

5-1999

## Effects of labor unions on regional economic development in Mexico

Rafael Otero  
*University of Texas-Pan American*

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EFFECTS OF LABOR UNIONS ON REGIONAL ECONOMIC DEVELOPMENT  
IN MEXICO

DISSERTATION

Presented to the Graduate School of the  
University of Texas - Pan American  
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in Business Administration  
with emphasis in International Business

by

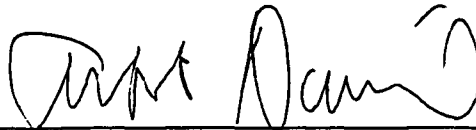
RAFAEL OTERO

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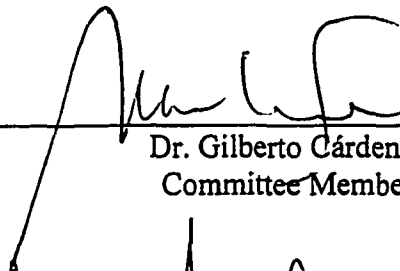
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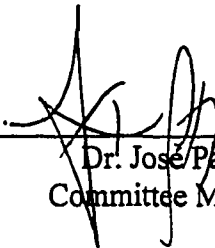
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Dr. Alberto Dávila  
Committee Chair



---

Dr. Gilberto Cárdenas  
Committee Member



---

Dr. José Pagán  
Committee Member



---

Dr. Ana María Rodríguez  
Committee Member

May 1999

## ABSTRACT

Otero, Rafael, Effects of Labor Unions on Regional Economic Development in Mexico. Doctor of Philosophy (Business Administration), May 1999, 128 pages, 33 tables, reference list, 96 titles.

The purpose of this research is to help determine the net effect of trade unionism in Northern Mexico (Matamoros, Nuevo Laredo, Juárez, and Tijuana). The maquiladora industry is used to empirically test union regional economic effects because there are different union structures along the regions where maquiladora firms are located. The results of the investigation regarding the relative changes in wages in the maquiladora and non-maquiladora sectors for the four cities in the study are consistent with the hypothesis that the real wage growth in a region's maquiladora sector relative to the non-maquiladora sector is associated with the strength of the labor union(s) in the maquiladora industry of that region ( $H_{1a}$ ). The results in terms of the changes in the maquiladora sector employment are also consistent with the hypothesis that employment growth in a region's maquiladora sector relative to the non-maquiladora sector is associated with the strength of the labor union(s) in the maquiladora industry of that region ( $H_{1b}$ ). Finally, the estimated net effect of unions on the wage bill for each one of the regions is consistent with the hypothesis that the wage bill growth in a region's maquiladora sector is

associated with the strength of the labor union(s) in the maquiladora industry of that region ( $H_{1c}$ ).

Implications for economic development and public policy along the U.S.-Mexico border labor markets are evident in the results of this investigation. The study provides useful information for policymakers to evaluate current labor policy on maquiladoras. Based on the results presented here, the government should ease labor laws in Mexico to make them more attractive for American and other foreign interests, perhaps by curbing union leadership power. Competition for labor contracts should be encouraged by fostering the creation of other unions, not necessarily by eliminating unions or limiting union membership. As found in this study, it is not union density that curtails investment, but rather, it may be the type of leadership in certain unions that hinders job creation. Public policy which fosters competition and encourages more democratic union leadership would contribute to more growth in maquiladoras in border cities like Matamoros.

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## CHAPTER I

### INTRODUCTION

Northern Mexican border cities have exhibited quite different labor market growth patterns in recent times. Much of those differentials might be attributed to uneven maquiladora development across cities in this region. Perhaps this uneven development can be in part attributed to differences in union strength across these cities.

Indeed, a large number of studies throughout this century using a variety of different data sets and techniques have found that unions have succeeded in raising wages. While a more extensive review of the studies is in Chapter III, it is worthwhile to note that Gregg Lewis (1963) estimated the union-nonunion wage differential to be between zero to 25 percent and about 15 percent under relatively stable economic conditions. More recent studies also suggest that union wages tend to be larger relative to nonunion ones during periods of recession. For example, Orley Ashenfelter (1978) estimated that the differential rose from 11.6 percent in 1967, a period of relative prosperity, to 16.8 percent in 1975, a period that included an economic slump. Other cross-sectional studies that control for characteristics of union and nonunion workers have also found that unions succeeded in increasing wages by 20 to 30 percent (Freeman and Medoff, 1984).

The effects of unionization on the wage differential between unionized and nonunionized workers has, therefore, been extensively investigated in the literature, however, most of these studies do not systematically address the impact of unionization on the economic conditions of *all* workers in a region or industry, unionized or not. An important question that must be answered to complement previous research is whether economic improvements achieved by unions for their members have been positive for the entire labor force of a particular region or industry, and not only for those *currently* working under a union contract. That is, workers in labor unions (and the labor unions themselves) may economically gain at the expense of the majority of the work force.

One possibility is that the presence of powerful labor unions in a particular region makes this region less attractive to investment capital which serves to reduce its potential employment and economic growth. In other words, regions and industries in which unions have achieved substantial economic and political clout might experience slower relative overall employment and economic growth. The purpose of this research is to determine if this phenomenon is empirically observable in Northern Mexico.

To make valid comparisons, of course, data in which the only difference is the presence or absence of a union would be needed. However, because these data are difficult to obtain, a second-best comparison might involve two similar industries or regions, one with a weak or nonexistent union and the other with a powerful union. Industry wage and employment levels for these industries or can then be compared over a period of time. The maquiladora industry is an industry with different levels of union strength along the different regions where the maquiladora firms are located. I employ

this “second-best” comparison data from the Mexican northern border in this dissertation: cities with the largest concentration of maquiladoras are employed to empirically test union regional economic effects.

Chapter II describes the history of maquiladora labor unions. Chapter III reviews the literature on the effects of labor unions on wages, employment and productivity. Chapter IV states the research objectives and hypotheses, while Chapter V describes the methodology used to test these hypotheses. Chapter VI focuses on the description of the data and the methodology used by INEGI to collect the data. Chapter VII provides an analysis of the results found in the investigation. Chapter VIII discusses conclusions and implications resulting from the analysis of the results and makes recommendations for future research.

## CHAPTER II

### LABOR UNIONS IN MEXICO

#### Historical Development of Labor Unions in Mexico

Labor unions were prohibited in Mexico under the dictatorship of Porfirio Díaz, but the period just before his fall from power in 1910 saw various attempts to organize them. The Industrial Workers of the World (IWW),<sup>1</sup> and especially its ideas, played an important role in the first important strike in Mexico. Cananea, a small mining town in the Sonora desert across the border from Arizona, was the site of a violent mining strike in early 1906. The town's proximity to American mining towns in southern Arizona, which were full of organizers for the newly founded IWW, made Cananea's labor force quite receptive to the influence of the IWW.

In mid 1911, after the toppling of Porfirio Díaz by Francisco I. Madero, the ban on labor unions was lifted by the new government. This event presented the IWW with new opportunities to expand into Mexico where many IWW locals were founded.

Of all the local labor unions to which the revolution of 1910 gave birth, undoubtedly, the most important was the *Casa del Obrero Mundial*. The *Casa* was

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<sup>1</sup> The IWW was organized as an industrial union while the American Federation of Labor (AFL) was organized as a craft union. Craft unions are made up of workers that do the same kind of work. Industrial unions include workers of all kinds in the same industry, regardless of their particular skill or craft.

founded in 1912 by a group of foreign and Mexican left-wing intellectuals. It was not a labor union in the American sense. Instead, it was more of an opportunity for individuals and local labor union leaders to exchange ideas and organize into action. From the beginning, the *Casa del Obrero Mundial* was controlled by anarcho-syndicalist<sup>2</sup> beliefs brought to Latin America by exiled Spanish intellectuals.

By late 1914, Mexico was in the middle of a revolution that brought economic and social chaos. The revolution was divided into two camps: one supported Venustiano Carranza, who was now President, the other supported two revolutionaries, Pancho Villa, fighting in the north, and Emiliano Zapata, fighting in the south. In February, 1915, Carranza entered into an agreement with the *Casa del Obrero Mundial*. They agreed that the *Casa* would organize workers into "red battalions" to fight on Carranza's side in the revolution. Carranza, in compensation, would have his military officers help the *Casa* organize branches in towns taken by the military. That year, Samuel Gompers sent John Murray to explore an alliance with the *Casa*. Murray was affiliated with the *New York Call*, a daily newspaper of the socialist party. Murray's mission appeared to be that of a newspaperman in search of material on the revolution for his paper. History would later show that his real purpose was to lay the foundation for a close relationship between the organized labor movements of the United States and Mexico. At the same time, Carranza needed to be officially recognized as the President of Mexico by the Wilson

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<sup>2</sup> Syndicalism is a socialist political doctrine that calls for the overthrow of the government and control of the economy by organized labor. This goal would be achieved through a violent revolution led by labor unions using boycotts, general strikes, and sabotage. Syndicalism developed during the 19th century in France, but enjoyed its highest popularity in the early 20th century.



Administration. This prompted the *Casa* to accept an alliance with the AFL on the condition that Gompers would urge President Wilson to recognize Carranza as the President of Mexico. Gompers carried out his part of the bargain (Middlebrook, 1991).

In the fall of 1916, Carranza dealt the *Casa* a devastating blow. The *Casa* organized a general strike demanding payment in gold or silver because of the high inflation rate the country was experiencing. Instead of meeting their demands, Carranza arrested the leaders and closed down the *Casa* by evicting them from the building that the government had given them. Withdrawal of support from the government began the decline of the *Casa*. In 1918, Carranza sponsored a new labor confederation with the expectation that the new organization would be subservient to the government. The new labor confederation, headed by Luis Morones, was called the Confederación Regional Obrera Mexicana (CROM). The new labor movement still maintained the overall influence of anarcho-syndicalism. The word "regional" in the name meant the organized movement in Mexico was to be a section of the world labor movement (Toledano, 1961).

During World War I, German efforts to persuade Mexico to join their side increased the efforts by the AFL to establish closer ties with the CROM. The Pan American Federation of Labor (PAFL) was created as an international confederation of labor unions for the American continent. One of the main purposes of the confederation was to control Mexican foreign policy through labor. Gompers viewed the PAFL as a means for putting into effect a "Monroe Doctrine" for labor. With the death of Samuel Gompers shortly after the creation of the PAFL, the new labor confederation failed to flourish (Snow, 1964; Gershman, 1975).

The close relationship between the CROM and the party in power contributed to a growth in membership. By 1925, the CROM claimed a membership of 1.5 million, making it the largest and most powerful confederation of unions in the country. The government supported the CROM in many ways. Perhaps the most important one was the threat of nationalization or confiscation if owners did not recognize a CROM union as the bargaining agent for their workers. The nationalization could be done in a constitutional manner. Although no law outlining the procedures to be followed in implementing it had yet been passed, Article 123 of the Mexican Constitution stated that management had to recognize and bargain with a union if a majority of its workers belonged to it. When a union recognized as a bargaining agent by the government declared a factory on strike, the government could call the strike a legitimate one and enforce the closure of the factory without the union having to mount picket lines. Because the Constitution gave the President the power to mandate this action by decree, the President had the political power to help his friends in the labor movement and hinder his enemies (Levenstein, 1971).

The disintegration of the CROM began in 1928 when Portes Gil became President and withdrew government support for the CROM. As governor of Tamaulipas, Portes Gil had been a rival of the CROM. He had supported more radical local unions and had expelled the CROM from the state. As President, he banned any CROM representative from holding office in the federal government (Guadarrama, 1994).

The weakening of the CROM leadership created internal turmoil. In 1932, a left-wing opposition within the confederation to the "moderate" policies promoted by Luis

Morones, patterned after those of the AFL, led to a split of most radical unions from the CROM. The opposition was led by Vicente Lombardo Toledano, a self proclaimed communist and a leader of the teachers' union. The new independent unions formed the Confederación General de Obreros y Campesinos de México (CGOOCM) (Toledano, 1961).

In December 1934, General Lázaro Cárdenas became President. Plutarco Elías Calles, a former President, had picked him because he thought he could control Cárdenas. Cárdenas, however, soon turned against Calles. Cárdenas began to cultivate the support of the CGOOCM in preparation for a showdown with Calles. The union staged a massive demonstration in support of Cárdenas in the main square of Mexico City, in front of the National Palace, and made it clear that any attempt by Calles to overthrow Cárdenas would carry grave consequences. Calles and Morones were soon exiled to the United States. Because of the political support given by the union to Cárdenas, his government backed the CGOOCM in their labor positions. In 1936, the CGOOCM became the Confederación de Trabajadores de México (CTM), officially a socialist union.

The full support of the Cárdenas government paid off for the CTM. Strikes by the CTM carried with them the threat of nationalization. In 1936 and 1937, for example, a strike against the Atlas hard-fiber factory in San Luis Potosí ended with its being delivered over to a workers' cooperative to run. A strike against the railroads of Mexico culminated in its nationalization. The largest nationalization of all, that of the entire oil industry, took place in 1938 after the foreign oil companies refused to carry out a government-imposed settlement of a CTM strike in the oil fields.

By 1940, as it became evident that Manuel Avila Camacho would become the next President (1940-46) and the government would move to the right, opposition to Lombardo Toledano grew within the CTM. It was clear that if the CTM was to retain its privileged position with the government, Lombardo Toledano had to leave. Avila Camacho set the pattern for handling the labor unions of Mexico by making the CTM an integral part of the *Partido Revolucionario Institucional* (PRI), the party in power since the revolution. As a result, the CTM became more tolerant of the government and began the slow movement toward the center of the political continuum that has characterized its history since (Levenstein, 1971).

President Miguel Alemán (1946-52), however, who had a more pro-business philosophy, was at odds with leftist radicalism. He contributed greatly to end the influence of leftist organizations within the CTM. In 1952, important leaders and major unions within the CTM were expelled. That year, President Alemán further helped curb the CTM's influence on the labor movements and reduce its power to pressure the state for political and economic concessions by facilitating the formation of the Revolutionary Confederation of Workers and Peasants (CROC). To more effectively communicate organized labor's demands, the major labor confederations agreed, in 1966, to bring together the organized labor movement under one umbrella organization connected to the PRI. The Labor Congress (CT) was formed with the executive committees of the CTM, CROM, CROC, and many other labor organizations. Today, however, the CTM is the one that has the *de facto* control of the Labor Congress. This new supra organization did not end the rivalry among the major labor confederations. The internal structure of the new

organization permits each affiliate confederation to preserve its autonomy within the CT (Zazueta, 1984).

### **Labor Unions in the Maquiladoras**

The maquiladora industry began in 1965 with the implementation of Mexico's Border Industrialization Program. The official intent of this new program was to combat the unemployment problem in the border region as a result of the United States' termination of the "bracero"<sup>3</sup> program in 1964. Basically, the industrialization program allowed the unrestricted entry of foreign capital into the border region (Baerresen, 1971; Hunt 1970). Government decrees enacted in March 1971 and October 1972 made the value added resulting from manufacturing in Mexico the only portion subject to taxation (Comercio Exterior, 1971). The enactment of these decrees detonated the growth of the maquiladora industry. By 1986, Mexico accounted for more value added from in-bond processing plants than the 63 other countries using this model of industrialization.

Labor organization in the maquiladoras is extremely heterogeneous with regard to the level of unionization, the number of labor unions in the region competing for the representation of the workers, and the form of unionism practiced by its leaders. Border cities can be grouped in two categories based solely on their level of unionization as a proportion of the labor force employed in the maquiladora industry. The cities of Matamoros (100 percent), Reynosa (100 percent), Nuevo Laredo (95 percent), and

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<sup>3</sup> The "bracero" program began during World War II to alleviate the shortage of agricultural workers in the United States.

Piedras Negras (100 percent)<sup>4</sup> are distinguished by the high proportion of the labor force that is unionized. All other cities on the border with an important number of maquiladora employees, including Juárez (13 percent) and Tijuana (30 percent), are notable for their low levels of unionization. For the most part, high levels of unionization seem to be concentrated in Tamaulipas. If one takes into consideration the other two major factors affecting the power of the unions (i.e. the number of labor unions in the region competing for the representation of the workers, and the form of unionism practiced by its leaders), one must separate Matamoros into a category of its own because the maquiladora union is largely concentrated in the hands of one man. On the other hand, in Reynosa, Nuevo Laredo, and Piedras Negras, there are different unions competing for representation, which weakens the strength of their positions. Thus, the virtual monopoly of control by one union and one leader makes the Matamoros union the most powerful. The second ranked group in terms of union power would be that comprised by Reynosa, Nuevo Laredo, and Piedras Negras. The lowest ranked group in terms of union strength would include the rest of the border cities, including Juárez and Tijuana<sup>5</sup> (Williams and Passé-Smith, 1992).

Table 2.1 shows that as of December 31, 1997 Tijuana and Juárez had the largest number of maquiladora employees by far. Tijuana had 196,095, almost 4 times as many as Matamoros (54,721) and Reynosa (50,091), and 10 times as many as Nuevo Laredo

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<sup>4</sup> Percent unionization figures are for 1990 as cited by Williams and Passé-Smith (1992).

<sup>5</sup> Union strength is a difficult variable to assess quantitatively because the dimension of the personality of the leader introduces subjectivity to the measurement.

**Table 2.1**

**Number of Maquiladora Firms and Employees: 1987-1997<sup>a</sup> Comparisons**

City	Number of Plants			Number of Employees			Average Plant Employees		Annual %
	1987	1997	Change	1987	1997	Change	1987	1997	Change
Matamoros	68	113	5.21	28,730	54,721	6.66	422.5	484.3	1.37
Cd. Juárez	233	289	2.18	100,446	196,095	6.92	431.1	678.5	4.64
Tijuana	317	628	7.08	40,409	135,042	12.82	127.5	215.0	5.36
Laredo	56 <sup>b</sup>	52	-1.47	15,742 <sup>b</sup>	19,798	4.70	281.1 <sup>b</sup>	380.7	6.25
Reynosa	78 <sup>b</sup>	94	3.80	32,233 <sup>b</sup>	50,091	9.22	413.2 <sup>b</sup>	532.9	5.22
<b>National Total</b>	<b>1,259</b>	<b>2,867</b>	<b>8.58</b>	<b>322,743</b>	<b>938,438</b>	<b>11.26</b>	<b>256.4</b>	<b>327.3</b>	<b>2.47</b>

*Source:* INEGI. Estadísticas de la Industria Maquiladora de Exportación.

a = numbers are for the end of year.

b = these figures are for 1992.

(19,798). In terms of the average plant size, Juárez had the largest average number of employees per maquiladora plant with 678 employees, while Tijuana had the smallest average number of employees per plant with 215 workers.

### **Labor Unions in the State of Tamaulipas**

Because of the strategic economic role that oil production has had in Tamaulipas since early in the 20th century, it was not surprising to find union activity in some of the most important cities, primarily in Tampico where the then private oil companies had settled. In 1915, the *Casa del Obrero Mundial*, the major confederation at the time, had one of its most important seats in Tampico. By 1918, the newly created CROM had brought important regional union federations into the organization (Guadarrama, 1984).

In 1924, local labor leaders, dissatisfied that their demands were not being well represented by the leadership of the CROM in their strike against the oil company El Aguila, gave Portes Gil, a candidate for governor, the opportunity to gain local labor support. As a result of a successful mediation in the strike that ended with the signature of a new collective contract and worker representation by the local union, Portes Gil won the election for governor in 1925 with the support of labor. As governor, Portes Gil expelled the CROM from most of Tamaulipas (Guadarrama, 1984). The close relationship between the state government in Tamaulipas and labor unions has been maintained until present, in particular since the state governorship remains in PRI hands.

The expulsion of the CROM from Tamaulipas gave the opportunity, in the 1940s and 1950s, to the new CTM, which now enjoyed the backing of the federal government, to fill in the vacuum of national representation. By the late 1970s, of all the unions



affiliated to a national confederation in Tamaulipas, 97.3 percent belonged to the CTM and the remaining 2.7 percent was split between the CROC and CROM. The strong centralization of union representation in the CTM and pro-labor state governments have allowed the Tamaulipas' unions to enjoy a strength unequalled in any state in Mexico. Such strength, however, has not been equal in all cities in Tamaulipas. There are some particular differences that have to be taken into account to determine the exact union strength (Quintero, 1997).

In Reynosa, the maquiladora industry is 100 percent unionized and centralized in the CTM, however, there has been a dispute between two labor leaders to gain the leadership of individual unions, fractionalizing the potential power. In the case of Nuevo Laredo, the union density is at 95 percent and is also centralized in the CTM, but the leadership has adopted a much more accommodating stance. They have demonstrated a flexible position in negotiating according to the circumstances of the moment. Williams and Passé-Smith (1992) rank the strength of the unions in Nuevo Laredo lower than in Matamoros but higher than in Reynosa. In Nuevo Laredo, the union is formally unified in a single organization as in Matamoros but reflects an undercurrent of dissidence that led to the division of the labor movement in 1989 in Reynosa. Pedro Pérez Ibarra heads the maquiladora workers' union in Nuevo Laredo as well as the local CTM confederation. Pérez Ibarra created the Federation of Workers of Nuevo Laredo affiliated to the CTM in 1956, and in 1968, he organized the first maquiladora in the city. In the mid-1970s, Pérez Ibarra became known for his militant anti-business approach as a union boss. This precipitated a crisis in the maquiladora industry and frightened prospective companies. In

fact, no new maquiladora plants were established in the city between 1974 and mid-1979. As a result, he fell from power in an election, but regained it later. During his second term as union boss, Pérez Ibarra became more accommodating to private sector interests (Williams and Passé-Smith, 1992).

In Matamoros, the *Sindicato de Jornaleros y Obreros Industriales* (SJOI) was born in 1932 as a union for workers working in the cotton industry, an important industry in the region until the 1960s. This organization was very influential from the beginning, electing mayors and other local government positions. In 1948, the SJOI affiliated with the CTM, and in 1957, Agapito González became its leader and has retained that position since. During the mid-1960s a combination of droughts, uncontrolled plagues, and the development of synthetic fibers in the world markets created a crisis in the local cotton industry. Employment in this sector declined by 90 percent. The loss of membership in the SJOI weakened its position, but fortunately for the union, the maquiladora industry began its development during this time. Although the focus of activities went from agriculture to manufacturing, the SJOI took advantage of the opportunity to enlarge its membership in the rising industry (Quintero, 1997). CTM maquiladora membership in Matamoros grew to over 50,000 by 1997 (Table 2.1).

Four petrochemical plants did not become part of SJOI, but instead, became a section of the national petrochemical union, affiliated also to the CTM. In 1990, because of President Salinas de Gortari's<sup>6</sup> national policy of attracting foreign investment, the

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<sup>6</sup> A few days after taking office as President, Salinas ordered the imprisonment for corrupt activities of Joaquín Hernández Galicia "La Quina" who was the *de facto* national leader of the oil industry union. In 1992 Agapito González was also investigated and taken to Mexico city, although he was released shortly after.

CTM created the *Sindicato Industrial de Trabajadores de Plantas Maquiladoras* (SITPM) in one of the new maquiladoras in an open competition with SJOI. As of 1991, the maquiladora membership was divided into 97 plants with 35,000 employees under a collective contract represented by SJOI, four plants with 1,000 employees under a collective contract held by section 104 of the petrochemical industry union, and one plant with 150 employees represented by the new SITPM. Agapito Gonzalez' union power is considered to be highly significant in Matamoros. One example of this is that a worker who wants to become an employee in a maquiladora plant has to become a member of the union first, and then, the union can appoint him/her to one of the plants. The employees are on probation for a month after which time the employee receives full protection under the collective contract established between the plant and the union. From that moment on, the employee will have to pay 4 percent of his/her monthly salary to the union (Quintero, 1997).

Agapito González Cavazos has controlled the Matamoros maquiladora union, affiliated to the CTM, since the first maquiladora was established in the area in 1968. The union has made it a requirement for investors to sign a contract with the union as a prerequisite for the creation of an in-bond processing plant. Because of its power, the union does not tolerate employer-controlled "company unions" nor does it allow potential rivals from competing for control over the labor force. The union also discourages workers from filing individual grievances before state-level conciliation and arbitration

boards.<sup>7</sup> According to local employers' associations, this union strength in Matamoros discourages investors' expansion of maquiladora operations. On the other hand, employees, as members of the union, have experienced many benefits. Workers in a maquiladora in Matamoros, for example, have enjoyed higher wage levels than workers at any other maquiladora center. In 1984, workers in Matamoros were the first to win a forty-hour work week with fifty-six hour pay. Higher wages and more stable employment have been achieved at the expense of not having union democracy (Middlebrook, 1991).

Matamoros represents the opposite case from Tijuana and Juárez in terms of union structure and strength. Matamoros has a more traditional form of unionism, more combative for higher wages, fewer hours, and other benefits. At the same time, unions in Tamaulipas have traditionally enjoyed an open support from state and federal governments, with the recent exception of the Salinas' administration.

### **Labor Unions in Juárez and Tijuana**

Union strength is minimal in the maquiladora industry in Tijuana and Cd. Juárez. Not only do they have low levels of unionization, but the competition among the major union confederations (CTM, CROM, and CROC) is minimal. The CROM, in 1925, affiliated the main unions in Tijuana, and, thus, became the first labor confederation to arrive in Tijuana. After the Cárdenas' administration withdrew his support for the CROM, the ground lost by the CROM was taken by the CROC and the CTM during the

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<sup>7</sup> According to Mexican labor law, labor disputes, authorization for strikes, complaints by workers, and so forth, are to be resolved by the *Junta de Conciliación y Arbitraje*. This board is integrated by a labor representative, an employer representative, and a government representative. The government, therefore, has the deciding vote. Depending on the political decisions of the governor of the state, the board can evidence a pro-labor, pro-management, or neutral stance (Williams and Passé-Smith, 1992).

1950s and 1960s. By the time the maquiladoras arrived in the 1960s, Tijuana was largely divided in terms of labor representation. An aggressive campaign to regain ground by the CROM, primarily in the newly born maquiladora industry, further splintered labor representation. That condition remains today. In 1988, of the about 30 percent unionized workers in Tijuana, CROM represented 9,717 maquiladora employees, while the CTM and CROC represented only 408 and 355 respectively. Taking all industries in the region into account, in 1991, the CROM represented about 50,000 workers, while the CTM and the CROC represented about 30,000 and 15,000 (Quintero, 1997).

The CTM and CROC represent traditional unionism in Tijuana. The CROM, on the other hand, represents a more conciliatory, non-confrontational, form of unionism. Joaquín Parada, leader of the CROM in Tijuana, has questioned the traditional form of unionism by describing its leadership as undemocratic and irresponsible by encouraging strikes which affect workers negatively. For the maquiladora industry this new form of unionism represented an alternative to get rid of the more traditional and aggressive unions (Quintero, 1997).

In Tijuana, the mid-1970s marked a turning point in the position of organized labor. A severe economic crisis in 1974-75 resulted in massive plant closings and gave employers the opportunity to eliminate some unions from the industry. Changes in state policy toward maquiladoras also increased employers' ability to move plants from one location to another. In the following years, it appeared that labor union leaders were more interested in becoming the workers' representatives to receive the compulsory union dues, which come with it under federal labor law, than in actually protecting workers' interests.

Sixty four percent of the workers' grievances filed with the Labor Conciliation and Arbitration Board in Tijuana between 1967 and 1983 came from workers in unionized maquiladora plants. Most of these complaints involved workers charging that they were fired in violation of contract provisions. This suggests that labor leaders may have given in to unjustified dismissals of employees (Carrillo, 1985).

The election in 1989 of a governor in Baja California from the pro-business political party, the *Partido Acción Nacional* (PAN), represented a setback for the labor confederations in Tijuana, particularly since the major labor organizations are an integral part of the PRI. The new governor believed that unions were separate entities from government, and, therefore, he marginalized labor representatives from the local and state offices. Pro-management labor policies can be expected in the 1990s and beyond, since both Chihuahua (where Juárez is located) and Baja California (where Tijuana is located) have elected governors from the PAN.

In Juárez, maquiladoras account for 90 percent of all manufacturing activity, and in terms of medium and large size manufacturing plants (with over 100 employees), the percentage is even larger (Carrillo, 1985). In this city, the competition for labor representation between the CROC and CTM has led to a reduction of the work force being represented by a labor union from 33 percent in 1979 to 13 percent in 1990 (Williams and Passé-Smith, 1992).

The average maquiladora plant size in Juárez is the largest of the major cities on the border with 679 employees by 1997 (see Table 2.1). Tijuana, on the other hand, had the largest percentage growth in terms of the number of new plants established,

employment growth, and average plant size during the 1987-1997 period. Of particular interest to this study is that Tijuana had a 234.2% employment growth during the period, compared to 95.2% in Juárez and 90.5% in Matamoros. Matamoros experienced the lowest employment growth of the three cities.

### **Summary**

This chapter has provided a historical perspective of unions in Mexico and of the different maquiladora unions on the major cities along the U.S.-Mexico border. The revolution of 1910 gave birth to unions in Mexico. From the beginning, a union's success was dependent on its relationship with the President at the time. Politicians used the unions as political leverage. In turn, unions received the support of the government in their disputes with employers. The entire oil industry, for example, was nationalized from British and American investors after a union strike.

At the same time, Presidents supported the creation of new union confederations whenever the existing confederation did not agree with the Presidents' economic model. The power of union confederations in Mexico has oscillated with the type of economic philosophy of the government leadership. The following chapter reviews the previous research on the effects of labor unions on wages, employment, foreign direct investment, and productivity.

## **CHAPTER III**

### **EFFECTS OF LABOR UNIONS**

#### **Effects of Labor Unions On Wages and Employment**

An important question to ask in this study is whether membership in a union increases workers' wages. According to many empirical studies, unions do raise wages. The following review of the research performed with data that spans the latter part of the nineteenth and most of the twentieth centuries demonstrate that unionization carries a wage premium.

One of the oldest historical accounts of the impact of trade unions on earnings was conducted by Hatton, Boyer, and Bailey (1994). The researchers found that, in Great Britain, the effect of union membership on earnings between 1889-1890 was approximately 15-20 percent (see Table 3.1). This wage differential was similar at different skill levels.

In the United States, Boal and Pencavel (1994) measured the impact of labor unions on wages, employment, and days of work in the coal mining industry of West Virginia using data from 1897 to 1938. They found an average wage differential of 12.5 percent in favor of unionized workers for the entire period. When they divided the data into different periods, they found a wage differential of 12 percent between 1897-1912,



**Table 3.1**

**Summary of Estimates of Union-Nonunion Wage Differential Over the Past Century**

<b>Author</b>	<b>Time Period</b>	<b>Subject of Study</b>	<b>Union-Nonunion Differential</b>	<b>Comments</b>
Hatton, Boyer, and Bailey	1889-90	Britain's industry	15-20%	Effect was similar at different skill levels for different industry groups, although greater across industries than across skill groups
Boal and Pencavel	1897-1938	Coal mining: Average for period	12.5%	Wage differential was similar for different skill levels.
		1897-1912	12%	
		1913-20	-1.4%	
		1921-30	3.7%	
		1930-38	33%	
Lewis	1923-29 1931-33 1939-41 1945-49 1957-58	Industrial	15-20% 25 + 10-20 0-5 10-15	Inadequate data a major aspect
Throop	1950 1960	Selected industries	25.0% 29.7	
Weiss	1959	Craftworkers Operatives	7-8% 6-8	

**Table 3.1 (continued)**

**Summary of Estimates of Union-Nonunion Wage Differential Over the Past Century**

<b>Author</b>	<b>Time Period</b>	<b>Subject of Study</b>	<b>Union-Nonunion Differential</b>	<b>Comments</b>
Ashenfelter	1961-66	Firemen	6-16%	Composed of: (i) reduction in hours: 3-9 (ii) increase in salaries: 0-10
Stafford	1966	Craftworkers Operatives Laborers Clerical Professional	24% 26 52 18 -8	
Boskin	1967	Professional Managers Clerical Sales Craftworkers Operatives Service Laborers	19.0% -5.3 9.1 2.3 15.5 15.2 7.4 24.7	Union effect smaller than previously thought
Schmenner	1962-70	Teachers Firemen/police	12-14% 15	Unionization important but not significant as other factors

**Table 3.1 (continued)**

**Summary of Estimates of Union-Nonunion Wage Differential Over the Past Century**

<b>Author</b>	<b>Time Period</b>	<b>Subject of Study</b>	<b>Union-Nonunion Differential</b>	<b>Comments</b>
Freund	1965-71	Municipal employees	Aver. weekly earn inc. \$7	Major explanatory factors were market forces
Personick and Schwenk	1971	Shirt manufacturing: All production workers	12.5-16%	
		Sewing machine operators (women)	10-13	
		Sewing machine repairs (men)	7-9	
Personick	1972	Construction industry: Carpenters	35-50%	Varied widely between regions
		Laborers	40-65	
		Electricians/Plumbers	55-70	
		Cement Masons	35-50	
Ryscavage	1973	All workers	12%	Larger than previously thought
		White men	8	
		Black men	27	
		White women	22	
		Black women	19	

**Table 3.1 (continued)**

**Summary of Estimates of Union-Nonunion Wage Differential Over the Past Century**

<b>Author</b>	<b>Time Period</b>	<b>Subject of Study</b>	<b>Union-Nonunion Differential</b>	<b>Comments</b>	
Ashenfelter			<b><u>1967</u></b>	<b><u>1973</u></b>	<b><u>1975</u></b>
		All workers	11.6%	15.0%	16.8%
		White men	10.0	15.5	16.0
		Black men	21.5	22.5	22.5
		White women	14.0	13.0	17.0
		Black women	6.0	13.0	17.0
Schultz and Mwabu	1993	African men:			Data from South Africa
		In lowest decile	144.7%		
		All	59.7		
		In top decile	11.3		
		White men:			
		In lowest decile	20.7		
All	-5.2				
		In top decile	-31		

*Source:* Updated reprint from *The Role of Unions in the American Economy*, copyright © 1985, National Council on Economic Education, New York, NY 10036. All rights reserved. Used with permission.

close to zero in 1913-1920, about 4 percent during the 1920s, and 33 percent between 1931-1938.<sup>8</sup> These estimated wage effects are consistent with the interpretation that union wages are less flexible than nonunion wages. During the boom years of World war I, wages of nonunion workers were able to capture the inflationary ride while unionized workers' were limited by previously signed contracts. Later, during the depression years, nonunion workers were immediately affected, while unionized workers were able to maintain the wage levels of the prosperous 1920's for a longer period. In the 1930s, labor unions were strongly supported by the federal government, which led to the passage of the National Labor Relations Act (also known as Wagner Act) in 1935.

Among the most prominent studies on the union effect on wages was that conducted by Gregg Lewis (1963). Table 3.1 contains, among others, Lewis' results. He found an average union-nonunion wage differential that ranged from zero to 25 percent. The variation occurred within the different occupations and through time. Lewis' findings also confirm that wage differentials tended to increase during recessions and depressions and decrease during periods of economic prosperity. His data, however, were comprised of averages, ignoring differences in wages among industries. Wage differentials within an occupation varied widely by skill levels. During the depression of the 1930s, unionized skilled construction workers earned 25 percent more than nonunion skilled construction workers. In the same industry, unskilled union workers earned only 5 percent more than unskilled nonunion workers. On the other hand, Lewis reported that during the time of

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<sup>8</sup> Jarley and Kuruvilla (1994) found that the union-nonunion wage differential has a negative effect on union popularity. Public approval declines significantly when the wage differential exceeds 20 percent.

economic prosperity after World War II, between 1945-49, the wage differential between union and nonunion workers was reduced to only between 0-5 percent.

More recent studies have also noted that union-nonunion wage differentials tend to be larger during periods of recession. Orley Ashenfelter (1978) found that the wage differential was 11.6 percent in 1967, a period marked by relative economic prosperity, while the wage differential grew to 16.8 percent in 1975,<sup>9</sup> a period characterized by an economic recession brought about by the oil embargo.

Parsley (1980) found that wage differentials also vary according to industry, occupation, sex, race, and region. Wage differentials seem to be larger in industries with few firms in competition where it is possible to pass on the higher wage costs to the consumer. Schultz and Mwabe (1998), for example, observed a different wage differential for blacks and whites in South Africa. The wage differential between unionized and nonunionized blacks at the lowest decile of the income scale was 145 percent, whereas for whites at the lowest decile was only 21 percent. The differential changed at higher income levels. For blacks at the top decile, the wage differential reduced to 11 percent, and for whites actually reversed to a negative 31 percent. This shows the wage compression for union workers, both blacks and whites.

In summary, careful examination of the data in Table 3.1 reveals that the union-nonunion wage differential varies over time and is largely linked to fluctuations in economic activity. The conventional explanation given by labor economists is that

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<sup>9</sup> Freeman and Medoff (1984) report that in cross-sectional studies using more sophisticated statistical techniques that allow for the control of workers' characteristics, such as education, unions were successful in increasing the wage differential 20 to 30 percent.

nonunion wages are much more sensitive to economic conditions than are union wages. Unions members have greater power to resist wage cuts during recessions because they are usually protected by union contracts that were negotiated years earlier before market conditions deteriorated. During periods of economic expansion and labor demand, nonunion workers see their wages increase more rapidly than unionized workers do because their wages may not be frozen by previously negotiated agreements.

There are other factors that affect the wage differential between union and nonunion workers. Some of these factors offset each other and make the differential smaller than it otherwise might be. One such factor is the threat effect which causes nonunion employers to pay employees wages similar to those paid to unionized workers to remove the incentive of joining a union (Masters 1969). The result of this action is that the wage differential is not as large as it might otherwise be had the employer not been threatened with unionization. One should note, then, that in some cases, empirical studies would not reflect the full effect of labor unions because of the difficulty of measuring the percent reduction in the differential attributable to the threat effect.

On the other hand, other factors may overstate the size of the wage differential. Union workers, for example, usually have more resources such as physical capital with which to work than nonunion workers. Likewise, union workers may be more skilled than nonunion workers. Therefore, part of the wage differential may be owed to the higher productivity resulting from greater resources available to union workers and to their possible higher qualitative differences. The statistical techniques used to quantify the wage differential should be able to extract the portions of the differential attributable to

these differences (Marshall and Rungeling, 1985).

According to the Harris and Todaro (1970) model, later adapted and applied to labor unions in less developed countries by Calvo (1978), the unemployment rate would be higher in regions where union wage effects are larger. Depending on the elasticity of demand for labor, the union wage increases can have a negative effect on employment. Several studies have empirically shown that increases in the relative wages decreases employment (Montgomery, 1989; Boal and Pencavel, 1994; Schultz and Mwabu, 1998).

### **Effects of Labor Unions on Foreign Direct Investment**

Some recent studies have analyzed the effects of unions on such factors as foreign direct investment (FDI). In turn, it can be assumed that FDI will have a direct effect on employment and regional economic development. William N. Cooke (1997) examined the influence of several key industrial relations variables,<sup>10</sup> including union density, on United States (U.S.) outward FDI with a sample of nine industries and nineteen Organization for Economic Cooperation and Development (OECD) member countries. He found that U.S. outward FDI was negatively related to the regional percent unionization. That is, U.S. multinational companies appear to have pursued investment strategies that avoided regions and industries with high levels of unionization. Furthermore, other industrial relations variables, such as countries with centralized collective bargaining, countries with the most restrictive legislation governing layoffs, and countries with extension of collective bargaining agreements to employers outside of centralized negotiations, are also highly negatively correlated to U.S. outward FDI. It can

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<sup>10</sup> Variables that show the relationships between employers and employees, labor unions, and governments.



be concluded from Cooke's analysis, therefore, that U.S. foreign direct investment strategies have been strongly influenced by the desire to minimize restriction on their ability to control the terms and conditions of employment. If we also consider that the U.S. is by far the largest exporter of investment capital (FDI), then it can be assumed that a foreign regional economic development will also be largely affected by its type of union structure. While there are other studies that also conclude that unionization deters foreign direct investment (Bughin and Vannini, 1995), there are those who have found no effect. Karier (1995), for example, examined the influence of union density on FDI and found no evidence that average unionization rates in ten different geographical regions contributed to attract or deter U.S. outward FDI.

A common limitation of these type of studies is that the figures for foreign direct investment and percent unionization are aggregated by industry and by country, which substantially distorts the analysis. In Cooke's case for example, each country's union density ratio was obtained from the aggregate country rates given by Visser (1992). As mentioned by Visser himself, union membership density measurements are not very accurate and should only be used as approximations. In addition, union density rates are not always the best proxy for union power. There are other important factors affecting bargaining coverage. Finally, the available ratios are averages for both private and public sectors within a particular country. Therefore, density ratios are substantially distorted reflecting the fact that union membership varies not only between the public and private sectors, but also within the same industry as in the maquiladora case.

### **Net Effects of Labor Unions**

Most of the previous research has concentrated on specific effects of unions. Much of this research reports the relative positive compensation effects of unions. Others concentrate on the employment effects of unions. However, the empirical literature to date has had little to say about the *net* economic effects of unions in a region or industry; and even then, the existing literature has done so only indirectly.

Unions, acting as a monopolistic seller of labor in a market, might create market inefficiencies by raising wages above the competitive level, which leads to unemployment and the underuse of labor, and by having work rules that reduce productivity, such as featherbedding. Still, there are other effects that increase productivity and lower labor costs (Freeman and Medoff, 1979). Empirical work demonstrates, for example, that union workers tend to show lower quit rates than nonunion workers (Freeman, 1980; Mitchell, 1982; Blau and Kahn, 1983; and Long and Link, 1983). Lower employee quit rates, which may be attributed to the difficulty presented to the worker of finding a better job, increases productivity and reduces the cost associated with training new workers.

Brown and Medoff (1978) found that unionization increased productivity by about 20 percent, more than offsetting the cost of increased wages. One can question, however, that if employers considered lowered quit rates and other such positive effects worthy, they would consider raising wages without being forced to do so by the union. In fact, if unions raised the profitability of the firm, management's usual opposition to unionization would seem contrary to the role of managers in maximizing stockholders wealth.

An attempt to determine the net effect of unions on firms was made by Ruback and Zimmerman (1984). Instead of trying to determine the effects of unions on intermediate objectives such as wages and productivity, they analyzed the effects of unions on profitability through changes in equity valuation. The most important advantage of this approach is that if the higher union wages and other costs are not offset by higher productivity and higher product prices, future expected earnings of the firm will decline. Consequently, changes in future profitability will be reflected in the present valuation of the firm through the stock market according to the efficient market hypothesis. Investors will react to the new information and its effects on the future cash flows of the company by adjusting what they are willing to pay for the stocks of a firm (Fama, 1976).

Ruback and Zimmerman (1984) analyzed the effect of unions on profitability by observing the changes of stock prices during the unionization process. There are three important dates in the unionization process which offer public information to investors: the date in which a petition for an election is filed by having at least 30 percent of the workers sign a petition card, the date of the election itself (which is won with a 50 percent plus one majority), and the date in which the National Labor Relations Board (NLRB) certifies the results of the election. Since Ruback and Zimmerman (1984) used monthly price changes in their analysis and the NLRB certifies the election results within five business days after the election, these two dates were not differentiated in their analysis. According to Roomkin and Block (1981), close to half of the elections occur within a month after petition, and about 80 percent occur within two months after petition, so

these two dates were examined separately.

The combined abnormal returns<sup>11</sup> for those firms who filed an election petition and had a subsequent successful union election was a statistically significant -3.84 percent. A decline in the value of the company of 2.41 percent occurred during the month of the election petition, and a further drop of 1.43 percent ensued during the month of the successful union election. The combined effects for firms which filed a petition for an election but had an unsuccessful election were -1.32 percent. Most of the loss of value was incurred during the petition month (-1.10), with no significant change during the election month. These results tend to confirm that the market anticipates, to a large extent, the outcome of the election. Ruback and Zimmerman (1984) also find that during the 12 months prior to the petition month, stockholders lose an additional 7.17 percent. They speculate that this reflects some anticipation by investors of potential unionization. If we were to add the loss during the 12 months prior to filing the petition (-7.17 percent) plus the loss that occurred during the petition and election months (-3.84 percent), one might conclude that unionization would lower the value of a firm by slightly more than 11 percent.

The net effect that unionization has on firms can be estimated by multiplying the percentage loss in equity value times the value of the firm the month prior to the filing of an election petition and dividing the product by the number of workers in the union contract. Ruback and Zimmerman (1984) estimate that the present value-effect on profits per unionized worker is a loss of about \$46,810 in 1980 dollars. This figure would be

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<sup>11</sup> Abnormal returns are either positive or negative deviations from the expected returns.

more than three times larger if the calculation included the equity value loss of the 12 months prior to the filing of the petition for an election.

In a similar fashion, the net effect of unions on a region can be estimated by calculating the effect on the total wage bill<sup>12</sup> (total payroll) of having a union versus not having one or having a less confrontational one. That is, the product of the suggested higher union wages times a smaller number of workers will be either larger or smaller than that of a region with a weaker union where employees earn less but with a larger workforce. The wage bill will depend on the elasticity of employment with respect to the union wage effect. If increased union wages have a relatively larger negative effect on future employment growth, then the net effect for the region would be negative. On the other hand, if the higher union wages do not affect, or affect only slightly, the employment growth, then the net effect would be positive. Because the research on the effects of unions on the total wage bill of a region is virtually nonexistent, the purpose of this research is to help determine the net effect of unionism on a region and, thus, contribute to the body of knowledge.

### **Summary**

This chapter reviewed the previous research on the effects of labor unions on wages, employment, foreign direct investment, and productivity. The literature shows that unions, on average, raise wages of unionized workers relative to non-union workers. At the same time, this increase in wages tends to decrease employment. The employment reduction is dependent on the elasticity of labor demand with respect to wages. A major

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<sup>12</sup> Wage bill = number of workers x average wage.

effect on employment is derived from the negative relationship that exists between unionization and foreign direct investment. The net effect on the wage bill, therefore, will be positive or negative depending on the elasticity of labor demand of the region. Research on the net effect of unions on firms has shown that for every worker that becomes a union member, companies tend to lose profitability as reflected in its capitalization value. The next chapter provides the research objectives and hypotheses of this study.

## CHAPTER IV

### RESEARCH OBJECTIVES AND HYPOTHESES

As noted in the introduction chapter, a reasonable way to test the net effect of unions in an industry or a region is to compare the actual economic gains generated by strong unions and compare it to the gains that would have been achieved if unions were relatively weak or nonexistent. However, this is a difficult task since we only observe economic outcomes under the current economic conditions and can only make inferences on alternative union-influenced economic outcomes. An alternative way is to compare two similar regions or industries, one with a powerful union and another with a relatively weak or nonexistent a union (or with a union that is more akin to capital investment). The alternate approach was used for this study. The maquiladora industry is an industry with different levels of union strength along the different regions where the maquiladora firms are located. Data from the Mexican northern border cities with the largest concentration of maquiladoras was used in this research to empirically test union regional economic effects. Formally, the hypotheses which were tested are as follows:

H<sub>1</sub>: Economic development in a region is associated to the strength of labor union(s) in that region.

Economic development was measured in terms of (a) relative real wage growth

and (b) relative employment growth over a period of time in the maquiladora sector of the different regions where there are different levels of union strength. According to the literature, real wages for maquiladora employees are expected to be higher in the regions where there is a stronger union. On the other hand, the relative employment growth for the maquiladora sector is expected to be higher for regions where there is a weaker union. Finally, the larger relative employment growth in regions with weaker unions might possibly offset their region's lower wages, bringing a higher net wage bill to that region. Hypothesis  $H_1$  can, therefore, be subdivided into three sub-hypotheses as follows:

$H_{1a}$ : The real wage growth in a region's maquiladora sector relative to the non-maquiladora sector is associated with the strength of the labor union(s) in the maquiladora industry of that region.

$H_{1b}$ : The employment growth in a region's maquiladora sector relative to the non-maquiladora sector is associated with the strength of the labor union(s) in the maquiladora industry of that region.

$H_{1c}$ : The wage bill growth in a region's maquiladora sector is associated with the strength of the labor union(s) in the maquiladora industry of that region.

Union power was categorized into strong, semistrong, and weak relying on the classification by Williams and Passé-Smith (1992) and Quintero (1997a) who have analyzed the differences in the maquiladora labor unions for different cities across the Mexican border with the United States. The estimation of union strength is determined by several factors, which include the union density or percentage of unionized workers in the maquiladora sector of that region, the existence of different unions that may compete for



representation of the workers in the maquiladora sector of that region, and the personality, character, and political influence of the union leader(s) in the maquiladora sector of that region.

In the Mexican case, there is no quantitative measure that captures all the different dimensions of union strength. The different variables that would be included in such an index are difficult to measure, and they would incorporate the subjectivity of the researcher by giving different weights to the different components of an index value. Consequently, given the data at hand, three broad categories representing union power can be employed: strong, semistrong, and weak. According to the analysis of Williams and Passé-Smith (1992) and Quintero (1997a), Matamoros represents the strong case, Nuevo Laredo represents the semistrong case, and Juárez and Tijuana represent the weak case. These categories were used in these investigation.

## CHAPTER V

### METHODOLOGY

To analyze the hypotheses stated in the previous chapter, a combination of descriptive and econometric statistical techniques were used. Descriptive statistics give us a general picture of the economic conditions of workers of the different cities recipients of most maquiladora investments during 1987 and 1997. The advantage of descriptive statistics is that they offer an easy-to-understand depiction of the regional economic conditions and labor market outcomes across time. The limitations of descriptive statistics are that they do not show the relationship between the different variables nor the statistical significance and strength of those relationships. These limitations are addressed by using the econometric techniques described in the next sections.

To empirically test hypothesis  $H_{1a}$  it is necessary to use an econometric technique that can break down the factors affecting the *changes over time* of the earnings differential between the maquiladora sector and the rest of the economy (non-maquiladora sector) of the different cities, with strong and weak unions, to extract the portion of the differential that can not be explained by changes in the levels of human capital characteristics of the local workers or by changes in the local labor market structure (observable factors). It is implicitly assumed, then, that a significant portion of

the changes in the wage differential that cannot be explained by the changes in the observable factors may be due to the type of unionization, which is not directly observed. The personality of union leaders, for example, is not part of any major data set. A similar process was followed to test hypothesis  $H_{1b}$ . Here the econometric technique decomposed the factors affecting the changes in employment shares between the two sectors of the different cities. Finally, to test hypothesis  $H_{1c}$  and determine the total net effect of the different types of unions, the portion of the change in the wage differential owing to differences in the returns to characteristics (wage structure) was multiplied by that city's maquiladora sector change in employment.

#### **Regional Changes in the Wage Differential During 1987-1997:**

##### **Maquiladora vs. Non-Maquiladora Sectors**

The Oaxaca (1973) decomposition technique is used to determine which portion of the wage differential between two groups of workers (employed, in say, two sectors at a specific point in time) reflects differences in the average human capital characteristics of individuals, and which portion is due to differences in the rates of return (prices) of those characteristics. Estimation of the wage equations and the Oaxaca decomposition provides insights into the factors that contribute to the difference in the wages. The methodology helps determine which portion of the difference in earnings can be explained by the labor market structure and the different levels of human capital between the two groups, and which portion is due to the different prices paid to workers of either sector of the economy (Oaxaca and Ramson, 1988). Gisser and Dávila (1998), for example, used this technique to study the wage differences between workers in the farm

and non-farm sectors of the economy.

To empirically test hypothesis  $H_{1a}$ , it is necessary to decompose the changes in earnings between the maquiladora and non-maquiladora sectors for different border cities during the 1987-1997 period to analyze which factors account for the changes in real wage sectoral differences during this period. This decomposition can be conducted by using the Juhn, Murphy, and Pierce (1991) methodology (referred to as JMP from now on). The JMP decomposition is an expansion of the original Oaxaca (1973) earnings decomposition model. The JMP model allows us to make inferences about the portions of the wage difference between the two sectors that can be attributed to changes over time in both observed (included variables) and unobserved (unknown variables) characteristics, as well as the portions attributable to changes in the returns to those observed and unobserved characteristics. This model, therefore, allows us to decompose the 1987-1997 sectoral wage gap change into a portion of change resulting from worker-specific characteristics and a portion of change due to differences in wage structure inequality between the two sectors.

Thus, the variation of the JMP model over the Oaxaca technique is twofold: the JMP (1) measures the part of the sectoral wage differential explained by sectoral differences in observed characteristics and the returns to those observed characteristics, and (2) assesses the portion of the sectoral wage differential attributed to unobserved characteristics and the returns to those unobserved characteristics.

While Juhn, Murphy, and Pierce (1991) developed their model to analyze the trends in race pay differentials, the model has been applied to compare different segments

of the economy. Margo (1995) used it to explain black-white wage convergence during the 1940-1950 period. Blau and Kahn (1992; 1994) used it to examine the changes in gender pay inequality between 1975 to 1987, and Pagán and Tijerina (1997) used it to study the changes in the wage gap between the formal and informal sectors in the Mexican economy between 1987 and 1993. Thus, the JMP model represents a suitable empirical technique to analyze the factors that affect the changes in wage differentials over time between the maquiladora sector employees and non-maquiladora sector employees.

Following their model, the wage equation for worker  $i$  in year  $t$  employed in the maquiladora ( $M$ ) sector is given by:

$$(1) \quad Y_{itM} = X'_{itM}\beta_{tM} + \theta'_{itM}\sigma_{tM}$$

where  $Y_{itM}$  represents the natural logarithm of wages for the  $i$ th worker during year  $t$  employed in the maquiladora sector ( $M$ );  $X_{itM}$  and  $\beta_{tM}$  represent, respectively, a set of explanatory variables, including human capital characteristics of the  $i$ th worker, and the returns to those characteristics;  $\theta_{itM}$  is a standardized residual (i.e., with mean of 0 and standard deviation of 1,  $\theta_{itM} = e_{itM}/\sigma_{tM}$ ); and  $\sigma_{tM}$  is the residual standard deviation of maquiladora wages for year  $t$ .

It follows, then, that the year  $t$  average log-wage differential ( $D_t$ ) between the non-maquiladora ( $NM$ ) and maquiladora ( $M$ ) sectors can be expressed as:

$$(2) \quad D_t \equiv Y_{tNM} - Y_{tM} = \Delta X'_t \beta_{tNM} + \Delta \theta'_t \sigma_{tNM}$$

where the  $M$  and  $NM$  subscripts represent the maquiladora and non-maquiladora sector averages for year  $t$ , respectively; and the  $\Delta$  refers to the non-maquiladora vs. maquiladora

average difference in the characteristics ( $\Delta X_t$ ) and standardized residual ( $\Delta \theta_t$ ). Therefore, this equation specifies that the intersectoral log-wage average differential in year  $t$  can be decomposed into intersectoral differences in the observed characteristics ( $\Delta X_t$ ), weighted by the average non-maquiladora rates of return to those characteristics ( $\beta_{iNM}$ ), and into intersectoral differences in the standardized residual ( $\Delta \theta_t$ ), multiplied by the average non-maquiladora rate of return of the combined unobserved characteristics ( $\sigma_{iNM}$ ).

Expanding equation (2) to reflect the changes in the two sector wage differential between 1987 and 1997, the model can be expressed as follows:

$$(3) \quad D_{97} - D_{87} = (\Delta X_{97} - \Delta X_{87})' \beta_{97NM} \\ + \Delta X_{87}' (\beta_{97NM} - \beta_{87NM}) \\ + (\Delta \theta_{97} - \Delta \theta_{87})' \sigma_{97NM} \\ + \Delta \theta_{87}' (\sigma_{97NM} - \sigma_{87NM}).$$

The first term after the equal sign in equation (3), referred to by Blau and Khan (1994) as the "observed-X's effect," represents the portion of the change in the wage differential between the maquiladora and non-maquiladora sectors during the 1987-1997 period that can be attributed to changing differences in observed characteristics ( $X$ ) between the two sectors. This portion is then weighted by the 1997 average rates of return to those observed characteristics in the non-maquiladora sector. For example, a narrowing of the educational difference between the two sectors will reduce the wage differential between the two sectors, *ceteris paribus*.

The second term, referred to as the "observed-prices effect," measures the portion of the change in the wage differential between the two sectors during the 1987-1997

period that can be explained by changes in the rates of return to the observed characteristics for non-maquiladora workers. This portion is evaluated at the 1987 intersectoral differences in observed characteristics. For example, all else equal, a rising return to education in the non-maquiladora sector during the 1987-1997 period would increase the wage gap between the two sectors, assuming the return to education was already higher in 1987 for the non-maquiladora sector workers relative to the maquiladora workers.

The third term, called the "gap effect," reflects the portion of the change in the intersectoral wage differential during the 1987-1997 period due to changes in the intersectoral differences in the standardized residual or unobserved characteristics. This segment describes the effect of changing differences in the relative wage positions of the maquiladora workers relative to the non-maquiladora workers after accounting for the observed characteristics, multiplied by the 1997 average non-maquiladora rates of return of the unobserved characteristics. It shows whether maquiladora workers rank higher or lower within the non-maquiladora residual wage distribution. In other words, this term offers the contribution to the change in the wage gap between the two sectors that would result if the level of residual non-maquiladora wage difference had remained the same during the period, and only the relative ranking of the maquiladora wage residuals had changed.

Finally, the fourth term, referred to as the "unobserved-prices effect," captures the portion of the change in the intersectoral wage difference during the 1987-1997 period attributable to changes in the returns to unobservable characteristics. It measures the

contribution to the change in the sectoral wage gap that would result if the relative ranking of the maquiladora wage residuals had remained the same and only the non-maquiladora residual wage difference had changed. *Ceteris paribus*, the larger the penalty for being below the average in the residual wage distribution, the larger the wage differential will be.

In summary, equation (3) reflects the full impact of the sector-specific factor differences in the sum of the first and third terms, reflecting the observed and unobserved characteristics, respectively. The wage structure is reflected in the sum of the second and fourth terms, which measure the changing returns (prices) of observed and unobserved characteristics, respectively. In this decomposition, the sum of the third and fourth terms depicts the change in the unexplained differential, commonly accepted in the literature to be an estimate of the pay bias between the two sectors of the economy.

### **Regional Changes in Relative Employment Shares During 1987-1997:**

#### **Maquiladora vs. Non-Maquiladora Sectors**

In order to test hypothesis  $H_{1b}$ , it is necessary to estimate the factors affecting the sectoral choice of employment relative to other sectors of the economy (e.g., maquiladora vs. non-maquiladora). To accomplish this task, econometric models that take into account the discrete nature of the dependent variable may prove useful. Probability models have been used to determine the factors affecting the likelihood of being employed in a particular sector. Furthermore, these models can be applied to understand the causes of changes in relative employment in a particular sector of the economy (Pagán and Tijerina, 1997).



There are basically two possible models that can be used: the probit and logit models. Although Maddala (1983) and Aldrich and Nelson (1984) discuss other distributions, the econometric applications in the literature dealing with discrete dependent variables have almost exclusively employed these two models.

The logit model and the probit model only differ in the cumulative distribution function that is used to define choice probabilities. The logistic probability function is a normal distribution that resembles a  $t$  distribution with 7 degrees of freedom, whereas the probability function of the probit model is the standard normal distribution. The parameter estimates obtained using either method have been found to be very similar. In some cases, we would expect somewhat different predictions from the two models (for example, when the sample contains very few responses of either choice,  $Y = 0$  or  $1$ ).<sup>13</sup> Nevertheless, on theoretical grounds there is no specific recommendation on when to use either model (Greene, 1997).

An adapted bivariate probit model with censored data was selected for this analysis. The model helps explain the *changes over time* in the relative employment share of a particular sector of the economy, an important dimension given this dissertation's objective to estimate the factors that affected the changes in the employment share for the maquiladora sector of several cities during the 1987-1997 period. In the probit model, the underlying value of the utility index ( $I_i$ ) can theoretically vary over the real number line from  $-\infty$  and  $+\infty$ , where the larger the value of  $I_i$ , the greater the utility individual  $i$  receives from choosing the option  $Y=1$ . Therefore, as the value of  $I_i$  increases, so will the

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<sup>13</sup> See Amemiya (1981) for a comparison of the two distributions.

probability ( $P_i$ ) that individual  $i$  will choose the option  $Y=1$ . To keep the probability values between zero and one, the probit model uses the standard normal cumulative distribution function (CDF):

$$(4) \quad P_i(Y=1) = F(I_i) = F(\beta_1 + \beta_2 x_{i2} + \dots + \beta_k x_{ik}) = F(X_i' \beta) = \Phi(X_i' \beta)$$

where  $F(\cdot)$  and  $\Phi(\cdot)$  are two customary means to express the CDF of the standard normal random variable, with mean of zero and variance of one, evaluated at  $I_i$ . The CDF is provided by:

$$(5) \quad P_i(Y=1) = P[z \leq I_i] = \int_{-\infty}^{I_i} (2\pi)^{-1/2} e^{-z^2/2} dz$$

where  $z$  is a standard normal random variable (Griffiths *et al.*, 1993; Greene, 1997).

The utility index ( $I_i$ ), and as a consequence the probability ( $P_i$ ), for the  $i$ th worker is determined by a set of explanatory variables ( $X_i$ ) that include the characteristics of the alternatives available to the individual and the characteristics of the individual decision maker, and by a set of parameters ( $\beta$ ) which reflect the impact of changes in the explanatory variables on the likelihood of making the choice  $Y=1$ . Using vector notation, the utility index functions for the bivariate probit model can be presented as:

$$(6) \quad I_{1i} = X_{1i}' \beta_1 + \varepsilon_{1i},$$

$$(7) \quad I_{2i} = X_{2i}' \beta_2 + \varepsilon_{2i},$$

$$\varepsilon_{1i}, \varepsilon_{2i} \sim BVN(0, 0, 1, 1, \rho),$$

where  $I_{1i} > 0$  indicates that the  $i$ th individual is employed ( $Y_i = 1$ ), and  $I_{1i} \leq 0$  means that the person is either unemployed or out of the labor force ( $Y_i = 0$ ).  $X_{1i}$  and  $\beta_1$  represent a set of variables that affect the decision to be employed, including human capital characteristics of the  $i$ th worker, and the returns to those characteristics, respectively.  $I_{2i} >$

0 signifies that the individual works in the maquiladora sector ( $Y_i=1$ ), and  $I_{2i} \leq 0$  symbolizes that the worker is employed in the non-maquiladora sector ( $Y_i=0$ ).  $X_{2i}$  and  $\beta_2$  represent a set of variables that affect the decision to be employed in the maquiladora sector relative to the non-maquiladora sector and the returns to those characteristics, respectively. These variables include human capital characteristics and type of occupation of the  $i$ th worker.

This bivariate censored model was first proposed by Wynand and van Praag (1981) for situations in which, for the  $i$ th individual,  $I_{2i}$  is not observed unless  $I_{1i}$  is greater than zero.<sup>14</sup> The role of  $\rho$ , the correlation coefficient of the errors, is to correct the bias in equation (7) generated by the sample selectivity of equation (6). Rho ( $\rho$ ) captures in a single value all the censored (unselected) information (Greene, 1997).

In the probability model (4), the parameter value of  $\beta_k$  cannot be directly interpreted as the effect of a change in the explanatory variable  $x_{ik}$  on the mean of the dependent variable. The rate of change in the probability that alternative 1 is chosen given a change in the  $k$ th explanatory variable, evaluated at the sample means, is determined by the partial derivative

$$(8) \quad \frac{\partial P_i}{\partial x_{ik}} = \frac{\partial F(X_i' \beta)}{\partial x_{ik}} = f(X_i' \beta) \beta_k = \phi(I_i) \beta_k$$

where  $f(I_i)$  and  $\phi(I_i)$  are two different ways to express the standard normal probability density function estimated at the point  $I_i$ , and  $\beta_k$  is the  $k$ th parameter in the vector  $\beta$ .

Because the value of the probability density function  $f(I_i)$  is always positive, the sign of  $\beta_k$

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<sup>14</sup> Poirier (1980) and Abowd and Farber (1982) discuss applications of the bivariate probit model to other types of censoring.

indicates the direction of the relationship between the explanatory variable and the probability  $P_i$ . It is also important to note that a change in the conditions ( $x_{ik}$ ) has its greatest effect on the probability of a choice for those individuals who are indifferent about the choices, which occurs when  $P_i = F(I_i=0) = 0.5$ , and has a smaller effect for those who are set in their ways, which occurs when  $I_i$  is large negatively or positively, equating to a  $P_i$  near zero or one, respectively (Griffiths *et al.*, 1993; Greene, 1997).

To analyze the changes in relative employment share and work status probabilities during the 1987-1997 period between the maquiladora vs. non-maquiladora sectors for the different cities in this study, it is necessary to disaggregate the probit model coefficients using the dichotomous modification (Pagán and Tijerina, 1997) of the ordered probit decomposition model proposed by Jones and Makepeace (1996). This decomposition, analogous to the Oaxaca (1973) decomposition technique for linear regression models, is calculated by estimating equation (7) for the maquiladora sector of a particular city during 1987 and 1997 and taking their difference to observe the sources of that period's change in the employment share for that sector:

$$(9) \quad \bar{I}_{97} - \bar{I}_{87} = [\Phi(\bar{X}'_{97}\hat{\beta}_{87}) - \Phi(\bar{X}'_{87}\hat{\beta}_{87})] + [\Phi(\bar{X}'_{97}\hat{\beta}_{97}) - \Phi(\bar{X}'_{97}\hat{\beta}_{87})],$$

where  $\bar{I}$  represents the mean share of maquiladora sector employment for 1987 and 1997;  $\bar{X}$  is a row vector with the means of the explanatory variables for either 1987 or 1997;  $\hat{\beta}$  is a vector with the estimated coefficients of the explanatory variables; and  $\Phi$  stands for the standard normal cumulative distribution function.

The first component with brackets on the right hand side of equation (9) explains the 1987-1997 changes in the mean share maquiladora sector employment that can be

attributed to changes in the mean characteristics of those employed in the maquiladora sector during that period. The second bracketed component in equation (9) captures the 1987-1997 changes in the relative maquiladora sector employment share due solely to changes in the labor market structure during this period. That is, the changes in the coefficients show increases or decreases in the likelihood of maquiladora sector employment according to the level of human capital characteristics and sectorial alternatives available to the worker.

To further disaggregate the two components of equation (9) into all the single explanatory variables and their coefficients, and to determine the contribution of each variable to the total change in the maquiladora employment share during this period, the probit decomposition technique developed by Even and Macpherson (1990) was used:

$$(10) \quad \Delta X_k = [\Phi(\bar{X}'_{97} \hat{\beta}_{87}) - \Phi(\bar{X}'_{87} \hat{\beta}_{87})][(\bar{X}_{97k} - \bar{X}_{87k})' \hat{\beta}_{87k}] / [(\bar{X}_{97} - \bar{X}_{87})' \hat{\beta}_{87}],$$

where  $\Delta X_k$  determines the portion of the change due to the  $k$ th variable. Similarly,

$$(11) \quad \Delta \beta_k = [\Phi(\bar{X}'_{97} \hat{\beta}_{97}) - \Phi(\bar{X}'_{97} \hat{\beta}_{87})][(\hat{\beta}_{97k} - \hat{\beta}_{87k})' \bar{X}_{97k}] / [(\hat{\beta}_{97} - \hat{\beta}_{87})' \bar{X}_{97}]$$

estimates the portion of the change due to the  $k$ th coefficient.

### Summary

The Juhn, Murphy, and Pierce (1991) methodology was used to study the changes over time of the earnings differential between the maquiladora sector and the rest of the economy (non-maquiladora sector). If differences in labor union composition in the maquiladora sectors of the different cities used in the sample do not impact wages differently, then there should be no significant changes in wage differentials between the two sectors once the procedure accounts for other changes in local sectoral labor structure

and employee characteristics.

The effects of maquiladora labor unions on the relative maquiladora employment gains or losses in the different regions was assessed using a bivariate probit model with censored data (i.e., the Jones and Makepeace (1996) decomposition). This methodology allows the researcher to analyze the changes in relative employment shares over time between the maquiladora and non-maquiladora sectors for the different cities in this study. Similarly, if labor unions had no effect on local employment, the relative employment shares of both sectors ought to be maintained over time once other changes in the local economy and labor market are accounted for. The following chapter describes the data used in the analysis.

## CHAPTER VI

### DATA DESCRIPTION

The primary source of data used for the empirical analysis is the National Urban Employment Survey (*Encuesta Nacional de Empleo Urbano* or ENEU), collected by the National Statistics, Geography and Informatics Institute (*Instituto Nacional de Estadística, Geografía e Informática* or INEGI). Specifically, the analysis employs ENEU data from the second quarters of 1987 and 1997. Other supplemental sources of information include INEGI's web page data and printed publications on Mexico's national accounts for the production, salaries, employment, and productivity of the maquiladora export industry. Finally, the *International Financial Statistics* published by the International Monetary Fund was used to obtain the peso-dollar exchange rates and inflation index to compare salaries for the different periods in real dollar terms. The following sections offer a description of the ENEU.

One of INEGI's main tasks is to collect statistics on economic, population, and social data at the national level. It carries out the Population and Housing, Economic, and Agricultural censuses as well as economic and sociodemographic surveys of households and establishments, such as the ENEU. It also consolidates sectoral, state, and regional information by compiling ongoing statistics prepared by federal, state, and municipal

governmental offices, among these, data dealing with the production, salaries, employment and productivity of the maquiladora export industry (INEGI 1998).

### **ENEU**

The National Urban Employment Survey (ENEU) is a quarterly survey conducted by INEGI for the purpose of measuring the employment and unemployment characteristics of the major urban areas in Mexico. The survey offers information on the population 12 years and older, including the number of hours worked, type of work performed, position held, sector of the economy in which they work, size of the firm, earnings, and other demographic information such as sex, age, marital status, number of children, and level of education.

### **Origins and Background of ENEU**

In 1971, as a result of an agreement between the Mexican President and the Secretariat of Industry and Commerce, the General Directorate of Statistics was ordered to collect and process information that would adequately describe the levels and characteristics of employment of the Mexican population along with sociodemographic data. The General Directorate of Statistics, after studying the methodology to follow for the new project, concluded that a household survey would permit the stable generation of statistical data needed to set the appropriate priorities in the instrumentation of plans, policies, and programs by the state. This gave birth in 1972 to the National Household Survey (*Encuesta Nacional de Hogares*) modeled after guidelines given by the U.S. Bureau of the Census on the collection of household surveys. During that year, the survey was implemented in the three major cities in Mexico: Mexico City, Guadalajara, and



Monterrey (INEGI 1997a).

Since the National Household Survey was a multiple purpose survey, the portion of the survey dealing with employment information was separated in 1973 and named *Encuesta Continua Sobre Ocupación* (ECSO). The general objective of ECSO, which has been maintained in the ENEU, was to produce information on the sociodemographic and occupational characteristics of the labor force. Between 1976 and 1978 the ECSO was expanded to cover other major urban areas, and in 1979 the General Directorate of Statistics held a round table with the users of the information with the objective of revising the conceptual basis and methodology of ECSO. It was concluded that the sampling design and questionnaire needed to be updated because they presented some limitations for the collection of specific urban employment information. Also, since the original questionnaire was based on the American classification of employment, unemployment, and underemployment, the questionnaire required some adaptations to reflect the Mexican labor market realities. For example, although the Mexican public sector had a 40 hour work week (35 in some instances), the private industry still maintained the 48 hour work week instead of the 35 hours required for the classification of full employment in the United States (INEGI, 1997a).

In response to these concerns, INEGI created the *Encuesta Nacional de Empleo Urbano* (ENEU). First, it was decided that the new survey would include only urban areas. Second, the sampling frame would be based on international norms to maintain international comparability while taking into consideration the specific local labor market characteristics. And, third, the questionnaire would be modified to better measure the

categories of occupation and unemployment with fewer questions and a better sequential structure that would maintain continuity of information with the ECSO for historical comparability.

During 1983 and 1984 the ENEU and ECSO surveys were simultaneously conducted in Mexico City, Guadalajara, and Monterrey<sup>15</sup> as a transitional pilot test which led to a further revision process of the ENEU questionnaire. The revision led to changes that were incorporated in the 1985 ENEU survey. The changes consisted of (1) the inclusion of new variables, such as the number of hours worked, income, and benefits, and (2) the expansion of the survey into the border cities of Tijuana, Juárez, Nuevo Laredo, and Matamoros due to the increasing economic importance of those cities. This expansion increased the coverage of the survey to 16 metropolitan areas. In 1992, the survey was expanded to include 18 more cities,<sup>16</sup> and during the 1993-1994 period, another 5 cities<sup>17</sup> were added to increase the total number of cities involved in the survey to 39. The ENEU, therefore, covers approximately 61% of the urban population living in cities with 2,500 or more residents, and about 90% of the residents living in urban areas of 100,000 inhabitants or more (INEGI, 1997a). It is estimated that of the total population in Mexico, approximately 70% live in urban areas with 2,500 or more residents, while the

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<sup>15</sup> The ENEU alone was also taken in the cities of Puebla, León, San Luis Potosí, Tampico, Torreón, Chihuahua, Orizaba, Veracruz, and Mérida.

<sup>16</sup> Aguascalientes, Campeche, Saltillo, Tuxtla Gutiérrez, Durango, Acapulco, Morelia, Cuernavaca, Tepic, Oaxaca, Culiacán, Hermosillo, Villahermosa, Toluca, Coatzacoalcos, Zacatecas, Colima y Manzanillo. The first 16 cities were added during the first quarter of 1992, and the last 2 during the third quarter of that same year.

<sup>17</sup> Monclova, Querétaro, and Celaya during the second, third, and fourth quarters of 1993, respectively. Irapuato and Tlaxcala during the third and fourth quarters of 1994, respectively.

remaining 30% live in rural areas (Fleck and Torrentino, 1994). The ENEU sample design and sample size estimation can be found in Appendix B.

## CHAPTER VII

### EMPIRICAL ANALYSIS

This chapter describes the empirical results obtained using the econometric techniques and data described in the previous two chapters. The first section offers a description of the data for the maquiladora and non-maquiladora sectors in each of the four cities covered in the study during 1987 and 1997. After that, the following sections directly address each one of the three sub-hypotheses stated in Chapter IV.

#### Descriptive Statistics

The observations for the four cities of interest (Matamoros, Nuevo Laredo, Juárez, and Tijuana) were extracted from the ENEU sample for both 1987 and 1997. The new sample was selected with only those individuals ranging in ages between 18 and 65. To be considered employed, the individual had to report positive earnings and hours of work. Likewise, to eliminate the plant size wage differential and to have a larger correlation between manufacturing and maquiladora plants, only plants with over 100 employees were included in the maquiladora sector. Finally, nominal income reported for 1987 was converted to 1997 real new pesos using the Mexican inflation rates.<sup>18</sup> Table 6.1 presents the definition of the variables used in the analysis. Tables 6.2, 6.3, 6.4, and 6.5 display the

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<sup>18</sup> The Mexican price indexes for 1987 and 1997 were 19.9 and 221.6, respectively.

descriptive statistics for the maquiladora and non-maquiladora sectors within each one of the four cities involved in the study.

Probably one of the most revealing pieces of information found is that employees in the maquiladora sector in Matamoros worked the fewest hours per week, on average, in both 1987 and 1997 relative to the maquiladora sectors of the other three cities, as well as relative to the non-maquiladora sector in Matamoros itself. This occurred despite the fact that the non-maquiladora sector workers in Matamoros worked the most hours compared to the other three cities in both years, with the sole exception of Tijuana in 1987.

To be more specific, for 1987 and 1997 the average number of hours worked in the maquiladora sector in Matamoros were 39.35 and 42.44, respectively, while for the non-maquiladora sector the average number of hours worked for these two years was 44.80 and 48.15. Maquiladora sector employees worked 5.45 and 5.71 fewer hours during 1987 and 1997, respectively, than their counterparts in the non-maquiladora sector of the Matamoros economy. In all the other four cities, maquiladora employees worked *more* than non-maquiladora sector workers in their respective cities. In Tijuana, maquiladora employees worked the most hours per week compared to workers in the maquiladora sectors of the other three cities in the study in both 1987 and 1997, 45.21 and 45.70 hours, respectively. These findings are consistent with one of the most important gains of unions. They have historically fought for the reduction of the number of hours of work for the same or even higher pay.

Consider also that the average monthly wages for maquiladora sector employees were lower than for non-maquiladora sector workers in all four cities. Matamoros,

**Table 6.1****Definition of Variables**

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LNWAGE	=	natural logarithm of real monthly income (1997 = base)
LNHWAGE	=	natural logarithm of real hourly income (1997 = base)
LNHOURS	=	natural logarithm of hours worked per week
WAGE	=	real monthly income (1997 = base)
HOURS	=	hours worked per week
EXPER	=	potential experience (age minus years of schooling minus 6)
EXPER2	=	EXPER squared divided by 100
SCHOOL	=	number of years of formal schooling
FEMALE	=	1 if female; 0 otherwise
MARRIED	=	1 if married or living as a couple; 0 otherwise
MIGRATED	=	1 if new immigrant to the area; 0 otherwise
MANPROF	=	1 if occupation is managerial or professional; 0 otherwise
TECHNIC	=	1 if occupation is technical; 0 otherwise
LABORER	=	reference occupation; activities included here are all those not classified as managerial, professional, or technical such as crafts workers, repair and maintenance employees, machinery operators, drivers, clerks, sales agents, guards, etc.
MATAM	=	1 if working in Matamoros; 0 otherwise
NLAREDO	=	1 if working in Nuevo Laredo; 0 otherwise
JUAREZ	=	1 if working in Juárez; 0 otherwise
TIJUANA	=	1 if working in Tijuana; 0 otherwise

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Table 6.2

**Means and Standard Deviations in Parentheses: Matamoros**

Variable	1987		1997	
	Maquiladora	Non-Maquiladora	Maquiladora	Non-Maquiladora
LNWAGE	7.7364 (.3275)	7.7738 (.5513)	7.6601 (.4711)	7.5158 (.7867)
LNHOURS	3.6650 (.1315)	3.7590 (.3373)	3.7338 (.1722)	3.7734 (.5195)
EXPER	13.4894 (9.9148)	21.3274 (14.2352)	12.7116 (8.9058)	20.9909 (13.7348)
EXPER2	2.8012 (4.0421)	6.5734 (7.5678)	2.4080 (3.3355)	6.2914 (7.3014)
SCHOOL	8.1373 (4.0082)	7.4379 (4.8608)	9.8741 (3.6042)	8.8366 (4.6544)
FEMALE	.5706 (.4954)	.2104 (.4077)	.5542 (.4974)	.2905 (.4542)
MARRIED	.4932 (.5003)	.6463 (.4783)	.5831 (.4934)	.6680 (.4711)
MIGRATED	.0030 (.0550)	.0023 (.0478)	.0025 (.0502)	.0084 (.0915)
MANPROF	.1897 (.3923)	.2630 (.4404)	.2758 (.4472)	.1809 (.3851)
TECHNIC	.0167 (.1282)	.0198 (.1394)	.0151 (.1221)	.0402 (.1965)
LABORER	.7936 (.4050)	.7172 (.4505)	.5793 (.4940)	.5616 (.4964)
n	659	1,312	794	1,542
N	29,748	119,523	36,359	117,004

Table 6.3

## Means and Standard Deviations in Parentheses: Nuevo Laredo

Variable	1987		1997	
	Maquiladora	Non-Maquiladora	Maquiladora	Non-Maquiladora
LNWAGE	7.4588 (.3908)	7.5066 (.4744)	7.4978 (.5432)	7.4697 (.7243)
LNHOURS	3.7615 (.1514)	3.7341 (.3065)	3.8013 (.1291)	3.7333 (.4421)
EXPER	11.7485 (8.5851)	20.9189 (14.0506)	11.6719 (7.8994)	20.6384 (13.8825)
EXPER2	2.1130 (2.9837)	6.3491 (7.4264)	1.9847 (2.8333)	6.1857 (7.2488)
SCHOOL	7.8655 (3.1177)	7.3160 (4.4395)	9.7638 (3.5216)	8.6826 (4.4976)
FEMALE	.5029 (.5015)	.2201 (.4144)	.3622 (.4813)	.2826 (.4504)
MARRIED	.3626 (.4822)	.6407 (.4799)	.5381 (.4992)	.6279 (.4835)
MIGRATED <sup>a</sup>	.....	.....	.....	.....
MANPROF	.1287 (.3358)	.2109 (.4081)	.2152 (.4115)	.1521 (.3592)
TECHNIC	.0234 (.1516)	.0229 (.1497)	.0656 (.2479)	.0469 (.2114)
LABORER	.8480 (.3601)	.7662 (.4234)	.5984 (.4909)	.5590 (.4966)
n	171	1,745	381	1,900
N	5,191	95,465	12,666	103,082

a = lack of observations with this characteristic for the maquiladora sector in 1987 caused collinearity; in order to calculate the coefficients the variable MIGRATED was deleted.



Table 6.4

**Means and Standard Deviations in Parentheses: Juárez**

Variable	1987		1997	
	Maquiladora	Non-Maquiladora	Maquiladora	Non-Maquiladora
LNWAGE	7.6510 (.4513)	7.6773 (.6131)	7.3600 (.4642)	7.5131 (.6153)
LNHOURS	3.7769 (.1890)	3.6364 (.4593)	3.7702 (.1144)	3.7093 (.4082)
EXPER	12.4618 (9.4991)	22.0528 (14.2871)	14.5953 (10.1022)	21.2063 (13.8168)
EXPER2	2.4540 (3.8497)	6.9031 (7.5918)	3.1496 (4.4744)	6.4048 (7.1696)
SCHOOL	7.9529 (3.9095)	7.1801 (4.5327)	8.0733 (3.4710)	8.4308 (4.1839)
FEMALE	.4559 (.4984)	.2823 (.4503)	.4059 (.4913)	.3021 (.4593)
MARRIED	.4603 (.4988)	.6466 (.4782)	.5592 (.4968)	.6259 (.4841)
MIGRATED	.0059 (.0765)	.0047 (.0687)	.0023 (.0475)	.0028 (.0528)
MANPROF	.2603 (.4391)	.2444 (.4299)	.1657 (.3720)	.1357 (.3426)
TECHNIC	.0441 (.2055)	.0440 (.2052)	.0598 (.2372)	.0469 (.2114)
LABORER	.6956 (.4605)	.7116 (.4532)	.6392 (.4805)	.5944 (.4912)
n	680	1,477	887	1,430
N	71,492	279,377	131,389	378,191

Table 6.5

**Means and Standard Deviations in Parentheses: Tijuana**

Variable	1987		1997	
	Maquiladora	Non-Maquiladora	Maquiladora	Non-Maquiladora
LNWAGE	7.7772 (.4332)	7.9024 (.5860)	7.6575 (.4896)	7.9199 (.6963)
LNHOURS	3.8006 (.1610)	3.7615 (.3347)	3.8172 (.0989)	3.7532 (.3414)
EXPER	12.9322 (10.1981)	19.6612 (14.0933)	14.1692 (9.7421)	19.5517 (12.7353)
EXPER2	2.7084 (4.4887)	5.8507 (7.1714)	2.9552 (4.1433)	5.4437 (6.2962)
SCHOOL	8.0950 (3.8369)	7.8126 (4.6681)	8.3551 (3.6985)	9.6110 (4.5492)
FEMALE	.5233 (.5004)	.2776 (.4479)	.4121 (.4926)	.2962 (.4567)
MARRIED	.4380 (.4971)	.5734 (.4947)	.5511 (.4978)	.5951 (.4910)
MIGRATED	.0039 (.0623)	.0029 (.0542)	.0050 (.0708)	.0060 (.0775)
MANPROF	.2519 (.4350)	.2392 (.4267)	.2345 (.4240)	.1885 (.3912)
TECHNIC	.0155 (.1238)	.0277 (.1641)	.0369 (.1886)	.0544 (.2269)
LABORER	.7326 (.4435)	.7331 (.4425)	.6147 (.4871)	.5632 (.4961)
n	258	1,697	597	1,820
N	22,157	294,269	101,869	464,387

however, was the only city in which the wage differential narrowed during 1987-1997. In Matamoros, the average monthly earnings of workers in the maquiladora sector in 1987 were 88 percent that of non-maquiladora sector employees. By 1997, this percentage increased to 90 percent, narrowing the gap from 330.83 to 265.15 Mexican pesos. For Nuevo Laredo, the percentage earnings of workers in the maquiladora sector relative to the other sector declined from 95 percent in 1987 to 91 percent in 1997, increasing the relative wage gap. For Juárez and Tijuana, the decline was even more dramatic. It decreased from 91 percent to 81 percent in Juárez, and from 82 percent to 69 percent in Tijuana. The wage gap in Tijuana was the largest in relative and absolute terms. Here the differential increased from 567.04 pesos in 1987 to 1,119.42 pesos in 1997. In general, these observations support the conventional wisdom that the maquiladora sector is a relatively low-wage sector.

Of course, the foregoing finding also reflects human capital differentials between the two sectors. In particular, the average level of formal education in the maquiladora sector of Matamoros was the highest in both sectors among the four cities in both 1987 and 1997, with 8.14 and 9.87 years respectively. The higher education levels in the maquiladora sector relative to the non-maquiladora sector in 1987 continued in 1997 in Matamoros and Nuevo Laredo, but reversed in Juárez and Tijuana. In other words, the education level of non-maquiladora sector workers in Juárez and Tijuana grew at a faster pace than education for their counterparts in the maquiladora sector. This is reflected in the fact that maquiladoras in Matamoros and Nuevo Laredo increased the proportion of managerial and professional staff during 1987-1997, while Juárez and Tijuana decreased

the proportion of these type of workers.

The level of female participation relative to males in the maquiladora sector, albeit high, declined between 1987 to 1997 for all four cities, while it increased in the non-maquiladora sector. Although the decline was small in Matamoros (from 57.06 to 55.42 percent) and moderate in Juárez (from 45.59 to 40.59 percent), it was considerable in Nuevo Laredo (from 50.29 to 36.22 percent) and Tijuana (from 52.33 to 41.21 percent). On the other hand, female participation in the non-maquiladora sector increased in all four cities from 1987 to 1997. It grew considerably in Matamoros (from 21.04 to 29.05 percent) and in Nuevo Laredo (from 22.01 to 28.26 percent), while only slightly in Juárez (from 28.23 to 30.21 percent) and in Tijuana (from 27.76 to 29.62 percent).

These descriptive statistics offered a general picture of the regional economic conditions of workers of the different cities which received most maquiladora investments during 1987 and 1997. However, some important limitations of descriptive statistics are that they do not show the relationship between the different variables nor the statistical significance and strength of those relationships. These limitations can be overcome by using the econometric techniques described in the next sections.

### **Regional Wage Differentials in the Maquiladora Sector**

While the JMP model was used to test hypothesis  $H_{1a}$ , a model using a single log-wage regression was used for a preliminary analysis of the wage differential among the maquiladora sectors of the different regions. This model assumes that the wage structure for the maquiladora sector of the different regions is the same throughout the distribution of residuals. This section describes the results obtained with a single log-wage regression

model. The next section describes the results using the JMP model, which does not have the same restriction and allows the variance of the error term to vary. In Table 6.6 all observable variables are interacted with Matamoros and Nuevo Laredo dummy variables to allow the coefficients to vary for workers in a strong (Matamoros) and semistrong (Nuevo Laredo) union. Control variables included the natural logarithm of hours worked per week, experience, experienced squared, years of formal education, gender, marital status, migration to the area, and occupation dummies.

Results show that, in 1997, maquiladora laborers in Juárez/Tijuana made 30.6 percent<sup>19</sup> less than those classified as technicians, managers or professionals in the same region. At the same time, laborers in Matamoros earned 17.6 percent *more* relative to laborers in Juárez/Tijuana,<sup>20</sup> a region where the unions are weak. Interestingly, laborers in Nuevo Laredo did not display a statistical wage difference with laborers in Juárez/Tijuana in 1997. As mentioned before, the disadvantage of this analysis is that wages of the different maquiladora sectors are compared without regard to differences that might exist in the wage structure for the maquiladora sector of the different regions. This type of model ignores regional differences that might contribute to differences in wages among the different maquiladora regions. For example, different rates of economic growth of the different regions may permeate to their respective maquiladora sectors. Moreover, differences in minimum wages and average salaries in a region may distort the true union effects. For this reason, it is imperative for the analysis to take into account regional

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<sup>19</sup> The percentages for dummy variables are calculated as  $e^{\beta}-1$  ( $e^{-2673}-1 = .3064$ ). See Kennedy (1993).

<sup>20</sup> Or to reduce the gap with technicians, managers and professionals from Juárez/Tijuana to 11 percent ( $e^{1052}-1 = .11$ ) using the sum of the relevant coefficients  $-2673 + .1621 = .1052$ ).

Table 6.6

**Log-Wage Function Estimates Interacted with Union Strength Proxies**

Variable	Maquiladora Sector	
	1987	1997
CONSTANT	6.0976***	5.5152***
<b>Juárez/Tijuana</b>		
LNHOURS	.3279***	.3495***
EXPER	.0206***	.0219***
EXPER2	-.0308***	-.0280***
SCHOOL	.0523***	.0752***
FEMALE	-.1014***	-.1011***
MARRIED	.1055***	.0120
MIGRATED	-.1293	-.1838***
LABORER	-.3561***	-.2673***
<b>Matamoros</b>		
LNHOURS * MATAM	.0781***	-.0845***
EXPER * MATAM	-.0033	-.0083
EXPER2 * MATAM	.0035	-.0073
SCHOOL * MATAM	-.0145**	.0165**
FEMALE * MATAM	-.0247	.0164
MARRIED * MATAM	-.1109***	.0890***
MIGRATED * MATAM	.0441	-.0635
LABORER * MATAM	.0544	.1621***
<b>Nuevo Laredo</b>		
LNHOURS * NLAREDO	.0819	-.0405
EXPER * NLAREDO	.0098	-.0033
EXPER2 * NLAREDO	-.0581	.0166
SCHOOL * NLAREDO	-.0351**	.0048
FEMALE * NLAREDO	.0051	-.0610
MARRIED * NLAREDO	-.0289	.1119**
LABORER * NLAREDO	-.1891*	-.0206
n	1768	2,659
Adjusted R <sup>2</sup>	.5077	.5132

Note: \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

differences not related directly to the maquiladora sector by comparing maquiladora wages and employment changes to the other sectors of the local economy. The next sections attempt to address these concerns.

### **Regional Changes in the Wage Differential During 1987-1997:**

#### **Maquiladora vs. Non-Maquiladora Sectors**

Equation (2) of Chapter V was estimated for both maquiladora and non-maquiladora sector workers for 1987 and 1997. Tables 6.7 through 6.10 show the log-wage regression function estimates for the maquiladora and non-maquiladora sectors of the four cities involved in the study during 1987 and 1997. Controls in  $X_t$  included the natural logarithm of hours worked per week, experience, experienced squared, years of formal education, gender, marital status, migration to the area, and occupation dummies. The same regressions were estimated without the variable LNHOOURS. No qualitative differences were observed, and the changes in the estimated coefficients were generally small (see Appendix A).

The descriptive data indicate that the wage structure substantially differs across years and sectors within a city, as well as across cities within the same sector and year. An F test for each one of the four cities was conducted interacting all the variables with the year 1997 and maquiladora sector to determine whether the wage structure changed over the period 1987-1997 and between the maquiladora sector and the rest of the local economy. A series of F tests were also estimated to determine if the wage structure changed for the maquiladora and non-maquiladora sectors over the 1987-1997 period. The results for the equations were statistically significant at the one percent level,

Table 6.7

## Monthly Log-Wage Function Estimates: Matamoros

Variable	Maquiladora Sector		Non-Maquiladora Sector	
	1987	1997	1987	1997
CONSTANT	6.3470*** (.5402)	6.9076*** (.3530)	5.6787*** (.3181)	4.8614*** (.1607)
LNHOURS	.2631* (.1466)	-.0816 (.0886)	.3439*** (.0781)	.4078*** (.0370)
EXPER	.0162*** (.0037)	.0243*** (.0051)	.0278*** (.0036)	.0265*** (.0045)
EXPER2	-.0256*** (.0070)	-.0253** (.0125)	-.0407*** (.0064)	-.0367*** (.0084)
SCHOOL	.0360*** (.0048)	.0790*** (.0060)	.0443*** (.0041)	.0672*** (.0051)
FEMALE	-.1329*** (.0204)	-.1407*** (.0270)	-.2652*** (.0363)	-.1474*** (.0339)
MARRIED	-.0049 (.0200)	.0871*** (.0253)	.1690*** (.0289)	.1757*** (.0343)
MIGRATED	-.0873* (.0472)	-.2867*** (.0942)	-.1050** (.0453)	-.1386 (.0878)
MANPROF	.3174*** (.0348)	.1917*** (.0356)	.3292*** (.0379)	.6147*** (.0568)
TECHNIC	.2511*** (.0905)	.3248*** (.1041)	.4081*** (.0897)	.2718*** (.0702)
n	659	794	1,312	1,542
Adjusted R <sup>2</sup>	.5245	.4567	.3336	.4614

Notes: (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses.



Table 6.8

## Monthly Log-Wage Function Estimates: Nuevo Laredo

Variable	Maquiladora Sector		Non-Maquiladora Sector	
	1987	1997	1987	1997
CONSTANT	4.4585*** (.6773)	4.8183*** (.4618)	6.1173*** (.2215)	4.6870*** (.1702)
LNHOURS	.6789*** (.1738)	.4328*** (.1208)	.2270*** (.0561)	.4996*** (.0418)
EXPER	.0342** (.0147)	.0200*** (.0068)	.0167*** (.0030)	.0234*** (.0037)
EXPER2	-.0958*** (.0367)	-.0182 (.0171)	-.0241*** (.0055)	-.0345*** (.0069)
SCHOOL	.0213 (.0155)	.0734*** (.0081)	.0336*** (.0033)	.0635*** (.0046)
FEMALE	-.0690 (.0418)	-.1394*** (.0397)	-.1922*** (.0305)	-.2103*** (.0301)
MARRIED	.0921 (.0572)	.1209*** (.0428)	.1289*** (.0243)	.1063*** (.0287)
MIGRATED <sup>a</sup>	.....	.....	.....	.....
MANPROF	.5366*** (.1060)	.4101*** (.0619)	.2498*** (.0285)	.5410*** (.0494)
TECHNIC	.4949** (.2226)	.2562*** (.0734)	.2549*** (.0629)	.1559** (.0679)
n	171	381	1,745	1,900
Adjusted R <sup>2</sup>	.4707	.5331	.2282	.4280

a = lack of observations with this characteristic for the maquiladora sector in 1987 caused collinearity; in order to calculate the coefficients the variable MIGRATED was deleted.

Notes: (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses.

Table 6.9

## Monthly Log-Wage Function Estimates: Juárez

Variable	Maquiladora Sector		Non-Maquiladora Sector	
	1987	1997	1987	1997
CONSTANT	5.6884*** (.5123)	4.0874*** (.4770)	6.0645*** (.1878)	4.7672*** (.1694)
LNHOURS	.3283** (.1350)	.6562*** (.1240)	.2777*** (.0490)	.4954*** (.0391)
EXPER	.0241** (.0047)	.0210*** (.0040)	.0206*** (.0040)	.0261*** (.0040)
EXPER2	-.0413*** (.0106)	-.0334*** (.0077)	-.0335*** (.0074)	-.0416*** (.0074)
SCHOOL	.0516*** (.0061)	.0652*** (.0057)	.0406*** (.0046)	.0572*** (.0050)
FEMALE	-.1397*** (.0261)	-.0676*** (.0223)	-.2131*** (.0369)	-.0498* (.0301)
MARRIED	.1280*** (.0251)	.0315 (.0226)	.0986*** (.0338)	.1399*** (.0303)
MIGRATED	-.0174 (.1079)	-.1564*** (.0267)	.2752 (.2438)	-.0946 (.0615)
MANPROF	.3986*** (.0378)	.4075*** (.0395)	.3032*** (.0391)	.4221*** (.0516)
TECHNIC	.3097*** (.0805)	.2251*** (.0473)	.1999*** (.0602)	.2201*** (.0616)
n	680	887	1,477	1,430
Adjusted R <sup>2</sup>	.5276	.5424	.2164	.3982

Notes: (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses.

Table 6.10

## Monthly Log-Wage Function Estimates: Tijuana

Variable	Maquiladora Sector		Non-Maquiladora Sector	
	1987	1997	1987	1997
CONSTANT	5.8065*** (1.3384)	6.1746*** (.8614)	6.0635*** (.2383)	5.0295*** (.2017)
LNHOURS	.3433 (.3469)	.1781 (.2218)	.3243*** (.0599)	.5216*** (.0485)
EXPER	.0154** (.0070)	.0192*** (.0054)	.0217*** (.0039)	.0239*** (.0035)
EXPER2	-.0140 (.0130)	-.0173 (.0111)	-.0297*** (.0071)	-.0283*** (.0067)
SCHOOL	.0531*** (.0089)	.0659*** (.0066)	.0429*** (.0043)	.0513*** (.0042)
FEMALE	-.0538 (.0435)	-.1782*** (.0261)	-.2728*** (.0299)	-.1993*** (.0285)
MARRIED	.0558 (.0476)	-.0066 (.0274)	.1197*** (.0309)	.1133*** (.0284)
MIGRATED	-.4029*** (.0423)	-.5174*** (.0457)	.1030 (.1288)	-.1128 (.2146)
MANPROF	.2799*** (.0546)	.4377*** (.0437)	.1376*** (.0344)	.5670*** (.0472)
TECHNIC	.6078** (.2649)	.2494*** (.0687)	.1982*** (.0765)	.2280*** (.0541)
n	258	597	1,697	1,820
Adjusted R <sup>2</sup>	.4058	.5098	.2049	.4185

Notes: (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses.

indicating that a different wage equation for each sector and year was appropriate.

Results indicate that the rates of return for the experience variable are very similar across sectors, years, and cities, ranging from about 1.5 to 3.5 percent increase in earnings for an extra year of experience but at a decreasing rate. The rates of return for an additional year of education, after controlling for occupation, increased from around 2 to 5.5 percent in 1987 to about 5 to 8 percent in 1997 for both sectors in all four cities. Since the average plant size increased from 1987 to 1997 (see Table 2.1) and formal education tends to be better compensated in larger plants in Mexico (Otero and Heino, 1998), as well as in other countries, part of this increase in the return to education is due to the increase in plant size.

Females received lower wages relative to males in both sectors of all four cities during 1987 and 1997. Interestingly, the smallest wage differential between females and males in 1987 among all four cities occurred in the maquiladora sector of Tijuana (-5.53 percent<sup>21</sup>), and the largest gender wage gap for that same year also occurred in Tijuana, in the non-maquiladora sector (-31.36 percent).

In general, there was a wage premium commanded by those who were married,<sup>22</sup> although there were some instances where the wage premium was not statistically

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<sup>21</sup>  $e^{\beta} - 1$  ( $e^{.0553} - 1 = .0553$ ).

<sup>22</sup> Virtually all cross-sectional studies which use a marital status control variable in their wage regressions report a statistically significant wage premium for married workers. A widely offered explanation for the marriage premium is that married individuals are more productive because, among other things, they can specialize in their work activities (Becker, 1991; Loh, 1996; Gray, 1997). Recent empirical work attributes the premium not to marriage per se, but to some other characteristics valued by employers and which are highly correlated to marriage and wages. In other words, individuals with unobservable traits cherished by employers tend to also be selected into marriage. Some of these characteristics are unobservable in the publicly available data such as responsibility, dependability, and determination (Cornwell and Rupert, 1995).

significant. Consistent with existing literature which reports married wage premiums ranging from about 3 to 40 percent (e.g., Duncan and Holmund, 1983; Korenman and Neumark, 1991; Gray, 1997),<sup>23</sup> married workers in the non-maquiladora sector received a premium that ranged from 10 to 18 percent that was statistically significant for all cities and years. The marriage premium in the maquiladora sector was significantly less, ranging from zero to 13 percent. In Tijuana, for example, there was no statistically significant wage premium for either 1987 or 1997, whereas in Matamoros and Nuevo Laredo, the premium increased from virtually zero in 1987 to 9 and 12 percent in 1997, respectively. In Juárez, the marriage premium declined from 13 percent in 1987 to practically zero in 1997. According to Cornwell and Rupert (1995), unobservable traits cherished by employers tend to be characteristics of people who are selected into marriage. Some of these characteristics include responsibility, dependability, and determination. Based on the results of this study, one might, therefore, conclude that stronger unions tend to seek membership with these traits.

The results also indicate that recent migrants to the selected border cities tended to earn less than non-immigrants. For the most part, recent immigrants earned less in the maquiladora sectors of the different cities, whereas the wage gap was not statistically significant in the non-maquiladora sectors. The most extreme case of underpayment of immigrants developed in the maquiladora sector of Tijuana in 1997, where immigrants earned 68 percent less, on average, than local residents.

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<sup>23</sup> Few studies have found no marriage premium once they control for unobservable individual effects. Marital status seems to play the role of a proxy for unobservable individual characteristics valued by the employer, similar to the role fulfilled by tenure (Nakosteen and Zimmer, 1987; Cornwell and Rupert, 1995).

The occupational controls have the expected signs. Professionals, managers, and technicians earned significantly more than laborers in both sectors of all four cities during 1987 and 1997. Notably, there was substantial narrowing of the wage gap between those at the high end of the income scale (managers and professionals) relative to laborers in the maquiladora sectors of Matamoros (from 37 to 21 percent) and Nuevo Laredo (from 71 to 51 percent). On the other hand, the maquiladora sectors of both Juárez and Tijuana, experienced a widening of the wage gap. This may be attributed, in part, to the compression of wages that tends to exist where there are strong unions.

Tables 6.11 through 6.14 present the decomposition of changes in the log-wage differential during the 1987-1997 period between the maquiladora and non-maquiladora sectors of the four cities in the study using equation (4) of Chapter V. The results reported on these tables are consistent with hypothesis  $H_{1a}$ .

The highest growth in wages of a maquiladora sector relative to the non-maquiladora sector occurred in Matamoros. In this city the log-wage differential went from .0374 log points in favor of the non-maquiladora sector workers to a -.1443 in favor of the maquiladora sector workforce, a net change of -.1817 log points. That is, wages in the maquiladora sector grew much faster than those in the non-maquiladora sector during this period. The decomposition of the changes in the wage differential suggests that changes in observed (-.1618) characteristics as well as the returns to observed (-.0256) and unobserved (-.0495) characteristics all contributed to improve earnings for maquiladora sector workers. Observed characteristics that contributed to this improvement include a smaller decline in the number of hours worked per week in the

Table 6.11

**Decomposition of Changes in the Monthly Log-Wage Differential During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Matamoros**

Log-Wage Differential:		
$D_{1987} = Y_{87NM} - Y_{87M}$		.0374
$D_{1997} = Y_{97NM} - Y_{97M}$		-.1443
Standardized Residual:		
$\theta_{1987}$		.3889
$\theta_{1997}$		.2933
Standard Deviation of Error:		
$\sigma_{1987NM}$		.4500
$\sigma_{1997NM}$		.5774
Differential:	$D_{97} - D_{87}$	-.1817
1. Observed Characteristics:	$(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$	-.1618
2. Observed Prices:	$\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$	-.0256
3. Unobserved Characteristics:	$(\Delta\theta_{97} - \Delta\theta_{87})\sigma_{97NM}$	.0552
4. Unobserved Prices:	$\Delta\theta_{87}(\sigma_{97NM} - \sigma_{87NM})$	-.0495
Disaggregation of 1 and 2 into j terms: $(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$ $\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$		
LNHOURS	-.0222	.0060
EXPER	.0117	-.0096
EXPER2	-.0041	.0149
SCHOOL	-.0227	-.0160
FEMALE	-.0142	-.0424
MARRIED	-.0121	.0010
MIGRATED	-.0009	.0000
MANPROF	-.1034	.0209
TECHNIC	.0060	-.0004

Table 6.12

**Decomposition of Changes in the Monthly Log-Wage Differential During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Nuevo Laredo**

Log-Wage Differential:		
$D_{1987} = Y_{87NM} - Y_{87M}$		.0478
$D_{1997} = Y_{97NM} - Y_{97M}$		-.0281
Standardized Residual:		
$\theta_{1987}$		.2151
$\theta_{1997}$		-.0374
Standard Deviation of Error:		
$\sigma_{1987NM}$		.4167
$\sigma_{1997NM}$		.5478
Differential: $D_{97} - D_{87}$		
1. Observed Characteristics: $(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$		-.2019
2. Observed Prices: $\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$		.0158
3. Unobserved Characteristics: $(\Delta \theta_{97} - \Delta \theta_{87})\sigma_{97NM}$		.1383
4. Unobserved Prices: $\Delta \theta_{87}(\sigma_{97NM} - \sigma_{87NM})$		-.0282
Disaggregation of 1 and 2 into j terms: $(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$ $\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$		
LNHOURS	-.0203	-.0075
EXPER	-.0048	.0610
EXPER2	.0012	-.0441
SCHOOL	-.0338	-.0164
FEMALE	-.0428	.0051
MARRIED	-.0200	-.0063
MIGRATED <sup>a</sup>	.....	.....
MANPROF	-.0786	.0239
TECHNIC	-.0029	.0000

a = lack of observations with this characteristic for the maquiladora sector in 1987 caused collinearity; in order to calculate the coefficients the variable MIGRATED was deleted.



Table 6.13

**Decomposition of Changes in the Monthly Log-Wage Differential During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Juárez**

Log-Wage Differential:		
$D_{1987} = Y_{87NM} - Y_{87M}$		.0264
$D_{1997} = Y_{97NM} - Y_{97M}$		.1531
Standardized Residual:		
$\theta_{1987}$		.0045
$\theta_{1997}$		-.2658
Standard Deviation of Error:		
$\sigma_{1987NM}$		.5427
$\sigma_{1997NM}$		.4773
Differential:	$D_{97} - D_{87}$	.1267
1. Observed Characteristics:	$(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$	.0468
2. Observed Prices:	$\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$	-.0494
3. Unobserved Characteristics:	$(\Delta\theta_{97} - \Delta\theta_{87})\sigma_{97NM}$	.1290
4. Unobserved Prices:	$\Delta\theta_{87}(\sigma_{97NM} - \sigma_{87NM})$	.0003
Disaggregation of 1 and 2 into j terms: $(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$ $\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$		
LNHOURS	.0394	-.0306
EXPER	-.0777	.0520
EXPER2	.0496	-.0359
SCHOOL	.0646	-.0128
FEMALE	-.0035	-.0283
MARRIED	-.0167	.0077
MIGRATED	-.0002	.0004
MANPROF	-.0060	-.0019
TECHNIC	-.0028	-.0000

Table 6.14

**Decomposition of Changes in the Monthly Log-Wage Differential During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Tijuana**

Log-Wage Differential:		
$D_{1987} = Y_{87NM} - Y_{87M}$		.1251
$D_{1997} = Y_{97NM} - Y_{97M}$		.2623
Standardized Residual:		
$\theta_{1987}$		-.0263
$\theta_{1997}$		-.3151
Standard Deviation of Error:		
$\sigma_{1987NM}$		.5225
$\sigma_{1997NM}$		.5310
Differential:		
	$D_{97} - D_{87}$	.1372
1. Observed Characteristics:	$(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$	-.0020
2. Observed Prices:	$\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$	-.0144
3. Unobserved Characteristics:	$(\Delta\theta_{97} - \Delta\theta_{87})\sigma_{97NM}$	.1534
4. Unobserved Prices:	$\Delta\theta_{87}(\sigma_{97NM} - \sigma_{87NM})$	.0002
Disaggregation of 1 and 2 into j terms:		
	$(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$	$\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$
LNHOURS	-.0130	-.0077
EXPER	-.0321	.0150
EXPER2	.0185	.0045
SCHOOL	.0789	-.0024
FEMALE	-.0259	-.0181
MARRIED	-.0104	-.0009
MIGRATED	-.0002	.0002
MANPROF	-.0189	-.0055
TECHNIC	.0012	.0004

maquiladora sector relative to the non-maquiladora sector, a larger increase in education, proportional increase of professional and managerial staff in this sector, and a relative decline in the proportional participation of females in the maquiladora sector. Here a reduction in relative female participation would increase average wages because of the smaller returns they command relative to males.

The portion of the change in the wage differential between the two sectors that deals with the relative increase in the prices of the observed and unobserved characteristics is the main concern of this study because unions have a partial direct effect on the wage structure. Almost half (41 percent)<sup>24</sup> of the net wage gain for maquiladora employees in Matamoros was due to changes in the wage structure. That is, there were factors that favored larger increases in the returns to characteristics of workers in the maquiladora sector, potentially union based.

The second largest growth in wages of maquiladora sector workers relative to the non-maquiladora sector occurred in Nuevo Laredo. Here the log-wage differential changed from .0478 log points in favor of the non-maquiladora sector workers during 1987 to -.0281 log points in favor of the maquiladora sector employees in 1997, a net change of -.0759 log points.

On the other hand, wages actually worsened during this period for maquiladora sector employees relative to the non-maquiladora sectors in Juárez (.1267 log points) and Tijuana (.1372). Nevertheless, the decomposition of the changes in the wage differential suggests that the improvement in the wages of maquiladora employees in Nuevo Laredo

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<sup>24</sup>  $(.0256 + .0495)/.1817 = .4133$

mostly reflected the relatively larger improvements in the observed characteristics (-.2019 log points), not so much changes in the wage structure (-.0124 log points). Although changes in the returns to employee characteristics were slightly positive for maquiladora employees in Nuevo Laredo, these changes were not significantly different from those in Tijuana (-.0142 log points) and were actually smaller than in Juárez (-.0491 log points). One can infer, then, that union density or lack of competition are necessary conditions for a strong union but are not the determining factors in making a union strong. Instead, what makes a union strong may be the characteristics of the union leader. This conclusion has important implications for future analysis of union effects. One cannot determine the effect of a union via comparisons of union versus nonunion workers. It is seemingly important to also make a qualitative analysis of the characteristics of union bosses.

A strong case in point is the leadership of the union boss in Nuevo Laredo. From Chapter II, one may recall that in Nuevo Laredo, the union density was at 95 percent in the early 1990s and, like in Matamoros, is also centralized in the CTM. Unlike Matamoros, the leadership has adopted a much more accommodating stance during the period of analysis. In the mid-1970s, Pérez Ibarra, leader of the maquiladora workers' union in Nuevo Laredo as well as the local CTM confederation, used a much more militant anti-business approach as a union boss. As a result, a crisis in the maquiladora industry occurred which frightened prospective companies. No new maquiladora plants were established in the city between 1974 and mid-1979. Eventually, Pérez Ibarra fell from power in an election but was elected again later. During his second term as union boss, under pressure from the federal government, he adopted a much more

accommodating posture with the private sector (Williams and Passé-Smith, 1992).

In summary, the results regarding the relative changes in wages in the maquiladora and non-maquiladora sectors for the four cities in the study suggest that Matamoros, the region with the strongest maquiladora unions, had the largest wage differential increase in favor of the maquiladora sector employees. Nuevo Laredo, the region with the second strongest unions, observed the second largest gain for maquiladora sector workers, although most of this relative gain seemingly is due to the enhanced employee characteristics and not to changes in the relative wage structure. Juárez and Tijuana, the regions with the weakest unions, had the reverse trend. Here, maquiladora sector employees observed a worsening of the wage differential in favor of non-maquiladora sector employees.

#### **Regional Changes in Relative Employment Shares During 1987-1997:**

##### **Maquiladora vs. Non-Maquiladora Sectors**

The results of estimating the bivariate probit model using equations (6) and (7) of Chapter V for 1987 and 1997 for the four cities involved in the study are reported in Tables 6.15 through 6.18. The partial derivatives as estimated by equation (8) are also presented for ease of interpretation. They capture the impact of a change in an independent variable on the probability of being employed in the first case and on the probability of being employed in the maquiladora sector given that the person is employed in the second case. Note that the estimate of rho ( $\rho$ ) is statistically significant and is relatively large in 4 out of the 8 models, suggesting that the bivariate probit model specification provides more consistent estimates of the parameters for those cases.

Table 6.15

## Bivariate Probit with Censored Data: Matamoros

Variable	1987		1997	
	Employed	Maquiladora	Employed	Maquiladora
CONSTANT	.9286*** (.1026)	.1563 (.1175)	.6429*** (.0891)	.4397** (.2099)
	<b>.2761</b>	<b>.0731</b>	<b>.1174</b>	<b>.1791</b>
EXPER	.0420*** (.0066)	-.0498*** (.0094)	.0364*** (.0054)	-.0425*** (.0126)
	<b>.0125</b>	<b>-.0233</b>	<b>.0066</b>	<b>-.0173</b>
EXPER2	-.1079*** (.0114)	.0645* (.0363)	-.0917*** (.0100)	.0172 (.0688)
	<b>-.0321</b>	<b>.0302</b>	<b>-.0167</b>	<b>.0070</b>
SCHOOL	-.0005 (.0068)	-.0051 (.0080)	.0113* (.0059)	-.0374*** (.0121)
	<b>-.0002</b>	<b>-.0024</b>	<b>.0021</b>	<b>-.0152</b>
FEMALE	-1.3454*** (.0484)	1.4163*** (.0618)	-.9936*** (.0435)	.9440*** (.2069)
	<b>-.4000</b>	<b>.6623</b>	<b>-.1814</b>	<b>.3846</b>
MARRIED	-.3038*** (.0525)	.2587*** (.0659)	-.1877*** (.0475)	.1874*** (.0672)
	<b>-.0903</b>	<b>.1210</b>	<b>-.0343</b>	<b>.0763</b>
MIGRATED	-.4465 (.3260)	.0109 (.4498)	-1.2407*** (.1495)	-.1098 (1.1234)
	<b>-.1327</b>	<b>.0051</b>	<b>-.2265</b>	<b>-.0447</b>
MANPROF		-.4207*** (.1269)		.3191** (.1440)
		<b>-.1967</b>		<b>.1300</b>
TECHNIC		-.4319** (.1813)		-.4575* (.2531)
		<b>-.2020</b>		<b>-.1864</b>
RHO		-.8780*** (.2282)		-.6908 (.6752)
n	3,561	1,971	4,011	2,336

Notes: (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses and partial derivatives in bold.

Table 6.16

Bivariate Probit with Censored Data: Nuevo Laredo<sup>a</sup>

Variable	1987		1997	
	Employed	Maquiladora	Employed	Maquiladora
CONSTANT	.7067*** (.1013)	-1.0276*** (.2224)	.5359*** (.0889)	-.1390 (.6125)
	<b>-.0337</b>	<b>-.1446</b>	<b>-.0057</b>	<b>-.0294</b>
EXPER	.0530*** (.0064)	.0042 (.0182)	.0426*** (.0054)	-.0204 (.0291)
	<b>-.0025</b>	<b>.0006</b>	<b>-.0005</b>	<b>-.0043</b>
EXPER2	-.1084*** (.0111)	-.0828* (.0450)	-.0881*** (.0099)	-.0658 (.0589)
	<b>.0052</b>	<b>-.0116</b>	<b>.0009</b>	<b>-.0139</b>
SCHOOL	.0174** (.0068)	-.0157 (.0156)	.0223*** (.0059)	.0489*** (.0188)
	<b>-.0008</b>	<b>-.0022</b>	<b>-.0002</b>	<b>-.0103</b>
FEMALE	-1.7484*** (.0494)	-.0604 (.0822)	-1.3619*** (.0438)	.1189 (.8639)
	<b>.0835</b>	<b>-.0085</b>	<b>.0144</b>	<b>.0251</b>
MARRIED	-.3481*** (.0535)	-.2629*** (.0864)	-.2696*** (.0475)	.0538 (.1729)
	<b>.0166</b>	<b>-.0370</b>	<b>.0028</b>	<b>.0114</b>
MANPROF		-.4980*** (.1062)		.3717*** (.1059)
		<b>-.0701</b>		<b>.0785</b>
TECHNIC		-.1425 (.2409)		.1890 (.1470)
		<b>.0201</b>		<b>.0399</b>
RHO		.9883 (5.0497)		.0845 (1.1373)
n	3,707	1,916	4,174	2,281

a = lack of observations with this characteristic for the maquiladora sector in 1987 caused collinearity; in order to calculate the coefficients the variable MIGRATED was deleted.

Notes: (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses and partial derivatives in bold.

Table 6.17

## Bivariate Probit with Censored Data: Juárez

Variable	1987		1997	
	Employed	Maquiladora	Employed	Maquiladora
CONSTANT	1.0067*** (.0959) <b>.0669</b>	.7706*** (.1807) <b>.2609</b>	.8998*** (.0930) <b>.1607</b>	1.1476*** (.1297) <b>.4923</b>
EXPER	.0353*** (.0063) <b>.0023</b>	-.0643*** (.0129) <b>-.0218</b>	.0440*** (.0057) <b>.0079</b>	-.0498*** (.0091) <b>-.0213</b>
EXPER2	-.0903*** (.0112) <b>-.0060</b>	.0383 (.0445) <b>.0130</b>	-.1072*** (.0106) <b>-.0191</b>	.0312 (.0321) <b>.0134</b>
SCHOOL	-.0098 (.0064) <b>-.0007</b>	-.0478*** (.0138) <b>-.0162</b>	-.0123* (.0064) <b>-.0022</b>	-.0920*** (.0187) <b>-.0395</b>
FEMALE	-1.3290*** (.0457) <b>-.0884</b>	.6448 (.5378) <b>.2183</b>	-1.2441*** (.0455) <b>-.2221</b>	.7113*** (.2058) <b>.3052</b>
MARRIED	-.3320*** (.0505) <b>-.0221</b>	.0701 (.1496) <b>.0237</b>	-.1724*** (.0481) <b>-.0308</b>	.1531*** (.0583) <b>.0657</b>
MIGRATED	-.9213*** (.2119) <b>-.0613</b>	.2974 (.6500) <b>.1007</b>	-1.5265*** (.2338) <b>-.2725</b>	.2511 (.6178) <b>.1077</b>
MANPROF		-.1703** (.0746) <b>-.0577</b>		.5012*** (.1100) <b>.2150</b>
TECHNIC		-.1318 (.1479) <b>-.0446</b>		.3200*** (.1200) <b>.1373</b>
RHO		-.3106 (.7673)		-.6615** (.3229)
n	3,992	2,157	4,003	2,317

Notes: (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses and partial derivatives in bold.



Table 6.18

## Bivariate Probit with Censored Data: Tijuana

Variable	1987		1997	
	Employed	Maquiladora	Employed	Maquiladora
CONSTANT	.9579*** (.0987)	-.1925 (.1635)	.8584*** (.0910)	.9744*** (.1486)
	<b>.1293</b>	<b>-.0325</b>	<b>.2196</b>	<b>.3759</b>
EXPER	.0518*** (.0062)	-.0601*** (.0077)	.0542*** (.0055)	-.0656*** (.0071)
	<b>.0070</b>	<b>-.0101</b>	<b>.0139</b>	<b>-.0253</b>
EXPER2	-.1166*** (.0108)	.0961*** (.0324)	-.1261*** (.0105)	.0789*** (.0183)
	<b>-.0157</b>	<b>.0162</b>	<b>-.0323</b>	<b>.0304</b>
SCHOOL	-.0069 (.0063)	-.0210 (.0193)	.0067 (.0059)	-.1014*** (.0137)
	<b>-.0009</b>	<b>-.0035</b>	<b>.0017</b>	<b>-.0391</b>
FEMALE	-1.5199*** (.0490)	1.3424*** (.1814)	-1.3788*** (.0460)	.9652*** (.0880)
	<b>-.2052</b>	<b>.2265</b>	<b>-.3528</b>	<b>.3724</b>
MARRIED	-.4273*** (.0532)	.3446*** (.0941)	-.3301*** (.0470)	.2971*** (.0540)
	<b>-.0577</b>	<b>.0581</b>	<b>-.0845</b>	<b>.1146</b>
MIGRATED	-1.6925*** (.2778)	1.3389*** (.5059)	-1.7269*** (.1587)	.8146*** (.3032)
	<b>-.2285</b>	<b>.2259</b>	<b>-.4419</b>	<b>.3143</b>
MANPROF		-.0256 (.0514)		.4829*** (.0898)
		<b>-.0043</b>		<b>.1863</b>
TECHNIC		-.2058 (.1922)		-.0506 (.1018)
		<b>-.0347</b>		<b>-.0195</b>
RHO		-.9339*** (.1764)		-.8964*** (.0810)
n	3,727	1,955	4,081	2,417

Notes: (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses and partial derivatives in bold.

A year of experience contributes little (1 percent or less) to the probability of being employed. Conversely, the probability of being employed in a maquiladora, given that the person was employed, was generally negatively related to years of experience, although the decrease was small, between 0 to 2.5 percent depending on the region and year.

A surprising fact is that, in 1997, education did not increase (or decrease) the probability of being employed, nor was it a determinant for employment in either sector, except in Juárez and Tijuana. In these cities, a year of education decreased the probability of being employed in a maquiladora by about 4 percent after controlling for the other observable characteristics. As discussed in the descriptive statistics section of this chapter, this phenomenon is confirmed by the fact that the maquiladora sectors in Matamoros and Nuevo Laredo employ workers with higher levels of education relative to their respective non-maquiladora sectors. On the other hand, the level of education for maquiladora employees in Tijuana and Juárez is lower than the level of education for their respective non-maquiladora sector employees. Furthermore, the level of education of maquiladora employees in Matamoros and Nuevo Laredo is almost 10 years, whereas the level of education in Tijuana and Juárez is slightly over 8 years. One could conclude that workers in Juárez and Tijuana with higher levels of education seek employment in the non-maquiladora sector, since the economic reward is much higher than in the maquiladora sector (see Tables 6.2 to 6.5).

With the exception of Nuevo Laredo, being female, married, or a recent immigrant to the area decreased the probability of being employed. But if employed,

these characteristics were highly positively related to being employed in the maquiladora sector. Although the probability of females being employed in a maquiladora compared to men in Matamoros declined from favorable odds of 66 percent in 1987 to about 38 percent in 1997, it increased in Juárez (from 22 to 31 percent) and Tijuana (from and 23 to 37 percent) during the same period. These results suggest that the maquiladora industry may serve as an equalizer by providing employment opportunities to those who would not have had job opportunities if the maquiladora industry did not exist. Being married also increased the probability of working in a maquiladora plant, but not as much as being a female. It increased the probability anywhere from practically zero (no statistically significant difference) to about 12 percent.

The probability of not finding employment for recent immigrants increased substantially from 1987 to 1997 in all cities. The maquiladora sector of the different regions did not show a statistical preference for either immigrants or local residents except for Tijuana, where immigrants were favored over local residents by 23 percent in 1987 and 31 percent in 1997. This finding indicates that the maquiladora sector in Tijuana attracts a large number of immigrants heading to work in the maquiladora sector, probably because this is by far the fastest growing employment sector, even when compared to the same sector in the other four cities.

The results of estimating the decomposition of changes in relative employment shares versus unemployment shares during the 1987-1997 period, as well as the changes in relative maquiladora employment shares relative to non-maquiladora employment shares for the four cities involved in the study, as described by equation (9) of Chapter V,

are reported in Tables 6.19 through 6.22. The contributions of each variable to the total change in employment shares as estimated by equations (10) and (11) are also presented in the same tables. The overall results suggest a relationship consistent with hypothesis  $H_{1b}$ , but changes in the wage structure do not show a relationship with unionization.

Equation (9) splits the change in employment shares between the two sectors into (1) a portion that can be explained by changes in the mean characteristics of those individuals in the sample and into (2) the portion due to changes in the estimated coefficients. Thus, the second component is the one of interest to this analysis because it captures the changes reflecting changes in the labor market structure during this time period for each city. As a major contributor to the conditions in the local labor market structure, maquiladora unions are assumed to be partially responsible for this portion of the change in employment share of the maquiladora sector.

There are small increases in the proportion of employment in the general population in Matamoros (2.89 percentage points), Nuevo Laredo (2.96 percentage points), and Juárez (3.85 percentage points). Tijuana saw the largest increase in the proportion of the population who was employed (6.77 percentage points). According to the decompositions, in all four cities, there is a relative improvement in the mean human capital characteristics of the employed population that would have led to a larger increase in the proportion of the population being employed had this improvement not been somewhat offset by the deterioration of the general labor market conditions. That is, the change in the labor market structure would have created a downward pressure in employment if the work-related characteristics of the population had not improved.

Table 6.19

**Decomposition of Changes in Relative Employment Shares During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Matamoros**

<b>Total</b> Employment Shares:	$\bar{I}_{87} = .5535$	$\bar{I}_{97} = .5824$
Change in Employment Share:	$\bar{I}_{97} - \bar{I}_{87}$	.0289
Change due to Changes in X's:	$[\Phi(\bar{X}'_{97}\beta_{87}) - \Phi(\bar{X}'_{87}\beta_{87})]$	.0923
Change due to Changes in $\beta$ 's:	$[\Phi(\bar{X}'_{97}\beta_{97}) - \Phi(\bar{X}'_{97}\beta_{87})]$	-.0634
<hr/>		
<i>Disaggregation into j Components:</i>	$\Delta X_j$	$\Delta \beta_j$
CONSTANT	.0000	.3460
EXPER	-.2390	.1371
EXPER2	.3595	-.1183
SCHOOL	-.0039	-.1252
FEMALE	.0417	-.2266
MARRIED	-.0379	-.0921
MIGRATED	-.0281	.0158
<hr/>		
<b>Maquiladora</b> Employment Shares:	$\bar{I}_{87} = .3344$	$\bar{I}_{97} = .3399$
Change in Employment Share:	$\bar{I}_{97} - \bar{I}_{87}$	.0055
Change due to Changes in X's:	$[\Phi(\bar{X}'_{97}\beta_{87}) - \Phi(\bar{X}'_{87}\beta_{87})]$	.1957
Change due to Changes in $\beta$ 's:	$[\Phi(\bar{X}'_{97}\beta_{97}) - \Phi(\bar{X}'_{97}\beta_{87})]$	-.1902
<hr/>		
<i>Disaggregation into j Components:</i>	$\Delta X_j$	$\Delta \beta_j$
CONSTANT	.0000	.2942
EXPER	.0623	.1388
EXPER2	-.0518	-.2442
SCHOOL	-.0183	-.3075
FEMALE	.1648	-.1864
MARRIED	.0268	-.0473
MIGRATED	.0000	-.0008
MANPROF	.0251	.1638
TECHNIC	-.0131	-.0008

*Note:* The sum of the individual components may not add exactly due to rounding.

Table 6.20

**Decomposition of Changes in Relative Employment Shares During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Nuevo Laredo**

<b>Total</b> Employment Shares:	$\bar{I}_{87} = .5169$	$\bar{I}_{97} = .5465$
Change in Employment Share:	$\bar{I}_{97} - \bar{I}_{87}$	.0296
Change due to Changes in X's:	$[\Phi(\bar{X}'_{97}\beta_{87}) - \Phi(\bar{X}'_{87}\beta_{87})]$	.1582
Change due to Changes in $\beta$ 's:	$[\Phi(\bar{X}'_{97}\beta_{97}) - \Phi(\bar{X}'_{97}\beta_{87})]$	-.1286
<hr/>		
<i>Disaggregation into j Components:</i>	$\Delta X_j$	$\Delta \beta_j$
CONSTANT	.0000	.5654
EXPER	-.2419	.7061
EXPER2	.2384	-.4269
SCHOOL	.0947	-.1359
FEMALE	.0630	-.6694
MARRIED	.0041	-.1678
MIGRATED <sup>a</sup>	.....	.....
<hr/>		
<b>Maquiladora</b> Employment Shares:	$\bar{I}_{87} = .0892$	$\bar{I}_{97} = .1670$
Change in Employment Share:	$\bar{I}_{97} - \bar{I}_{87}$	.0778
Change due to Changes in X's:	$[\Phi(\bar{X}'_{97}\beta_{87}) - \Phi(\bar{X}'_{87}\beta_{87})]$	-.0374
Change due to Changes in $\beta$ 's:	$[\Phi(\bar{X}'_{97}\beta_{97}) - \Phi(\bar{X}'_{97}\beta_{87})]$	.1152
<hr/>		
<i>Disaggregation into j Components:</i>	$\Delta X_j$	$\Delta \beta_j$
CONSTANT	.0000	.1649
EXPER	.0056	-.0874
EXPER2	-.0560	.0172
SCHOOL	.0326	-.0546
FEMALE	.0042	.0098
MARRIED	-.0011	.0360
MIGRATED <sup>a</sup>	.....	.....
MANPROF	-.0283	.0262
TECHNIC	.0053	.0031

a = lack of observations with this characteristic for the maquiladora sector in 1987 caused collinearity; in order to calculate the coefficients the variable MIGRATED was deleted.

Note: The sum of the individual components may not add exactly due to rounding.

Table 6.21

**Decomposition of Changes in Relative Employment Shares During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Juárez**

<b>Total</b> Employment Shares:	$\bar{I}_{87} = .5403$	$\bar{I}_{97} = .5788$
Change in Employment Share:	$\bar{I}_{97} - \bar{I}_{87}$	.0385
Change due to Changes in X's:	$[\Phi(\bar{X}'_{97}\beta_{87}) - \Phi(\bar{X}'_{87}\beta_{87})]$	.1141
Change due to Changes in $\beta$ 's:	$[\Phi(\bar{X}'_{97}\beta_{97}) - \Phi(\bar{X}'_{97}\beta_{87})]$	-.0756
<hr/>		
<i>Disaggregation into j Components:</i>	$\Delta X_j$	$\Delta \beta_j$
CONSTANT	.0000	.0972
EXPER	-.1199	-.1594
EXPER2	.1770	.0940
SCHOOL	-.0339	.0182
FEMALE	.0879	-.0409
MARRIED	.0067	-.0903
MIGRATED	-.0037	.0056
<hr/>		
<b>Maquiladora</b> Employment Shares:	$\bar{I}_{87} = .3153$	$\bar{I}_{97} = .3828$
Change in Employment Share:	$\bar{I}_{97} - \bar{I}_{87}$	.0676
Change due to Changes in X's:	$[\Phi(\bar{X}'_{97}\beta_{87}) - \Phi(\bar{X}'_{87}\beta_{87})]$	.0554
Change due to Changes in $\beta$ 's:	$[\Phi(\bar{X}'_{97}\beta_{97}) - \Phi(\bar{X}'_{97}\beta_{87})]$	.0122
<hr/>		
<i>Disaggregation into j Components:</i>	$\Delta X_j$	$\Delta \beta_j$
CONSTANT	.0000	.0105
EXPER	-.1022	.0075
EXPER2	.0589	-.0010
SCHOOL	.1867	-.0102
FEMALE	-.0138	.0006
MARRIED	-.0039	.0014
MIGRATED	.0034	-.0000
MANPROF	-.0782	.0027
TECHNIC	.0046	.0007

Note: The sum of the individual components may not add exactly due to rounding.

Table 6.22

**Decomposition of Changes in Relative Employment Shares During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Tijuana**

<b>Total</b> Employment Shares:	$\bar{I}_{87} = .5246$	$\bar{I}_{97} = .5923$
Change in Employment Share:	$\bar{I}_{97} - \bar{I}_{87}$	.0677
Change due to Changes in X's:	$[\Phi(\bar{X}'_{97}\beta_{87}) - \Phi(\bar{X}'_{87}\beta_{87})]$	.1441
Change due to Changes in $\beta$ 's:	$[\Phi(\bar{X}'_{97}\beta_{97}) - \Phi(\bar{X}'_{97}\beta_{87})]$	-.0764
<hr/>		
<i>Disaggregation into j Components:</i>	$\Delta X_j$	$\Delta \beta_j$
CONSTANT	.0000	.0516
EXPER	-.1333	-.0245
EXPER2	.2366	.0284
SCHOOL	-.0229	-.0629
FEMALE	.1148	-.0381
MARRIED	-.0144	-.0312
MIGRATED	-.0366	.0004
<hr/>		
<b>Maquiladora</b> Employment Shares:	$\bar{I}_{87} = .1320$	$\bar{I}_{97} = .2470$
Change in Employment Share:	$\bar{I}_{97} - \bar{I}_{87}$	.1150
Change due to Changes in X's:	$[\Phi(\bar{X}'_{97}\beta_{87}) - \Phi(\bar{X}'_{87}\beta_{87})]$	.2345
Change due to Changes in $\beta$ 's:	$[\Phi(\bar{X}'_{97}\beta_{97}) - \Phi(\bar{X}'_{97}\beta_{87})]$	-.1195
<hr/>		
<i>Disaggregation into j Components:</i>	$\Delta X_j$	$\Delta \beta_j$
CONSTANT	.0000	-.7266
EXPER	-.2974	.0628
EXPER2	.5236	.0515
SCHOOL	.2735	.4655
FEMALE	-.1785	.0763
MARRIED	-.0888	.0173
MIGRATED	-.0327	.0019
MANPROF	-.0094	-.0633
TECHNIC	.0443	-.0048

*Note:* The sum of the individual components may not add exactly due to rounding.



In terms of the changes in the maquiladora sector employment, the data indicate that relative employment in Matamoros rose .55 percentage points, a small gain; in Nuevo Laredo, relative employment rose 7.7 percentage points, a larger gain; in Juárez, relative employment rose 6.8 percentage points, a larger gain than Matamoros but less than in Nuevo Laredo; and finally, in Tijuana, relative employment rose by 11.5 percentage point, the largest relative gain in the employment share of all four maquiladora sectors. Initially, it appears that the relative percentage changes are not consistent with those predicted by hypothesis  $H_{1b}$ . Upon closer examination, one can observe that the proportion of workers in the maquiladora sector of Juárez is much larger than that of the maquiladora sector in Nuevo Laredo. Thus, the 6.8 percentage point gain in Juárez represents substantially more jobs created than those represented by the 7.8 percentage gain in Nuevo Laredo.

What seems to be partially inconsistent with hypothesis  $H_{1b}$  is the fact that the portion that captures the 1987-1997 changes due to changes in the labor market structure, which partly represents the type of union structure, do not follow the expected sequence for Nuevo Laredo and Tijuana. However, the trend is consistent with a more in-depth analysis. Matamoros is, as predicted, the city where the changes in the labor market conditions would have represented the largest decline in the maquiladora employment share. In fact, if the changes in the employment characteristics had remained constant at 1987 levels, the maquiladora sector employment share would have decreased by 19 percentage points. Juárez also followed the expected maquiladora market share change attributable to changes in the market labor structure. Here, the changes in the labor

market conditions helped improve the maquiladora market share by 1.22 percentage points. Although the change was small, it represents an improvement consistent with the fact that unionization in Juárez declined from an already low 33 percent in 1979 to 13 percent in 1990, a fraction of which occurred during the period of analysis, 1987-1997.

Initially, the market share change attributed to changes in the wage structure of the other two cities do not seem to follow the expected pattern. Nuevo Laredo's change in the wage structure of the maquiladora sector actually helped improve the relative maquiladora employment share (11.52 percentage points), while Tijuana's changes in the wage structure contributed negatively to the changes in maquiladora employment share (-11.95 percentage points). According to Williams and Passé (1992), Pérez Ibarra, the maquiladora union leader in Nuevo Laredo during the 1970s, was known for his militant anti-business approach. As a consequence, no new maquiladoras settled in Nuevo Laredo between 1974 and mid-1979. After falling from power in an election, he later returned with a more accommodating stance towards business. Despite not achieving the more pro-business atmosphere created in Reynosa in 1989, it represented a positive change for investment during the period of analysis. This helps explain the positive change in the maquiladora market share due to changes in the labor market structure of Nuevo Laredo.

In Tijuana, unions strengthened a little from an extremely low five percent unionization level in 1979 to about 30 percent in 1990. This helps explain the decrease in the maquiladora market share attributable to changes in the labor market conditions. It has not been a static strength level during the period of analysis. Although unions are considered generally weak in Tijuana, there has been a notable increase in union strength.

Union density is not the only determining factor of union strength, but it is a necessary factor.

#### **Actual vs. Potential Maquiladora Wage Bill Growth Estimates for 1987-1997**

To estimate the net effect of unions on the wage bill for each one of the regions, as specified in hypothesis  $H_{1c}$ , the actual wage bill would have to be compared against a potential wage bill that would have existed under different union conditions. Table 6.23 reports the actual and potential wage bill growths for the 1987-1997 period in Matamoros. The actual employment growth in the maquiladora sector, 25,991 new jobs, is easy to compute using the information on Table 2.1. The actual average monthly wages for 1997 for this sector was 2,440.49 pesos. Therefore, the actual monthly wage bill growth<sup>25</sup> by the end of 1997 was 63,430,775 pesos.

The computation of the potential wage bill growth is a much more arduous task. Obviously, the results are dependent on the assumptions made. Here, the assumption is that changes in the labor market conditions (changes in the  $\beta$ s) partially reflect unionization. To extract the portion of wage and employment changes that may be attributed to Matamoros specific conditions (i.e. those not found in Juárez and Tijuana, such as a strong union), the average portion of employment share and log-wage differential changes owing to changes in the coefficients in Juárez and Tijuana is subtracted from the Matamoros coefficients (see Table 6.23). The remaining wage and employment change due to changes in the coefficients are the portions attributable to Matamoros specific labor conditions. From these new values we can estimate the

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<sup>25</sup> Employment growth x monthly average wages.

Table 6.23

**Actual vs. Potential Maquiladora Wage Bill Growth Estimates for 1987-1997:  
Matamoros**

	Actual	Potential
1987-1997 employment share change due to change in $\beta$ 's:	-.1902	
1987-1997 average Juárez and Tijuana employment share change due to change in $\beta$ 's:	-.0537	
1987-1997 employment share change due to strong union:		-.1365
1997 employment share:	.3399	
1997 employment share if $\beta$ 's similar to Juárez and Tijuana:		.4764
1997 employment	54,721	76,696 <sup>a</sup>
1987 employment	28,730	28,730
1997-1998 employment growth:	25,991	47,966
1987-1997 log-wage diff. change due to changes in $\beta$ 's:	.0751	
1987-1997 average Juárez and Tijuana log-wage diff. change due to changes in $\beta$ 's:	.0317	
1987-1997 log-wage diff. change due to strong union:		.0434
1997 log-wage diff. change:	.1817	
1997 log-wage diff. change if $\beta$ 's similar to Juárez and Tijuana:		.1383
1997 wage diff. change between maquiladora and non-maq.:	65.68 <sup>b</sup>	49.99 <sup>c</sup>
1997 monthly average wages:	2,440.49	2,424.90 <sup>d</sup>
1997 monthly wage bill (in Mexican pesos):	63,430,775.59 <sup>e</sup>	116,312,753.40 <sup>e</sup>

$$a = (.4764)(54,721)/.3399 = 76,696$$

$$b = (2,782.74 - 2,451.91) - (2,705.64 - 2,440.49) = 330.83 - 265.15 = 65.68$$

$$c = (.1383)(65.68)/.1817 = 49.99$$

$$d = 2,440.49 - (65.58 - 49.99) = 2,424.90$$

$$e = (\text{employment growth}) \times (\text{monthly average wages}) = \text{wage bill}$$

potential employment and wage conditions that would have existed with a weaker labor union.

The results of these computations are displayed in Table 6.23. We can observe that, as the literature predicts, wages grew more under the current union conditions in Matamoros by 15.59 pesos (2,440.49 vs. 2,424.90), but not enough to offset the large number (21,975) of potential jobs lost (25,991 vs. 47,966). The estimated wage bill under a less powerful union is 116,312,753 pesos, or about 83 percent larger than under the current conditions.

### **Summary**

The purpose of this chapter has been to analyze the results of this investigation by using the procedures described in the methodology chapter. In general, the results are consistent with the hypotheses stated in Chapter IV. The largest wage gain of all four maquiladora regions in the study was found in Matamoros where the labor union is the strongest. On the other hand, maquiladoras in Juárez and Tijuana showed the largest relative employment gain. Both of these results are consistent with hypotheses  $H_{1a}$  and  $H_{1b}$ . Similarly, the estimate of the potential wage bill in Matamoros using the level of employment and wage growth in Juárez and Tijuana is much larger than the actual wage bill. These results are also consistent with hypothesis  $H_{1c}$ .

## CHAPTER VIII

### CONCLUSIONS AND RECOMMENDATIONS

The overall empirical results of this study appear to be consistent with the major premise of this research which states that economic development in a region is associated to the strength of labor union(s) in that region. The results regarding the relative changes in wages in the maquiladora and non-maquiladora sectors for the four cities in the study are consistent with the hypothesis that the real wage growth in a region's maquiladora sector relative to the non-maquiladora sector is associated with the strength of the labor union(s) in the maquiladora industry of that region ( $H_{1a}$ ). Among the labor markets in the study, the change in the wage gap between maquiladora and non-maquiladora sectors was the highest in Matamoros (.1817 log points), the city with the strongest maquiladora unions. The wage differential varied from .0374 log points against the maquiladora sector employees to .1443 log points in favor. Nuevo Laredo's maquiladora sector, second ranked in union strength, had a lower than Matamoros but higher than Juárez and Tijuana wage differential improvement (.0759 log points). The wage differential changed from a .0478 log points deficit to a .0281 log points surplus. Finally, Juárez and Tijuana, who were ranked third in terms of their maquiladora labor union strength, observed a worsening of the wage differential between their maquiladora and non-maquiladora

sectors. In Juárez, the wage differential increased .1267 log points, from a .0264 to a .1531 log points wage differential, always in favor of the non-maquiladora sector employees. In Tijuana, the relative wage conditions of maquiladora sector workers worsened from an already deteriorated condition of .1251 to a .2623 log wage differential in favor of the non-maquiladora sector employees. In summary, the largest relative wage improvement for employees in the maquiladora sector occurred in Matamoros, the region with the strongest union. On the other hand, the smallest relative wage gain occurred in the Juárez/Tijuana maquiladoras, where the unions are the weakest.

The results in terms of the changes in the maquiladora sector employment are also consistent with the hypothesis that the employment growth in a region's maquiladora sector relative to the non-maquiladora sector is associated with the strength of the labor union(s) in the maquiladora industry of that region ( $H_{1b}$ ). Employment in the maquiladora sector in Matamoros showed the smallest gain (.55 percentage points); maquiladoras in Nuevo Laredo realized a larger gain (7.78 percentage points); in Juárez, maquiladoras also experienced a larger relative gain than Matamoros, although slightly less than Nuevo Laredo (6.76 percentage points); and finally, maquiladoras in Tijuana realized the largest relative gain in the employment share (11.50 percentage points). Although initially one might think that the rankings of Juárez and Nuevo Laredo in terms of relative percentage change in employment are not consistent with the ones predicted by hypothesis  $H_{1b}$  because they seem to have the reverse ranking, the actual order is the correct one in terms of the number of jobs created by their respective maquiladora sectors. Juárez has a much larger maquiladora sector than Nuevo Laredo. Therefore, a 6.76 percentage point increase

represents substantially more jobs created than the 7.78 percentage point increase in Nuevo Laredo where the maquiladora sector is much smaller.

Finally, the estimated net effect of unions on the wage bill for each one of the regions is consistent with hypothesis that the wage bill growth in a region's maquiladora sector is associated with the strength of the labor union(s) in the maquiladora industry of that region ( $H_{1c}$ ). Here, the actual wage bill is compared against the potential wage bill that would have existed under different union conditions. The actual employment growth of the maquiladora sector in Matamoros during the 1987-1997 period was 25,991 new jobs, and the actual average monthly wages for 1997 for this sector was 2,440.49 pesos. Therefore, the actual monthly wage bill growth by the end of 1997 was 63,430,775 pesos. Also, as the literature predicts, individual worker wages grew more under the current union conditions in Matamoros (by 15.59 pesos) but not enough to offset the large number of potential jobs lost (25,991 vs. 47,966 = 21,975). The estimated wage bill under a less powerful union is 116,312,753 pesos, or about 83 percent larger than under the current conditions.

### **Major Implications**

The results found by this research study have implications for economic development and public policy, as well as for future industrial relations in Mexico, particularly, along the U.S.-Mexico border labor markets. With respect to public policy, the study provides useful information for policymakers to evaluate current labor policy on maquiladoras. In the past and present, maquiladoras have been among the major sources of foreign investment and employment in Mexico. According to results presented here,



public policy should ease labor laws in Mexico to make them more attractive for American and other foreign interests, perhaps by curbing union leadership power. Competition for labor contracts should be encouraged by fostering the creation of other unions, not necessarily by eliminating unions or limiting union membership. Arguably, as found in this study, it is not union density that curtails investment, but rather, the type of leadership and monopoly power enjoyed by certain unions that hinders job creation.

Public policy in this direction would contribute to more growth in maquiladoras in border cities like Matamoros. At the same time, the relative wage deterioration prevalent in the maquiladora industry of Juárez and Tijuana where labor unions have not played an important role in defending the rights of laborers might not be desirable from a social welfare perspective.

Implications for economic development along the U.S.-Mexico border labor markets are evident in the results of this investigation. The findings in this study suggest that the government should influence labor unions to become more flexible to benefit the entire community. The efforts could be directed toward attracting new investments that offer job opportunities to more people than only those currently under a union contract. The maquiladoras are one of the major sources of foreign investment, and one of the few industries that are actually creating new employment.

It should be noted that in Reynosa this type of federal government intervention has already been seen. The Salinas administration intervened to break the monopoly control that existed prior to 1989, and the consequences have been seemingly positive. Employment growth in Reynosa has been much higher than in Matamoros during the

1990s. As stated in the next sections, there are, however, several limitations to this study that require further research to make a more informed judgment about the appropriate role of labor unions in northern Mexico.

### **Limitations of the Study**

Although conclusions may be drawn from the results of the study, one must be careful in making generalizations about the findings. There are some limitations to the study that must be discussed. One important limitation is that the employment survey (ENEU) does not have a variable to identify directly whether the individual is a maquiladora employee. The data only identifies whether the worker is a manufacturing worker. It was necessary to take advantage of the fact that a large proportion of the manufacturing sector on the major border towns is comprised of maquiladora plants. Other studies have also used the manufacturing sector as proxy for the maquiladoras because it has been estimated that over 90 percent of the manufacturing production is made by maquiladoras in some of these towns (Carrillo, 1985; Roberts, 1999). Furthermore, only manufacturing plants with over 100 employees were selected as proxy for maquiladora plants for the analysis in this study.<sup>26</sup> This narrow selection further increases the percent of the manufacturing sector comprised of maquiladora plants because local non-maquiladora plants classified as part of the manufacturing sector tend to be small.

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<sup>26</sup> Dr. Roberts is a researcher at the University of Texas in Austin who has used the ENEU data set to study U.S.-Mexico border issues using plants in the manufacturing sector with over 100 employees as a proxy for maquiladoras on the border towns.

Another limitation, similar to the previous one, is that the ENEU does not have a variable that identifies whether the individual is a member of a union or not. Nevertheless, this limitation is not critical to this study because the analysis is done at the regional level and the unionization levels for the region have been identified. The literature on the wage and employment effects of unions have used industry or country unionization averages for their comparative analyzes. As seen in the case of the maquiladora industry, there are many levels of unionization within an industry by region of the country, and even bigger among different countries. Having used industry or country averages in those studies does not invalidate their important contribution to knowledge.

Finally, the study assumes that the difference in wage and employment growth differential between Matamoros and the Juarez/Tijuana regions not explained by the included variables but by differences in the labor market structure is primarily due to differences in union strength. However, there are probably other factors which could have impacted the results for which this study did not control because of data limitations. Data sources do not offer information on factors such as the innate abilities of employees, working conditions and other labor market characteristics. The need to control for these factors is discussed as part of the recommendations for future research.

### **Directions for Future Research**

The statistical techniques used here are a relatively new means to examine the sources of changes between two sectors. However, no complete empirical explanation will be available until data sources include more information on the employee, employer,

and market conditions. Efforts should be made to expand the data to include more information so that more accurate tests can be performed on these hypotheses. Obviously, the collection of such data is costly, time-consuming, and difficult to obtain.

Notwithstanding, the collection of certain data should not represent a major endeavor. In the case of the ENEU, for example, information on union membership, including the union to which they belong, ought to be incorporated. Pressure to limit the amount of information on the membership of unions for obvious political reasons ought not to interfere in the search for knowledge. The importance of unionization on labor conditions has been demonstrated in the literature. Without more complete data, one will not be able to determine the level to which wage differentials and employment are impacted by unmeasured factors (e.g., employee innate abilities and working conditions) or market inefficiencies.

The efficiency wage models suggest that the wage differential may reflect employee and employer heterogeneity not accounted for by the variables included in the current surveys. It is possible that employers are paying more for abilities in union workers not currently captured in the data. Under competitive markets, if employers with unions pay more for their labor, they have to either (1) pay less than employers without unions for other inputs to survive, or (2) unionized workers have to be more productive to justify the extra earnings. The sources of this productivity can only be fully determined with more thorough sources of data.

Future research should be expanded to other border and nonborder cities like Guadalajara, Monterrey, San Luis Potosí, Reynosa, and other important locations to make

the study more generalizable. Unfortunately, the lack of information on key issues such as unionization in current data sources may require direct investigation instead of just relying on those existing sources. For individual researchers, the collection of primary data is, however, expensive, time-consuming, and, most importantly, it is difficult for an individual without the proper authority to require subjects to participate in surveys in order to have a truly representative sample. Only large institutional or governmental agencies have the capacity to gather a comprehensive set of data.

Finally, future researchers dealing with the effects of labor unions need to look at (1) the level of competition among labor unions for a labor contract and (2) the characteristics of the union leadership in addition to union density. Union density by itself, as has been used by most of the previous empirical work, was found not to be a good proxy to estimate the effects unions have on wages. The case of Nuevo Laredo and Matamoros, which have practically the same level of union density and where the effects on wages was very different, demonstrate the need to distinguish among unions. Williams and Passé-Smith (1992) also make reference to the large difference in the level of new job creation in Reynosa relative to Matamoros. Reynosa has attracted a much higher level of new maquiladora investment despite having 100 percent union density. The difference between the two cities is that Reynosa has had competition between two labor unions for new labor contracts since the late 1980s, whereas Matamoros' maquiladora union (SJOD) has had a practical monopoly. Only recently, after the Salinas administration intervened, did a new maquiladora union (SITPM) begin to compete for maquiladora contracts in Matamoros. In 1991, the SITPM controlled only one plant with 150 employees compared

with 97 plants with 35,000 employees controlled by the SJOI. Currently, the SITPM has gained ground on the SJOI, offering some vestiges of an incipient competition. The effects of this competition will only be observed in the future.

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## APPENDIX A

**Table A.1**

### Hourly Log-Wage Function Estimates: Matamoros

Variable	Maquiladora Sector		Non-Maquiladora Sector	
	1987	1997	1987	1997
CONSTANT	2.1810*** (.0645)	1.3352*** (.0877)	1.6625*** (.0603)	1.0708*** (.0791)
EXPER	.0156*** (.0041)	.0246*** (.0056)	.0306*** (.0039)	.0303*** (.0048)
EXPER2	-.0240*** (.0081)	-.0277** (.0132)	-.0425*** (.0068)	-.0379*** (.0092)
SCHOOL	.0362*** (.0051)	.0823*** (.0066)	.0492*** (.0044)	.0680*** (.0058)
FEMALE	-.1143*** (.0208)	-.0710** (.0293)	-.2281*** (.0407)	-.0319 (.0397)
MARRIED	-.0079 (.0224)	.0934*** (.0293)	.1341*** (.0335)	.1423*** (.0386)
MIGRATED	-.0935 (.1577)	-.3052* (.1646)	-.1695** (.0766)	-.2065* (.1083)
MANPROF	.3094*** (.0356)	.1960*** (.0394)	.4037*** (.0471)	.6337*** (.0609)
TECHNIC	.2510*** (.0917)	.3735*** (.1222)	.4822*** (.1100)	.4024*** (.0901)
n	659	794	1,312	1,542
Adjusted R <sup>2</sup>	.4582	.3969	.3128	.3578

*Notes:* (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses.

Table A.2

## Hourly Log-Wage Function Estimates: Nuevo Laredo

Variable	Maquiladora Sector		Non-Maquiladora Sector	
	1987	1997	1987	1997
CONSTANT	1.7792*** (.2141)	1.2364*** (.1012)	1.6831*** (.0486)	1.2974*** (.0637)
EXPER	.0332** (.0144)	.0188*** (.0070)	.0175*** (.0033)	.0231*** (.0040)
EXPER2	-.0912*** (.0345)	-.0173 (.0176)	-.0219*** (.0062)	-.0300*** (.0077)
SCHOOL	.0205 (.0159)	.0723*** (.0082)	.0356*** (.0038)	.0651*** (.0049)
FEMALE	-.0424 (.0411)	-.1407*** (.0408)	-.0851** (.0356)	-.1060*** (.0321)
MARRIED	.1114* (.0577)	.1085** (.0445)	.1504*** (.0282)	.1013*** (.0313)
MIGRATED <sup>a</sup>	.....	.....	.....	.....
MANPROF	.5508*** (.1050)	.4020*** (.0629)	.2848*** (.0324)	.5447*** (.0530)
TECHNIC	.5095** (.2124)	.2433*** (.0728)	.2450*** (.0743)	.1641** (.0663)
n	171	381	1,745	1,900
Adjusted R <sup>2</sup>	.4405	.5020	.1820	.3177

a = lack of observations with this characteristic for the maquiladora sector in 1987 caused collinearity; in order to calculate the coefficients the variable MIGRATED was deleted.

Notes: (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses.



Table A.3

## Hourly Log-Wage Function Estimates: Juárez

Variable	Maquiladora Sector		Non-Maquiladora Sector	
	1987	1997	1987	1997
CONSTANT	1.6847*** (.0731)	1.3448*** (.0664)	1.9393*** (.0683)	1.3863*** (.0699)
EXPER	.0236*** (.0052)	.0210*** (.0039)	.0176*** (.0048)	.0247*** (.0041)
EXPER2	-.0371*** (.0131)	-.0343*** (.0076)	-.0250*** (.0088)	-.0344*** (.0076)
SCHOOL	.0509*** (.0065)	.0636*** (.0058)	.0424*** (.0049)	.0579*** (.0053)
FEMALE	-.1132*** (.0280)	-.0589*** (.0216)	-.1338*** (.0455)	-.0549* (.0329)
MARRIED	.1266*** (.0277)	.0340 (.0228)	.1158*** (.0415)	.1239*** (.0332)
MIGRATED	-.0649 (.1372)	-.1501*** (.0223)	.1655 (.2343)	-.0786 (.0911)
MANPROF	.4012*** (.0381)	.4062*** (.0396)	.3156*** (.0487)	.4526*** (.0546)
TECHNIC	.2929*** (.0808)	.2172*** (.0471)	.2011*** (.0670)	.2307*** (.0617)
n	680	887	1,477	1,430
Adjusted R <sup>2</sup>	.4618	.5022	.1349	.2903

Notes: (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses.

Table A.4

## Hourly Log-Wage Function Estimates: Tijuana

Variable	Maquiladora Sector		Non-Maquiladora Sector	
	1987	1997	1987	1997
CONSTANT	1.7839*** (.1130)	1.5656*** (.0826)	1.9811*** (.0623)	1.7443*** (.0605)
EXPER	.0195*** (.0072)	.0197*** (.0056)	.0226*** (.0043)	.0223*** (.0037)
EXPER2	-.0195 (.0135)	-.0186 (.0118)	-.0280*** (.0080)	-.0221*** (.0070)
SCHOOL	.0567*** (.0090)	.0675*** (.0068)	.0490*** (.0047)	.0510*** (.0044)
FEMALE	-.0285 (.0471)	-.1755*** (.0266)	-.1944*** (.0334)	-.1067*** (.0289)
MARRIED	.0323 (.0518)	-.0117 (.0280)	.0948*** (.0341)	.1139*** (.0298)
MIGRATED	-.4287*** (.0424)	-.5373*** (.0872)	.1824 (.1833)	-.1262 (.2579)
MANPROF	.2701*** (.0561)	.4294*** (.0461)	.1297*** (.0379)	.5812*** (.0498)
TECHNIC	.6570** (.2825)	.2287*** (.0686)	.1914** (.0781)	.2579*** (.0561)
n	258	597	1,697	1,820
Adjusted R <sup>2</sup>	.3741	.4971	.1421	.3448

Notes: (i) LABORER is the reference occupation.

(ii) \*, \*\*, and \*\*\* indicate the variables are statistically significant at the 10, 5, and 1 percent, respectively, using two-tailed tests.

(iii) Standard errors in parentheses.

Table A.5

**Decomposition of Changes in the Hourly Log-Wage Differential During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Matamoros**

Log-Wage Differential:		
$D_{1987} = Y_{87NM} - Y_{87M}$		-.0566
$D_{1997} = Y_{97NM} - Y_{97M}$		-.1839
Standardized Residual:		
$\theta_{1987}$		.4730
$\theta_{1997}$		.2862
Standard Deviation of Error:		
$\sigma_{1987NM}$		.4986
$\sigma_{1997NM}$		.6503
Differential:	$D_{97} - D_{87}$	-.1273
1. Observed Characteristics:	$(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$	-.1257
2. Observed Prices:	$\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$	-.0514
3. Unobserved Characteristics:	$(\Delta\theta_{97} - \Delta\theta_{87})\sigma_{97NM}$	.1214
4. Unobserved Prices:	$\Delta\theta_{87}(\sigma_{97NM} - \sigma_{87NM})$	-.0716
Disaggregation of 1 and 2 into j terms: $(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$ $\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$		
EXPER	.0134	-.0026
EXPER2	-.0042	.0172
SCHOOL	-.0230	-.0132
FEMALE	-.0031	-.0707
MARRIED	-.0097	.0013
MIGRATED	-.0014	.0000
MANPROF	-.1066	.0169
TECHNIC	.0088	-.0002

Table A.6

**Decomposition of Changes in the Hourly Log-Wage Differential During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Nuevo Laredo**

Log-Wage Differential:		
$D_{1987} = Y_{87NM} - Y_{87M}$		.0751
$D_{1997} = Y_{97NM} - Y_{97M}$		.0398
Standardized Residual:		
$\theta_{1987}$		.1307
$\theta_{1997}$		-.0835
Standard Deviation of Error:		
$\sigma_{1987NM}$		.4766
$\sigma_{1997NM}$		.5883
Differential:	$D_{97} - D_{87}$	-.0353
1. Observed Characteristics:	$(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$	-.1611
2. Observed Prices:	$\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$	.0144
3. Unobserved Characteristics:	$(\Delta\theta_{97} - \Delta\theta_{87})\sigma_{97NM}$	.1261
4. Unobserved Prices:	$\Delta\theta_{87}(\sigma_{97NM} - \sigma_{87NM})$	-.0146
Disaggregation of 1 and 2 into j terms: $(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$ $\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$		
EXPER	-.0047	.0512
EXPER2	.0011	-.0343
SCHOOL	-.0346	-.0162
FEMALE	-.0215	.0059
MARRIED	-.0191	-.0136
MIGRATED <sup>a</sup>	.....	.....
MANPROF	-.0792	.0214
TECHNIC	-.0030	.0000

a = lack of observations with this characteristic for the maquiladora sector in 1987 caused collinearity; in order to calculate the coefficients the variable MIGRATED was deleted.

Table A.7

**Decomposition of Changes in the Hourly Log-Wage Differential During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Juárez**

Log-Wage Differential:		
$D_{1987} = Y_{87NM} - Y_{87M}$		.1668
$D_{1997} = Y_{97NM} - Y_{97M}$		.2139
Standardized Residual:		
$\theta_{1987}$		-.1618
$\theta_{1997}$		-.3012
Standard Deviation of Error:		
$\sigma_{1987NM}$		.6349
$\sigma_{1997NM}$		.5166
Differential:	$D_{97} - D_{87}$	.0471
1. Observed Characteristics:	$(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$	.0122
2. Observed Prices:	$\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$	-.0179
3. Unobserved Characteristics:	$(\Delta\theta_{97} - \Delta\theta_{87})\sigma_{97NM}$	.0720
4. Unobserved Prices:	$\Delta\theta_{87}(\sigma_{97NM} - \sigma_{87NM})$	-.0191
Disaggregation of 1 and 2 into j terms: $(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$ $\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$		
EXPER	-.0737	.0688
EXPER2	.0410	-.0416
SCHOOL	.0654	-.0120
FEMALE	.0038	-.0327
MARRIED	-.0148	.0015
MIGRATED	-.0001	.0003
MANPROF	-.0064	-.0022
TECHNIC	-.0029	-.0000

Table A.8

**Decomposition of Changes in the Hourly Log-Wage Differential During 1987-1997  
Between the Maquiladora and Non-Maquiladora Sectors: Tijuana**

<b>Log-Wage Differential:</b>		
$D_{1987} = Y_{87NM} - Y_{87M}$		.1642
$D_{1997} = Y_{97NM} - Y_{97M}$		.3264
<b>Standardized Residual:</b>		
$\theta_{1987}$		-.0927
$\theta_{1997}$		-.3659
<b>Standard Deviation of Error:</b>		
$\sigma_{1987NM}$		.5676
$\sigma_{1997NM}$		.5535
Differential:	$D_{97} - D_{87}$	.1622
1. Observed Characteristics:	$(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$	.0203
2. Observed Prices:	$\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$	-.0081
3. Unobserved Characteristics:	$(\Delta\theta_{97} - \Delta\theta_{87})\sigma_{97NM}$	.1513
4. Unobserved Prices:	$\Delta\theta_{87}(\sigma_{97NM} - \sigma_{87NM})$	-.0013
Disaggregation of 1 and 2 into j terms: $(\Delta X_{97} - \Delta X_{87})\beta_{97NM}$ $\Delta X_{87}(\beta_{97NM} - \beta_{87NM})$		
EXPER	-.0300	-.0024
EXPER2	.0145	.0184
SCHOOL	.0784	-.0006
FEMALE	-.0139	-.0216
MARRIED	-.0104	.0026
MIGRATED	-.0003	.0003
MANPROF	-.0194	-.0057
TECHNIC	.0014	.0008

## APPENDIX B

### Sample Design of the ENEU

The sample selection is done in such manner that every housing unit has the same chance of being selected. The household is the basis of the sampling unit. Nevertheless, because it is virtually impossible to list all households given that sometimes multiple households live in the same domicile,<sup>27</sup> a sampling unit that can be more easily identified in the field is employed. As such, the INEGI uses housing units as the sampling unit. The Population and Housing Census constitutes the main source for the sampling frame. The ENEU then uses a three-stage, stratified clustered sample to select the housing units from the sampling frame as follows.

INEGI uses the housing information from the census to create Basic Geostatistical Areas (AGEB, *Áreas Geoestadísticas Básicas*) with the following attributes: (a) the areas are delineated by clearly identifiable and enduring topographical landmarks; (b) in general, the areas are homogeneous in terms of their social, economic, and geographic characteristics; and (c) their size is such that a single person can go over them in a single day.

Each AGEB is classified according to the socioeconomic characteristics of the

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<sup>27</sup> A household is made of people who have a common source to pay for expenses, primarily for food. It includes relatives or friends living with a head provider.

housing units within the AGEB into High, Medium, Low, and Marginal Stratum. High Stratum includes all houses located in a residential area, condominiums, and luxury apartments with all the public and private services, and with little public transportation. Medium Stratum consists of housing units with better access to public transportation, general public services, and is generally surrounded by small commercial businesses. Low Strata contains partially built housing made with low quality materials, with roofs made of carton or sheets of metal, with little public services, generally with easy access to public transportation, and surrounded by several small commercial stores. Marginal Stratum includes all the housing units with 1 or 2 rooms, built with low quality materials such as adobe or bricks, with roofs made of carton or sheets of metal, without public services, and with little access to public transportation and commercial stores.

The first stage is to create the Primary Sampling Units (UPM, *Unidades Primarias de Muestreo*) which are conformed by either (a) a single AGEB with a minimum of 240 houses and a maximum of 480, or (b) by the union of 2 or more contiguous AGEBs with similar economic characteristics, with a minimum of 240 houses and a maximum of 480, or (c) if a single AGEB contains more than 500 houses, the AGEB is subdivided to form 2 or more UPMs with a minimum of 240 houses and a maximum of 480. The UPMs are selected with a probability proportional to the number of housing units in them relative to all the houses in the last census. From each selected UPM, there are 30 housing units selected as described in the following paragraphs.

In the second stage, they create the Secondary Sampling Unit (USM, *Unidad Secundaria de Muestreo*) or "listed area" by sending someone to personally count the



number of housing units in each block within the selected UPMs for verification and making housing clusters composed of either (a) a single block containing a minimum of 20 houses and a maximum of 50, or (b) of 2 or more contiguous blocks with at least 20 houses total, or (c) if a block has more than 50 houses, the block is subdivided into housing clusters with a minimum of 20 houses in each, creating 2 or more USMs or listed areas. Six USMs are selected from each of the previously selected UPMs with a probability proportional to the number of housing units in the USM relative to all the houses in the UPM.

In the third stage, an average of 5 housing units are then selected systematically with a randomly selected starting unit number from each of the 6 listed areas selected. Each of the selected housing units constitute the Tertiary Sampling Unit (UTM, *Unidad Terciaria de Muestreo*). The UTM is made up of permanently inhabited housing or uninhabited but ready for use. These include railway cars, trailers, boats, caves, etc., which serve as housing for people (INEGI 1997a).

### **Sample Size**

To estimate the number of housing units visited every month, INEGI takes into account that, according to the previous census, (a) there are on average about 3.14 people 12 years or older per housing unit, (b) the participation rate in urban areas is between 48% and 52%, (c) the nonresponse for prior ENEU surveys has been about 15% of the selected housing units, and (d) that the rate of unemployment ranges from 1% to 7%. It was estimated, using a sample size formula and administrative adjustments, that the appropriate sample size per city was going to be 700 housing units per month for most

cities, except for Guadalajara, Monterrey, Puebla, Torreón, and León, where they would use 1,000, and 1,700 for Mexico City. Therefore, the number of housing units surveyed per quarter ranges from 2,100 for the smaller cities to 5,100 for México city, totaling 89,400 housing units surveyed per quarter for the entire nation as of 1995. If we multiply 89,400 housing units times 3.14 people, the average number of people per unit, we obtain an approximated total of 280,716 individual surveys. Most of the time the sample is larger because, as mentioned before, although the sampling process uses the housing unit as the basis, many times there is more than one household living in the selected domiciles, and they are also interviewed as additional households. The entire sample size constitutes about .3%<sup>28</sup> of the entire Mexican population (INEGI 1997a).

To select a proportional number of housing units from each of the 4 economic strata previously described, the following formula is used for each metropolitan area:

$$(12) \quad N = \frac{n}{30}, \quad N_h = \frac{M_h}{M} N, \quad h = 1, 2, 3, 4$$

where

- $n$  : Number of housing units to be selected from the specified metropolitan area (700, 1,000, or 1,700).
- $N$ : Number of UPM to be selected. There is no specification as to how the 30 housing units per UPM was determined.
- $N_h$ : Number of UPMs to be selected from stratum  $h$ .
- $M_h$ : Number of housing units of stratum  $h$  in the metropolitan area, according to

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<sup>28</sup>  $(280,716/90,000,000) = .003$

previous information.

M: Number of total housing units in the metropolitan area.

h: Type of stratum (High, Medium, Low, Marginal).

To divide the sample into five panels of 20% each, it is necessary to rotate one panel of households every quarter with a new panel to avoid higher nonresponse rates because of the wearing out the people being interviewed. Each new panel is notified at the beginning that they will be interviewed for five quarters until they exit the sample to decrease the chances of nonresponses. The selection of every new panel follows the process previously described integrating new metropolitan areas that might have developed.

In a summary, the ENEU is a survey conducted quarterly covering most of the urban population living in cities with over 2,500 or more residents. Its purpose is to offer employment and demographic information on the population 12 years of age and older. The methodology used to collect the information is modeled after guidelines provided by the U.S. Census Bureau following international norms to maintain international comparability. The sampling selection process of housing units follows a three-stage, stratified clustered. In the third stage, housing units are selected systematically with a randomly selected starting unit number. The process is such that every housing unit has the same chance of being selected in the sample. Despite some limitations, the ENEU is internationally recognized as one of the best sources of employment data in Latin America.