

ABSTRACT

HAMILTON, BRIAN JOHN. Short- and Long-Term Opportunities for US Textile Manufacturing. (Under the direction of Dr. William Oxenham and Dr. Kristin Thoney).

The United States (US) textile industry exists in an intensely competitive global environment. Various trade agreements have given US customers access to cheaper textile goods from overseas competitors. This has led to a decrease in business and the closure of many US textile companies.

Recently, there has been a renewed enthusiasm for US manufacturing. Politicians speaking on the importance of manufacturing may raise awareness, but the only way the US textile industry will grow is if actual business opportunities exist.

This research used two exploratory vehicles to determine short- and long-term opportunities for US textile manufacturing: interviews with members of the industry and secondary data analysis. The interviews were used to determine strategies, concerns, and insights from those actively participating in the global textile marketplace. The secondary data analysis was used to identify trends in the manufacturing costs of various countries and the impact of ‘what-if’ scenarios to the overall textile manufacturing cost structure of these countries. The scope of this study included spinning, weaving, and knitting. The interview portion featured representatives from each of these processes, from a variety of company sizes, and from various sections of the USA.

The interviews led to insights about successful strategies, inherent advantages, inherent disadvantages, helpful government policies, harmful government policies, the level of optimism in the industry, the impact of foreign competition, and the identity of key technology and management factors.

The secondary analysis performed for this research led to findings regarding trends in worldwide textile production, the relative modernization of textile machinery in the USA, trends in worldwide textile production costs, and the impact that sudden increases in raw material or energy costs might have.

This research concluded that short-term opportunities exist for adaptable US textile companies that are willing to serve niches, provide a fast speed-to-market, and constantly adjust to changes in the marketplace.

Long-term opportunities are being created by rising costs in the countries of foreign competitors. US customers will begin using more domestic textile products if the cost is similar to those from countries such as China. This will create a larger market and lead to an increase in successful US textile companies.

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Short- and Long-Term Opportunities for US Textile Manufacturing

by
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Biography

Brian John Hamilton was born in the picturesque town of Tewksbury, Massachusetts in 1986. His education began in the Tewksbury public school system, where he learned about life and scholastics from K-12. After that, he attended the University of Massachusetts - Dartmouth as a Commonwealth Scholar, and his four years there culminated with a Bachelor of Science degree in Materials Technology with a minor in Business Administration in 2008.

From there, Hamilton headed straight to Raleigh, North Carolina, where he participated in the Master's Degree program at the College of Textiles at North Carolina State University as a Fellow for the Institute of Textile Technology. Hamilton was awarded a Master of Science degree from the Textile & Apparel, Technology & Management Program in 2010 after successfully defending his thesis, "Process and Product Data Management for Staple Yarn Manufacturing." Upon graduation, Hamilton immediately enrolled in the Textile Technology Management PhD program at the College of Textiles at North Carolina State University and began work on this dissertation.

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Chapter 1 - Introduction

The United States (US) textile manufacturing industry exists in an environment of constant challenges. With the advent and consequent growth of global textile trade, these challenges only became all the more copious and unrelentingly unpredictable. For decades, the USA has been losing manufacturing to lower-cost countries such as China. Many have been left wondering how long this trend would continue before the dynamics of the global textile industry would swing manufacturing opportunities back toward the USA.

This subject has been brought closer to the forefront recently, and not just specifically for textiles. The government has been outspoken about the importance of manufacturing for the economy of the USA. With the upcoming 2012 US Presidential Election, candidates will undoubtedly be armed with plans for a booming manufacturing industry. President Obama already delivered a well-publicized speech (Obama, 2012). in January of 2012 emphasizing the importance of manufacturing to the health of the nation. He spoke eloquently about the necessity of “insourcing” production back into the USA.

The role of textiles, long one of the country’s largest industries, is usually a key component to these visions of a thriving manufacturing sector. In fact, Francisco J. Sánchez, the US Under Secretary of Commerce for International Trade, made a trip to Raleigh, North Carolina, to deliver a speech on this subject to the College of Textiles at North Carolina State University on January 25, 2012. The Under Secretary stressed the significance of textile manufacturing to a healthy US economy (Trade.gov, 2012).

All of this talk, however, can only get the industry so far. Textile manufacturing is a facet of a dynamic global marketplace, and all increases and decreases in the industry are caused by changes in a plethora of variables. If a textile manufacturer is unable to make a profit, it has no reason to continue operating. Likewise, if an opportunity to make a profit does not exist, new textile manufacturers have no reason to take the place of those that shut down.

The purpose of this research is to determine the short-term and long-term opportunities available to the US textile manufacturing industry. These determinations will come from an analysis of the answers to a series of research questions formalized in this chapter. Specifically, an attempt will be made to supply meaningful answers to the following research questions:

- What domestic manufacturing opportunities exist for the USA in the current global competitive environment?
- What strategies are being utilized by companies that remain competitive?
- What are the inherent advantages of US textile manufacturing?
- What are the inherent disadvantages of US textile manufacturing?
- What are the trends in the factors influencing the cost-competitiveness of the US textile manufacturing industry?
- What circumstances would improve the US textile industry's global cost-competitiveness?

- What circumstances would worsen the US textile industry's global cost-competitiveness?
- How does the textile industry fit into the US government's plans for manufacturing "insourcing"?
- How do government policies impact the US textile industry?
- What will the opportunities be for US textile manufacturers in 5 years?
- What will the opportunities be for US textile manufacturers in 10 years?

Success in interpreting the answers to these research questions will lead to an increase in academic knowledge of the nuances of seemingly small and often unpredicted changes, which can ultimately produce potentially status-quo altering scenarios. This knowledge will also have obvious use to textile leaders.

Chapter 2 of this research consists of an extensive literature review encompassing a variety of applicable topics. Chapter 3 is the methodology used as a means of answering the aforementioned research questions. Chapter 4 contains the results of the primary research portion of this study. Chapter 5 contains the results of the secondary research portion of this study. Chapter 6 consists of the conclusions and recommendations for future work based on this research.

Chapter 2 - Literature Review

A wide base of knowledge is essential for answering the research questions of this study. This chapter first reviews global trade in the context of textiles; this includes the global supply chain and the use of trade agreements. Next, the importance of cotton price on the textile industry is reviewed in light of the elevated prices seen in 2010-2011. Then, US manufacturing is reviewed both in general and specifically for textiles. Subsequently, various opportunities in US textile manufacturing are both identified and categorized. Finally, relevant prior studies in this area are analyzed to determine the current level of academic knowledge available on this subject.

2.1 Global Textile Trade

The global textile complex includes all of the industrial activities that transform raw textile materials into finished goods (Dickerson, 1999). Globalization in the textile and apparel industry has intensified international competition within this complex. In order to be successful, textile businesses must maintain low costs while keeping up with ever-changing technology and improving customer service (Su, Gargeya, & Richter, 2005). The increase in demand from the emerging global economy also provides opportunities that previously did not exist (Singletary & Winchester Jr, 1998).

As businesses in the 21st century strive to maximize profits, many have chosen to seek suppliers and customers outside of their home country. Globalization is becoming essential for businesses in the modern economic climate, as failure to globalize can result in losing customers to competitors with superior products and lower prices (Keegan & Green,

2008). In fact, a global supply base is now generally considered a requirement in the face of global competition (Handfield & Nichols Jr., 2004). A study by Su, Dyer, & Gargeya (2009) confirmed that strategic supplier selection and sourcing are being utilized more and more in the US apparel and textile industries in order to triumph over global competition.

Products that have aspects that require high skill or low cost can be outsourced to the best location on the globe for those specific requirements (Azoulay, 2004). While the core functions of a business are not generally outsourced, many processes can be performed by foreign suppliers more efficiently and effectively than they can at home (Helm & Jones, 2010). Low cost functions are typically carried out in developing countries where skilled labor can be obtained for a low cost. This is especially prevalent in industries that are labor intensive, such as the apparel industry (Su et al., 2005).

What drives outsourcing is a desire by firms for increased business flexibility and a lower cost of operations (Shelton & Wachter, 2005) as well as high quality, reliable delivery, and quick response time (Su et al., 2005). Other advantages include access to larger markets, opportunities for subsidized finance, and potential government inducements such as tax abatements for new businesses (Manuj & Mentzer, 2008).

Important global trade decisions are made with trade factors, economics, the environment, and the competition in mind (Su et al., 2005). The right balance between these factors must be found. For example, a certain foreign supplier may offer a significant cost advantage in manufacturing but impair lead-times. It is more than just the distance that can

hinder lead-times, as import/export procedures and internal processes at both ends of the shipment contribute as well (Christopher, Lowson, & Peck, 2004). Teng & Jaramillo (2005) created a model (Figure 1) which includes all of these aspects. This model is designed to help firms make decisions on the best location to source a particular product.

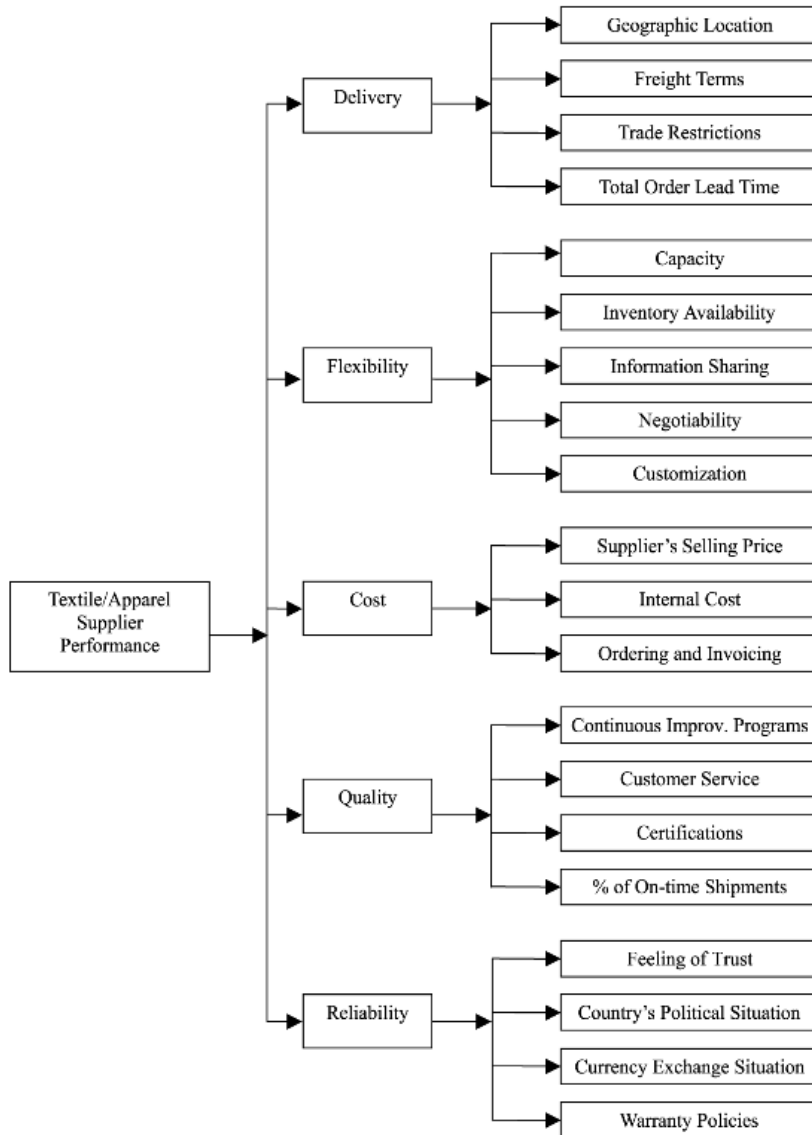


Figure 1 - Supplier Performance Evaluation Matrix Structure
 Source: (Teng & Jaramillo, 2005)

For the home country, global trade can mean more sales opportunities and opens up sourcing and production options. However, it also leads to increased competition. Other drawbacks include problems with technology, time zones, languages, and foreign customs (Azoulay, 2004). These cultural, organizational, and technological obstacles must be handled so that the firm can choose its best potential upstream or downstream partner (Bozarth, Blackhurst, & Handfield, 2007). Growth of global trade has also come at a time in which the dynamics of the textile retail industry are hastening, product life cycles are becoming shorter, and high cost pressure abounds (Gentry, 2006).

2.1.1 The Global Supply Chain

Global trading leads to the establishment of global supply chains, which are basically flow lines in which the raw material input goes in one end and the finished product comes out the other end (Wang & Chan, 2010). There are numerous definitions as to what exactly comprises a supply chain, but two accepted definitions are as follows:

“The supply chain encompasses all activities associated with the flow and transformation of goods from the raw materials stage (extraction) through to the end user as well as the associated information flows. Material and information flow both up and down the supply chain” (Handfield, 1999). (p. 2)

“A supply chain is defined as a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer” (Mentzer et al., 2001). (p. 4)

These definitions are similar in that they both mention the flow of products and information in both directions. They also both include the end consumer. Mentzer et al. (2001) also present a depiction of both a simple direct supply chain, including only those most directly involved, and the ultimate supply chain, which involves all peripheral influences (Figure 2).



Figure 2 - Direct and Ultimate Supply Chains
Source: (Mentzer et al., 2001)

Su et al. (2005) presents a comprehensive supply chain specific to the textile industry (Figure 3), which was adapted from previous studies. It shows both the upstream and downstream activities for home furnishings, apparel, and industrial products. Note that the textile and apparel supply chain not only includes the entire textile complex as discussed earlier, but also includes distributors and end users. Supply chains exist in other industries as well, including the automotive industry (Weber, 2007).

Supply chains can consist of members from different organizations and locations, each with their own interests (Wang & Chan, 2010). Supply chains are most successful

when they are organized to achieve a common goal. Otherwise, members of the chain will selfishly compete to extract the most value. This condition can be overcome with network orchestration, in which optimal supply chain decisions are made by the orchestrator (Fung, Fung, & Wind, 2008). Supply chain managerial costs should always be less than the benefits of operating a global supply chain (Rugman, Li, & Oh, 2009).

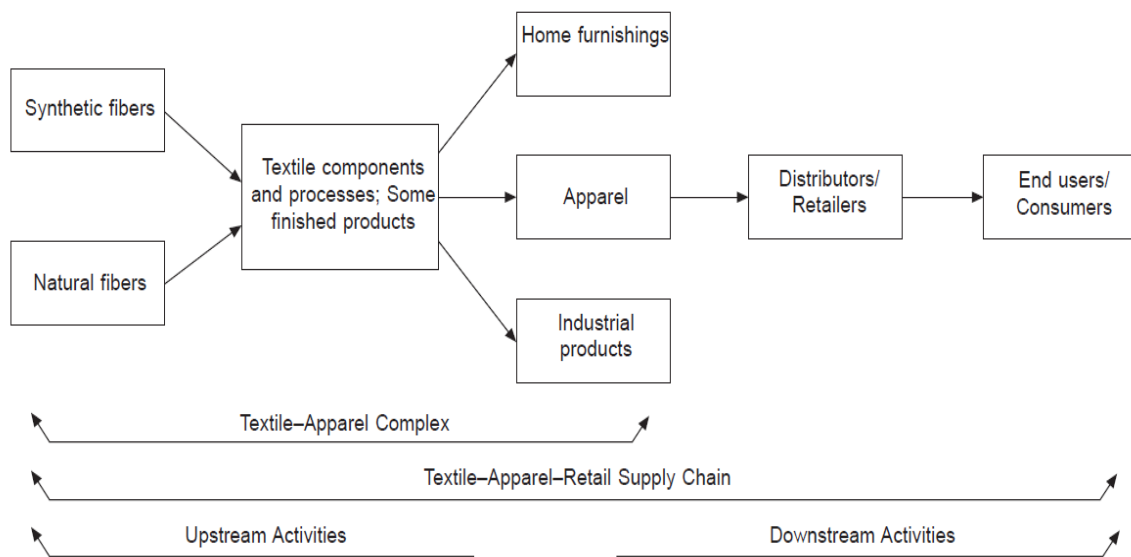


Figure 3 - Textile-Apparel Supply Chain
 Source: (Su et al., 2005)

Supply chain management (SCM) is concerned with information, sourcing, scheduling, order processing, inventory, customer service, and more (Handfield, 1999). SCM can vary depending on the specific industry in question. For example, fashion products are known for being difficult to forecast and have short life-cycles for products. Fashion firms need to respond to market changes and communicate well across the chain. They should be

set up to react quickly, and ideally have networks made up of small subcontractors (Christopher et al., 2004).

2.1.2 US Trade Agreements

Modern trade agreements got their start in 1947 with the signing of the General Agreement on Tariffs and Trade (GATT), which was the first effort to regulate worldwide trade. This was followed in 1974 with the signing of the Multi-Fiber Arrangement (MFA) which provided rules for imposing quotas for textiles and apparel. These quotas were imposed on developing countries entering the markets of developed countries. In 1994, the Agreement on Textiles and Clothing (ATC) was signed, which phased out the MFA. In its place, the General System of Preferences (GSP) would govern trade disputes (Au & Wong, 2007; Shelton & Wachter, 2005).

This was followed almost immediately by the formation of the World Trade Organization (WTO) on January 1, 1995. The WTO sought to abolish all textile and clothing quotas by the start of 2005. The WTO phased out the ATC by 2005, allowing for free trade among member countries (Au & Wong, 2007; Shelton & Wachter, 2005). Lawton & McGuire (2005) showed that the WTO did indeed have an effect on international policies and business behavior. In 2007, Au & Wong (2007) demonstrated that developed countries were losing worldwide textile export shares, while developing countries were gaining.

One type of trade agreement allowed by the WTO is a preference program. The USA uses these programs to enhance developing countries' access to the US market as a means of

assistance. Table 1 gives an overview of current US preference programs. The importance of these agreements to the textile industry can be seen in the value of textile and apparel (T/A) products imported through each of these programs. There is also the Generalized System of preferences (GSP), which provides for duty-free entry for certain products from 129 designated beneficiary countries and territories (Office of the US Trade Representative, 2011b).

Table 1 - Overview of US Preference Programs

<u>Trade Agreement</u>	<u>Textile/Apparel Benefits</u>	<u>US T/A Imports 9/2010 - 9/2011</u>
AGOA (African Growth and Opportunity Act)	- preferential access to the US market for qualifying countries in Africa	\$883 million
ATPA (Andean Trade Preference Act)	- duty-free benefits for Colombia, Peru, Ecuador, and Bolivia	\$1.05 billion
CBI (Caribbean Basin Initiative)	- duty-free access to the US market for most goods	\$8.59 billion
Hope II (Haitian Hemispheric Opportunity through Partnership for Encouragement Act)	- expanded duty-free and quota-free access to certain products assembled in Haiti.	\$685 million

Sources: (Adams, Boyd, & Huffman, 2011; Office of the US Trade Representative, 2011b; US Department of Commerce, Office of Textiles and Apparel, 2011a)

These programs benefit the developing countries while also using eligibility requirements to entice political changes. For AGOA, these requirements include working to establish a market-based economy, creating policies aimed at reducing poverty, and protecting worker rights (Office of the US Trade Representative, 2011b). ATPA requirements include being a non-communist nation, not accepting preferential treatment

from other developed countries, not infringing on US copyrights and patents, and protecting worker rights (Office of the US Trade Representative, 2010). CBI eligibility requirements are very similar to those of the ATPA (Office of the US Trade Representative, 2009).

These agreements have proved beneficial to US textile firms. For example, Hanesbrand was the number two underwear producer and seller behind Fruit of the Loom until it took advantage of the Caribbean Basin Initiative (CBI) to move much of its sewing operations to that area. Fruit of the Loom kept most of its production in the USA and Hanesbrand passed them to become the number one underwear seller (Travis, 2007).

Countries will tend to trade more with countries that have the lowest barriers, all else being equal (Lam & Postle, 2006), and free trade agreements completely eliminate tariffs and quotas, allowing conditional unrestricted trade between nations (Office of the US Trade Representative, 2011a). Table 2 lists the countries with which the USA currently has free trade agreements along with the dollar value of US textile and apparel imports each country was responsible for in the year ending in September, 2011. Many of these countries are members with the USA in the North American Free Trade Agreement (NAFTA) or its Central American counterpart, DR-CAFTA.

As can be seen in the value of imports from these countries, free trade agreements are responsible for a significant amount of textile and apparel trade for the USA. Note that knit apparel is actually the largest single input category from DR-CAFTA (Office of the US Trade Representative, 2011a).

Table 2 - Current US Free Trade Agreements Partners (with T/A imports \$) *: NAFTA +: DR-CAFTA

Australia (\$44 million)	Bahrain (\$177 million)	* Canada (\$2.2 billion)
Chile (\$16 million)	+ Costa Rica (\$174 million)	+ Dominican Republic (\$771 million)
+ El Salvador (\$1.8 billion)	+ Guatemala (\$1.3 billion)	+ Honduras (\$2.7 billion)
Israel (\$366 million)	Jordan (\$896 million)	* Mexico (\$5.7 billion)
Morocco (\$84 million)	+ Nicaragua (\$1.3 billion)	Oman (\$3.8 million)
Peru (\$753 million)	Singapore (\$43 million)	

Sources: (Office of the US Trade Representative, 2011a; US Department of Commerce, Office of Textiles and Apparel, 2011b)

The USA is not the only country taking advantage of free trade agreements. In fact, the WTO has been notified of over 300 free trade agreements worldwide. Some noteworthy free trade areas include Mercosur and the Andean group in South America, Caricom in the Caribbean, the Association of Southeast Asian Nations (ASEAN) in Asia-Pacific, the European Union, the Gulf Cooperation Council (GCC) in the Middle East, the Economic Community of West African States (ECOWAS) and the South African Development Community (Keegan & Green, 2008). Each of these trade areas has its own rules and regulations.

China is a major player in the worldwide textile and apparel industry. The size of the nation alone gives it the ability to have a significant impact on global trade. Earlier this decade, the WTO, which China joined in 2001, allowed safeguards to be put in place in order to keep imports originating in China from disrupting trade markets. The USA had such

restrictions in place from 2006 to 2008, which put limits on imports of certain textile goods from China. This temporarily slowed the percentage increase of Chinese textile goods into the USA (Adams et al., 2011).

Since these safeguards have been lowered, textile imports from China have been increasing at the expense of countries which have free trade agreements that encourage the use of raw cotton from the USA (Figure 4) (Adams et al., 2011). The more the Chinese textile industry expands, the larger a customer it will be for the US raw cotton export industry. Without safeguards, Chinese textile firms are finding it cheaper to import new textile machinery at lower tariffs and export the final product without the challenge of export quotas (Yeung & Mok, 2004).

Market Share of US Textile Imports

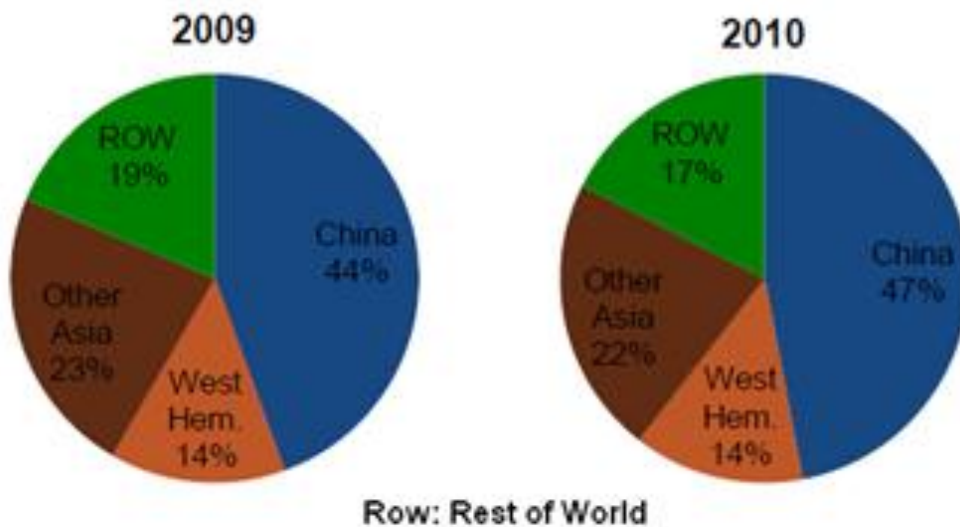


Figure 4 - Market Share of Textile Imports into the USA
Source: (Adams et al., 2011)

With Chinese income rising faster than inflation, demand for discretionary goods and clothing in the country will continue to increase (Cotton Incorporated, 2011b). This will have an impact on not only the USA but other countries in similar situations. Unless China can increase its own cotton production, the expansion of the Chinese textile industry will continue to make it a larger customer for the major exporters of raw cotton (Yeung & Mok, 2004).

2.2 The Influence of Cotton Price on the Textile Industry

One area of interest in this study is total manufacturing costs of spinning, weaving, and knitting. The cost of raw input material is a substantial part of these costs. Therefore, fluctuations in raw material cost have an influence on total manufacturing costs.

It has been noted that elevated cotton prices could potentially benefit countries with higher labor costs that have been losing business to countries with cheaper labor costs (Erdumlu, 2009). Moore (2009) projected the impact that a 100% worldwide increase in cotton price would have on the overall cost of producing ring-spun cotton yarn in certain countries (Figure 5).

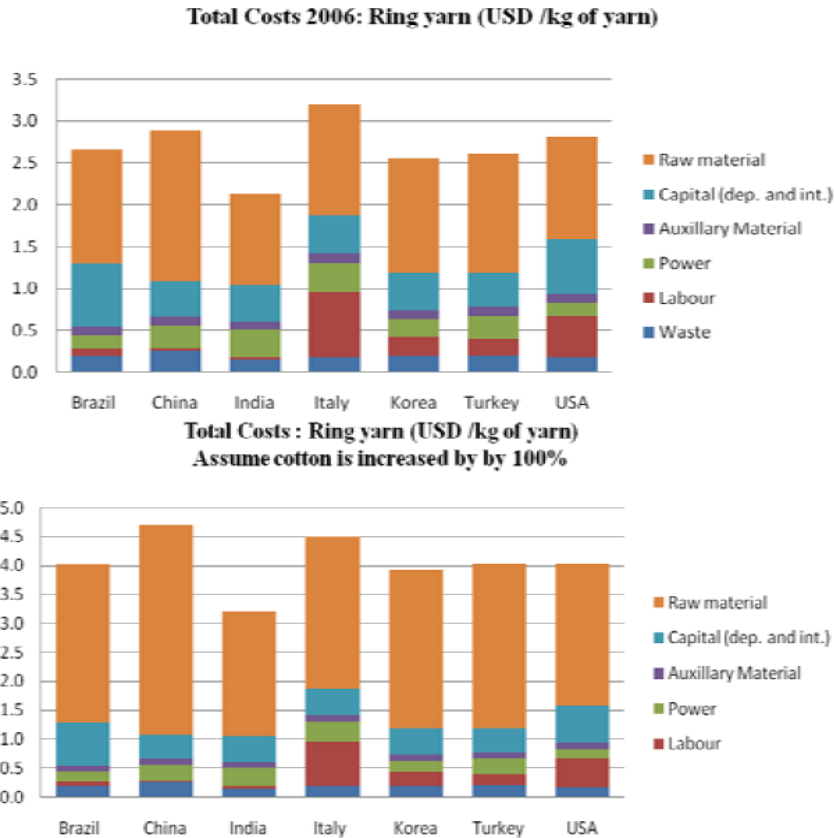


Figure 5 - Projected Impacts of Increased Cotton Price on Ring-Spun Yarn Cost
Source: (Moore, 2009)

Figure 6 shows a diagram of the factors influencing fiber prices and who is influenced by these prices. In the figure, production, stocks, and consumption all directly affect fiber prices. The influence of fiber price will then be passed, in order, to the yarn spinner, the fabric manufacturer, the retailer, and the consumer. It will also affect acreage dedicated to the crop (Cotton Incorporated, 2010c).

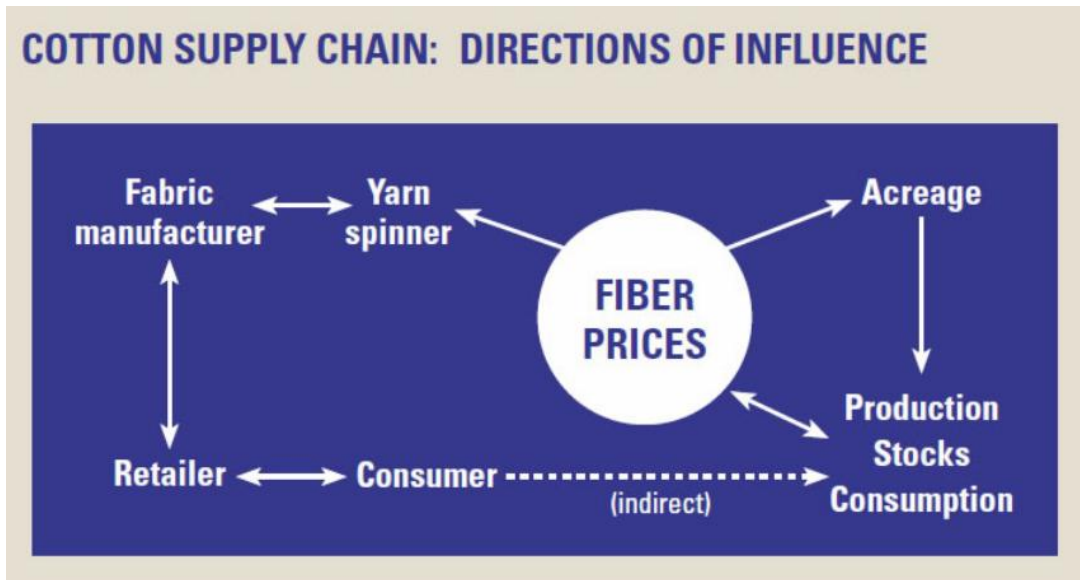


Figure 6 - Fiber Prices and the Cotton Supply Chain
Source: (Cotton Incorporated, 2010c)

2.2.1 Cotton and Global Trade

While cotton fiber is used all over the world, the plant will only grow effectively in semi-tropical environments (Brown, 2011). Consequently, cotton is transported all around the world to meet demand.

Beginning at the end of Reconstruction, cotton became the United States' primary export and cash crop. By 1902, cotton was the world's top globally traded good, with the USA as the chief supplier, accounting for 75% of the raw cotton market (Brown, 2011).

In the USA, market share in the global cotton market began to dwindle after World War I, as other nations began to get participate in the market. The country's proportion of

world production dropped below 50% by the 1930s. The proportion continued to diminish after World War II (Table 3).

Table 3 - USA and World Cotton Production, 480-Pound Bales (Thousands), 1945-2005

<u>Year</u>	<u>USA</u>	<u>World</u>	<u>USA % of Total</u>
1945	9,015	21,410	42.11
1955	4,698	44,329	10.60
1965	14,938	56,900	26.25
1975	8,302	54,000	15.37
1985	13,432	80,100	16.77
1995	17,900	93,900	19.06
2005	23,890	116,600	20.49
2011	16,000	123,200	12.99

Source: (Brown, 2011)

Tables 4-7 show the outcomes of global cotton trade by identifying the world's leading consumers, producers, importers, and exporters from 2010-2011. During this time period, China was the top consumer and producer of raw cotton, with India second in both categories (Tables 4 & 5). China supplements its own supply of cotton by also being the world's top importer of the fiber (Table 6).

With a large portion of its spinning industry shifting overseas, the United States does not consume nearly as much raw cotton as it produces (Brandon, 2011). In fact, as a nation, while US was the third leading producer of raw cotton, it was in sixth place globally in cotton consumption in 2010-2011. This makes the US the world's major exporter of raw cotton (Table 7) (Cotton Incorporated, 2011a).

Table 4 - 2010-11 Worldwide Cotton Consumption

<u>Country</u>	<u>Millions of Bales Consumed</u>
China	45.5
India	20.5
Pakistan	10.3
Turkey	5.8
Brazil	4.4
United States	3.8
Bangladesh	3.6

Table 5 - 2010-11 Worldwide Cotton Production

<u>Country</u>	<u>Millions of Bales Produced</u>
China	33.5
India	27.5
United States	16.3
Pakistan	10.0
Brazil	9.0
Australia	5.0
Uzbekistan	4.2

Table 6 - 2010-11 Worldwide Cotton Imports

<u>Country</u>	<u>Millions of Bales Imported</u>
China	14.0
Bangladesh	3.5
Turkey	3.1
Indonesia	2.3
Thailand	1.7
Vietnam	1.6
Pakistan	1.5

Table 7 - 2010-11 Worldwide Cotton Exports

<u>Country</u>	<u>Millions of Bales Exported</u>
United States	11.3
India	5.3
Australia	4.2
Brazil	3.8
Uzbekistan	2.8
African Franc Zone	4.0
European Union	3.8

Sources: (Cotton Incorporated, 2011a; US Department of Agriculture, 2011)

2.2.2 Review of Cotton Prices in 2010-2011

Cotton captured headlines in 2010-2011 due to large spikes in pricing (Brandon, 2011; Home Textiles Today, 2011b; Roberson, 2011; Ruvo, 2011). For a variety of reasons to be discussed later, the price per pound of cotton fiber approached unprecedented levels during this time period.

When the year 2011 began, the international price of cotton had doubled over the preceding 6 months, and crossed the \$2.00 per pound threshold in February. This was on top of a 50% increase over the previous 12 months (Brandon, 2011). The changes during this time period for the Cotlook A index can be seen in Figure 7. The NY Nearby price represents the domestic price of the next expiring cotton futures contract, while the A index, which will be detailed later, indicates the international price.

While the prices discussed so far regard the Upland cotton represented by the Cotlook A Index, other varieties of cotton also saw fluctuations. In fact, long staple and extra-long staple cotton increased even more dramatically. American Pima cotton reached prices of over \$3.00 per pound in 2011 (Southwest Farm Press, 2011).

The prices of cotton eventually began to stabilize after months of being historically high. These price decreases were partly due to an expected increase in cotton production. Demand decreased as everyone was holding off for lower prices in the future. Also, some retailers were not placing orders because they expected demand from their own consumers to decrease once higher prices made it to their shelves (Devine, 2011).

Monthly NY Nearby and A Index Prices: Last Three Years

Note: Values for the A Index were unavailable from June 23, 2010 to August 1, 2010 and again from June 10, 2011 to August 1, 2011.

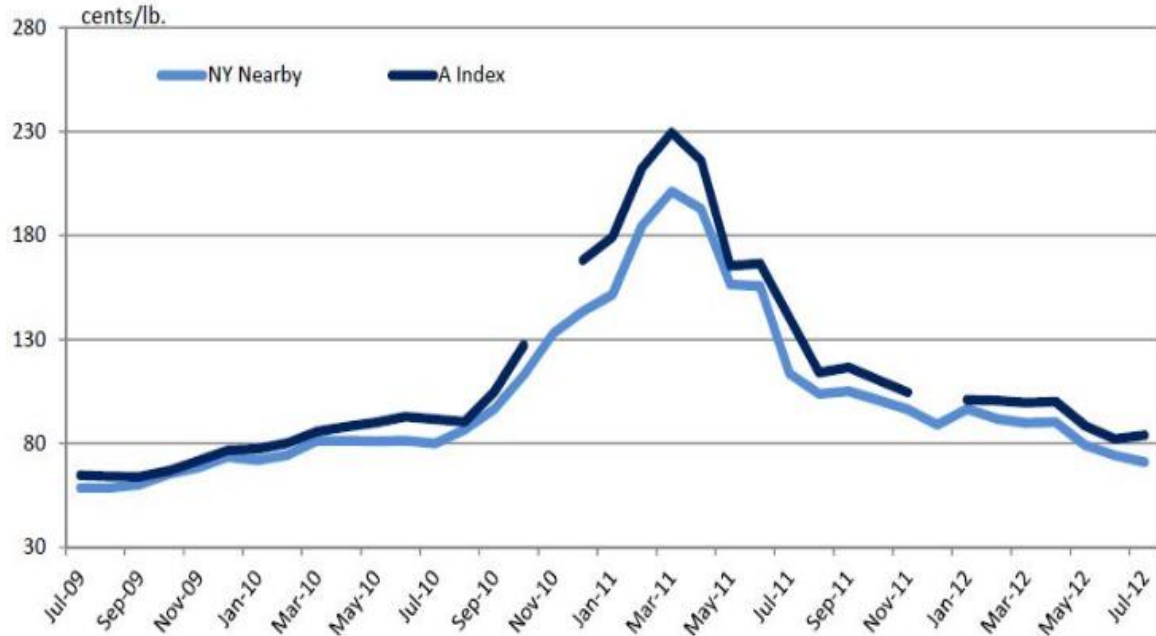


Figure 7 - Cotton Prices from July 2009 to July 2012
Source: (Cotton Incorporated, 2012)

2.2.3 Cotton vs. Other Fibers

Cotton is a globally traded commodity product, exported by countries with the ability to cultivate a surplus and imported by countries in which domestic demand exceeds supply. While preferences regarding commodities such as grains and livestock vary in different regions of the globe, cotton is the basic material used to make clothing all around the world. For this reason, and because oil was not always as indispensable as it is today, cotton has been regarded as the first global commodity (Brown, 2011). In 2010-2011 however, cotton

was just one of many globally traded commodities (Table 8), and it was not alone in this phenomenon of price increases.

Table 8 - Overview of Major Commodities

<u>Commodity</u>	<u>Examples</u>
Energy	- crude oil, heating oil, natural gas
Grains	- corn, soybeans, wheat
Industrials	- copper, cotton
Livestock	- live cattle, lean hogs
Precious Metals	- gold, platinum, silver
Softs	- cocoa, coffee, orange juice, sugar

Source: (Commodity Research Bureau, 2011)

The marketplace for commodity products is very sensitive to price because these products are generally the same no matter where they come from (Commodity Research Bureau, 2011). Figure 8 shows the price trends of oil, corn, and cotton commodities from 1996-2012. Cotton held steady the longest, but all three increased significantly. In addition to influencing the costs of other items, increased gas prices force consumers to spend more of their discretionary income on fuel, leaving them with less money with which to purchase cotton products (Blake, 2011). The increase in crude oil price was passed along to petroleum products such as synthetic fibers, which are in direct competition with cotton in the global textile industry (National Cotton Council of America, 2011).

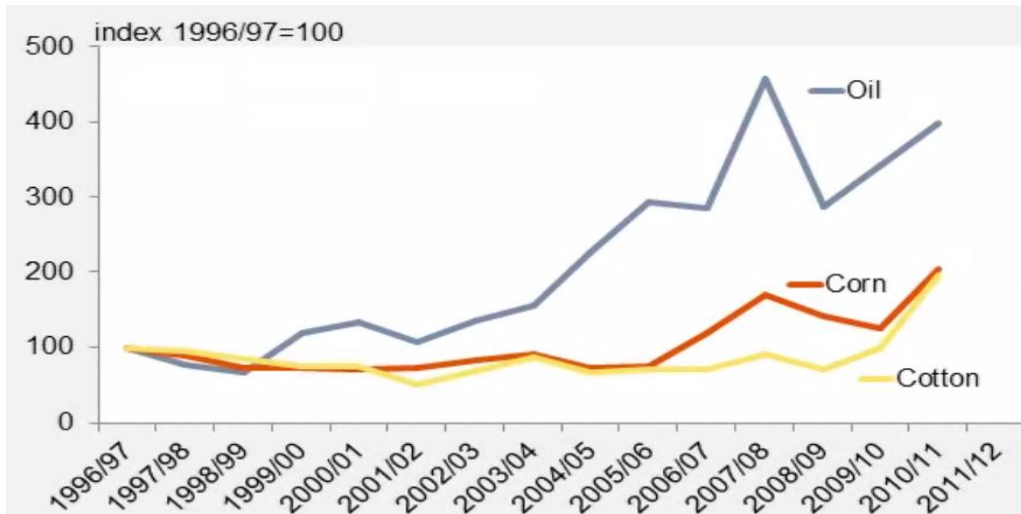


Figure 8 - Commodity Price Increases from 1996-2012
 Source: (Devine, 2011)

Table 9 shows the prices for various fibers as well as crude oil for the months of May 2010, May 2011, and December 2011. The table shows that between May, 2010 and May, 2011, an increase in crude oil price was passed along to petroleum products such as synthetic fibers, which are in direct competition with cotton in the global textile industry (National Cotton Council of America, 2011). Both cotton and polyester staple fibers significantly increased in price during this time period, with cotton increasing by the highest percentage. By December, 2011, every item on the table had receded to lower levels, but not all the way down to the levels of 2010.

Table 9 - Various Fiber Prices from May 2010, May 2011, and December 2011

Fiber	5/28/2010	5/30/2011	12/26/2011
Cotton (price per pound)	\$0.76	\$1.51	\$0.86
Wool (price per pound)	\$3.65	\$6.00	\$5.11
Polyester Staple (price per pound)	\$0.78	\$0.96	\$0.84
Polyester Filament (price per pound)	\$0.67	\$0.84	\$0.73
Crude Oil (price per barrel)	\$78.86	\$100.23	\$99.53

Sources: (Celeste, 2011; 399 Friedman, 2011)

Both cotton and polyester staple fibers significantly increased in price during this time period, with cotton increasing by the highest percentage (National Cotton Council of America, 2011). As can be observed in Figure 9, cotton (Cotlook A Index) and polyester staple fiber were similarly priced for much of the decade. In fact, cotton was generally lower in price until mid-2007. Since then, cotton exceeded the price of polyester fiber, and peaked at a much higher price going into 2011.

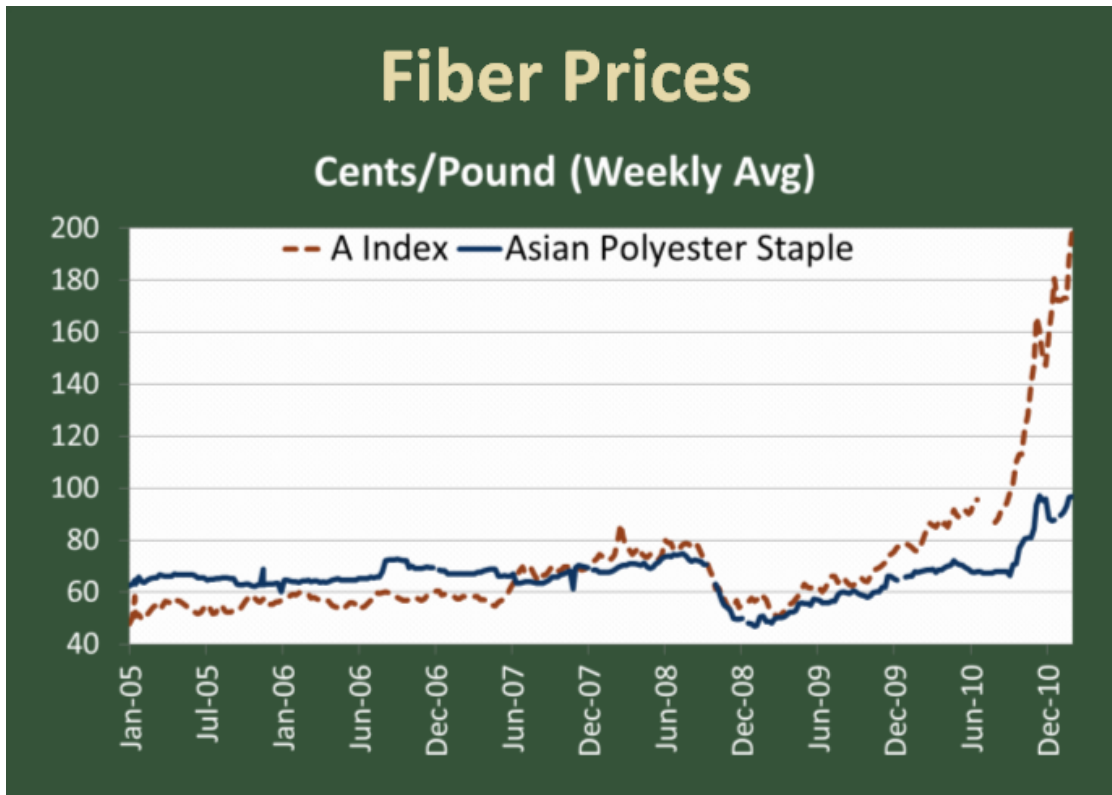


Figure 9 - Fiber Prices, 2005-2010

Source: (National Cotton Council of America, 2011)

The cotton industry would prefer not to lose any more business to synthetic fibers, but that is what has been happening for some time (ITMF, 2008). As science advances, and new and improved synthetic fibers are released, each is a threat to cotton's standing as a leading textile fiber. As is shown in Figure 10, while world consumption of raw cotton has increased steadily (with world population) since 1987, it has been losing percentage market share to synthetic fibers (ITMF, 2008), a trend that could continue if cotton prices remain at historically high levels.

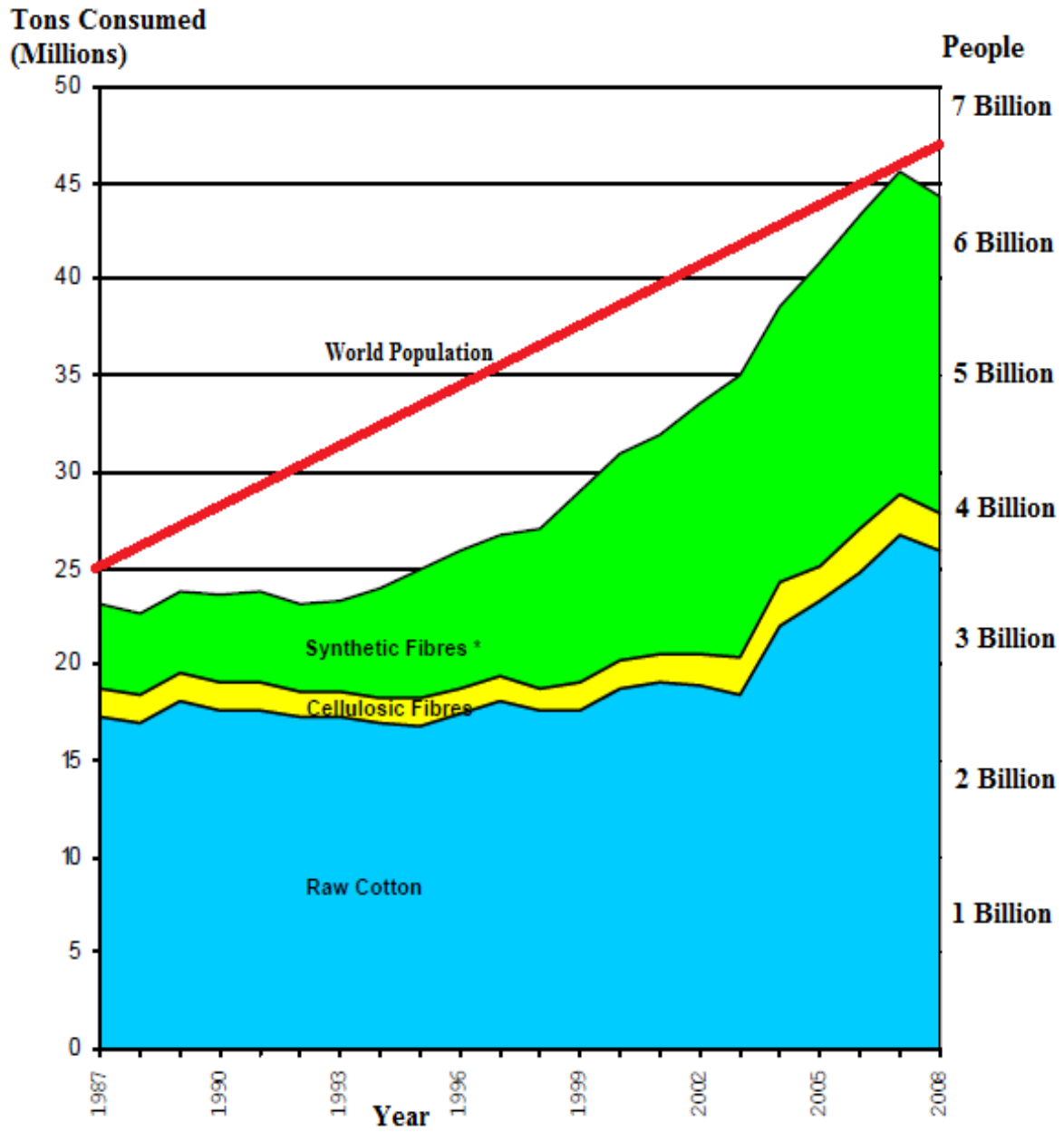


Figure 10 - World Consumption of Raw Materials by Principal Fiber Type.

Sources: (ITMF, 2008), World population line added by author from www.google.com/publicdata

2.2.4 How Cotton Price is Determined

Cotton Outlook has been publishing raw cotton prices since 1966. Presently, they provide the Cotlook A Index, which is a determination of the international offer prices for Upland variety cotton. Cotton Outlook claims that this index has an “unrivalled position as the leading barometer of international cotton price movements” (Cotton Outlook, 2011).

The Cotlook A index is calculated daily and is based off the prices offered to spinning mills. It employs a method of using the average of the five cheapest quotations available for middling 1-3/32 inch cotton, with middling being a common color grade. These parameters were chosen so that the index would utilize the widest possible selection of cotton. Currently, nineteen worldwide growths of cotton fit these criteria (Cotton Outlook, 2011).

Since 1988, Cotton Outlook has been using a Dual Index system for the Cotlook A Index. This is a means of including prices for the next season’s crop at times when such a value has been established. This is known as the Forward Index. The price for cotton in the present season is the Current Index. As seen in Figure 11, once the current cotton season ends, the Forward Index becomes the Current Index until another Forward Index can be instituted (Cotton Outlook, 2011).

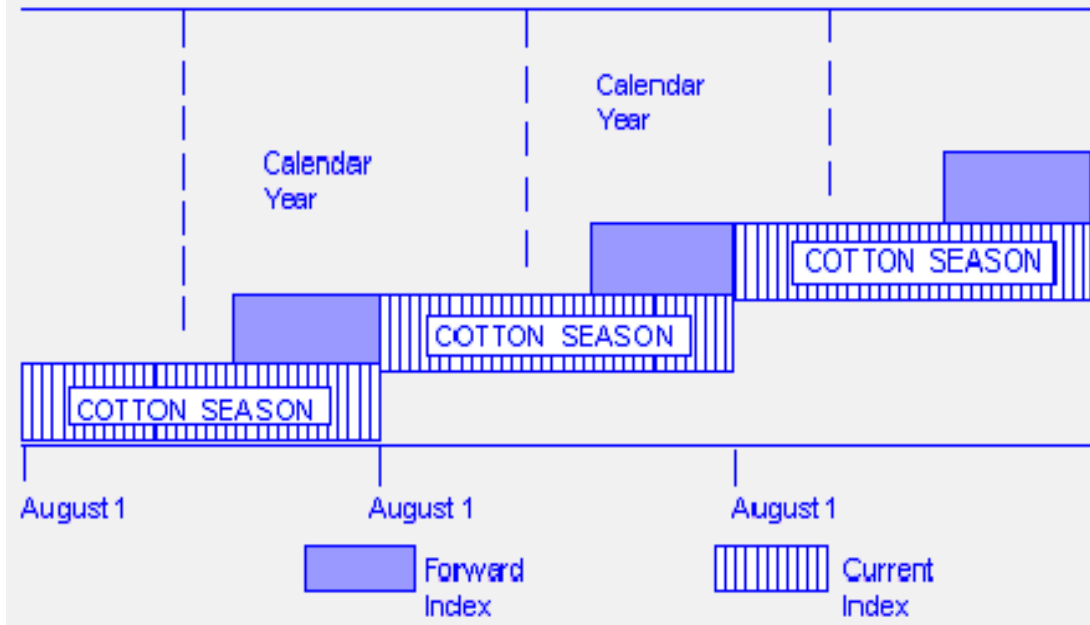


Figure 11 - Cotlook A Index Duel Index System

Source: (Cotton Outlook, 2011)

Since 2003, the Cotlook A Index has been based off of quotations taken in the Far East. This was done because once China joined the WTO, much more fiber was going to Asia, which had a vast impact on international cotton trade (Cotton Outlook, 2011). The Index uses ports without significant surcharges for freight and the prices are based on the following terms, according to Cotlook.com:

- Cost and Freight
- Letter of Credit at sight
- One percent agent's commission
- Notional profit

2.2.5 Causes of 2010-2011 Cotton Prices

There are multiple causes that came together to create the pricey environment in the global cotton industry in 2010-2011. These causes that synergistically raised cotton prices to unprecedented levels can be split chiefly into two categories: economic factors, and agricultural conditions.

Economic Factors

There are numerous economic factors responsible for the 2010-2011's increase in the price of raw cotton. In fact, any change in supply or demand will have an effect on price as seen in Figure 12. One factor could be traced back to 2006-2007 when the three grain commodities of wheat, corn, and soybeans had significant increases in price per pound. The high price these commodities were fetching on the market prompted many farmers to dedicate more acreage for cultivating them (Brandon, 2011). This came at the expense of cotton acreage. Production worldwide began to decline just as global demand started increasing (Southwest Farm Press, 2011).

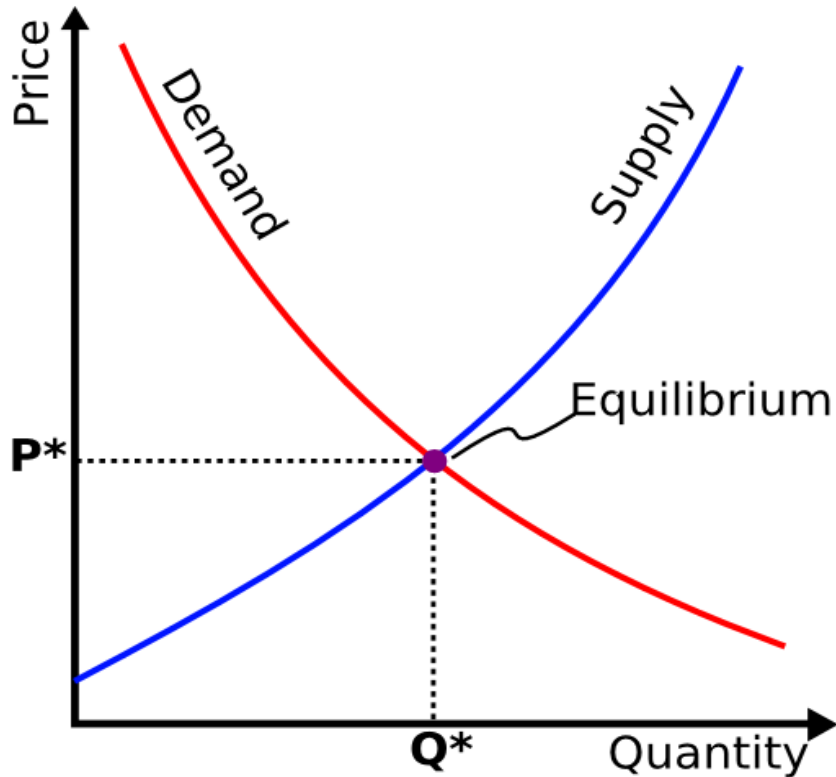


Figure 12 - Supply & Demand Chart
Source: (Stephansmithfx.com, 2011)

Worldwide cotton production decreased from 2008 to 2009, followed by a recovery in 2010. However, cotton use still exceeded production in each of these years (Table 10). Demand continues to increase worldwide as the population grows and China and India become more developed. The country of India also played a part in its decreased supply as it limited its own exports in order to contain domestic prices (Ruvo, 2011). However, predictions for 2011 were that cotton production (estimated 26.9 million metric tons) was expected to exceed cotton use (estimated 24.7 million metric tons) (Barrie, 2011).

Table 10 - Global Cotton Production and Use, 2008-2010.

Year	Cotton Produced (metric tons)	Cotton Used (metric tons)
2008	24.3 million	24.8 million
2009	23.0 million	26.8 million
2010	26.1 million	26.8 million

Source: (Roberson, 2011)

Beginning in the second half of 2010, the world began to come out of its recession and first-world countries, as well as emerging nations, regained some buying power (Ruvo, 2011). With less cotton being grown, the supply of raw cotton began to dwindle, leading to rising prices in the face of growing demand. In such a situation, prices will rise until they reach a level that entices farmers to begin growing more cotton (Brandon, 2011). This was true in 2010-2011, as farmers increased cotton acreage by 25% (Clark, 2011a). China, followed by Mexico and Turkey, is the largest market in the world for US cotton (Mongelluzzo, 2011). As China's economy has grown, it is demanding more cotton while exhausting its own stocks (Brandon, 2011).

Initially, the recently reduced worldwide supply of cotton was offset by the carryover supply that is left over from year to year, but a decrease in dedicated acreage led to a reduction of US surplus cotton stocks (US Census Bureau, 2011). As seen in Table 11, the ratio of average daily cotton use to cotton stocks greatly increased from 2009 to 2011 due to a modest increase in average daily use and significant decrease in stocks.

Table 11 - US Cotton Use and Stocks, June 2009 - June 2010

Month	Cotton Avg. Daily Use	Cotton Stocks (thousands of bales)
June, 2009	11,388 bales	10,800
June, 2010	12,898 bales	5,660
June, 2011	13,164 bales	4,234

Source: (US Census Bureau, 2011)

Agricultural Conditions

Another factor that can reduce cotton supply, and thus increase price, can be traced to the cotton plantation itself. To grow a bountiful raw cotton crop, a farmer needs a number of uncontrollable variables to work out. The two main worries are pests and weather (Yeung & Mok, 2004).

Pests have been a terror to US cotton plantations from the beginning. There are over 500 species of insects that prey on the cotton plant because of its large foliage and long fruiting period (Lord, 2003). In 1999, an inflation-adjusted figure of \$102 billion was estimated in total cotton losses due to insects. The arch-nemesis of cotton, the boll weevil, first surfaced State-side from Mexico in 1892. This insect started in Texas and made its way to the Atlantic coast by 1921. Farmers have been fighting it ever since, and have come up with numerous methods to keep infestations in check (Brown, 2011). Aside from consuming cotton plants, pests can leave behind honeydew, a sticky secretion that cause problems in all levels of cotton processing (Hequet & Abidi, 2005).

While pests did not have an unusually large affect in the 2010-2011 cotton growing season, there were significant issues with weather, particularly droughts in the cotton-growing state of Texas, where 213 counties have been declared natural disaster areas, and elsewhere in the Southeast. These droughts severely affected crop quality, leaving 41% of crops grown in the region to be poorly to very-poorly rated (Clark, 2011a). The USA was not alone in this, as both China and Pakistan faced poor growing conditions as well in the 2010-2011 season (Reichard, 2011).

2.2.6 Supply Chain Reactions to 2010-2011 Cotton Prices

Major increases in the price of cotton have an effect on the entire supply chain of cotton products. Increases in raw cotton prices will be passed along the chain, leading to more expensive yarn and pricier attire. This means that members of each level of the chain will have to adjust and strategize in order to maintain satisfactory business (Cotton Incorporated, 2010c). In response to the increase in cotton prices in 2010-2011, spinners, weavers, knitters, retailers, and even consumers made strategic and tactical decisions in order to succeed in a changed environment.

Reactions of the Yarn Spinner

The yarn spinner is the direct consumer of raw cotton, and is thus the first business to be impacted by rising cotton prices. In response to price increases, many spinners will stock up on cotton in order to lock in the price. This protects against further price increases. Their hope is that prices will decrease before their next purchase (Apparel Magazine, 2011). Some spinners will also search for alternative materials such those seen previously in Table 9.

Another strategy is to lower cost through such things as increased efficiency and process reengineering (Prior, 2011). An example of this possibility can be seen with the Trüetzschler WASTECONTROL system. This system claims a 0.5% savings on waste, a number that could lead to substantial savings, especially with higher cotton prices (Figure 13) (Trüetzschler Spinning, 2011).

It has been noted that spinners with an export strategy are best equipped to handle the modern cotton environment. This greatly increases their customer base, allowing them to meet demand wherever it might arise. Open-end spinners are also said to be benefitting from an increased consumer preference for soft-hand materials (Phillips, 2007).

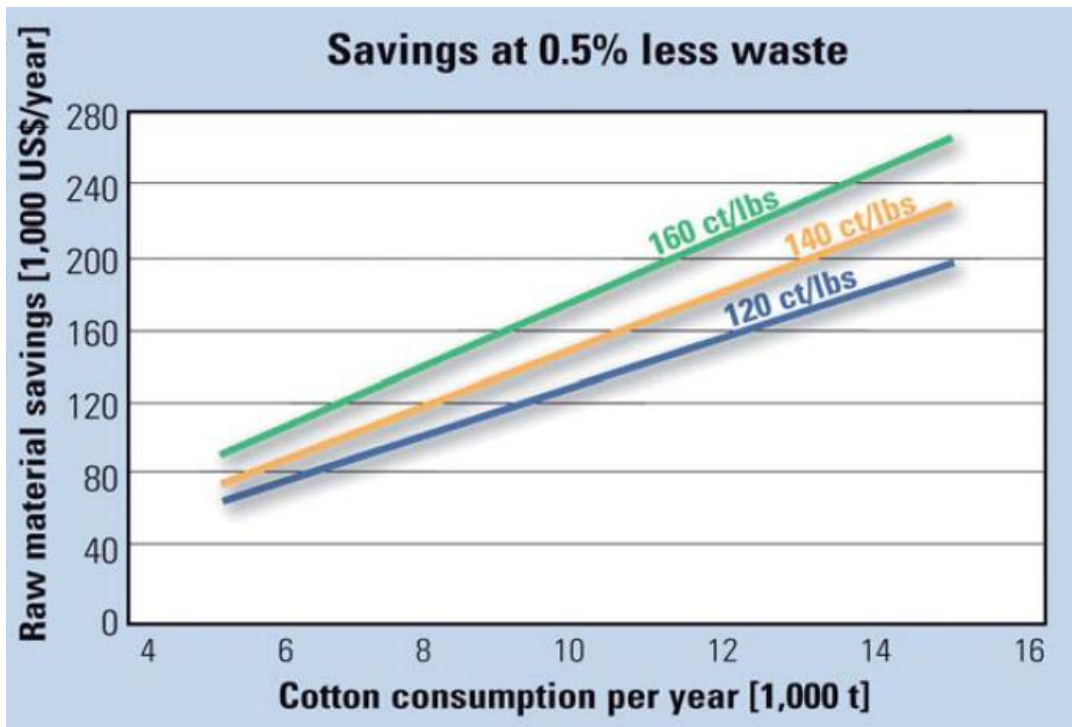


Figure 13 - Trüetzschler WASTECONTROL Raw Material Savings
Source: (Trüetzschler Spinning, 2011)

Reactions of the Fabric Manufacturer

The fabric manufacturer has to deal with the increased cost of their input material, yarn. Figure 14 shows the fluctuations of both ring-spun and open-end yarns in response to fluctuations in raw cotton price. As can be expected, the price of the raw cotton has supreme influence on the price of yarn.

One way fabric manufacturers have managed their price increases is through shorter contracts with retailers (Cotton Incorporated, 2010c). This keeps them from getting locked into deals that might sink them if their input costs rise. Similarly, surplus yarn can be purchased in order to maintain prices for a period of time (Tran, 2010).

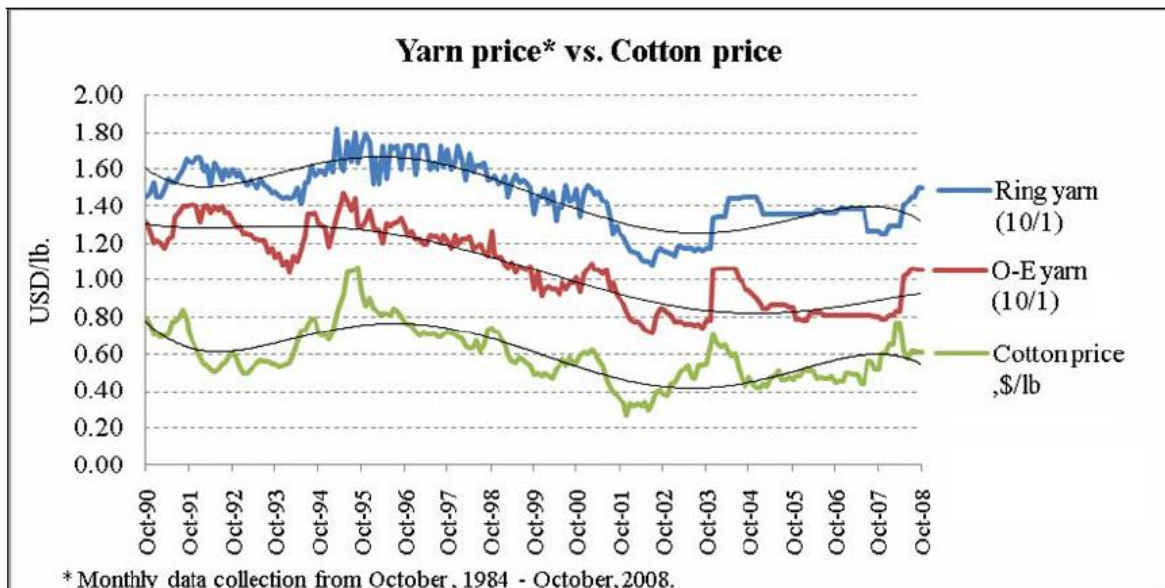


Figure 14 - Raw Cotton and Cotton Yarn Prices from 1990-2008

Source: (Moore, 2009)

Fabric suppliers might also raise prices on certain products rather than on all products, so that they can protect their best-sellers (Ruvo, 2011). Additionally price increases can be offset with an increase in order minimums, which would reduce the relative fixed cost per item (Tran, 2010). Fabric manufacturers can also benefit from a customer deciding to absorb costs themselves. Rather than increasing prices and risk losing customers, Jockey International absorbed some of the cost increases in 2010-2011 while pushing the rest to their fabric suppliers (Monget, 2010).

Reactions of the Retailer

Retailers have increasingly been using inventory management strategies in recent years, as consumer demand has been more unpredictable than ever. The turning point for many retailers was the holiday 2008 season, when the recession hit and demand floundered just after many retailers had amassed large inventories (Cotton Incorporated, 2010c). This caused the retailers to change their strategies in order to become more flexible and reactive in the face of changes such as those caused by increased cotton prices. Tuesday Morning, however, is one retailer that did just the opposite by investing in surplus inventory in order to keep prices constant going into the future (Home Textiles Today, 2011b).

Retailers have a choice of strategic options. They can pass on some of the cost to customers, but possibly lose sales; or absorb the costs, but risk losing margins (Karr, 2011). Those that have not passed costs straight to their customers can reduce their own costs by reexamining their sourcing options and even simplifying designs (Cotton Incorporated, 2010c). Some retailers will both pass on and reduce costs. Aeropostale, for instance, was

willing to pass on some of the cost to their customers, but also tried to lower costs on their end. Two of the popular retailer's strategies were finding cheaper ways to apply graphics, and saving 5 cents per garment by reducing the amount of fabric used in its tags (Cotton Incorporated, 2011c). With standardized products such as plain t-shirts, economies of scale can be used to reduce price (Hassler, 2003).

Cost Plus, a specialty and import retail chain, relied on its relationships with its vendors to allow it to overcome increased cotton prices. They worked with vendors on value engineering in their products and hoped to keep prices down as per their value pricing strategy (Home Textiles Today, 2011a). Other supply chain strategies include removing layers and doing more services overseas to decrease inventory domestically (Apparel Magazine, 2011).

Retailing giant Wal-Mart has the resources to pay for rising supply costs in order to maintain prices. Wal-Mart's president and CEO of the US Discount Division, Bill Simon, refers to this as "investing in prices." Meanwhile the CEO of discount chain T.J. Maxx, reasons that as long as other retailers raise prices, T.J. Maxx can do the same and still maintain their "value gap" (Clark, 2011b).

US Apparel saw cotton price decreases on the horizon and kept a low inventory while employing a made-to-order strategy in the meantime (Lone et al., 2011). This strategy is seen as risky to some, who wonder what will happen if the price does not come down and a business is left without quality materials (Celeste, 2011).

Retailers and distributors also were already looking ahead and strategized for when cotton prices would come down from their peak levels of the winter of 2010-2011. VF Corporation hoped to hold their prices despite decreasing material costs in order to offset losses caused by the cotton price increases. Likewise, Hanesbrand considered raising prices, but also including more shirts or underwear per pack, in order to make back lost gross margins (Daniels, 2011).

Reactions of the Consumer

The final consumer of the end-product will ultimately decide how much of the cost can be passed all the way through the supply chain. In 2010-2011, however, consumers had their guard up when it came to spending. They compared value to price, did their homework, and would not buy if they did not determine there to be a good deal (Cotton Incorporated, 2010b). When deciding whether to purchase new clothing, price was still the primary consideration for worldwide consumers (Cotton Incorporated, 2010a).

History has shown that consumer demand for textiles tends to fall in line with GDP (gross domestic product). Consumers are ready to update their wardrobe after a few years of curbing purchases (Reichard, 2011). Figure 15 shows that over half of all consumers in 2011 would pay more for natural fibers, such as cotton. Also, in a survey, consumers were said to be willing to pay up to 25% more for a quality item if they had to (Cotton Incorporated, 2011c). In tests of higher prices, Kohl's Corporation saw consumers react by purchasing fewer units, but the store still saw an increase in overall revenues (Clark, 2011b).

Many Consumers Are Willing to Pay More For Natural Fibers Like Cotton

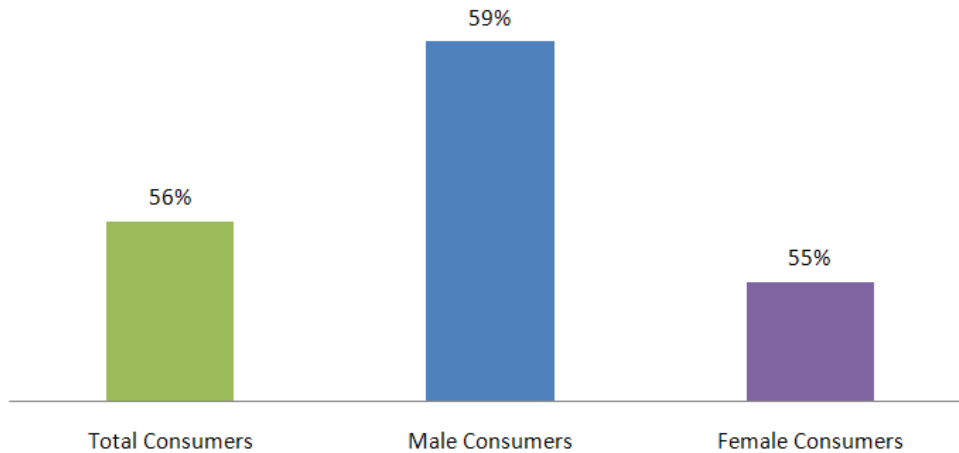


Figure 15 - Consumers Willing to Pay More for Natural Fibers
Source: (Cotton Incorporated, 2011c)

2.2.7 Forecasting Cotton Prices

Elevated cotton prices subsided in subsequent seasons, but members of the textile industry that were caught off guard would certainly have preferred to have seen the rise in prices coming. With so many unpredictable factors going into cotton pricing, accurate forecasting has proven difficult.

In addition to the factors that led to the 2010-2011 increase in cotton prices, another factor that industry members were paying attention to for the future was potential monetary inflation in China. If the Chinese Yuan were inflated, it would make imports from countries such as the USA a cheaper option, probably increasing US imports into China (Reichard, 2011). This would further increase demand for US raw cotton, and global cotton prices

would rise. It is believed that consumers in such large countries as China and India are the global drivers of cotton demand (Nelson, 2011).

Researchers at Texas Tech University have constructed a complicated model (Figure 16) to forecast cotton prices. This model was used by (Ethridge, Welch, Pan, Fadiga, & Mohanty, 2006) to make 10-year projections for the global cotton industry (Figure 17). The future prices in cotton were predicted using this model with assumptions being made for environmental, political, and economic variables. The results were meant to be used as a tool for farmers, policy makers, and anyone interested in the impact of the changing worldwide cotton market.

As seen in Figure 17, this study predicts cotton and man-made fiber prices to become practically equal by 2015, with cotton usage in pounds to remain at about 60% of man-made fiber usage, as it is today (Ethridge et al., 2006). This study clearly has its limitations, as it failed to predict the 2010-2011 elevation in cotton prices.

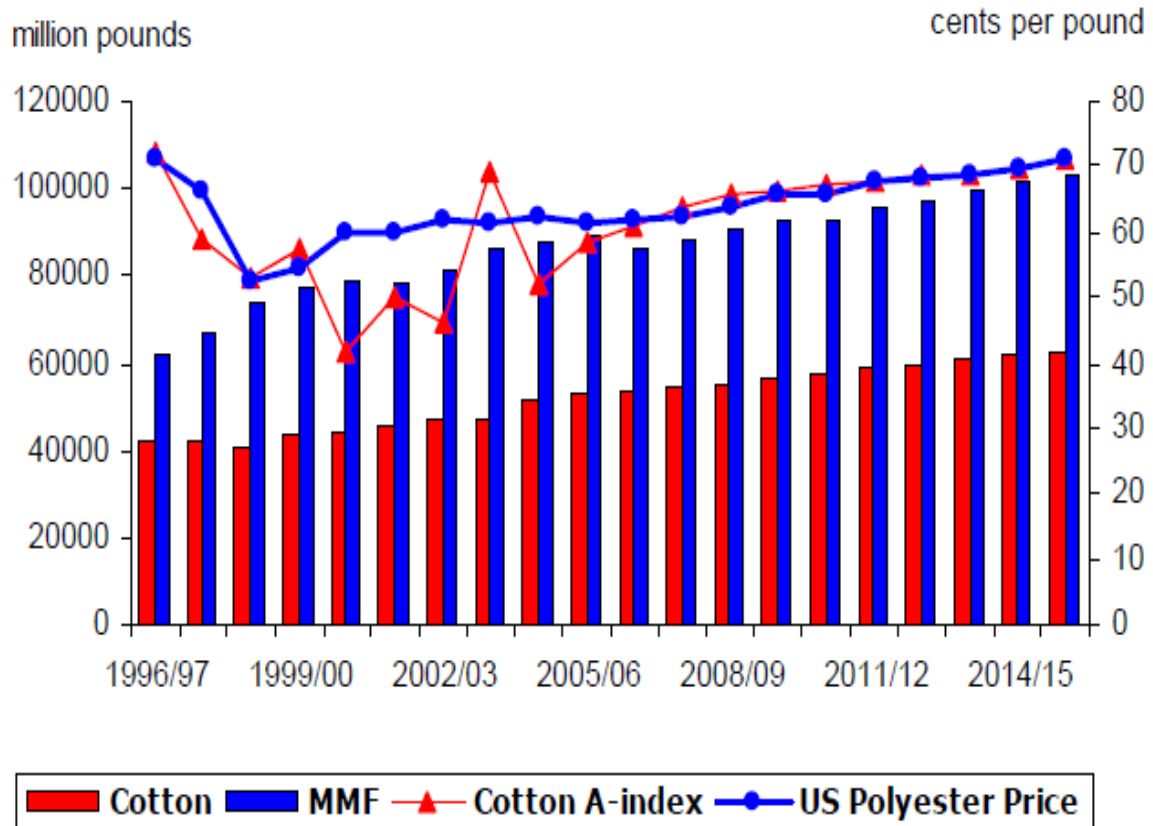


Figure 17 - World Cotton Demand and Prices
 Source: (Ethridge et al., 2006)

2.3 US Manufacturing

Historically, “insourcing” meant a company would perform activities itself, rather than contracting them out. Today, “insourcing” can also be defined as keeping production and competencies within national borders rather than using overseas suppliers (Sikula Sr., Kim, Braun, & Sikula, 2010).

While much textile manufacturing has been outsourced, it has been stated that those companies that remain in the US manufacturing industry are the very best. Surviving US

textile companies are resilient, tough, and innovative (Jasper, 2011). It is their innovation, efficiency, and time-to-market that have allowed them to survive while so many others have closed down, or moved overseas (Figure 18). For this reason, many experts think the industry is in a position to begin to grow again (Bennett, 2009).



Figure 18 - Manufacturing Leaving the USA
Source: (Pisano & Shih, 2009)

This is important because much of the US economy relies on manufacturing, which is responsible for 60% of exports, 90% of patents, and 70% of private-sector research. Further reasons for the importance of manufacturing are the new housing, restaurants, and tax revenues that come along with the opening of a new manufacturing facility (Scherer, 2012).

2.3.1 “Insourcing” Versus Outsourcing

While outsourcing manufacturing has long been the way to minimize costs for US textile companies, there are also numerous benefits to making products in the USA. Three examples are quality of materials, the reliability of a domestic supply chain, and faster delivery (Rodie, 2011a).

Downsides of outsourcing that have led to some companies reconsidering “insourcing” are unhappy customers, foreign scandals, global recession, terrorism, rising transportation costs, concern for safety and an increase in national pride in the USA (Sikula Sr. et al., 2010). Figure 19 depicts the benefits and costs of “insourcing” versus outsourcing for a company. These must be balanced in order to make the correct decision. Table 12 and Table 13 also list advantages and disadvantages of outsourcing internationally. Further, Table 14 lists the risks of manufacturing in a foreign market.

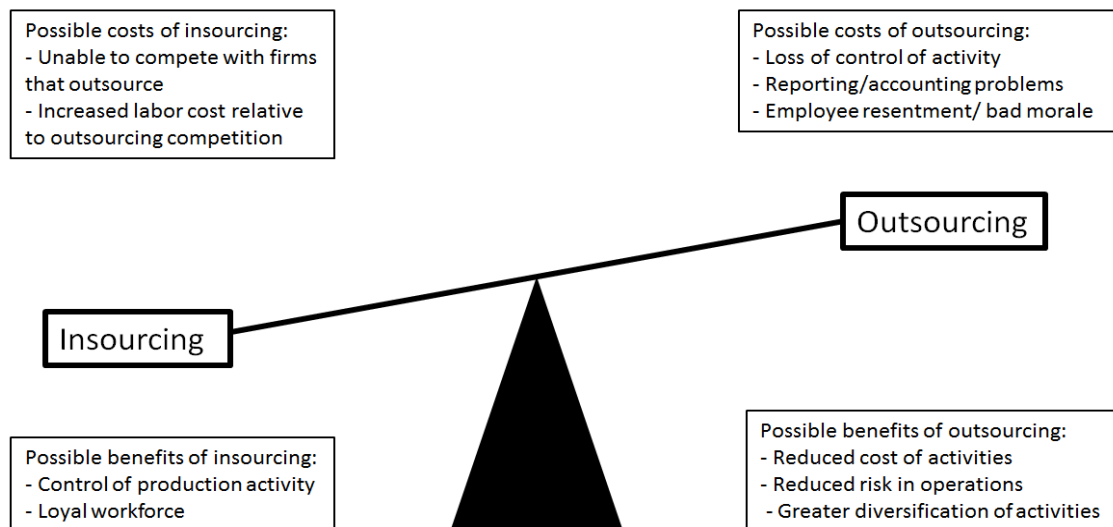


Figure 19 - Balancing Outsourcing and Insourcing Benefits and Costs
Source: (Schneiderjans, 2005)

Table 12 - Advantages of Outsourcing Internationally

<u>Reasons for outsourcing</u>	<u>Potential Advantage</u>
Increased profits	- Cost of outsourced business activities can be less due to less restrictive laws - Can take advantage of currency exchange rates
Improved operations	- Foreign markets have raw materials and labor that is otherwise unavailable
Improved markets	- Working closely with outsource provider can be a learning experience about international markets - Can protect home country markets from imports by competing with lower costs
Other	- Outsource provider can act as a branch of the company, avoiding the complications of going international

Source: (Schniederjans, 2005)

These figure and tables show that choosing between “insourcing” and outsourcing is a multifaceted decision and unique to each company. For some companies, the risks and costs of outsourcing will be outweighed by the benefits. For others, the benefits of “insourcing” will override the benefits of outsourcing that the company would have to give up.

The textile industry, due to the nature of fashion is susceptible to constant change and seasonality. This puts reduced lead times at a premium. However, when companies outsource much of an item’s manufacturing to low-wage countries, lead times are impaired. This impasse has led to more and more companies in developed countries looking to “insource” some or all of their manufacturing. They perform more manufacturing operations in their home country, where it is possible to get the job done with automated, high-tech, informed operations. This puts products closer to customers and increases independence from third parties. It also allows for stricter quality control and allows for customization, as

smaller batches can be made precisely to customer specifications (Caputo & Palumbo, 2005). When making an “insourcing” decisions, textile companies have to keep in mind the considerations found in Table 15.

Also, “insourcing” allows customers to better protect proprietary designs and information. With economies of scale, unit costs are reduced and fixed costs can be spread amongst more volume. Drawbacks to textile “insourcing” include large capital investments needed to establish manufacturing facilities. Because of this, the market must be assuredly stable (Caputo & Palumbo, 2005).

In 2010, 98% of all apparel products sold in the USA were made in another country; 40% of the time, this other country was China. Likewise, 99% of footwear sold in the USA was not made domestically, and China is actually responsible for the production of 85% in this category. These figures come from the American Apparel and Footwear Association (Siemers, 2011).

Table 13 - Disadvantages of Outsourcing Internationally

<u>Reasons for not outsourcing</u>	<u>Potential disadvantage</u>
Increased costs	<ul style="list-style-type: none"> - Higher delivery costs from lag time due to distance - Costly and difficult to change outsourcing agreements - The expense of negotiating, maintaining, and enforcing outsourcing agreements may outweigh benefits
Loss of control	<ul style="list-style-type: none"> - A dependence on the outsource provider can lead to loss of markets and higher costs - Loss of flexibility in controlling business activities, final product, etc. - Lack of contractual flexibility
Negative impact on employees	<ul style="list-style-type: none"> - Negative impact on employee morale - Organizational restructuring results in dislocations and social costs for employees
Negative impact on customers	<ul style="list-style-type: none"> - Lag time in service may delay delivery and increase costs to customers - Operations can be disrupted in the transfer to the outsourcing provider
Difficulties in managing relationships	<ul style="list-style-type: none"> - Difficult to quantify the advantages of outsourcing - Design changes for products are difficult to order from distance - Excessive investment in time to build a relationship with outsource provider - Occasional inability to communicate with outsource provider - Outsource provider might be unable to communicate difficulties and opportunities
Other risks	<ul style="list-style-type: none"> - Outsource provider may share knowledge with competitor - Can be costly and difficult to recruit personnel if outsourcing decision is reversed - Outsource provider may fail to achieve objectives - The outsourcer's risks are all assumed by the client firm - Can require an alliance with an undesirable provider - Outsourcing business activities can lead to a loss of skills - Corporate knowledge within the firm can be lost over time - Innovative capacity weakened in the longer term - Failure in outsourcing can result in failure of firm - Outsourcing can result in security or confidentiality breaches

Source: (Schniederjans, 2005)

Table 14 - Risks of manufacturing in Emerging Markets

Risk	Definition
Sovereign risk	Domestic liquidity is decreased from the government defaulting on its debts, This impacts the level and quality of government services
Transfer risk	Exchange of liquidity regulations prevent the repatriation of capital or profits
Currency risk	Currency fluctuations impact the value of profits and investment
Economic risk	General economic difficulties cause a decline in growth or profit opportunities
Political/institutional risk	A war or revolution results in changes in government regulations, taxes, legal framework, or the government itself
Intellectual property risk	When proprietary idea and designs are stolen

Source: (Duesterberg & Preeg, 2003)

Table 15 - Considerations for Textile “Insourcing”

- The familiarity the company has with the product
- The company’s core competencies including better control, reduced lead times, reduced costs, internal skills, and technology
- The stability of the technology and the product life cycle
- Concern about the current suppliers regarding reliability
- Concern about current suppliers regarding capability of meeting required quality levels
- Concern about current suppliers regarding capability of meeting required performance levels
- The consistency in strategy between the company and the suppliers
- The possibility of economies of scale given the a particular product’s forecast

Source: (Caputo & Palumbo, 2005)

For over 40 years, the textile industry’s core strategy has including finding the lowest-cost producer. However, there has been a renewed interest in US manufacturing that has not been seen in a long time. The lifting of the global recession is partly responsible for

this. Consumers have been inspired to shop closer to season and demand better quality. Many companies themselves are seeking to reduce risks and reduce the unpredictability that comes with global sourcing. There is also a renewed sense in patriotic pride, as some consumers feel responsible to seek out “Made in the USA” products and do their part in creating jobs. The 2012 US Presidential Election has also given candidates the platform to increase awareness of the need for more manufacturing jobs for the economy (Friedman, 2012)

On January 11, 2012, President Barack Obama made a speech imploring US companies to bring jobs back into the country. He said that “insourcing” is important because a “commitment to country” is needed. He pointed out that although US manufacturers have added jobs for the last two years, the intensity of these additions needs to be increased due to the development of markets all over the globe. Obama promised to forward proposals that would both eliminate the tax breaks companies get for moving jobs to foreign countries and will instead actually reward companies that bring jobs back to the USA (Obama, 2012).

Specifically, the Obama administration would like to take away the tax deduction of moving expenses when a company transfers a job out of the country. They would also like more deductions for US manufacturing, including a doubling of those manufacturing deductions related to advanced technologies. There is also a proposed "manufacturing communities tax credit," which would give billions of dollars per year to companies that

choose to expand into areas that have been affected by a plant closing or other major job-loss event(Scherer, 2012).

As part of his effort, Obama stated a desire to double exports by 2014. He said this could be achieved through the combination of several things (Obama, 2012):

1. Trade agreements with countries such as Korea, Panama, and Columbia,
2. Investment in education to maintain the high quality of American workers, and
3. Investments in transportation and communication networks to ensure that businesses have the opportunity for growth.

He iterated the need for “Made in the USA” products that the nation can be proud of, and that companies have a responsibility to the country that made their businesses possible. He expressed that “insourcing” is the right thing to do, but also often the economic thing to do; this being the case due to a higher level of productivity and increasingly competitive costs (Obama, 2012). Exports are also a significant area of focus for the government’s plans for domestic manufacturing. US textile and apparel exports to the Western Hemisphere in 2011 alone were \$13 billion, a 33% increase over the previous year (Trade.gov, 2012).

Some state governments have also invested in manufacturing. Through tax credits and refunds, New York put \$1.2 billion towards recruiting the company GlobalFoundries to locate their new plant in the state. The state figures that for every 1 job that is made in the new plant, 5 support jobs outside the plant are created. This is known as the multiplier effect.

In addition, there might be 5 or 6 indirect jobs associated with the plant job, such as in new restaurants in the community (Scherer, 2012).

Changes in global textile manufacturing are occurring faster than ever. Variables that many decision makers may have been taking for granted have been in flux. One such variable is raw material prices. Another is the production landscape in China. This flux has necessitated fresh ways of thinking in regarding to where textiles are manufactured. In this situation, sourcing must be done sensibly and analytically. Companies should be looking at what their customer wants and how to delivery that want, rather than just looking at prices. Often, customers will value quality over price, and retailers will no longer tolerate off-time delivery (Friedman, 2011).

A 2011 report from the White House listed examples of the “insourcing” that has already been taking place and the opportunities for US production. The report pointed out that US exports have increased by over 30% since 2009. Additionally, the 334,000 jobs added to the economy over the preceding two years were the most for a two-year period since the 1990s, and this included investments in new domestic facilities for major manufacturers Ford and Caterpillar (Agency, 2012).

Overall, the manufacturing sector has been recovering from the recession at a faster rate than the rest of the economy (Agency, 2012). Gene Sperling, the director of the National Economic Council said in 2012 that the USA is more competitive in manufacturing than it been at any time during the past 20 to 30 years (Scherer, 2012).

The USA was the world's leading importer of textile and apparel products in 2010, bringing in 25% of all imports. Textile and apparel output for the USA dropped by over 35% from 2007 to 2009, but showed signs of growth by increasing by about 6% in 2010. In this time, from 2007 to 2010, textile and apparel employment decreased by 27%. Going even further back, from the years 1990 to 2002, textile and apparel manufacturing employment dropped by over 61% (Friedman, 2012).

For US manufacturing in general, two deterrents for either keeping existing manufacturing facilities or creating new ones are high labor costs and high corporate taxes. These costs, however, must be compared to the rising costs, in both money and time, of doing business on the other side of the globe (Goldsberry, 2010).

These rising costs come from an extended supply chain and inventory pipeline as well as the theft of intellectual properties. Additionally, rising fuel costs make transportation an ever-increasing expenditure, particularly for those US companies that are bringing their products back into the States to sell (Goldsberry, 2010).

It is not just US companies relying on US manufacturing, as plants are increasingly becoming foreign owned (Evans & Engel, 2011). In fact, between 1998 and 2008, over \$2 trillion in stakes of major US firms were purchased by foreign investors. These investments have occurred because of the US Dollar's low strength against some foreign currencies in recent years (Goodman, 2009).

However, the cost of US manufacturing is improving in relation to other countries. This is the case because of the confluence of several factors (Agency, 2012):

1. Rising costs in countries like China,
2. Increased efficiency in the USA, including a productivity rise of almost 13% in 2009 alone, and
3. Lowered US energy costs, reduced pollution, and investment in related industries caused by an increase in natural gas production.

2.3.2 Rising Costs in China

China is continuing to lose its production advantages due to rising costs and currency inflation. (Evans & Engel, 2011). Chinese labor costs are rising at 40% per year due to workers becoming more selective and a shortage of young adult workers from China's one-child policy (Trends Magazine, 2011). The rising labor costs are also partly due to laborers moving into higher paying industries. This smaller supply of available laborers brings the price up (Siemers, 2011). It has been said that, over the next 5 years, the Chinese government wants worker wages to double. Additionally the inflation of Chinese currency will make products coming from China more expensive in the USA. It has also been said that what happens in China is likely to influence all of Asia (Engel, 2011).

The gap between labor wages in the USA and China will get smaller as Chinese wages increase. Additionally, currencies in emerging economies around the globe will

continue to appreciate, decreasing the value of the US dollar in those countries. This will lead to, among other things, more customers for US businesses (Schonberger, 2011).

The textile industry in China is not a constant. The nation is undergoing changes as it emerges into more of a developed country. China recently released a plan for its textile industry in which manufacturing operations would begin moving inward from the East coast, where over 80% of Chinese textile manufacturers currently operate. The plan calls for an effort for more investments in advanced technologies. It is believed that this would make China more globally competitive (Farrar, 2012).

The Chinese see these moves as necessary because of its increased material and labor costs, and the inflation of Chinese currency. The thought is that cheap labor and abundant resources will be more readily available inland. Plus, the country concedes that many cheap labor operations are moving to other places, such as India and Southeast Asia (Farrar, 2012).

The government's solution is not to become cheaper, but to be able to compete with the West in advanced technology and innovation. While the country still hopes to export to the USA, Japan, and Europe, more of an emphasis is being placed on meeting the growing demand of China's own growing middle class (Farrar, 2012).

It has been said that after adding everything up, and with new Chinese laws on employee wages and benefits, the manufacturing advantage of using China as a low cost country is only around 5%. Company's found that the higher cost of manufacturing in the

USA can be offset by taking advantage of local and state tax breaks, lack of import duties, and using “Made in the USA” marketing (Goldsberry, 2010).

With costs continuing to go up in China, much manufacturing has found its way into other Asian countries such as Bangladesh, Indonesia, the Philippines, and Vietnam.

However, while prices are lower than China, the drawback of these and other cheaper countries is often longer lead times to the USA. This is also the case if companies look to source too far away from China’s east coast (Friedman, 2011).

2.3.3 Increased US Manufacturing Efficiency

Increased efficiency comes from improved productivity and automation. It would seem to follow that these things would entail less job opportunities in the textile industry. In fact, many believe that the high level of US productivity means that jobs will not grow in step with increased manufacturing output (Scherer, 2012). However, increased productivity and automation does not always mean a net loss of jobs. In fact, it is usually the opposite. For instance the cotton gin took the job of many manual laborers at first, but it also greatly increased the size of the textile industry, creating many more new jobs than were lost (Trends Magazine, 2011).

While it is true that efficiency through automation can reduce the need for manual labor, there are other factors that go into increased productivity. Better productivity is also achieved through innovations that improve quality, performance, and value in goods and services. There is also the fact that savings due to productivity are often reinvested

elsewhere in the economy, which can ultimately increase the creation of new jobs (Manyika, Remes, & Roxburgh, 2011).

Many US manufacturers believe that automation is a key factor in both quality improvements and cost competitiveness. Inman Mills in South Carolina is one such company. They recently finished an automation project, working with Patti Engineering, Inc. The project included the installation of a modern electrical control system. Patti Engineering is able to retrofit existing systems as well, updating them with new software. This saves manufacturer's the cost of purchasing new equipment. This is one way US textile manufacturers are combating new regulations and rising costs in the face of aging infrastructure (Textile World, 2011).

Automation in manufacturing succeeds in optimizing manufacturing operations, elevating profitability and customer value. The benefits of automation, as found in Table 16, are plentiful.

Table 16 - Manufacturing Objectives of Automation

- Reduce production costs
- Enhance product quality
- Increase production speed to reduce delivery times
- Improve the pace and scope of innovation
- Expand product and process flexibility
- Make feasible the production for goods that could not otherwise be created

Source: (Duesterberg & Preeg, 2003)

2.4 Opportunities in US Textile Manufacturing

US textile manufacturers can adopt global strategies and try to find customers in global markets. This can be done by leveraging core competencies and selling what no other firm can to those customers that demand these products, and enhanced services can also be provided (Duesterberg & Preeg, 2003). There are increasing opportunities in the USA as more brands and retailers reassess their sourcing (Rodie, 2011b).

Specific manufacturing strategies that may be used by US textile companies include supply chain optimization, adding a service component to products, being a technology leader, integrating products into the internet, and customization (Duesterberg & Preeg, 2003). Categories for successful strategies include, speed-to-market, technical textiles, eco-friendly textiles, selling to the military through the Berry Amendment, and “Made in the USA” marketing.

2.4.1 Speed-to-Market

As customers get more particular and cautious, retailers must be able to respond to changing demands. This makes the speed-to-market of having local suppliers all the more important. Retailers are finding out that paying more for items that cost less to ship and arrive on time to satisfy demands can be more cost effective than paying less but spending more for transportation and possibly missing the demand window (Rodie, 2011b).

It is also important to grow the supply chain in the Western Hemisphere so that retailers have options and are not at the mercy of Chinese suppliers, should they suddenly

raise prices (Rodie, 2011b). Sourcing is being re-balanced with more opportunities coming back into the Western Hemisphere from China, where costs are rising and internal demand is growing (Jasper, 2011).

Benefits of being a local supplier include shipping times, strong customer service, custom design, quick response, residing in the same time zone as customers, speaking the same language as customers, better relationships, and greater transparency (Friedman, 2012). Executives and designers can also work more closely with manufacturing when it is located domestically (Siemers, 2011). Domestic sourcing for retailers usually comes with an enhanced level of trust. Retailers are able to visit the manufacturers and have input into the quality (Rodie, 2011b).

Businesses continue to stress speed-to-market as the main advantage of the USA. The key is not to try and compete on price, but rather the value of innovation. Being able to replenish store shelves quicker allows for a higher percentage of items to sell for full price and not be subject to mark-downs (Friedman, 2012).

The emphasis on speed-to-market began with the advent of lean retailing. This means that large retailers began to minimize the risk of holding large inventory by using smaller shipments to replenish inventory based on real time electronic data. Because many of the cost savings of outsourced manufacturing comes in the ability to make and ship mass orders, this created an opportunity for local manufacturing. Lean retailers are looking for

manufacturers with the most agility, which is a combination of speed and flexibility (B. Jin, 2004).

Lean retailing has made it more important for US manufacturers to introduce new management practices and information systems than to just increase operations. This is because improved flexibility and communication with retailers make manufacturers a better candidate for lean retailers, because they can now delivery orders with short notice. The shift to lean retailing can be seen in the increase in dollar percentage of sales replenishment orders, which jumped from 8.7% in 1988 to 33.9% in 1992, right around the boom of lean retailing practices (Abernathy, Dunlop, Hammond, & Weil, 1999).

There is also a growing trend of basic textile apparel products to have more fashion qualities. This makes them more susceptible to trends and seasonality and better candidates for US manufacture with shorter lead times and better communication. The speed with which retailers want goods from apparel manufacturers is also passed up the supply chain, meaning that the apparel manufacturers now want to be able to order smaller quantities with shorter lead times from their fabric makers. The fabric makers will then demand shorter lead times for yarn, and so on (Abernathy, Dunlop, Hammond, & Weil, 1999).

2.4.2 Technical Textiles

One particular area of US manufacturing that has been notable for recent growth and opportunities is the advanced manufacturing sector (Scherer, 2012). Technical textiles, which are those textiles that have high performance qualities such as high strength or

elasticity, are said to be a great opportunity in the US production industry. These textiles tend to have specified attributes for performance which makes it more important for customers to have confidence in their suppliers because the customers need to avoid potential liability issues with these types of products. For this reason, technical textile consumers appear to prefer to source technical textiles locally (Kaufmann, 2007).

Companies that produce technical textiles need to keep their advantage by continually innovating and improving their products. This keeps them ahead of foreign competition. They are also working closely with customers in research and development toward customer needs (Kaufmann, 2007).

For man-made fiber, apparel and home textiles only make up about 20% of output. For this reason, these fibers are not subject to the same global trends. The fibers that go into industrial uses and floor coverings show steady growth along with those industries, which have not been greatly impacted by imports (Horn, 2006).

2.4.3 Eco-Friendly Textiles

With increasing government regulations and public awareness, more and more manufacturers have found themselves trying to become more environmentally friendly. These efforts not only appease customers and the government, but they can also be cost saving measures as well. Recycling has been found to reduce costs associated with energy, conserve raw materials, and reduce pollutants (Handfield, 1999).

Brands and retailers, who represent the customers of manufacturers, are also trying to make their supply chain greener. Proactive retailers might use the following programs in order to increase both financial and environmental performance: supplier evaluation, scrap deposition, transportation selection, and product design including labeling and packaging. If a supplier does not score favorably in the supplier evaluation, they may lose the business and find themselves outside of that customer's supply chain (Handfield, 1999).

2.4.4 The Berry Amendment

The Berry Amendment, which was enacted in 1941, is a statutory requirement on the US Department of Defense (DoD), which includes the US Army, Navy, and Air Force. Among the things it precludes the DoD from purchasing, with exceptions, are textiles products not reprocessed, reused, or produced in the USA. This includes fibers, yarns, fabrics, clothing items tents, tarpaulins, and covers. Restricted clothing items include “outerwear, headwear, underwear, nightwear, footwear, hosiery, handwear, belts, badges, and insignia.” This amendment makes the US military a valuable customer to US spinners, weavers, knitters, and clothing makers (OTEXA, 2012).

The amendment works under the rules of the World Trade Organization because there is an exception for the procurement requirements of national security agencies. In 2008 alone, the DoD made 2.8 billion dollars' worth of textile and apparel purchases under the Berry Amendment. This total was equated to 210,000 jobs. It has also been posited that these amendments can be the difference between a plant closing and staying open. It does

not only benefit the workers and factories, as the money also goes into tax revenues and the economy in general (Bennett, 2009).

In 2009, the government also added the Kissell Amendment. This acts like the Berry Amendment, but is for the Department of Homeland Security (DHS), which includes the US Customs and Border Protection Agency, the US Coast Guard, the US Secret Service, the Transportation Security Administration (TSA), and the Federal Emergency Management Agency (FEMA). The Kissell Amendment is named for Congressman Larry Kissell, a Democrat from North Carolina, where many textile manufacturing plants have been shut down over the past decade (Bennett, 2009).

The passing of the amendment will enable textile manufacturers to hire-back some of the positions in which they have had to lay off workers. Like the Berry Amendment, it keeps production going in the USA regardless of other factors affecting demand. In fact, it means that US-made uniforms will be worn by all Homeland Security employees, a staff of about 250,000 people (Bennett, 2009).

These amendments are certainly widely used by US manufacturers. About 90% of US textile companies have been found to be producing products sold under the Berry Amendment, according to a poll of the National Council of Textile Organizations (Bennett, 2009).

2.4.5 Made in the USA

Many US consumers use country-of-origin as a factor in deciding on buying products. To take advantage of this, many companies that manufacture products in the USA seek to market their products as such. There are various brand certification labels being used for this purpose including the one shown in Figure 20. Companies may use this label if they meet the accreditation standards laid out by the brand (Madeintheusabrand.com, 2012). In one recent Textile World article, the founder of a US-made apparel brand (The Goodwear Corp) explained that customers will pay more for “Made in the USA” because they are local and of the higher quality (Rodie, 2011a).



Figure 20 - The Made in USA Brand Certification Mark
Source: (Madeintheusabrand.com, 2012)

Additionally, many retailers and vendors take the state of local and national economies into account when considering where products are manufactured. They realize that unemployment is high and additional jobs will help the economy (Evans & Engel, 2011). Some companies are starting to ask how many jobs would be generated if they source from a US supplier (Friedman, 2012). Also, customers who are into sustainability and eco-garments often times also value “Made in the USA” products (Friedman, 2012). “Made in the USA” goods are not just popular in the USA, either. Other countries, such as Japan demand US made goods for their superior quality (Rodie, 2011a).

US customers consider items made domestically to be safer than alternatives (O'Neill, 2011). “Made in the USA” products can be especially popular for items in which safety is a priority, including baby products. Customers for such products are usually willing to pay more for the comfort of owning a safer product (O'Neill, 2011).

2.4.6 Organizations

Organizations such as the National Council of Textile Organizations (NCTO) are working to promote US suppliers to potential customers. This promotion includes the growing infrastructure in textile supply chains, along with the values and capabilities of US manufacturers. The NCTO also works to ensure that political regulations do not harm US companies’ ability to compete internationally (Jasper, 2011).

The organization is strongly against the new United States-Korea Free Trade Agreement because they feel it is inequitable in regards to textiles. The concern is that Korea

has been known to allow illegal transshipments from China, which would now enter the USA duty-free. In a related effort, the NCTO also works to improve custom enforcements in the USA (Jasper, 2011).

Some in the US textile industry feel that textile manufacturers are not getting the same government support that fiber producers are. National Cotton Council leaders are asking US Congress to give monetary assistance to US textile mills proportional to the amount of US cotton they consume (Laws, 2007).

2.4.7 US Textile Manufacturing Examples across Several Markets

In the furniture upholstery segment of the textile industry, several companies have recently opened manufacturing facilities in the USA. Reasons for these facilities include the ability for shorter lead times and a wider range of fabric choices when compared to Asian production. These companies also want to have domestic manufacturing to reduce risk associated with China continuing to lose its production advantages due to rising costs and currency inflation. They want to have their options open so that they are prepared for uncertainty. (Evans & Engel, 2011)

Footwear company Keen recently opened a new facility in Oregon for the manufacture of boots, which they had previously done in China (Agency, 2012). While Keen still does the vast majority of their manufacturing overseas, the company wants to always have at least one US facility as part of a message to their customers, according to their Vice President of Product (Siemers, 2011).

An apparel company that recently moved manufacturing from China into the USA is Nine 1 One Gear, a manufacturing of apparel for fire, police, and emergency workers. With rising costs and lengthening lead times from suppliers such as China, more companies, especially niche brands, find themselves contemplating this decision (Siemers, 2011).

Nine 1 One Gear purchased its apparel from third-party sources in China, but will operate its own apparel manufacturing in the USA. It did this by purchasing a local competitor that made rain-gear. This move was inspired after the CEO went for a visit to China and learned that production costs were due to rise 30% and lead time by 50%, from 4 weeks to 6 weeks. This move also introduces the opportunity to sell products to the military under the Berry Amendment (Siemers, 2011).

Another US apparel manufacturer, Boathouse Sports, has a strategy of customization and quick response. This is accomplished by keeping a large inventory of fabrics. The President and CEO of the company explains that his customers value having the convenience of just-in-time delivery, which allows them to place their orders closer to when they actually need the products (Rodie, 2011a).

Gerbing's Heated Clothing, a high-tech apparel maker, has recently switched from using Chinese suppliers to purchasing an apparel manufacturing facility in the USA. This was done because the company was experiencing unreliable delivery, large minimum orders, and rising prices from the supplier in China. The owner and CEO posited that the company lost a large amount of money in the previous year because of deliveries not arriving on time.

The company is also sourcing US-made fabrics for its new manufacturing facility, and finds the quality and cost of these fabrics to be superior to what they were getting in China (Rodie, 2011a).

The American Cotton Growers, part of the Plains Cotton Cooperative Association, which is a cooperative for marketing cotton, does denim manufacturing in Lubbock, Texas. They recently purchased three new modern spinning frames in order to increase the flexibility and speed of production. This is used in their American Denimatrix entity, which is a completely integrated apparel supply chain; the only one for denim in the Western Hemisphere (Textile World, 2012).

One pillow company is bringing back much of its cut-and-sew operations (from 20% domestic to 60%) for reasons including extended lead times, inconsistent quality, and rising manufacturing prices. The president of the company pointed out that the cost gap between China and the USA is narrowing. Additionally, he says that there is great customer demand for “Made in the USA” products. Like many companies, they include a label expressing the origin of their US products (C. Corral, 2011).

The rug industry also has customers with a preference for “Made in the USA”. One company uses its local advantage to make each rug individually and delivers right to each customer’s doorstep. Another rug company is making a conscious effort to have 100% domestic manufacturing. The company made investments in equipment and people while

figuring out how to make all of their products in the USA while only raising prices by 10% (C. B. Corral, 2011).

2.5 Previous Studies

2.5.1 General Previous Studies

In 1994, Handfield identified the following 5 considerations when choosing between international sources: required levels of quality, schedule requirements, cost reductions, new technologies, and a broad supply base. Downsides to global outsourcing were identified as cultural barriers, communication barriers, increased transportation costs, employee travel costs, increased lead times, and the risks that come with sharing new technologies.

Handfield used a survey with 97 responses to find supplier selection criteria, and global sourcing issues. The survey found that both domestic and international sourcing companies ranked quality as their number 1 criteria for choosing suppliers. However, cost was number 2 for international sourcing companies, whereas it was number 10 for domestic sourcing companies. Additionally 62% of domestic sourcing firms were using just-in-time purchasing compared to just 32% for international sourcing firms. Domestic sourcing companies also had higher quality, shorter lead times, and smaller average lot sizes. The survey also identified the top 5 costs and managerial problems associated with sourcing globally (Table 17). This survey dealt with US manufacturing in general, and not specifically the textile industry (Handfield, 1994).

Table 17 - Costs and Managerial Problems When Using International Sources

<u>Costs</u>	<u>Managerial Problems</u>
1. Long lead times	1. Differences in culture
2. Transportation costs	2. Communication problems
3. Customs duties	3. Different time zones
4. Currency fluctuations	4. Sharing technology
5. Inventory costs	5. Obtaining technical support

Source: (Handfield, 1994)

A study by Caputo & Palumbo (2005) proposed a decision-making flow-chart designed to allow a company to decide which activity should be “re-insourced.” It has the company first analyze its current supplier on the basis of possible shortages, performance requirements, and alignment with the company’s strategy. If the supplier is not satisfactory, another foreign supplier is sought. If none can be found, the company asks whether it is a core activity and whether a core competency exists or can be created. The process is then redesigned for “insourcing”, and if the end result is economically justified, the decision is made to “insource” the activity.

A report in the July-August 2009 issue of the Harvard Business Review indicated that because the USA has been outsourcing manufacturing for so long, it no longer has the capabilities to innovate the next generation of products. The report claims that the USA must restore its ability to manufacture high-technology goods in order to repay deficits while maintain the current standard of living for its citizens. The two changes suggested in the report that would potentially lead the USA down this path are changes to government support

to research and changes to corporate management's practices of cutting research and development while understating the risks of outsourcing production (Pisano & Shih, 2009).

This article is about US manufacturing in general and focuses on the high-technology industry, however, its assertions can be applied to textiles as well. More investments into high-tech textile products along with research and development could lead to sustained growth in the textile sector if the same holds true for other sectors (Pisano & Shih, 2009).

In the March 2012 issue of the Harvard Business Review, an article appears that explains that companies are not considering everything that they should be when deciding whether to manufacture globally or domestically. The author postulates that while companies are mainly considering only short and long-term costs in their decision, they are not taking into account manufacturing's influence on a company's innovation potential. The article proposes a new way of making sourcing decisions which takes the phenomenon of innovation through manufacturing into account (Pisano & Shih, 2012).

For each product, the article says decisions should be made based on two dimensions: the opportunities available to improving the process through which the product is manufactured, and how much of the product's information can be taken away from its manufacturing process. These two dimensions make up the axes of the "Modularity-Maturity Matrix," and the quadrants of the resultant chart are separated into four categories. This can be seen in Figure 21. If product design is highly integrated with its manufacturing process, this provides a high barrier of entry for competitors and suppliers, who would have

to understand the technologies of the product and the process as well as their interactions.

This is a case where outsourcing is generally a bad idea (Pisano & Shih, 2012).



Figure 21 - The Modularity-Maturity Matrix

Source: (Pisano & Shih, 2012)

Another recent study concluded that the US manufacturing industry is at a key juncture and its next steps could help determine if the industry will regress or begin to take off in the long run. Five advantages of US manufacturing were identified (Trends Magazine, 2011):

1. Close proximity to large markets, which minimizes logistics and transportation costs,
2. A unique understanding of the US marketplace,
3. Higher productivity due to advanced technology,
4. Superior management, and
5. Diminishing labor cost gap between the USA and China

Yasin, Wafa, & Zimmerer (1995) conducted survey research with the intention of evaluating different successful US manufacturing strategies and practices. The main objective of the research was to profile high-performance manufacturers in the USA. One finding of the surveys was that 57% of low-performing manufacturers were using a cost-leader strategy compared to only 15% of high-performing manufacturers. In contrast, only 14% of low-performing manufacturers used a differentiated strategy compared to 44% for high-performing manufacturers. The rest of the manufacturers were using a mixed strategy. In terms of primary production strategy, low-performing manufacturers focus mainly on low cost, while the majority of high-performing manufactures put their focus on product quality.

These results indicated that at the time of the survey, US manufacturers not using a low-cost strategy were outperforming their counterparts. This makes sense because low-cost US producers were often still more expensive than global competitors. While this survey is now dated, the general results likely give an indication to the current state of US manufacturing as well. It should be noted that this research was for US manufacturing in general and not specifically for textile manufacturing (Yasin et al., 1995).

Sikula Sr. et al. (2010) identified 8 benefits of “insourcing” and 8 benefits of outsourcing. Weights can be assigned to each of these factors on an “insourcing” versus outsourcing scale (Figure 22) to determine if a particular activity should be “insourced” or outsourced.

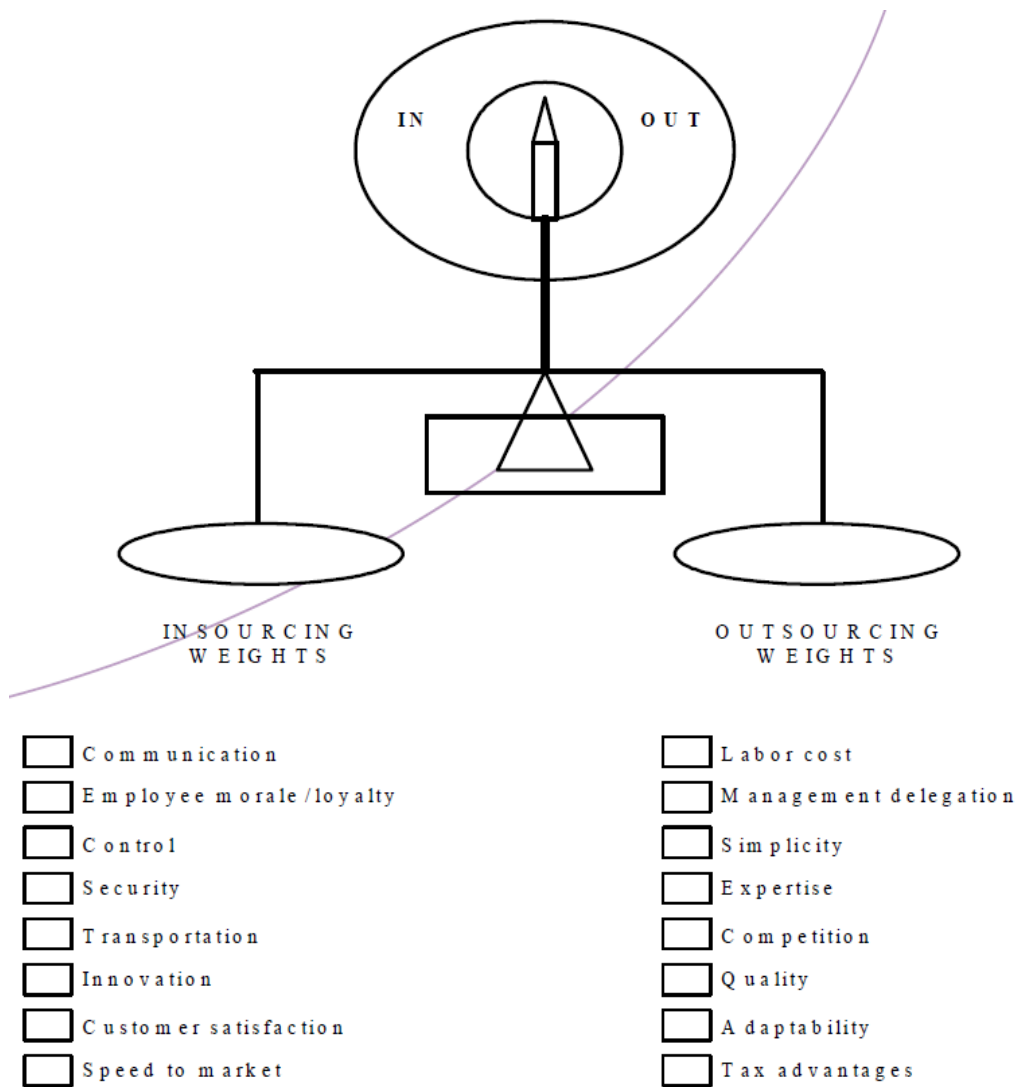


Figure 22 - Insourcing vs. Outsourcing Factors
 Source: (Sikula Sr. et al., 2010)

2.5.2 Textile-Specific Previous Studies

In 1990, Forney, Rosen, & Orzechowski performed a survey of US apparel producers in which information was sought regarding the following: the percentage of production each company did in the USA, the companies' reason for choosing to produce in the USA or overseas, the quality of materials in the USA as compared to foreign production, the quality

of production techniques in the USA compared to foreign production, predictions regarding the influence of government intervention, opinions about making US production more profitable, predictions for the future of the US apparel industry, and awareness of industry-related programs and regulations.

This research, while enlightening at the time, was limited in that it only surveyed apparel companies headquartered in San Francisco. Additionally, only 18 companies were interviewed. Of those, only nine manufactured domestically, while the other half ran their production overseas. While the methodology is similar to the current research, it differs in that it focuses on US apparel production rather than spinning, knitting, and weaving. It also focuses on one area of the USA and includes companies which locate 100% of manufacturing offshore. Also, 1990 is a very long time ago in the world of textiles, and it would be faulty to suggest that all of the results would translate into the current environment (Forney et al., 1990).

In a 1999 study, Ormerod suggests that high wages alone should not preclude a country from having a thriving textile manufacturing industry. This study was written about England, and actually used the USA as an example of a country that is able to employ many workers in the textile and apparel industry despite high wage rates. It was noted that high wages in developed countries could be offset by increased manufacturing efficiency. The researcher noted that much of England's problem stemmed from allowing more market penetration from foreign manufacturers than other textile producing countries, such as the

USA, which resisted such penetration. The researcher's solution involved an investment in cutting-edge technologies.

In 2000, Ormerod used the 1997 ITMF International Production Cost Comparison data to propose a cost-effective vertical spinning and weaving mill for England. The study used the survey data to determine that efficiency in new mills in developed countries could be cost effective even when compared to low-wage countries, using the US data from the survey as an example. The study went on to suggest specific machines and costs, but relevant to this research is that the USA was found to be able to compete internationally in spinning and weaving.

This research, however, is potentially dated because the data used is from the 1997 ITMF International Production Cost Comparison data. The current research, in contrast, can use the ITMF data from the year that is most recently available, 2010. The current research will also compare that data to that of the 2010 ITMF International Textile Machinery Shipments data and to the previous Production Cost Comparison data that had been released in the time since this research was performed.

Jin (2004) set out to mathematically determine the percentage of manufacturing a single textile firm should source domestically and the percentage that firm should source globally. The study pointed out that due to lean retailers, such as Wal-Mart, many manufacturers needed to shift some of their foreign manufacturing to local manufacturing in order to be more responsive to smaller orders. It is pointed out that the VF Corporation uses

plants overseas to handle most routine demand for manufacturing, but also operates two plants in the USA specifically so that a 4-day turnaround can be achieved for replenishment orders from places like Wal-Mart (Jin, 2004).

The researcher points out that the optimal level of outsourcing versus “insourcing” for a manufacturer is neither 100% domestic nor 100% overseas, but somewhere in the middle. This is seen at point “I” in Figure 23. In this chart, the CD curve is the total cost of global sourcing against different delivery times, while the AB curve is the total cost of domestic sourcing against different lead times. The study sought to find a way of mathematically finding these percentages for individual companies (Jin, 2004).

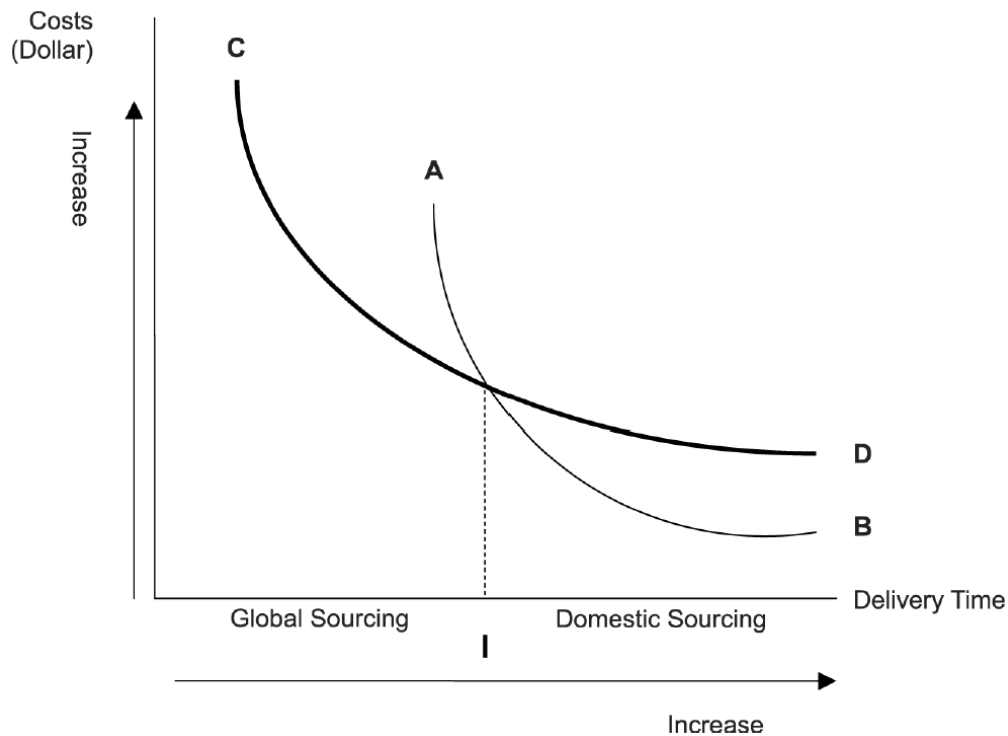


Figure 23 - The Total Costs of Sourcing with Increasing Delivery Time Requirements
Source: (Jin, 2004)

This study also identifies four situations that favor a higher degree of domestic manufacturing: higher demand uncertainty, the contribution of technology in the manufacturing process, the presence of local subcontractor clusters, and long-term relationships with subcontractors (Jin, 2004).

In 2005, Jin used a survey with 113 responses from US apparel manufactures. The study sought to describe current global sourcing strategies and practices. The survey was designed to compare global and domestic apparel firms regarding technology implementations, competitive advantage perceptions, and performance. The study also inquired about the use of information technology (IT) of US versus off-shore production.

The study found that firms that are sourcing globally placed more of an emphasis on process and product technology, which they need to hasten their reaction times. The study also found that domestic sourcing firms produce more basic products while internationally sourcing firms were producing more fashion items. This is perhaps because basic items, such as socks, can be created with a higher level of automation than high-fashion items, even though socks have a more predictable demand and do not require as short lead times as fashion items. Overall, the study found that global-sourcing apparel firms considered low cost to be their main competitive advantage, while domestic-sourcing apparel firms considered short lead times to be theirs (Jin, 2005).

This research differs from the current research in that it focuses solely on apparel manufacturing companies and used a mass-survey method, whereas the current research

focuses on US spinners, weavers, and knitters and uses an in-depth interview method.

Additionally, while more recent than other related research, this study is already 7 years old and the dynamics of the textile industry suggest the results may no longer be as applicable.

In another study, Lawson (2003) suggests a total acquisition cost model framework for retailer textile sourcing decisions. The driver behind this study is that the researcher felt that retailers focus only on low-cost and do not take into consideration the different hidden costs involved with off-shore sourcing. The study presents the apparel supply chain to include factors of lead-time, inventory, supplier performance, and customer service, as seen in Figure 24. These are the areas where some potential hidden costs such as transportation costs, delays, and costs of quality, can be incurred.

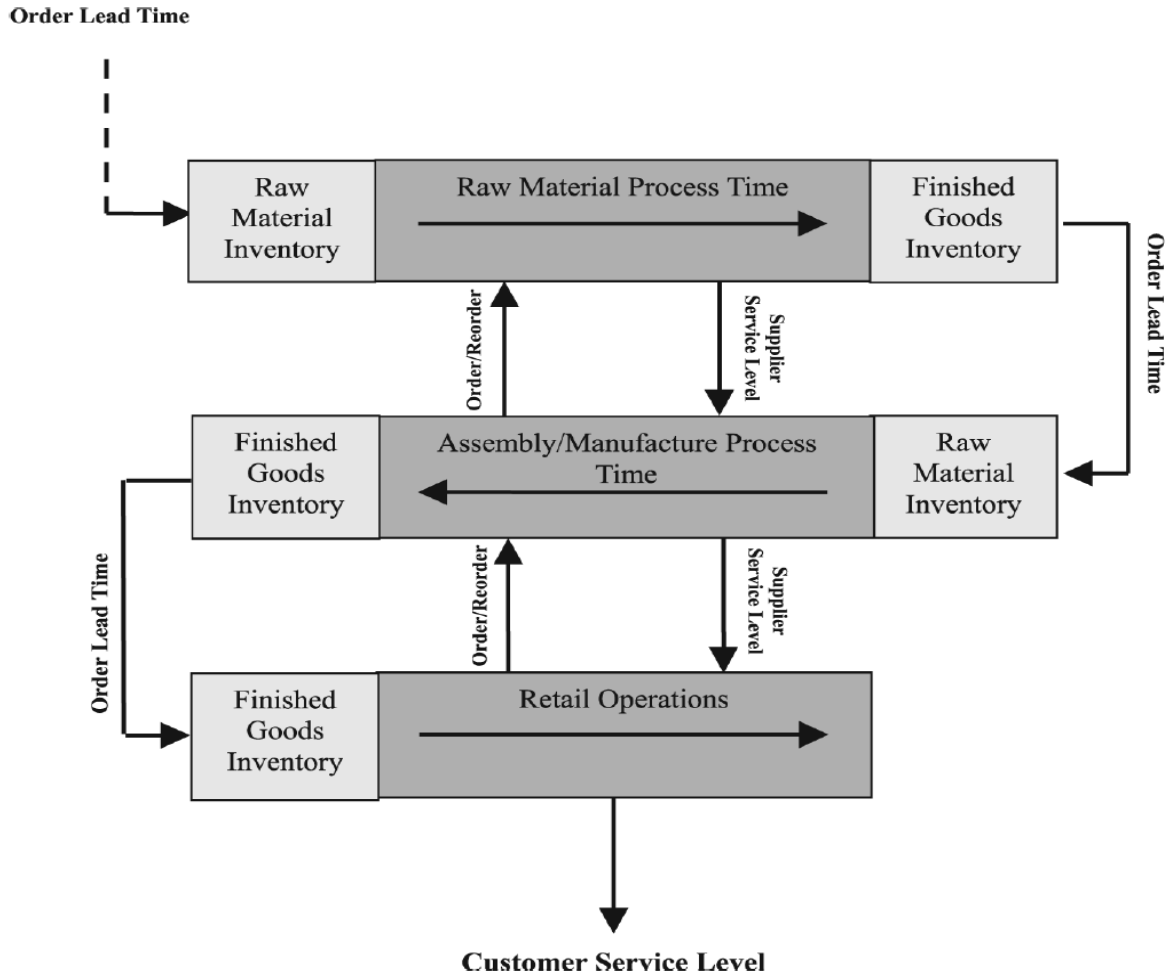


Figure 24 - Factors in an Apparel Supply Network
 Source: (Lowson, 2003)

Kim & Rucker (2005) used survey results from 82 US apparel manufacturers. The purpose of this research was to determine significant influences on the sourcing strategies of these companies. The researcher compared apparel firms on the factors of brand reputation, degree of technical sophistication, size, product fashionability, experience in foreign business, lead times, flexibility, labor costs, and years in business. There were only a couple

of significant conclusions in the results of this study. Both firms that consider their products to be highly fashionable and firms with a high degree of foreign business experience are more likely to contract manufacturing instead of doing it in-house. This study differs from the current research in that it was focused on the strategies of apparel manufacturers, and not spinners, weavers, and knitters.

Uncu (2003) completed a dissertation on the decision making involved in the international textile industry. One section determined 7 categories into which factors affecting plant location decisions could be separated. These categories are: cost, availability, accessibility, quality, risk/uncertainty, ease of operations, and quality of life. Table 18 shows the factors in each of these categories.

Uncu used these factors in a survey which asked respondents to rank the importance of each. The responding firms, which came from fiber, textile, apparel, and nonwovens companies from the USA, were then put into groupings based on 4 different strategy categories. These categories were compared on the basis of the importance placed on these cost factors (Uncu, 2003).

Table 18 - Factors in Plant Location Decisions

Category	Factors	
Cost	Total cost of product	Cost of Land
	Transaction costs	Cost of quota
	Participation in trading group	Tax rules
	Government Incentives	
Availability	Skilled labor	Suppliers
	Bargaining power	Raw materials
	Lending institutions	Technology
	Transportation modes	Capital
	Middle management	Infrastructure
	New markets	Government incentives
Accessibility	Lead time	Production flexibility
	Market proximity	Location integration between fabric and garment manufacturers
	Supplier proximity	
Quality	Product quality	Environmental standards
	Ethical standards	
Risk/uncertainty	Labor unions	Banking system stability
	Income trends	Interest rate
	Population trends	Inflation rate
	Location on competitors	Delivery reliability
	Political stability	National content laws
	Currency stability	
Ease of operation	Participation in trading group	Favorable ownership rights
	Clarity of corporate investment rules	Favorable legal system
	Join venture/merger regulations	Favorable import/export regulations
	Taxation on foreign-owned firms	
Quality of life	Availability of schools	Per capita income
	Cost of living	Average temperature

Source: (Unctu, 2003)

In the corporate strategy category, the cost leadership strategy differed from differentiators and focus strategists in that they were more concerned with the cost factors. In the product strategy category, it was the low-profit grouping that was most concerned with cost factors. In the risk taking category, low risk takers ranked most factors as more important than the higher risk-taking strategies (Uncu, 2003).

Fiallos (2009) developed cost models for sourcing some specific apparel products. This study used ITMF International Production Cost Comparison data from 2008 and the specific materials and processes that went into the garments in order to derive mathematical models that could be used to make supply chain sourcing decisions. This study showed the importance of raw material costs in overall yarn and fabric costs. It also showed the difference in labor rates and energy rates between the USA and competing developing countries in 2008. The data used in this research is similar to the secondary data used in the current research, however Fiallos sought to create cost models for analysis while the current research will be focused on looking deeper into present and past data for trends and sensitivity to a number of scenarios.

Moore (2009) used secondary and primary sources in order to identify the impact of different global issues on short staple yarn manufacturing. Moore discovered through the 2006 ITMF International Production Cost Comparison data to determine the impact rising raw material prices might have on the global cost competitiveness of the USA in terms of ring and rotor spinning. This inspired the current research to look further into this finding, especially in light of the spike in cotton prices during the 2010-11 season. This research will

also go one step further and determine what impact these price changes might have on the global cost competitiveness of the USA in terms of knitting and weaving.

The primary research portion of this dissertation revealed the thoughts of both US yarn spinners and their customers. For example, yarn spinners determined short lead time to be the most important factor for their customers, however, the customers themselves responses indicated that product quality was actually the most important factor. This research also got comments and opinions from executives regarding the importance of costs and other topics. This research does not however, seek the opinions of weavers or spinners.

Overall, while many of these studies produced interesting results, none answer the research questions of this research. Even the studies that relate closely to this research are likely dated in the dynamic environment of the textile industry. However, the knowledge developed in this previous research helped contribute to the methodology of the current research.

Chapter 3 - Methodology

3.1 Purpose of Research

The stated purpose of this research was to determine the short-term and long-term opportunities available to the US textile manufacturing industry. In order to create an effective methodology to make such determinations, the research goals were first broken into more specific research questions.

Note: The methodology presented in this chapter was adapted from Hair, Wolfinbarger, Ortinau, & Bush (2008).

3.2 Research Questions

It was determined that this study would effectively accomplish the research purpose if the following research questions were addressed:

- What domestic manufacturing opportunities exist for the USA in the current global competitive environment?
- What strategies are being utilized by companies that remain competitive?
- What are the inherent advantages of US textile manufacturing?
- What are the inherent disadvantages of US textile manufacturing?
- What are the trends in the factors influencing the cost-competitiveness of the US textile manufacturing industry?
- What circumstances would improve the US textile industry's global cost-competitiveness?

- What circumstances would worsen the US textile industry’s global cost-competitiveness?
- How does the textile industry fit into the US government’s plans for “insourcing”?
- How do government policies impact the US textile industry?
- What will the opportunities be for US textile manufacturers in 5 years?
- What will the opportunities be for US textile manufacturers in 10 years?

In answering these research questions, a better understanding about the future of the US textile industry was achieved. This understanding should prove beneficial to both the industry and academia.

3.3 Research Objectives

In order to answer these research questions, they were first converted into a series of actionable research objectives. The “US textile manufacturing industry” referred to in the research questions was too broad for the execution of an effective research design. In order to focus the scope of this research while still exploring multiple sectors of the US textile manufacturing industry, these research objectives dealt only with spinning, knitting, and weaving in the USA. Table 19 shows the research objectives used in this study.

Table 19 - Research Objectives

Research Objective	Description
RO1	- Determine opportunities for cost-competitiveness for US spinners, weavers, and knitters
RO2	- Determine the inherent advantages and disadvantages of spinning, knitting, and weaving in the USA
RO3	- Determine strategies, concerns, and predictions for US weavers, and knitters regarding relevant industry issues

3.4 Research Design

This research was designed around the stated research objectives. These objectives were best answered using an exploratory research approach. Exploratory research can generate new insights and deepen understanding of a subject (Hair et al., 2008). The specific design for each of the 3 research objectives follows.

3.4.1 Research Objective 1

Research Objective 1 was to determine opportunities for cost-competitiveness for US spinners, weavers, and knitters. This objective was satisfied by exploring secondary data and primarily data from surveys conducted by the International Textile Manufacturers Federation (ITMF).

One available survey from the ITMF was the International Production Cost Comparison. This survey broke down both production costs and total costs for spinning, weaving, and knitting for a selection of countries including the USA. Production costs included only the cost of conversion, whereas total costs incorporated the cost of raw materials as well. ITMF International Production Cost Comparison reports available to this study were from 1991, 1995, 1997, 1999, 2001, 2003, 2006, 2008, and 2010.

Trends in international production costs were tracked over time by combining the data from these reports into one database. Additionally, the most recent report was used to explore the impact of potential cost fluctuations. For instance, the input cost for knitting was increased by 100% for all countries, and the resultant changes in overall manufacturing were analyzed.

The other relevant ITMF survey available for this study was the International Textile Machinery Shipment Statistics report. This yearly survey displayed the current capacity and yearly installations for an assortment of textile machinery categories for a broad range of countries, including those that participated in the International Production Cost Comparison surveys. The machinery shipment data for these countries was also added to the database created from ITMF International Production Cost Comparison reports so that machinery shipment trends could be tracked over time. International Textile Machinery Shipment Statistics reports available to this study were from 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, and 2010.

3.4.2 Research Objectives 2 and 3

Research Objective 2 was to determine the inherent advantages and disadvantages of spinning, knitting, and weaving in the USA. Research Objective 3 was to determine strategies, concerns, and predictions for US spinners, weavers, and knitters regarding relevant industry issues. Both of these objectives were addressed using an in-depth interview technique. This technique requires an interviewer to ask a set of semi-structured, probing

questions. This allows for the interviewer to turn the initial responses of the interviewee subjects into further questions. This can result in more detailed discussion of the topic. The more that a subject discusses a topic, the more likely they are to reveal underlying motives, attitudes, and emotions (Hair et al., 2008). Table 20 shows the steps in conducting an in-depth interview.

Table 20 - Steps in Conducting an In-Depth Interview.

<u>Step</u>	<u>Description</u>
Step 1	- Understand initial research objectives
Step 2	- Create an interview guide
Step 3	- Decide on the best environment for conducting the interview
Step 4	- Select and screen the respondents
Step 5	- Respondent greeted, given interview guidelines, and put at ease
Step 6	- Conduct the in-depth interview
Step 7	- Analyze respondent's narrative responses
Step 8	- Write summary report of results

Source: (Hair et al., 2008)

Step 1 was accomplished through the thorough literature review performed in Chapter 2. For Step 2, interview guides were created based on Research Objectives 2 and 3 and information found in the literature review. These guides are found in Appendix 1.

For Step 3, a hybrid in-depth interviewing technique was chosen (Hair et al., 2008). This allows for face-to-face, telephone, and email interviewing to be utilized based on the preferences of interview subjects and other considerations. Multiple techniques can also be combined, such as when email is used to follow-up on a face-to-face interview, if an additional question or concern arises.

For Step 4, respondents were selected based primarily on considerations of how the research objectives could best be accomplished. For Research Objective 2, it was determined that respondents would have to represent US spinners, weavers, and knitters. Five to 10 respondents were to be utilized for each sector. Research Objective 3 was also addressed using the same respondents. Additional industry experts were also interviewed for additional insight and opinions.

Interview subjects were a convenience sample from the population of US spinners, weavers, and knitters. A list of potential interviewees and contact information was amassed from online listings, databases, past interactions with the author, and suggestions from other experts. Additionally, interview subjects were asked to recommend further suitable subjects. Chosen subjects were recruited via e-mail using the recruitment letter found in Appendix 2.

Steps 5-7 contain the actual interview process. As the interviews took place, detailed notes were made of the subject's responses. Immediately following the interview, the responses were made into detailed interview reports. At that time, the interview subjects were assigned a code to ensure confidentiality. This report was also sent to the interview subjects for review to ensure accuracy

In Steps 7-8, the interview reports were investigated in the context of the research objectives. All similarities and differences within each manufacturing segment were analyzed and themes were identified. Similarities and differences across manufacturing

segments were also examined. Results were combined with the results of RO1 and reported as described in Section 3.5.

See Appendix 3 for the approval letter for this research from the North Carolina State University Institutional Review Board for the Protection of Human Subjects in Research (IRB).

3.5 Reporting Research Objective Results

The results of analysis for both secondary (RO1) and primary (RO2 and RO3) data sources were presented against each of the research objectives. Results were grouped into table form with special attention to the main findings. Furthermore, the results were used to create a visual representation of the opportunities for spinning, knitting, and weaving in the USA. Figure 25 shows the base visualization, which was to be altered to accommodate research results.

Factors affecting the widening or narrowing of the circles were to be identified and placed into the visualization. The idea was to show the level of opportunities that exist at a given period of time and the ratio of those opportunities being actualized. The sizes of both circles, and their relation to each other could potentially have been shown for different industry segments at different times.

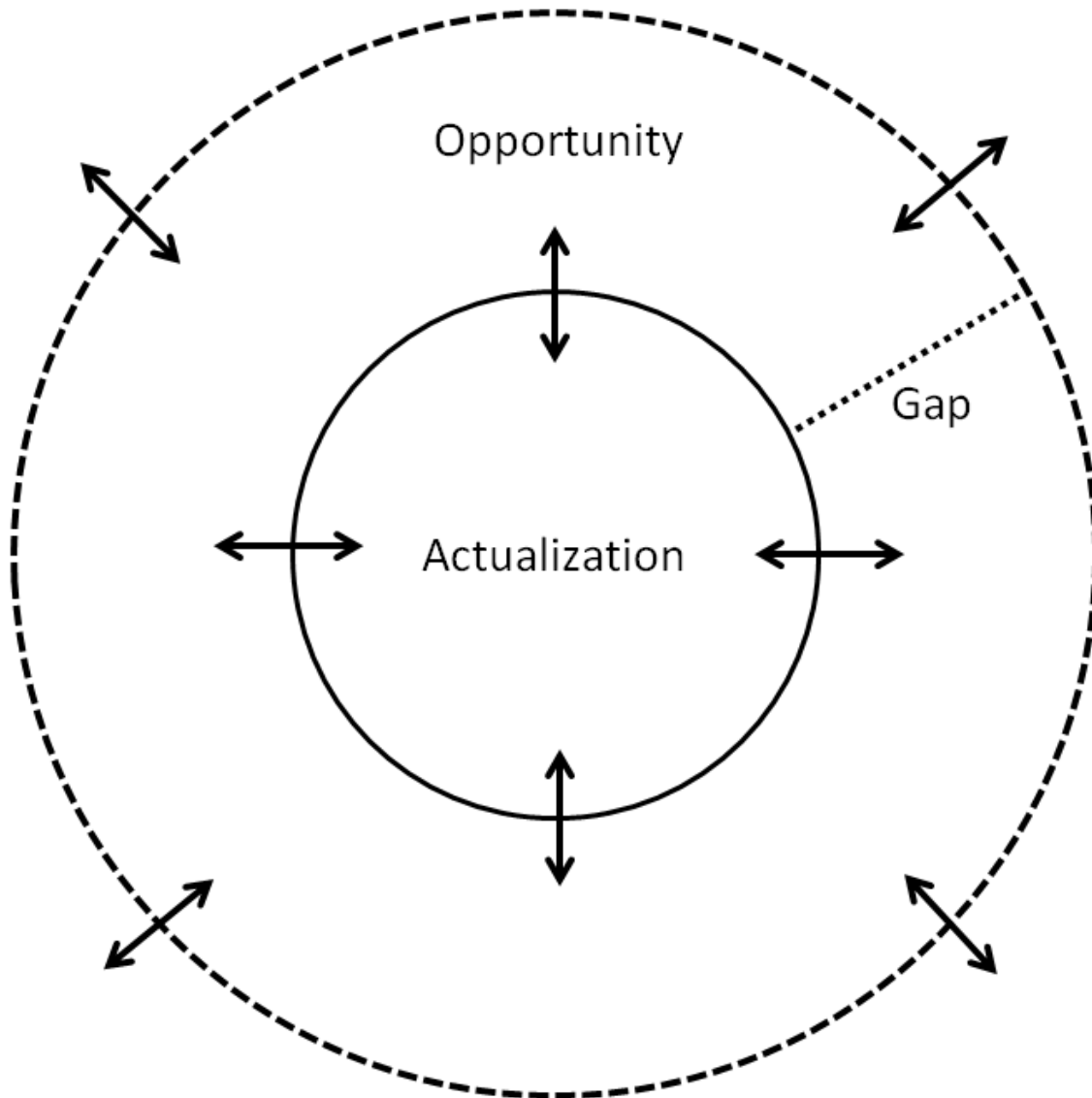


Figure 25 - Manufacturing Opportunity Visualization
Source: Created by author.

3.6 Research Limitations

This research had a number of limitations. Firstly, for RO1, while conclusions based on historical data were subject to statistical analysis and the significance of trends were reported, the overall research was exploratory and speculative and, thus, it was not possible to attach statistical significance to predicted trends. Furthermore, for RO2 and RO3, it would have been very unlikely to get a significant representative population of spinners, weavers, and knitters for the USA. It was decided that exploratory research across multiple sectors and various geography would be preferred to the study of just one sector in one particular region, which would have been necessary to link results to an entire population. However, this research included the possibility of unearthing interesting findings about a particular sector or region which would represent intriguing future work.

Chapter 4 - Interview Results

As discussed and outlined in Chapter 3, two of the research objectives, RO2 and RO3, were addressed using in-depth interviews. This chapter will discuss the results of the interview process. First, the interview process itself will be detailed, including the timetable of recruiting members of the US textile industry, scheduling interviews, and performing interviews. Next, a general overview of the interview results will be presented in a series of figures and tables. Following this, the sum of the interviews will be discussed in association with 9 major research areas which were identified based on the results.

4.1 The Interview Process

The process of completing the interview portion of this research was undertaken over the course of 77 days in the Spring/Summer of 2012. These actions are presented in Table 21 and details follow.

Table 21 - Timetable of Interview Actions

<u>Date(s)</u>	<u>Action</u>
May 9 - May 15, 2012	- 9 preliminary emails sent to members of the textile industry
May 22, 2012	- 139 recruitment emails sent to members of the textile industry
June 13, 2012	- 42 additional recruitment emails sent (13 to new companies)
May 24 - July 24, 2012	- Interviews conducted and follow-up emails sent

The first action taken in the interview process was to email some selected members of the textile industry in order to get their opinions about the interview guides created for this research and to gather any additional advice or recommendations of research subjects.

The second action taken was to send out 139 recruitment emails (found in the Appendixes) to members of the textile industry. As discussed in the previous chapter, these names were limited to include only spinners, weavers, and knitters. A spreadsheet was created to store the names and emails of these potential interview subjects. It was populated by using a variety of resources, including previous acquaintances of the researcher, potential subjects mentioned by previous acquaintances of the researcher, and 4 directories. One directory was provided by the Institute of Textile Technology, one was from the North Carolina Textile Connect website, one was from the South Carolina Textile Connect website, and the last was a wool fiber processor list found at the website of the Pygora Breeder's Association.

These resources were chosen in order to get the most diverse group of interview subjects possible. The recruitment emails were sent to industry members in a variety of geographic locations within the USA, at companies of various sizes (by number of employees), and representing various processes (spinning, weaving, knitting, and combinations thereof).

The result of these 139 emails was 19 returned by the email provider as bad addresses, and 32 positive responses. Of the positive responses, 3 were recommendations of a colleague who would be a better contact and the remaining 29 were responded to with a request to schedule an interview.

The third action, as seen in the table, was 42 additional recruitment emails. Of these, 13 were sent to new addresses brought to the researcher's attention during other interviews, and 28 were sent to a selection from the original list who had either responded once and then became unresponsive or who fit a criterion that was underrepresented by the original responses.

The final actions were conducting the interviews themselves and then sending the interview notes to the subjects for their amendment or approval. In the end, 28 interviews were conducted over the phone, 2 were conducted in person, and 1 was completed via email.

4.2 Overview of Interviews

Once all 31 interviews had been completed and approved by the interview participants, they were used to create a spreadsheet. Everything that could be represented numerically or categorically was included in this spreadsheet, as well as responses to what were considered yes/no questions (represented as 1 for 'yes' and 0 for 'no'). A portion of this spreadsheet is displayed in Figure 26.

Company	Employees Category	Spinning?	Weaving?	Knitting?	Location	Foreign Comp?	100% US?	Global Customers?	Global Suppliers?	Disadvantage: Cost?	Berry Amendment?
Company 1	S	0	1	0	SE	1	1	0	0	1	1
Company 2	M	1	1	0	SE	0	0	0	0	1	1
Company 3	S	1	0	0	NW	1	1	0	0	1	0
Company 4	M	0	0	1	SE	1	1	0	1	0	1
Company 5	S	1	0	0	NW	0	1	0	0	1	0
Company 6	S	1	0	0	NE	1	1	0	0	1	0
Company 7	S	0	1	0	SE	1	1	0	1	0	0
Company 8	S	1	0	0	MW	0	1	0	0	1	0
Company 9	L	0	1	0	SE	1	0	0	0	1	0
Company 10	M	0	1	1	SE	0	1	1	1	1	1
Company 11	M	1	1	0	SE	1	1	1	1	0	1
Company 12	S	1	0	0	NE	0	1	0	0	1	0
Company 13	S	1	1	0	SW	0	1	0	0	1	0
Company 14	L	1	0	0	SE	1	0	1	0	0	0
Company 15	M	1	0	0	SE	0	1	1	1	1	1
Company 16	S	0	0	1	SE	0	1	1	0	1	0
Company 17	L	0	0	1	SE	1	0	0	0	1	0
Company 18	S	0	0	0	NW	0	1	0	0	1	0
Company 19	M	1	0	0	SE	1	1	1	0	0	0
Company 20	L	1	0	0	SE	0	1	1	0	1	0
Company 21	L	1	0	0	SE	1	1	0	1	0	1
Company 22	S	0	0	0	NE	0	1	0	0	1	1
Company 23	M	0	1	0	SE	1	1	0	1	1	1
Company 24	L	1	1	0	SE	1	0	1	1	1	0
Company 25	M	1	1	0	NW	0	1	1	1	1	0
Company 26	L	1	1	1	SE	1	0	1	1	1	1
Company 27	L	1	1	0	SE	1	0	1	1	1	1
Company 28	M	0	0	0	NE	1	1	0	0	1	1
Company 29	S	0	0	0	SE	1	0	0	1	1	0
Company 30	M	1	0	0	SE	0	1	1	1	1	1
Company 31	M	0	0	1	NW	0	1	1	0	1	0

Figure 26 - Snapshot of Interview Overview Spreadsheet

The data from this spreadsheet was used to produce a number of tables and figures. Table 22 shows the minimum, maximum, numerical average, and total for the following categories: All, Spinners, Weavers, Knitters, Small Companies, Medium Companies, and Large Companies. These size categories were determined using the number of employees working at each company. Small companies were defined to have 1 - 100 employees, medium companies have 101-1000 employees, and large companies have over 1000 employees.

Table 22 - Overview of Interviews by Category

	<u>Min</u>	<u>Max</u>	<u>Average</u>	<u>Total</u>
<u>All - 31 Interviews</u>				
Interview Duration (minutes)	13	70	31.3	971
Years at Company	1	31	13.3	411
Years in Industry	3	40	23.5	730
Employees	1	8,000	947.7	29,379
<u>Spinners - 18 Interviews</u>				
Interview Duration (minutes)	13	52	29.3	527
Years at Company	3	31	14.2	255
Years in Industry	3	40	24.1	433
Employees	1	8,000	1,378.9	2,4820
<u>Weavers - 12 Interviews</u>				
Interview Duration (minutes)	21	70	36.6	439
Years at Company	4	31	18.8	226
Years in Industry	5	40	26.8	321
Employees	2	8,000	1,527.8	18,334
<u>Knitters - 6 Interviews</u>				
Interview Duration (minutes)	21	70	36.2	217
Years at Company	1	19	12.0	72
Years in Industry	9	35	24.0	120
Employees	40	3,000	870.0	5,220
<u>Small Companies - 12 Interviews</u>				
Interview Duration (minutes)	13	46	27.6	331
Years at Company	3	31	9.7	116
Years in Industry	3	40	17.8	214
Employees	1	40	8.3	99
<u>Med. Companies - 11 Interviews</u>				
Interview Duration (minutes)	21	70	35.8	394
Years at Company	1	31	15.7	173
Years in Industry	9	40	27.2	299
Employees	100	850	361.8	3,980
<u>Large Companies - 8 Interviews</u>				
Interview Duration (minutes)	21	50	30.8	246
Years at Company	5	26	15.3	122
Years in Industry	5	36	27.1	217
Employees	1,100	8,000	3,162.5	25,300

Note that the number of spinning, weaving, and knitting interviews exceeds the number of all interviews because companies that performed multiple processes were counted in multiple categories. Also note that there were 4 interview subjects who were not from spinning, weaving, or knitting, companies. These subjects were included in order to add more perspective to the research and because they were considered expert in their area. The 4 experts were a sheep wool producer, an alpaca wool producer, the owner of a cut and sew business in the Northeast, and a former chairman of a textile trade committee.

The geographical locations of the various interview subjects are displayed in Figure 27. Most interviews were with representatives from the Southeast. The causes of this were: the researcher's location in the Southeast, the large proportion of US textile businesses in that region, and the North and South Carolina Textile Connect directories used to acquire interviewees.

Location of Interviewees

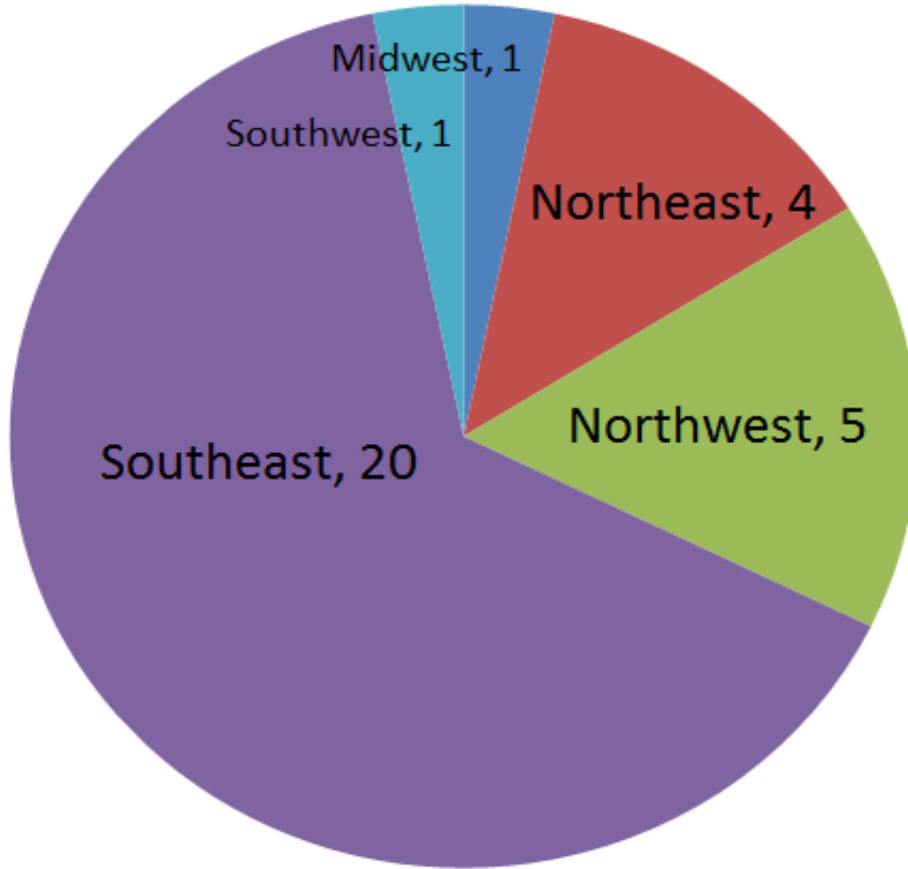


Figure 27 - Location of Interviewees

Figure 28 is a graphical display of the various professional positions of the interview respondents. For the purpose of this research, it was favorable to interview someone of at least a senior management position to ensure an advanced knowledge of the company's business from a strategic perspective.

Job Title of Interviewees

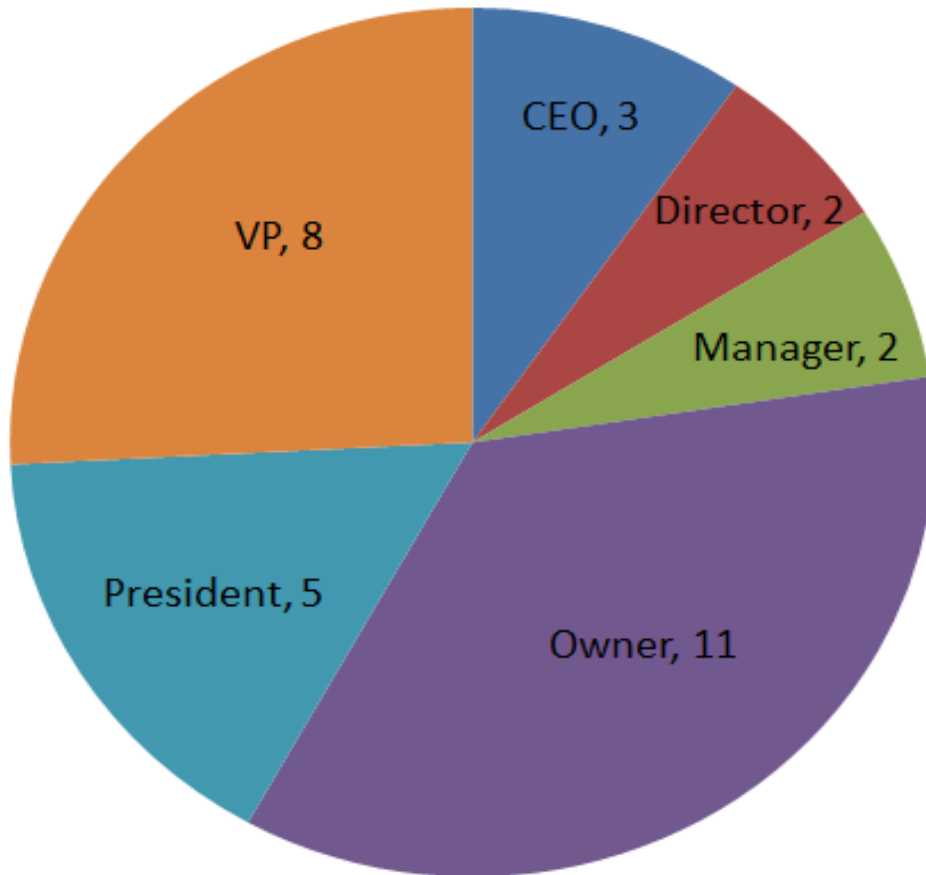


Figure 28 - Job Title of Interviewees

Further charts were created to distinguish any patterns in interview responses that could be correlated to either the process performed by each textile company or the size of each textile company. It is important to note that these charts only represent an overview of the responses given by the interview respondents of this research and do not necessarily reflect on the whole population of US textile companies.

Figure 29 is the result of a question on the interview guide that asked representative of the US textile industry to answer whether or not their company uses the following market strategies: low cost, high quality, high automation, speed-to-market, high technology, niche marketing, customization, “Made in the USA,” or local/green/sustainable. These strategies were chosen based on previous literature and preliminary discussions with industry members. The final section of the x-axis represents whether the interviewee indicated that their company planned on maintaining their same strategies in the future. Note that the percentages for spinners, weavers, and knitters do not average out to the percentages for all because of some companies being in multiple categories.

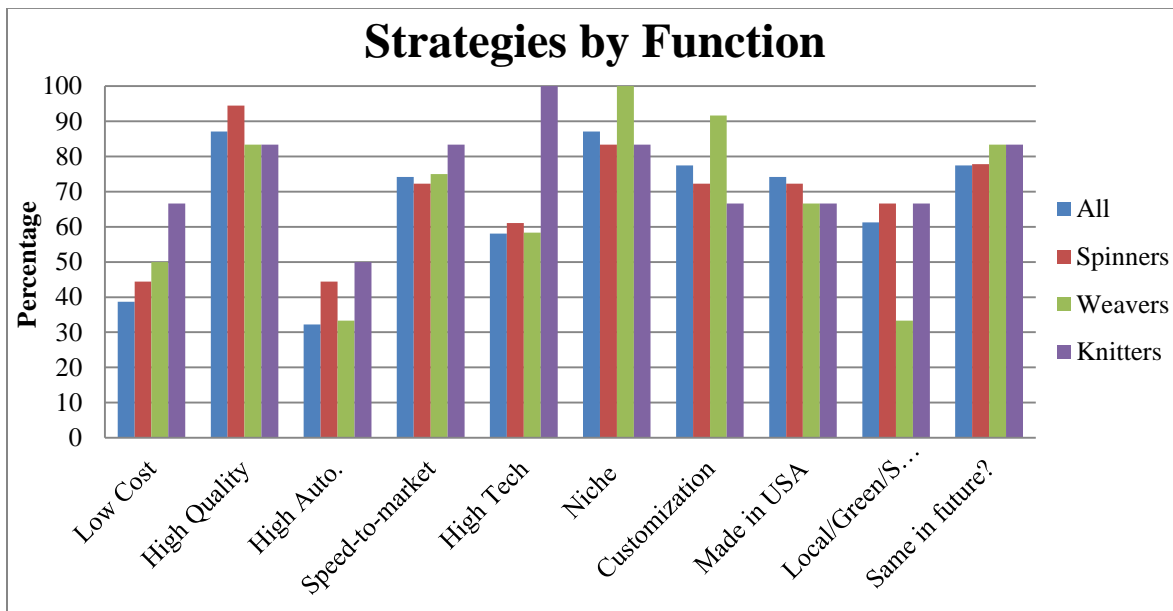


Figure 29 - Strategies by Function

This chart shows that the most popular strategies for all textile companies are high quality and niche marketing. The least popular are low cost and high automation. Notable differences are weavers being the only segment low in local/green/sustainable, and all 6 knitting respondents indicated high technology compared to closer to 60% from other respondents. Most companies in all categories plan on maintaining the same strategies going forward.

Figure 30 uses the same data, but compares responses on the basis of the size of the company. Small companies were much less likely to use high technology or high automation. Large businesses were less likely to market products as “Made in the USA” or high quality, but were more likely to use low cost. Also notable is that all of the small companies use niche marketing and all of the medium-sized companies responded affirmatively to both high quality and speed-to-market.

Another series of question with yes/no responses were grouped into the following charts. These questions asked whether the company dealt with a lot of foreign competition, performed 100% of manufacturing in the USA, had many global customers, had many global suppliers, noted cost to be a disadvantage, or noted that they used the Berry Amendment to their advantage. As shown in Figure 31, there is not much difference in how these questions were answered among the different textile processes performed by the companies. It is notable that 80% of respondents named cost when asked about disadvantages.

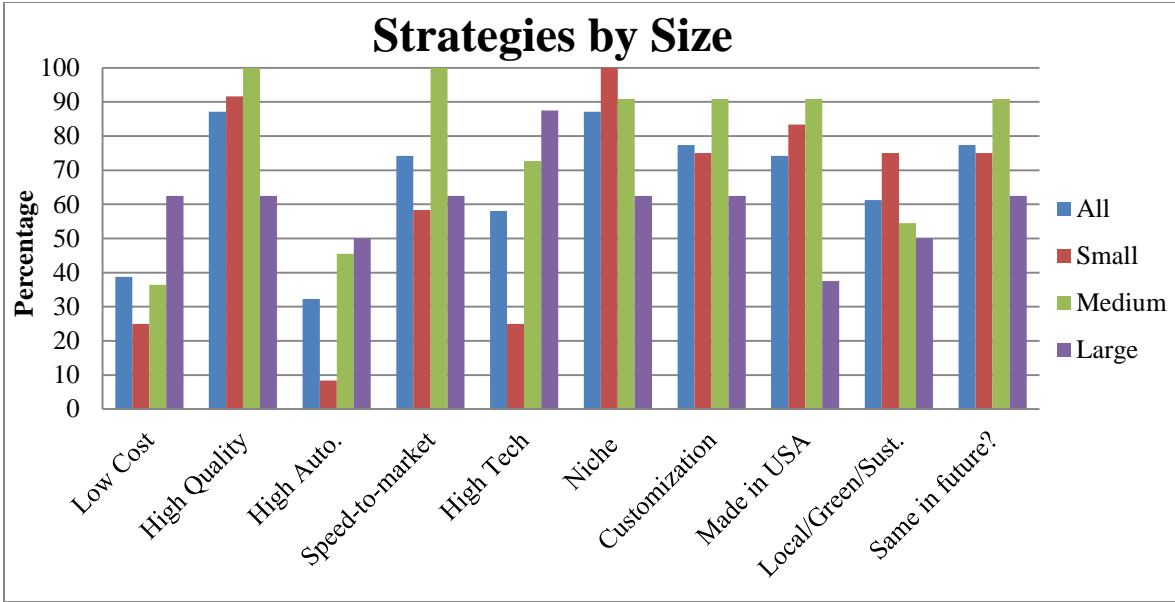


Figure 30 - Strategies by Size

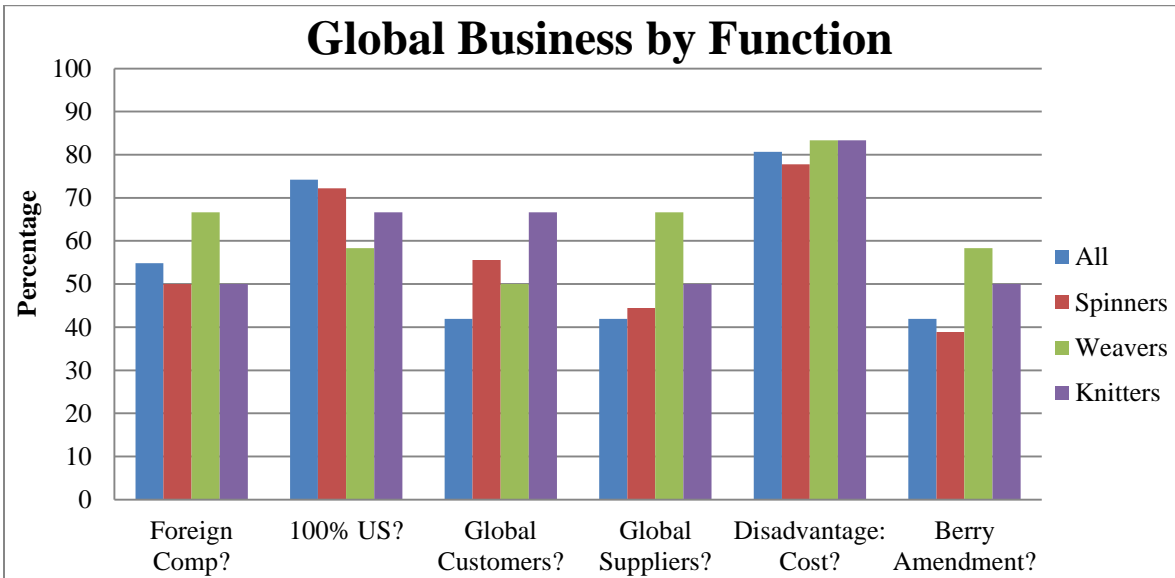


Figure 31 - Global Business by Function

The size of the business seems to have more of a correlation with global business questions than the textile process performed. Figure 32 show several notable difference between the 3 size categories. Barely any of the small companies had many global customers or global suppliers. The small businesses interviewed also did not use the Berry Amendment to sell to the US military. Medium-size companies were most likely to use the Berry Amendment. Large companies had the most responses of foreign competition, and the least amount of respondents representing companies that performed 100% of their manufacturing in the USA.

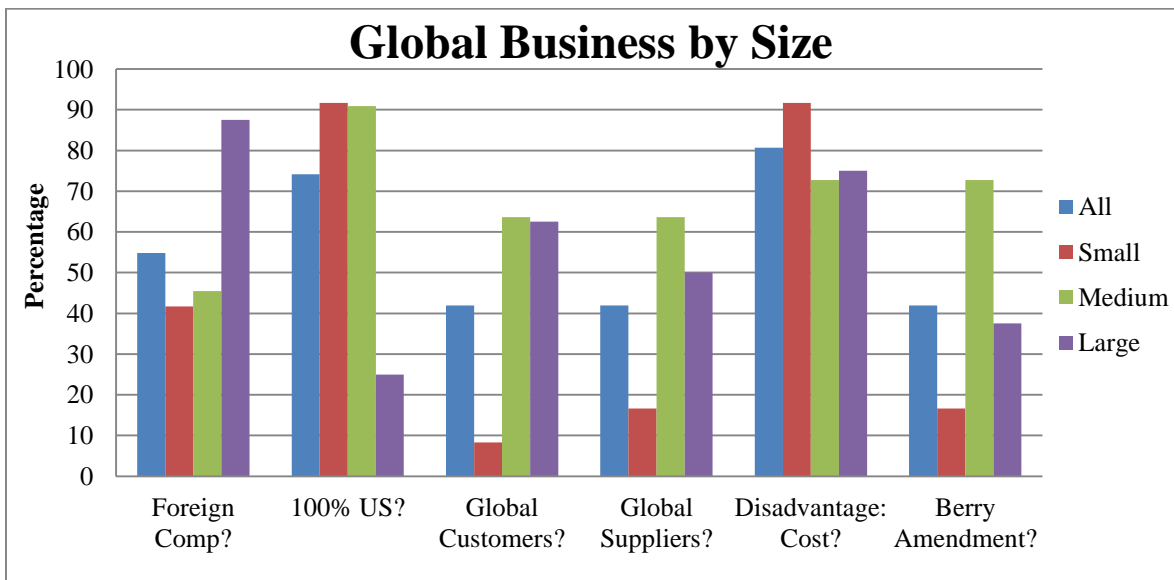


Figure 32 - Global Business by Size

The members of the industry were also asked about whether they were optimistic about both their company and the US textile industry in general. The answers to these questions showed no sizable trends related to function or size (Figure 33). The only aspects to note are that large companies are most optimistic about the industry and that the sample interviewed was, in general, more optimistic about their own company than they were about the entire US textile industry but were generally optimistic about both.

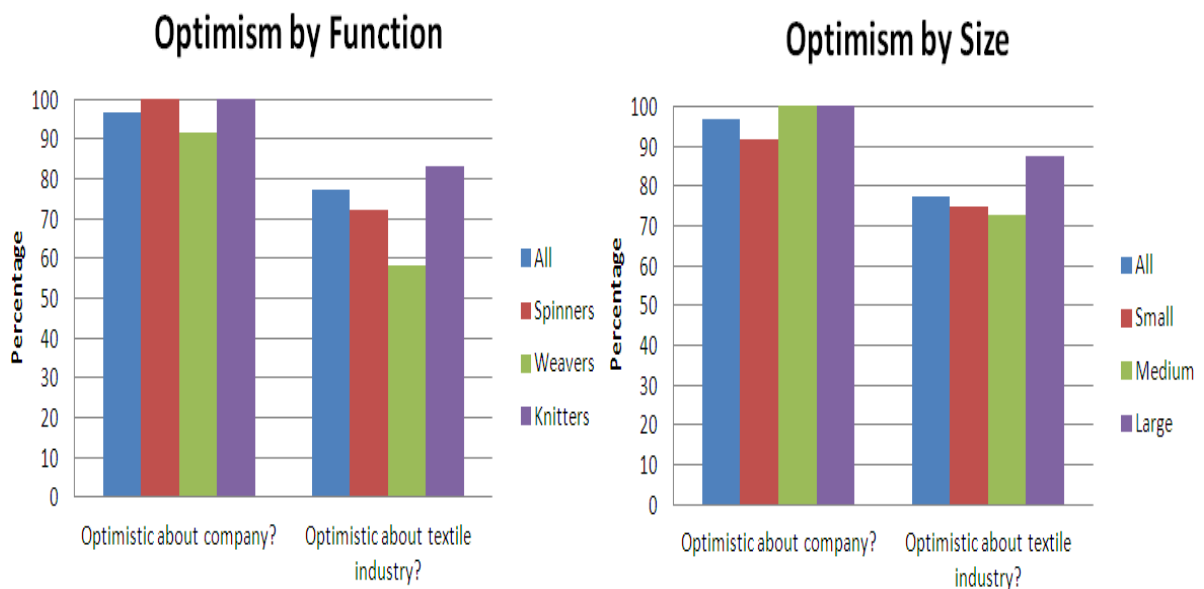


Figure 33 - Optimism by Function and by Size

4.3 Interview Discussion by Research Area

The content of the interviews was first made into summary tables. In those tables, the interviewer’s insights were divided in the following 9 categories: Foreign competition, Advantages of US manufacturing, Disadvantages of US manufacturing, Helpful government

policies/regulations, Future viability of US textile processes, Company optimism, Industry optimism, and Key factors going forward. These categories were created to address the research objectives and based on the responses given in the interviews. A detailed discussion of each area is given, followed by a table that summarizes the key insights gained for each research area.

4.3.1 Foreign Competition

The majority of interview subjects discussed dealing with mostly foreign competition, and others have at least some competitors overseas. For many, this has not always been the case. However, it has become a growing problem after the WTO passed and once the safeguards against China were lifted. One president from a medium-sized spinning and weaving company pointed out that they had 8 to 10 domestic competitors just 15 years ago, and now that number is down to only 1 or 2.

An interviewee from a larger company pointed out that since getting into their industry 10 years ago, China has successfully commoditized the market. Another respondent from a large company discussed having to downsize and exit the markets that were commoditized by Chinese firms. A smaller weaving company used to face only US competition until as recently as 5 years ago, but is now facing worldwide opponents. The owner of one spinning company was accustomed to dealing only with local competitors at fiber shows, but the internet has opened up their niche to the entire globe.

Many of the interviewees pointed out that there are some mismatches when facing off against overseas adversaries. A couple of interview subjects mentioned that some countries, such as China, have state-sponsored or subsidized textile industries. This allows them to compete at lower profit margins. One owner of a weaving business lamented that some Asian goods in their market can be shipped in cheaper than they can get raw materials. However, some industry members pointed out that Chinese companies have lately been becoming less interested in simple commodity products and investing more in quality.

The companies that do not have to deal with foreign competition claimed a variety of reasons their situation. One owner of a spinning business in the Northeast said that in a niche market, there is no competition if it is a good product. Another interviewee mentioned that foreign companies in their market cannot make the same colors or have as quick of a turnaround. It was pointed out by another that in their niche market, it is cost prohibitive for customers to send fiber offshore to be processed.

While most of the industry members interviewed pointed to foreign competition, especially from Asia, being a major issue, many agreed that a variety of factors were pushing to reverse the momentum back in favor of domestic manufacturers. One of the major advantages of textile companies in the Far East has been cost, but several interviewees mentioned that both labor and shipping costs are rising for these firms, making the USA more appealing in comparison. As wages in China have risen, there has been an increase in competition from other Far East countries where costs remain lower. The director of a medium-sized spinner in the Southeast was wary of Vietnam, which has state-run

corporations and will soon be able to get items into the USA even cheaper through the Trans-Pacific Partnership.

It was also pointed out in multiple interviews that speed-to-market is becoming a larger concern in many segments of the textile industry. One director from a medium-sized Southeast weaving and knitting company said that this means that customers are becoming less willing to wait 8 weeks to get something from China that they could get from a US manufacturer in less than 2 weeks. Additionally, textile companies in China will normally want minimum order quantities before making an overseas shipment because they ship by container. One industry member echoed these sentiments, pointing out that the largest consumer market is here in the States, and China is at a disadvantage from being so far away. However, one weaver mentioned that US yarn suppliers may be hurting themselves by carrying low amounts of inventory, making it sometimes quicker to receive an order from an overseas spinner with higher inventory levels.

4.3.2 Advantages of US Manufacturing

A variety of inherent advantages to manufacturing textiles in the USA were discussed by the various interview subjects of this research. One obvious advantage, mentioned a number of times, is being located proximally to the market into which they are selling. Some of these advantages, according to the interviewees, are quantifiable savings in shipping costs and transit times. This speed-to-market is important when selling to customers who are not interested in carrying large inventories. This was referred to by multiple companies as being able to “turn on a dime.” This also enables US companies to sell to customers who want

order quantities that would be too small for overseas competitors, including custom orders which can be tailored to customer needs.

Other industry members pointed out the advantage of appealing to patriotic customers that are willing to pay more for domestically manufactured goods. The owner of a small spinning company noted that many of their customers are supports such as “Back to Farm” and “Made Locally.” The customers are realizing that supporting local businesses can counteract high unemployment rates. The owner of a craft yarn business mentioned that the recession is actually helping business, as people are buying knitting yarn in lieu of expensive vacations. Another spinner compared the patriotic buying of “Made in the USA” products subsequent to the terrorist attacks of 2001 to a similar movement that occurred after World War II. Other interviewees contend, however, that while there has been more interest in locally-made products, most customers will balk if they see that it entails a higher price.

Several interview subjects mentioned having an upper hand because of the knowledge they have gained by being located in or near their major markets. The owner of a small weaving business in the Southeast posited that they can produce what the customers want because they know the market. Others mentioned that they have more knowledge of their supply chain than overseas competitors.

Communication is another advantage of US manufacturing, according to some interviewees. Having local suppliers and customers allows for in-person visits to troubleshoot any problems as they come up, improving a company’s ability to manage

quality. Several industry members counted speaking a common language and sharing another time zone as factors in better communication through their supply chain. It was mentioned that this allows for problems to be resolved more quickly. A vice president of a spinning and weaving company located in the Southeast said having this close relationship with customers can get a 10-15% higher price on a product.

Several of the interviewees from large and medium-sized textile businesses pointed out that the dependability and cost of energy in the USA is unmatched. Others mentioned that the workforce, while expensive, is highly skilled and capable of producing higher quality products at higher efficiencies.

Some advantages were specific to members of certain segments of the textile industry. For example, the interview subjects involved with spinning cotton were quick to point out that US cotton is high quality and consistent in its availability. The president of a spinner that has customers in the carpet industry mentioned that all the big carpet-tufters are located in the USA, so it is advantageous to be located near them.

4.3.3 Disadvantages of US Manufacturing

When asked about the disadvantages of US manufacturing, over 80% of subjects responded that cost is definitely one. The main cost discussed was labor costs, including healthcare. Many are weary of the impact that Patient Protection and Affordable Care Act (PPACA, also known as Obama-Care) would have on their business.

Some interviewees also mentioned high real estate, material, and equipment costs. It was pointed out on several occasions that it is difficult to find US technicians who can service textile machinery. Additionally, according to the owner of a small weaving business, it can be difficult to get replacement parts because textile machinery is all made overseas.

Another price of producing textiles in the USA is the costs of compliance with OSHA (Occupational Safety and Health Administration), the EPA (Environmental Protection Agency), and other local, state, and federal regulations. Interviewees called these regulations excessive and cumbersome. A president of a large spinning company noted that that these regulations can be changed with the stroke of a pen, adding new costs to businesses.

The competitive environment of the USA was also called litigious, and it was mentioned that US companies, unlike those in some other countries, do not work together. The subjects who mentioned the World Trade Organization believed it is not enforced well and is disadvantageous to US companies. The illegal transshipment of goods into the USA was also said to be damaging.

4.3.4 Helpful Government Policies/Regulations

When asked about the government policies or regulations that are helpful to their business, many interview subjects instantly responded that there are none. Even the interviewees that were able to provide answers were usually limited to only one or two. One specific example mentioned was a company that complained to the government about a

Chinese competitor breaking anti-dumping laws. The government responded by putting a heavy duty on the Chinese product, benefitting the interviewee's business.

By far the most mentioned helpful government policy of regulation was the Berry Amendment, which requires US military and government agencies to buy textile products that are made completely within the United States, which allows companies to avoid foreign competition in those markets. A vice president from a large spinning and weaving company in the Southwest pointed out that the extra security and protection provided by the Berry Amendment allows for more development and innovation in these products.

Several respondents mentioned CAFTA as a helpful trade agreement, especially by the larger spinning companies who export to the CAFTA countries. One such interviewee called the agreement vital for where they ship their yarn, while also pointing out that the Andean agreement has been helpful to their spinning business. There NAFTA agreement was also mentioned by a director at a spinning company that has customers in Canada and Mexico.

Another industry member credited the Farm Bill with helping their company to create over 1000 jobs in 2010. Also, interviewees who produce or purchase natural fibers such as cotton and wool credited the US Department of Agriculture (USDA) with supporting those industries.

Some interview subjects had suggestions for future helpful government policies. A president from a small weaving company in the Southeast suggested that the government

should invest in propping companies up instead of paying unemployment after the workers lose their jobs. It was suggested in another interview that tax breaks be provided to get companies to purchase new equipment.

4.3.5 Harmful Government Policies/Regulations

In contrast to the results of the question regarding helpful government policies or regulations, most responders to the research questionnaire were able to provide numerous examples of government policies or regulations that they found to be detrimental to their business. It was commonly held that the government does not do enough to protect and help the US textile industry, especially in free trade negotiations.

A vice president from a medium-sized spinner pointed out that although they are called free trade agreements, the textiles usually just go one way. Countries in the Far East are not purchasing textile products from the USA, but are just exporting products into it. Another vice president, this one from a large spinning and weaving business in the Southeast, suggested that fair trade would be better than free trade and that the government has to determine which industries are important to the economy and protect those.

The implication is that the textile industry is vastly important to the US economy. However, most respondents that are in markets with foreign competitors lament that textiles are used only as a bartering chip to help other industries that benefit by exporting through the trade agreements, according to a director from a medium-sized spinning firm. A president of

a large company that does spinning, weaving, and knitting took it a step further by referring to textiles as a “giveaway” in trade talks.

Another issue discussed by several industry members is that free trade rules are rarely properly enforced. Many discussed having issues with illegal transshipments from China through free trade partner countries, making these Chinese imports effectively duty-free. Other respondents point out an uneven playing field, as foreign competitors get government subsidies and fewer regulations than their US counterparts. For instance an interview subject from a large spinning and weaving company pointed out that they may not be allowed to use the same chemicals that their overseas competition is utilizing in their products.

Another issue that received many mentions was healthcare costs. One respondent thought that the employer should just provide the jobs and not healthcare as well, pointing out that the total costs of employment has led to less people actually being hired. OSHA was also deemed to be too restrictive from several interviewees. The manager of a large weaving company noted that even something like supplying earplugs represents a cost to the business. The EPA was also named as an overly-restrictive government entity. The president of a large spinning company admitted that EPA regulations are important, but stated that they can go overboard.

Lastly, some members of the US textile industry simply found that the government makes things too complicated and that filling out paperwork is turning into a full-time job.

This was especially a concern with smaller business owners who tended to do administrative work themselves.

4.3.6 Future Viability of US Textile Processes

The members of the textile industry who were interviewed in this research offered a variety of opinions about the viability of performing various textile processes in the USA. A couple of the respondents pointed out that all processes are viable if the production is being done for the military, as the products are protected by the Berry Amendment.

In general, spinning was thought to be a viable process going forward, with some possible room for growth. However, others, including a director from a weaving and knitting company thought spinning would continue to decline.

For weaving and knitting, respondents were not anticipating a big comeback, but several acknowledged that companies that are still in business will likely carry on, while others foretold a continued decline with further consolidation of corporations. Others noted a future for performing these processes in the USA if they offer customized products or sell into niche markets. A vice president from a large spinning and weaving company stated that anything that is more geared toward innovation and customization will continue to flourish. Interviewees were slightly less optimistic of dyeing and finishing, although some pointed out that it would be needed as long as knitting and weaving are still around.

The cut and sew process saw the most pessimism, as it has already mostly left the country. Being the most labor-intensive of the processes, it is the first to move to low-wage

countries overseas. One respondent, a president of a large spinning business simply noted, “Cut and sew: Goodbye.” The owner of a medium-sized knitting company in the Southeast said a successful future for the cut and sew industry in the USA would require revolutionary technology that could reduce the amount of labor involved in the process.

Non-wovens were given the most hope by the subjects interviewed in this research. It was noted that the nonwovens industry in the USA is “good and growing” and that it “won’t go away because it is an efficient market. A manager from a large weaver added that nonwovens would grow in the technical and medical fields. The overall feeling of the industry members was that the less labor-intensive processes have the most chance for future viability, given the nation’s advantages in power costs and disadvantages in labor costs.

4.3.7 Company Optimism

Almost every member of the textile industry who was interviewed was optimistic about the future of their company, especially for the next 5 year. The degree of optimism did vary from person to person. While some respondents predicted a “very bright future” and were “very optimistic,” others claimed to be optimistic only of survival but not of growth. Others hoped that survival during the recession will mean growth once the recession ends.

The reasons for optimism included company history of success, the rate of growth being experienced, the strength of the product, increased inquiries from potential customers, a viable distribution channel, lack of debt, and the predicted growth of the company’s market segment. A president from a large spinning company in the Southeast said that their business

was dependent on the success of their customers, so to be optimistic about the customers would be optimism for the spinning company as well. Another respondent was dependent on the continued existence of a particular niche, so their optimism was tied to that niche.

Some interviewees were confident for 5 years, but were not willing to predict out to 10 years, or were more cautiously optimistic about 10 years forward. A president from a medium-sized weaving company said the business's longer-term future would depend on disruptive technologies and government policies. A vice president from a large knitter pointed out that the days of "printing money" in the textile industry are over and firms would have to make moves to influence their future.

4.3.8 Industry Optimism

There was less optimism about the US textile industry in general than there was for the individual companies of the interview subjects. Over 20% of the respondents lacked optimism for the industry. Some were optimistic only about certain segments of the industry, including technical textiles, industrial textiles, nonwovens, and small niches.

The main reason for pessimism is an erosion of national resources. One owner of a small spinning business pointed out that older textile machines are being sold overseas, and there is a lack of skill and expertise compared to years ago. According to this owner, the infrastructure is not there anymore for the US textile industry.

Some respondents were optimistic by default, saying that the companies that remain have already proven they have what it takes to survive during tough times, so they should be

able to grow now that some weaker competitors have left. A president from a small weaving company in the Southeast noted that it would be hard not to grow a little from where the industry is now.

It was stated in several interviews that the successful future of the industry was contingent on harder work and innovation. The vice president of a large spinning and weaving business said US firms should specialize in niches and stay away from areas being targeted by Asian competitors. The owner of a medium-sized knitting company in the Southeast was optimistic for companies that are innovating, continuing capital investments, and partnering with local governments on training programs.

Other interview subjects noted some recent changes to the competitive landscape, including rising prices in Asia and more customers coming back to the Western Hemisphere, as reasons for optimism. It was also noted that increased consumption within India and China would reduce the imports coming in from those countries, and provide more opportunities domestically.

4.3.9 Key Factors Going Forward

Interview subjects were asked to discuss key factors going forward, including both technology factors and management factors, both inside their industry and for the US textile industry at large. There was a variety of opinions given, but also plenty of overlap between answers.

Many saw the biggest technology factors to come in the form of machinery innovations. One example of this would simply be faster and more efficient machinery, reducing manual labor while increasing production and limiting energy consumption. Some respondents pointed out other ways in which machinery can be improved, including the ability to make faster changes and adjustments to make it easier to produce customized orders. Another machinery improvement, pointed out by a director from a medium-sized spinning company, would be machinery that is easier to fix and troubleshoot, thus reducing the need for technicians.

Another form of technological innovation mentioned by some respondents as being a key factor going forward is chemistry innovations. One example of this is the creation of new fibers with unique properties. Another example is in chemical finishes. These include finishes for things such as water repellency, antimicrobial properties, stain release, and ultraviolet protection.

Some interviewees also predicted larger-scale technological advancements as key factors going forward. A president from a medium-sized weaver in the Southeast opined that there has not been a disruptive technology in the past 10 years, and there may need to be in the next 10. Another president, this one from a large spinning company, thought the same way, pointing out the need for a game-changing or leapfrog technology such as yarn-to-knit or roving-to-knit machinery. Print-on-demand t-shirt graphics were also brought up as a new technology coming into the industry. Other technology factors mentioned were energy costs, continued growth of internet business, and the aging of equipment.

As far as managerial factors, many respondents pointed out the need to market in niches. A vice president from a medium-sized spinning and weaving company stated that US companies should be attaining and creating markets that are difficult for others by utilizing core competencies. The owner of a smaller spinner in the Northwest added that small businesses must continue to fill the niches that bigger companies are unwilling or unable to fill. Another owner of a small spinner added that the market is being cut into smaller pieces, so small companies can come in and get those pieces. One interviewee noted that there are plenty of opportunities for aggressive companies, and there are still things out there that people do not know that they need.

A significant number of medium- and large-sized companies mentioned the decline of the US textile workforce as a serious management problem going forward. Many were finding it very difficult to find qualified, young candidates looking for management jobs in the textile industry, even with historically high unemployment rates in the country. One vice president noted that young smart people see textiles as a declining industry and go to other areas where they see a brighter future. This becomes more important as more long-time textile employees are retiring and taking their years of wisdom with them. These companies find themselves making more hires of managers without a textiles background who require more training. A couple of respondents noted that the government should help in this training of new employees. In addition to management candidates, many businesses are having a hard time finding qualified technicians to work on textile machinery.

Another important management factor, in the opinion of the members of the textile industries interviewed for this research, is supply chain management. One president from a large spinning company noted the need for a faster business that can move the product through the supply chain quicker, manage inventory, and manage cash. Another respondent mentioned the need to think and work globally and be involved in the entire supply chain process.

Some industry members, especially owners of small textile businesses, saw the growth of a “Buy Local” movement to be an important factor. One owner of a company that sells craft yarn mentioned that the retiring of Baby Boomers has led to more people knitting as a hobby and an increased demand in knitting yarns.

Another general management factor mentioned is that companies must lose the old loom mentality of turning on the machines and running them forever. They must instead be willing to be more dynamic. Other management factors mentioned include responding to generation shifts and habits, increased demand for luxury goods, the strength of the US Dollar, new product development, processing yield, quality management, patenting and licensing, and fiber pricing.

4.4 Summary

Table 23 is a summary of the key insights gained for each research area from the 31 interviews. Interesting insights were gained in each of the 9 designated research areas of the interviews.

Table 23- Summary of Key Interview Insights

<u>Research Area</u>	<u>Key Insight From Interviews</u>
Foreign competition	<ul style="list-style-type: none"> - More foreign competition than ever before. - Foreign competitors losing some of their advantage because of rising labor rates and an increased demand for short lead times from US customers.
Advantages of US manufacturing	<ul style="list-style-type: none"> - Proximity to major market leading to better market knowledge and relationship with customers. - Skilled workforce and low energy costs.
Disadvantages of US manufacturing	<ul style="list-style-type: none"> - Higher costs, particularly labor costs. - Strict regulations that change too easily.
Helpful government policies/regulations	<ul style="list-style-type: none"> - Many companies feel there are none. - The Berry Amendment for selling into the US military market. - CAFTA for spinners selling into Central America.
Harmful government policies/regulations	<ul style="list-style-type: none"> - Free trade agreements are not fair for the US textile industry and difficult to enforce. - Too many regulations that impede the ability of US companies to compete globally and excessive healthcare costs.
Future viability of US textile processes	<ul style="list-style-type: none"> - Nonwovens is most viable because of innovation and efficiency. - Cut and sew is least viable because of high labor necessity. - Other processes need niches or improved technology to decrease labor and increase efficiency.
Company optimism	<ul style="list-style-type: none"> - Most are optimistic of at least continued survival. - Optimism based on the fact that the companies are still around.
Industry optimism	<ul style="list-style-type: none"> - Most are optimistic given that companies adjust to changing times.
Key factors going forward	<ul style="list-style-type: none"> - Technology factors: Faster, more flexible machines. Innovations in materials and finishes. Possible disruptive technologies. - Management factors: Marketing into niches, recruiting new textile employees, global supply chain management, developing new mentality.

Chapter 5 - Secondary Data Analysis Results

This chapter discusses the results of all secondary data analysis performed in this research. The purpose of this analysis was to address Research Objective 1 (RO1), which was to determine opportunities for cost-competitiveness for US spinners, weavers, and knitters.

The main sources of secondary data which were utilized in this research were surveys conducted by the International Textile Manufacturers Federation (ITMF). As described in Chapter 3, the survey reports used were the ITMF International Production Cost Comparison reports (1991, 1995, 1997, 1999, 2001, 2003, 2006, 2008, and 2010) and the ITMF International Textile Machinery Shipment Statistics reports (1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, and 2010).

In order to validate some of the assumptions made in the analysis of these reports, the *Yarn Market* section of *Textile World Magazine* (monthly from 1980 - 2012) was used to track fiber and yarn prices over time. Additionally, several industry members were contacted to discuss the relevancy of some of the analyses undertaken.

5.1 Data Preparation

The first step of the data analysis process was the proper preparation of the available data. In the case of the ITMF International Production Cost Comparison reports and the ITMF International Textile Machinery Shipment Statistics reports, Excel spreadsheets were

made with different tabs for each country and all relevant data for each country was transferred year by year into the spreadsheet.

The countries analyzed in this chapter were chosen based on the availability of data in these surveys. The ITMF International Production Cost Comparison included data on 9 different countries, however only 7 of these countries (Brazil, China, India, Italy, Korea, Turkey, and USA) had data available for each report from 2003 - 2012. These 7 countries plus Egypt were available on the most recently available report (2010). While the ITMF International Textile Machinery Shipment Statistics reports included many more countries, this research limited the analysis to those countries that were also available in the other surveys.

5.2 Results Pertaining to Spinning

5.2.1 Spinning Machinery Capacity

The spinning capacity of each country from 1990 to 2009 was analyzed to determine the trends of worldwide staple yarn production. This data was broken down into three machine categories: rotor spinning, short-staple ring spinning, and long-staple yarn spinning. The yearly capacities (in number of spindles) for each of these categories are displayed in Figures 34-36.

Figure 34 shows that, among the included countries, the USA had the highest capacity for rotor spinning from 1990 to 2001. After that year, China became the leader in rotor spinning capacity and continued to increase capacity every year. Meanwhile, the USA

continued to decline, and in the most recent survey, had less capacity than countries such as India and Turkey.

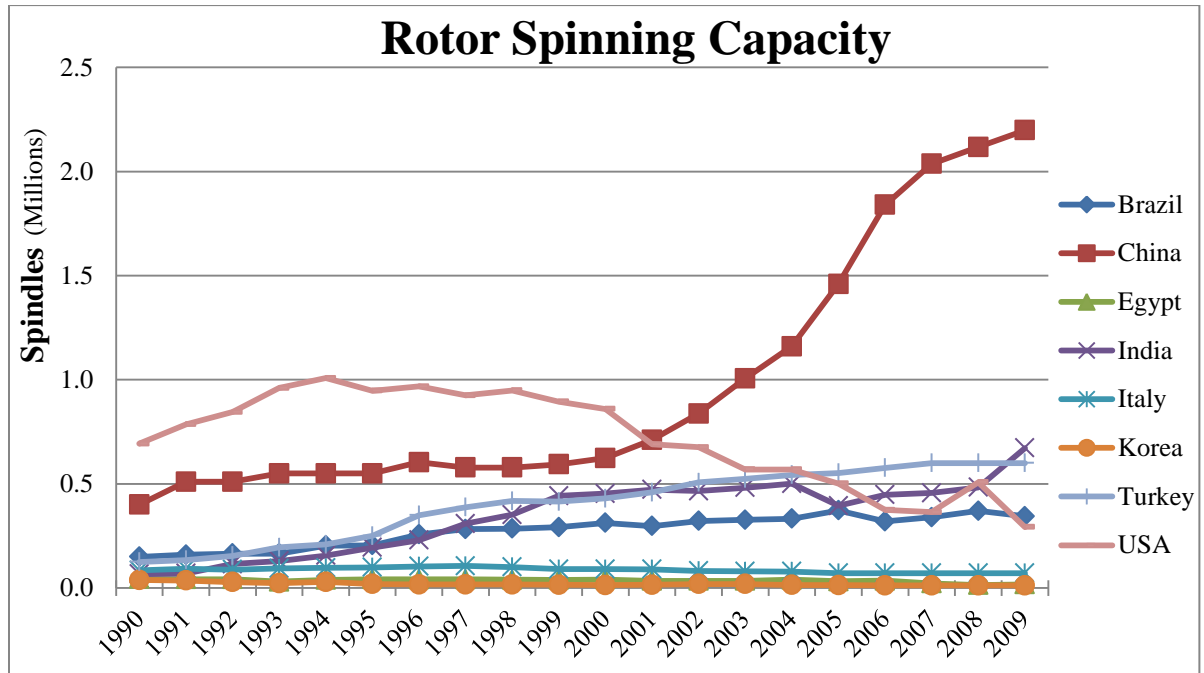


Figure 34 - Country Rotor Spinning Capacities by Year
Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

Figure 35 shows the yearly short-staple ring spinning capacity for each country. This shows a similar trend of China increasing every year beginning in 2001, and having by far the highest capacity in the most recent survey. These patterns reflect the phasing out of the WTO safeguards that were in place for China during this time period.

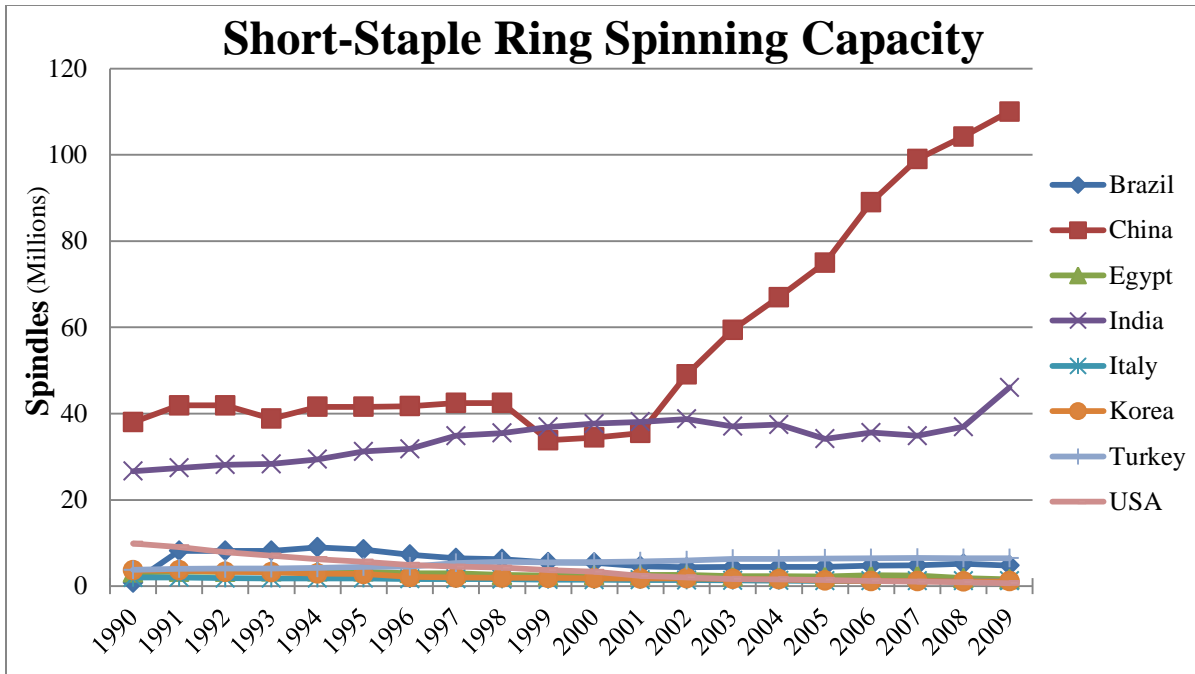


Figure 35 - Country Short-Staple Ring Spinning Capacity by Year
Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

Figure 36, which shows yearly long-staple ring spinning capacities for each country, exhibits a different pattern than the previous 2 figures. In this figure, China actually levels out in 2001, rather than increasing every year. In fact, after China surpassed Italy in the early 1990s for highest capacity, every country in the survey mostly maintained their capacity in the following years. The USA is in the middle of the pack in this category.

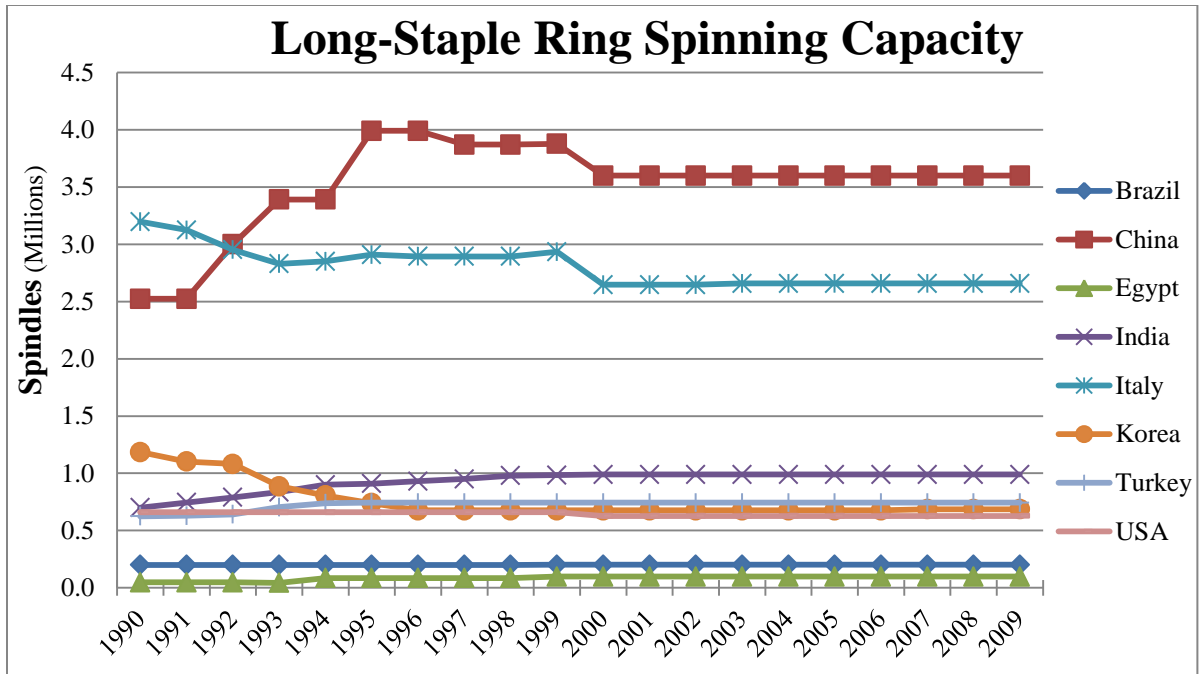


Figure 36 - Country Long-Staple Ring Spinning Capacity by Year
 Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

5.2.2 Spinning Machinery Modernization

Moore (2009) introduced the “modernization rate of spinning technology,” which calculated an estimate of the percentage of spinning machines in each country that were less than 10 years old. It was calculated by dividing the cumulative shipments of new equipment to that country over the preceding 10 years into that year’s total capacity and then multiplying by 100 to get the percentage. That concept was used in this study to calculate the modernization rate for not only spinning machinery, but weaving machinery as well. Knitting machinery was excluded because the ITMF International Textile Machinery Shipment Statistics included only yearly knitting shipment figures and not total capacities for each country.

Figures 37-39 show the percentage of total capacity for each of the included countries that is 10 years old or newer. For rotor spinning (Figure 37), China has by far the most modern machinery, with a modernization rate of over 80%. Turkey is second-highest; Egypt is lowest; and the USA is in the middle, but below 50%. For short-staple ring spinning (Figure 38), every country is below 50%, with Korea and Turkey having the 2 highest percentages and the USA around the middle. For long-staple ring spinning (Figure 39), only Turkey, China, and Egypt exceed 10%, with Turkey representing the country with the highest rate of modernization. The USA is lowest in this category.

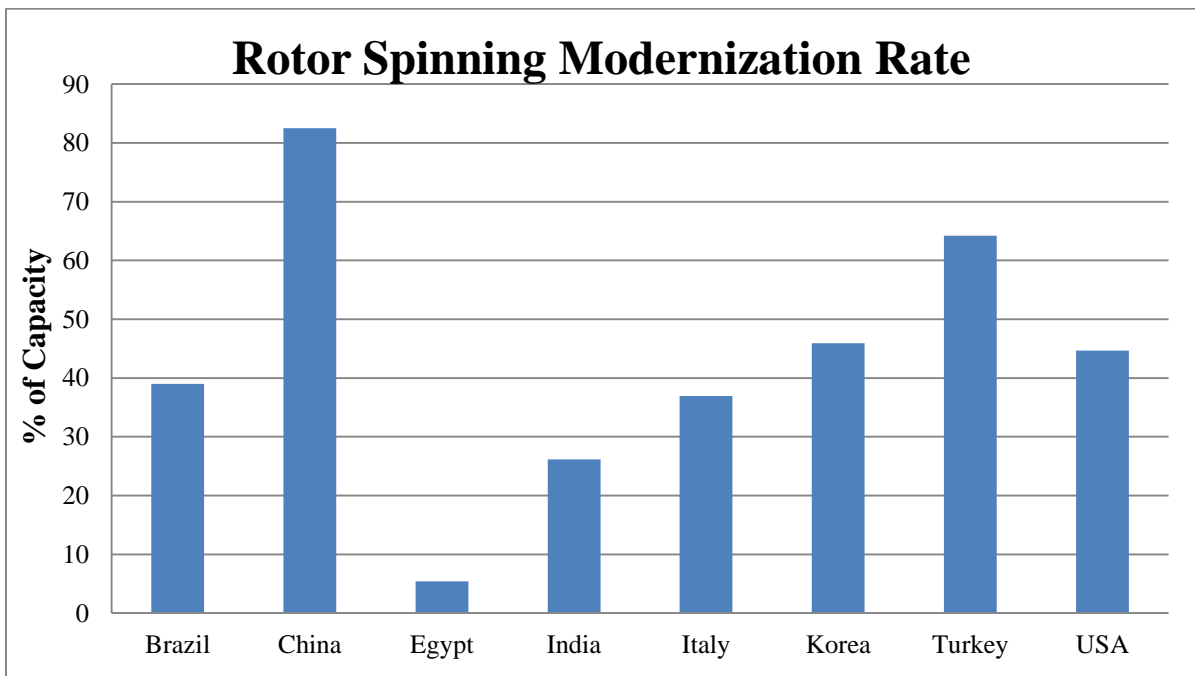


Figure 37 - Rotor Spinning Modernization Rate by Country

Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

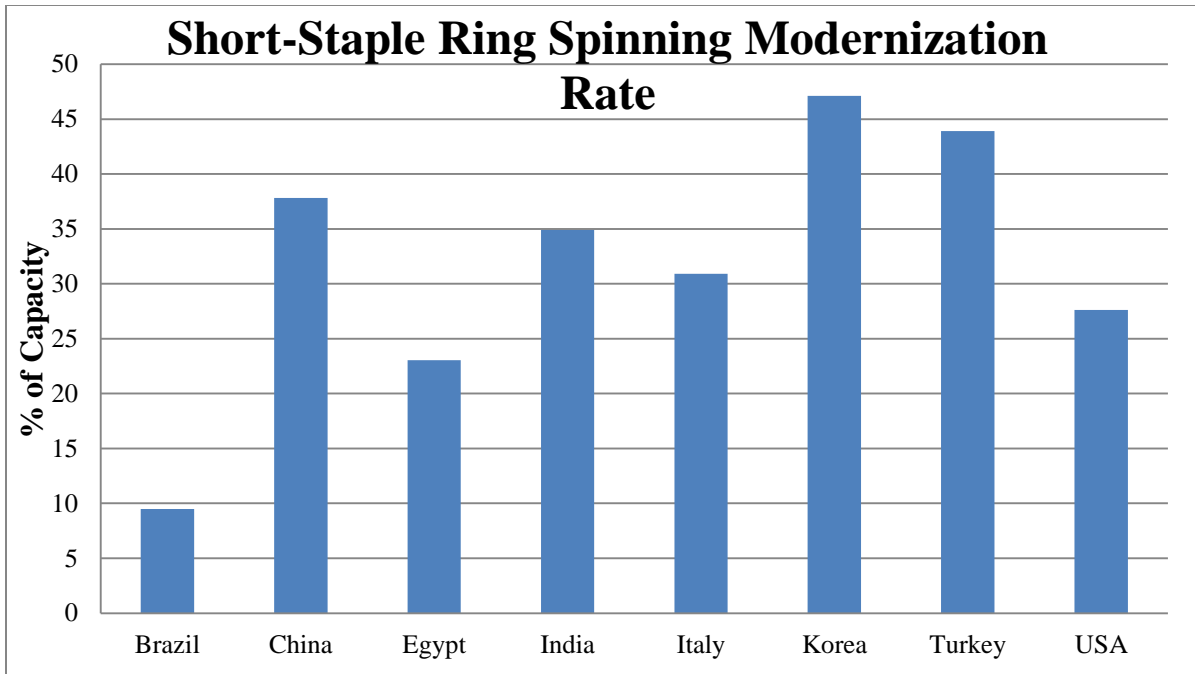


Figure 38 - Short-Staple Ring Spinning Modernization Rate by Country

Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

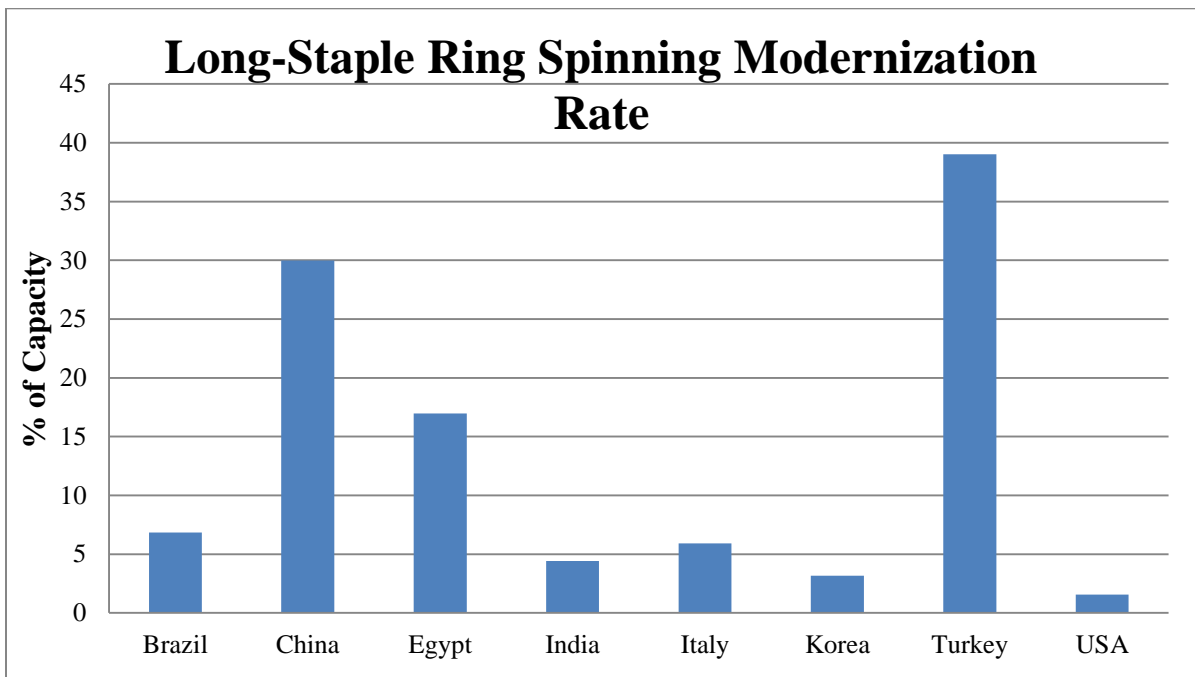


Figure 39 - Long-Staple Ring Spinning Modernization Rate by Country

Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

While the rate of modernization is useful to look at, it does not necessarily tell the entire story. It only takes into account new machinery. In reality some countries might be better at maintaining, modifying, or upgrading existing machinery. This could make it comparable to brand new machinery in some instances.

A number of industry members were contacted about this subject and they confirmed that machines are “overhauled” or upgraded much more often than they are replaced with brand new equipment. They also pointed out that what is considered “basically new” in one segment of the industry could be considered “old and used up” to another. For instance, a commodity woven fabric maker would place a higher importance on having the latest, most efficient machinery in order to achieve the highest productivity possible. Meanwhile, for a wool spinner, the latest long-staple spinning machinery does not necessarily generate significantly more productivity than well-maintained older equipment.

5.2.3 Spinning Cost Trends

Figures 40 and 41 exhibit the time-trends of total spinning costs (including the cost of fiber) for each participating country from the ITMF International Production Cost Comparison reports from 2003 to 2010. In both figures, the USA was highlighted with a bold red line to show its place among the other countries over this time period.

Figure 40 shows that for ring-spinning, Italy had the highest cost for the entire time period. The USA began with the second-highest cost, but over the years was surpassed by 4 other countries and ended up having the second-lowest cost per kilogram of yarn.

Meanwhile, the cost of ring-spinning in China rose to become the clear second-most expensive behind only Italy.

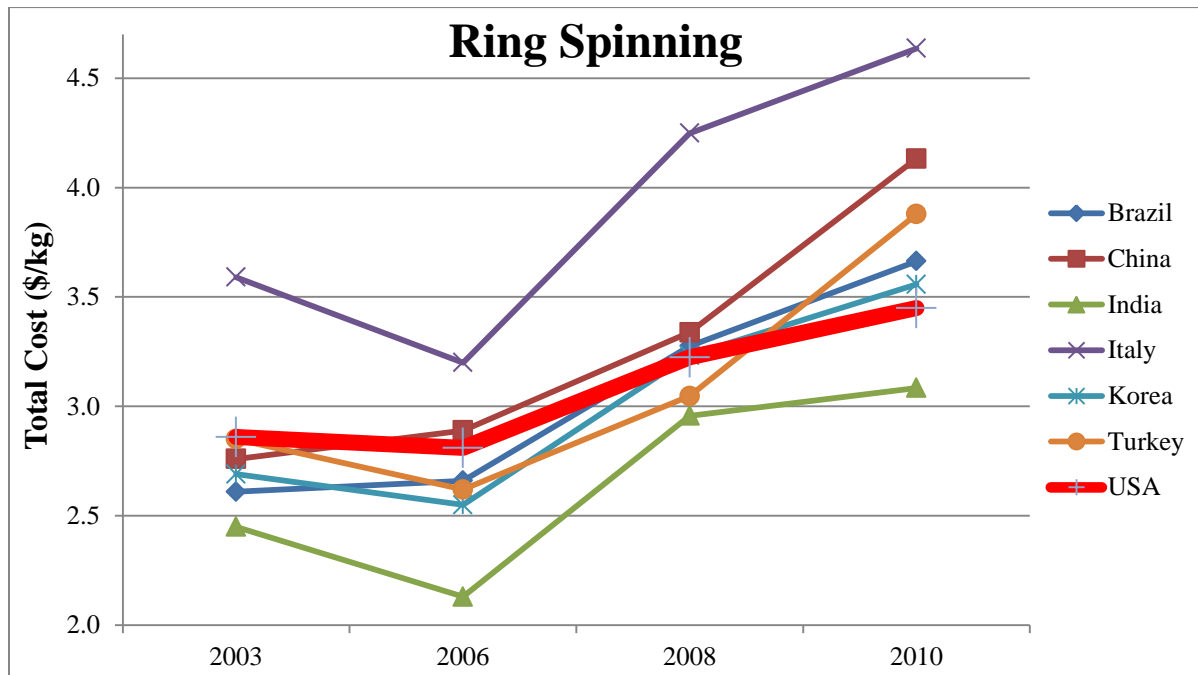


Figure 40 - Country Ring Spinning Costs by Year
 Source: Created by author. Data from ITMF International Production Cost Comparison (2003-2010)

This echoes the results of the in-depth interviews from Chapter 4, in which many members of the industry pointed to rising costs in China as an opportunity for the future of US textiles. Figure 41 also shows the rising cost of making yarn in China, this time for rotor spinning. The USA was already one of the less expensive countries in 2003, but the gap between it and China widens over the years.

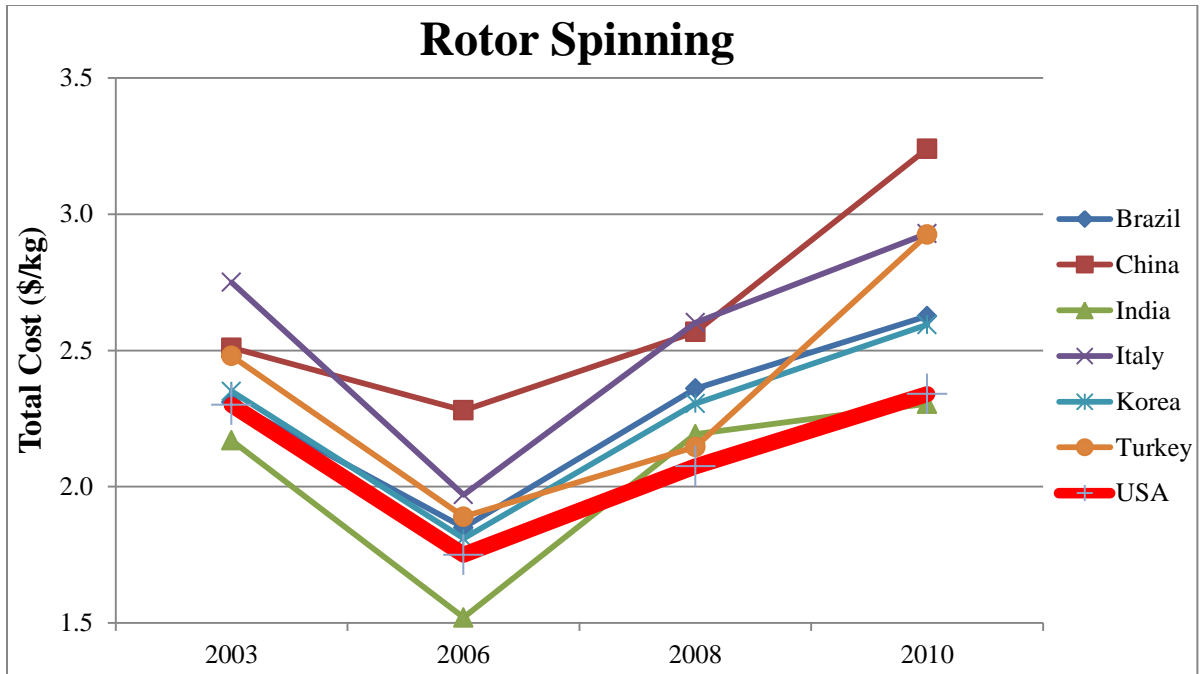


Figure 41 - Country Rotor Spinning Costs by Year
Source: Created by author. Data from ITMF International Production Cost Comparison (2003-2010)

This trend is extremely important to the future of the US textile industry. American companies already have the location advantage, so any cost advantage gives US customers even less reason to import textile products. Opportunity is coming to the USA because worldwide costs are rising at a faster rate.

5.2.4 Components of Spinning Cost

The cost of spinning in each country was further broken down in the surveys into the cost components of raw material, interest, depreciation, auxiliary material, power, labor, and waste. This was useful because it allowed for the impact of an increase in a particular cost driver to be analyzed.

This was seen in Moore (2009), as discussed in Chapter 2. That research showed that a two-fold increase in raw material cost for spinning could enhance the relative global cost competitiveness of the USA because of its access to less expensive raw materials.

Conversely, countries for which raw materials represented a higher percentage of the total cost would be affected more severely by such an increase. The validity of that research was confirmed in 2010-11, when cotton (and to a lesser extent, polyester) did, in fact, see a large elevation in price. This confirms that analyzing these scenarios is relevant to the US textile industry.

Ring Spinning

Figure 42 shows the total cost of ring spinning for each country in 2010. In this and all similar figures to follow in this chapter, a bold red line was placed on the top of the USA bar in order to gauge its cost relative to the other countries. This figure shows that the USA has the second-lowest total cost and that raw material is the largest cost driver for each country.

Figure 43 shows what the total cost for each country would become if the raw material cost is doubled. The USA remains the second-least expensive, however the gap between it and some of the more expensive countries, such as China, Egypt, and Italy, has widened, with several of the countries now being a full dollar per kilogram higher. India gains a similar advantage and remains less costly than the USA.

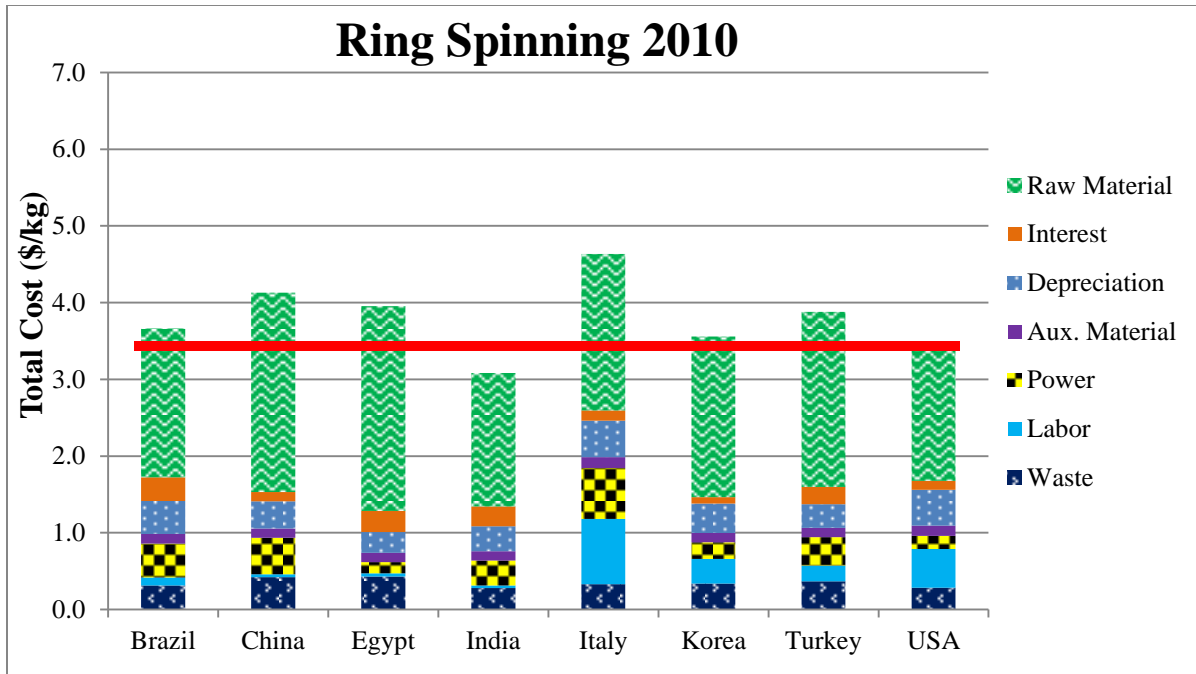


Figure 42 - Cost Components of Ring Spinning
Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

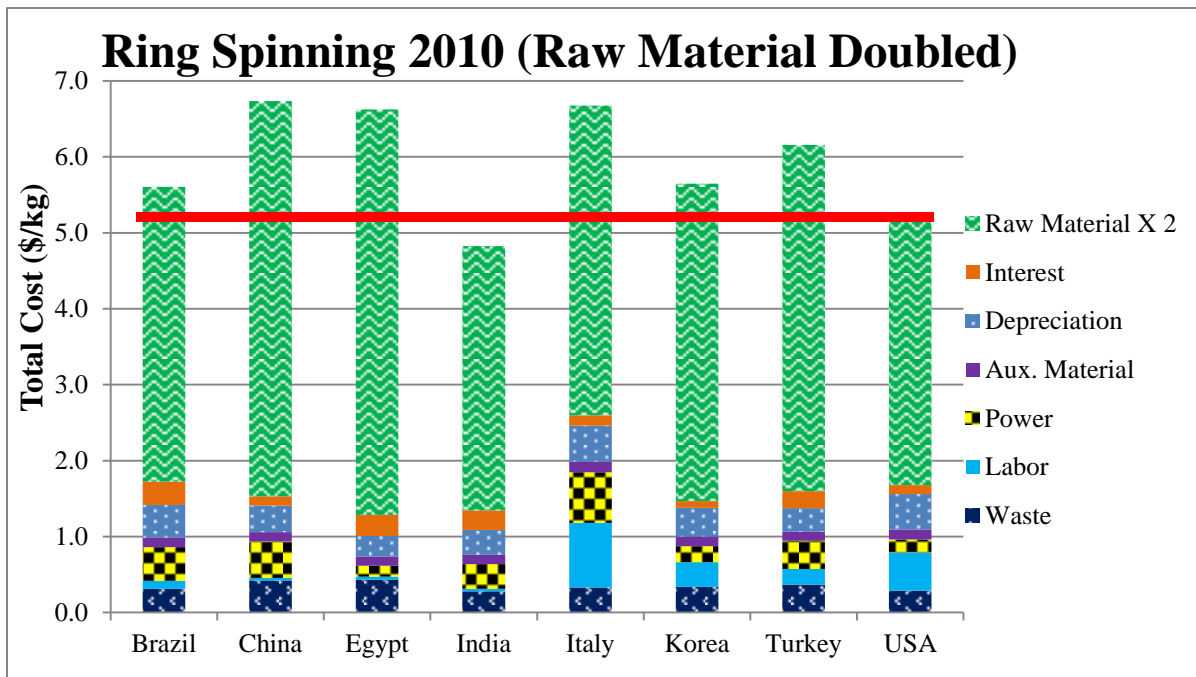


Figure 43 - Cost Components of Ring Spinning (Raw Material Doubled)
Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

Figure 44 was created to illustrate the progressive effect on total cost that results from incremental increases in raw material cost. The left end of this figure shows the total cost for each country as reported in the 2010 ITMF International Production Cost Comparison report. The raw material cost is then increased from 0 to 300% in order to show the impact on total cost. Red lines were added to show the difference in total cost between the USA and China and how this difference grows as the cost of raw material rises. This difference, obviously, would continue to grow at this rate for even larger increases in raw material costs.

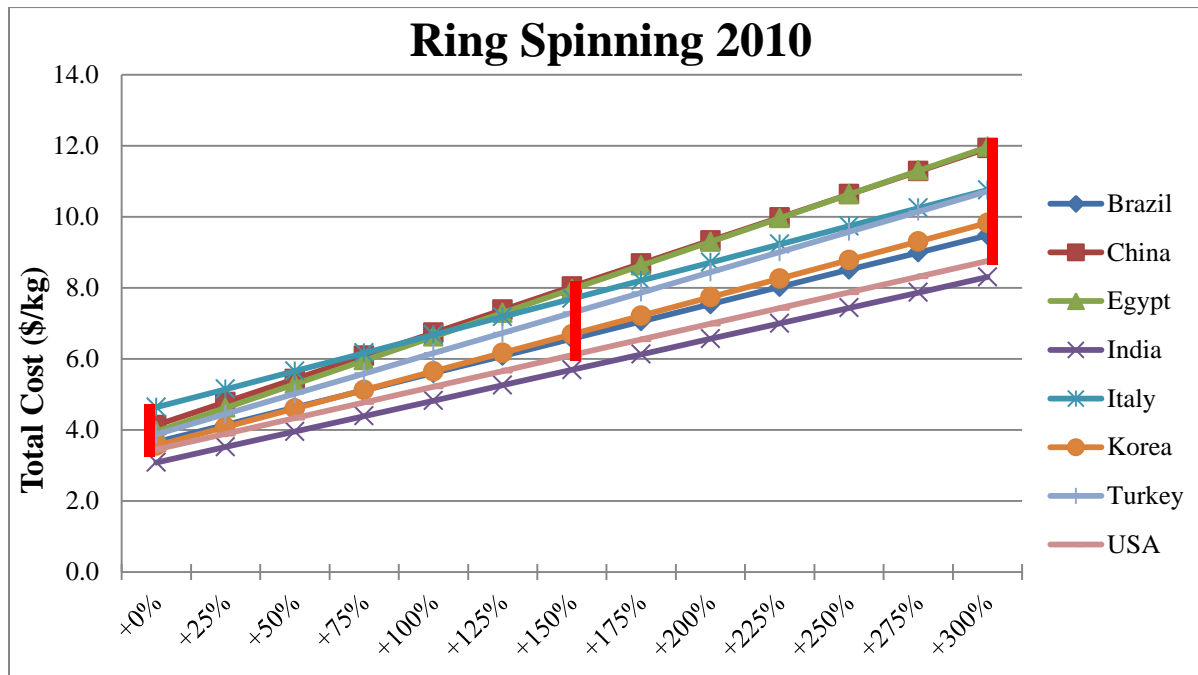


Figure 44 - Incremental Increase in Raw Material Cost for Ring Spinning
Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

This process is repeated for rotor yarn cost in Figure 48, but is not continued in the weaving and knitting sections because the concept remains the same for each process.

Another cost advantage held by the USA, as pointed out by many interview subjects in Chapter 4, is with power cost. For this reason, this research analyzed what impact a great fluctuation in power cost might do for US global cost-competitiveness. Figure 45 can be compared to Figure 42 to show the difference that a doubling of power cost in each country would make as compared to the 2010 survey results. As it turns out, a doubling of power cost would in fact benefit the USA in terms of cost-competitiveness against several of the countries, including China, and to a lesser degree, India.

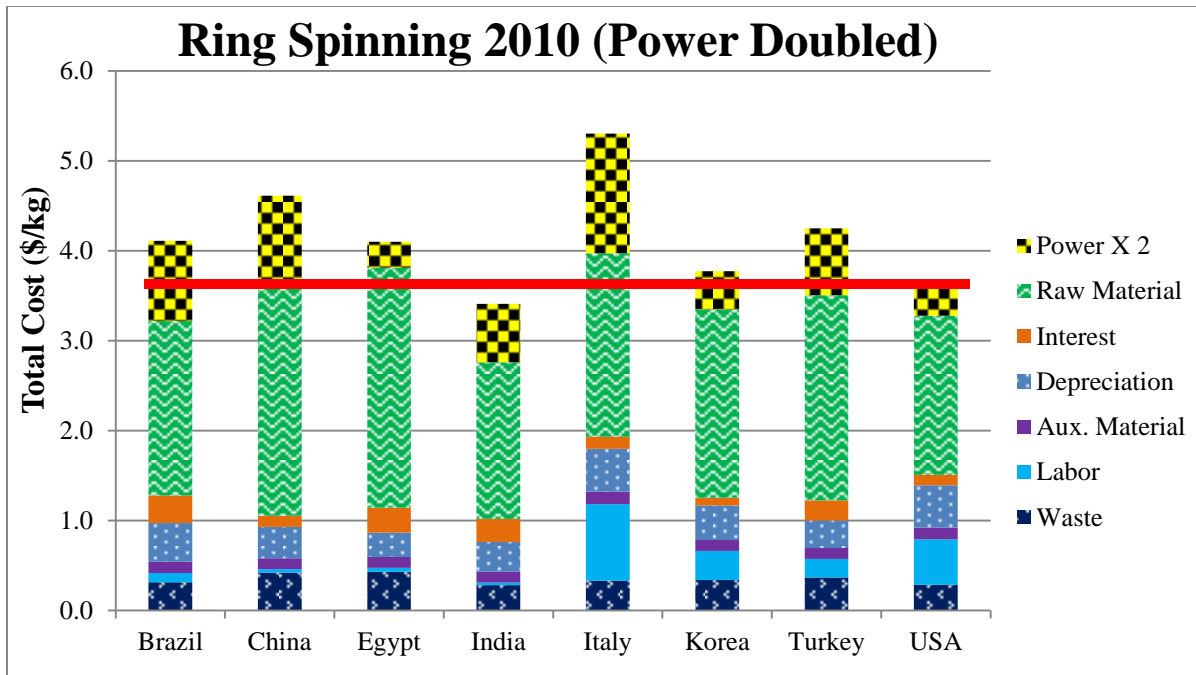


Figure 45 - Cost Components of Ring Spinning (Power Doubled)
Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

Further research would need to be done to determine how realistic such an increase might be. A US energy expert was contacted for this research and that expert explained that there are a number of major unknowns that make it difficult to predict future US energy prices. These unknowns include what the USA will do in regards to nuclear power, the future price of natural gas, whether the USA might shut down coal-powered generation, and how much expensive “green energy” will be imposed by the government. As touched upon in the interviews in Chapter 4, complying with strict regulations from the Environmental Protection Agency can be costly to textile companies, so any new regulations on coal or other kinds of power could prove detrimental. These are all political issues that could have an impact on energy prices.

While Figure 45 shows power costs increasing by a universal percentage for every country, this would not likely be the case in practice. Because of many of the political issues mentioned, as well as a number of other factors, power would likely increase at different rates for each country. For instance, power cost could rise 25% for the USA while rising 75% for China. Again, more information would be needed to estimate potential global power cost-increase scenarios.

Rotor Spinning

The figures in this section are similar to those created for ring spinning cost, except these figures deal with rotor spinning. The previous section can be referenced for more detailed explanation, as this section will concentrate on identifying interesting results. The

first figure for rotor spinning is Figure 46, which shows that the USA and India are the least expensive countries for producing rotor yarn, while China and Egypt are the most expensive.

Figure 47 shows the impact of a doubling in raw material cost for rotor spinning. As with ring spinning, the gap in US Dollars between the USA and the countries with higher costs, such as China and Egypt, grows with this increase. On the other hand, India actually benefits slightly more from this increase than does the USA. Note that for both spinning techniques, labor cost, which is known as the main reason the textile industry has moved overseas, is not nearly as influential as some of the other cost drivers.

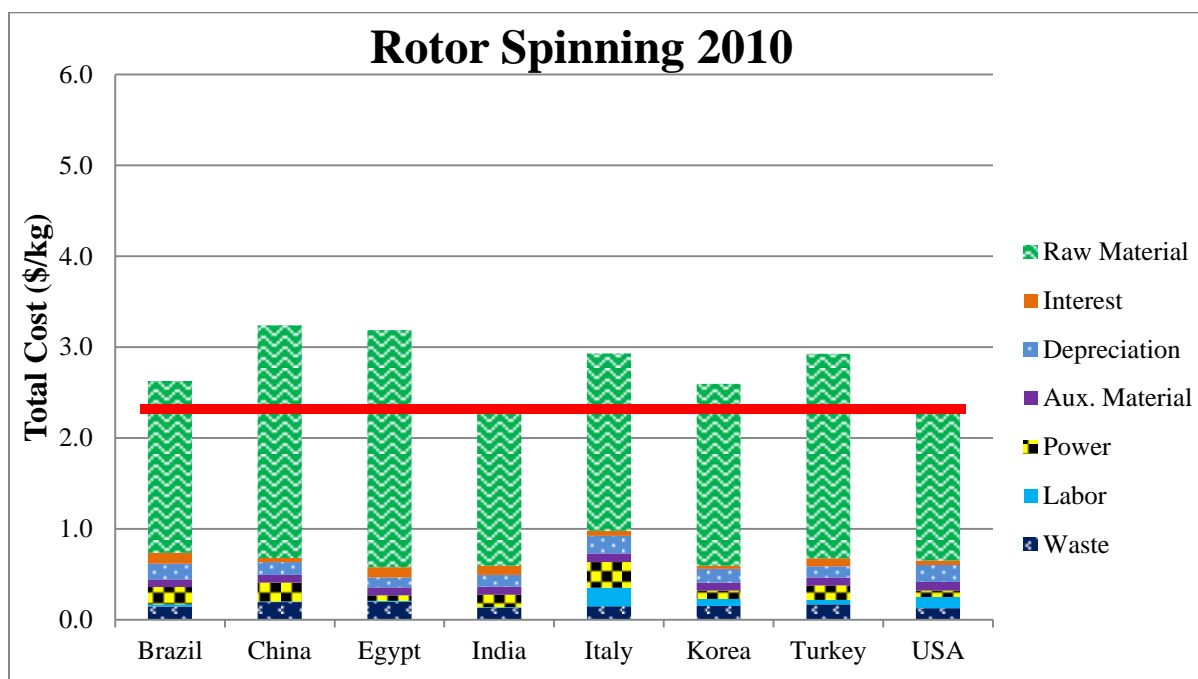


Figure 46 - Cost Components of Rotor Spinning

Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

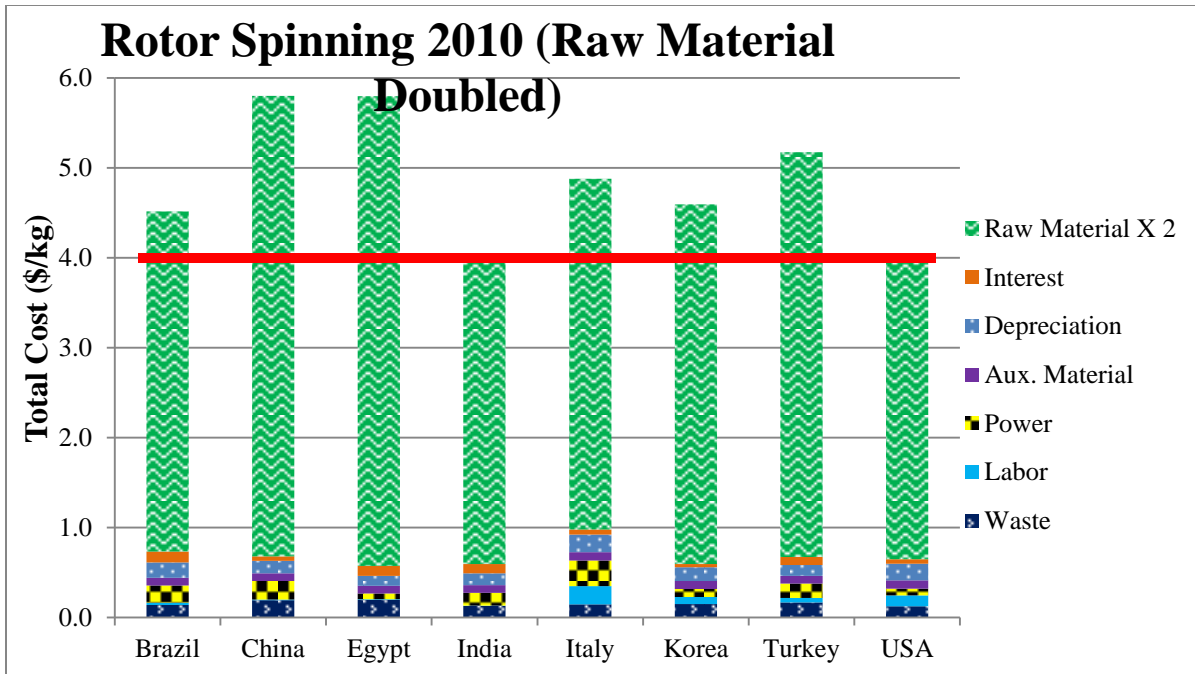


Figure 47 - Cost Components of Rotor Spinning (Raw Material Doubled)

Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

Figure 48 shows that the cost gap between the USA and China for rotor spinning grows with greater hypothetical increases in raw material cost. Again, the red lines were added to illustrate this difference. The other countries included, with the exception of India, also show marked growth in difference with the USA.

A two-fold increase in power cost for each country (Figure 49) benefits the USA for rotor spinning, but not quite as much as for ring spinning because power cost is not as large a cost driver for rotor spinning.

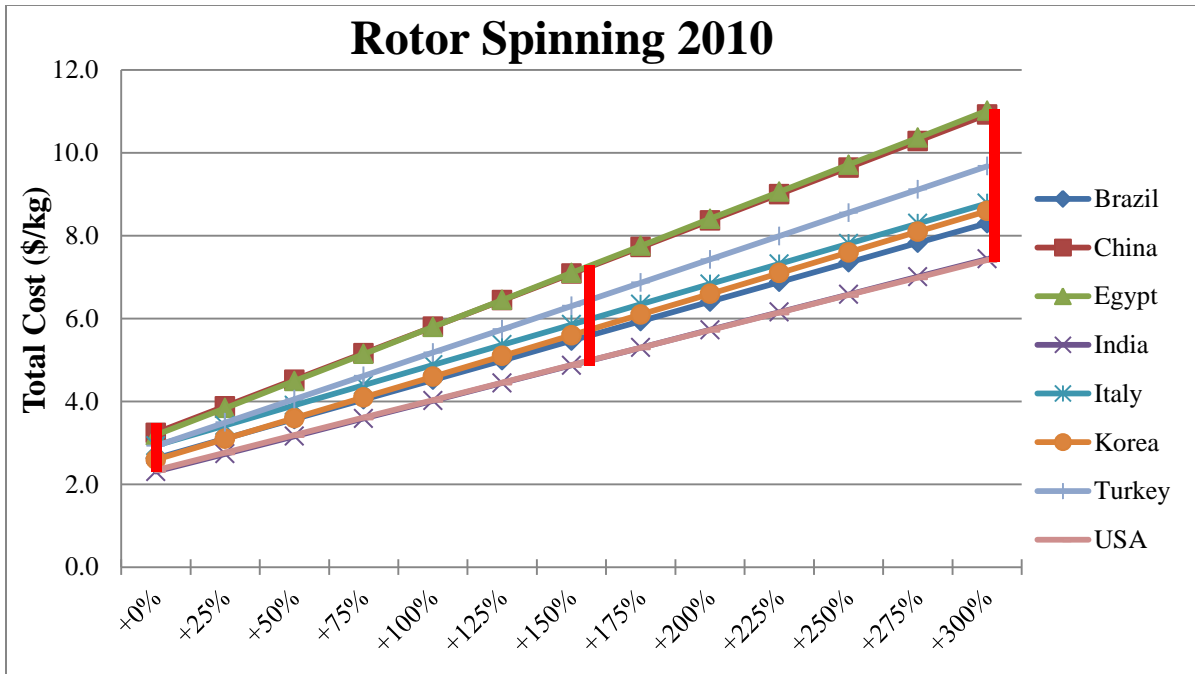


Figure 48 - Incremental Increase in Raw Material Cost for Rotor Spinning
 Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

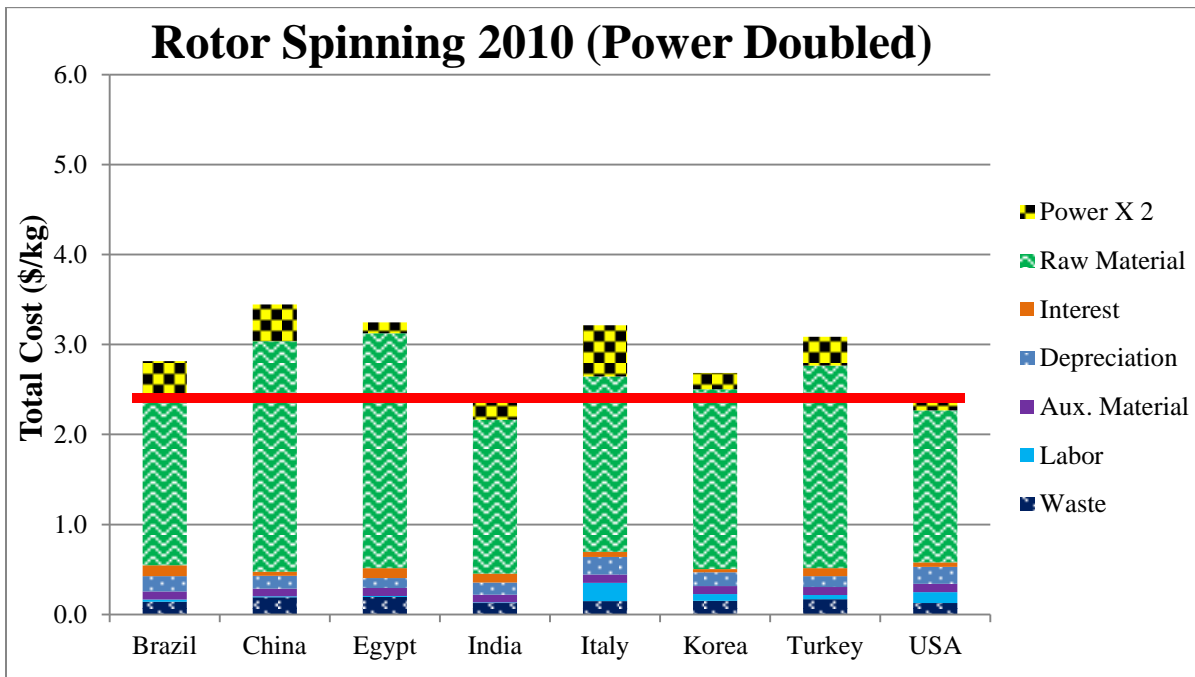


Figure 49 - Cost Components of Rotor Spinning (Power Doubled)
 Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

5.3 Results Pertaining to Weaving

5.3.1 Weaving Machinery Capacity

The yearly weaving machine capacities for the countries included in this research are displayed in Figures 50-52 for the years from 1990 to 2009. Figure 50 exhibits shuttle-less loom capacity, Figure 51 exhibits shuttle loom capacity, and Figure 52 exhibits wool loom capacity.

Figure 50 shows that shuttle-less looms have a more exaggerated version of the pattern seen earlier in this chapter for rotor spinning machinery. The USA is the leader among these countries in capacity throughout the 1990s, but the turn of the Century and the discontinuation of WTO safeguards led to a surge by China. The USA dropped to the middle of the pack, while China rose every year through the most recent ITMF International Textile Machinery Shipment Statistics report. By 2009, China had a capacity that was over 10X greater than every other country in the figure.

Figure 51 shows that shuttle loom capacity follows a different pattern altogether from shuttle-less looms capacity. In this case, China had by far the largest capacity since the earliest report, but then actually shows a slow decline in capacity. Meanwhile, the other countries also declined, so China maintained its lead in shuttle loom capacity.

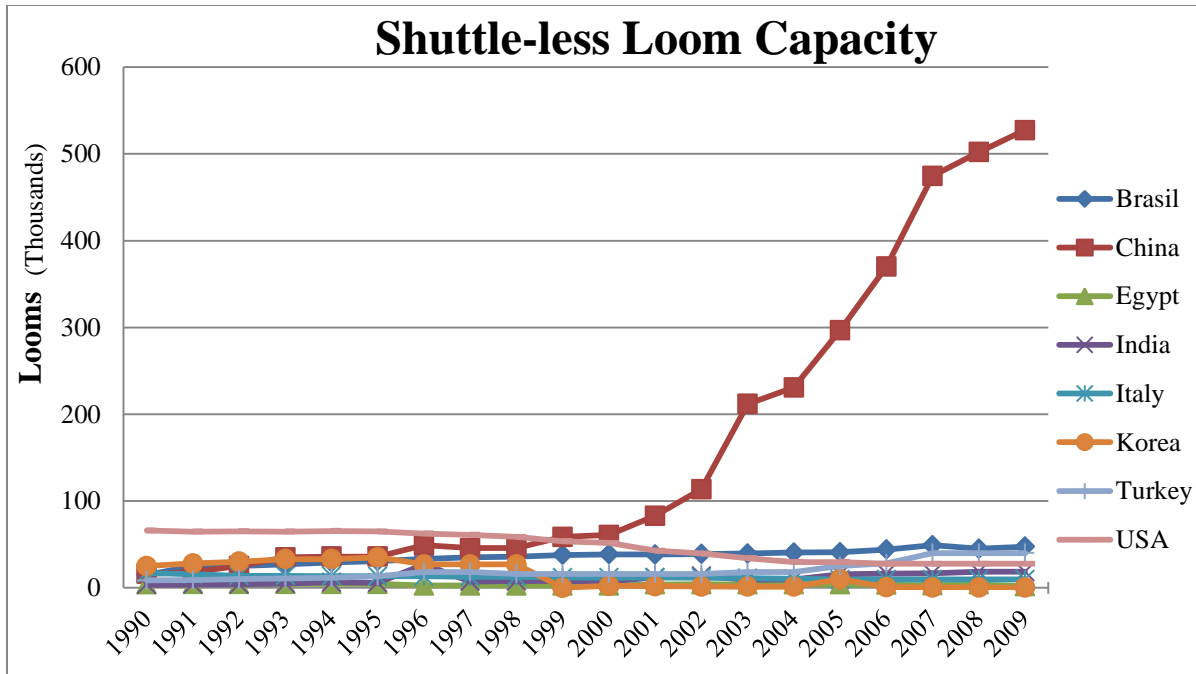


Figure 50 - Country Shuttle-less Loom Capacities by Year

Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

Figure 52, which displays wool loom capacity, shows that almost every country participating in this survey maintained a steady wool loom capacity over the previous 20 years. China actually showed a significant drop-off at around 2001, which is when WTO safeguards were lifted and capacity for other textile machinery began to vastly increase.

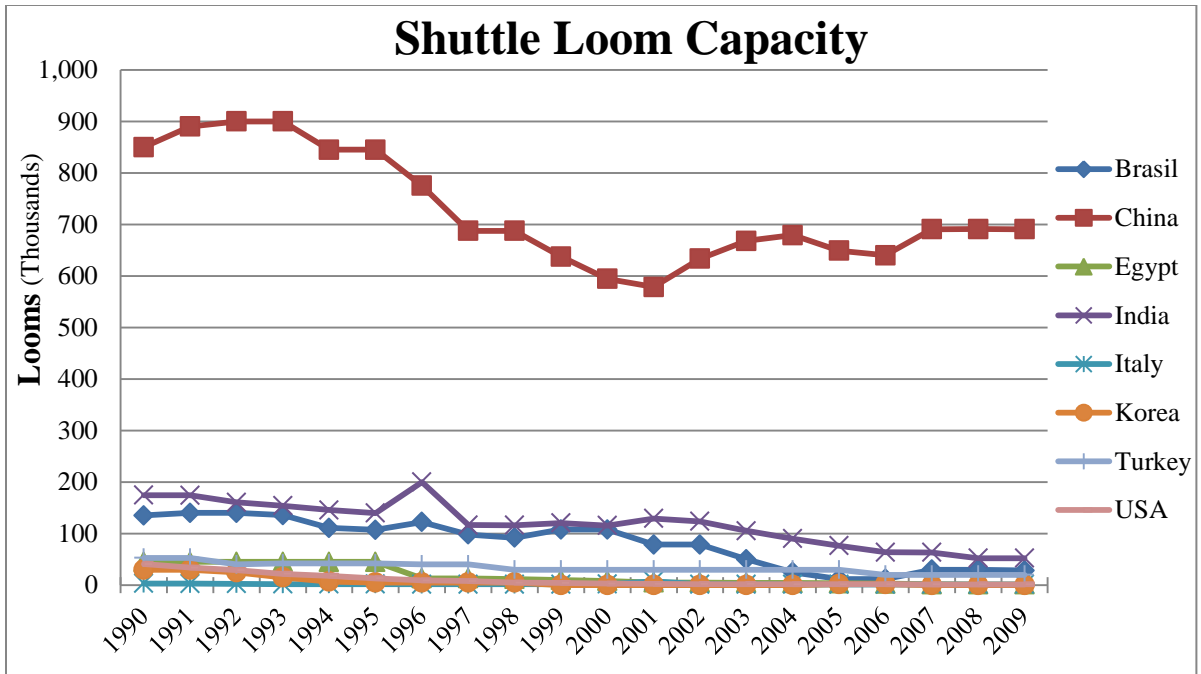


Figure 51 - Country Shuttle Loom Capacities by Year

Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

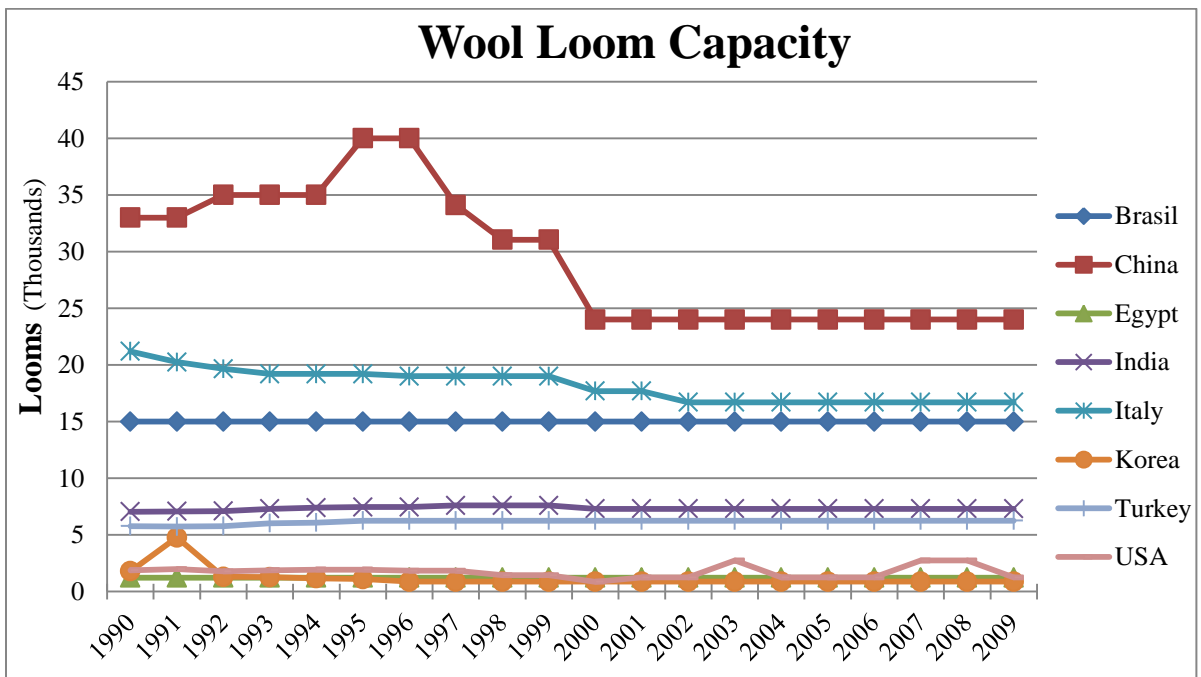


Figure 52 - Country Wool Loom Capacities by Year

Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

5.3.2 Weaving Machinery Modernization

The machinery modernization rate is only available for shuttle-less looms and shuttle looms, as yearly shipment data is not provided for wool looms. The two types of looms with available data, which are displayed in the following 2 figures, show a great difference in modernization rate by country. Egypt, India, Italy, and Korea all have a 100% modernization rate for shuttle-less looms (Figure 53), meaning all such machinery in those countries is less than 10 years old. The USA has a much smaller modernization rate, as it and Brazil are both well below 20% in this category.

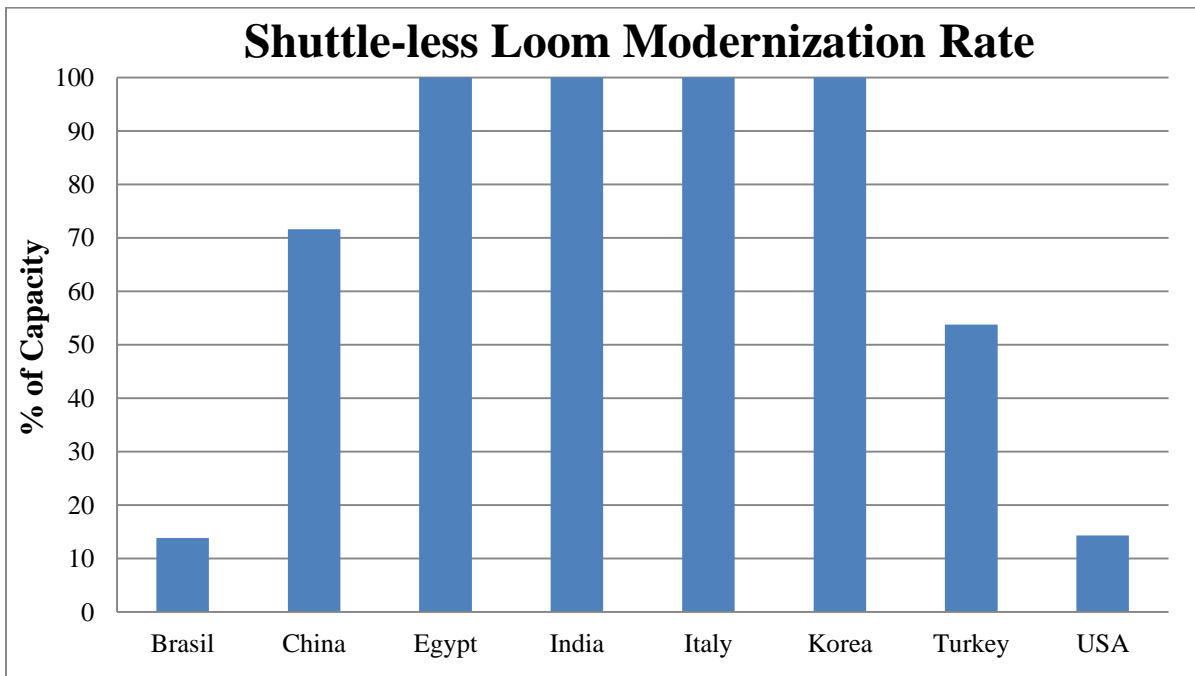


Figure 53 - Shuttle-less Loom Modernization Rate by Country

Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

For shuttle looms (Figure 54), every country in the survey is below a 12% modernization rate, and the USA is one of 3 countries that showed no shipments of shuttle looms in the last 10 years.

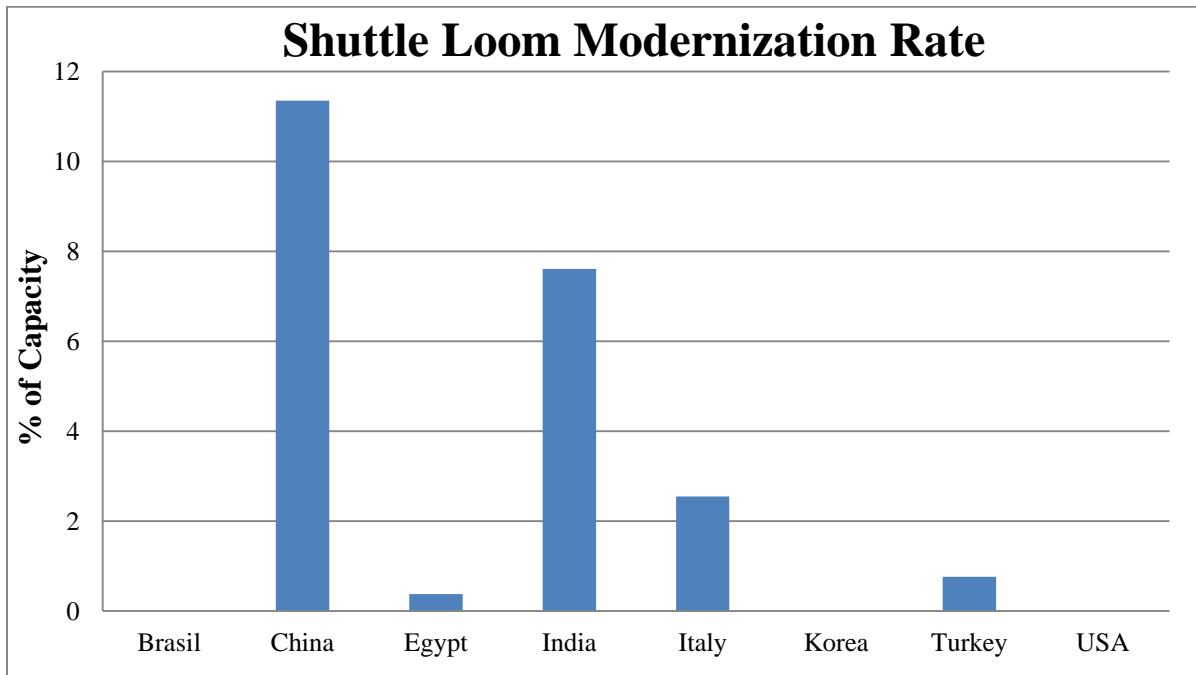


Figure 54 - Shuttle Loom Modernization Rate by Country

Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

5.3.3 Weaving Cost Trends

The total cost of weaving, including input cost (yarn), for each country is displayed in Figures 55 and 56. Figure 55 shows that for weaving with ring yarn, the USA has improved its global position with regard to cost-competitiveness. In 2003, it was the second most expensive country for weaving ring yarn, whereas it is the third-least expensive in 2010 (and only \$0.001 per meter more than Korea) after being surpassed by Turkey, China, and Brazil. This pattern is very similar to that of weaving with rotor yarn (Figure 56).

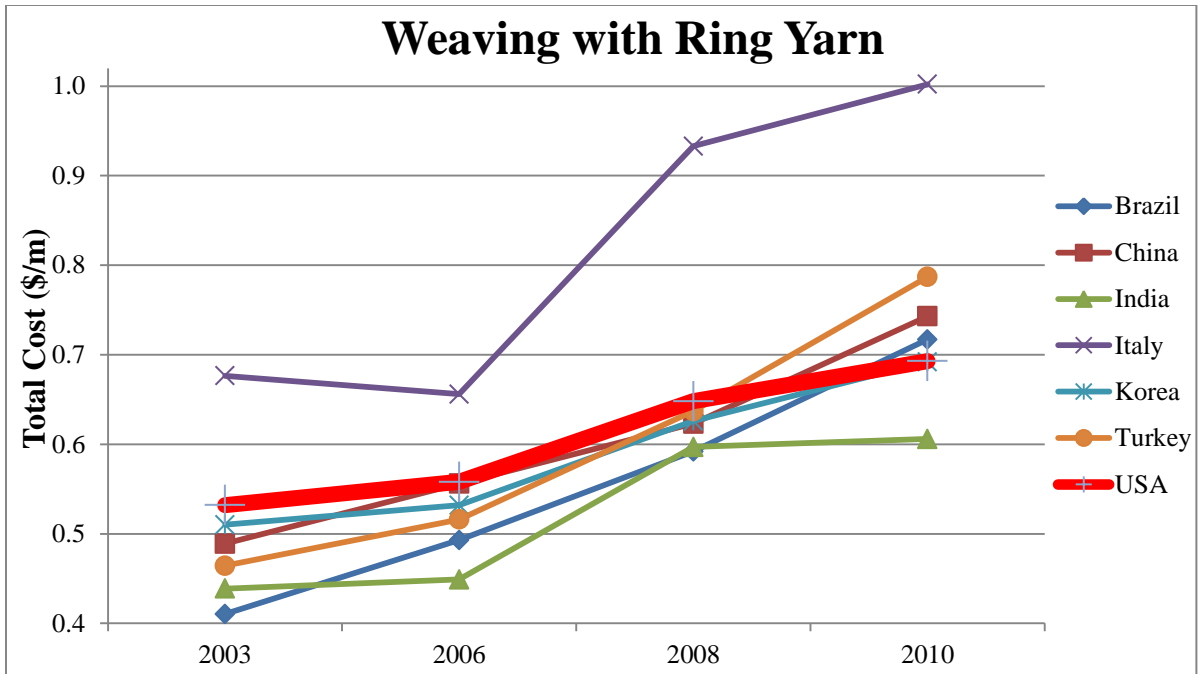


Figure 55 - Weaving with Ring Yarn Costs by Year

Source: Created by author. Data from ITMF International Production Cost Comparison (2003-2010)

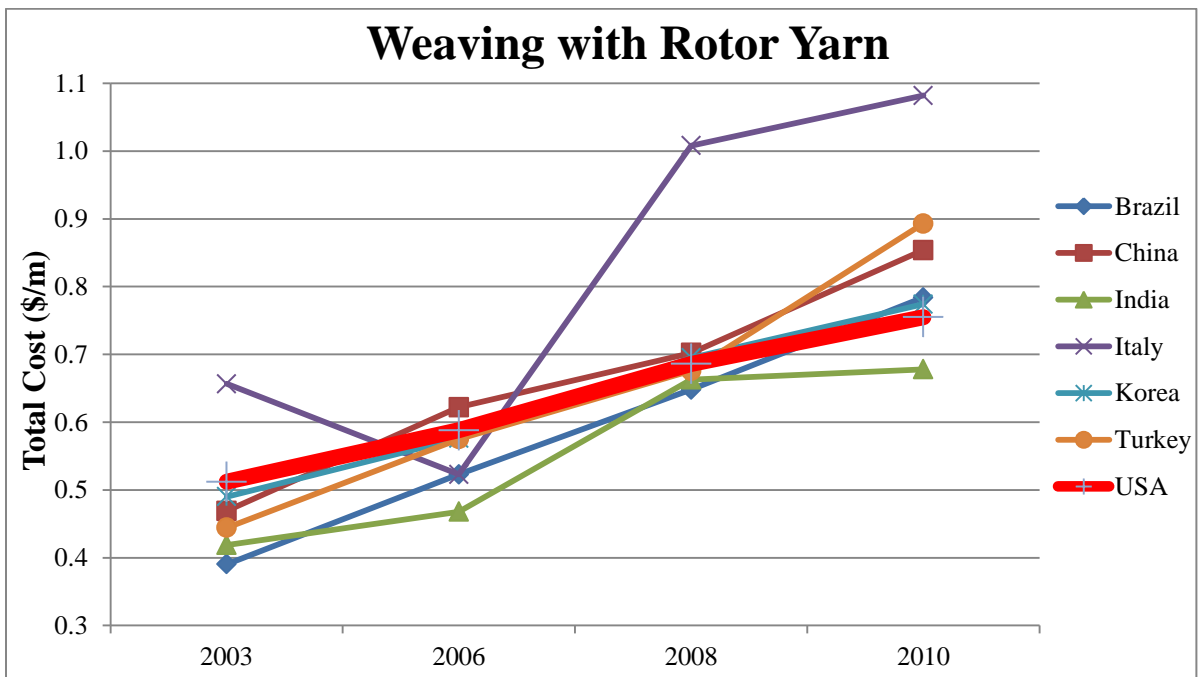


Figure 56 - Weaving with Rotor Yarn Costs by Year

Source: Created by author. Data from ITMF International Production Cost Comparison (2003-2010)

5.3.4 Yarn Price vs. Fiber Price

Before moving on to the analysis of the cost components of weaving, an analysis was first done on the relationship between yarn price and fiber price. This was necessary to show that a potential elevation in fiber price, as was discussed in the spinning section, would have a similar effect on the following textile process (weaving or knitting). Figures 57-59 show the historical prices of fibers and the yarns made from those fibers. All data for these figures was taken from the monthly *Yarn Market* section of *Textile World* magazine.

Figure 57 shows the prices of raw cotton fiber, 10/1 ring-spun yarn and 10/1 rotor spun yarn from 1990-2012. Figure 58 shows the prices of 1.5 denier polyester fiber and 8/1 ring-spun polyester yarn from 1984 - 2012. Figure 59 shows the prices of 3 denier acrylic fiber and 12/1 rotor-spun acrylic yarn from 1984 - 2012. In each instance, any increase in fiber price is reflected by a similar increase in yarn price.

Figure 60 compares the prices of the fibers found in the past 3 figures from 1990 - 2012. A relationship can be seen between the 3 fibers, as the market dictates that if the price for one goes up, the demand for others will increase, leading to the price of the other fibers also increasing.

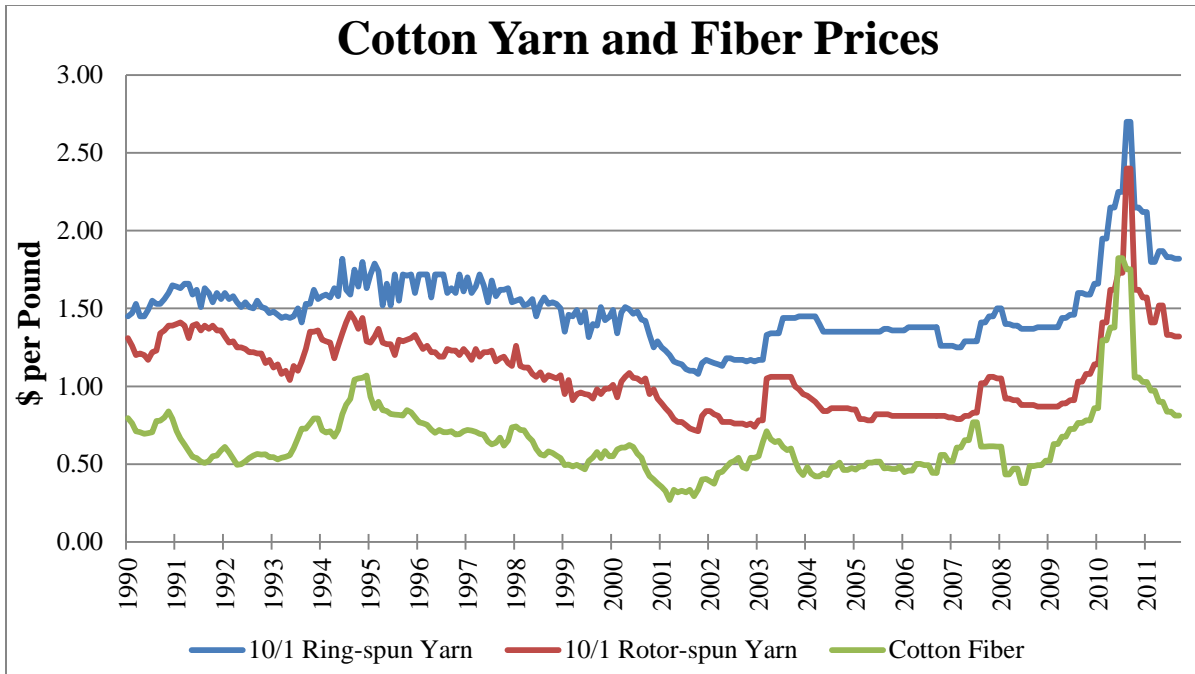


Figure 57 - Cotton Yarn and Fiber Prices by Year
 Source: Created by author. Data from Textile World, *Yarn Market (1990 - 2012)*

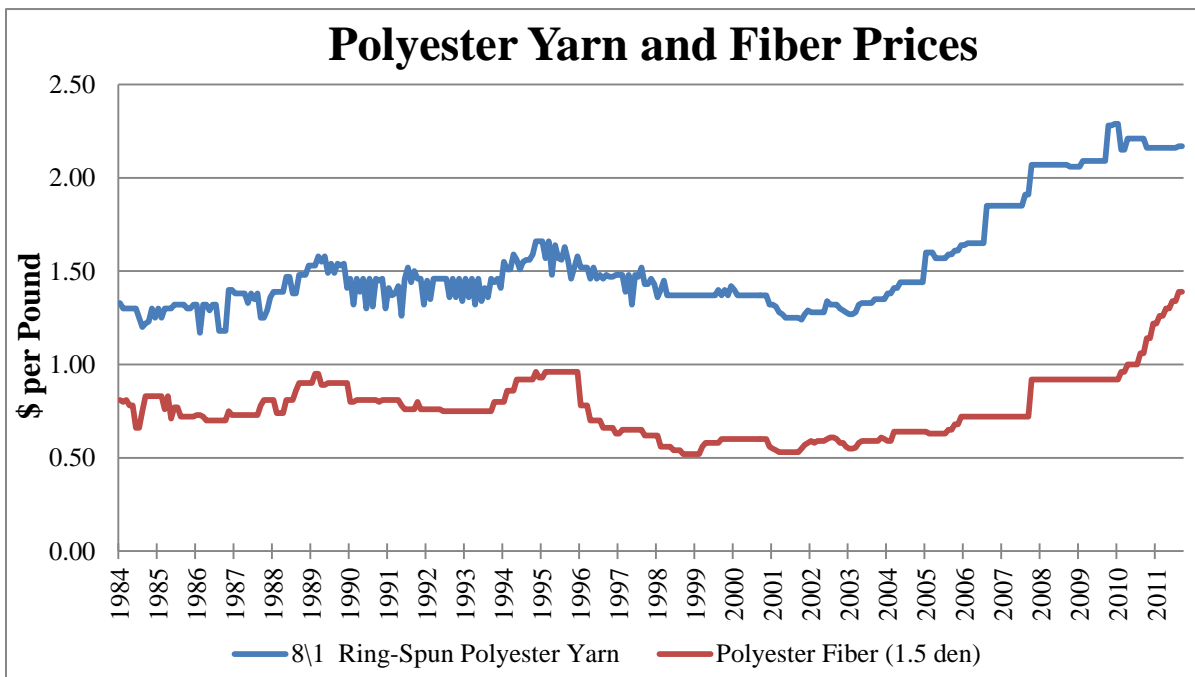


Figure 58 - Polyester Yarn and Fiber Prices by Year
 Source: Created by author. Data from Textile World, *Yarn Market (1984 - 2012)*

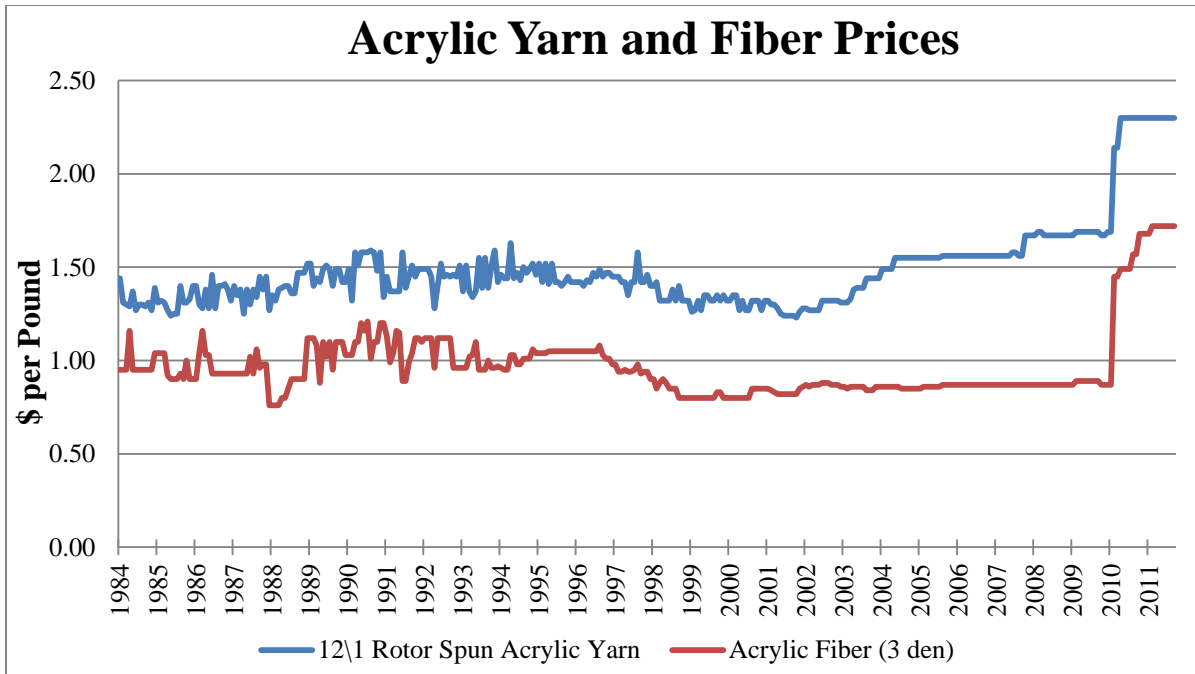


Figure 59 - Acrylic Yarn and Fiber Prices by Year
 Source: Created by author. Data from Textile World, *Yarn Market (1984 - 2012)*

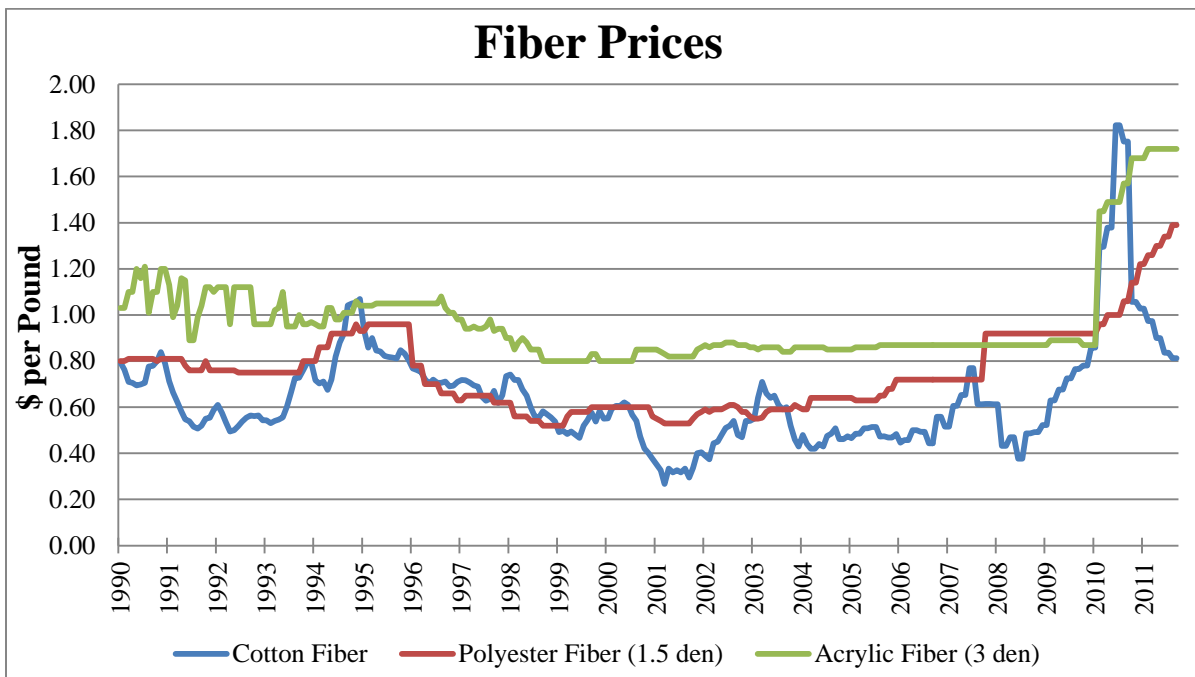


Figure 60 - Different Fiber Prices by Year
 Source: Created by author. Data from Textile World, *Yarn Market (1990 - 2012)*

5.3.5 Components of Weaving Cost

The components of weaving cost provided in the 2010 ITMF International Production Cost Comparison report are raw material, interest, depreciation, auxiliary material, power, labor, and waste. The costs of each of these components are given for both weaving with ring yarn and weaving with rotor yarn. These are discussed separately in the following sections. Please note that the “raw material” for weaving and knitting processes refers to the costs of purchasing yarn.

Weaving with Ring Yarn

The cost of weaving with ring yarn (Figure 61) is generally closer between countries than was the cost of spinning. Every country is between 60 and 80 cents per meter with the exception of Italy (higher) and India (lower).

Once raw material is doubled (Figure 62), there is a noticeable increase in the difference of price between the USA and China, Egypt, and Turkey, which are now all over 20 cents per meter higher than the USA. India remains less expensive than the USA, but by about the same amount as before raw material was doubled.

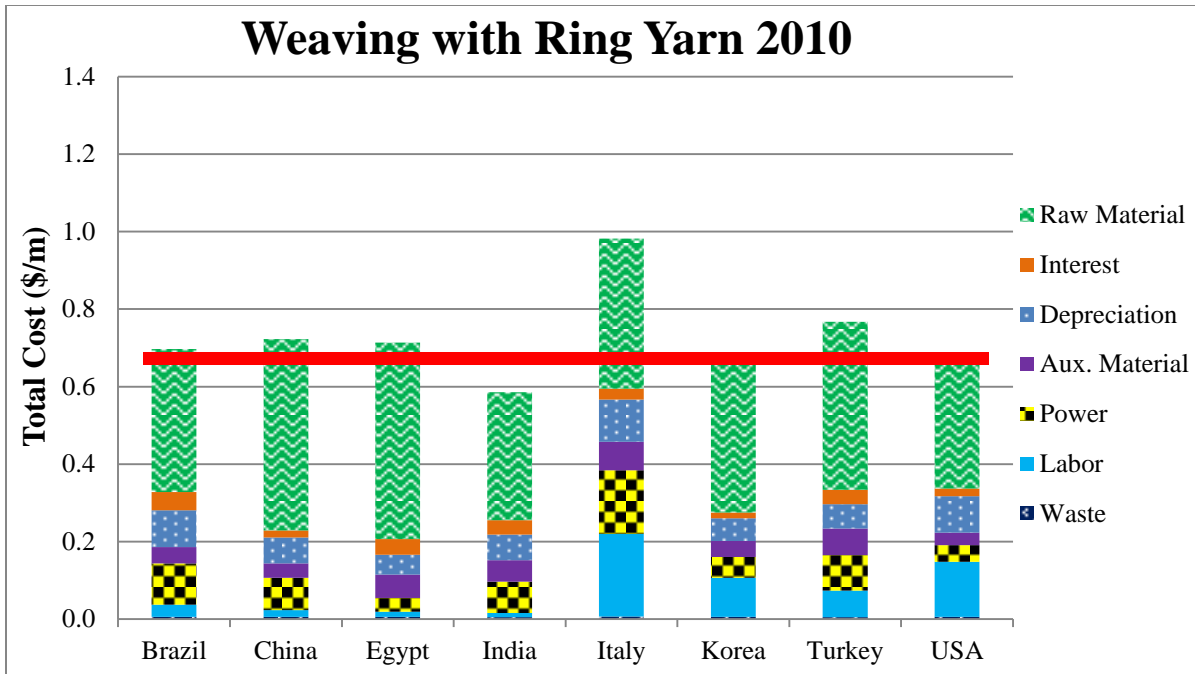


Figure 61 - Cost Components for Weaving with Ring Yarn
 Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

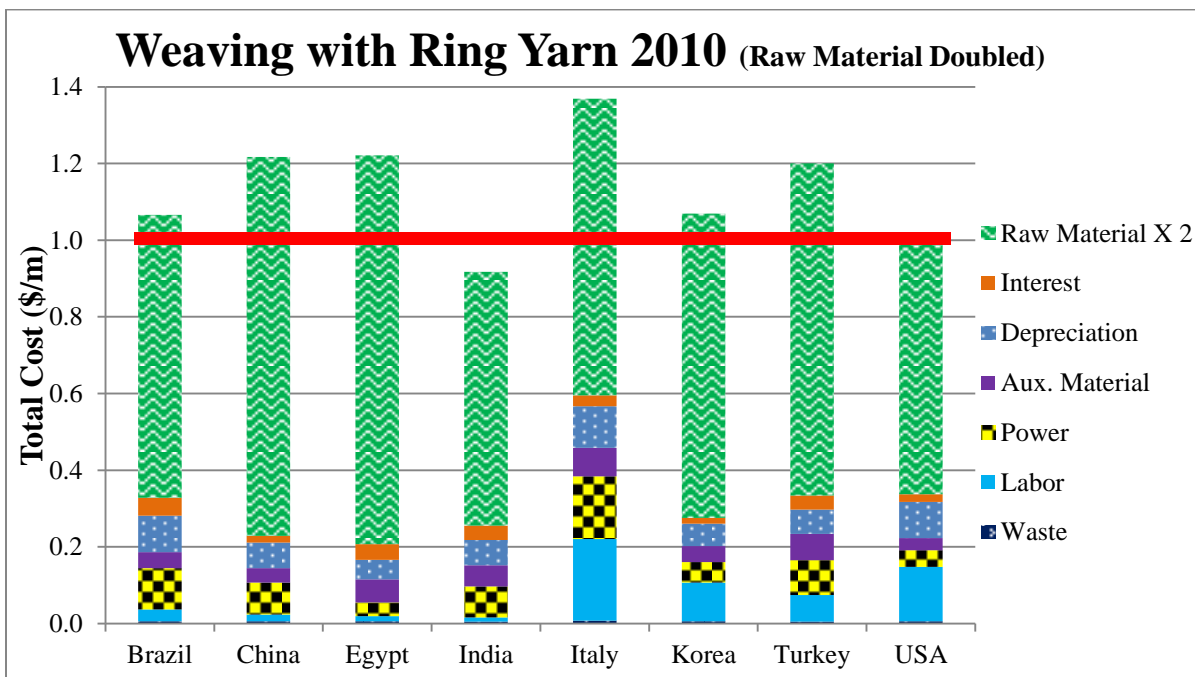


Figure 62 - Cost Components for Weaving with Ring Yarn (Raw Material Doubled)
 Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

When the cost of power is doubled for every country (Figure 63) the USA gains some advantage over China and other countries, including India, but nothing as significant as an increase in raw material cost.

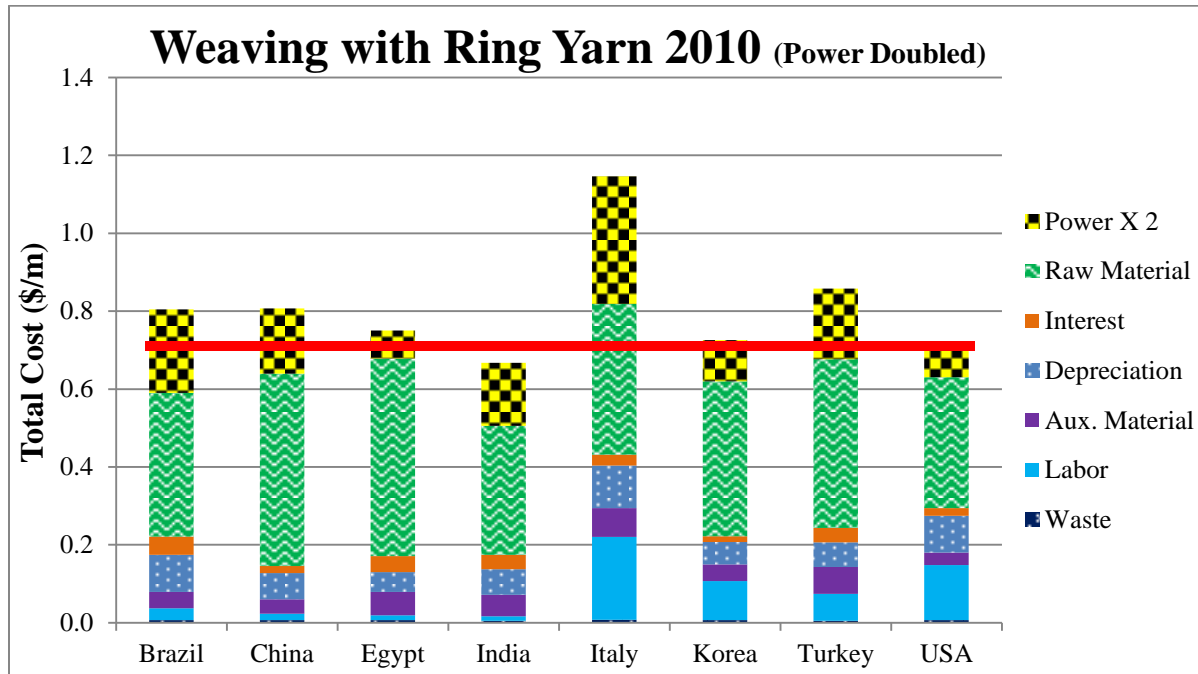


Figure 63 - Cost Components for Weaving with Ring Yarn (Power Doubled)
Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

Weaving with Rotor Yarn

One difference between the costs of weaving rotor yarn and weaving ring yarn is that raw materials represents a larger proportion of total rotor yarn weaving cost. This makes the total cost more sensitive to a significant increase in raw material cost.

This can be seen when comparing the Figures 64 and 65. The total cost for the USA goes from being about one cent per meter less expensive than China, Egypt, and Turkey (Figure 64) to over three cents per meter less expensive than those countries (Figure 65). Once again, the doubling of power cost (Figure 66) has a less significant impact on total price than the doubling of raw material cost.

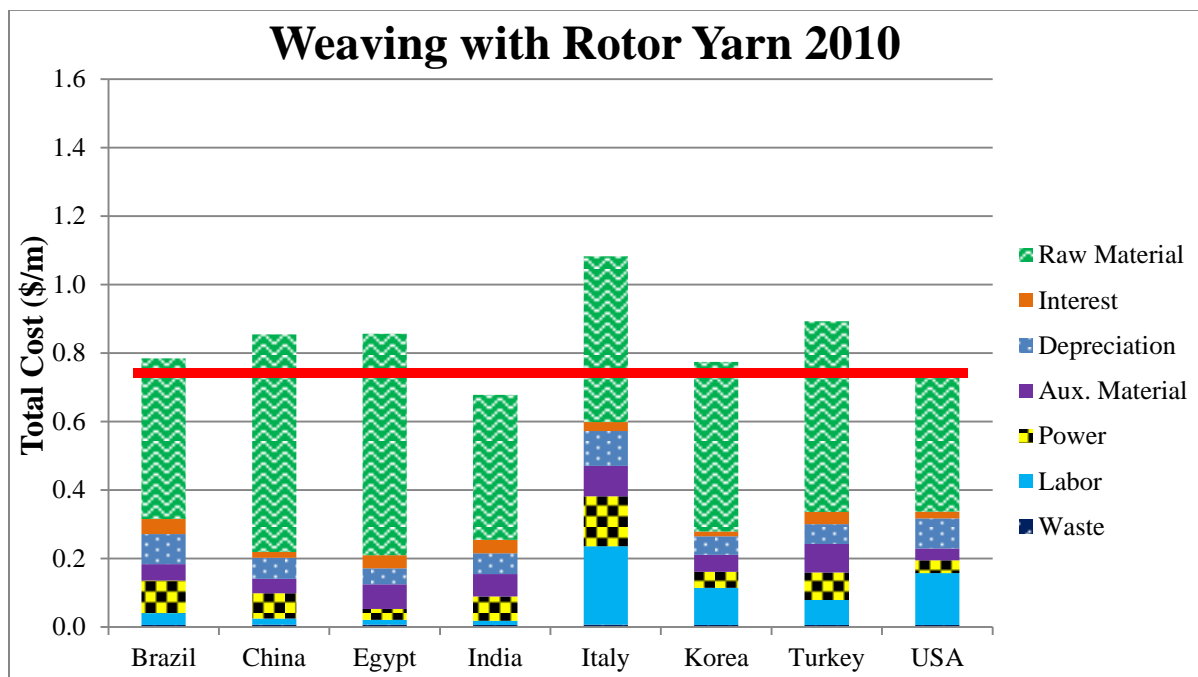


Figure 64 - Cost Components for Weaving with Rotor Yarn

Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

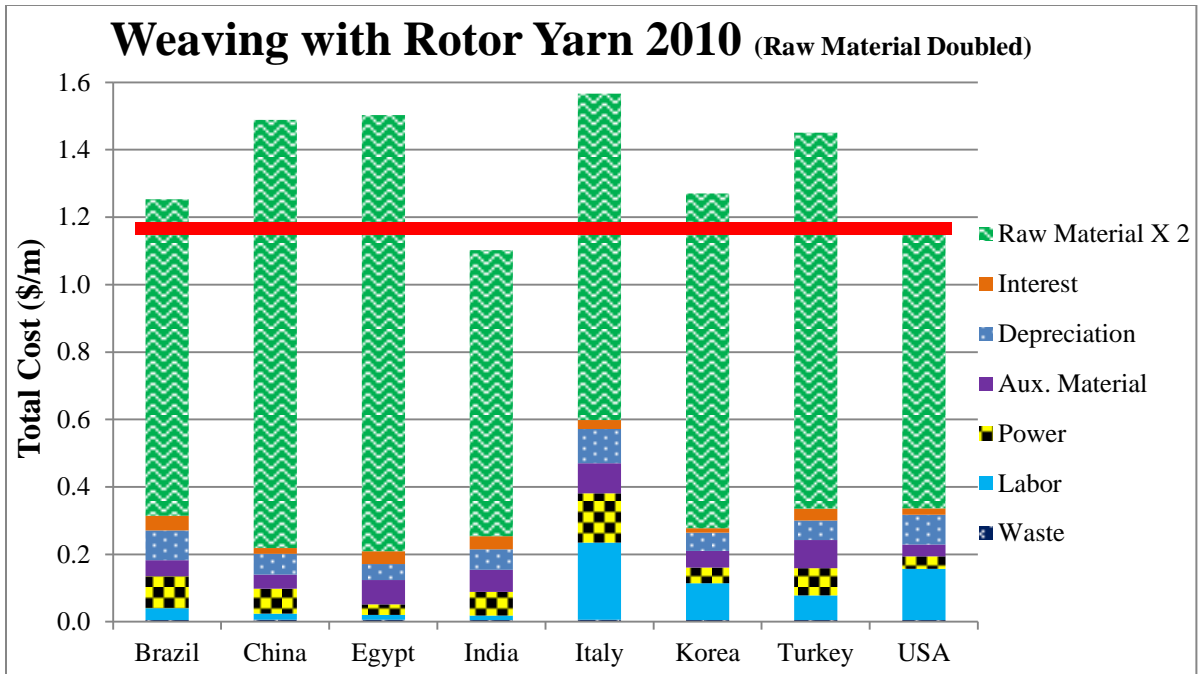


Figure 65 - Cost Components for Weaving with Rotor Yarn (Raw Material Doubled)
 Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

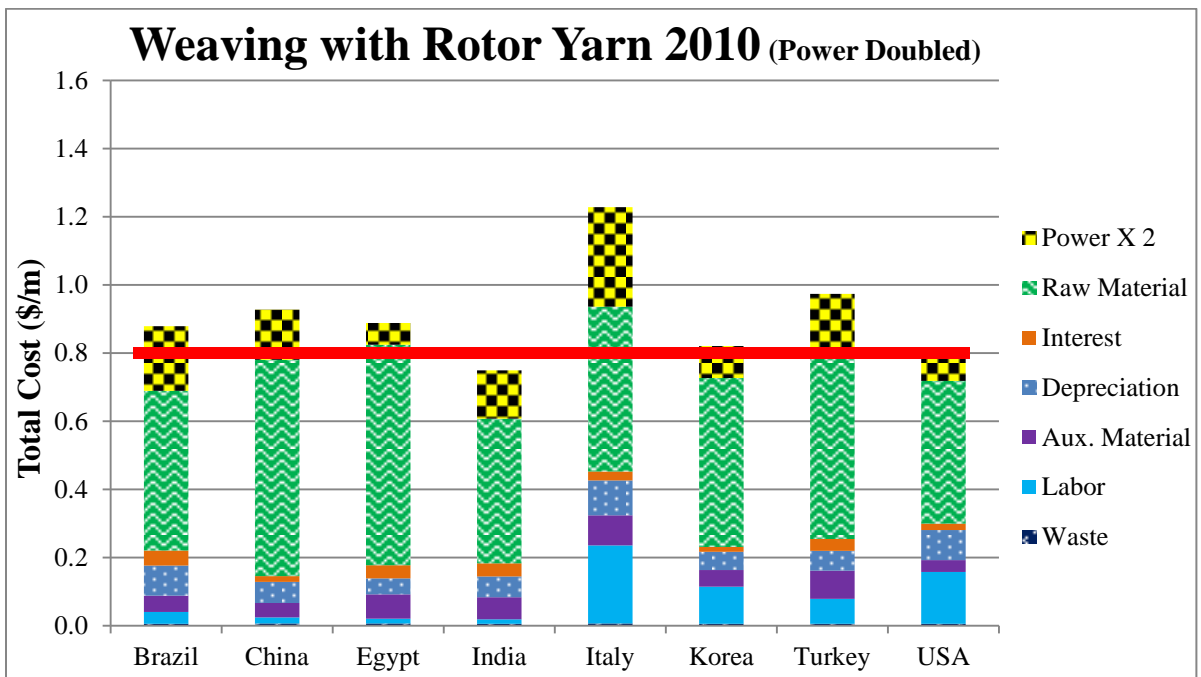


Figure 66 - Cost Components for Weaving with Rotor Yarn (Power Doubled)
 Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

5.4 Results Pertaining to Knitting

5.4.1 Knitting Machinery Cumulative Shipments

The ITMF International Textile Machinery Shipment Statistics reports did not include knitting capacity for each country. So, using the available data, Figures 67 and 68 will instead show the cumulative shipments from 2000 to 2010 for flatbed knitting machines and for large circular knitting machines. Figure 67 exhibits that China accumulated over 88 thousand flatbed knitting machines during that time period. No other country accumulated more than 13 thousand such machines during the same period. Figure 68 shows an even more extreme accumulation of large circular knitting machines by China, with over 130 thousand cumulative shipments between 2000 and 2010. No other country exceeded 20 thousand over that time frame.

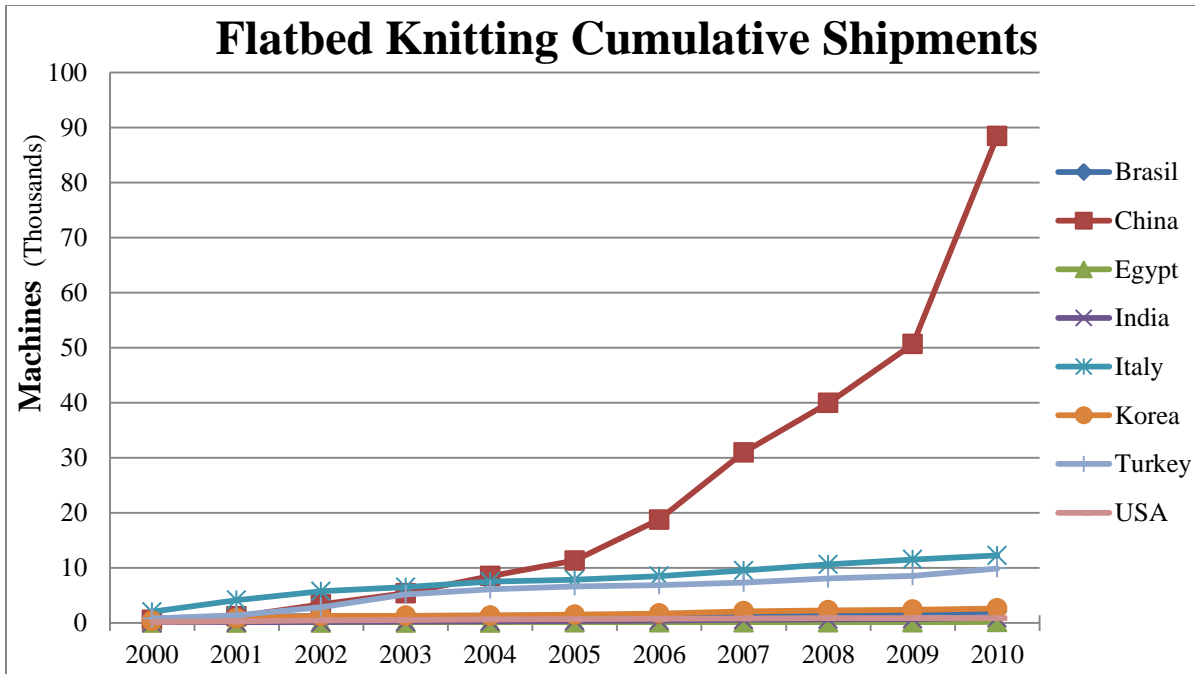


Figure 67 - Cumulative Shipments of Flatbed Knitting Machines
 Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

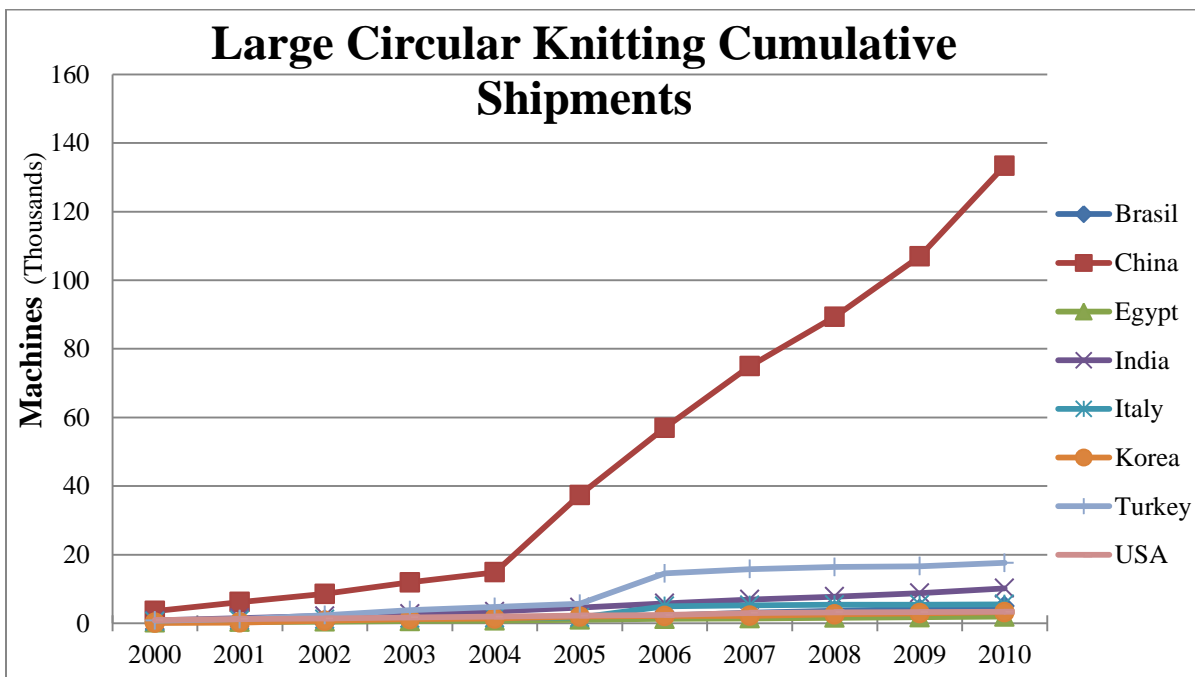


Figure 68 - Cumulative Shipments of Large Circular Knitting Machines
 Source: Created by author. Data from ITMF International Textile Machinery Shipment Statistics (1991-2010)

5.4.2 Knitting Cost Trends

Figures 69 and 70 show the trends of knitting cost in each of the countries from 2003 to 2010. Once again, the USA is shown in a bold red line to emphasize its place among competition. Both figures show the USA lowering from third-least expensive to second-least expensive over this time frame and China rising from third-most expensive to second-most expensive over this time frame and China rising from third-most expensive to second-most expensive.

Note that for the cost of knitting with ring yarn (Figure 69), the steep decline for all countries between 2003 and 2006 is caused by an adjustment to how the costs were calculated by the ITMF. Specifically, a different base knit fabric was used for the calculations.

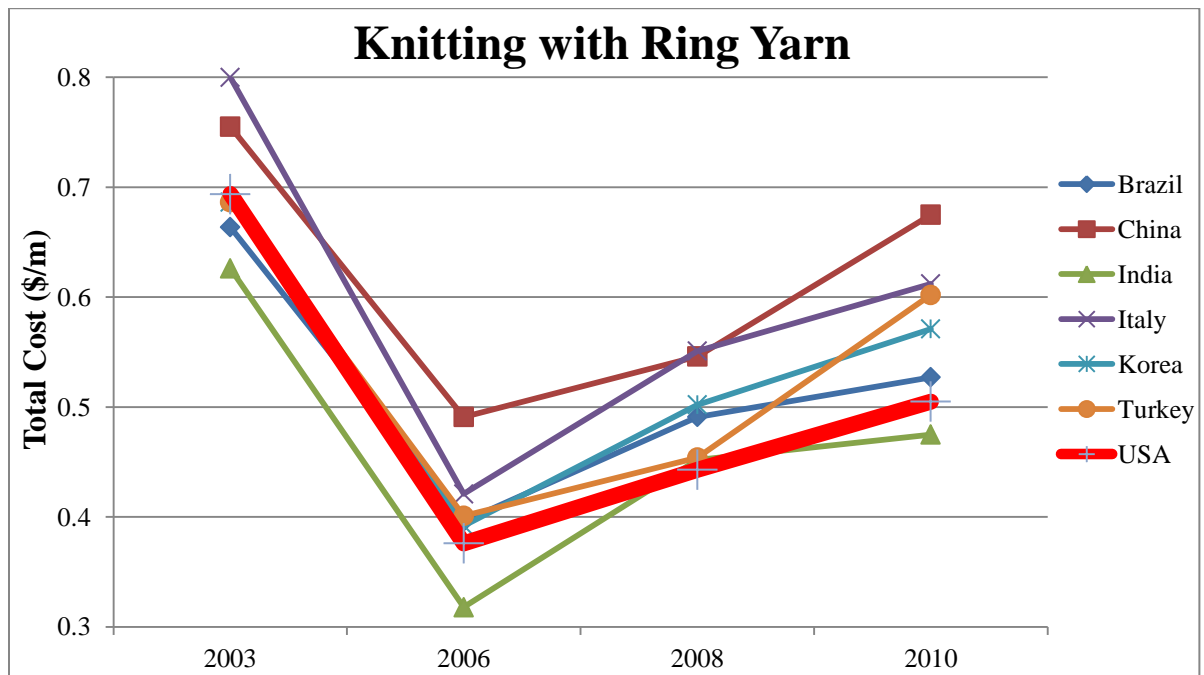


Figure 69 - Knitting with Ring Yarn Costs by Year

Source: Created by author. Data from ITMF International Production Cost Comparison (2003-2010)

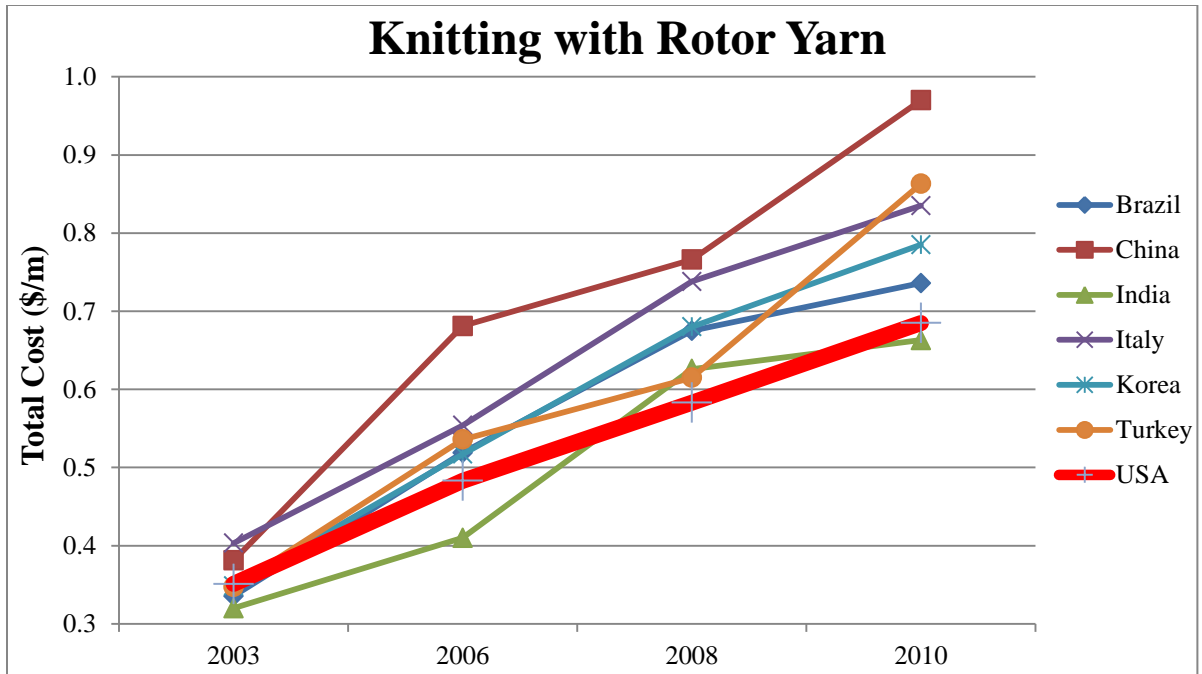


Figure 70 - Knitting with Rotor Yarn Costs by Year

Source: Created by author. Data from ITMF International Production Cost Comparison (2003-2010)

5.4.3 Components of Knitting Cost

It can immediately be recognized that, according to the surveys of the ITMF, raw material costs are more significant to knitting than for spinning or weaving. The individual cost components available for each country for knitting in the 2010 ITMF International Production Cost Comparison report are raw material, interest, depreciation, auxiliary material, power and labor.

Knitting with Ring Yarn

Figures 71 and 72 show the clear advantage gained by the USA vs. the majority of its competitors in the face of a large increase in yarn cost. Figure 73 shows the impact of doubling power costs are less pronounced for knitting because power is a much smaller cost driver for knitting than it is for spinning or weaving.

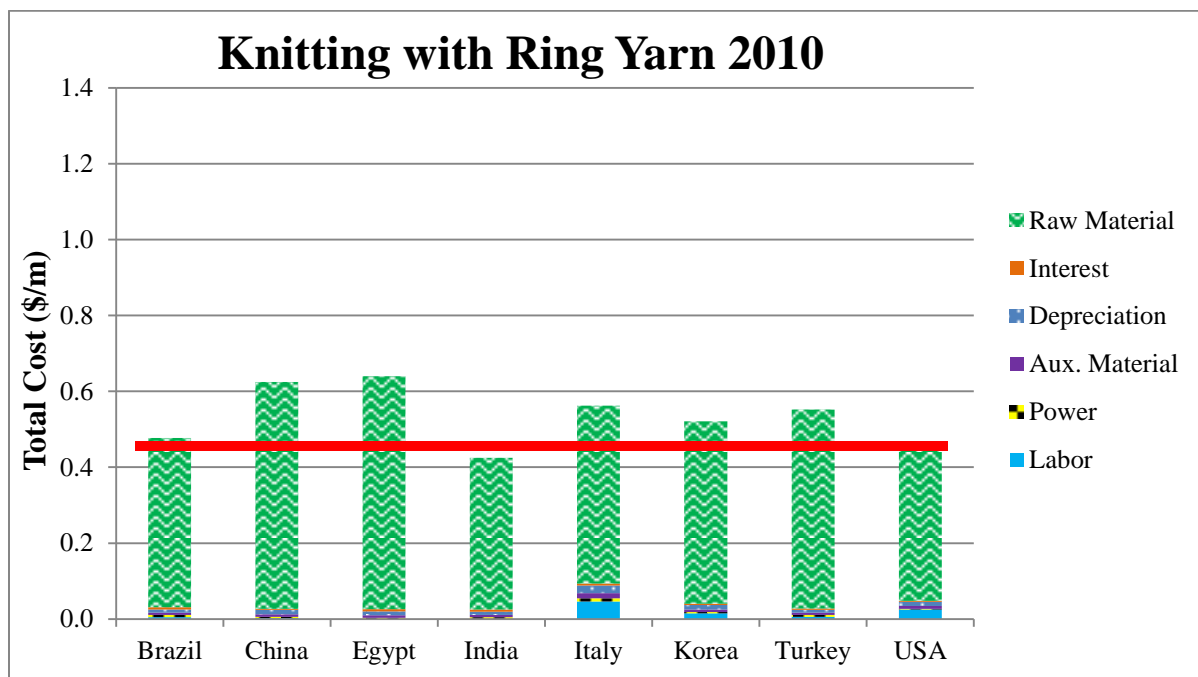


Figure 71 - Cost Components for Knitting with Ring Yarn

Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

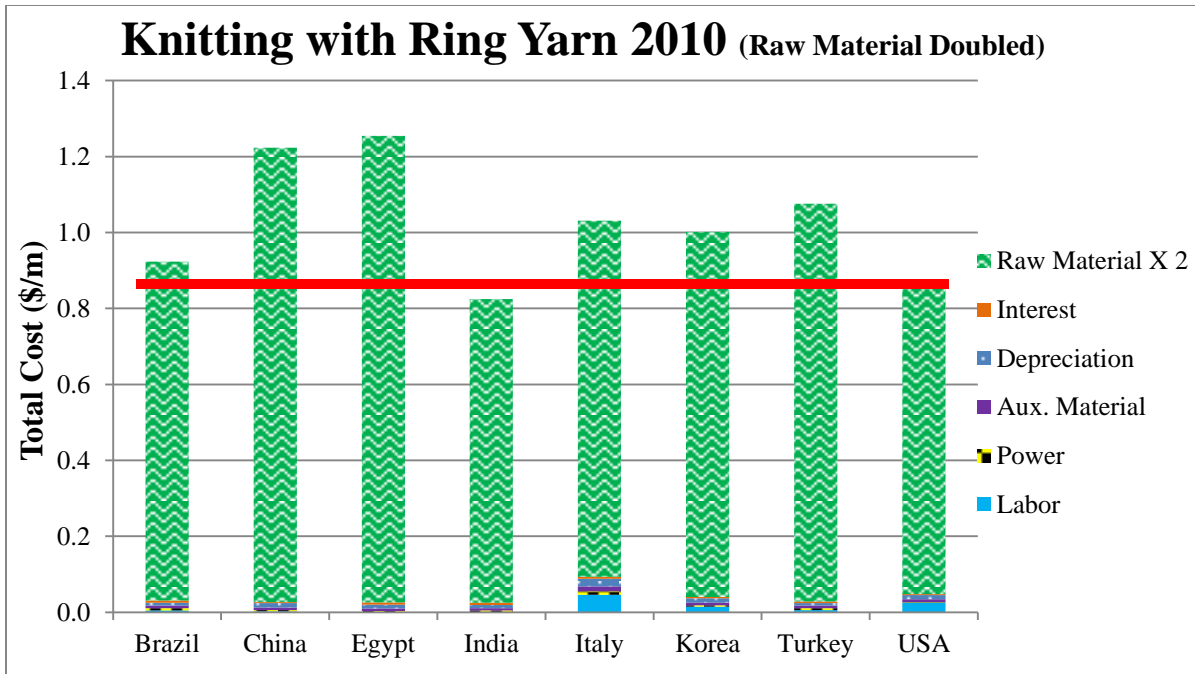


Figure 72 - Cost Components for Knitting with Ring Yarn (Raw Material Doubled)
 Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

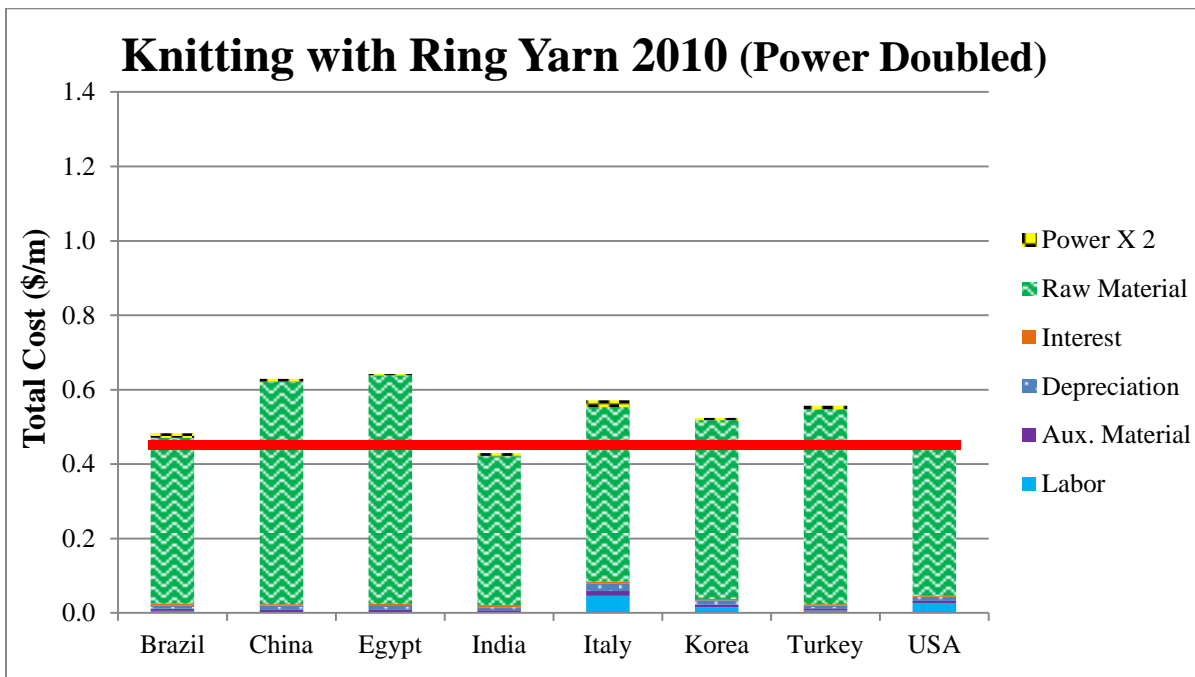


Figure 73 - Cost Components for Knitting with Ring Yarn (Power Doubled)
 Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

Knitting with Rotor Yarn

Figures 74-76 exhibit the cost components for knitting with rotor yarn and what happens to total cost when either raw material cost (Figure 75) or power cost (Figure 76) is doubled. The same patterns are found here as have been seen previously in this chapter, with the raw material increase having a major impact on the global cost competitiveness of the USA and the power increase having a minor impact. The raw material increase is particularly affective with knitting because it represents such a high portion of the total amount of cost for the knitting process.

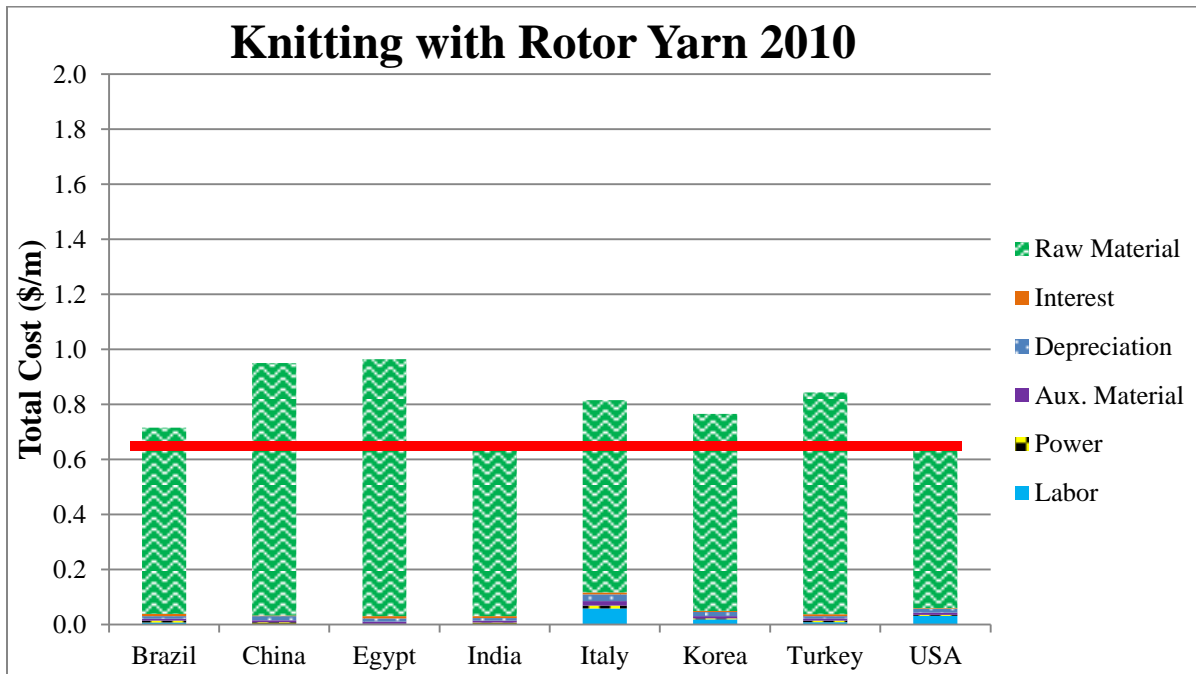


Figure 74 - Cost Components for Knitting with Rotor Yarn

Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

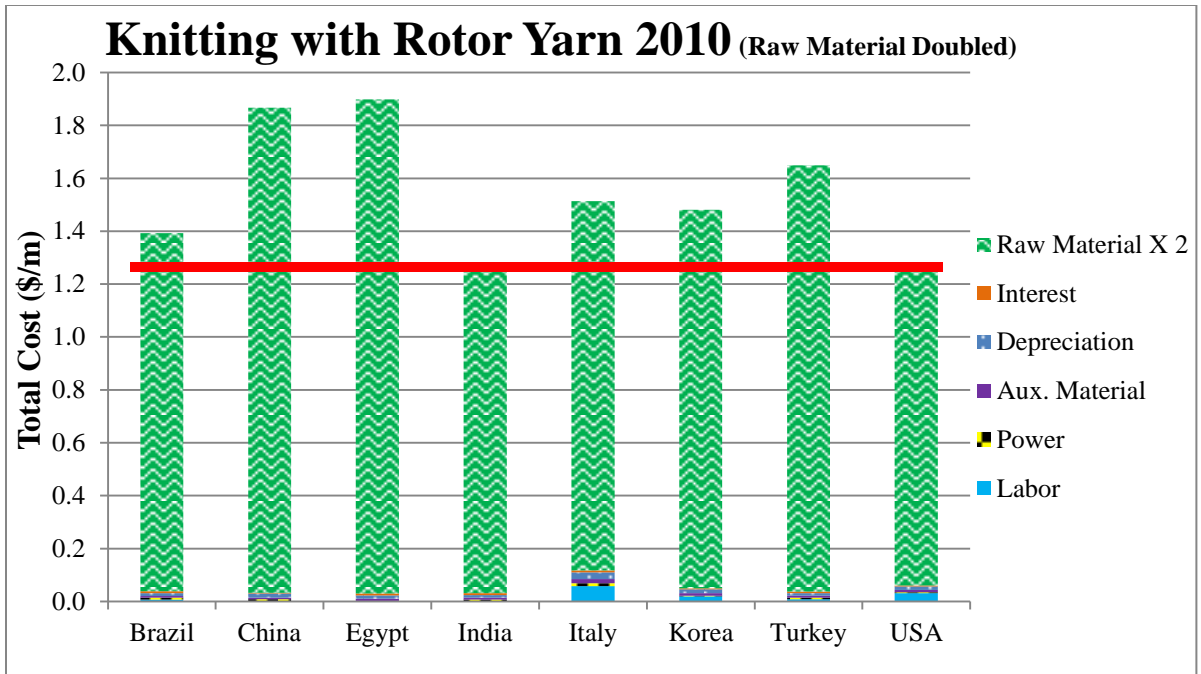


Figure 75 - Cost Components for Knitting with Rotor Yarn (Raw Material Doubled)
 Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

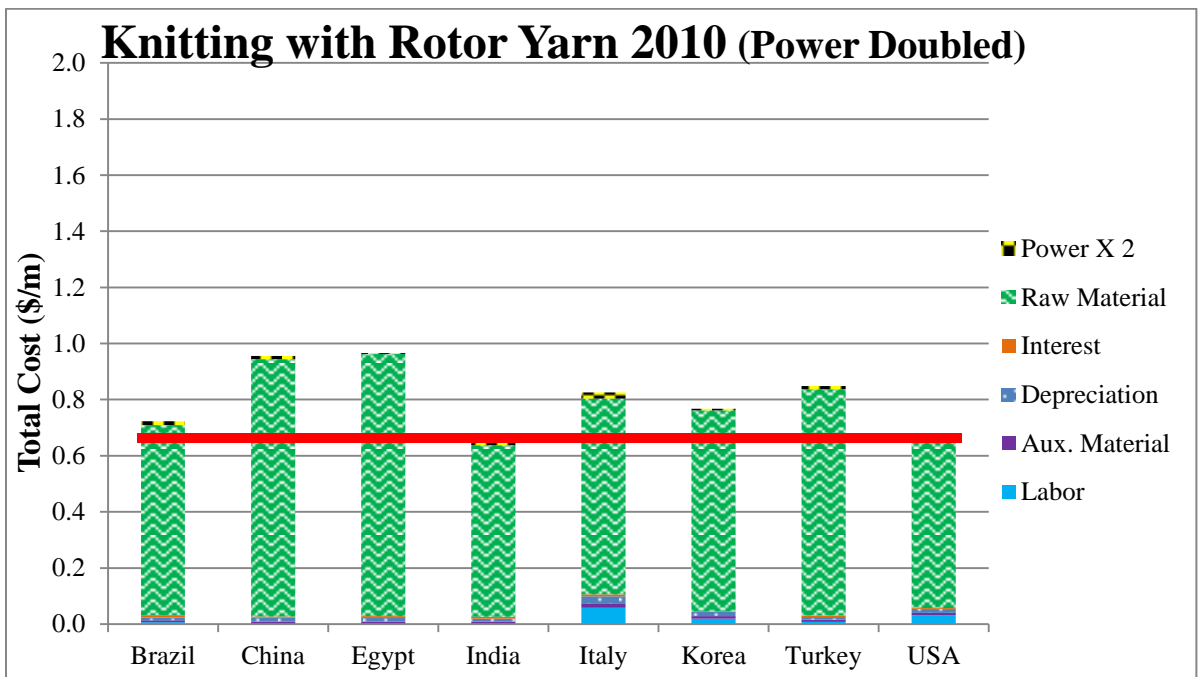


Figure 76 - Cost Components for Knitting with Rotor Yarn (Power Doubled)
 Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

5.5 Key Findings

This chapter took a systematic approach to using secondary data sources to identify the USA's place in global textile competition. This included analyzing the country's capacity for different spinning, weaving, and knitting processes and also the costs associating with performing these processes. Additionally, projections were made with regard to potential steep increases in raw material and power costs across all countries. The increase in raw material cost has precedence from the elevation in cotton price in 2010-11, and power costs will remain unpredictable going forward for a variety of reasons. However, the scenarios suggested in this research introduce members of the industry to important 'what-if' scenarios that can be considered for global strategy.

The machine capacity tables in this chapter showed which categories have been seized by China as WTO safeguards were lowered and eventually dropped altogether. These were rotor spinning, short-staple ring spinning, shuttle-less loom weaving, flatbed knitting, and large circular knitting. Meanwhile, the global capacity for other processes, such as long-staple ring spinning, shuttle-loom weaving, and wool weaving stayed more consistent over the 20 year period that this research included.

Looking at the total cost trends from 2003 to 2010, all areas researched showed similar trends, especially with regard to China and the USA, with the costs in China rising to the top or near the top and the costs in the USA becoming one of the least expensive by 2010.

The cost components for each of the process reacted similarly to the respective doubling of raw material cost and energy cost. The processes in which these costs represented a higher percentage of total cost showed the greatest impact. Table 24 shows the percentage of total cost represented by both raw material and power for each of the processes discussed in this chapter for both China and the USA. This percentage gives an idea of the impact an increase in one of these components would cause. An increase in either area would be a positive for the USA vs. China in terms of overall cost competitiveness because these components are generally less expensive in the USA.

Table 24 - % of Total Cost of Material and Power for Textile Processes (China & USA)

Source: Created by author. Data from ITMF International Production Cost Comparison (2010)

	<u>China</u>	<u>USA</u>
Ring Spinning		
Material	62.9%	51.3%
Power	11.6%	5.0%
Rotor Spinning		
Material	79.0%	72.2%
Power	6.3%	3.1%
Weaving with Ring Yarn		
Material	68.3%	49.9%
Power	11.6%	6.4%
Weaving with Rotor Yarn		
Material	74.4%	55.5%
Power	8.7%	4.9%
Knitting with Ring yarn		
Material	95.7%	89.5%
Power	0.6%	0.4%
Knitting with Rotor Yarn		
Material	96.5%	91.0%
Power	0.6%	0.5%

This chapter is strictly about the costs of these textile processes, and the results only include countries for which this data was available to the researcher. The findings do show that the USA is more cost-competitive than many realize. Labor cost, despite being significant for the USA, does not tend to be a large cost driver for these textile processes. The results of this chapter generally agree with the interview results in Chapter 4 and the results of both chapters will contribute to the final conclusions and recommendations of this study.

Chapter 6 - Conclusions

The textile industry has long been a part of the identity of the United States. Throughout the years, members of the industry have been challenged to keep up with constant changes in technology and the marketplace. Since the 1990s, the greatest challenge facing the industry has been global competition. A great disparity in the costs of production, particularly labor costs, has allowed countries such as China to increasingly gain global market share in textile products.

For the textile processes requiring the highest amount of manual labor, such as cutting and sewing, it is difficult to overcome this cost disparity. However, for other textile processes, advances in machine efficiency and automation take much of this advantage away. Additionally, members of the US textile industry enjoy globally favorable energy and raw material costs. These and other factors have allowed a number of US spinning, weaving, and knitting companies to continue to succeed even in this more competitive global environment.

One positive sign for the future of the US textile industry is if foreign companies begin opening operations in the USA. And in fact, at the conclusion of this research, Santana Textiles, a large Brazilian denim manufacturer, announced that they will be opening a facility in Texas for spinning, dyeing, and weaving (Specialty Fabrics Review, 2012).

The purpose of this research was to determine the short-term and long-term opportunities available to the US textile manufacturing industry. It focused on three textile processes: spinning, weaving, and knitting. The specific research questions were converted

into three actionable research objectives. The specific actions taken to achieve these objectives were described in Chapter 3 and the results of these actions were detailed in Chapters 4 and 5. This chapter will briefly summarize the findings for each objective, update the visualization of the results conceived in Chapter 3, and make some recommendations.

6.1 Summary of Results by Research Objective

6.1.1 Research Objective 1

- *Determine opportunities for cost-competitiveness for US spinners, weavers, and knitters*

This research objective was addressed with an analysis of secondary resources. The results were detailed in Chapter 5. It was determined that US spinners, weavers, and knitters have become increasingly cost-competitive with China and other countries over the past 10 years. As Chinese companies have taken on more spinning, weaving, and knitting capacity, their costs of production for these processes has been rising. In fact, according to the most recent survey analyzed, the cost of production was higher in China than it was in the USA for each relevant process.

It was determined that the USA has a distinct advantage over China in two of the bigger production cost drivers, raw materials and energy. This makes China more susceptible to sudden cost increases in either component. Secondary survey data was manipulated to stage ‘what-if’ scenarios in which the costs of materials or energy were doubled for each country. The USA gained competitively from such manipulations.

6.1.2 Research Objective 2

- *Determine the inherent advantages and disadvantages of spinning, knitting, and weaving in the USA*

This objective was addressed through primary data collection. A questionnaire was created and administered to US spinners, weavers, and knitters to gain insights and attitudes from members of the US textile industry. Key advantages identified included proximity to a major market (shorter lead times), greater market knowledge than foreign competitors, enhanced relationships with customers, access to a skilled workforce, and low energy costs. Key disadvantages identified were higher labor costs and strict regulations.

Also contributing to inherent advantages and disadvantages were government policies or regulations. Key helpful government policies or regulations were the Berry Amendment and DR-CAFTA. However, many interview subjects simply stated that there are no helpful policies or regulations when compared to the governments of foreign competitors. Key harmful government policies or regulations were identified as trade agreements being unfair to the US textile industry, free trade agreements being difficult to enforce, excessive regulations, and high health care costs.

6.1.3 Research Objective 3

- *Determine strategies, concerns, and predictions for US spinners, weavers, and knitters regarding relevant industry issues*

This objective was also researched using the questionnaire given to members of the US textile industry. Strategies being used by over 50% of the interview subjects were high quality, speed-to-market, niche marketing, customization, and “Made in the USA.” Concerns

about foreign competition were that there are more overseas rivals than ever before. Key technology factors were faster machinery, more flexible machinery, and innovations in both materials and finishes.

Key managerial factors going forward were identified as marketing into niches, recruiting new textile employees, global supply chain management, and developing a new management mentality. Almost every industry member predicted survival of their company on the basis that they have already survived challenging times. Most interview subjects also expressed optimism for the textile industry, not to go back to exactly how things were in the past, but for companies being able to adjust to the changing marketplace and succeed through creating new niches and being able to consistently adjust strategies to changing conditions.

6.2 Visualization of Results

Before the interview questionnaire was administered and before primary and secondary data was analyzed, a visualization was proposed that could be altered to accommodate research results. In the end, the basic structure of the visualization was changed to better capture the results of this research in regards to potential opportunities in spinning, weaving, and knitting. In the proposed visualization, as presented in Chapter 3, the assumption was that there was a gap between the opportunities available to US textile manufacturers and the actualization of these opportunities.

After confronting each of the research objectives, it was determined that most available opportunities are generally filled. Because of this, the more important dynamic was identified as being between current and potential opportunities. This dynamic is illustrated in

Figure 77. The larger opportunity circle represents current textile opportunities. The entire circle will grow when the industry gains generic advantages, such as a reduction in the cost gap with China. The smaller circles represent the opportunities for smaller niches to be created and grown. These can grow independently even if the larger circle stagnates.

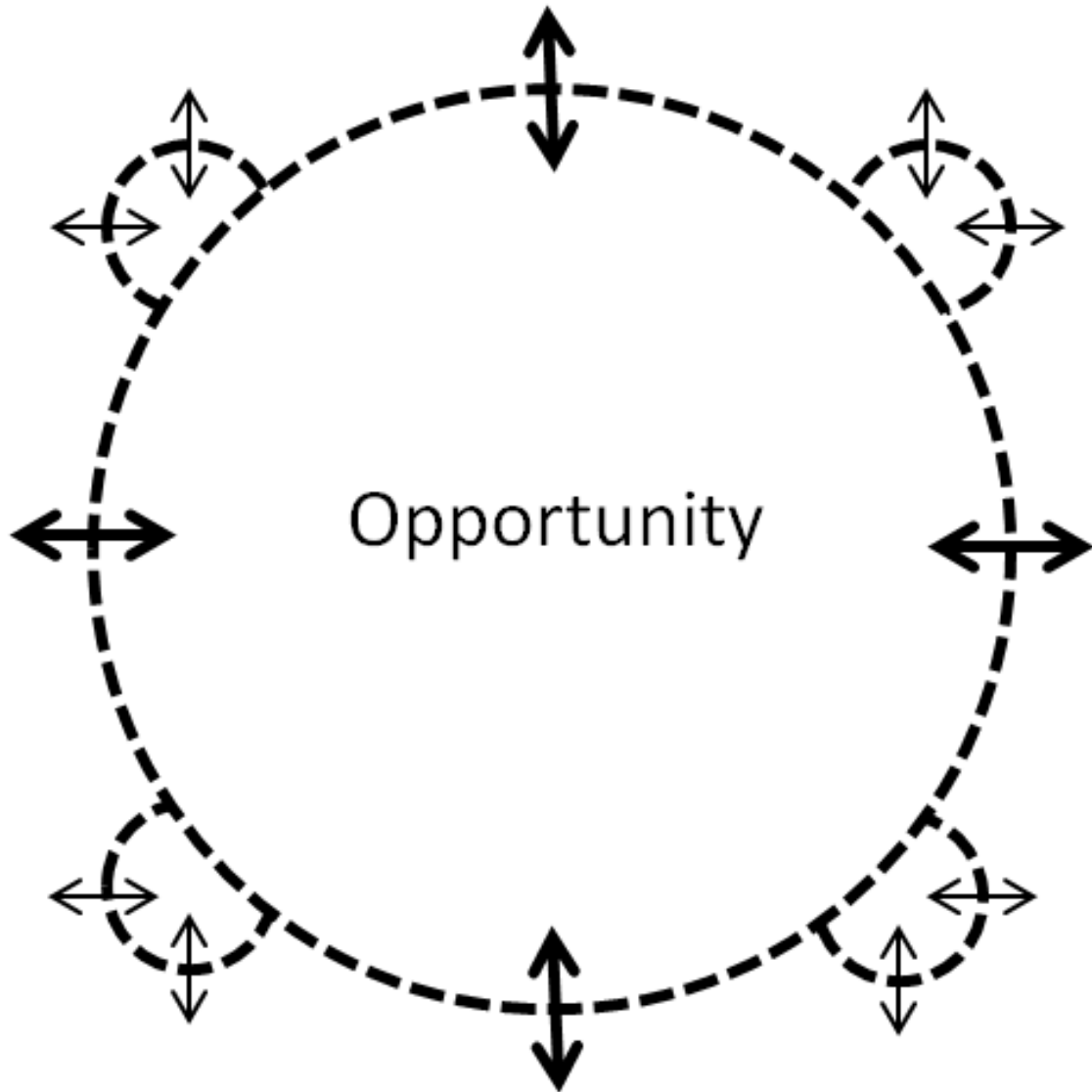


Figure 77 - Final Visualization of US Textile Opportunities
Source: Created by author.

The big picture to take away from this research is that the US textile industry is in a position to grow. Short-term opportunities exist for those companies that concentrate on serving niches and staying within what they do best. The US textile companies that exist today have survived through tough times for the industry because they were able to make these adjustments.

Long-term opportunities should be even broader, with global price trends favoring the USA for spinning, weaving, and knitting. A growth in the US textile industry would mean that more jobs would be available and more students would likely train to enter the industry. This will lead to a stronger industry down the line.

6.3 Recommendations

The results of this research can be interpreted into recommendations for members of the industry, researchers, and even young students. For members of the industry, one recommendation is to continue to look for opportunities to be cost-competitive. Rising costs in Asia are making US manufacturers more and more appealing to US customers. As the savings that these customers have been getting from sourcing overseas dwindle, the appeal of more proximal suppliers increases, especially when the additional advantages identified in Chapter 4 are considered. The other recommendation for industry members is to actively change and adapt. This includes finding new markets and breaking tradition to better suit the current environment.

For researchers, this study exposed a number of areas for additional study. The results of the questionnaire could possibly be used to create a larger survey, perhaps with a sample size large enough to make significant statistical conclusions. The dynamics of energy prices could also be tracked more closely, and forecasts could be incorporated into cost models. Researchers could also look for more and updated sources of textile production costs. Also, with the constant changes in the global textile enterprise, including newer trade agreements and innovations, even this same study could yield different results in the future.

For young students, the important take-away from this research is how many US textile industry members pined for qualified young textile employees, particularly with basic knowledge of textile machinery operations.

This research has the potential to impact each of these groups. While this research has been exploratory and results were anecdotal, if it can raise some eyebrows and get some people to rethink assumptions, perhaps it can contribute to the future success of US textiles.

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Appendix

Appendix 1

Interview Guides

Research Objective 2

1. What is your position at your company?
2. How long have you been with this company? In this industry?
3. What is your company's background info? (Size, location, history, etc.)
4. What textile operations are performed by your company?
5. What is your company's market share?
6. Who are your major competitors? (Location, size, ownership)
7. How much of your company's manufacturing takes place in the USA?
8. How has this proportion changed over the company's history?
9. Where are your customers located?
10. Where are your suppliers located?
11. What are the competitive advantages of domestic manufacturing in your market?
12. What are the competitive disadvantages of domestic manufacturing in your market?

Research Objective 3

Company Specific Questions

1. How has your competitive environment changed in the last 5 years?
2. What changes do you expect in your competitive environment over the next 5 years?
10 years?
3. What government policies or regulations are helpful to your company?
4. What government policies or regulations are detrimental to your company?
5. What future government policies could impact your company?
6. Which of the following competitive strategies apply to your company:
 - low cost
 - high quality
 - high automation
 - niche marketing
 - customization
 - Made in the USA

- speed-to-market
 - high technology
 - local/green/sustainable
7. Do you think this strategy will be effective 5 years from now, 10 years from now?
 8. Which of the other strategies might be effective/ ineffective in the future?
 9. What do you think are the key technology factors in the future of your market?
 10. What do you think are the key managerial factors in the future of your market?
 11. Are you optimistic about your company's future (5 years, 10 years)?

General Industry Questions

12. Please rate the following segments of the textile industry in terms of viability for domestic production over the next 5 years, 10 years.
 - Spinning
 - Weaving
 - Dyeing/finishing
 - Knitting
 - Non-wovens
 - Cut and sew
13. Are you optimistic about the US textile industry in general in the future (5 years, 10 years)?
14. How would you assess the gap between opportunities and actualizations in your industry?
15. Do you expect this gap will grow/shrink in the next 5 years? 10 years?
16. What do you think are the key technology factors in the future of the US textile manufacturing industry
17. What do you think are the key managerial factors in the future of the US textile manufacturing industry?

Research Objective 3 (for experts other than spinners, weavers, or knitters)

1. What is your position in the textile industry?
2. How long have you had this position? In this industry?
3. How has the competitive environment in the US textile industry changed in the last 5 years?

4. What changes do you expect in the competitive environment over the next 5 years, 10 years?
5. What government policies or regulations are helpful to spinners, weavers, knitters?
6. What government policies or regulations are detrimental to spinners, weavers, knitters?
7. What future government policies could impact spinners, weavers, knitters?
8. Which of the following competitive strategies will be effective/ineffective now, 5 years from now, 10 years from now:
 - low cost
 - high quality
 - high automation
 - speed-to-market
 - high technology
 - niche marketing
 - customization
 - Made in the USA
 - local/green/sustainable
9. Please rate the following segments of the textile industry in terms of viability for domestic production over the next 5 years, 10 years.
 - Spinning
 - Weaving
 - Dyeing/finishing
 - Knitting
 - Non-wovens
 - Cut and sew
10. Are you optimistic about the US textile industry in the future (5 years, 10 years)?
11. How would you assess the gap between opportunities and actualizations in spinning, weaving, and knitting?
12. Do you expect these gaps will grow/shrink in the next 5 years? 10 years?
13. What do you think are the key technology factors in the future of the US textile manufacturing industry?
14. What do you think are the key managerial factors in the future of the US textile manufacturing industry?

Appendix 2

Interview Recruitment Letter

To (Name of Contact),

I would like to invite you to participate in my doctoral research on short- and long-term opportunities for US textile manufacturing. I am hoping to gain some first-hand insights and opinions from actual members of the industry. The identities of all interview subjects and companies will be kept confidential.

I will be conducting interviews during the weeks of X/X/2012 to X/X/2012. It would be greatly appreciated if I could interview you or another member of your company either in person or by telephone during this time period.

Participation in this study is completely voluntary. Please respond to this email if you are willing to be interviewed. All interview participants can request a summary of the results of this research as well. Thank you for your time. I appreciate your help.

Sincerely,

Brian John Hamilton

PhD Student, NC State College of Textiles

Phone: [REDACTED]

Email: [REDACTED]

Appendix 3

IRB Approval Letter

North Carolina State University is a land-grant university and a constituent institution of the University of North Carolina

Office of Research and Innovation
Division of Research Administration

NC STATE UNIVERSITY

Campus Box 7514
Raleigh, North Carolina 27695-7514

919.515.2444 (phone)
919.515.7721 (fax)

From: Carol Mickelson, IRB Coordinator
North Carolina State University
Institutional Review Board

Date: April 19, 2012

Title: Short- and Long Term Opportunities for US Textile Manufacturing

IRB#: 2619

Dear Brian John Hamilton

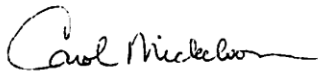
The research proposal named above has received administrative review and has been approved as exempt from the policy as outlined in the Code of Federal Regulations (Exemption: 46.101. b.2). Provided that the only participation of the subjects is as described in the proposal narrative, this project is exempt from further review.

NOTE:

1. This committee complies with requirements found in Title 45 part 46 of The Code of Federal Regulations. For NCSU projects, the Assurance Number is: FWA00003429.
2. Any changes to the research must be submitted and approved by the IRB prior to implementation.
3. If any unanticipated problems occur, they must be reported to the IRB office within 5 business days.

Please forward a copy of this letter to your faculty sponsor, if applicable. Thank you.

Sincerely,



Carol Mickelson
NC State IRB