

T-Shirt's Journey to Market

Highlights Shifting Global Supply Chain, Economic Ties

By Janet Koech



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In the book *The Travels of a T-Shirt in the Global Economy*, Georgetown University economist Pietra Rivoli documents the roles of three countries on three continents (*Chart 1*): the United States, where the raw materials are produced; China, where cheap labor and flexible manufacturing practices are tailored to U.S. speed-to-market demands; and Tanzania, an east African country, whose used-clothing industry imports extensively from the U.S. Along the way, cotton for the T-shirt is spun, woven, cut and stitched to U.S. specifications in China. Before the garment can travel from the factory, it is subject to trade policies (most formulated in Washington), which determine sourcing and the quantity allowed into the country. Once the T-shirt arrives in North America, a U.S. shopper becomes its first owner.

Years later, after a household spring cleaning, the now-faded garment is donated to charity, perhaps to the Salvation Army or Goodwill.¹ It then starts another journey, this time across the Atlantic to used-clothing stores in parts of Africa and other developing nations. Here, a second consumer buys the T-shirt. The single garment provides a source of income to many during its lifespan (Rivoli 2009).

The tale of this everyday item sheds light on the complexities of globalization, mapping the role of apparel and textiles in emergent economic development, global shifts in sourcing and the impact of trade policies.

Apparel and Textiles in Industrialization

Producing textiles and apparel typically represents a “starter” opportunity for countries engaged in export-oriented industrialization. It involves global production, employment and trade ties as nations cater to various markets. The textiles and apparel industries each offer a range of possibilities, including entry-level positions for unskilled labor and a broad source of earnings (Gereffi 2003). The two industries have migrated from high-income locales to developing (low-income) ones. Countries importing textiles and apparel consider not only production costs and trade agreements, but also the speed to get products to market and flexibility to adapt to retailers’ demands. Supply chains able to react quickly to changing requirements have gained prominence over inflexible ones.

Textile and apparel industries—although often thought of interchangeably—are two distinct, albeit closely related, endeavors. Both represent important links in the chain of production and distribution responsible for providing consumers with clothing and related products. Textile mills manufacture yarn, thread and fabric for clothing and items such as carpeting, automotive upholstery, fire hoses, cord and twine. The textile industry is highly automated and includes yarn spinning, weaving, knitting, tufting and nonwoven production.

Apparel manufacture converts textile industry-produced fabrics into clothing and other finished goods. The industry’s intermediate processes include cutting, sewing, assembly, design, pressing, dyeing and transportation to the consumer. The largest apparel-related occupation is sewing machine operator, the most labor-intensive step in production (Mittelhauser 1997).

Industrialization's First Rung

Development theory suggests that a poor country opening up to international trade will tend to specialize in the export of raw or slightly processed (primary) products—typically, output from agriculture, forestry, mining and quarrying and oil extraction. As income growth exceeds that of the rest of the world, export specialization will gradually accompany a shift to manufacturing. Initial manufactured goods will be especially labor intensive, dependent on a country's resource endowment or its population density. Since many processes in textile and clothing production rely on an abundance of unskilled labor, textiles and apparel are among the first items an industrializing economy exports. As national income rises with growing exports, and the workforce becomes more skilled, the country moves on to the manufacture of more capital- and technology-intensive goods it previously imported. In time, another generation of newly industrializing countries replicates this process, gradually displacing predecessors (Park and Anderson 1991).

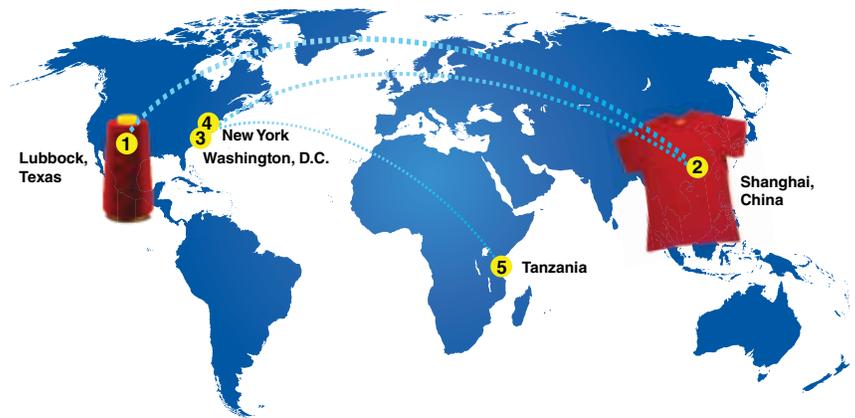
Barriers to entry in the clothing industry are low, and capital requirements are not onerous. Knowledge requirements vary and tradability of goods at each level of production is high. Moreover, clothing and textiles have been the source of rapid, export-led industrialization in several countries (Gereffi and Memedovic 2003). The textile and clothing value chain is particularly suited to global production networks since most products can be exported at each stage of the chain, making the sector highly trade-intensive and sensitive to a country's trade regime. Thus, clothing and textile industries become a good starting point for countries with an abundance of low-wage labor to export their way to development. Textiles' role as a forerunner for industrialization goes back to 18th-century Britain, where the mechanization of cotton processing provided the impetus for the Industrial Revolution.

Cotton Textile Production— One-Time Wonder Industry

The Industrial Revolution was a period of accelerated structural change in world economies, involving a rapid, technology-driven increase in industrial output and factory-based activity.

Chart 1

The Travels of a T-Shirt in the Global Economy



SOURCE: ©2005 National Public Radio, Inc. Illustration from NPR® news report titled "Behind Shanghai's Boom Is A Simple T-shirt," originally published on April 27, 2005, and used with permission by NPR.

From its roots in Britain, this transformation spread to the European continent, North America, Japan and, ultimately, the rest of the world. The textile industry played an important role in development of key industrial innovations that transformed cotton manufacturing. In 1733, John Kay invented the flying shuttle, a machine used to weave cloth. This was accompanied by the improvement of yarn production using James Hargreaves' 1764 invention of the spinning jenny, allowing more than one ball of yarn or thread to be spun. The jenny relied on manpower, and it wasn't long before Richard Arkwright's creation of the water frame in 1769 introduced water as an alternate energy resource. The steam engine, which provided yet another source of power, enabled rapid development of factories in places where water power was unavailable. This greatly increased the output, quality and efficiency of textile production. Mills sprang up throughout Britain, and the factory system—the first successful network of mass production—was created.

Rising textile production brought with it increased demand for raw cotton, which came from Britain's colonies in India, Africa and the southern U.S. Raw cotton consumption jumped to 267,000 metric tons in 1850 from just over 1,000 tons in 1750. Consumption peaked at 988,000 tons in 1913. Related data indicate that in 1764, the import of cotton wool (raw cotton) into Britain totaled 3.9 million pounds; by 1833, it had risen to

303.7 million pounds (Baines 1965).

The early success of the cotton industry and its contribution to the Industrial Revolution were highlighted in a British print publication appearing on Sept. 5, 1739 (Baines 1965, pp. 108–09):

"The manufacture of cotton, mixed and plain, is arrived to so great perfection within these twenty years, that we not only make enough for our own consumption, but supply our colonies, and many other nations of Europe. The benefits arising from this branch are such as to enable the manufacturers of Manchester alone to lay out thirty thousand pounds a year for many years past on additional buildings. 'Tis computed that two thousand new houses have been built in that industrious town, within these twenty years."

The cotton industry created forward and backward linkages to other industries that collectively contributed to the Industrial Revolution's progress. The advances in cotton textile manufacturing required coal for fuel and iron for new machinery; the increase in coal and iron mining dictated improvements in transportation; and the transportation enhancements, in turn, hastened development of railroads and steamships. By the end of the 18th century, the various specializations had coalesced, with the achievements of one contributing to the success of the other, and gradually the world's first Industrial Revolution took root.

Industries Spread Beyond Britain

The industrial achievements of Great Britain extended to Europe and the U.S. in the 19th century. The first American mills lined the banks of rivers around Massachusetts and New Hampshire, and by the late 1800s, the world's largest textile

mills were in New England.² In the early 1900s, U.S. cloth production surpassed that of Britain, whose dominance ended (*Chart 2*).

The New England mills' labor force, like that in Britain, was drawn from women, children and, later, immigrants with few other work alternatives. As labor costs rose, the industry's prosperity in the region did not last, and between 1880 and 1930, cotton textile production gradually shifted to the lower-wage southern Piedmont region of the U.S. Pay in North Carolina during this period was generally 30–50 percent less than what Massachusetts textile workers received (Wright 1979). Southern mills adopted a strong export-oriented market, and exports to China provided an important engine of growth for the regional industry before 1900.³

By the mid-1930s, Japan produced about 40 percent of the world's exports of cotton goods. Its industry leadership, based on low labor costs and the prevalence of “night work,” doubled textile machinery productivity. Research on Japanese wages in the early 1900s found mill worker pay 20–47 percent below pay in the U.S. and England (Moser 1930, p. 13).

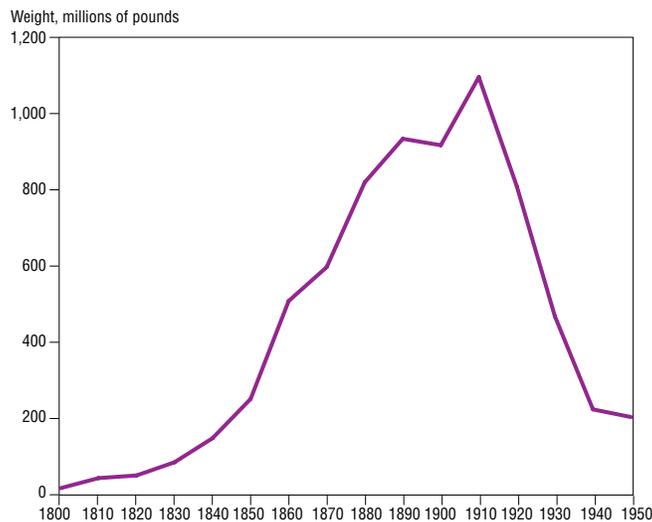
Japan's leadership in textile production weakened in the 1950s as new players offered yet-lower labor costs (*Chart 3*). By the 1970s, members of the Asian “tiger” economies (Hong Kong, South Korea, Taiwan) passed Japan in textile and apparel exports. They were subsequently supplanted by less-developed countries and regions with still cheaper costs—China, Southeast Asia, Sri Lanka and the Caribbean.

Flying-Geese Paradigm and Textile Production Shifts

The catch-up process of industrialization in laggard economies where industrial development is transferred from the leader to the next tier of followers, and then to the next, resembling an inverted formation of flying geese, was dubbed the “flying geese model” by Kaname Akamatsu in the 1930s (Akamatsu 1962). This theory refers to industry and product life cycle from origination, growth and decline and the shift from one country or product to another.

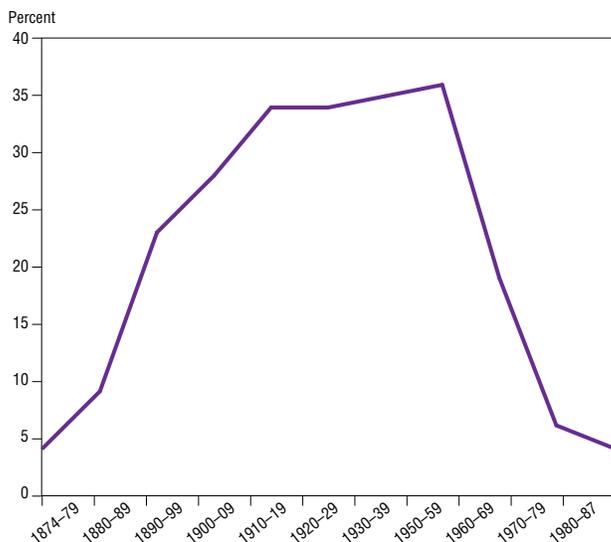
A scatter plot showing changes in consumption of textile production input (raw cotton) as countries' income levels advance, with resulting

Chart 2
The Rise and Fall of Britain's Cotton Industry
(Exports of cotton goods, 1800–1950)



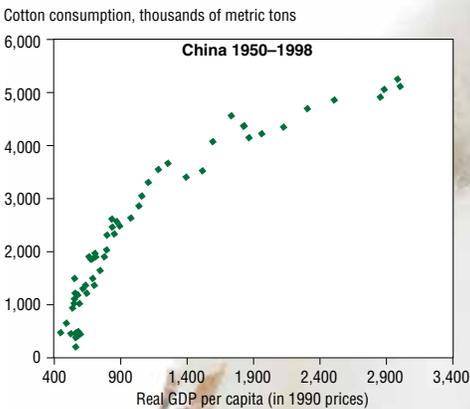
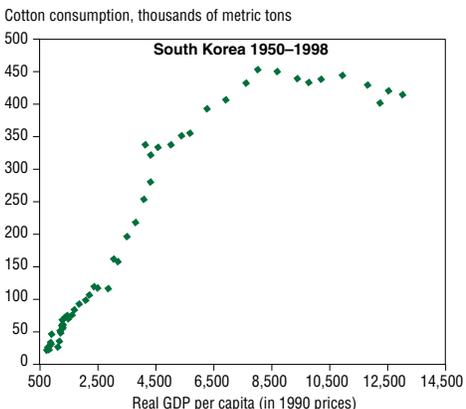
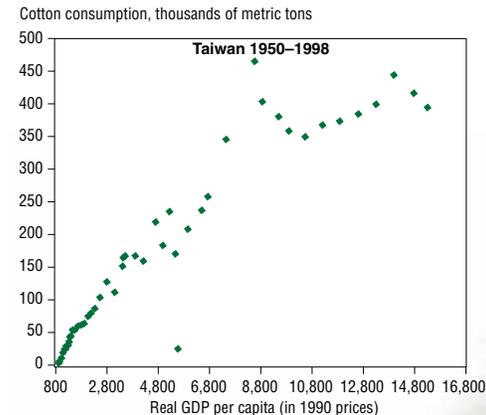
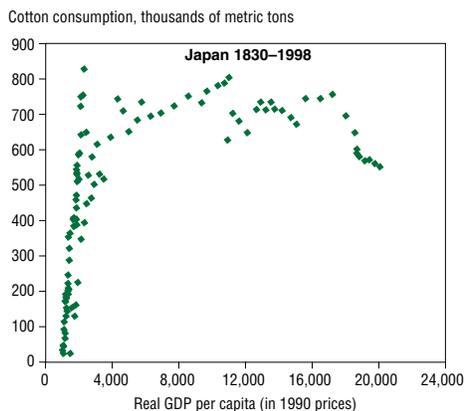
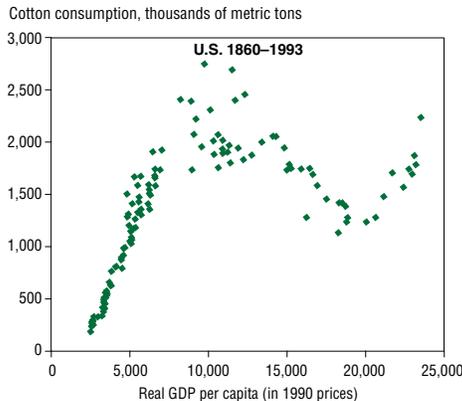
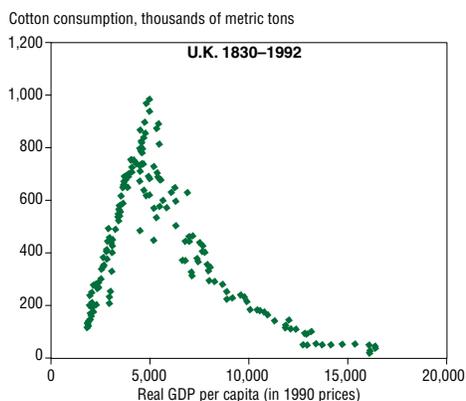
SOURCES: Ellison's *Cotton Trade of Great Britain*, Liverpool Cotton Association and the Cotton Board as reported in Robson (1957), pp. 331–33.

Chart 3
The Rise and Fall of Japanese Textile Industry
(Textile and clothing share of exports)



NOTE: Data for 1940-49 are unreported, coinciding with the war period.
SOURCES: Yearbook of National Accounts Statistics, United Nations, and others as reported in Park and Anderson (1991).

Chart 4
Flying Geese Paradigm Illustrates Production Relocation



SOURCES: *International Historical Statistics: Europe, 1750–2000*, by B.R. Mitchell, Palgrave Macmillan, 2003; *International Historical Statistics: Africa, Asia and Oceania, 1750–1988*, by B.R. Mitchell, Palgrave Macmillan, 1995; *Historical Statistics of the World Economy: 1–2008 AD*, by Angus Maddison.

industry shifts, is indicative of the flying-geese paradigm (*Chart 4*). The model helps explain the growth, decline and shift of textile and apparel industries from developed to developing countries. When nations produce for export, consumption

of raw materials increases, and over time export earnings translate into higher incomes and greater capital accumulation. Production inputs such as labor become more skilled and more expensive relative to other nations with cheaper inputs, thus,

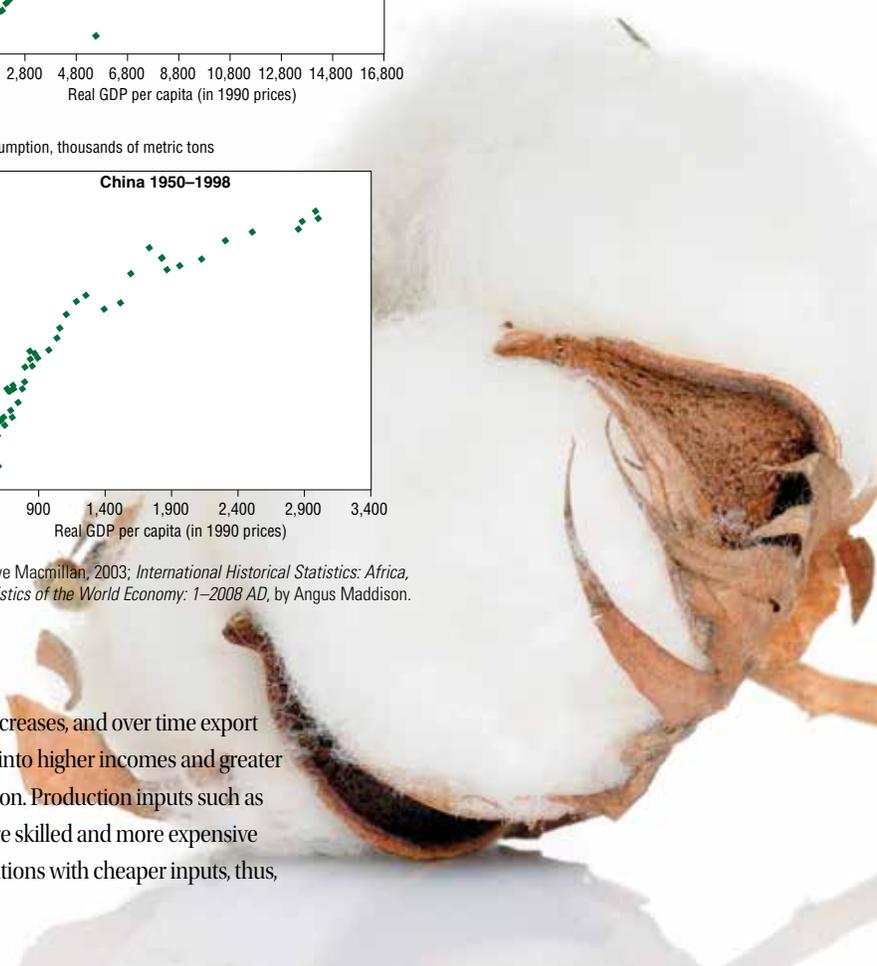
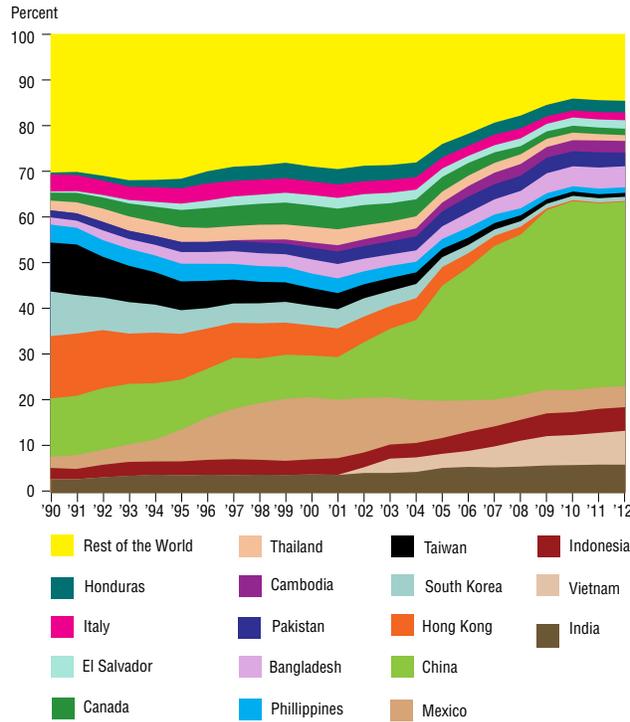


Chart 5
U.S. Textile and Apparel Sourcing Shifts Over Time



NOTE: The yellow area represents other countries from which the U.S. imports textiles and apparel. This group, which accounts for 30 percent or less of U.S. textile and apparel imports, consists of over 180 countries, each accounting for a small portion of U.S. imports.

SOURCE: U.S. Department of Commerce's Office of Textiles and Apparel.

leading to a loss of comparative advantage in textile production. These countries then move to the next tier of manufactured goods requiring more capital and skilled labor (up the industrial ladder), and consumption of textile production inputs drops. Another country embarks on textile production until it loses comparative advantage to others that produce cheaply.

U.S. Textile and Apparel Sourcing Patterns

The production shift from developing to developed countries is evident in U.S. textile and apparel sourcing patterns. Hong Kong, Taiwan and Korea make the top 10 list of suppliers in the 1990 to 2000 period, but drop out after 2000, with China, Vietnam and India taking the lead since 2008 (Chart 5). In the U.S., falling employment in these industries also illustrates movement of pro-

duction offshore. Textile mill employment peaked at about 1.4 million in 1941, while apparel industry employment topped out in 1973 at 1.5 million workers. Today, these sectors each employ fewer than 250,000 people, with their shares of total manufacturing similarly declining. In 1939, textile and apparel employment represented about 10 percent of total U.S. manufacturing. Today, their share has dropped to around 2 percent (Chart 6).

Surviving industries in the U.S. include the manufacture of articles for armed forces personnel and certain high-end items. To remain competitive, enterprises must be extremely labor-efficient. The use of advanced machinery—computers and computer-controlled equipment in designing, patternmaking and cutting—helps boost productivity. The industry also benefits from procurement regulations mandating that U.S. military clothing be produced in the United States—a requirement subsequently extended to cover the Transportation Security Administration (Bureau of Labor Statistics 2011).

Behind Global Shifts

The U.S., as one of the largest importers of textiles and apparel, significantly influences world markets. U.S. sourcing patterns have changed over time (see Chart 5), owing to such traditional considerations as labor, transport and procurement costs, and trade policies. There also are new factors—speedy product delivery and flexibility to adapt to changing market demand.

Labor costs have driven relocations of textile and apparel production—from Britain to the U.S., to Japan, to the Asian Tigers and, finally, to China and other developing nations. Government and trade policies also help determine industry location. As the newly manufactured T-shirts in Rivoli's narrative return to the U.S. via the Pacific, the economist notes that they enter the most complex and most challenging part of their existence: accessing U.S. markets. Trade decisions in the U.S. significantly influence world markets; conversely, international trade policies impact U.S. sourcing decisions.

As globalization of textiles and apparel has accelerated, countries have sought to protect their domestic industries. Textiles and apparel are among the most heavily protected sectors in industrialized countries, with the average tariff as





high as 32 percent on clothing, according to the United Nations (UNDP 2005).

One of the most influential government policies was the Multi-Fiber Agreement (MFA), established in 1974 to help manage market disruptions in developed countries while allowing growth of textile and apparel exports from developing countries. The agreement consisted of bilateral arrangements establishing quotas for certain product lines. In 1995, the Agreement on Textiles and Clothing (ATC), a 10-year transitional program for quota removal under the World Trade Organization (WTO), replaced the MFA. The ATC regulated quotas until it expired on Dec. 31, 2004.

Under the quota system, a firm's purchases from one country were limited, forcing companies

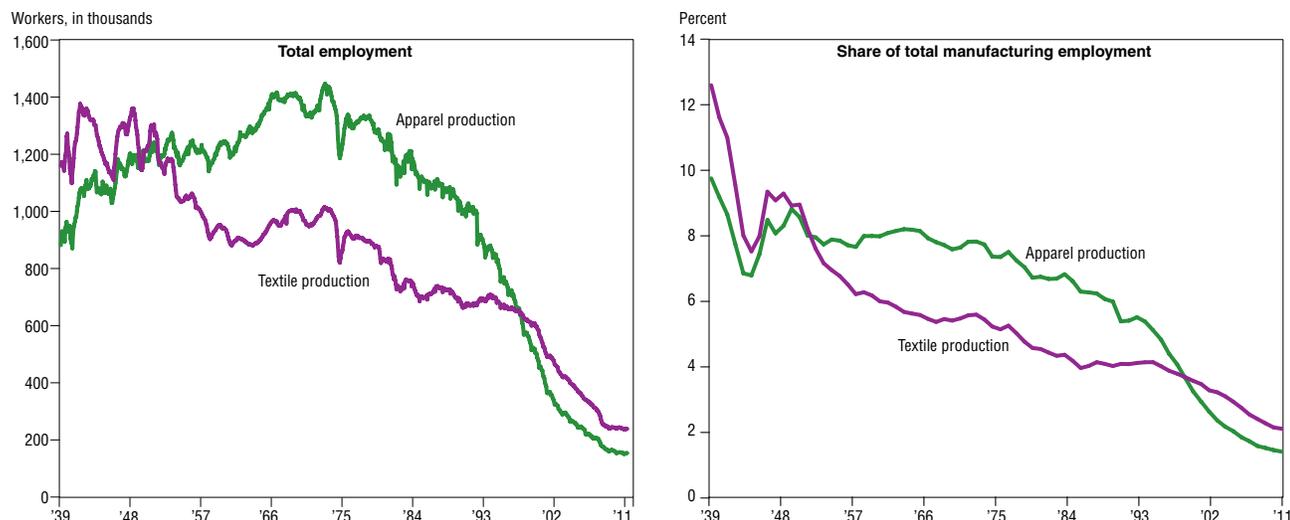
to buy where quota slack existed, not necessarily where goods were most efficiently produced. This system shielded many developing countries from large-supplier competitors, such as China. After the ATC expired, competition became fierce and some countries benefited by freely trading their goods, particularly those nations that could produce additional product at low cost and gain market share.

Trade agreements provide an advantage to suppliers operating in duty-free environments. The North American Free Trade Agreement (NAFTA), signed in 1994, is one such arrangement affecting the U.S. textile and apparel industries. NAFTA eliminated quotas and tariffs on goods produced in member countries: Mexico, Canada and the

U.S. The Caribbean Basin Preferential Trade Act, enacted in 2000, is a production-sharing arrangement linking U.S. market access to the Caribbean Basin with duty- and quota-free products if they are made of U.S. yarns and textiles. The Dominican Republic–Central America Free Trade Agreement offers favorable trade policies and expansion of regional trade involving Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, the Dominican Republic and the U.S. The African Growth and Opportunity Act is a U.S. agreement with African countries for tariff-free trade if production inputs are sourced from the U.S. or African countries covered under the agreement.

Such trade arrangements have impacted U.S. sourcing decisions. For example, China's integra-

Chart 6
U.S. Textile and Apparel Employment Declines Along with Employment Share

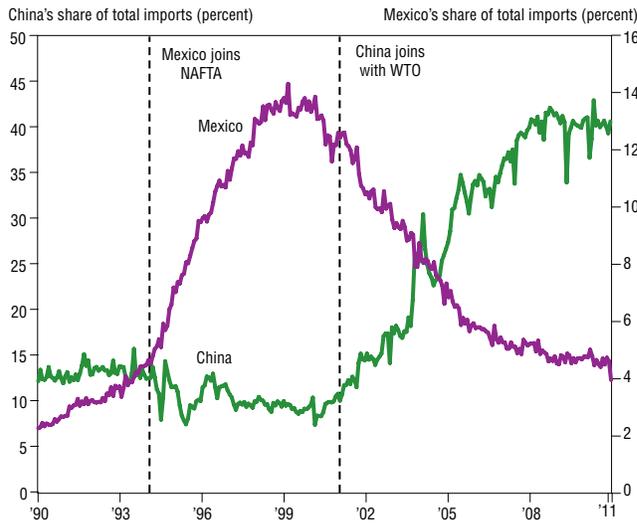


SOURCES: Bureau of Labor Statistics' Current Employment Statistics Survey reported in *Employment, Hours and Earnings, United States, 1909–1990*, Volume II, Bulletin 2370 and 1991–1993, Bulletin 2429; Haver Analytics; author's calculations.

Chart 7

U.S. Imports of Textiles and Apparel Shift

(Impact of trade policies on manufacturing)



SOURCE: U.S. Department of Commerce's Office of Textiles and Apparel.

tion into the world trading system through its accession to the WTO at the end of 2001 diminished Mexico's textile and apparel industry, which greatly expanded following NAFTA's enactment (*Chart 7*).

Retailers' Preferences Dictate Sourcing

Often, discussion of apparel and textile industries shifts focus to national trade flows. These movements reflect decisions of private parties and supply chains (retailers and producers of textiles and apparel) operating within the constraints of national and international policies. More recently, retailers' preferences increasingly dictate national sourcing patterns.

With new technologies enabling retailers and suppliers to efficiently track products and consumer demand, suppliers confront demands to quickly replenish products and adopt efficient inventory management while maintaining low costs. Bar coding and point-of-sale scanning provide real-time information on product sales; electronic data interchange tells retailers what inventory to replenish; and automated distribution centers handle small orders, replacing traditional warehouse systems used for large bulk shipments (Abernathy et al. 1999). This deployment of

technology to capture information on consumer demand, reduce inventory surplus, and improve operations efficiency and profitability is known as *lean retailing*.

Lean retailing allows department stores, mass merchandisers and other retailers to minimize exposure to demand uncertainty while restraining inventory costs. Widespread adoption of these strategies means that suppliers must invest in basic technologies providing information links necessary for rapid replenishment to retailers. Additionally, apparel suppliers must devote resources for capital improvements to package, label, route and quickly move products from their production centers directly to retailers. The lean strategy requires frequent shipments sent from suppliers on the basis of continuous replenishment orders.

For example, an order may be placed with a manufacturer on a Sunday, after a week's retail sales have been tallied. Typically, it might specify a number of men's jeans of a given style, color, fabric weight and finishing treatment and size. The manufacturer's computer receives the order stipulating the jeans be placed in particular cartons for each of the retailer's stores. The cartons bear bar codes identifying the specific location where each will go. The product must be ready for placement on sales displays with the appropriate price marked.⁴

The jeans most likely won't be touched from the time they leave the manufacturer until they go on sale Thursday morning. The processes and associated documentation must be fully understood by the manufacturer and retailers and conform to industrial standards (Abernathy et al. 1999). These are significant new costs for suppliers, in essence shifting the risk of added variability and quickly changing fashion trends from the retailers to suppliers. Manufacturers that haven't adopted the new technology may end up holding retailer inventory—a particularly common occurrence with high-fashion and seasonal items.

Replenishment considerations and the need for speed to market arising from the new economics of distribution and production explain an important portion of sourcing shifts during the past decade. As lean retailing becomes even more widespread and suppliers more adept at managing risk, sourcing decisions increasingly include replenishment considerations. This heightens



competitiveness among countries able to help manage retailer inventories.

“In the new quota-free environment, we will have no choice but to be very discriminating about our suppliers, selecting only those who can provide real value to our customer,” said Janet Fox, then-senior vice president and director of sourcing for J.C. Penney, during congressional testimony in 2004. “Value does not mean the product with the cheapest price. It means a supplier that is able to provide a quality product and service, including speed to market and supply chain efficiency and reliability.”

The Next Destination

As production and labor costs inch higher in China, the primary textile and apparel supplier to the U.S., global winds may shift, possibly sending the industry to yet other destinations, including ones in Africa.⁵ Indeed, Rivoli’s T-shirt tale ends up in Africa, as do many articles of clothing and textiles. Salvation Army and Goodwill stores in the U.S. take in donations of old clothes. The charities’ stores once sold or gave away much of this inventory, but the domestic supply has grown so large that only a fraction of the clothing stays in the U.S. America’s castoffs have therefore found customers elsewhere in the world.

The U.S. exported nearly 5.5 billion tons of used clothing and textiles between 2000 and 2010, becoming the largest used-clothing seller over the period. Rivoli’s T-shirt arrives in Tanzania, a big beneficiary; used clothing was Tanzania’s no. 1 import from the U.S. in 2010 and its no. 2 U.S. import in 2011. Critics charge that an influx of used clothing has kept Africa from ascending the traditional development ladder via textile and apparel manufacture (Frazer 2005). Other studies show that producing for export rather than for domestic consumption is the more effective development path (Ekanayake 1999) and that imports of used clothing present no threat to African exports (Rivoli 2009). Nonetheless, Africa’s share of world textile and apparel exports has stagnated at around 2 percent from 1995 to 2011, even as other developing countries’ share increased to 58 percent in 2011, from 52 percent in 1995. Developed economies’ share declined to 38 percent from 44 percent over the same period.



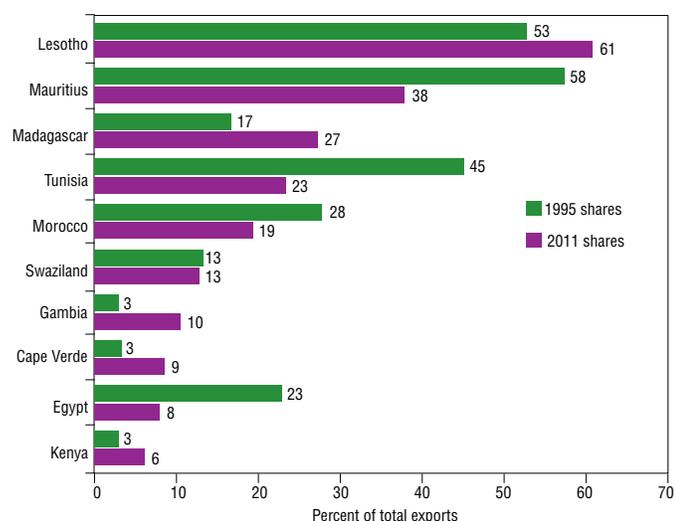
Textiles and apparel were responsible for 61 percent of Lesotho’s total exports in 2011, up from 53 percent in 1995 (*Chart 8*). These sectors accounted for 20 percent or more of total exports for four countries—Lesotho, Mauritius, Madagascar and Tunisia—in 2011, down from five nations in 1995. The sector’s performance across the continent has been mixed, with export shares for previ-

ous major exporters, such as Egypt and Morocco, dropping in 2011 from 1995 levels.

The continent offers some of the basic ingredients needed for establishment of these industries—cheap and abundant labor, availability of raw materials (cotton) and favorable trade agreements, such as the African Growth and Opportunity Act and the Everything but Arms initiative offering access

Chart 8

Africa’s Export Share of Textiles and Apparel Shows Mixed Picture of Sector Dominance



NOTE: Countries are ranked according to their 2011 textile and apparel export shares. The reported figures are all rounded.

SOURCE: United Nations Conference on Trade and Development.

to U.S. and European markets. The sector's growth in Africa has been hindered by the same factors limiting the expansion of all manufacturing—lack of infrastructure, corruption, unstable political environments, inaccessibility to capital and lack of regional and foreign market knowledge. Poor roads, railways and ports create delays, adding to the cost of importing raw materials and exporting finished goods. African countries have been disadvantaged dealing with retailers seeking fast order-to-delivery cycles. Insufficient transportation networks also impede intraregional trade and economies of scale achievable through larger regional production and market centers. Furthermore, the effects of the MFA expiration in 2005 exposed smaller, previously quota-protected economies to fierce competition from large suppliers in Asia. Greater regional integration could bolster competitiveness through improved access to materials, product specialization, production sharing and speed to market.

Competitive Challenges

Textiles and apparel were the starting point of world industrialization. Both industries are viewed as starter endeavors for development efforts. Because apparel and textiles are labor-intensive, their manufacture has migrated from

high-income countries to developing economies with relatively lower pay.

The increasing importance of logistic connections between manufacturing and distribution of textiles and apparel means that supply chains must exhibit a blend of considerations reflecting factor prices, transportation costs and adjustment to the risks of sourcing products in various locations. The impact of replenishment and risk-shifting within supply channels alters the traditional role apparel and textiles can play in developing countries. The two sectors remain attractive industries in terms of economic development, but assuring their success has become more complex (Abernathy, Volpe and Weil 2006). It will be difficult for nations with inadequate infrastructure, located far from major consumer markets or plagued by political instability to gain competitive advantage for textile and apparel production even if they have low wage rates.

Notes

¹ The bulk of these donations not sold in stores is sold to textile recyclers, who resell a portion of their purchase to used-clothes merchants around the world.

² The Amoskeag Manufacturing Co. in Manchester, N.H., was the largest cotton textile plant in the 19th century.

³ In the late 1800s, China purchased more than half of U.S. cloth exports, and more than half of U.S. exports to China were cotton textiles. In essence, the Chinese market built Piedmont textile mills. A century later, floods of cheap cotton clothing from China are an almost symmetric reversal of previous trade flows (Rivoli 2009).

⁴ Under traditional retailing, retailers prepared items received from manufacturers for display in the stores. They unpacked the items, affixed price tags and put them on hangers. However, lean retailing entails using standards to ensure that products are “floor-ready” on delivery—that is, on hangers and tagged and priced when they arrive in stores.

⁵ China's hourly manufacturing costs increased 138 percent from 2002 to 2008, according to estimates by the Bureau of Labor Statistics.

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—Janet Fox, then-senior vice president and director of sourcing for J.C. Penney, testimony before the Subcommittee on Trade, U.S. House Ways and Means Committee, Sept. 22, 2004.



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