

## LUCINDA VARGAS

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Prior to joining the Federal Reserve Bank, Ms. Vargas was Senior Economist and Director of International Services at CIEMEX-WEFA (formerly known as Wharton Econometric Forecasting Associates)-an economic forecasting company based in the Philadelphia area. Under this position, Ms. Vargas was responsible for analyses and forecasts of Mexico's maquiladora industry and for the production of several publications, including CIEMEX-WEFA's *Maquiladora Industry Analysis* and *Mexican Economic Outlook*.

Ms. Vargas also worked as a Research Manager for Grupo Bermúdez Industrial Developers in Cd. Juárez, Chihuahua, Mexico, and has held research positions at the U.S. Treasury Department in Washington, D.C., and at the University of Texas at El Paso's Center for Inter-American and Border Studies. In addition, Ms. Vargas has conducted independent research on U.S.-Mexico border issues and market opportunities in Mexico and has been a lecturer at several universities in the United States and Mexico in the areas of microeconomics, international trade, the Mexican economy and Latin American economic development.

Ms. Vargas has an M.A. in economics from the Pennsylvania State University and a B.B.A. in economics from the University of Texas at El Paso. Ms. Vargas is a native of the U.S.-Mexico border: she was born in El Paso, Texas, and raised in Cd. Juárez, Chihuahua, Mexico.

### **Articles in Dallas Fed Publications:**

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# **“Importance of the Maquiladora Industry for the Mexican and U.S. Economies and Its Relevance to the U.S. Trade Deficit”**

## **Complete Report to Testimony Remarks before the U.S. Trade Deficit Review Commission**

**by  
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**January 21, 2000**

Mexico's maquiladora industry is part of a worldwide phenomenon more commonly known as production sharing. Through the maquiladora framework, foreign manufacturers—predominantly U.S. companies—are able to locate labor-intensive operations in labor-abundant Mexico, thus achieving lower labor costs in the overall production process. Mexico, in turn, receives investment-factories, machinery and equipment, state-of-the-art production technology—from countries such as the United States that have a relative abundance of capital. Thus, Mexico is able to attract some of the foreign direct investment it needs to grow.

Maquiladoras have not only become an increasingly significant component of the Mexican economy, they are also an important part of U.S. corporate strategy in achieving competitively priced goods in the world marketplace. As a result, consumers worldwide reap the benefits of maquiladora production in the form of lower-priced goods. This report examines the importance of the maquiladora industry for both the U.S. and Mexican economies and looks at the relevance of maquiladora trade flows to the U.S. trade deficit.

### **Importance for Mexico**

**Jobs, Exports and Foreign Exchange.** In 1998, the maquiladora industry stood at nearly 3,000 plants with over a million workers, and growth continues strong this year. During January–October 1999, plants and employment grew at 10.7 percent and 12.8 percent, respectively, relative to the year-earlier period. **Table 1** summarizes the industry's key indicators for 1998 and for the period January–October 1999. **Chart 1** shows the industry's principal sectors: electronics, transportation equipment, and textiles and apparel. Together, these three sectors represented over 74 percent of maquiladora employment and nearly 80 percent of maquiladora production during January–October 1999.

The maquiladora industry's importance for the Mexican economy has been increasing over time, especially in the areas of job creation, exports and foreign exchange. **Chart 2** shows the industry's employment growth trend from 1983 through 1998. During this period, maquiladora employment grew at an average rate of 14.1 percent per year. Maquiladora employment growth has been so dynamic, especially visa-vis growth in the Mexican economy, that its share in formal and manufacturing employment has risen considerably.\* In 1998, maquiladoras provided almost 8 percent of Mexico's formal employment, up from just over 2 percent in 1983. They accounted for a greater share of the country's manufacturing employment—almost 28 percent—up from 7.2 percent in 1983. Undeniably, maquiladoras have been very important to Mexico in job creation.

As a key component of Mexico's export platform, the maquiladora industry also contributes to enhancing the country's place in the world economy. **Chart 3** depicts the industry's export growth since 1983. On an average annual basis, maquiladora exports grew 20.4 percent during 1983-98 and totaled almost \$53 billion last year. During the first six months of this year, maquiladora exports grew 16.4 percent relative to the year-earlier period and represented almost 46 percent of the country's total exports and the majority—51.1 percent—of its manufacturing exports.

The maquiladora industry's solid export record has placed it among Mexico's top foreign exchange generators, affording the country a stronger position in its external-sector accounts. As **Chart 4** shows, since the early 1980s maquiladoras have been Mexico's second-largest source of foreign exchange, after oil. However, in 1998, because of the precipitous drop in the oil price—and the maquiladora industry's continued robustness last year—foreign exchange generated through oil fell behind that of maquiladoras for the first time, making maquiladoras the country's top foreign exchange source. Last year, maquiladoras contributed \$10.3 billion in foreign exchange for Mexico. The figure through October 1999 was already at \$10.9 billion.

**Regional and Technological Development.** The maquiladora industry has also contributed to Mexico's regional and technological development. Maquiladoras are concentrated in Mexico's northern border states, specifically in cities adjacent to the United States. The two most important locations are Ciudad Juárez, Chihuahua (across from El Paso, Texas), and Tijuana, Baja California (across from San Ysidro and San Diego, California). Together, these two cities represented 35 percent of Mexico's total maquiladora industry employment in 1998 and 39 percent of its maquiladora production. For all border cities combined, 1998 maquiladora employment and production shares were 65.5 percent and 73.4 percent, respectively.

Before the maquiladora program's implementation, cities along Mexico's northern border had among the highest unemployment rates in the country, typically in double digits. Because of the industry's settlement in these cities and its consistent employment growth, these two locations now have among the nation's lowest unemployment rates. Last year, the open unemployment rate in Ciudad Juárez and Tijuana was more than 2 percentage points below the national average (**Chart 5**).<sup>2</sup> The maquiladora industry has become so important in border cities that in Ciudad Juárez, for example, more than 57 percent of all jobs came from maquiladora companies in 1998. Moreover, the overwhelming majority of the city's manufacturing jobs—85.4 percent—was attributable to these companies.

When Mexico's maquiladora program began in 1965, most maquiladora companies were basically assembly operations requiring unskilled labor. The industry has evolved significantly over the years to where the maquiladora factory floor now involves much more sophisticated production techniques. Concomitantly, maquiladora operations have increasingly required much more skilled labor. For example, during January-October 1999, technicians represented 12 percent of maquiladora employment, compared with 8.8 percent in 1975. Moreover, the skill level of the maquiladoras' largest labor component—direct line workers<sup>3</sup>—has been upgraded to suit newer technologies.

Some of the highest state-of-the-art production technology in Mexico today is found in maquiladora companies. Research and design centers are now part of the maquiladora landscape as well. A key example of this is the Delphi Mexico Technical Center in Ciudad Juárez. This center, which until recently was part of the General Motors maquiladora production infrastructure, is dedicated to the research and design of auto parts used by General Motors cars throughout the world. Considered the most advanced of 27 such centers around the world, it employs some 2 1,500 workers at 15 plants in Ciudad Juárez. Opened in April 1995, the center doubled capacity within four years. Mexico is thus proving to be a formidable production site at all levels of the manufacturing technology spectrum.

The regional and technological development that maquiladoras have brought to the border is spreading to Mexico's interior as more and more maquiladoras locate there.<sup>4</sup> Maquiladora growth in the interior is helping alleviate some of the physical and social infrastructure pressures that dynamic growth has brought to the border cities. However, because border growth is still very strong, it continues to attract people from the interior. This has created problems for some border locations, such as insufficient or inadequate housing for maquiladora workers. Maquiladora companies are now working with the Mexican government to build adequate and affordable housing for workers and assist them with financing. The first such program was launched by Delphi Automotive in 1997. Since then, other large maquiladora companies have followed with similar programs.

## **Importance for the United States**

**International Competitiveness.** Maquiladoras have offered an important investment option for U.S. companies wanting to locate in Mexico. Since its inception, the maquiladora program has allowed for the duty-free importation of materials into Mexico' and for 100 percent foreign ownership of operations. These features—which predated Mexico's current policy of freer foreign trade and investment by almost three decades—plus Mexico's availability of low-cost labor relative to the United States resulted in U.S. companies creating maquiladoras for their labor-intensive manufacturing processes. Examples of industries that have a labor-intensive work component are the top three maquiladora production sectors mentioned earlier: electronics, transportation equipment, and textiles and apparel. By generating important labor-cost reductions through their maquiladora operations, U.S. companies have been able to remain competitive in the world marketplace and thus have retained or even increased their world market share in the production of goods in these and other sectors.

A case in point is the U.S. auto industry. During the mid- to late 1970s, the U.S. auto industry faced intense competition from Japanese carmakers and, as a result, saw its world market share fall. In response to these developments, the U.S. auto industry restructured to become more competitive internationally, and part of its restructuring strategy involved more use of production-sharing operations. Thus, as their maquiladora operations grew from the early 1980s onward, U.S. automakers were able to regain some of the market share they had lost and maintain a stable share since-despite continued intense competition from Asian and other foreign carmakers.

**Lower-Priced Consumer Goods.** Maquiladora production ultimately garners the largest benefits for the U.S. consumer—indeed, the world consumer—since this strategy results in lower-priced consumer goods than would be the case if the goods were produced entirely in the United States. The price of U.S.-brand-name cars today is lower because the U.S. automobile industry—like the auto industry in the rest of the world—has made extensive use of production-sharing operations. If U.S. automakers were forced to produce cars entirely in the United States, they would face wage rates that in 1998 were almost \$22 per hour. Under maquiladora production-sharing operations, they can achieve wage rates on their labor-intensive production operations of around \$5 per hour. Clearly, such cost benefits in a competitive environment have translated into lower-priced cars for the consumer.<sup>6</sup>

**Production Sharing, U.S. Content and U.S. Jobs.** Mexico's maquiladoras are just one example of the production sharing that takes place between U.S. companies and countries throughout the world. However, maquiladoras represent the preferred production-sharing strategy of U.S. producers. Moreover, given the proximity of maquiladoras to the United States, these operations have a high degree of U.S. content (raw materials and components originating in the United States).

In 1997, over 36 percent of total U.S. production-sharing imports came from Mexico. The next highest source was Japan, with 20 percent, followed by the Dominican Republic, with 3.4 percent.<sup>7</sup> For certain products, the maquiladora share of U.S. imports coming from Mexico is almost absolute. For example, 99.7 percent of total 1997 U.S. imports of motor vehicles from Mexico and 99.8 percent of television receivers came from maquiladoras. Indeed, through its maquiladora industry, Mexico is the leading exporter of television sets to the United States.<sup>8</sup>

Mexico's use of U.S. components relative to U.S. production-sharing operations in other parts of the world is substantial. In 1997, 58 percent of the value of U.S. components incorporated in worldwide production-sharing operations was derived in Mexico. In the case of motor vehicles, while U.S.-made parts represented 56 percent of the value of finished vehicles imported from Mexico under production sharing, they represented only 1 percent of the value of vehicles imported from Japan and Germany.

This high degree of U.S. content in Mexican maquiladoras highlights, in yet another way, the production sharing between maquiladoras and U.S. producers. According to the U.S. International Trade Commission, 82 percent of the materials imported by maquiladoras and similar operations are of U.S. origin.<sup>9</sup> This translated into \$3.1 billion worth of U.S.

components used by the industry in 1998. Moreover, these U.S. supplier industries are usually higher-tech manufacturers that employ thousands of high-skilled workers throughout the United States. In fact, a 1988 survey of maquiladora companies in Ciudad Juarez alone showed that maquiladoras in this city had suppliers in every U.S. state except Hawaii.” Even though the nature and importance of suppliers varied across the different maquiladora companies surveyed, there were substantial linkages with the U.S. economy.

Thus, maquiladoras support U.S. jobs through their extensive use of U.S. suppliers. Because U.S. production-sharing operations in East Asia are not as reliant on U.S. suppliers as are maquiladoras, the positive impact on U.S. employment of these more distant operations is either absent or not as significant. Also, because some U.S. companies have been able to stay in business as a result of their maquiladora production-sharing strategy, we can assume that without such a strategy and unable to cope with intense international competition, these companies would likely have closed and the direct U.S. jobs they now support would not exist. Hence, for all these reasons, maquiladoras help preserve U.S. jobs and generate new jobs in the long run.”

**Border Development.** The maquiladora industry’s large presence on Mexico’s northern frontier has resulted in important benefits to U.S. border cities. Because of the maquiladora industry’s large trade flows going through border ports of entry, transportation and customs services and the industrial real estate sectors have flourished on the U.S. side. Maquiladoras also create jobs in the legal, accounting and financial professions. Even the hotel, car rental and restaurant industries in border cities profit from maquiladoras since corporate personnel and other maquiladora visitors usually stay and eat on the U.S. side.<sup>12</sup>

Beyond the service industry, however, the U.S. border is increasingly benefiting from maquiladoras in manufacturing. Because maquiladora companies use the just-in-time inventory system, they have been urging and even requiring their suppliers in the United States and elsewhere to locate closer to them. This has prompted maquiladora suppliers to expand or even relocate their operations to cities like El Paso. An example of a maquiladora supplier industry that has been attracted to El Paso is plastic-injection molding.

In 1998, there were over 50 plastic-injection molding companies in El Paso with some 3,700 employees. These companies mostly service the maquiladora industry across the border in Ciudad Juarez in sectors that range from automotive and computers to medical and consumer goods. Moreover, employment in plastics manufacturing in El Paso—up 85 percent since 1990—is highly skilled. From 1990 through 1998, for example, the hourly compensation rate paid by this sector was, on average, 2 1.5 percent higher than the apparel sector, El Paso’s largest and most established manufacturing sector.<sup>13</sup>

For a city like El Paso, which, like most U.S. border cities, has a high unemployment rate relative to the nation, its maquiladora linkages are important to the extent that they raise the city’s overall employment level. Also, since the jobs that maquiladoras create in El Paso are in the white-collar professions or in higher-skilled manufacturing, maquiladoras also work to move the city up the economic ladder.

## Relevance to the U.S. Trade Deficit

In 1998, the U.S. trade balance with Mexico equaled a deficit of nearly \$16 billion, composed of \$78.8 billion of U.S. exports to Mexico and \$94.6 billion of imports from Mexico. A sizable portion of U.S.-Mexico trade is through the maquiladora industry. In 1998, nearly 40 percent of total U.S. merchandise exports to Mexico and over 55 percent of total U.S. merchandise imports from Mexico were maquiladora-related. **Chart 6** shows the overall U.S.-Mexico trade balance (*trend A*), the “maquiladora only” portion of this trade (*trend B*), and the trade balance that would result if the maquiladora portion were excluded from U.S.-Mexico trade (*trend C*). As can be observed, the “maquiladora only” trade balance (*trend B*) sustains a deficit throughout the observation period 1990-98, so that if this portion of U.S.-Mexico trade is assumed away (U.S.-Mexico trade without maquiladoras) the overall trade balance would predominantly yield a surplus (*trend C*).

However, because maquiladora production is, in large measure, the processing and manufacturing of U.S. imports of raw materials and components, the final maquiladora export to the United States that results from this process can be viewed as a re-exportation. That is, materials and components that the U.S. exports to the maquiladora industry are processed and then exported back to the United States. Hence, the share of maquiladora export production that originated in the United States should not be counted, strictly speaking, as part of the value of the final Mexican maquiladora export to the United States. **Chart 7** shows Mexico’s maquiladora exports to the United States and the corresponding value of those exports that originated in the United States as an export to the maquiladora industry.

If, therefore, the “true” or “actual” value of a maquiladora export to the United States is considered to be the value that would result after the portion that originated in the U.S. is discounted from the export value, the resulting trend in the “maquiladora only” trade balance would be very different than the one mentioned earlier. In fact, this “actual” maquiladora trade balance would show a surplus (**Chart 8, trend B**) throughout the observation period rather than a deficit (**Chart 6, trend B**). If we then see how this “actual” maquiladora trade balance would impact the overall U.S.-Mexico trade balance, and, further, see what happens when this “maquiladora only” trade balance is assumed away, the resulting outcomes would be (1) a sustained U.S. trade surplus with Mexico when maquiladora “actual” trade is considered (**Chart 8, trend A**), and (2) a sustained U.S. trade deficit with Mexico if no maquiladora trade were taking place under its “actual” or more accurate valuation (**Chart 8, trend C**).

Irrespective of whether a trade deficit or a surplus is considered good or bad, it is important to recognize that maquiladora trade flows as they are included now in the trade statistics yield a very different net result for the trade relationship between the United States and Mexico (deficit) than if such trade flows were accounted for more accurately to reflect maquiladora exports to the United States only after being discounted by the portion that first originated in the United States as a maquiladora export to Mexico (surplus). Also, whether maquiladora trade flows push the overall U.S.-Mexico trade balance into a deficit or a surplus position is not as relevant as recognizing that these trade flows are simply a part of a single, integrated production-sharing manufacturing process that benefits both the U.S. and Mexican economies.

## Conclusion

Overall, the maquiladora industry is an important positive force behind the growth and development of both the Mexican and U.S. economies. It has proved to be a consistent engine of job, export and foreign exchange growth in Mexico. Maquiladoras have also contributed to Mexico's regional and technological development. For the United States, the maquiladora industry has proved to be a vehicle by which U.S. industry has retained or even enhanced its international competitiveness and has resulted in lower-priced goods for consumers. Moreover, the high degree of U.S.-generated content in maquiladora operations reflects important production and employment linkages between maquiladoras and producers throughout the United States. For U.S. border cities-traditionally high-unemployment locations-the presence of maquiladoras across the border has translated into more abundant and better-paying jobs. Finally, whether maquiladora trade flows contribute to a deficit or a surplus position in the U.S. trade balance with Mexico, this has less significance than if they are simply considered part of an integrated production-sharing process that results in important benefits for both the U.S. and Mexican economies.

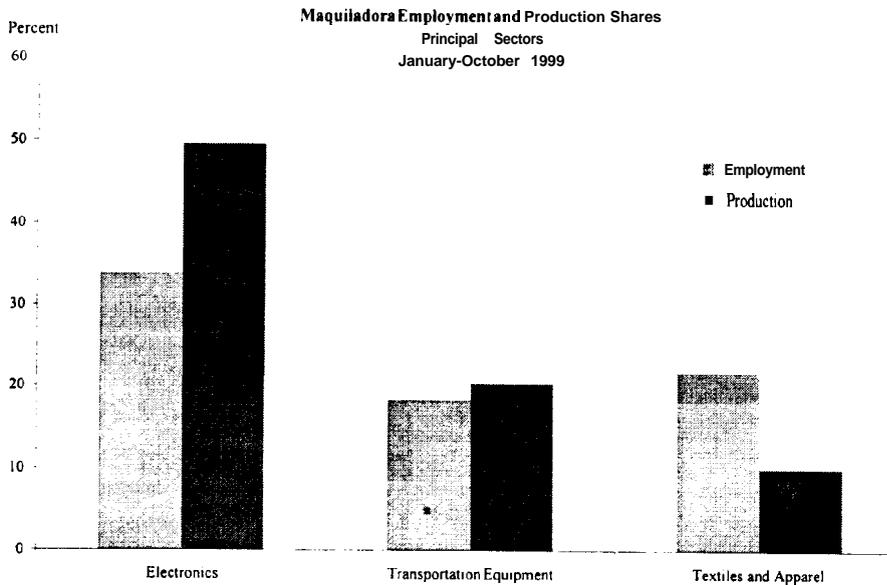
Table 1

**Maquiladora Industry -Key Indicators**

	% Change		Jan-Oct 1999	% Change	
	1998	Year Ago		Year Ago	Year Ago
<b>Plants</b>	2,983	9.8	3,272	10.7	
<b>Employment</b>	1,008,031	12.2	1,128,238	12.8	
<b>Total Raw Materials</b> <i>(Billions of U.S. dollars)</i>	39.1	8.8	37.7	16.4	
<b>Imported</b> <i>(Billions of U.S. dollars)</i>	38.1	8.4	36.7	16.1	
<b>Domestic</b> <i>(Billions of U.S. dollars)</i>	1.1	28.2	1.1	243	
<b>Value Added</b> <i>(Billions of U.S. dollars)</i>	10.6	19.4	10.9	25.6	
<b>Exports</b> <i>(Billions of U.S. dollars)</i>	52.9	17.0	51.6	19.4	

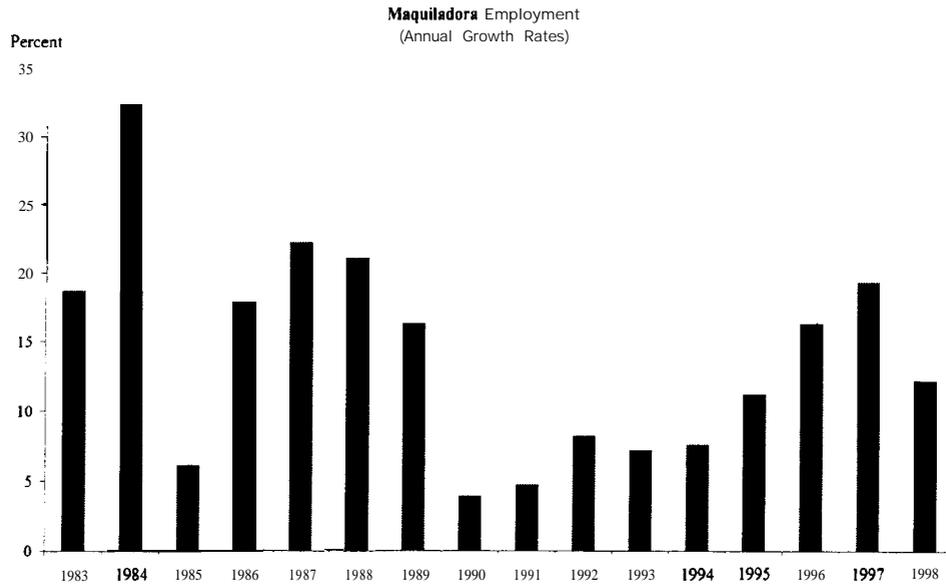
SOURCE OF PRIMARY DATA: Instituto Nacional de Estadística, Geografía e Informática.

Chart 1



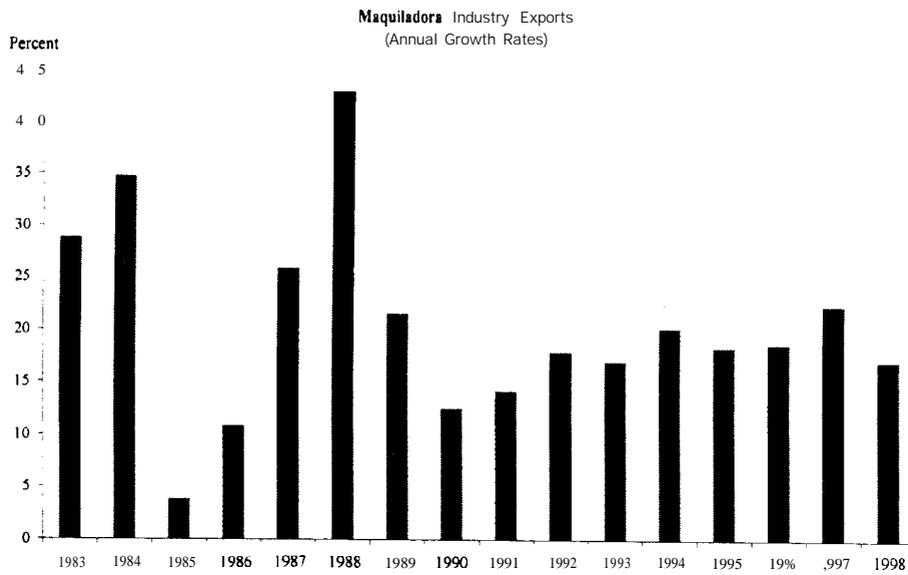
SOURCE OF PRIMARY DATA: Instituto Nacional de Estadística, Geografía e Informática.

Chart 2



SOURCE OF PRIMARY DATA: Instituto Nacional de Estadística, Geografía e Informática

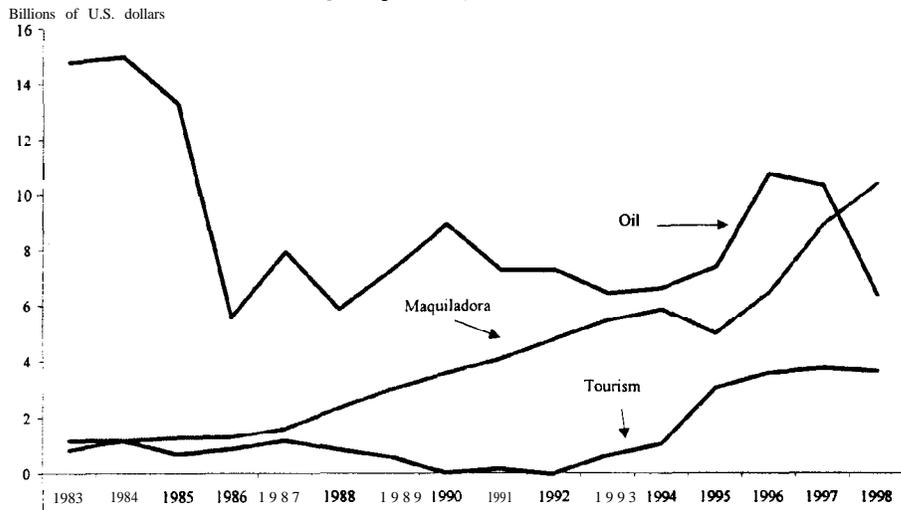
Chart 3



SOURCE OF PRIMARY DATA: Banco de México

**Chart 4**

**Top Foreign-Exchange Generators For Mexico**



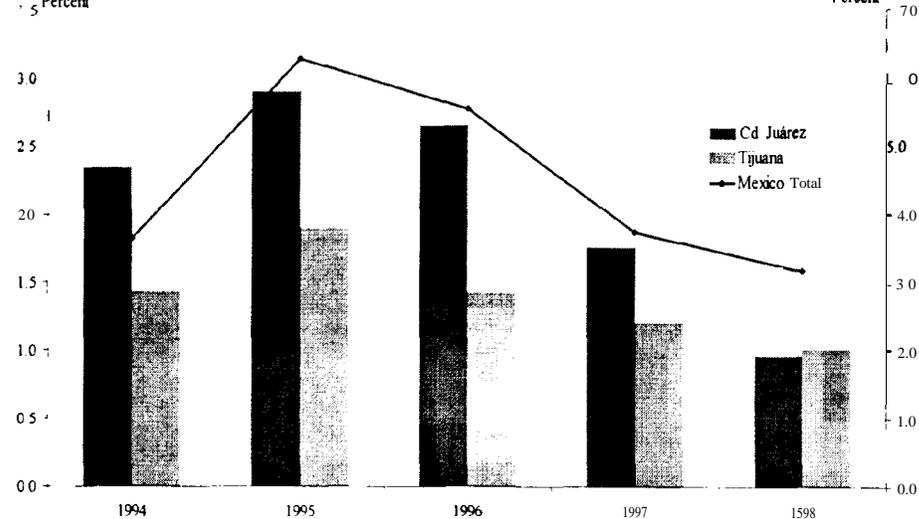
SOURCE OF PRIMARY DATA: For the oil sector, data through 1987 is PEMEX; remaining oil data are from Banco de México, Secretaría de Hacienda y Crédito Público and Instituto Nacional de Estadística, Geografía e Informática. Maquiladora and tourism data are from Banco de México.

**Chart 5**

**Cd Juárez and Tijuana**  
Percent

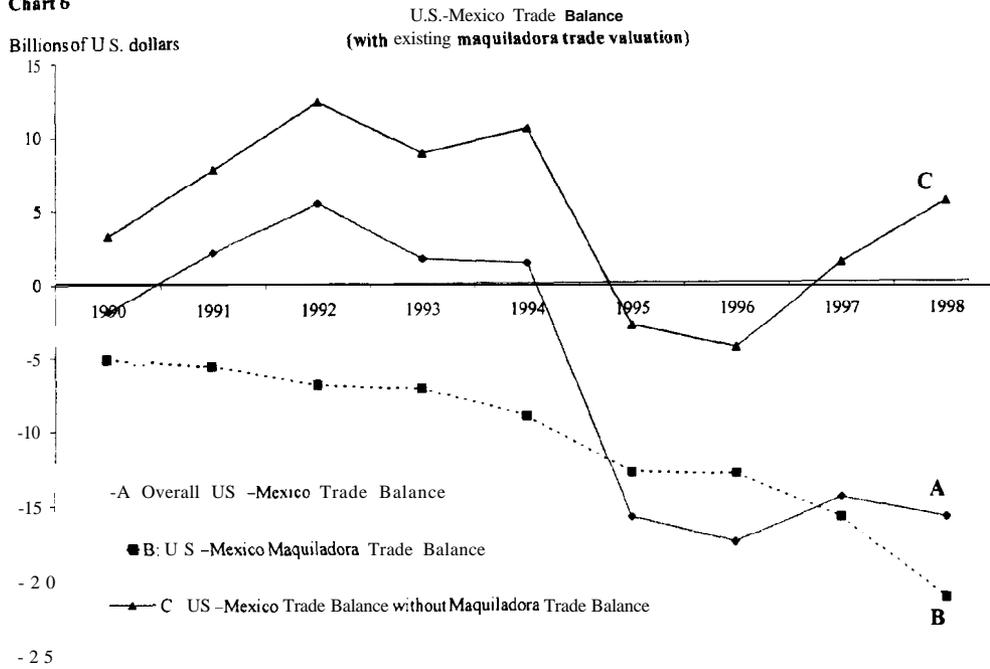
**Open Unemployment Rate**  
1994-98

**Mexico Total**  
Percent



SOURCE OF PRIMARY DATA: Instituto Nacional de Estadística, Geografía e Informática

**Chart 6**



**Chart 1**

