005	0.027	0.152	0.051	0.430	2.500
2003	0.005	0.027	0.144	0.061	0.306	2.170
2006	0.005	0.001	0.004	0.005	0.010	1.520
2008	0.005	0.002	0.005	0.006	0.012	2.193
2010	0.005	0.001	0.004	0.006	0.014	2.304
Year	Brazil					
	Waste	Labor	Power	Aux. Material	Capital	OE Yarn
1995	0.006	0.074	0.035	0.058	0.306	3.99
1997	0.006	0.086	0.035	0.054	0.176	3.27
1999	0.006	0.035	0.025	0.026	0.087	2.32
2001	0.006	0.036	0.032	0.049	0.103	2.23
2003	0.006	0.02	0.03	0.04	0.11	2.310

Table 5.17 Continued

Year	Brazil					
	Waste	Labor	Power	Aux. Material	Capital	OE Yarn
2006	0.006	0.02	0.03	0.03	0.12	1.850
2008	0.006	0.027	0.066	0.047	0.078	2.360
2010	0.005	0.035	0.095	0.048	0.132	2.626
Year	Italy					
	Waste	Labor	Power	Aux. Material	Capital	OE Yarn
1995	0.009	0.208	0.052	0.05	0.287	4.25
1997	0.009	0.222	0.06	0.05	0.194	3.37
1999	0.009	0.198	0.064	0.04	0.098	2.59
2001	0.009	0.186	0.069	0.055	0.093	2.49
2003	0.009	0.23	0.08	0.06	0.1	2.750
2006	0.009	0.21	0.06	0.06	0.09	1.960
2008	0.009	0.22	0.138	0.097	0.13	2.601
2010	0.006	0.229	0.146	0.049	0.128	2.930
Year	Korea					
	Waste	Labor	Power	Aux. Material	Capital	OE Yarn
1995	0.006	0.061	0.037	0.067	0.224	4.03
1997	0.006	0.111	0.034	0.054	0.155	3.22
1999	0.006	0.061	0.033	0.038	0.085	2.36
2001	0.006	0.063	0.036	0.095	0.062	2.14
2003	0.006	0.08	0.04	0.09	0.08	2.350
2006	0.006	0.09	0.03	0.06	0.07	1.800
2008	0.006	0.089	0.045	0.055	0.073	2.305
2010	0.005	0.109	0.047	0.049	0.068	2.593
Year	Turkey					
	Waste	Labor	Power	Aux. Material	Capital	OE Yarn
1997	0.008	0.022	0.034	0.036	0.195	3.38
1999	0.008	0.024	0.04	0.029	0.115	2.91
2001	0.008	0.034	0.062	0.058	0.107	2.7
2003	0.008	0.03	0.05	0.06	0.1	2.480
2006	0.008	0.05	0.02	0.07	0.09	1.890
2008	0.007	0.081	0.061	0.06	0.08	2.146
2010	0.005	0.073	0.081	0.083	0.093	2.924
Year	U.S.					
	Waste	Labor	Power	Aux. Material	Capital	OE Yarn
1995	0.008	0.186	0.060	0.067	0.467	4.130
1997	0.008	0.185	0.059	0.063	0.289	3.010
1999	0.008	0.187	0.068	0.053	0.192	2.560
2001	0.008	0.192	0.063	0.067	0.196	2.200
2003	0.008	0.140	0.030	0.030	0.100	2.300
2006	0.008	0.140	0.030	0.030	0.100	1.750
2008	0.007	0.139	0.035	0.037	0.121	2.075
2010	0.005	0.152	0.037	0.035	0.107	2.340

5.1.3.2 Dyeing and Scouring Information

In Fiallos' study, manufacturing assumptions were obtained from several manufacturers. This study assumes that the manufacturing assumptions will be constant from 1995 to 2010, and uses 2008 data for all years. Also, this study assumed that the price of chemicals and dyes was the same over time. Table 5.18 shows the assumptions for the T-shirt dyeing and scouring process, and Table 5.19 shows the assumptions for the rope dyeing of denim jeans.

Table 5.18 Assumptions for Dye and Scouring Process for T-shirts

Productivity (lbs/hr)	188
Labor (men/machine)	1/3
Chemicals ($/lb)	0.0874
Dyes ($/lb)	0.6818
Energy (kWh/lb)	0.0853
Steam (lbs/lb)	2.13
Water (gal/lb)	4.8

Table 5.19 Assumptions for Rope Dye for Denim Jeans

Productivity (lb/hr)	3702.9
Labor (men/machine)	3
Chemicals ($/lb)	0.0824
Dyes ($/lb)	0.0556
Energy (kW)	57.5
Steam (kg/hr)	2930
Water (m^3/hr)	19.8

5.1.2.3 Drying and Compacting/Finishing Information

In the drying and compacting/finishing process, this study also assumes that the manufacturing assumptions from 1995 to 2011 were all the same as the 2008 manufacturing assumptions from Fiallos' study. Table 5.20 shows the manufacturing assumptions for the T-shirt drying and compacting process, and Table 5.21 shows the manufacturing assumptions for the denim jeans finishing process.

Table 5.20 Assumptions for Drying and Compacting Process

Labor (men/machine)	1
Energy (kW)	80
Steam (kg/hr)	1400
Drying output (m/hr)	1140
Drying Capacity (kg/hr)	450

Table 5.21 Assumptions for Finishing Process

Labor (men/range)	1
Energy (kW)	30
Steam (kg/hr)	1400
Water (m^3/hr)	7
Chemicals ($/m)	0.0365
Finishing output (m/hr)	1800

5.1.3 Trims Input

In Fiallos' study, he pointed out that trim cost would likely be similar for all apparel manufacturing companies with a large production volume. Fiallos obtained 2008 trim cost from manufacturers. This study assumes that the cost of trims was constant from 1995 to 2010. Table 5.22 and Table 5.23 show trim information for T-shirts and denim jeans, respectively.

Table 5.22 Trims for T-shirts

Materials	**Requirement**		**$/UOM**	**$/Garment**
	UOM	**QTY**		
Thread	lb	0.08	1.9200	0.1536
Tagless neck label	unit	1	0.0180	0.0180
Poly bag	unit	1	0.0160	0.0160
Swiftach	unit	1	0.0010	0.0010
Hang tag	unit	1	0.0320	0.0320
Size strip	unit	1	0.0210	0.0210
Boxes	unit	1/60	0.8900	0.0178
Tape	ft	0.08	0.0029	0.0002
TOTAL				**0.2597**

Table 5.23 Trims for Denim Jeans

Materials	Requirement		$/UOM	$/Garment
	UOM	QTY		
Pocketing	unit	2	0.1663	0.3326
Zipper	unit	1	0.1550	0.1550
Thread	lb	0.19	2.0550	0.3905
Fusionables	unit	1	0.0077	0.0077
Patch Label	unit	1	0.0490	0.0490
Woven Care Label	unit	1	0.0666	0.0666
Country of Origin Label	unit	1	0.0146	0.0146
Size Strip	unit	1	0.0409	0.0409
VM Foldover	unit	1	0.0200	0.0200
Hang tag	unit	2	0.0320	0.0640
Swiftachs	unit	1	0.0016	0.0016
Poly bag	unit	1	0.0375	0.0375
Boxes	unit	1/24	0.8900	0.0371
Tape	ft	0.19	0.0029	0.0006
Tack	unit	5	0.0102	0.0510
Button	unit	1	0.0285	0.0285
Rivets	unit	6	0.0138	0.0825
TOTAL				**1.3795**

5.1.4 Cut and Sew Input

This study uses 2008 cut and sew manufacturing assumptions from Fiallos' study for all years. Table 5.24 and Table 5.25 show the manufacturing assumptions for the cutting and sewing process of T-shirts and denim jeans, respectively.

Table 5.24 Assumptions for Cutting and Sewing Process of T-shirts

Fabric Consumption (m/garment)	0.9906
Spread Loss (%)	0.8
Tubular Width (inch)	22
Efficiency (%)	85
Time On-standard (%)	90
Standard Allowed Minutes (SAM/garment)	7
Directs to Indirect	5
Machine Energy Consumption (kWh)	0.4
Lighting Consumption (kWh)	0.37
Other Energy Consumption (kWh)	0.3
Off Quality (%)	2
Capital (%)	3

Table 5.25 Assumptions for Cutting and Sewing Process of Denim Jeans

Fabric Consumption (m/garment)	1.5453
Spread Loss (%)	3
Efficiency (%)	85
Time On-standard (%)	90
Standard Allowed Minutes (SAM/garment)	21
Directs to Indirect	5
Machine Energy Consumption (kWh)	0.4
Lighting Consumption (kWh)	0.37
Other Energy Consumption (kWh)	0.3
Off Quality (%)	3
Capital (%)	3

5.1.5 Garment Wash Information for Jeans

Only the denim jeans were put through a garment washing process during manufacturing. This study assumes that the wash process structure and manufacturing assumptions will be constant from 1995 to 2010, and uses 2008 wash assumptions of Fiallos' study for all years. Table 5.26 shows the assumptions for the garment wash process for denim jeans.

Table 5.26 Assumptions for Garment Wash

Water (gln/load)	2400
Sanding Output (garments/hr/person)	35
K Spray Output (garments/hr/person)	75
Grinding Output (garments/hr/person)	75
Washer Load (garments/load)	120

5.1.6 Transportation, Tariff and Rebate Information

To calculate the FOB value, no garment transportation and tariff costs were used. In this section, transportation cost is the cost, insurance, and freight rate for imports of U.S. finished fabric into Mexico, Nicaragua, and Guatemala. For U.S. exports, OTEXA and USITC do not provide cost, insurance, and freight rate values as they do for imports. At first, this study assumes that the transportation cost of knit and woven fabric from the U.S. to Mexico, Nicaragua, and Guatemala is equal to the transportation cost of knit and woven fabric from Mexico, Nicaragua, and Guatemala to the U.S. The transportation cost of knit and woven fabric for T-shirt or pair of jeans was in many cases more than 10 times higher than the transportation cost of a knit T-shirt or a pair of denim jeans, which does not seem to make sense. Therefore, this study assumes the transportation cost of knit and woven fabric from the U.S. to Mexico, Nicaragua, and Guatemala is the same as the transportation cost of knit T-shirts and jeans, respectively, from Mexico, Nicaragua, and Guatemala to the U.S.. Transportation costs are shown in Table 3.4 and Table 3.16 in Chapter 3. No tariff information of fabric imported to Mexico, Nicaragua, and Guatemala could be found. So this study did not consider fabric tariff costs in the calculation, which might cause the FOB value of the three non-ITMF countries to not be accurate before they signed an FTA. There were only two countries that provided rebates to domestic apparel exporters: China and India. Table 5.27 and Table 5.28 show the rebate rate of China and India, respectively, for T-shirts and denim jeans.

Table 5.27 Rebate Rate of China for T-shirts and Denim Jeans in Percentage

Year	2003	2006	2008	2010
Rebate Rate	17	11	14	16

Table 5.28 Rebate Rate of India for T-shirts and Denim Jeans in Percentage

Year	2006	2008	2010
Rebate Rate	6.7	8.8	7.1

5.1.7 FOB Value Calculation

The FOB value includes the exit-factory price and rebate as shown in Equation 5.4. For China, the FOB value includes the exit-factory cost, rebate, and quota selling price. Equation 5.5 shows the FOB value calculation for China. Table 5.29 and Table 5.30 show the quota selling price for T-shirts and denim jeans, respectively, in MFA categories from 2003 to 2008 that was obtained from China Quota (2012). The FOB value of the non-ITMF countries were not calculated directly by the software discussed in Chapter 4. Equation 5.6 shows the FOB value calculation for Mexico, Nicaragua, and Guatemala with fabric imported from the United States.

Equation 5.4 FOB Value Calculation

$$\frac{\$_{FOB\ value}}{garment} = \frac{\$_{exit-factory\ cost}}{garment} - \frac{\$_{rebate}}{garment}$$

Equation 5.5 FOB Value Calculation for China

$$\frac{\$_{FOB\ value}}{garment} = \frac{\$_{exit-factory\ cost}}{garment} - \frac{\$_{rebate}}{garment} + \frac{\$_{quota\ selling\ price}}{garment}$$

Table 5.29 Quota Price of China for MFA338/339 in $ Per Garment

Year	2003	2006	2008
Quota Price	0.3333	0.4500	0.0917

Table 5.30 Quota Price of China for MFA438/439 in $ Per Garment

Year	2003	2006	2008
Quota Price	3.2000	0.8333	0.1750

Equation 5.6 FOB Value Calculation for Mexico, Nicaragua, and Guatemala

$$\frac{\$_{FOB\ value}}{garment} = \left[\left(\frac{\$_{U.S. fabric\ cost}}{garment} + \frac{\$_{fabric\ transportation\ cost}}{garment} + \frac{\$_{trims}}{garment} + \frac{\$_{labor}}{garment} + \frac{\$_{energy\ cost}}{garment} + \frac{\$_{garment\ finishing}}{garment}\right) \times \left(1 + factor_{off-quality}\right)\right] \times (1 + Capital_{rate})$$

5.2 Comparison of FOB Values

The purpose of comparing the FOB value of OTEXA to the results of the cost model was to see if it was possible to forecast the OTEXA value based on the cost model value. The FOB value of OTEXA is the customer import value excluding the logistics costs, insurance, and tariff. The differences between the results of the cost model and the FOB value of OTEXA, are at least in part due to manufacturing markup which was not included in the cost model, and possibly some overhead not accounted for in the cost model. Though complicated forecast models could certainly be used to see how well the OTEXA value could be predicted, this study is going to define good correspondence between the OTEXA and cost values to be cases in which Fiallos' cost model could forecast the OTEXA value reasonably well by either adding a constant or percentage markup.

5.2.1 Comparison of FOB Values for T-shirts

This section compares the FOB values from OTEXA to the results of the cost model for T-shirts. Figure 5.1 and Figure 5.2 show the U.S. T-shirt import market share of the ITMF countries from 1995 to 2010 for the years in which ITMF reports were published. Brazil, India, Italy, Korea, and Turkey had a small market share. Among these countries, the highest market share was 4.01% of India in 1995. China had much more market share then other ITMF countries in 2010. Figure 5.3 and Figure 5.4 show the U.S. T-shirt import market share of non-ITMF countries for ITMF report years from 1995 to 2010. Guatemala and Nicaragua did not have market shares over 4.5% from 1995 to 2010. Mexico had a very large market share of 44.63% in 1999.

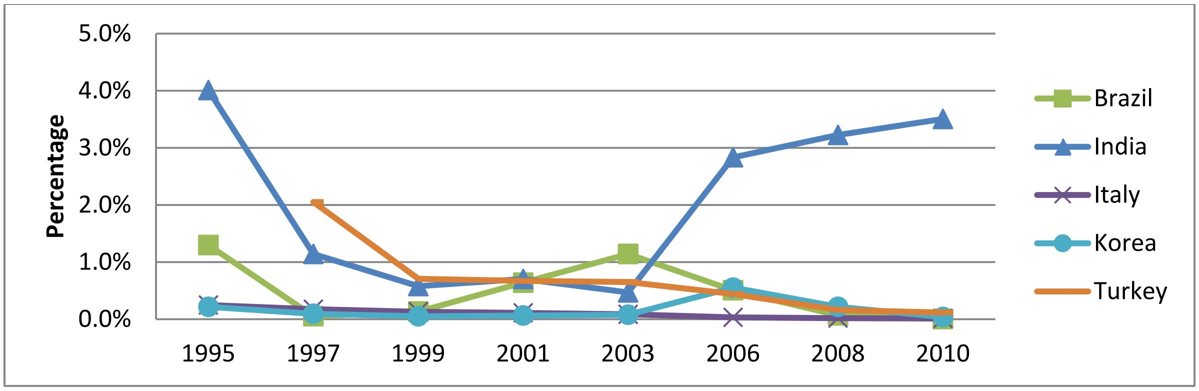


Figure 5.1 Market Share of ITMF Countries Except China from ITMF Report Years from 1995 to 2010

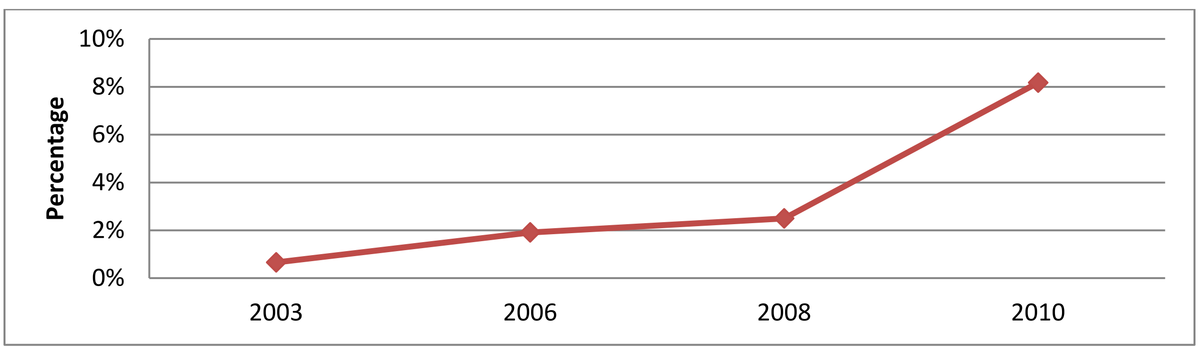


Figure 5.2 Market Share of China from ITMF Report Years from 2003 to 2010

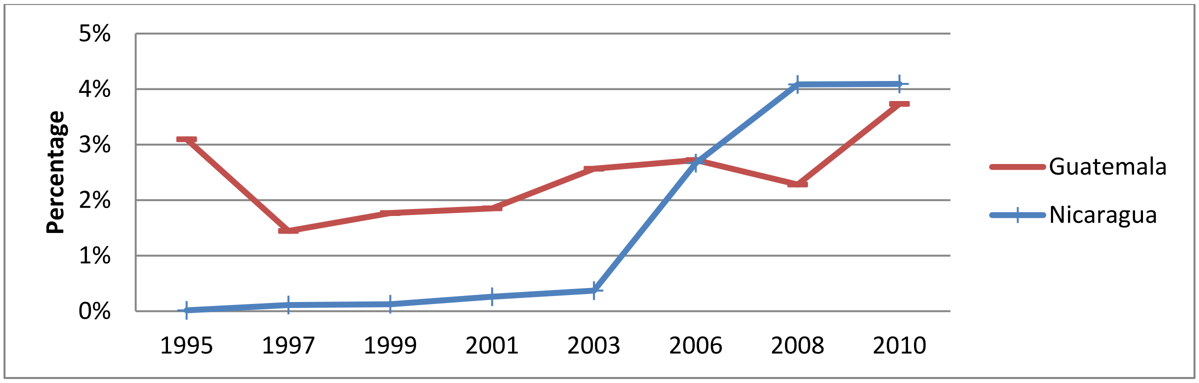


Figure 5.3 Market Share of Non-ITMF Countries Except Mexico from ITMF Report Years from 1995 to 2010

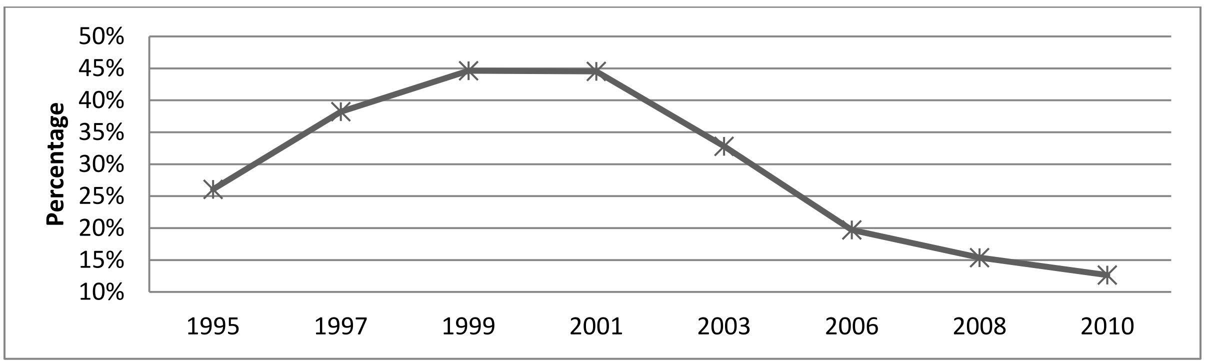


Figure 5.4 Market Share of Mexico from ITMF Report Years from 1995 to 2010

Figure 5.5 to Figure 5.10 show the comparison of the FOB values of OTEXA and the results of cost model for all ITMF countries, and Table 5.31 to Table 5.36 show actual corresponding values.

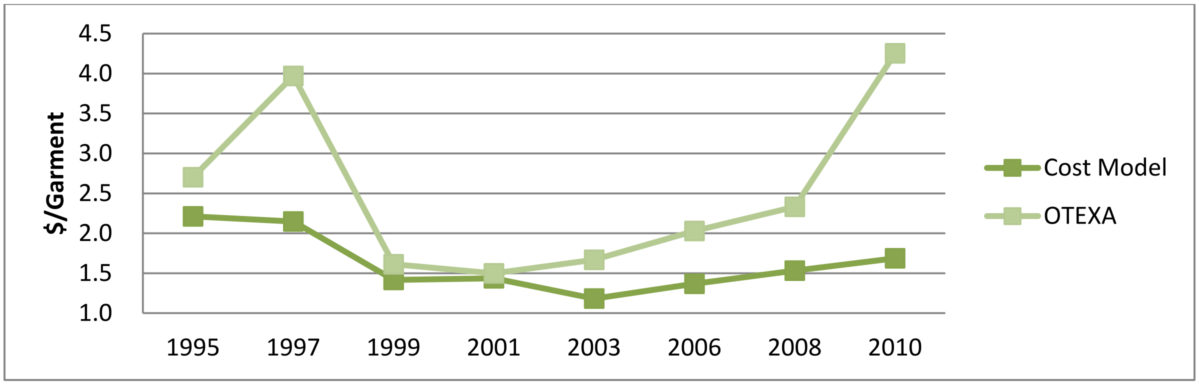


Figure 5.5 T-shirts FOB Value Comparison of OTEXA and Cost Model for Brazil

Table 5.31 T-shirts FOB Value Data of OTEXA and Cost Model for Brazil in $ Per Garment

Cost Model								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Brazil	2.21	2.15	1.42	1.44	1.18	1.37	1.53	1.69
OTEXA								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Brazil	2.70	3.97	1.61	1.50	1.67	2.03	2.33	4.25

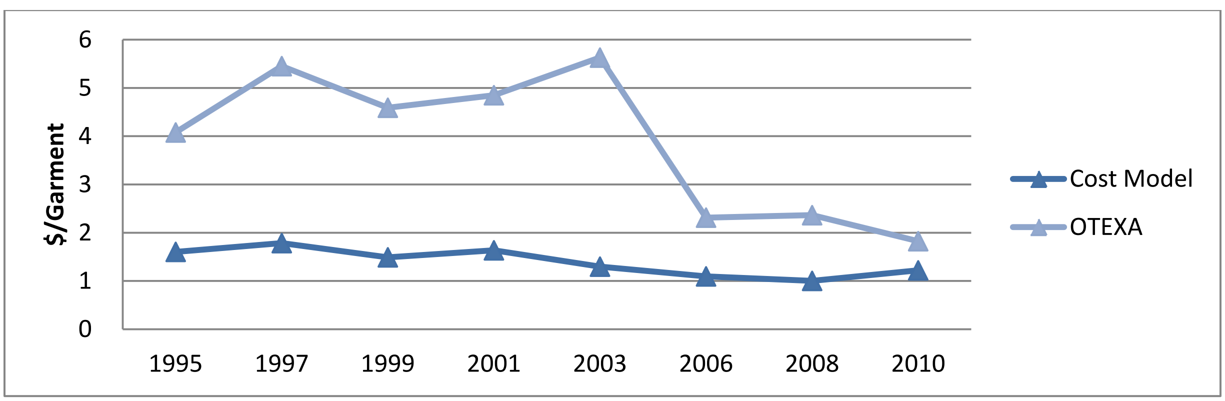


Figure 5.6 T-shirts FOB Value Comparison of OTEXA and Cost Model for India

Table 5.32 T-shirts FOB Value Data of OTEXA and Cost Model for India in $ Per Garment

Cost Model								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
India	1.60	1.79	1.49	1.64	1.30	1.10	1.00	1.22
OTEXA								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
India	4.08	5.45	4.59	4.85	5.63	2.31	2.36	1.83

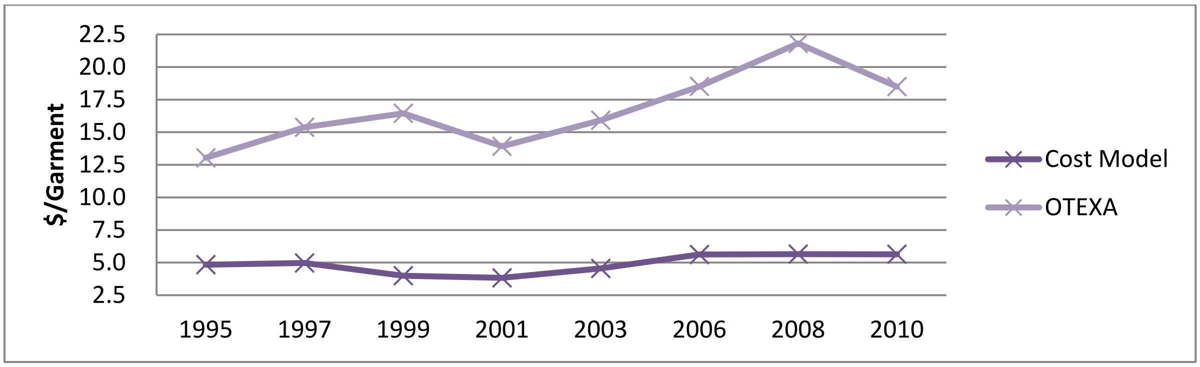


Figure 5.7 T-shirts FOB Value Comparison of OTEXA and Cost Model for Italy

Table 5.33 T-shirts FOB Value Data of OTEXA and Cost Model for Italy in $ Per Garment

Cost Model								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Italy	4.84	4.97	4.00	3.83	4.55	5.62	5.65	5.64
OTEXA								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Italy	13.03	15.38	16.45	13.92	15.92	18.51	21.80	18.49

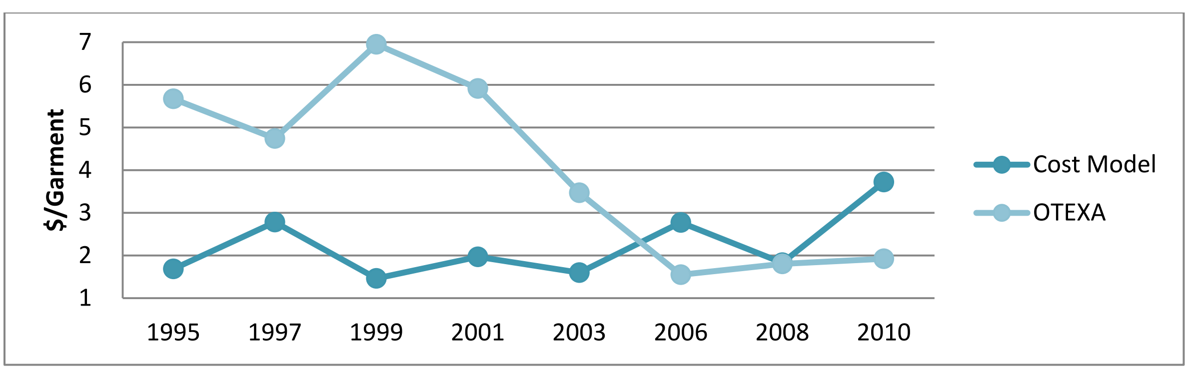


Figure 5.8 T-shirts FOB Value Comparison of OTEXA and Cost Model for Korea

Table 5.34 T-shirts FOB Value Data of OTEXA and Cost Model for Korea in $ Per Garment

Cost Model								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Korea	1.69	2.78	1.46	1.97	1.60	2.77	1.83	3.72
OTEXA								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Korea	13.03	15.38	16.45	13.92	15.92	18.51	21.80	18.49

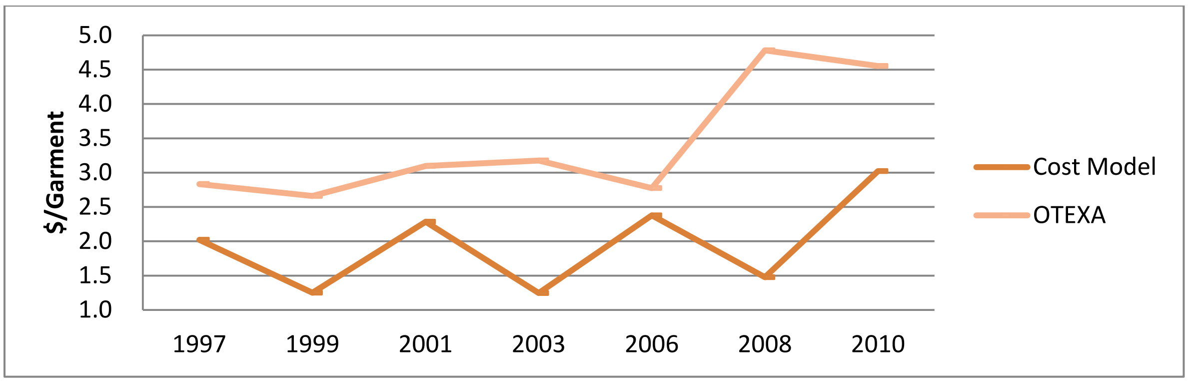


Figure 5.9 T-shirts FOB Value Comparison of OTEXA and Cost Model for Turkey

Table 5.35 T-shirts FOB Value Data of OTEXA and Cost Model for Turkey in $ Per Garment

Cost Model							
	1997	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Turkey	2.02	1.25	2.28	1.25	2.38	1.48	3.02
OTEXA							
	1997	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Turkey	2.83	2.66	3.10	3.18	2.78	4.78	4.55

Figure 5.10 T-shirts FOB Value Comparison of OTEXA and Cost Model for China

Table 5.36 T-shirts FOB Value Data of OTEXA and Cost Model for China in $ Per Garment

Cost Model				
	2003	**2006**	**2008**	**2010**
China	1.48	1.44	1.18	1.15
OTEXA				
	2003	**2006**	**2008**	**2010**
China	2.52	2.32	2.84	1.97

From Figure 5.5 and Table 5.31, the correspondence was not good for Brazil. The trends of OTEXA and cost model were different. As seen in Figure 5.6 and Table 5.32, the correspondence of the FOB value of the cost model and OTEXA for India was not great. The difference between the FOB value of OTEXA and the results of the cost model fluctuated between $3 and $4 from 1995 to 2003. In 2006, the FOB value of OTEXA and the results of the cost model became close, and in 2010, the difference was only $0.6. The correspondence of the cost model and the FOB value of OTEXA for Italy is not good as seen in Figure 5.7 and Table 5.33. The FOB value of OTEXA for Italy was over $10, higher than other ITMF countries. The high FOB value of OTEXA indicates that Italy probably provided higher quality products or products with higher fashion content. For Korea, it seems that there is not any correspondence between the cost model and the OTEXA data as seen in Figure 5.8 and Table 5.34. Similar to Korea, there was not much correspondence between the cost model and the OTEXA data for Turkey as seen in Figure 5.9 and Table 5.35. In general, the correspondence of the cost model and the OTEXA data for China is better than the other ITMF countries. The markup percentage was about 70% in 2003 and 2010, and 61% in 2006. In 2008, the difference between cost model and OTEXA was $1.66, and the markup percentage was 140.67%.

Figure 5.11 to Figure 5.13 show the comparison of the FOB value of the cost model and the OTEXA data for non-ITMF countries, and Table 5.37 to Table 5.39 show the corresponding values.

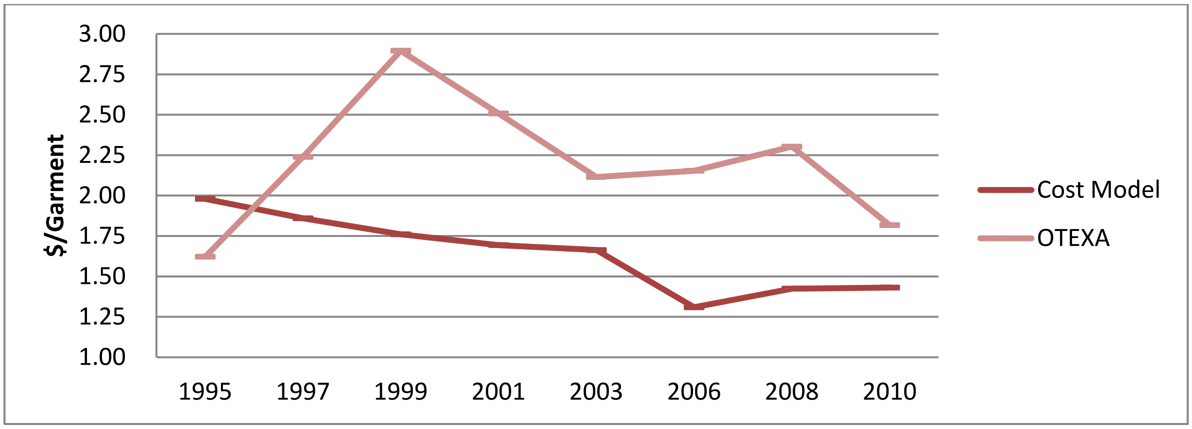


Figure 5.11 T-shirts FOB Value Comparison of OTEXA and Cost Model for Guatemala

Table 5.37 T-shirts FOB Value Data of OTEXA and Cost Model for Guatemala in $ Per Garment

Cost Model								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Guatemala	1.98	1.86	1.76	1.69	1.66	1.31	1.42	1.43
OTEXA								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Guatemala	1.62	2.24	2.90	2.51	2.11	2.15	2.30	1.82

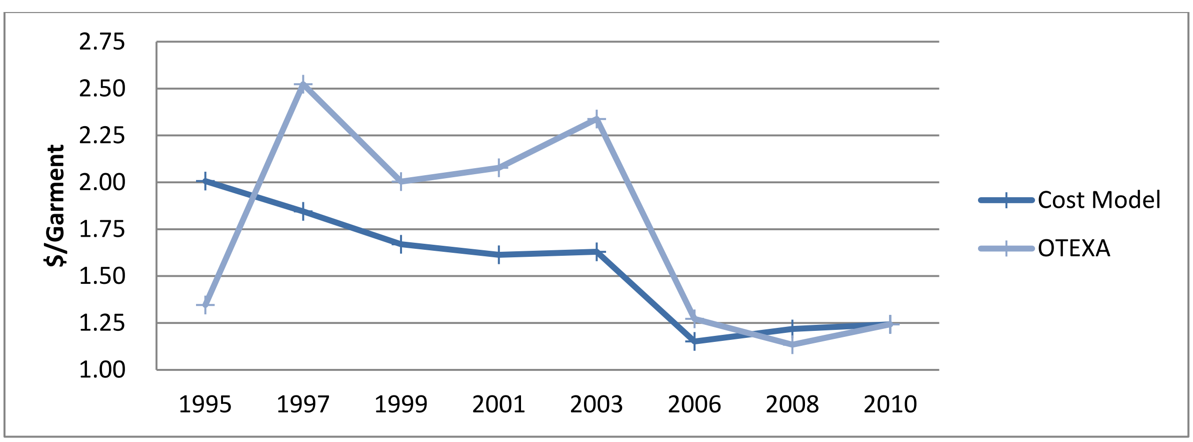


Figure 5.12 T-shirts FOB Value Comparison of OTEXA and Cost Model for Nicaragua

Table 5.38 T-shirts FOB Value Data of OTEXA and Cost Model for Nicaragua in $ Per Garment

Cost Model								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Nicaragua	2.01	1.85	1.67	1.61	1.63	1.15	1.22	1.24
OTEXA								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Nicaragua	1.35	2.52	2.00	2.08	2.34	1.27	1.13	1.24

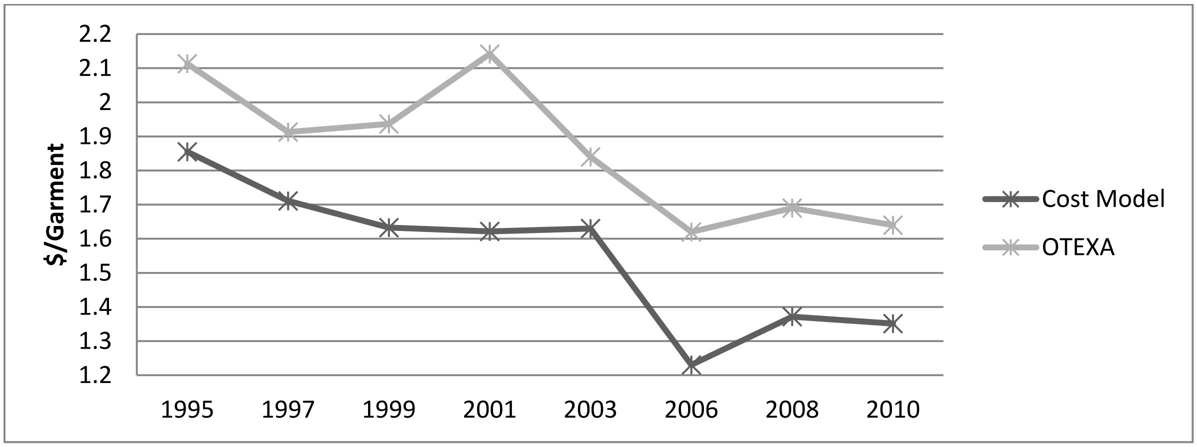


Figure 5.13 T-shirts FOB Value Comparison of OTEXA and Cost Model for Mexico

Table 5.39 T-shirts FOB Value Data of OTEXA and Cost Model for Mexico in $ Per Garment

Cost Model								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Mexico	1.85	1.71	1.63	1.62	1.63	1.23	1.37	1.35
OTEXA								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Mexico	2.11	1.91	1.94	2.14	1.84	1.62	1.69	1.64

Guatemala had little correspondence between the cost model and the OTEXA data as seen in Figure 5.11 and Table 5.37. From Figure 5.12 and Table 5.38, the correspondence between the cost model and the OTEXA data of Nicaragua was not good. However in 2010, the FOB value of OTEXA and result of cost model was the same as $1.24. Overall, Mexico had a good correspondence between the FOB value of OTEXA and the result of the cost model from 1995 to 2010. The difference between the cost model and the OTEXA data fluctuated between $0.20 and $0.32 from 1995 to 2010 except the difference was $0.52 in 2001 and $0.39 in 2006. The lowest markup percentage was 11.80% in 1997, and the highest markup percentage was 32.06% in 2001.

5.2.2 Comparison of FOB Values for Denim Jeans

Figure 5.14 and Figure 5.15 show the denim jeans import market share for all ITMF countries considered in this analysis for ITMF report years from 1995 to 2010. Figure 5.16 and Figure 5.17 show the denim jeans import market share of non-ITMF countries for ITMF report year from 1995 to 2010.

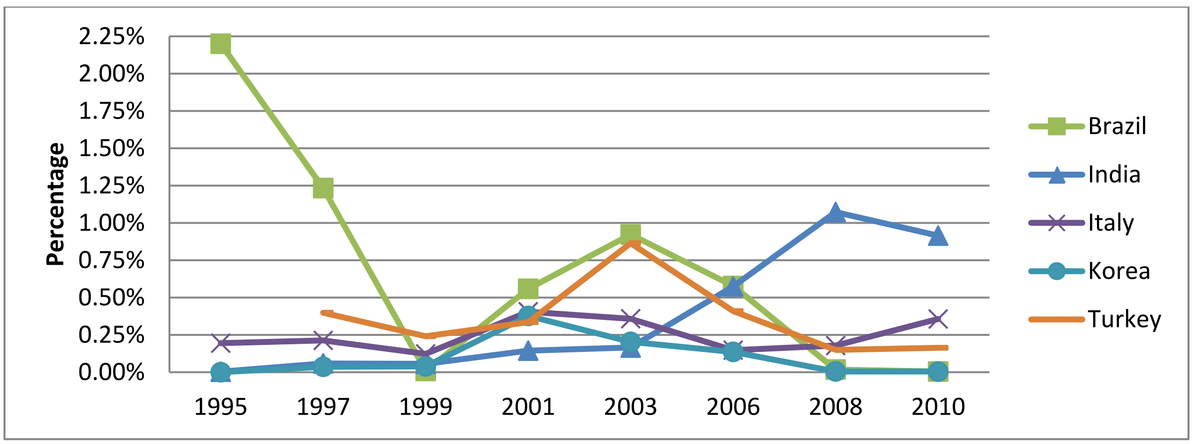


Figure 5.14 Denim Jeans Import Market Share of ITMF Countries Except China of ITMF Report Years from 1995 to 2010

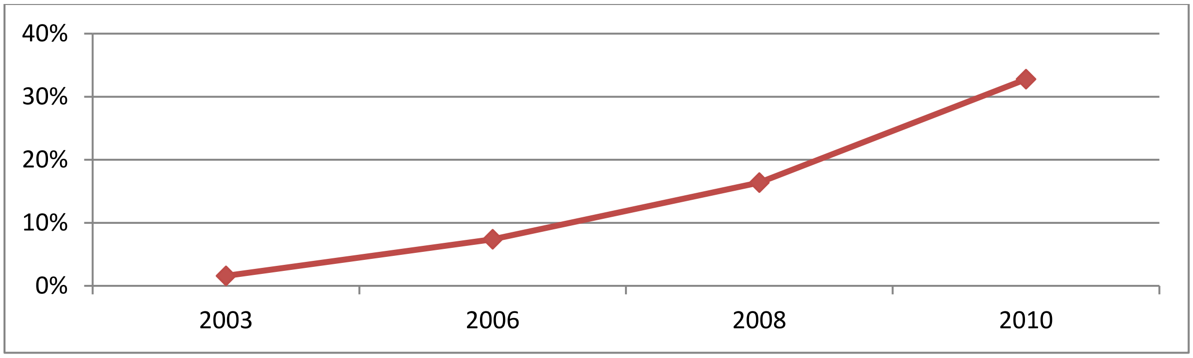


Figure 5.15 Denim Jeans Import Market Share of China from ITMF Report Years from 1995 to 2010

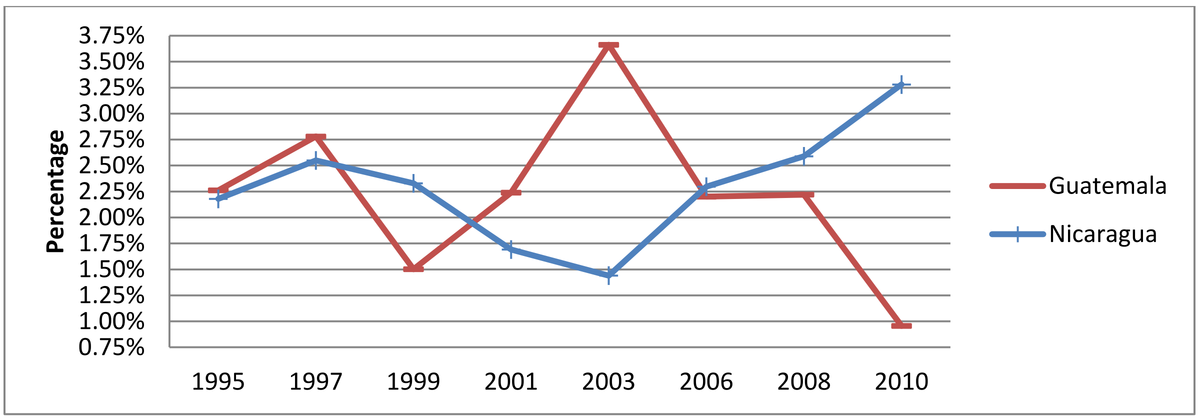


Figure 5.16 Denim Jeans Import Market Share of Non-ITMF Countries Except Mexico from ITMF Report Years from 1995 to 2010

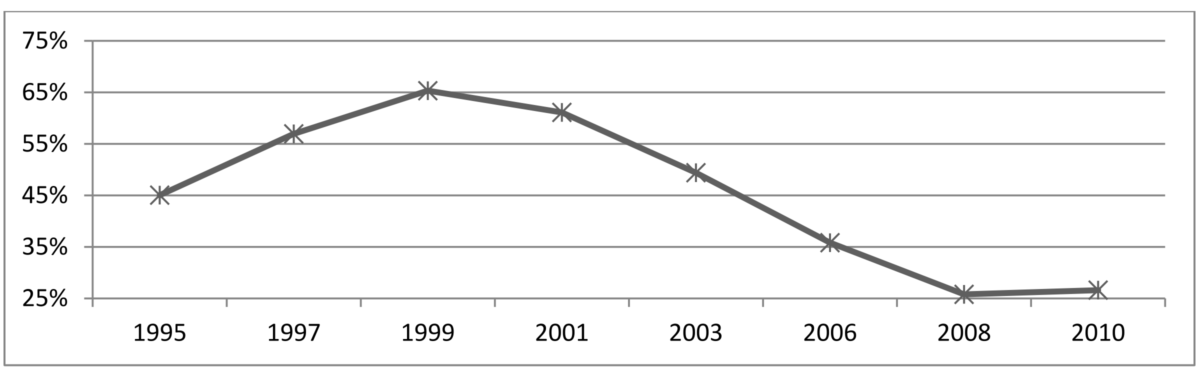


Figure 5.17 Denim Jeans Import Market Share of Mexico from ITMF Report Years from 1995 to 2010

The denim jeans import market share of ITMF countries except China was small under 2.25%. China had an increasing trend of denim jeans import market share, which reached 32.78% in 2010. The denim jeans import market share of non-ITMF countries except Mexico fluctuated between 0.75% and 3.75% from 1995 to 2010. The market share of Mexico stayed above 25% from 1995 to 2010, and in 1999 the market share of Mexico reached 65%.

Figure 5.18 to Figure 5.23 show denim jeans FOB value comparison of OTEXA and the cost model for ITMF countries, and Table 5.40 to Table 5.45 show the corresponding data.

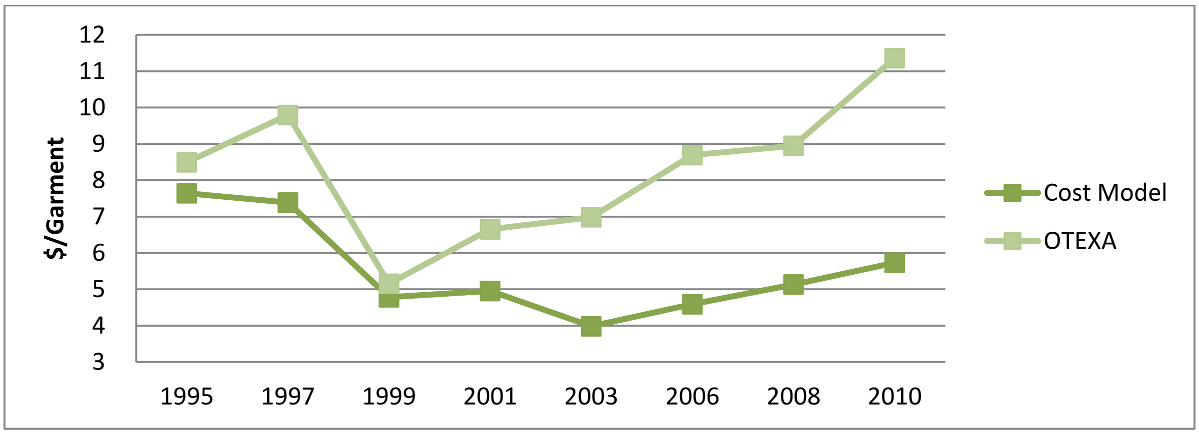


Figure 5.18 Denim Jeans FOB Value Comparison of OTEXA and Cost Model for Brazil

Table 5.40 Denim Jeans FOB Value Data of OTEXA and Cost Model for Brazil in $ Per Garment

Cost Model								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Brazil	7.64	7.39	4.78	4.95	3.98	4.59	5.13	5.73
OTEXA								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Brazil	8.49	9.79	5.15	6.65	6.98	8.69	8.95	11.36

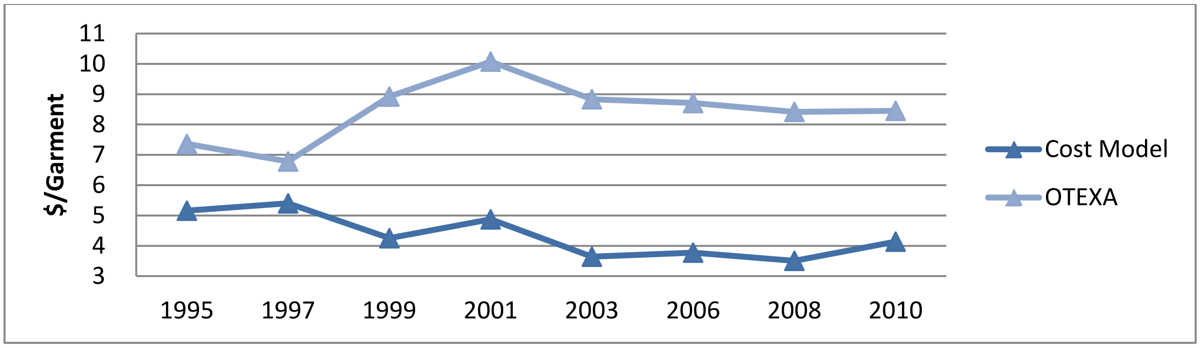


Figure 5.19 Denim Jeans FOB Value Comparison of OTEXA and Cost Model for India

Table 5.41 Denim Jeans FOB Value Data of OTEXA and Cost Model for India in $ Per Garment

				Cost Model				
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
India	5.16	5.40	4.25	4.87	3.64	3.78	3.51	4.14
				OTEXA				
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
India	7.36	6.78	8.92	10.08	8.83	8.71	8.42	8.45

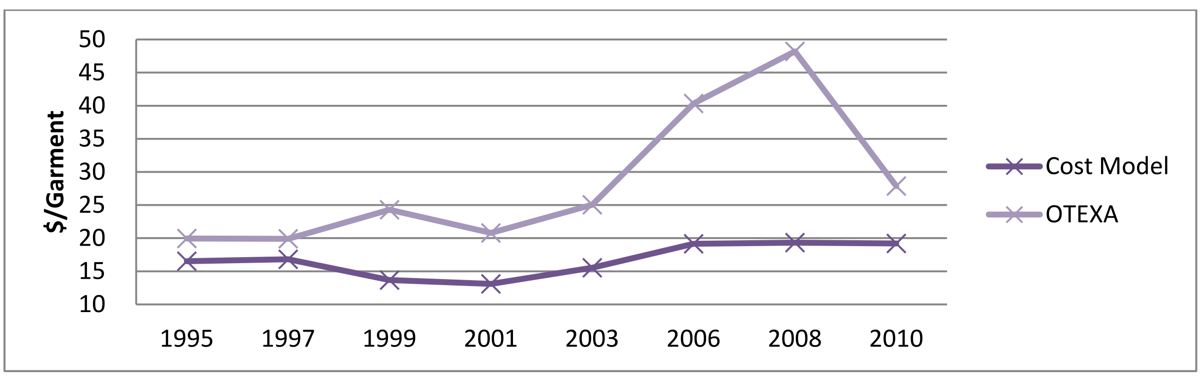


Figure 5.20 Denim Jeans FOB Value Comparison of OTEXA and Cost Model for Italy

Table 5.42 Denim Jeans FOB Value Data of OTEXA and Cost Model for Italy in $ Per Garment

				Cost Model				
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Italy	16.52	16.80	13.67	13.10	15.53	19.15	19.33	19.20
				OTEXA				
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Italy	19.95	19.91	24.29	20.79	25.04	40.33	48.20	27.87

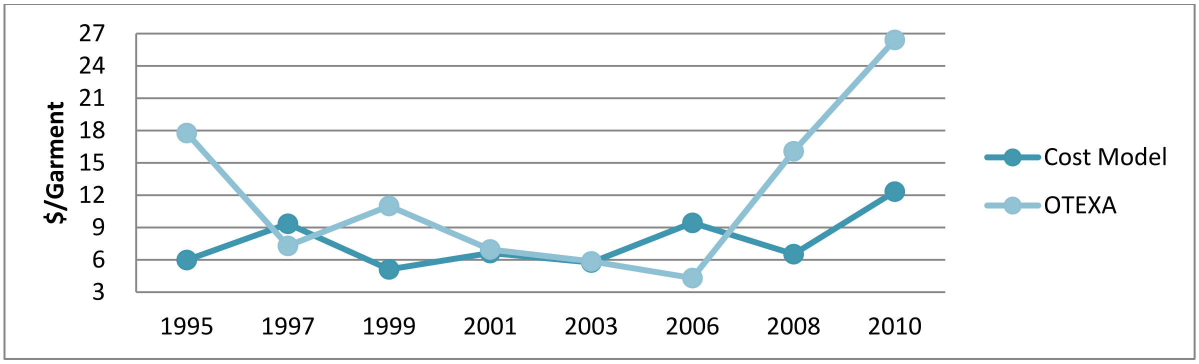


Figure 5.21 Denim Jeans FOB Value Comparison of OTEXA and Cost Model for Korea

Table 5.43 Denim Jeans FOB Value Data of OTEXA and Cost Model for Korea in $ Per Garment

Cost Model								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Korea	5.98	9.35	5.11	6.63	5.75	9.43	6.53	12.33
OTEXA								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Korea	17.77	7.30	11.00	6.96	5.86	4.31	16.08	26.41

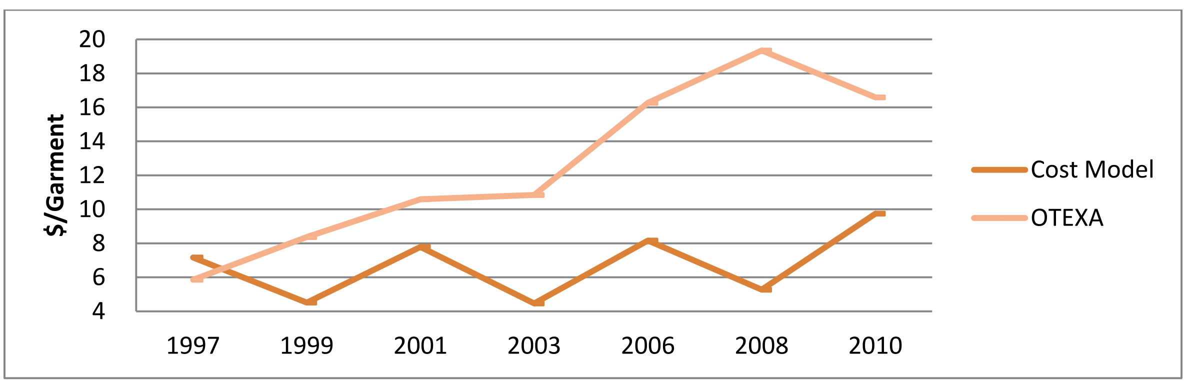


Figure 5.22 Denim Jeans Data Comparison of OTEXA and Cost Model for Turkey

Table 5.44 Denim Jeans FOB Value Data of OTEXA and Cost Model for Turkey in $ Per Garment

Cost Model							
	1997	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Turkey	7.17	4.52	7.79	4.46	8.17	5.27	9.75
OTEXA							
	1997	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Turkey	5.86	8.37	10.59	10.84	16.27	19.34	16.59

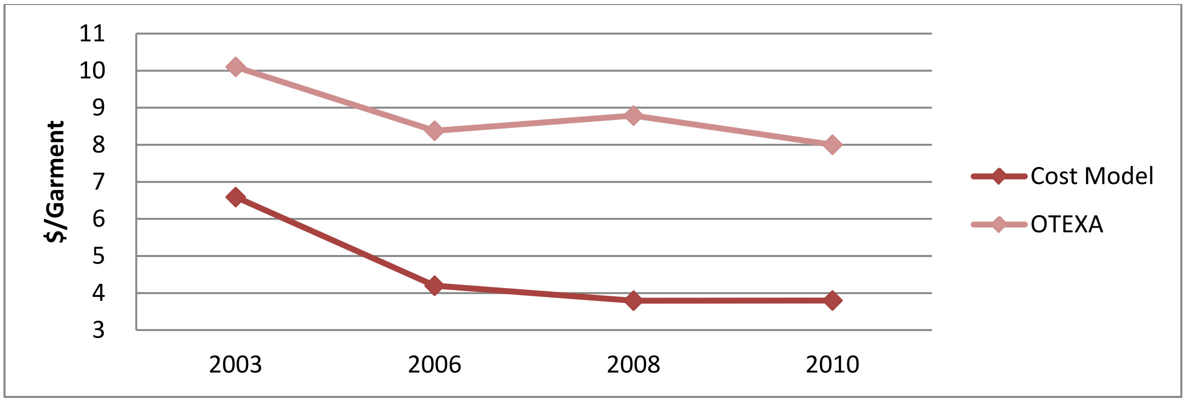


Figure 5.23 Denim Jeans FOB Value Comparison of OTEXA and Cost Model for China

Table 5.45 Denim Jeans FOB Value Data of OTEXA and Cost Model for China in $ Per Garment

Cost Model				
	2003	**2006**	**2008**	**2010**
China	6.59	4.20	3.79	3.80
OTEXA				
	2003	**2006**	**2008**	**2010**
China	10.10	8.38	8.79	8.00

From Figure 5.18 and Table 5.40, the correspondence of the cost model and the OTEXA data of Brazil was not good. As seen in Figure 5.19 and Table 5.41, the correspondence of the cost model and the OTEXA data of India was not great before 1999, and the correspondence from 1999 to 2010 was better. From 1999-2010, the difference between the cost model and the OTEXA data fluctuated between $4.21 and $5.31, and the percent markup fluctuated between 104% and 142%. From looking at the FOB value of OTEXA in Figure 5.20 and Table 5.42, it seems that Italy is producing higher quality products or higher fashion products, similar to T-shirts. Korea and Turkey did not have much correspondence between the cost model and the OTEXA data from 1995 to 2010 as indicated in Figure 5.21, Figure 5.22, Table 5.43 and Table 5.44. China had good overall correspondence between the cost model and the OTEXA as seen in Figure 5.23 and Table 5.45. The markup percentage of 2003 and 2010 was about 70%, and in 2006 the markup percentage is 60.88%.

Figure 5.24 to Figure 5.26 show denim jeans FOB value comparison of the cost model and the OTEXA data for non-ITMF countries from 1995 to 2010, and Table 5.46 to Table 5.48 show the corresponding values.

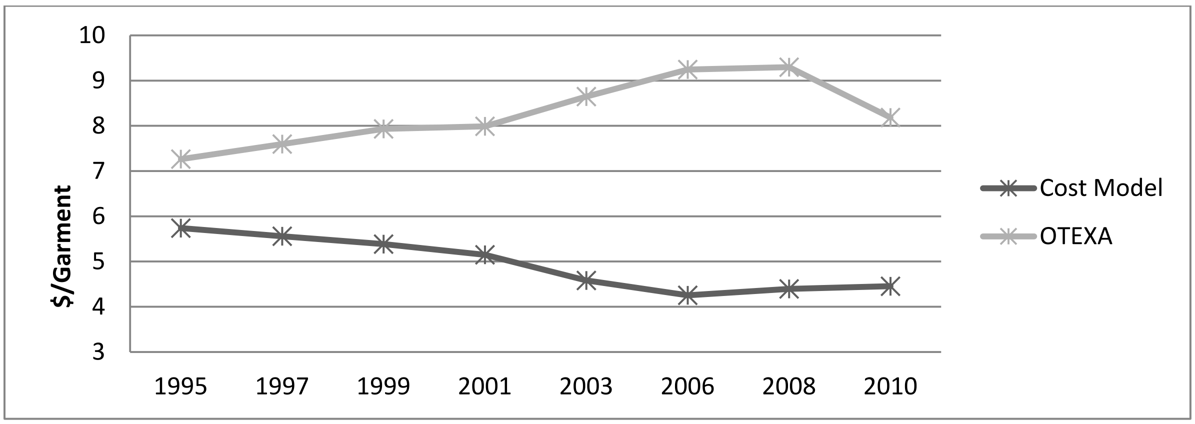


Figure 5.24 Denim Jeans Data Comparison of OTEXA and Cost Model for Mexico

Table 5.46 Denim Jeans FOB Value Data of OTEXA and Cost Model for Mexico in $ Per Garment

Cost Model								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Mexico	5.74	5.56	5.39	5.15	4.58	4.25	4.40	4.45
OTEXA								
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Mexico	7.27	7.60	7.93	7.99	8.65	9.25	9.30	8.18

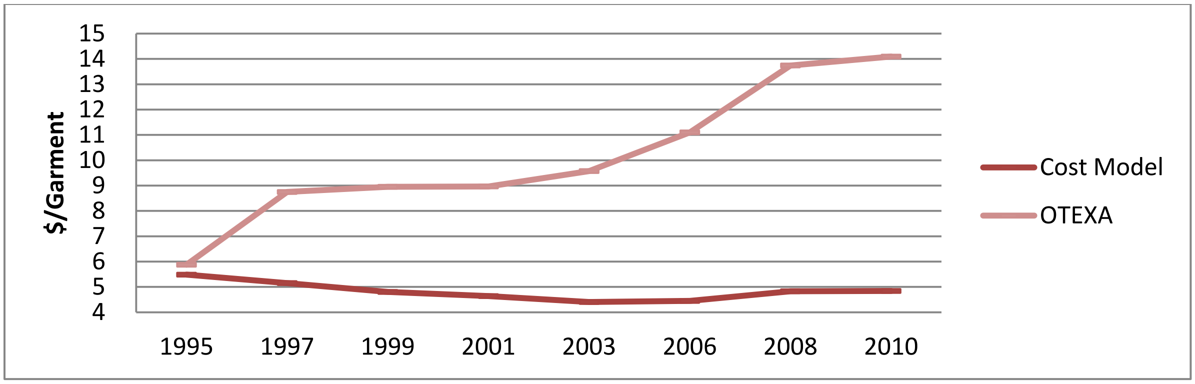


Figure 5.25 Denim Jeans Data Comparison of OTEXA and Cost Model for Guatemala

Table 5.47 Denim Jeans FOB Value Data of OTEXA and Cost Model for Guatemala in $ Per Garment

				Cost Model				
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Guatemala	5.48	5.15	4.80	4.64	4.40	4.45	4.83	4.84
				OTEXA				
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Guatemala	6.90	8.75	8.95	8.97	9.57	11.10	13.74	14.09

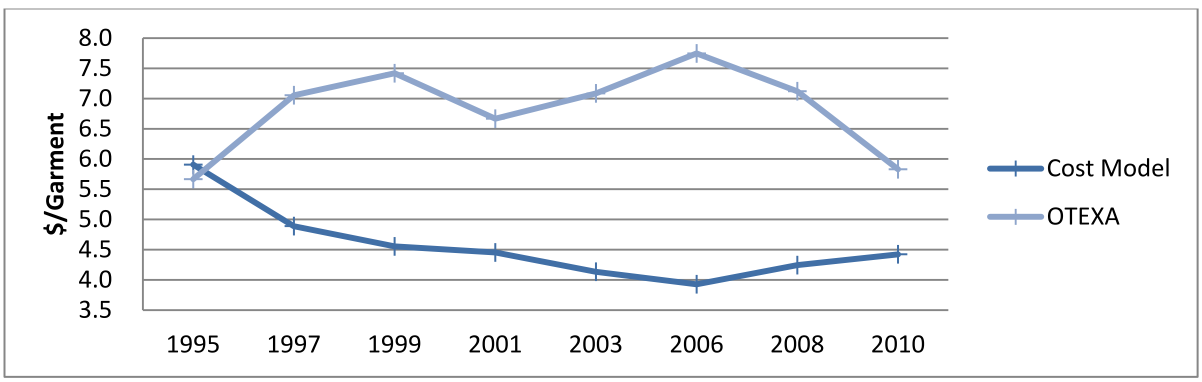


Figure 5.26 Denim Jeans Data Comparison of OTEXA and Cost Model for Nicaragua

Table 5.48 Denim Jeans FOB Value Data of OTEXA and Cost Model for Nicaragua in $ Per Garment

				Cost Model				
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Nicaragua	5.91	4.89	4.55	4.45	4.13	3.93	4.24	4.42
				OTEXA				
	1995	**1997**	**1999**	**2001**	**2003**	**2006**	**2008**	**2010**
Nicaragua	5.90	7.05	7.42	6.67	7.09	7.75	7.12	5.83

Mexico, Guatemala, and Nicaragua did not have good correspondence between the cost model and the OTEXA data. The markup percentage of Mexico increased from 26.6% in 1995 to 88.75% in 2003. The markup percentage of Guatemala and Nicaragua fluctuated significantly.

From the above sections, the overall correspondence of the ITMF countries and the non-ITMF countries is not great. In the T-shirt part, Mexico had a good correspondence between the cost model and the OTEXA data, in which Mexico had over 10% of the market share. In the denim jeans part, China had a good correspondence between the cost model and the OTEXA data in which China had and increasing market share that was 32.78% in 2010. It seems that countries with higher market share could have a better correspondence between the cost model and the OTEXA data. However, although Mexico had a really large denim jeans market share, the correspondence of the values for Mexico in jeans was not good.

Lack of correspondence between the cost model and the OTEXA data could be the result of the large number of assumptions that were made, particularly with some costs and parameters not varying with time. These assumptions could have a large impact on calculating the FOB value. For example, the cost of trims was a big part in the total FOB value which was $0.2596 for T-shirts and $1.3795 for denim jeans. As this study assumes that the trim costs were the same for all years, the total FOB value was not affected by trim costs changes over time. Because the trim costs for 2008 were used for all years, the calculated FOB cost might overestimate the true cost for years prior to 2008.

6 CONCLUSIONS AND FUTURE RESEARCH

6.1 Conclusions

This study examined the impact of costs on making sourcing decisions for knit T-shirts and denim jeans and compared the results of Fiallos' cost model to the FOB value of OTEXA. Sourcing decisions for T-shirts seems to be significantly affected by total landed cost. The U.S. T-shirt import market was dominated by the top six major import players. The total market share of the top 6 major players was over 50% in all years except 1991, 1992 and 2005. The correlation between import quantities and the total landed cost was significant. Almost all countries that were in both the top 6 import countries and the top 6 least expensive countries were countries in the Western hemisphere. When compared to countries in Western hemisphere, Asian countries sometimes had competitive FOB values. For example, Pakistan was competitive from 1991 to 1992, and 2006 to 2010. As seen from import quantities and total landed cost, companies tend to source from low cost countries with sufficient capacity that are not too unstable.

For denim jeans imports, the total landed cost does not seem to be as significant of a factor in making sourcing decisions, as in T-shirts. The U.S. denim jeans import market was also dominated by the top 6 import countries, especially Mexico. Mexico dominated over half of the denim jeans import market from 1997 to 2002. The total market share of the top 6 import players was over 60% from 1991 to 2011. The correlation between import quantities and the total landed cost was not really significant as it fluctuated between -0.0339 and -0.1421. There are five countries in the Western hemisphere and four Asian countries that are in both the top 6 import countries and the top 6 least expensive countries. Imports from Costa

Rica seem to be significantly affected by the total landed cost. Looking at all top 6 import countries, Hong Kong was the one which seems to be least affected by the total landed cost.

When comparing the estimated FOB value of the cost model and the real FOB value of OTEXA, the correspondence between the cost model and the OTEXA data was not good for most ITMF countries and most non-ITMF countries. It seems that countries with a larger market share had better correspondence than countries with a smaller market share. There were lots of assumptions that were made for calculation. The trim cost assumptions had a significant effect on the total FOB value. Also the company margins and some overhead were not accounted for in the cost model.

6.2 Limitations

This study was limited by several things. First, the choice of countries was restricted by the countries in the ITMF reports. The ITMF reports did not provide manufacturing information for major T-shirts and denim jeans import players, with the exception of China. Second, there was not as much trade data for exports as there were for imports, which made getting transportation cost for exports difficult. Third, lack of product mixture information for import countries made drawing conclusions more difficult. Some countries might export more fashion products to the U.S., and some countries might export more high quality products into the U.S.

6.3 Future Work

There are lots of further studies that could be conducted based on this study. Future research could include the following:

1. Differences in import quantities and costs between men's, women's, and children's T-shirt and denim jeans imports could be analyzed by looking at separate HTS code.

2. Tariff rate quotas and trade preference levels could also be taken into consideration.

3. Cost estimates could be evaluated, particularly trims.

4.Manufacturing data estimates could be evaluated, such as manufacturing output, productivity, and consumption, by communicating with manufacturers in the textile and apparel industry.

5. More countries and more apparel products could be analyzed.

6. More factors for making sourcing decisions, such as lead time, could be examined.

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APPENDIX

Appendix A

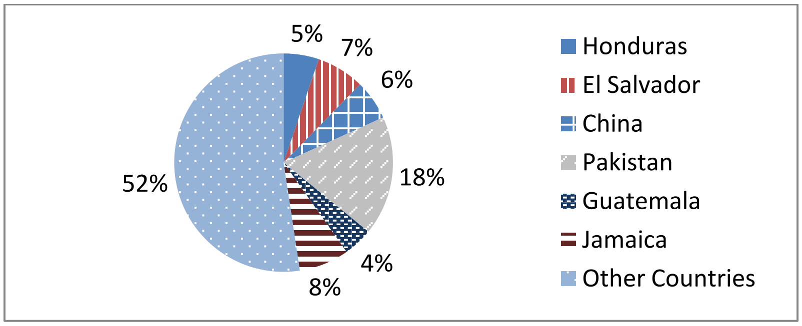

Figure A.1 Market Share of Top Six Knit T-shirt Import Countries for 1992

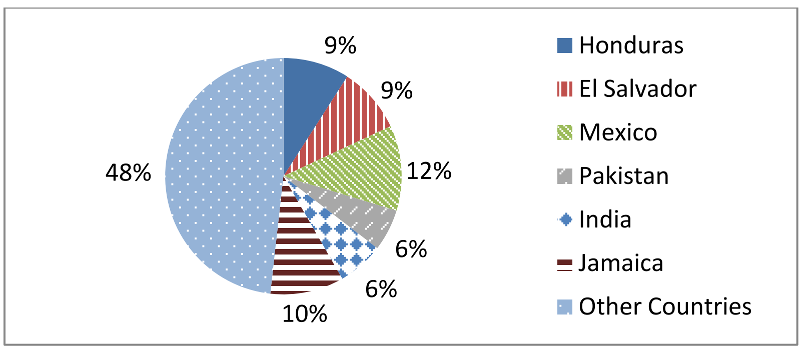

Figure A.2 Market Share of Top Six Knit T-shirt Import Countries for 1993

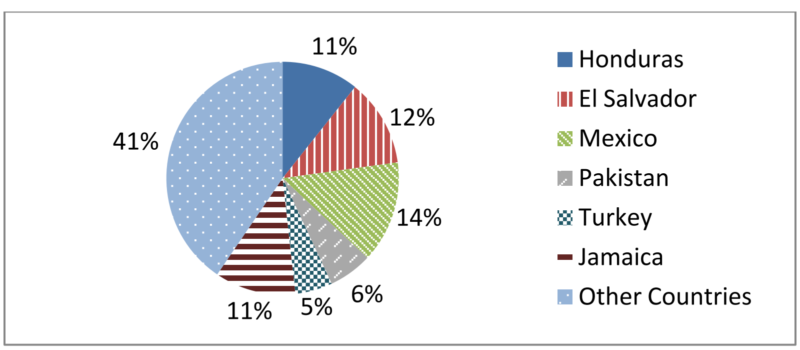

Figure A.3 Market Share of Top Six Knit T-shirt Import Countries for 1994

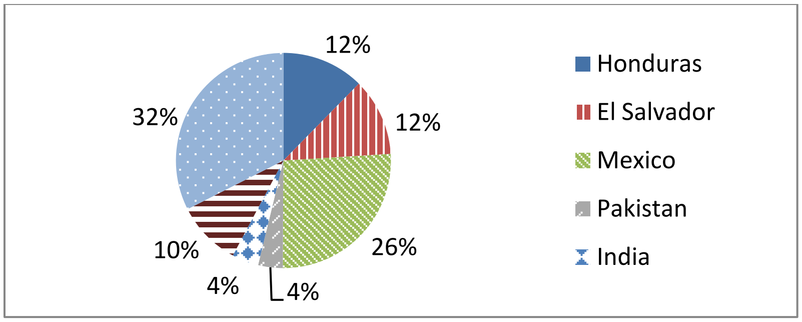

Figure A.4 Market Share of Top Six Knit T-shirt Import Countries for 1995

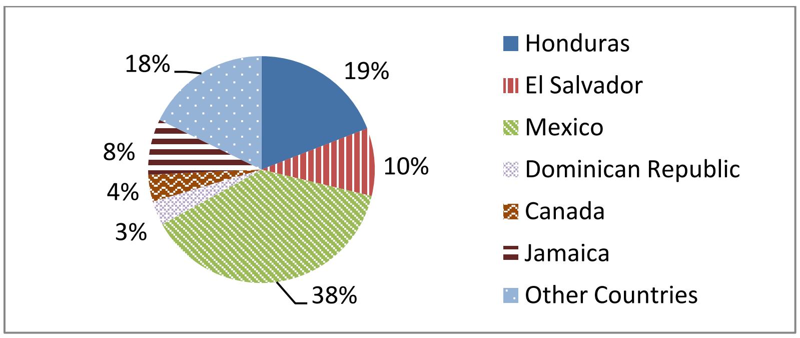

Figure A.5 Market Share of Top Six Knit T-shirt Import Countries for 1997

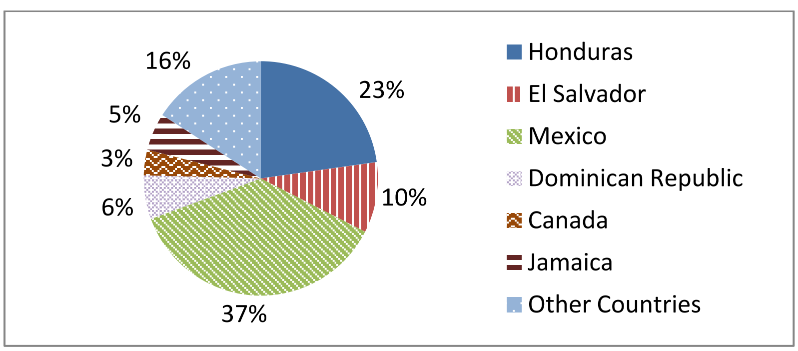

Figure A.6 Market Share of Top Six Knit T-shirt Import Countries for 1998

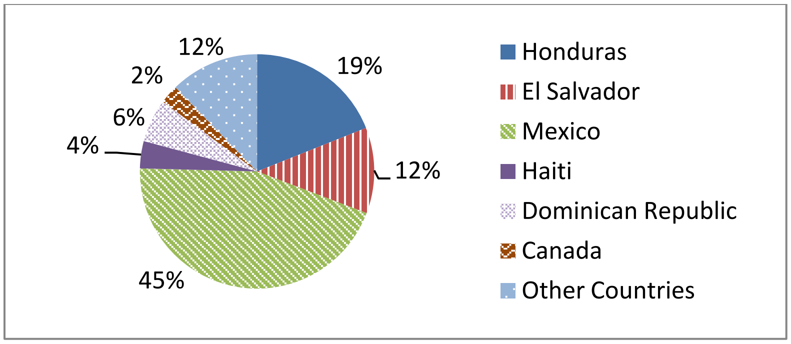

Figure A.7 Market Share of Top Six Knit T-shirt Import Countries for 1999

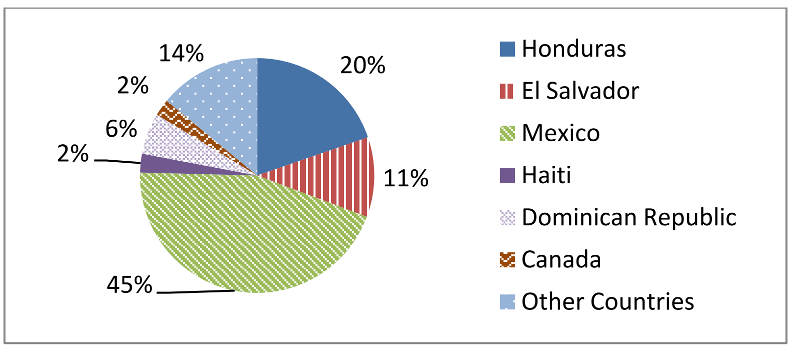

Figure A.8 Market Share of Top Six Knit T-shirt Import Countries for 2000

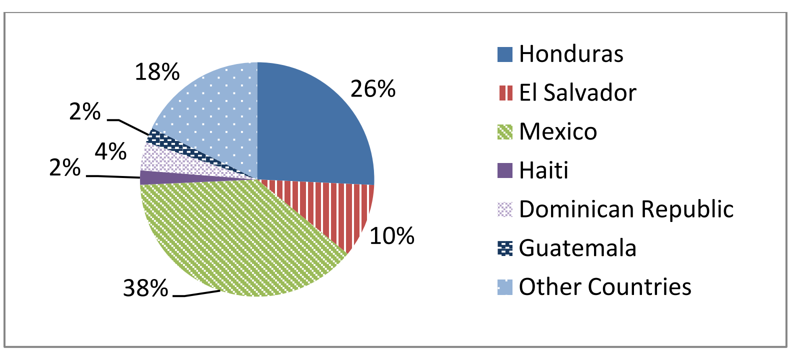

Figure A.9 Market Share of Top Six Knit T-shirt Import Countries for 2002

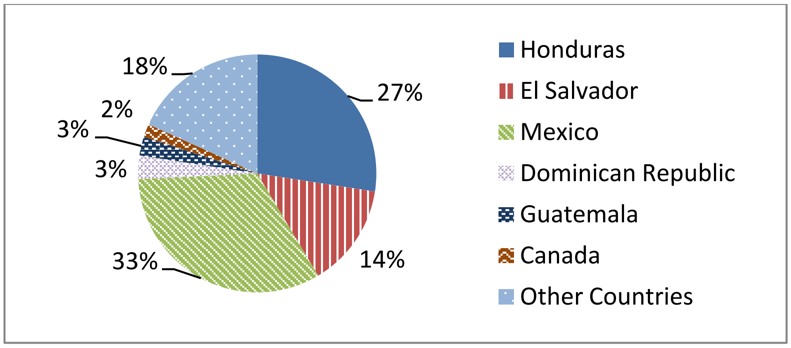

Figure A.10 Market Share of Top Six Knit T-shirt Import Countries for 2003

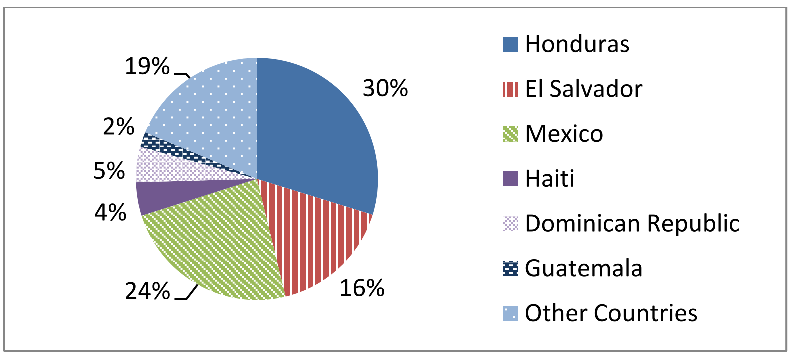

Figure A.11 Market Share of Top Six Knit T-shirt Import Countries for 2004

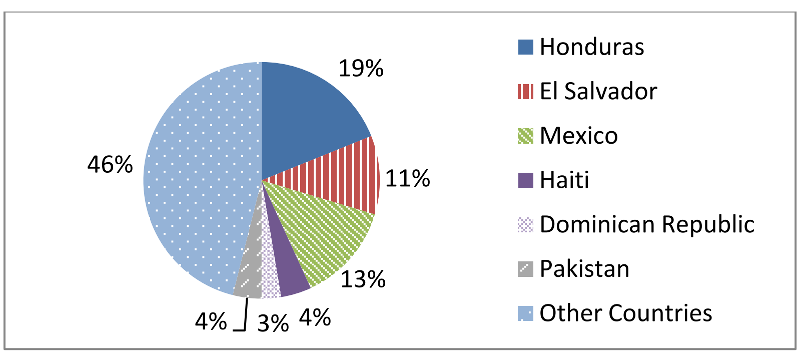

Figure A.12 Market Share of Top Six Knit T-shirt Import Countries for 2005

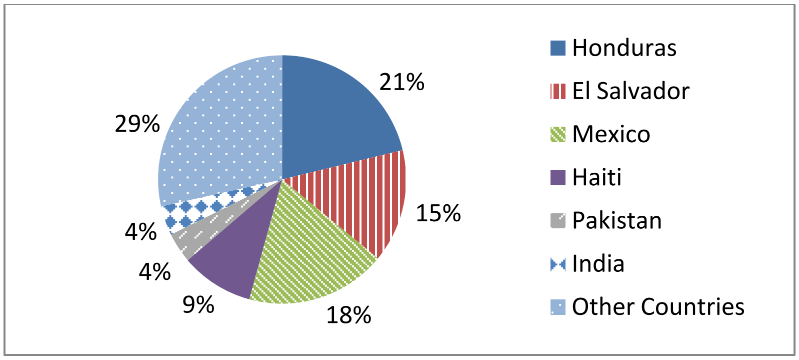

Figure A.13 Market Share of Top Six Knit T-shirt Import Countries for 2007

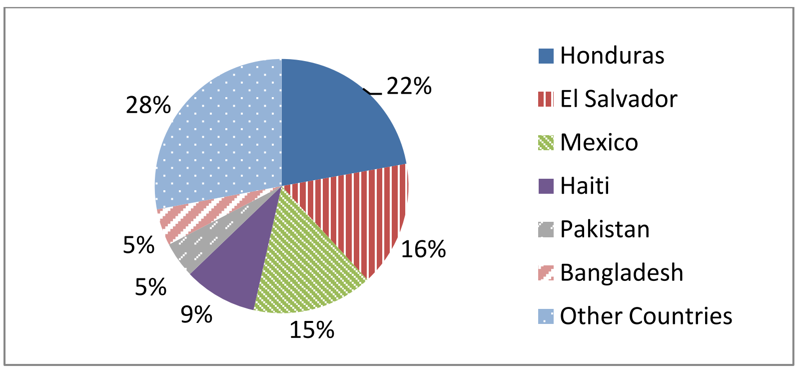

Figure A.14 Market Share of Top Six Knit T-shirt Import Countries for 2008

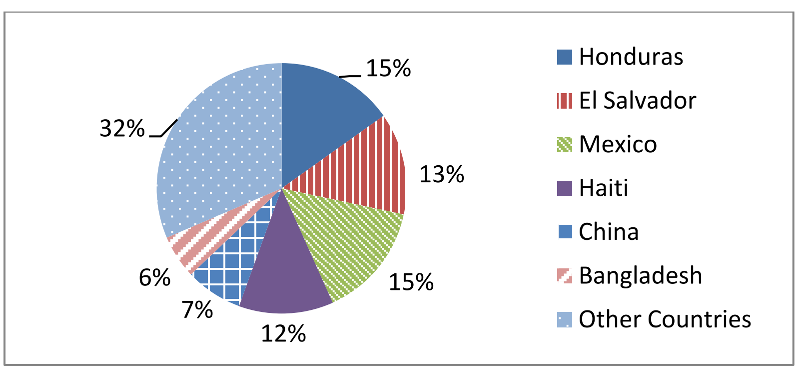

Figure A.15 Market Share of Top Six Knit T-shirt Import Countries for 2009

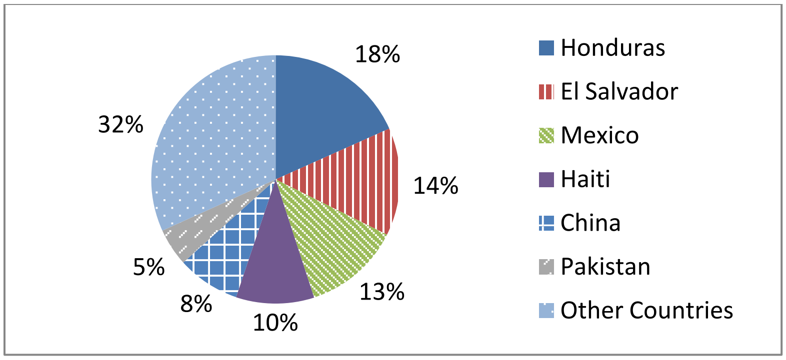

Figure A.16 Market Share of Top Six Knit T-shirt Import Countries for 2010

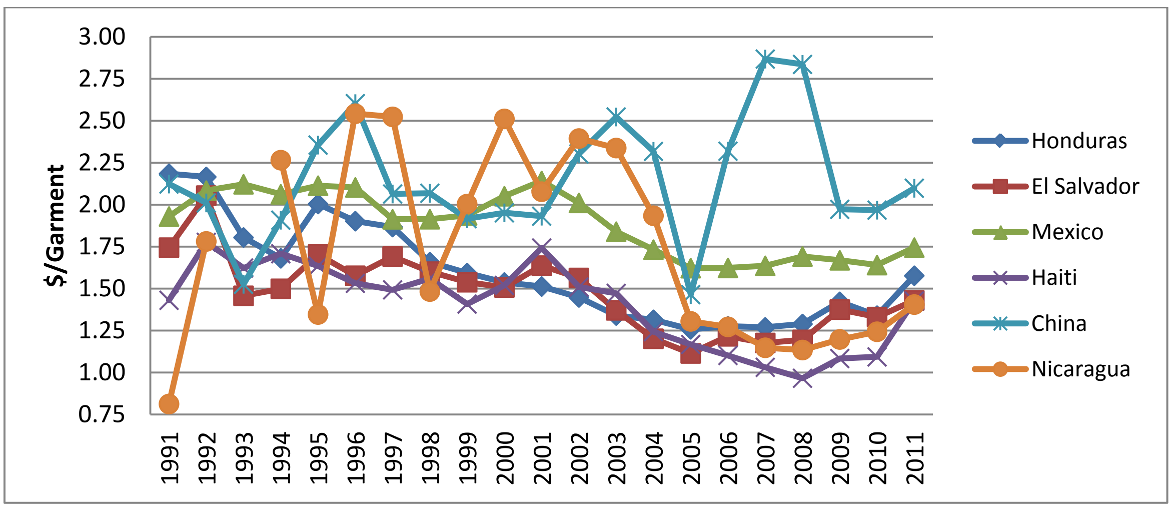

Figure A.17 T-shirt Value in $ Per Garment of Top 6 T-shirt Import Countries in 2011

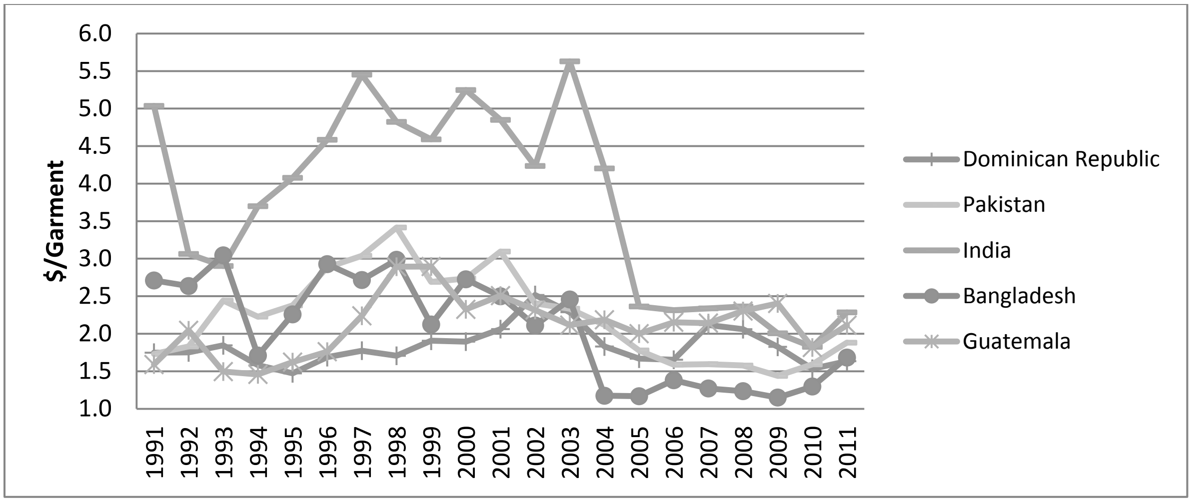

Figure A.18 T-shirt Value of Middle 6 T-shirt Import Countries in 2011 of 15 Countries Considered in the Analysis

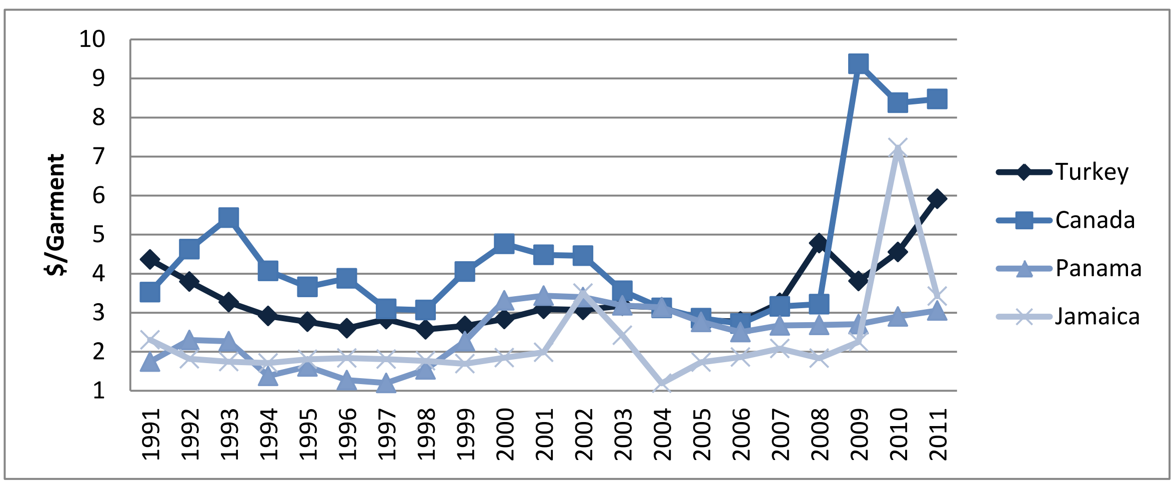

Figure A.19 T-shirt Value of Remaining 4 T-shirt Import Countries in 2011 of 15 Countries Considered in this Analysis

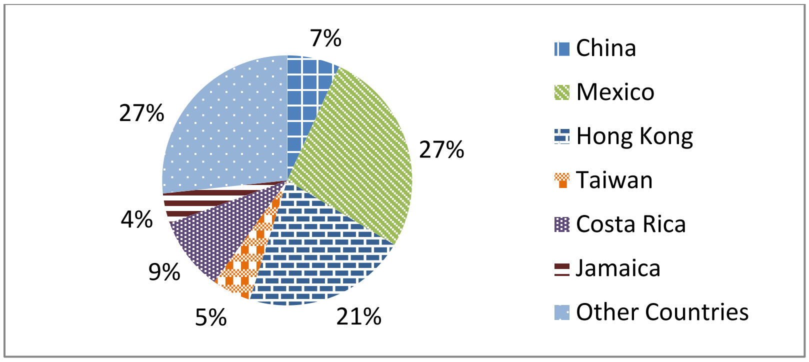

Figure A.20 Market Share of Top Six Denim Jeans Import Countries for 1992

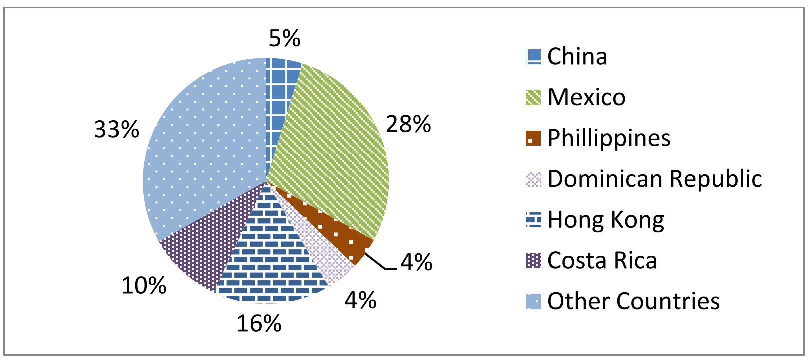

Figure A.21 Market Share of Top Six Denim Jeans Import Countries for 1993

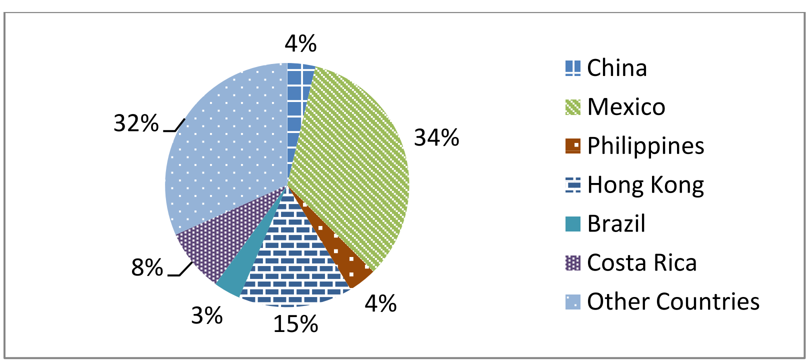

Figure A.22 Market Share of Top Six Denim Jeans Import Countries for 1994

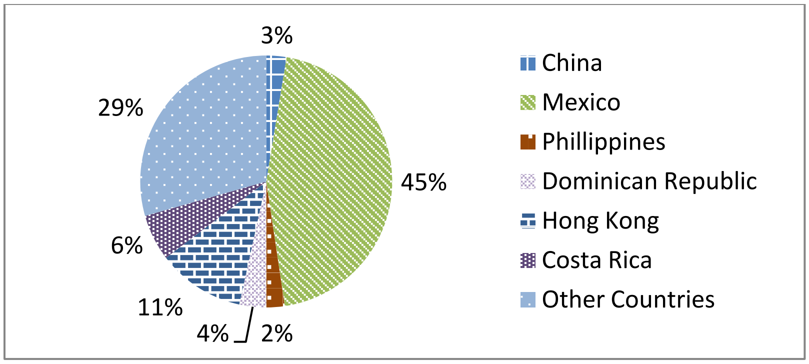

Figure A.23 Market Share of Top Six Denim Jeans Import Countries for 1995

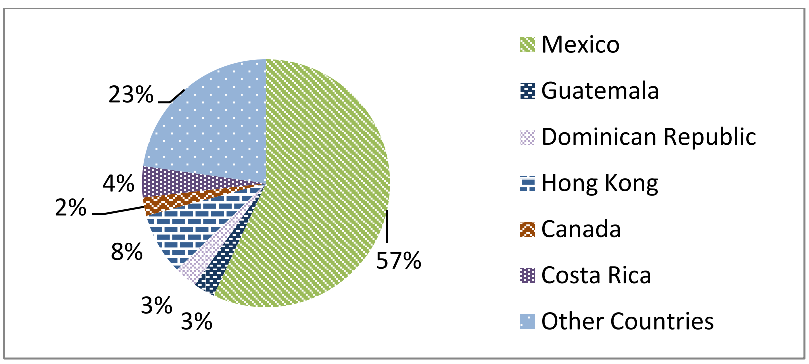

Figure A.24 Market Share of Top Six Denim Jeans Import Countries for 1997

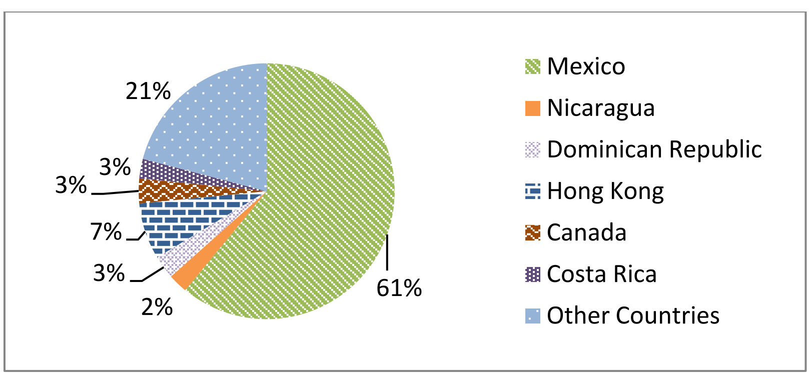

Figure A.25 Market Share of Top Six Denim Jeans Import Countries for 1998

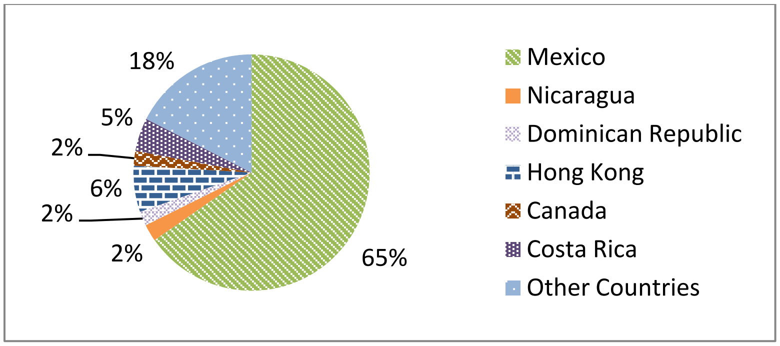

Figure A.26 Market Share of Top Six Denim Jeans Import Countries for 1999

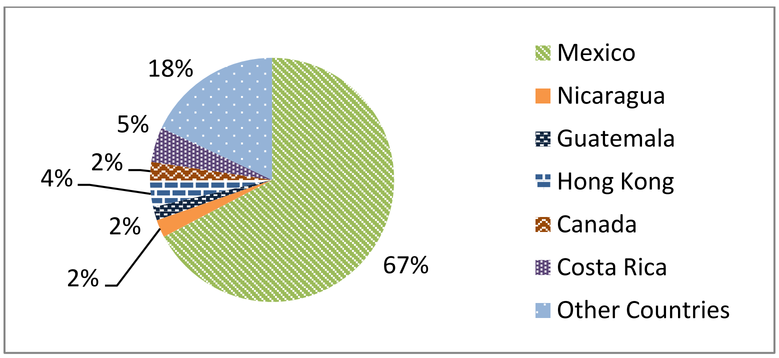

Figure A.27 Market Share of Top Six Denim Jeans Import Countries for 2000

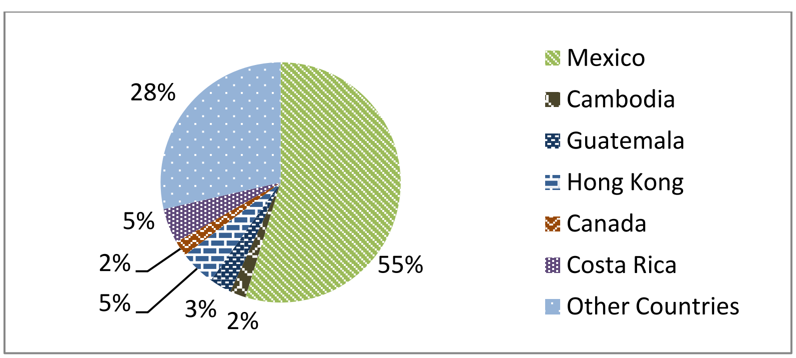

Figure A.28 Market Share of Top Six Denim Jeans Import Countries for 2002

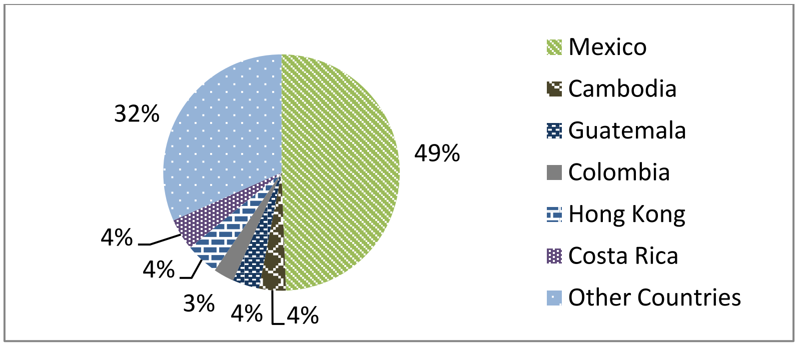

Figure A.29 Market Share of Top Six Denim Jeans Import Countries for 2003

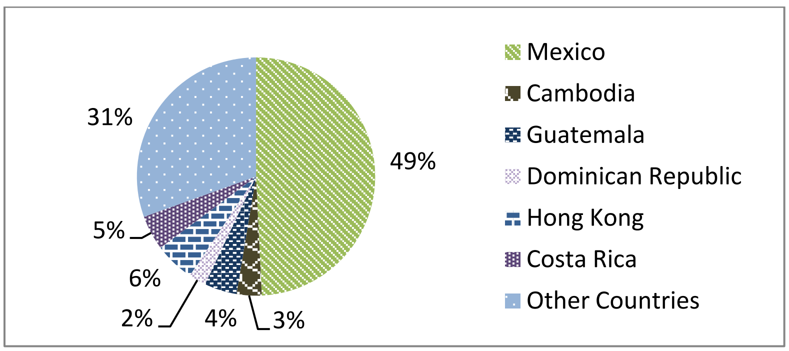

Figure A.30 Market Share of Top Six Denim Jeans Import Countries for 2004

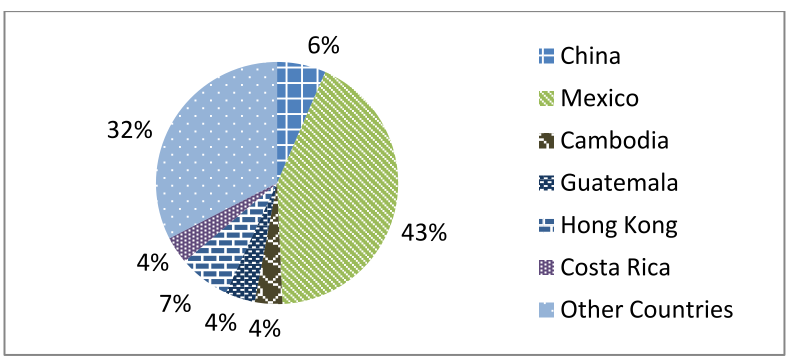

Figure A.31 Market Share of Top Six Denim Jeans Import Countries for 2005

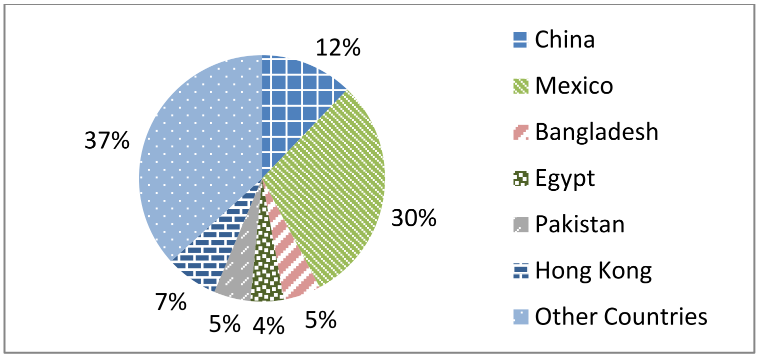

Figure A.32 Market Share of Top Six Denim Jeans Import Countries for 2007

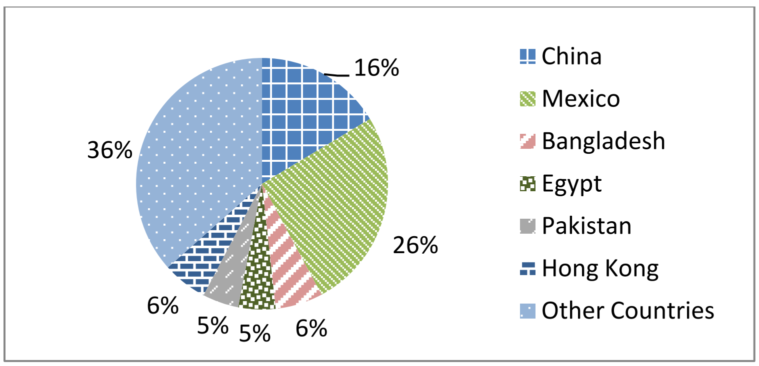

Figure A.33 Market Share of Top Six Denim Jeans Import Countries for 2008

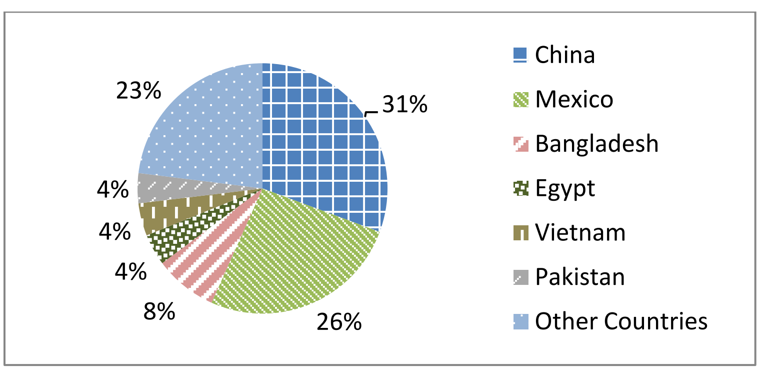

Figure A.34 Market Share of Top Six Denim Jeans Import Countries for 2009

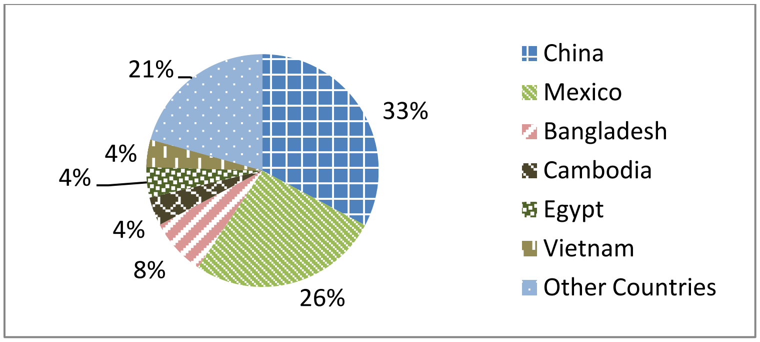

Figure A.35 Market Share of Top Six Denim Jeans Import Countries for 2010

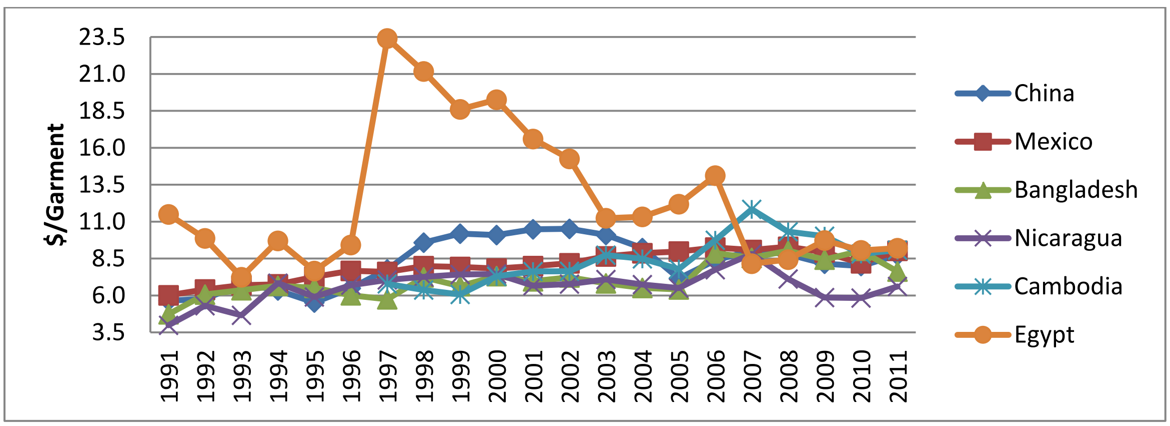

Figure A.36 Denim Jeans Value of Top 6 Import Countries in 2011

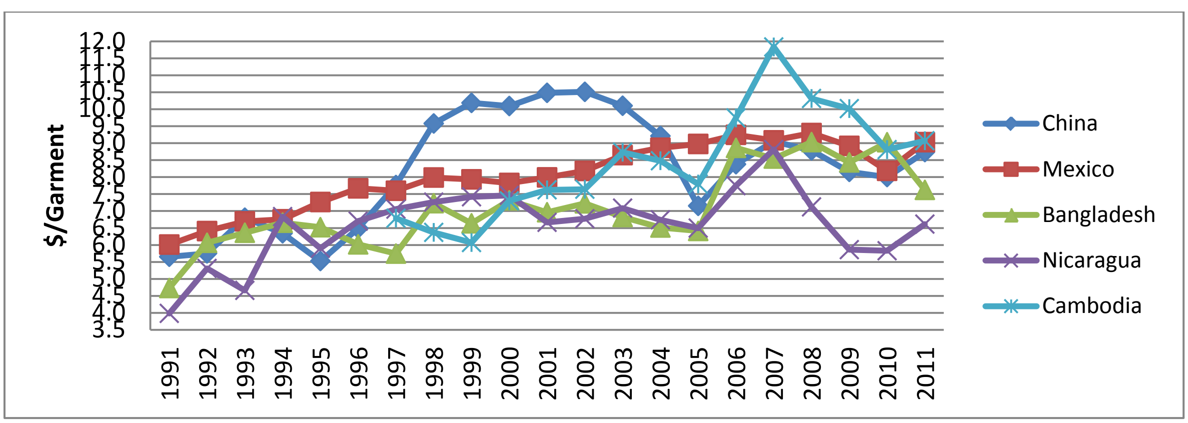

Figure A.37 Denim Jeans Value of Top 6 Import Countries except Egypt in 2011

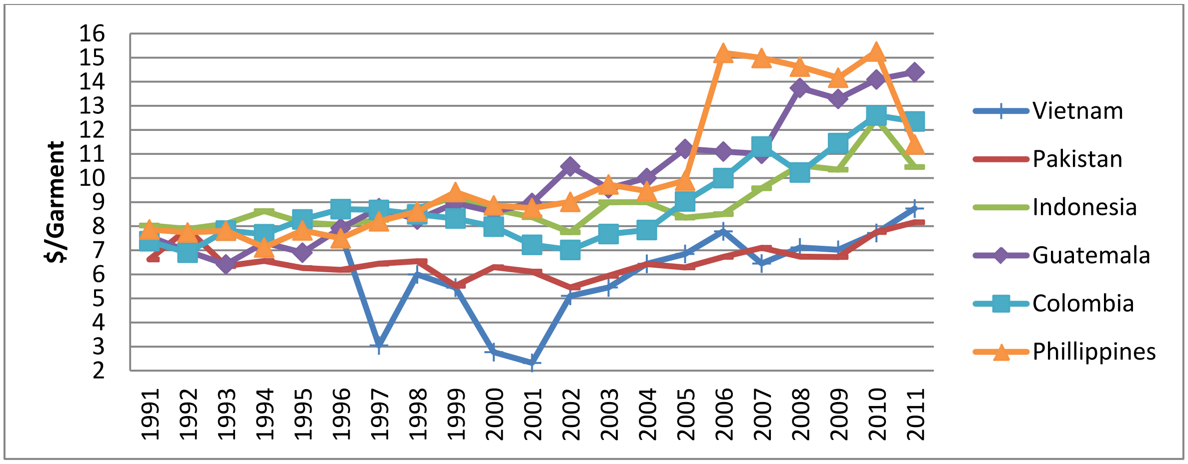

Figure A.38 Denim Jeans Value of Middle 6 Denim Jeans Import Countries in 2011 of 19 Countries Considered in the Analysis

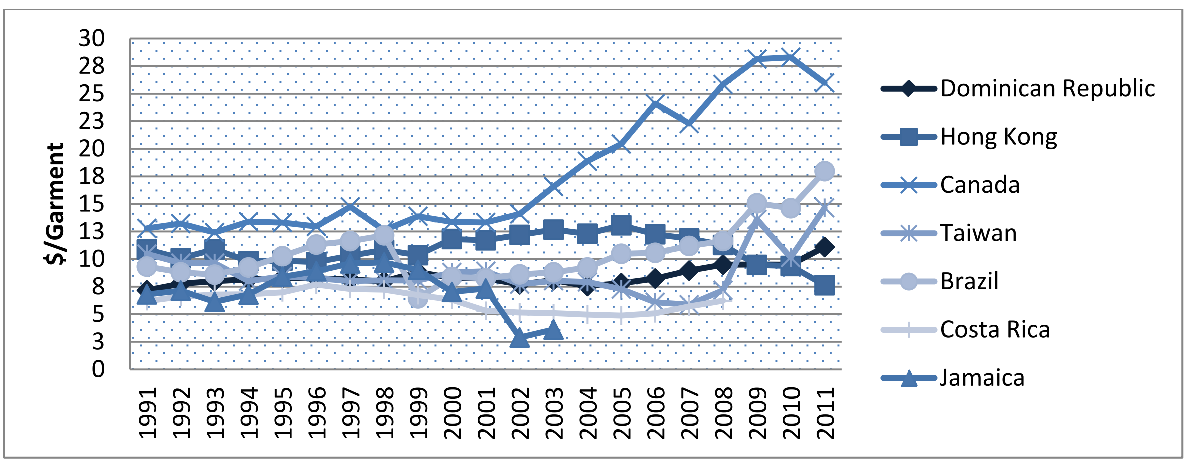

Figure A.39 Denim Jeans Value of Remaining 7 Denim Jeans Import Countries in 2011 of 19 Countries Considered in this Analysis

Appendix B

Table B.1 Absolute Quotas for Knit T-shirts Imports for 1997-2008

	Mexico(638/639)			China		
Year	**Limit**	**Released**	**%Filled**	**Limit**	**Released**	**%Filled**
1997	650,000	375,782	57.8	2,472,536	2,154,653	87.1
1998	721,500	682,237	94.6	2,508,121	2,102,703	83.8
1999	601,629	600,675	99.8	2,520,661	2,388,600	94.8
2000	650,000	614,275	94.5	2,457,483	2,187,069	89.0
2001	-	-	-	2,545,931	2,285,078	89.8
2002	-	-	-	2,510,048	2,368,041	94.3
2003	-	-	-	2,525,562	2,211,244	87.6
2004	-	-	-	2,523,532	2,341,712	92.8
2005	-	-	-	4,704,115	4,704,115	100.0
2006	-	-	-	20,822,111	17,312,792	83.1
2007	-	-	-	23,893,373	20,480,721	85.7
2008	-	-	-	26,938,606	21,832,317	81.0
	Dominican Republic(638/639)			**Pakistan**		
Year	**Limit**	**Released**	**%Filled**	**Limit**	**Released**	**%Filled**
1997	9,921,111	8,645,848	87.1	6,279,309	5,651,923	90.0
1998	12,446,218	10,589,580	85.1	7,558,532	5,759,543	76.2
1999	14,060,152	11,639,089	82.8	7,875,000	6,854,095	87.0
2000	12,827,416	10,458,587	81.5	8,765,649	8,632,378	98.5
2001	4,973,953	1,854,296	37.3	9,452,564	8,964,624	94.8
2002	5,409,469	1,099,674	20.3	11,271,428	9,683,399	85.9
2003	5,785,613	1,156,542	20.0	12,407,090	11,369,937	91.6
2004	6,207,259	1,484,597	23.9	12,796,913	12,128,229	94.8
2005	-	-	-	-	-	-
2006	-	-	-	-	-	-
2007	-	-	-	-	-	-
2008	-	-	-	-	-	-
	India			**Bangladesh**		
Year	**Limit**	**Released**	**%Filled**	**Limit**	**Released**	**%Filled**
1997	3,899,054	3,538,251	90.7	1,485,225	1,367,502	92.1
1998	4,176,074	4,118,664	98.6	1,482,333	1,285,179	86.7
1999	4,479,198	4,315,190	96.3	1,803,579	1,602,337	88.8
2000	4,733,150	4,346,353	91.8	1,986,641	1,785,963	89.9
2001	5,134,479	4,407,416	85.8	2,188,286	2,060,727	94.2
2002	5,495,007	5,495,007	100.0	2,473,117	2,447,940	99.0
2003	5,777,024	5,289,654	91.6	2,791,914	2,432,820	87.1
2004	6,001,600	5,936,586	98.9	3,030,502	2,339,007	77.2
2005	-	-	-	-	-	-
2006	-	-	-	-	-	-
2007	-	-	-	-	-	-
2008	-	-	-	-	-	-

Table B.2 Absolute Quota for Denim Jean Import Countries from 1997 to 2008

	China			Mexico(647/648)		
Year	Limit	Released	%Filled	Limit	Released	%Filled
1997	2,454,034	2,452,976	100.0	690,000	677,554	98.2
1998	2,529,199	2,467,374	97.6	650,000	572,165	88.0
1999	2,464,000	2,393,371	97.1	650,000	554,343	85.3
2000	2,419,985	1,831,781	75.7	650,000	603,547	92.9
2001	2,544,403	2,239,718	88.0	-	-	-
2002	2,480,353	2,459,508	99.2	-	-	-
2003	2,486,743	2,359,566	94.9	-	-	-
2004	2,421,922	2,032,794	83.9	-	-	-
2005	4,340,638	4,340,638	100.0	-	-	-
2006	19,666,049	16,957,810	86.2	-	-	-
2007	22,566,791	19,977,490	88.5	-	-	-
2008	25,442,951	22,183,963	87.2	-	-	-
	Bangladesh			Cambodia(647/648)		
Year	Limit	Released	%Filled	Limit	Released	%Filled
1997	2,582,282	2,577,872	99.8	-	-	-
1998	2,846,760	2,651,820	93.2	-	-	-
1999	3,135,706	3,135,311	100.0	3,600,000	3,494,224	97.1
2000	3,453,982	3,342,662	96.8	3,427,800	3,427,800	100.0
2001	3,804,561	3,386,284	89.0	3,685,620	2,789,236	75.7
2002	3,949,163	3,949,163	100.0	4,323,388	3,726,962	86.2
2003	3,734,721	3,355,712	89.9	4,696,415	4,388,131	93.4
2004	4,541,618	3,879,402	85.4	4,606,258	4,217,929	91.6
2005	-	-	-	-	-	-
2006	-	-	-	-	-	-
2007	-	-	-	-	-	-
2008	-	-	-	-	-	-
	Vietnam			Pakistan		
Year	Limit	Released	%Filled	Limit	Released	%Filled
1997	-	-	-	921,638	754,404	81.9
1998	-	-	-	1,054,179	771,543	73.2
1999	-	-	-	1,108,795	1,028,331	92.7
2000	-	-	-	1,279,039	1,192,372	93.2
2001	-	-	-	1,245,231	1,137,739	91.4
2002	-	-	-	1,622,579	1,508,882	93.0
2003	5,320,000	5,260,722	98.9	1,831,737	1,758,968	96.0
2004	7,927,471	6,682,579	84.3	1,976,418	1,976,418	100.0
2005	4,340,638	6,328,395	77.5	-	-	-
2006	9,740,910	8,898,205	91.3	-	-	-
2007	-	-	-	-	-	-
2008	-	-	-	-	-	-
	Indonesia			Guatemala		
Year	Limit	Released	%Filled	Limit	Released	%Filled
1997	1,798,653	1,798,653	100.0	3,659,395	3,036,057	83.0
1998	1,956,570	1,879,106	96.0	3567452	3,192,737	89.5
1999	2,126,793	2,089,195	98.2	3780833	3,357,005	88.8
2000	2,136,774	1,783,643	83.5	3719448	3,170,320	85.2
2001	2,412,951	2,366,897	98.1	3204351	1,647,419	51.4

Table B.3 Continued

	Indonesia			Guatemala		
Year	**Limit**	**Released**	**%Filled**	**Limit**	**Released**	**%Filled**
2002	2,793,269	2,657,965	95.2	3676676	1,955,896	53.2
2003	3,101,896	2,778,810	89.6	4189686	2,564,693	61.2
	Indonesia			**Guatemala**		
Year	**Limit**	**Released**	**%Filled**	**Limit**	**Released**	**%Filled**
2004	3,226,042	2,917,217	90.4	4336111	2,665,580	61.5
2005	-	-	-	-	-	-
2006	-	-	-	-	-	-
2007	-	-	-	-	-	-
2008	-	-	-	-	-	-
	Philippines			**Dominican Republic(647/648)**		
Year	**Limit**	**Released**	**%Filled**	**Limit**	**Released**	**%Filled**
1997	2,343,917	2,343,238	100.0	11,855,935	11,107,137	93.7
1998	2,649,634	2,518,651	95.1	13,008,050	11,999,051	92.2
1999	2,960,856	2,960,122	100.0	12,222,369	11,638,841	95.2
2000	3,168,321	2,935,180	92.6	13,476,912	11,941,241	88.6
2001	3,248,538	2,702,974	83.2	11,075,976	2,328,534	21.0
2002	3,651,305	3,436,569	94.1	11,548,920	1,410,191	12.2
2003	3,540,738	3,540,738	100.0	11,972,175	1,918,447	16.0
2004	3,925,725	3,282,202	83.6	12,446,631	1,603,891	12.9
2005	-	-	-	-	-	-
2006	-	-	-	-	-	-
2007	-	-	-	-	-	-
2008	-	-	-	-	-	-