

## Technological Change and the Relocation of the Apparel Industry

Isaac Minian<sup>1</sup>

Ángel Martínez<sup>1</sup>

Jenny Ibáñez<sup>1</sup>

<sup>1</sup>Institute for Economic Research at the National Autonomous University of Mexico (UNAM), Mexico.  
E-mail addresses: minian.economia@gmail.com, amonroy@unam.mx, and  
jennyj.ibanez@ciencias.unam.mx, respectively.

### Abstract:

New technologies are transforming the production process, but they have yet to penetrate clothing manufacturing and, therefore, have not played a role in the relocation of the industry. This paper aims to determine whether new production technologies have played a main role in the location of this industry, as they have in other industries. To do so, we distinguish between communication and transportation technologies and new technologies. The former have allowed manufacturers to relocate production phases into different countries; here, wage costs have played a decisive role. Wage differences account for four out of the five moves made in the industry. The other relocations can be explained by quotas and trade agreements, with a considerable impact on the Mexican export cycle.

**Key Words:** Technological change, apparel industry, new technologies, competitiveness, industrial migration, relocation

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## 1. Introduction

The principal driving forces behind globalization are declining communications and transportation costs, trade agreements, and the global wage arbitrage engaged in by multinational companies. The manufacturing industry is one of the most globalized, and the apparel industry has been especially pioneering in this regard, having gone through four major migrations and with another one under way.

In order to confront the competitiveness of developing countries and their low wages, and slow the relocation of the apparel industry, developed countries have undertaken three strategies: 1) establish a mechanism to restrict international trade (quota system); 2) promote the automation of the industry; and 3) sign free trade agreements to encourage companies to relocate to countries in their region. In turn, developing countries sought to foster relocation of the industry to their territories by offering, in addition to low wages, export processing zones, free trade agreements, infrastructure, and tax incentives.

The quota strategy started to operate in 1961 with the Short- and Long-Term Arrangements Covering Cotton Textiles (ACLPTA); in 1974, they were extended to include other materials under the Multi-Fiber Arrangement (MFA) (Organización Internacional del Trabajo, 2005, cited in Fernández-Stark *et al.*, 2011). For over 30 years, these arrangements protected developed economies from cheap imports from developing countries. However, in 1995, the MFA was replaced by the Agreement on Textiles and Clothing (ATC), which did away with restrictions on international trade for the textile and clothing industries, distinct from the normal rules of the World Trade Organization (Fernández-Stark *et al.*, 2011).

In response to strong competition from Asian companies in the American market, retail firms and sellers of America brands chose the easy way out: outsourcing,<sup>2</sup> while the manufacturers of brands and fabrics relocated within the region (offshoring). Even so, after the quota system was eliminated, it became evident that Mexico and other countries in the Caribbean Basin were simply not competitive in the apparel industry.

To boost the competitiveness of apparel industry companies, in the 1980s, the United States, Japan, and Europe opted for a technology-related strategy, spending millions of dollars on research programs to automate the industry; although the programs did yield some advances, industry automation did not progress enough to compete with cheap labor in developing countries, which became evident after the implementation of the ATC.

In order to understand the determinants behind the migration of the apparel industry and predict its possible behavior in the medium term, this study aims to identify and examine the principal factors that explain the five waves of industry relocation since the 1950s; analyze whether in this context of relocation the causes behind the rapid rise and fall of Mexico's share of global apparel industry exports can be explained; and, finally, explore whether in the medium term, new technologies (in particular: industrial robots and computerized numerically controlled tools and machines) could become the determining factor driving the location of industry production, and even incentivize its relocation towards developed countries.

The next section presents the stylized facts that describe the migrant behavior of the apparel industry since the 1950s; then, the third section analyzes the principal factors behind the relocation and retention of apparel industry production, the evolution of Mexican imports in said industry, and technology penetration. Finally, the last section contains some conclusions.

## 2. Stylized Facts

*a)* Since the 1950s, the apparel industry has been characterized as a migrating industry, tending to relocate to countries in which production costs are more competitive, with greater proximity to major markets, that have a well-organized productive chain (CEC-ITAM, 2008), or have trade agreements that provide preferential access to the big markets.

*b)* The strong competitiveness of developing countries has prompted the dislocation of apparel industry production away from developed countries since the 1950s. In 1980, developed countries were the source of 45.1% of global exports. This share fell to 25.6% by 2014 (see Appendix).

*c)* The first industry migration took place in the 1950s and the beginning of the 1960s, from the United States and Western Europe to Japan, when the textiles and clothing items manufactured by local companies were displaced by cheap imports from Japan (Gereffi and Memedovic, 2003).

*d)* The second migration was from Japan to Taiwan, Hong Kong, and South Korea (the “three Asian giants”) and allowed this group to dominate global textiles and apparel exports in the 1970s and early 1980s (Gereffi, 2000). These countries would soon become the big losers of the industry, as their share in global exports plunged drastically from 27% in 1980-1990 to 5.2% in 2014 (see Appendix).

*e)* The third industry relocation took place at the end of the 1980s and 1990s, from the “three Asian giants” to continental China, mainly, although also towards other countries in Southeast Asia and Sri Lanka (Gereffi and Memedovic, 2003). This migration has significantly boosted Chinese exports, making China’s share in global exports spike from 4% in 1980 to 39% in 2014 (see Appendix).

*f)* In the 1990s, Mexico and other southern Asian and Caribbean Basin countries led the fourth wave of apparel industry migration (Khanna, 1993, cited in Gereffi, 2000). This process drove Mexican apparel exports, permitting the country to jump 30 spots in the ranking in just one decade, becoming the fourth-highest exporter in the industry in 2000. That year marked an inflection point for the trend, as Mexico's share took a nosedive to less than 1% in 2014 (see Appendix).

*g)* Over the past decade, exports from Bangladesh and Vietnam have grown considerably, and their share in global exports more than doubled. Between 2005 and 2014, Bangladesh’s market share rose from 2.5% to 5.1%, and that of Vietnam from 1.7% to 4%, becoming the third- and sixth-highest ranked exporters in the industry (see

Appendix), respectively, by 2014. The rapid rise in the share held by Bangladesh and Vietnam and, to a lesser degree, India, suggests that the fifth industry migration is under way, and that these countries are the starring actors.

*h)* On the other hand, throughout the entire study period, the apparel industry market has been highly concentrated, and the top destinations for industry exports have been developed countries. In 1980, developed countries accounted for 83.3% of global industry exports. By 2014, their share had hardly budged, to 78.9%. Although there has been a trend towards less concentration, the evolution has been slow.

### **3. The Main Determinants Behind the Relocation or Retention of Apparel Industry Production**

This industry's products are generally classified into: commodities, fashion basics, better fashion, bridge fashion, designer collections, and made-to-order haute couture (Abernathy *et al.*, 1999, cited in Doeringer and Crean, 2006). The former two categories are produced *en masse*, with prices oriented towards the mass market. Moving towards haute couture, both the designs and fabrics become more unique, the market is smaller and more specialized, and demand is more price-sensitive (Doeringer and Crean, 2006).

Globalization has seen production in the first two categories move towards low-wage countries. According to Lin *et al.* (2002, cited in Dana *et al.*, 2007), the cost of labor accounts for between 30% and 50% of the final cost of clothing, and the larger the volumes manufactured, the lower the unit cost will be (Doeringer and Crean, 2006), with the exception of capital-intensive products, like socks and lingerie (Doeringer and Crean, 2006). In the other categories, the comparative advantages of production are not exclusively dependent on labor costs (Doeringer and Crean, 2006), which has allowed higher-salary countries to hold on to certain market niches and, in the best of cases, like in Italy, to even have a trade surplus in this industry.

Below are the main factors behind why production is relocated or retained in the apparel industry.

#### **3.1 Global Wage Arbitrage: A Determinant of Industry Migrations**

Technological developments during and after the Second World War made it possible to codify and digitalize tasks, bringing down the costs of transportation and drastically lowering that of communications. Trade liberalization created the right conditions for multinational companies to capitalize on international wage disparities.

According to the United Nations Organization for Industrial Development (2013, cited in the International Labor Organization, 2014), worldwide, apparel industry wages are on average 35% lower than average manufacturing industry wages. The vast majority of developing countries that were among the top 20 exporters for the apparel industry around the globe in 2014 (China, Bangladesh, Vietnam, India, Indonesia, Cambodia, Sri Lanka, and Malaysia) are those countries with the lowest minimum monthly wages in the industry (Organización Internacional del Trabajo, 2014).

In order to keep labor costs competitive, companies may violate certain provisions of local laws, as demonstrated by Vaughan-Whitehead (2014) in a survey administered to 122 companies in 10 Asian countries. Some of the most severe labor irregularities included: *a*) 20% of the companies surveyed paid wages below the legal minimum; *b*) 43% of the companies did not offer any social security to their workers; *c*) employees worked on average 71 hours a week, when the legal maximum permitted is 60; and *d*) 61% of companies did not pay overtime pursuant to local laws.

In order to commit these infractions and avoid penalties by the authorities, companies resort to keeping two sets of books and informal employment. Vaughan-Whitehead (2014) found that 48% of companies surveyed use this double recording mechanism to hide overtime in the work day, and pay less in overtime wages than what is legally required. Moreover, the need for greater flexibility and pressures on labor costs have led to an increase in informal employment in the textile, apparel, leather, and footwear industries (Organización Internacional del Trabajo, 2014).

Vaughan-Whitehead (2014) asserts that for the majority of clothing suppliers in China, migrant workers represent between 70% and 100% of the total workforce, and that companies shield themselves behind the Hukou system to avoid providing them with social security. In case studies of three Chinese companies, Vaughan-Whitehead (2014) found that they paid wages slightly above the legal monthly minimum for total number of hours worked, which were far above 40 a week (up to 32 more).

Comparing wages in Mexico with those of the top Asian apparel industry exporters, it turns out that the Mexican minimum wage in 2001 was five times higher than that of China and more than eight times higher than that of Bangladesh. As of 2011, wages in the industry had fallen 29% in Mexico, to become competitive with some of its Asian peers. However, in spite of this decline, in the same year, Mexican wages were 1.6 times higher than those in China (Worker Rights Consortium, 2013).

Finally, even though labor costs are the main determinant behind the relocation of the apparel industry, in practically all African countries, low wage levels have not automatically translated into a comparative salary advantage for apparel industry manufacturers, because these countries still face serious limitations

in terms of the availability and cost of key services for the industry, like transportation, work skills, and a stable business climate (Fukinishi *et al.*, 2013). The foregoing means that low labor costs are a necessary but insufficient condition for the relocation of the industry.

### **3.2 Trade Agreements: Understanding the Rise and Fall of Mexican Exports<sup>3</sup>**

In order to protect local companies in developed economies from cheap imports from the developing world, between 1961 and 1994, international trade in the apparel industry was constrained by trade agreements. However, starting in 1995, the MFA was supplanted by the ATC, whose objective was to do away with international trade quotas in the textile and apparel industry over a ten-year period (Frederick and Gereffi, 2011; Fernández-Stark *et al.*, 2011; World Trade Organization, 1996; Martin, 2007).

Even with the quota system, imports from Asia continued to pose a serious challenge to local American companies, which, in response, essentially resorted to two strategies: offshoring and outsourcing. Brand manufacturers used offshoring to install subsidiaries for the most-labor intensive production processes in export processing zones, located primarily in Mexico and the Caribbean Basin, and took advantage of Rules 807/9802,<sup>4</sup> and, subsequently, free trade agreements, to re-export production, free of tariffs, to the United States (Cepal, 1998).

On the other hand, retailers and brand sellers opted for the outsourcing strategy, with full-package producers located principally in Asia (Appelbaum and Gereffi, 1994, cited in Bair and Dussel, 2006). With the passing of time, brand manufacturers also began to use the outsourcing strategy, abandoning production altogether (Bair and Gereffi, 2003; Cepal, 1998).

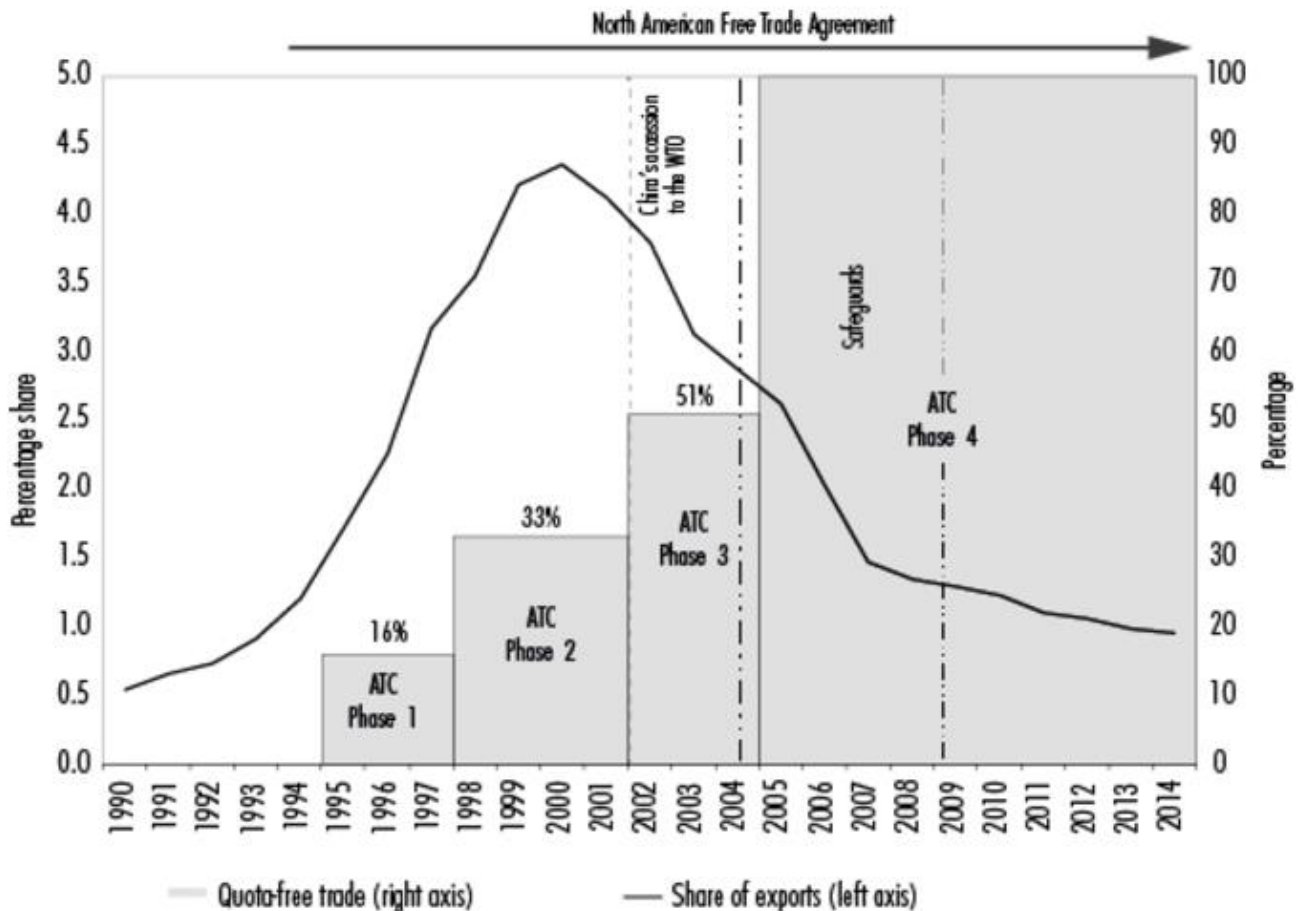
In light of the threat of growing clothing imports and the shift away from production in brand manufacturers, fabric manufacturers began to capitalize on the growing demand for full-package services, by way of forward vertical integration. The idea was that this strategy would garner sales with customers who would otherwise subcontract their production in Asia, with producers who would very likely not use American textiles (Bair and Gereffi, 2002, cited in Bair and Dussel, 2006).

The possibility for vertical integration with Mexican manufacturers to revert the long-term downward trend in production, and allow them to come out on top as major players, made American textile companies, such as Burlington Industries, Guilford Mills, Galey & Lord, Cone Mills, and Dan River, strong supporters of the North American (NAFTA) and Central American (UNCTAD, 2005) free trade agreements.

The forward vertical integration of American textile companies came about through the establishment of subsidiaries, acquisitions, and joint venture investments with Mexican companies (Cutchin *et al.*, 1999). However, the strategy did not work out as expected, and in just a few years, practically all of the major textile companies that offered the full package abandoned this approach. Not only that, but also, between 2001 and 2005, many of the large companies that had invested in Mexico went bust (Bair and Dussel, 2006).

Rules 807/9802, the export processing zones, and the North American Free Trade Agreement (NAFTA) all endowed Mexico with access to a market protected by the quota system, the United States, which allowed the country to rapidly increase clothing exports. Between 1990 and 2000, Mexico's share in global exports skyrocketed (see Figure 1), going from 0.5% in 1990 to 4.4% in 2000 (see Appendix). As exports rose, so too did the number of jobs and factories for assembling clothing items in the *maquiladora* export industry. The number of factories went from 277 in 1990 to 1,088 by the year 2000, with the number of employees going from 42,464 to 282,755, respectively (INEGI, 1990-2006).

**Source:** Created by the authors based on data from the World Trade Organization (2015, 2016), Martin (2007).



## **Figure 1. Share of Mexican Exports in the Apparel Industry and its Relationship to Trade Agreements**

However, the year 2000 marked a change in trend in the share of Mexican exports out of global exports, mainly due to the elimination of the quota system, China's joining the World Trade Organization (WTO), and Article 303 of NAFTA. Due to the advancement of the ATC, by 2002, quotas had already been removed for 51% of the international clothing and textiles trade, gradually reducing the protections afforded by the quota system and the advantages that Rules 807/9802 and NAFTA had given Mexico in the 1990s. China's accession to the WTO (December 11, 2001) intensified competition between this country and the American market. When Article 303 of NAFTA took effect in 2000, taxes on *maquiladora* factories were raised, considering them to be national enterprises, and chipping away at their competitiveness (Carrillo, 2007).

The voiding of the quota system, as well as the other preceding factors mentioned, caused Mexico to sink from the fourth-highest spot on the list of top industry exporters in 2000 to being ranked twenty-first in 2014 (see Appendix). Mexico's falling share of global exports led to the closure of factories and destroyed apparel industry jobs. In 2000, Mexico was home to 1,088 clothing assembly factories in the *maquiladora* export industry.<sup>5</sup> By 2006, only 484 remained. Jobs also fell by 40% in the same time period, from 282,755 employees in 2000 to 169,490 in 2006 (INEGI, 1990-2006).

Losses in the Mexican piece of the global apparel industry export pie, and bankruptcies for many American textile companies with plants in Mexico, in the wake of the implementation of the ATC, made evident that the competitiveness of the Mexican apparel industry was based on neither wages nor productivity, but rather on trade agreements.

### **3.3 Fashion, Quality, and Production Volumes**

Several factors can help explain why certain production niches are still held by high-wage countries: production volumes are very low, production is high quality, requiring direct collaboration between designers, producers, and retailers, and the goods are very sensitive to production times (Doeringer and Crean, 2006).

The first group of these niches is composed of high-quality products, fashion for the high-end market, made-to-order clothing items, small fashion product orders for regional chains and independent stores, and products that use exotic fabrics that require special care and skilled labor. The second set of niches comprises products directed at specialized mid- and low-range markets, principally, surgical wear, big





Italy	41	50	24	95	100	84	16	30	13	29	37	26
Netherlands	35	37	19	30	31	28	20	20	20	20	33	16
United Kingdom**	20	23	14	25	23	38	15	17	14	21	31	19

\*Data from the Netherlands was not included in 2014 exports. Data from Italy was not included in 2014 imports.

\*\*Data are for 2002 and 2012; Information from Saudi Arabia and Kuwait was not included for 2002. Information from Spain was not included for 2012 exports.

**Source:** United Nations 2015; UN Comtrade Database.

### 3.4 Economies of Scale, Infrastructure, and Governmental Support

Besides competitive labor costs and preferential trade agreements, the location of the apparel industry in developing countries is also affected by the economies of scale, infrastructure, and tax incentives offered by host countries to investors.

The Chinese export market and domestic market (the latter absorbing more than half of the industry's local production) (Gereffi and Frederick, 2010, cited in Fukinishi *et al.*, 2013) has enabled the Chinese apparel industry to capitalize in economies of scale in two ways (Appelbaum, 2008; Tewari, 2006; and Gereffi, 2009, cited in Frederick and Gereffi, 2011): *a*) by creating clusters revolving around a large vertically integrated company; and *b*) by creating product clusters. The Chinese government has fostered the creation of both types of clusters through fiscal incentives, and by building ports and roads.

Transportation and communications infrastructure plays an essential role in the competitiveness of the apparel industry. China has boosted exports and reduced time-to-market by building and improving roads and ports and developing clusters in coastal cities (Frederick and Gereffi, 2011; Tewari, 2006, cited in Frederick and Gereffi, 2011).

Compared to China, Mexico has faced serious disadvantages in the apparel industry. First, in spite of sharing a low-wage policy, salaries in the Mexican apparel industry in 2011 continued to be higher than those of the Asian nation (Worker Rights Consortium, 2013). Second, contrary to what China has done, Mexico has not made significant investments in transportation infrastructure or logistics to improve its competitiveness (Frederick and Gereffi, 2011; Robinson, 2010, cited in Frederick and Gereffi, 2011).

Another factor to consider is the exchange rate. In 1994-1995, the Mexican peso suffered a sharp devaluation, which incentivized the growth of exports in the industry, and led more *maquiladora* factories to sprout up in the country (Cepal, 1998; Gereffi and Bair, 1998). However, by 2000, the costs of *maquiladora* production in Mexico had risen due to, among other factors, the overvaluation of the Mexican peso against the dollar (Carrillo, 2007).

Finally, the following aspects must be considered in determining the location of apparel industry production: the business climate, quality and on-time deliveries, reliability, availability of qualified labor and productivity, access to quality inputs at competitive prices, capacity of manufacturers to offer full-package services, etc. (UNCTAD, 2005; Freund and Wallace, 2004).

### **3.5 Technology: Could it be a Central Factor in the Location of Production?**

According to Book *et al.* (2010), the need for automation in the apparel industry has been widely acknowledged by many since the early 1980s. For that reason, during that decade, the United States, Japan, and Europe spent millions of dollars on research programs to automate the apparel manufacturing industry. Although none of these programs managed to fully automate production, some advances were made (Byrne, 1995).

Even though automation has made progress in the design, patterning, and cutting phases, not enough has been done to make it competitive with cheap labor in developing countries. The foregoing becomes evident with a look at the growing share of developing nations, with their limited use of technology, in global apparel industry exports (see Appendix). According to Bhavani and Tendulkar (2001, cited in Yunus and Yamagata, 2012), production in the developing world is done through processes that combine various general and specialized machines with manual, mechanical, and electronic systems operated by skilled and unskilled workers.

Greater evidence as to the limited use of technology in developing countries comes from the industry's top exporter (China). Pursuant to Zhang *et al.* (2016), the rate of adoption for mechatronic equipment (industrial robots) and digital equipment in the Chinese apparel industry has not risen significantly;

storage equipment is inadequate given the high level of production, and design is still done primarily on paper samples.

Mexico is another clear example of a country with limited use of technology in this industry (González, 2006). According to the National Employment, Salaries, Technology, and Training in the Manufacturing Sector Survey (ENESTYC, 2005; INEGI STPS, 2005), in 2004, only 31.39% of apparel industry companies made use of automatic or numerically controlled equipment (computerized or not), and 0.04% used robots; the rest used only manual equipment (39.56%) and tool machines (29.02%). Compared to 2000, the use of advanced technology has fallen. In that year, 32.38% of companies were using automatic or numerically controlled equipment, and just 0.13% robots (INEGI. STPS, 2001). Because a more updated version of the ENESTYC has not been released, and neither have similar surveys, the evolution of technology usage in the Mexican apparel industry is approximated via the change in the capital/labor ratio in this sector between 2003 and 2013.

According to data from the 2004 and 2014 economic censuses, the apparel industry has shrunk in size, measured by added value (-44%) and number of people employed (-32%). The total stock of industrial machinery and equipment has also been reduced, although not to the same degree as the other variables mentioned, so the capital/labor ratio rose (35%) between 2003 and 2013. However, this greater intensity in capital use was not reflected in a rise in productivity. On the contrary, productivity fell by 17% (see Table 2).

**Table 2.** Mexican Apparel Industry Indicators

<i>Variables</i>	<i>Value</i>		<i>Percentage</i>
	<i>2003</i>	<i>2013</i>	<i>Variation</i>
			<i>2003-2013</i>
Total employed persons	444 020	301 094	-32
Added value <sup>a</sup>	51 743	29 234	-44
Productive capital <sup>a</sup>	12 372	11 355	-8
Total gross production <sup>a</sup>	104 132	85 760	-18
Capital/labor <sup>b</sup>	28	38	35
Labor productivity <sup>b</sup>	117	97	-17
Added value/gross production	0.50	0.34	-31

<sup>a</sup> Millions of pesos at 2013 prices;

<sup>b</sup> Thousands of pesos at 2013 prices.

**Source:** Created by the authors based on data from INEGI (2004-2014).

There are at least three reasons why in spite of the increase in the capital/labor ratio, productivity could have declined in the apparel industry: 1) greater idle capacity installed; 2) lower added value goods were produced; and 3) workers were not sufficiently trained to use new machines.

Higher idle capacity can be ruled out. According to the Monthly Industrial Survey for 2003 (INEGI, 2003), the apparel industry reported utilized capacity of 77.1%, and the Monthly Manufacturing Industry Survey (INEGI, 2013a) indicated that the capacity utilized in the industry in 2013 was 81.6%. To verify that the industry is producing goods with lower added value, its share in total gross production for 2003 and 2013 was estimated, and it was found that the figure went from 50% in 2003 to 34% in 2013 (see Table 2).

Finally, if the increase in the capital/labor ratio were due to the incorporation of more advanced technology, a reduction in the share of workers in total employment would be expected. However, the share of workers in total employed persons rose marginally during the time period, going from 92.8% of workers employed by a company in 2003 to 93.2% in 2013 (information broken down for personnel not employed by a company is not available, although their share in total industry employment continues to be low, 10% in 2013) (INEGI, 2013b). The empirical evidence suggests that falling productivity is principally due to the fact that the industry is producing goods with lower added value.

Considering the use of advanced/automated technology in the apparel industry in 2003 (15.2% cutting, 6.5% sewing, 13% ironing, and 1.4% air transportation systems) (CEC-ITAM, 2008), the rise of 35% in the capital/labor ratio between 2003 and 2013, and the 17% decline in labor productivity, we believe it is very likely that an increase in the degree of automation in the apparel industry in 2003-2013 would have been insignificant, making Mexico a clear example of the low automation of this industry in developing countries.

The scant penetration of new technologies in the apparel industry is not exclusive to developing countries, though, in particular when it comes to industrial robots, one of the technologies that has made the greatest leaps forward in the manufacturing industry. In 2013, globally, the manufacturing industry had 1.1 million industrial robots in operation, 26% more than in 2008, while in the same time period, the textile, leather, and clothing industries together went from 1,127 to 1,228 robots (IFR, 2015). Compared to industries like the automotive, electrical-electronics, metal, and plastics and chemical products sectors, the textile, leather, and clothing industries are lagging extremely behind in their usage of industrial robots, and furthermore, there is no foreseeable change in this trend.

Even though according to Byrne (1995), new technologies have managed to permeate the majority of stages/tasks in the apparel industry production process, the cost and flexibility of labor have gotten in the way of widespread adoption. The highest barrier to the penetration of new technologies resides in the sewing phase, because the heterogeneity of cuts and the flexibility of fabrics still present challenges for some automated equipment (Book *et al.*, 2010; Paraskevi, 2012). Michelini and Razzoli (2013) assert that the sewing process can be automated for mass production, but that the use of this technology is not compatible with the economies of scope that characterize the current markets.

## 4. Conclusions

This paper aimed to determine whether new production technologies have played a key role in the location of this industry, as they have in others. To do so, a distinction was made between communication and transportation technologies and new technologies (which transform the production process itself). The former permit multinational companies to break up the production process and relocate certain phases in different countries; here, wage costs have played a decisive role in the migration of production. By contrast, new technologies have not managed to permeate the industrial production process and, therefore, have not influenced its location.

Despite the major efforts made by the United States, Japan, and Europe to make the apparel industry more automated, new production technologies have not managed to become one of the top determinants of industry location. The forecast is that in the medium term, technology penetration in the industry will continue to be slow, as there are still unresolved problems, such as: the incapacity of equipment to manipulate flexible materials, and high costs and long timeframes required to reprogram production equipment. As such, it is unlikely that production processes will be relocated from developing (low wage) to developed countries.

Since the 1950s, the principal determinant of the relocation of production in the apparel industry has been labor costs. Wage discrepancies can explain four of the five production relocation waves: to Japan in the 1950s, to the three "Asian giants" in the 1970s and early 1980s; to continental China at the end of the 1980s and 1990s; and to Bangladesh and Vietnam, in the present day.

In a context with a migrating industry, it is worthwhile noting the role of quotas and trade agreements in the relocation of the apparel industry. In fact, the fourth migration of the industry, to Mexico and the Caribbean Basin, is primarily explained by trade agreements. Because the rapid growth in Mexican exports in this industry was tied to neither productivity nor competitiveness gains, but rather to factors outside of the industry, it is important to recall that the variation in exports is simply not a reflection of any change in the real competitiveness of countries.

The falling share of Mexican exports in the global total, starting in 2000, is primarily due to China's accession to the WTO and the implementation of the ATC, rather than to technological factors. In the medium term, a change in trend is expected, because the principal factor behind industry competitiveness will continue to be labor costs, and Mexico still has higher wages than various Asian countries, in particular, higher than the protagonists of the fifth industry relocation process.

High-salary countries have managed to retain the production of apparel items for certain niche markets in which comparative advantages are not tied to labor costs, but rather to factors such as: small production volumes adapted to the changing requirements of markets, high-quality production, fashion products for the high-end market, made-to-order clothing, products that require direct collaboration among designers, producers, and retailers, and items sensitive to production times.

Low wage costs were the reason behind the third wave of apparel industry relocation to continental China at the end of the 1980s and throughout the 1990s. However, nowadays, it is economies of scale, productivity, infrastructure, and governmental support which enable competitive production costs in order to retain industry production, even when labor costs are higher than in other countries throughout the region.

**Appendix 1.** Share of Top 20 Apparel Industry Exporter Countries in Global Exports, 1980-2014  
(Percentage Share)

<i>N</i>	<i>Country</i>	<i>19</i>	<i>Country</i>	<i>19</i>	<i>Country</i>	<i>20</i>	<i>Country</i>	<i>20</i>	<i>Country</i>	<i>20</i>	<i>Country</i>	<i>20</i>
<i>o.</i>		<i>80</i>		<i>90</i>		<i>00</i>		<i>05</i>		<i>10</i>		<i>14</i>
1	Hong Kong**	12.3	Hong Kong**	14.2	China	18.2	China	26.6	China	36.6	China	38.6
2	Italy*	11.3	Italy*	10.9	Hong Kong**	12.2	Hong Kong**	9.8	Hong Kong**	6.8	Italy*	5.1
3	South Korea**	7.3	China	8.9	Italy*	6.8	Italy*	6.7	Italy*	5.7	Bangladesh	5.1
4	Germany*	7.1	Germany*	7.3	Mexico	4.4	Germany*	4.4	Germany*	4.9	Hong Kong**	4.2
5	Taiwan*	6.0	South Korea**	7.3	United States*	4.4	Turkey	4.2	Bangladesh	4.2	Germany*	4.1
6	France*	5.7	France*	4.3	Germany*	3.7	India	3.1	Turkey	3.6	Vietnam	4.0
7	United Kingdom*	4.4	Taiwan*	3.7	Turkey	3.3	France*	3.0	India	3.2	India	3.7
8	China	4.0	Portugal*	3.2	India	3.0	Mexico	2.6	Vietnam	2.9	Turkey	3.5
9	United States*	3.1	Turkey	3.1	France*	2.7	Bangladesh	2.5	France*	2.8	Spain*	2.6
10	Belgium-Luxembo	2.5	United Kingdom	2.8	Bangladesh	2.6	Belgium*	2.4	Belgium*	2.2	France*	2.4

1	urg*		*									
1	Netherla	2.2	Thailand	2.6	South	2.5	United	1.8	Spain*	2.0	Netherla	1.9
1	nds*				Korea**		States*				nds*	
1	Finland*	1.8	United	2.4	Indonesi	2.4	Indonesi	1.8	Netherla	2.0	Belgium	1.8
2			States*		a		a		nds*		*	
1	India	1.7	India	2.3	United	2.1	United	1.8	Indonesi	1.9	United	1.7
3					Kingdo		Kingdo		a		Kingdo	
					m*		m*				m*	
1	Poland	1.6	Netherla	2.0		2.0	Netherla	1.7	United	1.5	Indonesi	1.6
4			nds*				nds*		Kingdo		a	
									m*			
1	Portugal	1.6	Belgium-	1.9		1.9	Vietnam	1.7	United	1.3	United	1.3
5			Luxembo						States*		States*	
			urg*									
1	Austria*	1.4	Philippin	1.6		1.5	Romania	1.7	Mexico	1.2	Cambod	1.2
6			es								ia	
1	Japan*	1.2	Greece*	1.6		1.4	Spain*	1.5	Thailand	1.2	Pakistan	1.0
7												
1	Singapor	1.1	Indonesi	1.5		1.4	Thailand	1.5	Pakistan	1.1	Sri	1.0
8	e**		a								Lanka	
1	Macao,	1.0	Singapor	1.5	Netherla	1.4	Pakistan	1.3	Malaysi	1.1	Malaysi	1.0
9	China		e**		nds*				a		a	
2	Yugoslav	1.0	Malaysia	1.2	Dominic	1.3	Tunisia	1.1	Denmar	1.0	Poland	1.0
0	ia				an				k*			
					Republic							
Sum		78		84		79		81		87		87
* Developed countries		41		36		24		23		23		22
* Newly industrialized countries		27		27		16		10		7		5
* Developing countries		11		22		38		48		57		60
Mexico (72)		0.0	Mexico (34)								México (21)	208

Notes: For 1980, the data from Germany refer to the Federal Republic of Germany. For 1990, the exports from the Federal Republic of Germany and the Democratic Republic of Germany were added together. For years prior to 1992, Chinese data were reported with the classification HS. For Mexico, export processing zones are included.

**Source:** Created by the authors based on data from the World Trade Organization, 2015.



<sup>1</sup>According to the OECD, the terms offshoring and outsourcing are sometimes used as synonyms. In this paper, outsourcing shall be understood to mean the acquisition of services from a company external to the firm that does the hiring; offshoring shall refer to the production of goods and services by an affiliate of the company located abroad.

<sup>2</sup>Work on this theme is based in large part on the unpublished papers of A. Martínez, a co-author of this paper.

<sup>3</sup>Rules 807/9802 permitted the exportation of textiles or cut fabrics to Mexico and other countries, and when the clothing was reimported into the United States, taxes were only charged on the value added in the *maquiladora* plant.

<sup>4</sup>2006 is the latest year for which disaggregate information for the *maquiladora* export industry was published.

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