The Maquiladoras:
Prospects for Mexico

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I. Introduction

Substantial trade deficits and high levels of unemployment have been chronic problems plaguing the Mexican economy. One of the steps taken by the Mexican government to both improve the trade balance and bolster domestic employments was the establishment of a program to promote the development of a new type of export-oriented industry. The Mexican "maquiladora" program began in the mid-1960s, after Octaviano Campos Salas, at that time Mexico's Secretary of Industry and Commerce, visited the Orient and observed re-export assembly operations performed there on raw and intermediate goods of U.S. origin.[1] A maquiladora is an assembly plant similar to those found in the Far East. Its name comes from the word, "maquila," which in Spanish is the toll that millers collect for performing the service of milling someone else's grain.[2] Because maquiladoras must post bonds insuring they will re-export materials and equipment that have been

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[1] See Manuel Martínez del Campo (1983), p. 147.

[2] Prior to the establishment of the export assembly plants, the term was commonly used in Mexico to denote payments by one firm to another for performing work on the product of the former. See Real Academia Española (1950), p. 974.

exported from the U.S. or other countries to them, they are sometimes called "in-bond plants."

In Mexico, much of the maquiladora output consists of products assembled from U.S.-produced components and subsequently re-exported to the United States.[3] Most maquiladoras are located near the United States-Mexico border, although there are a few in the interior of Mexico. Some of the maquiladoras have a "twin plant" which is located on the U.S. side of the border and performs some operations on the product either before it enters Mexico, upon its return, or both. The legal authority for maquiladoras consists of a set of complementary U.S. and Mexican laws, the latter implemented specifically to allow Mexico to participate in the kind of assembly operations that U.S. trade laws have permitted for quite some time.

The present study has two main objectives. The first is to provide a description of the development of the maquiladora industry in Mexico, and the second is to develop a regression model that relates maquiladora activity to a number of Mexican and U.S. economic variables. Although data on maquiladoras from various Mexican sources sometimes conflict, we believe that it is possible to construct a reasonably accurate series on one important statistic, value added, for the period 1966-1982. Therefore, in the latter part of the paper, value added in the maquiladoras is related to selected measures of economic activity and to relative prices. However, we begin our study with the legal and economic bases for the development of the maquiladoras.

II. Legal Framework and Economic Objectives

United States law provides for foreign assembly operations under sections 806.30 and 807.00 of the Tariff Code. Section 806.30 incorporates the provisions of the Tariff Act of 1930, as amended by the Customs Simplification Act of 1956. It specifies that any item made of nonprecious metal manufactured or partially manufactured in the United States that is exported for fur-

[3] However, thirty nations are now represented in the maquiladora program in Mexico. See *San Antonio Express* (Nov. 20, 1983), pp. 1-K, 7-K.

ther processing and then returned to the United States for further processing, shall be assessed a duty only on the value of the processing outside the United States. Although TSUS 806.30 has been helpful to Mexico, TSUS 807.00 is of far greater importance to that country.[4]

The basic terms of TSUS 807.00 were adopted on August 31, 1963. This section of the Tariff Code provides for a well-established but not clearly legally defined practice under paragraph 1615(a) of the Tariff Act of 1930. Specifically, it permits the duty-free entry of exported domestic products returned to the United States that have not been "advanced in value or improved in condition by any process of manufacture or other means." In 1954, an important ruling of the Customs Court held that the labor involved in installing a motor in a boat did not violate the condition above. In later rulings, the Customs Service allowed the duty-free importation of such components if they were "capable of being identified and removed without injury to themselves or the articles of which they were a part."

Section 807.00 provided for the continuation of the above policy except that it no longer required that U.S.-made components not be advanced or improved by assembly or that they could be removed without injury or constructively segregated. In 1965, this issue was further clarified by specifying that such articles must be ready for assembly without further fabrication, have retained their original form or shape, and not be advanced in value except by assembly or other related processes such as cleaning, lubricating, painting, gluing, sewing, and soldering. This portion of the Tariff Code does not apply to the mixing or combining of chemical products, food ingredients, liquids, gases, and powders; painting intended to improve the appearance of an article; machining or polishing operations; melting of ingots; or cutting operations for garments. The latter restriction has particularly encouraged the existence of "twin plants" along the United States-Mexico border.[5]

[4] In 1982, the duty free value of Mexican exports to the United States under TSUS 806.30 was $24.3 million, while the duty-free value under TSUS 807.00 was $1,429.80 million. These data were supplied by the United States International Trade Commission.

[5] There is some ambiquity regarding the treatment of wire and tape on spools which is sent abroad and cut to length prior to assembly with other items. The Court of Customs and

The beginning of the border industry program (Programa de industrialización Fronteriza) in Mexico can be traced back to May of 1965 when Octaviano Campos Salas, mentioned above, first proposed the idea. In September, President Gustavo Díaz Ordaz announced formal acceptance of the scheme in his report to the nation. However, the initial operational procedures for the program were not established until June of 1966.[6]

The Mexican government gave several incentives for the establishment of new firms under the program. First, unlike other firms established in Mexico, the assembly plants could be as much as 100 percent foreign owned. Other new firms generally were required to have majority Mexican ownership.[7] Second, the Mexican government allows maquiladora firms to temporarily import, free of duties, machinery and other equipment, parts, and raw materials to be used in the production process. In addition, there are no taxes on the export of such assembled items. Finally, foreign managers and technicians are allowed to work in these plants.[8]

In return for the government incentives, the firms must meet certain conditions. First, they must comply with Mexican mercantile laws, labor laws, and social security regulations. Second, the firms must post a bond to guarantee that the imported machinery, equipment, components parts, and other materials will be used only in the authorized activities of the assembly plant. Originally, the firms were authorized to operate only where there were ports of entry with customs facilities.[9] In 1972, firms were

Patent Appeals (CCPA) has held that such operations do not constitute further fabrication, although these rulings appears to be contrary to the intent of 807.00. See United States International Trade Commission, *Import Trends in TSUS Items 806.30 and 807.00,* Washington, D.C.: USITC, 1980, pp. 2-14.

[6] See Hunt (1970) and Manuel Martínez del Campo (1983).

[7] On February 16, 1984, the government of Mexican President Miguel de la Madrid stated that it would be more flexible in applying the fifty-one percent rule. Specifically, the government stated that it would allow exceptions in thirty-four categories of industry, to companies locating in less industrialized areas, and to companies whose existence would create a substantial number of new jobs and/or foreign exchange earnings. See *San Antonio Express-News* (Feb. 18, 1984), p. 1-D.

[8] See Comite Consultativa de Fomento Industrial (1969), p. 10.

[9] See Ibid., p. 11.

allowed to establish in-bond or maquiladora plants in the interior of Mexico.[10] The first of these began to operate in 1973.

There have been some recent changes in the maquiladora regulations. A decree published in the *Diario Oficial* on August 15, 1983, placed limits on the establishment of maquiladoras in the interior of Mexico. Specifically, it stated that such plants would be authorized in locations designated as priority areas for industrial development but would not be permitted in areas already highly industrialized. In addition, the decree provided that the Secretariat of Commerce and Industrial Development could in certain cases allow in-bond companies to sell up to 20 percent of their annual output in the domestic (Mexican) market. Authorization for such sales will not be given if sufficient domestic production exists or if there is a program to promote the internal production of similar merchandise. In-bond companies producing for the domestic market must meet certain conditions, such as achieving a specified level of national integration (content), maintaining the same quality control as for exported products, fulfilling a foreign exchange budget, and rendering technical assistance to domestic suppliers.[11]

The current goals of the maquiladora program as specified in the Mexican government's decree of August 1983 include promoting investment in advanced technology sectors, encouraging a greater proportion of domestic components in the production of the in-bond companies, and increasing the skill levels of workers.[12] (at the inception of the program, the emphasis was mainly on employment since the government anticipated widespread unemployment in the border zone because of a phase-out of the United States' Bracero Program, which allowed Mexican workers temporary access to the U.S. market for unskilled labor.) In addition, the maquiladoras are viewed as a significant generator of foreign exchange. Under existing rules, they must each month sell foreign exchange receipts to government-owned credit institutions at the controlled rate of exchange in an amount (local currency equivalent) equal to their disbursements for wages, salaries, ren-

[10] See Escenarios económicos de México (1981), p. 625.

[11] See *Diario oficial* (Aug. 15, 1983).

[12] *Ibid.*

tals, local purchases of goods, federal and local government payments due, insurance premiums, interest, and other similar local operating expenditures. Companies of the terminal automotive industry or domestic (Mexican) suppliers of inputs to in-bond companies may be authorized to purchase the foreign exchange sold by the maquiladoras to the national financial institutions at the controlled rate to pay for imports of inputs.[13]

III. Development of the Industry

The first maquiladoras in Mexico began operations in 1966. Government data show that in 1967 there were 72 firms in the industry with total employment of almost 18,000 workers and a value added of over 900 million pesos (74 million dollars). Table 1 summarizes the growth in number of firms, employment, and output that followed. The largest number of firms recorded (620) was in 1980, but thereafter employment and output continued to increase even though the number of firms fell.[14] The growth rate of the industry has been remarkable. The number of firms and employment have grown at compound annual rates of about 14 percent. The rate of growth of real value added has been slightly slower — about 12 percent. There has been only one recession in the industry, and it occurred during the period from 1974-77. It shows up in Table 1 as a decline in establishments, employment, and value added from 1974 to 1975. Employment recovered somewhat in 1976, and substantial increases in all three variables occurred in 1978-1979.

The maquiladoras have undergone only slight changes in industrial structure over the relatively brief existence of the program. Electrical and electronics items have accounted for the largest share of firms and output from the inception of the program. However, there has been some recent diversification of activities which has moved nonelectrical machinery and transport

[13] See "Accord That Reforms and Adds the Second of the Complementary Rules on Exchange Controls for In-Bond Companies," translation from *Diario oficial* (Sep. 28, 1983).

[14] The recession helped to reduce the number of "fly-by-night" firms with easily portable investments. Such firms sometimes vacated an area, leaving Mexican workers unpaid. By 1980, the percentage of maquiladoras run by well-established U.S. companies operating in Mexico had increased relative to the early 1970s. See Grunwald (1983), p. 4.

Table 1

MEXICAN MAQUILADORAS: NUMBER OF ESTABLISHMENTS, EMPLOYMENT, AND VALUE ADEED, 1967-82

Year	Number of Establishments	Total Employment	Value Added (million pesos at 1970 prices
1967	72	17,936	925.4
1968	79	17,000	974.8
1969	108	15,858	973.8
1970	120	20,327	1,035.4
1971	209	20,000	1,227.3
1972	339	48,060	1,820.2
1973	357	64,330	2,415.0
1974	455	75,974	2,609.5
1975	454	67,214	2,402.5
1976	448	74,496	2,655.4
1977	443	78,433	2,468.0
1978	457	90,704	2,994.9
1979	540	111,365	3,681.8
1980	620	119,546	3,613.0
1981	605	130,973	3,920.9
1982	585	127,048	4,884.9

Sources: *Estadística de la industria maquiladora de exportación, 1974-1982* (México, D.F.: Secretaría de Programación y Presupuesto, 1983), p. 1, and data supplied by Mr. John H. Christman, Director of International Business Development, American Industrial Parks, Inc.

equipments into second place (in terms of output), a rank which was earlier held by clothing and footwear. (See Table 2.) Apparently, this change in ranking is largely attributable to efforts by the major U.S. automobile makers to assemble certain components in Mexico.

U.S. and Mexican government data provide three concepts that can serve as a rough measure of the aggregate net foreign exchange impact of the maquiladoras. First, the Mexican balance of payments contains a line item called "servicios por transformación" (processing services) that has been employed in Mexican

Table 2
MEXICO: PERCENTAGE DISTRIBUTION OF MAQUILADORA ACTIVITY BY INDUSTRY GROUP

Industry Group	1977		1979		1980		1981		1982	
	Establish-ments(%)	Output (%)	Establish-ments(%)	Output (%)	Establish-ments(%)	Output (%)	Establish-ments(%)	Output (%)	Establish-ments(%)	Output (%)
Foodstuffs	2.7	1.0	2.2	1.5	1.9	1.6	1.5	1.3	1.5	1.3
Clothing and Footwear	29.0	17.6	26.3	13.7	22.3	13.7	22.5	11.9	21.9	9.8
Furniture	3.6	2.0	10.0	4.9	9.5	3.8	8.9	3.6	8.9	3.1
Machinery, Parts and Transport Equipment, except electrical	7.4	3.9	9.6	7.5	11.1	9.8	9.8	14.7	9.7	18.5
Electrical and Electronic Apparatus and Accessories	38.5	65.1	33.3	55.4	36.0	56.8	38.0	55.5	38.1	54.4
Toys and Sporting Goods	n.a.	n.a.	3.0	1.7	3.4	1.9	3.8	1.7	3.8	2.2
Other Manufactures	16.8	7.5	10.0	10.0	10.8	8.4	11.2	6.8	11.8	6.5
Services	2.0	2.9	5.6	5.3	5.0	4.0	4.3	4.5	4.3	4.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Estadística de la industria maquiladora de exportación, 1974-1982 (México, D.F.: Secretaría de Programación y Presupuesto, 1983), pp. 25-27.

government studies to estimate foreign exchange generation.[15] If this category really measures only services, it fails to capture any foreign exchange inflow attributable to domestically-produced components contained in maquiladora products. Presumably, a second measure of maquiladora output, value added, would exceed "processing services" by the amount of such other inputs. Unfortunately, Mexican data on value added generally are less than those on processing services, suggesting that value added may be understated. For the period 1974-78, the discrepancies between these two statistics are rather large. For example, in 1978, value added was reportedly $440.3 million, but the Mexican balance of payments showed processing services of $714.3 million (both figures U.S. dollars).[16]

There is a third source of data that closely agrees with the processing services item in the Mexican balance of payments for the period 1970-78. The U.S. government reports the dutiable value of TSUS 806.30 and 807.00 imports from Mexico. (See Table 3.) This figure should be the same as maquiladora foreign exchange receipts net of re-exported U.S. content. (a slight overstatement of exchange receipts might occur since some U.S. content might not be allowed to return duty free and certain goods might contain dutiable third-country inputs.) As noted above, the U.S. data closely approximately Mexico's report of processing services from 1970-78. However, the U.S. statistic is significantly greater than that for processing services for the years 1979-82, suggesting that either (1) Mexican data understate maquiladora output and exchange earnings after 1978, or (2) a significant change occurred in 1979 that raised the ratio of dutiable U.S. imports to Mexican value added. (The latter might be caused by an increase in the use of third-country component parts or of U.S.-produced supplies that could not be re-entered on a duty-free basis.)

If one assumes that the U.S. import data are the most reliable indicator of maquiladora earnings, then column C of Table 3 is the best available measure. It indicates that in recent years as much as 6 to 7 percent of Mexico's foreign exchange receipts were

[15] See Escenarios económicos de México, *op. cit.*, p. 629.

[16] The source of value added data is the same as for Table 1, above. The source of processing data is the same as for Table 3, below.

Table 3

MEXICO: FOREIGN EXCHANGE EARNINGS OF MAQUILADORAS

Year	A. Total Exports of Goods and Services (million dollars)	B. Exports of "Processing Services" (million dollars)	C. Dutiable U.S. 806.30 and 807.00 Imports from Mexico (million dollars)	(C/A·100) Percent of Export Earnings Generated By Maquiladoras
1967	2,206.6	n.a.	7.1	0.3
1968	2,506.3	n.a.	24.1	1.0
1969	2,976.1	n.a.	52.1	1.8
1970	3,257.1	80.9	80.5	2.5
1971	3,534.8	101.9	101.6*	2.9
1972	4,283.6	164.7	170.1	4.0
1973	5,410.2	277.6	266.4*	4.9
1974	6,844.0	443.5	463.9	6.8
1975	7,140.5	454.4	467.5	6.5
1976	8,188.0	535.7	535.5	6.5
1977	9,124.5	524.7	524.4	5.7
1978	11,682.8	714.3	713.8	6.1
1979	16,199.9	637.6	1,015.7	6.3
1980	24,828.1	773.4	1,155.1	4.7
1981	28,786.6	982.0	1,272.0	4.4
1982	30,717.4	831.8	1,383.4	4.5

* Does not include data for 806.30.

Sources: *La economia mexicana en cifras* (México, D.F.: Nacional Financiera, S.A., 1981), p. 331; *10 años de indicadores económicos y sociales de México* (México, D.F.: Secretaría de Programación y Presupuesto, 1982), p. 183; *Boletín mensual de información económica* (México, D.F.: Secretaría de Programación y Presupuesto, 1983), Vol. VII, No. 8, p. 76; and data supplied by U.S. International Trade Commission.

The U.S. data probably overstate the contribution of the maquiladoras to foreign exchange earnings since some inputs are imported into Mexico and used in the production process that are not eligible for duty-free treatment under TSUS 806.30 and 807.00. For a third estimate see the Mexican data on value added in *Estadística de la Industria Maquiladora de Exportación, 1974-81, op. cit.*

net maquiladora earnings. Although the percentage drops in 1980-82, the absolute value continues to grow significantly. This probably occurs because of the large increase in foreign exchange receipts from petroleum exports in recent years.

Relative to other foreign exchange-generating activities, the maquiladoras must be viewed as quite important to Mexico. For example, Joseph Grunwald has calculated that in recent years maquiladora earnings have exceeded both net income from tourism and the value of Mexican exports under the U.S. Generalized System of Preferences.[17]

As discussed earlier, the maquiladoras were expected to be significant sources of employment for Mexicans living near the U.S. border. The data above on total employment show that a significant number of jobs have been generated in maquiladora activities. Still, the decree of August 1983 reflects a concern that has troubled Mexican policymakers, namely, that the employment opportunities in the new plants do not either require or foster increases in the skill levels of local workers. Mexican official data on the maquiladoras do not contain any detail on the structure of employment (or on the characteristics of the labor force) for the period before 1975. However, some research studies have been conducted and indicate (1) that the workforce is predominantly female, (2) that the skill levl tends to be quite low, and (3) that most of the workers are border area residents rather than migrants from the interior.[18]

Table 4 presents government data on the gender and occupational structure of the maquiladora workforce for the period since 1975. Blue-collar workers certainly predominate, as do females. However, the proportion of female to total employment appears to be decreasing slightly whereas the percentage of technicians and white-collar workers is increasing over time. These are both favorable developments from the point of view of Mexican policymakers. One Mexican scholar, Manuel Martinez del Campo, has suggested that there may be enough turnover in the technical maquiladora jobs to supply a significant flow of skilled workers to non-maquiladora firms in the border region. Unfor-

[17] See Grunwald, *op. cit.*, p. 2.

[18] See Gambrill (1979). Martínez del Campo reports that other labor force studies have been conducted by El Colegio de Mexico and the Centro de Investigación y Docencia Económicas.

Table 4

MEXICAN MAQUILADORAS:
LABOR FORCE CHARACTERISTICS, 1975-82

Year	Total Employment	As Percent of Total Employment			
		Blue-Collar		Technicians	White-Collar Workers
		Total	Female		
1975	67,214	86.1	67.4	8.8	5.1
1976	74,496	86.8	68.4	8.3	4.9
1977	78,433	86.9	67.8	8.1	5.0
1978	90,704	86.6	66.6	8.3	5.1
1979	111,365	86.0	66.3	8.6	5.4
1980	119,546	85.3	66.0	9.1	5.6
1981	130,973	84.5	65.4	9.6	5.9
1982	127,048	82.9	64.1	10.5	6.5

Sources: Estadística de la industria maquiladora de exportación, 1974-1982 (Mexico, D.F.: *Secretaría de Programación y Presupuesto,* 1983), p. 5.

tunately, there has not been enough follow-up research on workers to determine where they go after leaving the maquiladoras.[19]

In the following section of this paper, regression analysis is employed to further explore the relationship between the output of the maquiladoras, certain indicators of the level of economic activity in the United States, and relative price levels in the two countries. As we shall show shortly, our results are consistent with the hypothesis that the level of aggregate demand in the United States and relative price levels are important determinants of maquiladora production.

IV. Regression Analysis

The purpose of this regression analysis is to investigate which are the primary factors that determine the output of the maquila-

[19] See Martínez del Campo, *op. cit.*, p. 150.

doras as a group. We assumed that two basic types of things affect the real value added by in-bond plant production — first, the general demand for the products and second, the cost factors that make production in maquiladoras less expensive than producing in plants in the United States.

Accordingly, we hypothesized that the real value added by maquiladoras as a group is a function of aggregate demand in the United States, the aggregate U.S. unemployment rate, the Mexican wage rate relative to that of the United States, and the Mexican price index of producer goods relative to that of the United States. In addition, as is explained later, a dummy variable that reflects the inauguration of the Generalized System of Preferences program was also included.

Our hypothesis can be written symbolically as follows:

$$Q_M = f(U_{US}, GNP_{US}, \frac{W_{MX}}{W_{US}}, \frac{P_{MX}}{P_{US}}, GSP),$$

where

Q_M is the output of the maquiladoras,

U_{US} is the U.S. unemployment rate,

GNP_{US} is U.S. GNP (billions of 1970 dollars),

$\frac{W_{MX}}{W_{US}}$ is the ratio of the Mexican wage rate to the U.S. wage rate (adjusted for the exchange rate),

$\frac{P_{MX}}{P_{US}}$ is the ratio of the Mexican producer price index to the U.S. producer price index (also adjusted for the exchange rate), and

GSP is the dummy variable for the Generalized System of Preferences. More specifically, we estimated the coefficients in the function below using linear regression analysis:

$$\ln Q_{M_t} = \beta_1 + \beta_2 \ln U_{US_t} + \beta_3 \ln GNP_{US_t} + \beta_4 \ln(\frac{W_{MX}}{W_{US}})_t$$

$$+ \beta_5 \ln(\frac{P_{MX}}{P_{US}})_t + \beta_6 GSP_t + e_t$$

We expected the U.S. unemployment rate and real U.S. GNP to be important determinants of the quantity demanded of the output of in-bond firms because they reflect the level of aggregate demand in the United States. We thought that the unemployment variable would capture primarily cyclical variations whereas the real gross national product variable would reflect long-term trends in the growth of the U.S. economy. We hypothesized that the level of aggregate demand in the United States would directly affect the quantity demanded of the maquiladoras' output and, therefore, that β_2 would be negative (a higher unemployment rate would lower the quantity demanded) and that β_3 would be positive.

A priori, we would expect that the greater the Mexican wage rate relative to the U.S. wage rate the lower the incentive to produce in Mexico and, therefore, that β_4 would be negative. However, wages make up a very large portion (usually, about sixty percent) of the value added by the maquiladoras. This latter fact would tend to result in a positive relationship between the relative wage rate and the value added, particularly since the producer price index used to deflate nominal value added probably does not fully reflect the importance of the wage rate variable. As we show below, the latter relationship appears to dominate the results.

We also hypothesized that the higher the prices of Mexican producer goods relative to those of the United States, the fewer Mexican raw materials and supplies utilized and, therefore, the smaller the value added by the maquiladoras. Thus, β_5 would be negative. This hypothesis also agrees with the impressions of other authors who have discussed this issue with representatives of some of the in-bond firms.[20]

Finally, the emergence of the Generalized System of Preferences (GSP) in the mid-1970s (the program became fully operational in 1976) was expected to somewhat reduce Mexican exports under TSUS 806.30 and 807.00. Under GSP, Mexican producers could export certain products to the United States entirely duty free. Although the dollar value of duty-free exports from Mexico under GSP is much smaller than that for TSUS 806.30 and 807.00 ($633.5 million and $1,437.7 million, respectively in 1981), we hypothesized that GSP would still have a perhaps small but

[20] See Grunwald, *op. cit.*, p. 3.

negative influence on the volume of exports under the latter program.

We used data from 1967 through 1982 in the regression. Our results are shown in Table 5. We estimated two versions of the above relationship: one using U.S. data for the real dollar value of dutiable Mexican exports to the United States under TSUS 807.00, and one using Mexican data for the real value added (in dollars) of the maquiladoras.[21] The former variable is used in the first equation and denoted by DUT_{US}, whereas the latter is used in the second equation and denoted by VAL AD_{MX}. In either case, the value of duty-free exports is in millions of U.S. dollars.

One additional variable requires further discussion before we examine the regression results. We used the average Mexican industrial hourly wage rate and the average U.S. manufacturing wage rate in constructing the relative wage rate variable. We could not obtain data on the average wage rate paid by the

Table 5

REGRESSION RESULTS

(t-values)

R^2 = .93, DW = 2.74

$$\ln DUT_{US_t} = \underset{(-5.241)}{-58.757} - \underset{(-.575)}{0.336} \ln U_{US_t} + \underset{(6.368)^{***}}{11.032} \ln GNP_{US_t} + \underset{(4.279)^{***}}{7.529} \ln \left(\frac{W_{MX}}{W_{US}}\right)_t \underset{(-3.278)^{**}}{-9.754} \ln \left(\frac{P_{MX}}{P_{US}}\right) \underset{(-4.672)^{***}}{-1.511} GSP_t$$

R^2 = .90, DW = 2.06

$$\ln VAL\ AD_{MX_t} = \underset{(-2.159)}{-10.504} - \underset{(-1.590)}{0.404} \ln U_{US_t} + \underset{(4.244)^{**}}{3.190} \ln GNP_{US_t} + \underset{(5.353)^{***}}{3.698} \ln \left(\frac{W_{MX}}{W_{US}}\right)_t - \underset{(-3.040)^{*}}{3.924} \ln \left(\frac{P_{MX}}{P_{US}}\right)_t - \underset{(-5.009)^{***}}{.703} GSP_t$$

* Significant at the one percent level of significance.

** Significant at the .5 percent level of significance.

*** Significant at the .05 percent level of significance.

[21] We did not have data for exports under TSUS 806.30 for two years during this period, so we had to use only data for TSUS 807.00.

maquiladoras prior to 1974 and, therefore, had to use a proxy variable. The actual average wage rate paid by the maquiladoras appears to fall somewhere between the average Mexican minimum wage rate and the average Mexican industrial wage rate.

Turning to Table 5, we find that the estimates of the coefficients were generally as hypothesized *a priori,* with the exception of the sign of the wage rate variable as discussed above. The value of R^2 was high using both U.S. and Mexican data (.93 and .90, respectively). However, the value of the Durbin-Watson statistic for the first relationship was in the inconclusive region. As stated with respect to Table 3 above, the U.S. data for 806.30 and 807.00 dutiable exports may overstate the value added by the maquiladoras, especially in the latter half of the 1967-82 period. This relationship may be the reason that the Durbin-Watson statistic is in this range for that equation.

Examining the estimated relationships more closely, we find that the estimated coefficients of the GNP_{US} and producer price ratio ($\frac{P_{MX}}{P_{US}}$) variables were as hypothesized and significant at the one percent (or lower) level of significance. The estimated coefficient of the unemployment variable was not significant, but its sign was as hypothesized. The estimated coefficient of the GSP variable had the hypothesized sign in both equations and is significant at the .05 percent level of significance.

As mentioned above, the sign of the relative wage rate variable is positive. This result is not surprising for two reasons. First, as stated previously, wages paid constitute over half of the value added by maquiladoras. Second, Mexican wage rates — even at their highest — have still been far below U.S. wage rates. For example, in the fall of 1983, most of the workers in a Sony plant in Nuevo Laredo were paid approximately $.90 an hour, including fringe benefits.[22]

There has been made discussion among economists, politicians, and union leaders about the effect of the maquiladoras on employment in the United States. Unions, of course, are concerned that production in maquiladoras tends to "take away jobs"

[22] See "Maquila Program: The Sides Pro and Con," *op. cit.*, p. 7-K.

Table 6

VALUE OF DUTY-FREE AND TOTAL EXPORTS UNDER TSUS 806.30 AND 807.00
(Millions of Dollars)

Country	1970		1975		1980		1982	
	Duty-Free	Total Value	Duty-Free	Total Value	Duty-Free	Total Value	Duty-Free	Total Value
Mexico	138.3	218.8	552.4	1,019.8	1,141.4	2,341.4	1,454.1	2,837.5
Singapore	16.0	31.5	66.4	213.0	402.2	773.3	368.2	845.2
Korea	19.6	27.4	58.8	112.0	166.5	312.6	218.8	375.9
Taiwan	28.5	90.1	57.0	281.3	107.1	473.9	101.3	543.3
Hong Kong	66.5	124.4	45.5	148.0	113.7	408.7	102.6	508.3
Malaysia	0.2	0.6	72.2	167.7	465.2	820.0	670.3	1,111.9

Sources: Data supplied by the United States International Trade Commission

Table 7

DUTY-FREE EXPORTS AS A PERCENT OF TOTAL EXPORTS UNDER TSUS 806.30 AND 807.00, 1970-1982

Country	Year						
	1970	1975	1978	1979	1980	1981	1982
Mexico	63	54	54	51	51	53	51
Singapore	51	31	50	51	53	47	44
Korea	72	52	57	54	54	58	58
Taiwan	32	20	22	22	23	21	19
Hong Kong	55	31	36	32	28	24	20
Malaysia	33	43	62	61	59	60	60

Sources: Compiled from data in the preceding table.

from U.S. citizens. The available data at this point, however, do not clearly, if at all, support this conclusion.

Our results are consistent with the hypothesis that U.S. unemployment is an indicator of the cyclical demand for the maquiladoras' output. In this case there is an inverse, rather than direct relationship between U.S. unemployment and the value of production by the maquiladoras.

While acknowledging the relationship above, one could, on the other hand, argue that if these products were produced in the United States the employment of U.S. citizens would surely rise. Two factors, however, work against this thesis. First, the alternative to maquiladora production in Mexico is not necessarily production in the United States. Other potential places of production — with or without TSUS 806.30 and 807.00 — include Singapore, Korea, Taiwan, Hong Kong, and Malaysia, as shown in Table 6. Some economists have argued that it is better for such production to take place in Mexico because the maquiladoras use a greater proportion of U.S. components than do producers in other countries.[23]

[23] See Baerresen (1975), pp. 85-87 and (1971), pp. 60-61.

As Table 7 shows, Mexico does use a greater proportion of U.S. components (the percentage of *duty-free* value to total exports) in TSUS 806.30 and 807.00 items than do Singapore (generally), Taiwan, and Hong Kong. However, this relationship no longer holds for Korea and Malaysia. Nevertheless, because of transportation costs, Mexican producers are far more likely to use certain U.S. machinery, materials, and other supplies that do not show up as duty-free items than are producers in the Far East. For example, the presence of the "twin plants" helps to make utilization of these products easier. One Mexican source states that imported inputs make up from 68 to 72 percent of the total value of the items assembled by the maquiladoras.[24]

A second factor mitigating the impact of maquiladora production on employment in the U.S. occurs because nearly all (between eighty-five and ninety percent) of these plants exist along the Mexican border. Other economists have reported that a large portion of the wages paid to maquiladora workers ends up on the northern side of the border, as these workers purchase products in U.S. border cities.[25] Such a relationship could surely not exist so easily with workers in the Orient.[26]

V. Conclusions

Virtually since its inception, as stated above, the border industry program has been a subject of controversy in both Mexico and the United States. Labor unions in the United States take the view that the plants result in an export of U.S. jobs to Mexico, while management argues that moving assembly operations to Mexico preserves actual *manufacturing* jobs in the U.S. Scholars and policymakers concerned with the impact of the maquiladoras

[24] See Escenarios Económicos de México, *op. cit.*, p. 635.

[25] See Grunwald, *op. cit.*, p. 2, Hunt, *op. cit.*, pp. 10-11 and Anna-Stina Ericson (1970), p. 35.

[26] In a 1970 study, the U.S. Tariff Commission concluded that the maquila program increases U.S. employment and that it benefits the U.S. balance of payments. See Van der Spek (1975), p. 35.

However, during the same year another source argues that the data are inconclusive. See Anna-Stina Ericson, *op. cit.*, pp. 34-35.

on Mexico have noted that the plants have weak linkage effects to the rest of the Mexican economy, that they are dependent on the U.S. business cycle, and that they may have some adverse sociological and labor force effects.

It seems clear that the maquiladoras have been a significant source of foreign exchange for Mexico, and that they have contributed to the overall level of employment in that country. However, up to the present time, the maquiladoras have not been a major factor in reducing unemployment among adult males. On the other hand, the available evidence to date does not support the view that they have added to the problem of illegal immigrants in the United States.[27]

The impact of the "in-bond" plants on the level of unemployment in the United States and their long-term effects on the skill levels of Mexican workers, the introduction of technology, and industrial development are still unclear. There are indications, however, that the maquiliadoras are beginning to have a positive impact in these areas. The decree of August 1983 attempts to get at the problems of weak linkages to the rest of the economy by allowing the sale of some output in the domestic market, providing for the transfer of foreign exchange receipts to the domestic automotive industry, and encouraging the use of domestically- produced in assembly plants. It is intended also to encourage the establishment of plants that bring advanced technology to Mexico and increase the skill level of workers.

Our results are certainly consistent with the hypothesis that the level of aggregate demand in the United States is an important factor affecting the output of the maquiladoras. However, this problem is not peculiar to the maquiladora industry but is pervasive throughout the Mexican economy, a situation that should be expected since the United States is Mexico's main trading partner. Our findings are also consistent with the hypothesis that lowering Mexican prices relative to those of the United States for raw materials and supplies would result in the use of a greater proportion of domestic materials by the maquiladoras.

[27] See Seligson and Williams (1981).

Our statistical results are not consistent with the hypothesis that increases in Mexican wage rates relative to those of the United States have had a negative effect on maquiladora output during the period covered by our study. However, we did not have the necessary data to examine the relationship between wage rates in Mexico relative to those in the Orient and TSUS 806.30 and 807.00 production in the two areas. Clearly, there is an upper limit to the level of Mexican wage rates relative to the rest of the world before they will have a negative effect on Mexican assembly operations.

Finally, one aspects of TSUS 806.30. and 807.00 is a major irritant to the in-bond plants. Under the present U.S. import quota system, U.S. components are treated as foreign made when they are assembled abroad. This ruling has had the greatest effect on cotton garments, as far as the border industry program is concerned. In some cases, large inventories of cut cloth imported from the U.S. into Mexico for sewing have ended up stranded in Mexico because the quota for cotton imports from Mexico was already filled (in one case as early as April).[28] A revision in the quota policy so that U.S. made components assembled abroad are no longer considered foreign-made would certainly be helpful to the maquiladoras in industries with quota restrictions. Such a change, although sure to be challenged in the United States, does not seem to be too much to ask.

[28] See Baerresen, *op. cit.*, p. 89 and Baerresen, *op. cit.*, pp. 62-64.

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