

# E I P a s o Business Frontier



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## Maquiladora Industry: Past, Present and Future

*Although currently industry circumstances are less favorable than in the past, Mexico remains a competitor in the global production-sharing market in the long run.*

**M**exico's maquiladora industry is currently the focus of much attention on the border, in the media, in corporate boardrooms and among Mexican government officials. After seeing the maquiladora industry sustain its biggest employment decline ever in 2001, many observers are questioning the industry's future in Mexico.

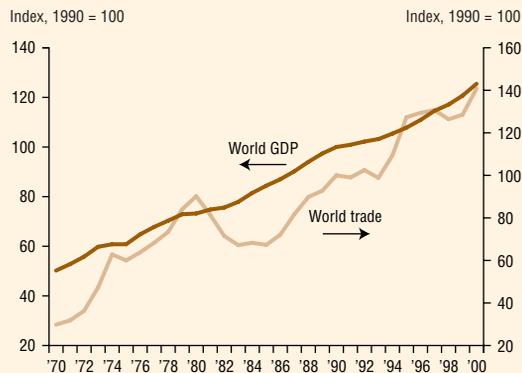
This article gives an overview of this important industry—from its inception in the 1960s to its heyday in the 1980s, the boom following the implementation of the North American Free Trade Agreement (NAFTA) and its current condition. We conclude that even though increased manufacturing activity in other countries such as China has produced a tougher global manufacturing market, Mexico remains attractive for foreign direct investment. However, structural reforms are needed to maintain the competitive advantages Mexico has developed over the past three decades.

### THE RISE OF PRODUCTION SHARING

The second half of the 20th century was marked by a dramatic increase in world trade. Between 1970 and 2000, world trade increased almost fivefold, or more than 370 percent. At the same time, world GDP increased 150 percent. Chart 1 shows the relationship between increasing world trade and rising world GDP. Trade allows countries to allocate natural, labor and capital resources more efficiently. As a result, productivity increases, which in turn improves income and, hence, living standards.<sup>1</sup>

Trade gains occur as nations specialize according to their comparative advantage. Comparative advantage implies that a country can produce a good or service at a lower opportunity cost than other countries. If this is the case, countries achieve efficiency by exporting goods and services with lower opportunity costs and importing goods and services with higher opportunity costs.

Chart 1  
World Trade and GDP, 1970–2000



SOURCES: International Financial Statistics; International Monetary Fund; World Trade Organization.

Production sharing has played a key role in the growth of world trade in recent decades. In production sharing, the processes used to manufacture a good are conducted in more than one country. Production sharing, or trade in intermediate goods, represents more than \$800 billion in trade annually, or at least 30 percent of world trade in manufactured goods.<sup>2</sup>

Several factors account for this remarkable upward trend in production sharing. First, large cross-country cost differences have arisen as richer countries have established more environmental and work-related rules. Second, falling tariffs—a byproduct of growing membership in the General Agreement on Tariffs and Trade (GATT) and the World Trade Organization (WTO)—have lowered the penalty on imports. Third, shipping and transportation costs have fallen dramatically as packing innovations increase storage and transport capacity.

In addition, information technology has reduced data, search and communication costs, making it much easier and less expensive for firms to set up and maintain offshore operations. For example, the Internet has enabled firms to more closely synchronize orders with inventories and sales, increasing efficiency and reducing operating costs. And finally, more firms have turned to production sharing to stay competitive. Once one firm initiates production sharing to cut costs, others are forced to do the same to maintain their competitive edge.

Traditional trade theory predicts that capital, and hence investment, flows to where the return is highest. This is typically where the supply of capital is scarce and labor is abundant. According to theory, capital-rich nations such as the United States should export capital to relatively capital-poor countries like Mexico and China. This was

the thinking in the 1960s, when Mexico implemented economic development initiatives like the maquiladora program on its northern border to take advantage of production sharing. The border area had little capital investment but a plentiful labor force.

Today, maquiladora-led U.S.–Mexico trade is primarily intra-industry trade. About 80 percent of U.S. trade with Mexico is intra-industry.<sup>3</sup> This article follows the development of Mexico's maquiladora industry in an era of increasing world trade and global production sharing.

## INTRODUCTION OF MAQUILADORAS

The impetus for the maquiladora program, initially called the Border Industrialization Program, came in 1965 after the United States terminated the Bracero program. The main objective of the Bracero program was to bring in Mexican workers to fulfill U.S. agricultural labor demand. The end of the Bracero program left thousands of unemployed farm workers in Mexican border cities.

The maquiladora program was designed to alleviate the resultant unemployment and growing poverty. Contrary to Mexico's Import Substitution Industrialization regime at that time, the maquiladora program's intent was to subsidize foreign manufacturers that set up plants on the Mexican side of the border, creating jobs for Mexican workers. The maquiladora program allowed plants to temporarily import supplies, parts, machinery and equipment necessary to produce goods and services in Mexico duty-free as long as the output was exported back to the United States. The United States, in turn, taxed only the value-added portion of the manufactured product.

The maquiladora industry experienced slow but steady growth during the early years. By 1969, 147 companies, employing about 17,000 workers, were registered under the Border Industrialization Program. The first two industrial parks were built almost simultaneously in Ciudad Juárez, across from El Paso, Texas, and Nogales, across from Nogales, Arizona. Tijuana and Mexicali, across from San Diego and Calexico, California, respectively, and Reynosa and Matamoros, across from McAllen and Brownsville, Texas, followed.

U.S. firms responded enthusiastically to the lure of cheap labor, particularly in electronics, textiles, footwear and toys and, later, in auto parts. RCA, Convertors, Sylvania, Centralab, Acapulco Fashion and Ampex were among the first U.S. companies to set up maquiladora operations. The new industry was not immune to business cycles, however. It suffered its first crisis in 1974 when maquiladora employment fell 11.5 percent in response to a U.S. recession.

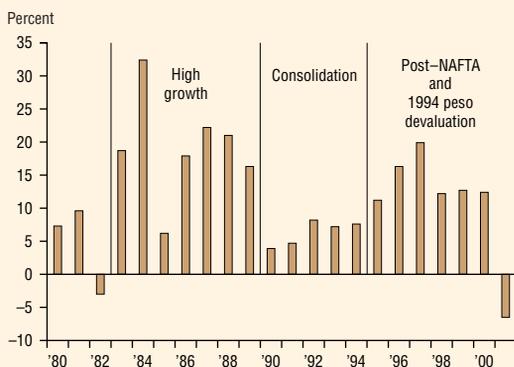
### THREE STAGES OF MAQUILADORA GROWTH

After the initial phase, maquiladora industry employment growth falls into three periods: high growth (1983–89), consolidation (1990–94) and post-NAFTA growth (1995–present) (*Chart 2*). The high-growth era started with the 1982 peso devaluation. Because most maquiladoras have dollar-denominated budgets but pay costs in pesos, the 1982 devaluation substantially reduced peso-denominated operating costs. In 1986, Mexico also joined GATT, abandoning 42 years of protectionism and antitrade sentiment. Mexico started to eliminate its complicated import-licensing program and reduce high import tariffs. Consequently, maximum tariff rates in Mexico fell from 60 percent to 15 percent by 1990.<sup>4</sup> These changes began to attract more foreign companies to Mexico. From 1983 to 1989, maquiladora employment grew at an annual average rate of 19.2 percent.

The deceleration and consolidation era was characterized by a strong peso performance—from 1990 to 1994, the peso depreciated only 3 percent per year—and continuing economic openness. In 1992, Mexico signed a free trade agreement with Chile, and the following year it joined Asia–Pacific Economic Cooperation, the primary regional vehicle for promoting open trade and economic cooperation among Asian–Pacific economies. The next year, Mexico finalized NAFTA with the United States and Canada and became a member of the Organization for Economic Cooperation and Development. During the 1990–94 period, maquiladora employment grew an average 6.3 percent per year.

Mexico's December 1994 peso devaluation and the recently signed NAFTA gave a second boost to the maquiladora industry. The peso depreciation

**Chart 2**  
**Three Stages of Maquiladora Growth**  
*(Annual employment growth)*



SOURCE: Instituto Nacional de Estadística, Geografía e Informática.

**Chart 3**  
**Top Foreign-Exchange Generators for Mexico**



SOURCES: Oil, PEMEX (data through 1987); Banco de México; Secretaría de Hacienda y Crédito Público; Instituto Nacional de Estadística, Geografía e Informática. Maquiladoras, remittances and tourism, Banco de México.

of over 60 percent encouraged maquiladoras to again expand operations. Maquiladora employment grew 11 percent per year, on average, from 1995 to 2001. By 2001, overall maquiladora employment had increased 300-fold since 1967, and maquiladora exports represented almost half of Mexico's total exports. In addition, the maquiladora industry generated more than \$19 billion in foreign exchange that same year. In fact, since 1998 maquiladoras have been Mexico's top foreign-exchange generator, followed by oil and natural gas, migrant remittances and tourism (*Chart 3*). Further, the industry employs almost 10 percent of Mexico's formal sector workers, equivalent to about 3 percent of the country's total labor force.

### EVOLUTIONARY CHANGES

Trends in maquiladora employment do not tell the whole story. While jobs have grown, maquiladoras themselves have changed drastically since 1965. Carrillo and Hualde classify maquiladoras into three generations based on the nature of their manufacturing operation.<sup>5</sup> First-generation maquiladoras are typical of the earliest plants: labor-intensive with limited technology and dependent on decisions made by parent companies and principal clients. Textile maquiladoras are a typical example.

Second-generation plants are oriented less toward assembly and more toward manufacturing processes. Such firms use automated and semi-automated machines and robotics. In addition, they employ more technicians and engineers. Maquiladora plants that manufacture auto harnesses, television sets and electrical appliances are examples of second-generation plants.

Third-generation maquiladoras are oriented toward research, design and development. They

rely on highly skilled labor, such as specialized engineers and technicians. According to Carrillo and Hualde, technological dependence on the parent company disappears in third-generation maquiladoras, and thus the decisionmaking becomes autonomous. By reducing project length, operating costs and manufacturing time, producers become more competitive. However, they are still evaluated and certified by clients. Delphi Corp.'s Mexico Technical Center in Ciudad Juárez is a good example of a third-generation maquiladora. Delphi's Juárez operation employs about 700 Mexican engineers to develop patented products, such as oil sensor and brake systems for automobiles.

## CURRENT CHALLENGES

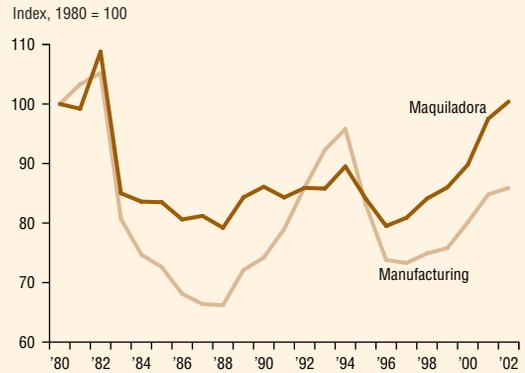
The 2001 U.S. recession took a heavy toll on Mexico's maquiladora industry. From October 2000 to June 2002, the industry lost more than 240,000 jobs; plants in border states accounted for about 76 percent of these losses. Although the layoffs along the border have far outweighed those in the interior, the proportions reflect the concentration of maquiladora jobs in border states, which account for about 77 percent of total maquiladora employment. The number of maquiladora plants has also been affected. Whereas employment growth turned negative in October 2000, the net number of plants began to fall a bit later, in mid-2001. From May 2001 to June 2002, about 420 plants closed, three-fourths of them in border states.

The size of the industry's contraction during the most recent recession suggests there are more factors at work than simply the effects of a mild business cycle. The maquiladora industry faces some serious domestic challenges, including increasing labor costs and an environment of unprecedented fiscal uncertainty.

Whereas in the past recurring peso devaluations helped maquiladoras control costs, Mexico's recent macroeconomic stability has kept the peso strong. Maquiladora wages, which account for about 51 percent of total maquiladora value added, have grown consistently since 1996. It bears noting that despite recent progress, real maquiladora wages surpassed 1980 levels only this year (*Chart 4*). However, other Mexican wages, such as the manufacturing wage and minimum wage, still remain well below their 1980 levels, down 14 percent and 69 percent, respectively. In addition to employment benefits established by law, maquiladoras face the added expense of providing workers with transportation and food subsidies. Also, some maquiladoras have worked with the Mexican government to build adequate and affordable housing for workers and assist them with financing.

Another persistent domestic challenge is fiscal

Chart 4  
Hourly Wages: Maquiladora vs. Manufacturing



NOTES: Both wage indexes include fringe benefits. Data for 2002 are for January through May.

SOURCES: Instituto Nacional de Estadística, Geografía e Informática; Banco de México.

uncertainty. Two 1990s tax law changes, “permanent establishment” and NAFTA Article 303, threw the maquiladora industry into fiscal confusion with regard to both income and customs taxation. The permanent establishment (PE) clause, added to the Mexican tax code in 1998 and slated to take effect in 2000, repealed the transitory status of maquiladoras and required them to pay Mexican income taxes in much the same way as the domestic manufacturing industry.<sup>6</sup>

However, because the U.S. government would not credit U.S. multinational corporations operating in Mexico any tax paid to the Mexican government, the PE clause would have entailed double taxation of maquiladora income. To temporarily resolve this problem, in 1999 Mexican and U.S. tax authorities created exceptions to the PE clause with two provisions referred to as “safe harbor” and advance pricing agreements (APAs).<sup>7</sup> To qualify for an APA, a maquiladora submits a tax proposal to the government. Unfortunately, response times have been long; some maquiladoras are still waiting to find out their tax liability from two or three years ago. To make matters worse, safe harbor and APA rules were set to expire in December 2002. In August, Mexican officials prolonged the fiscal uncertainty by extending the deadline to late 2007—apparently passing the responsibility of resolving this issue to the next administration. Thus, long-term financial planning is still not possible for maquiladoras and is a significant deterrent to further investment in Mexico-based operations.

NAFTA Article 303 represents another aspect of fiscal uncertainty for maquiladoras. As of January 2001, Article 303 eliminated duty-free imports from non-NAFTA countries. The maquiladora in-

dustry anticipated a large negative effect on operations as many components and other inputs would become subject to tariffs. In response to the industry's appeals, in December 2000 the Mexican government passed a decree creating 20 Sectoral Promotion Programs, one for each maquiladora sector, to protect the tariff-free entry of non-NAFTA components not readily available on the domestic market. Sectoral Promotion Programs (Programas de Promoción Sectorial, or PROSECS) allow maquila and nonmaquila companies to apply for reduced tariffs of 0 to 5 percent.<sup>8</sup> Despite the welcome reprieve from Article 303, maquiladoras that apply for a PROSEC must undertake extensive paperwork to track the origin of thousands of parts used in the production process.

## RISING GLOBAL COMPETITION

Another challenge to the maquiladora industry is rising global competition. The advantages of operating plants in Mexico, such as low wages and tax incentives, are now offered by a great number of developing countries. At the same time, location has become less important as innovations in transportation and technology lower shipping costs.

Countries around the globe have adopted export-oriented manufacturing programs similar to the Mexican maquiladora industry. Central European countries offer prospective assembly plants tax-free imports of components and five- to 10-year tax holidays on profits. For example, companies such as Audi AG, General Motors Corp., Ford Motor Co., Suzuki Motor Corp., IBM Corp., TDK Corp., Sony Corp., Royal Philips Electronics and Samsung now operate in Hungary, producing largely for the export market. India and Pakistan have export-processing zones that offer export-oriented industries fiscal and institutional incentives as well as fully developed infrastructure in the form of industrial parks.

Mexico has been especially concerned about the opening up of China's economy. It was initially opposed to China's entry into the WTO last year. Analysts estimate that China will generate 10 million jobs in services, textiles, garments and nonfarm rural activities in its first five years of WTO membership. There are plenty of anecdotes of maquiladora plants moving operations from Mexico to China. The transfer of a Royal Philips Electronics plant and 900 jobs to China surprised Ciudad Juárez in early July. A month earlier Arneses de Juárez, an auto parts maquila, laid off about 800 employees and moved its operation to China. Sanyo Electric Co. closed two of its six Tijuana plants last year, laying off 1,884 employees; the video components Sanyo once made in Tijuana

are now produced in China and Indonesia. Canon shut an inkjet printer factory in Tijuana in March and joined the exodus to Asia by shifting production to Vietnam.

Although China is clearly becoming a leading choice for many multinational manufacturing firms, obstacles remain to long-term Chinese economic development and continued growth. These include heavy reliance on government spending, rising public debt, insolvent state-owned banks and companies, extensive state pension liabilities, low rural incomes, high unemployment, huge disparities in regional development, and undeveloped legal and commercial systems.<sup>9</sup>

## IMPLICATIONS FOR THE FUTURE

Measured in today's dollars, world trade is 10 times what it was in 1958, and production sharing has been key to this growth. Through its maquiladora program, Mexico has loomed large in the intra-industry trade boom. Maquiladora employment has grown 300-fold since 1967, and maquiladora exports now account for half of Mexico's total exports. Some maquiladoras have evolved from first-generation plants—labor-intensive with limited technology—to third-generation businesses that perform research, product design and development. In recent years, however, the maquiladoras have faced increasing labor costs, fiscal uncertainty and fierce competition from other developing countries.

For Mexico to remain a key player in global production sharing, changes are needed. The government must introduce structural reforms as well as clear and definite tax rules. Further, the maquiladora industry must focus on developing more efficient processes. Managers can no longer rely on peso devaluations to absorb increasing labor costs. Some maquilas are introducing new production techniques, such as "lean manufacturing" and cross-training, to achieve higher productivity growth. Thus, as more capital-intensive manufacturing becomes the norm, employment growth will likely be slower than in the past although wages should be higher.

The challenges facing the maquiladora industry provide an opportunity for positive change. Although currently industry circumstances are less favorable than in the past, Mexico remains a competitor in the global production-sharing market in the long run.

—Jesus Cañas and Roberto Coronado

*Cañas and Coronado are economic analysts in the Research Department at the El Paso Branch of the Federal Reserve Bank of Dallas.*

## NOTES

- <sup>1</sup> Douglas A. Irwin and Marko Tervio (2002), "Does Trade Raise Income? Evidence from the Twentieth Century," *Journal of International Economics* 58 (October), pp. 1–18.
- <sup>2</sup> Alexander J. Yeats (1998), "Just How Big Is Global Production Sharing?" The World Bank Policy Research Working Paper no. WPS 1871 (Washington, D.C., January).
- <sup>3</sup> Roy J. Ruffin (1999), "The Nature and Significance of Intra-industry Trade," Federal Reserve Bank of Dallas *Economic and Financial Review*, Fourth Quarter, pp. 2–9.
- <sup>4</sup> See Secretaría de Economía, [www.economia.gob.mx](http://www.economia.gob.mx).
- <sup>5</sup> Jorge Carrillo and Alfredo Hualde (1998), "Third Generation Maquiladoras? The Delphi-General Motors Case," *Journal of Borderlands Studies* 13 (Spring), pp. 79–98.
- <sup>6</sup> This ruling requires maquiladoras to pay Mexican income taxes on the share of their income derived in Mexico, plus a 1.8 percent asset tax on their machinery, equipment and inventories. See James Gerber (2001), "Why Aren't All the Maquilas Located in Chiapas? A Re-examination of the Low Labor Cost Hypothesis." Presented to the Center for U.S.–Mexico Studies, University of California, San Diego, May.
- <sup>7</sup> "Safe harbor" allows firms to avoid permanent establishment designation by electing to pay a 6.9 percent tax on assets employed in Mexico or a 6.5 percent tax on the cost of the maquila operations, whichever is greater. If profits are less than either of these two amounts, maquiladoras have the option of signing an advance pricing agreement, which covers the methodology used to calculate the costs of production and the value of assets. See Gerber (2001).
- <sup>8</sup> To apply for a PROSEC, maquiladoras must ascertain that the finished product is covered by one of the 20 PROSECS. Then, they must identify if the input that needs to be imported is included in the list of inputs covered. If a firm uses the same input in production of different final goods that fit into more than one sector, then the firm must register for all the applicable PROSECS. If the same input has different import duties in different sectors, then the firm will pay the duties specified for the input that will be used for production of goods in a specific sector. The number of parts or components/inputs used in maquiladoras' manufacturing processes varies by industry. For instance, the electrical and

electronics sectors use, on average, 3,916 and 4,303 components/inputs, respectively. The automobiles and auto parts sector uses 2,292 components/inputs. See *NAFTA Works*, Vol. 6, Issue 1, January 2001 (Washington, D.C., U.S. Embassy of Mexico, SE-NAFTA Office).

- <sup>9</sup> Ralph Watkins (2002), "Mexico Versus China: Factors Affecting Export and Investment Competition," *Industry Trade and Technology Review* (Washington, D.C., U.S. International Trade Commission, July).

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