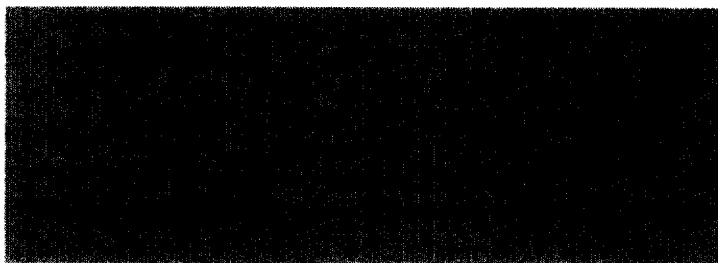


The Structure of U.S. Outward Foreign Direct Investment in Mexico's Export Processing Industry*

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1. Introduction: Maquila investments as enhancements to U.S. competitiveness

Ever since Peter Drucker coined the term “production sharing” in a *Wall Street Journal* article in 1977, social scientists and business analysts have been writing about the “fragmentation” of manufacturing production processes through outward foreign direct investment (FDI).¹ The production sharing literature has grown over the intervening decades, in part fostered by Mexico’s adoption of outward oriented policies in the late 1980s, and the signing of the North American Free Trade Agreement (NAFTA) in 1993.

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¹ Recently, economists have begun to describe production sharing as “fragmentation.” For example, see the recent articles by Bond (2001) and Jones and Marjit (2001).

Much of the literature on production sharing in general, and Mexico's case in particular, uses a case study approach to look at the behavior of specific industries or firms or host country experiences. In contrast, this paper offers a statistical examination of the structure of investments by industries located in a major FDI sending country. In particular, the structure of U.S. investments in Mexico's maquiladora sector are analyzed with aggregate level statistics. The paper argues that U.S. investment in Mexico's maquiladora industry enhances the competitiveness of the sending industries through several overlapping mechanisms. In particular, U.S. investment in Mexican maquilas is less likely to fulfill the role of an export platform for leading U.S. industries, and is more likely to help older industrial sectors maintain their competitiveness through production sharing arrangements. The role of U.S. investment in Mexico's maquiladora sector is well recognized, but the contribution of maquila investments to U.S. competitiveness is perhaps less apparent. No attempt is made to measure the impact of enhanced competitiveness on either U.S. or Mexican workers, although it is expected that stronger industries and more jobs benefit both groups.

The focus on the United States as the source of investments in Mexico's maquiladora sector is entirely appropriate. The existing stock of foreign owned maquila are mainly of U.S. origin, and recent investment flows show no signs of changing this. From 1994 through 2000, U.S. investment was 87.5 percent of the \$US 13,229 million that the world invested in Mexico's maquiladora sector, while South Korea, the second largest investor, accounted for only 2.5 percent of the total (Comisión Nacional de Inversiones Extranjeras, 2000).

2. Aggregate foreign investment trends in Mexico's maquiladora sector

Figures 1 and 2 show the last seven years of foreign direct investment (FDI) in Mexico. World FDI in Mexico and world investment in the maquiladora sector are shown, along with the corresponding values for U.S.

FDI. The high level of world FDI in 1994 shown in Figure 1 is the result of large non-U.S. investments, possibly in response to the signing and implementation of the new rules of origin under the NAFTA. Throughout the period 1994-2000, U.S. FDI averages one-half of total world FDI.

Figure 1: World and US FDI in Mexico

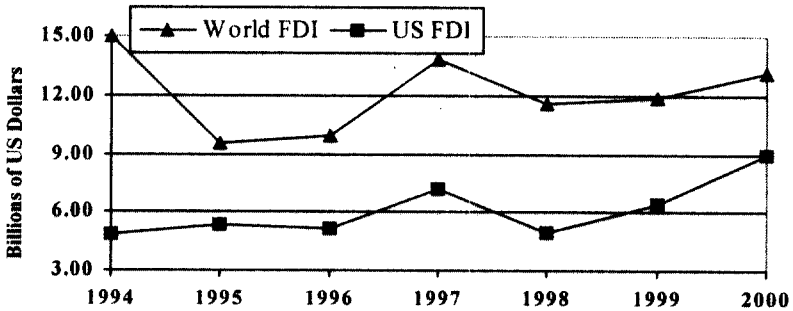
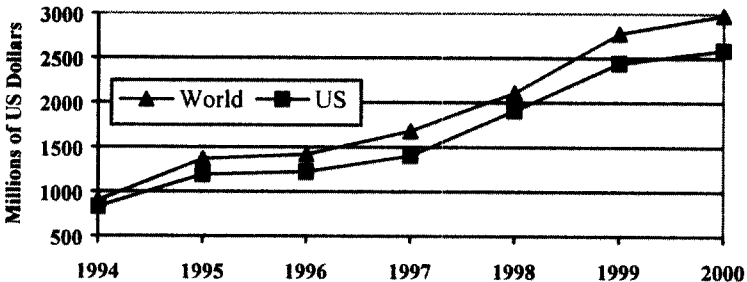


Figure 2 shows the subcomponent of FDI that makes up maquiladora industry investment. Over the same span of years, 1994-2000, while total U.S. FDI was 50 percent of world FDI in Mexico, U.S. investment in the

Figure 2: World and US FDI in Mexico's Maquiladora Industry



maquiladora industry was 87.5 percent of the world level. The range of the

share of U.S. maquiladora investment was between 83 percent (1997) and 92 percent (1994), and there was no trend.

Given that U.S. investment constitutes about 50 percent of world FDI, and 87 percent of FDI in the maquiladora, the likelihood of U.S. firms using the maquiladora form is much higher than for firms from other countries. Table 1 illustrates this point with a simple intensity index for U.S. investment in the maquiladora industry. The index is calculated as the ratio of the U.S. share of U.S. FDI in maquilas, to the non-U.S. share of non-U.S. FDI in maquilas:

$$(I_{\text{maq, us}}/I_{\text{tot, us}})/(I_{\text{maq, non-us}}/I_{\text{tot, non-us}}),$$

where I is foreign direct investment, the subscripts “maq” and “tot” represent maquilas and total (including maquila investments), and us and non-us are the United States and the rest of the world.

Table 1:
The Relative Intensity of U.S. Foreign Direct Investment (FDI)
in the Maquiladora Industry

	<i>Non-US FDI in Maquilas as a share of non-US FDI</i>	<i>U.S. FDI in maquilas as a share of U.S. FDI</i>	<i>Intensity Index of US FDI in Maquilas</i>
1994	0.007	0.170	25.15
1995	0.042	0.222	5.25
1996	0.042	0.236	5.67
1997	0.042	0.194	4.61
1998	0.030	0.382	12.64
1999	0.061	0.379	6.20
2000	0.093	0.290	3.11

Source: Authors calculations based on data from Comisión Nacional de Inversiones Extranjeras, 2000.

The intensity index is essentially a location quotient, but rather than describing the relative importance of a type of regional employment or income, it measures the extent to which U.S. firms are more likely to use the maquila form of investment. Interpretation of the columns in Table 1 are as follows. Looking at the row for the year 2000, for every dollar that non-U.S. firms put into Mexico in the form of FDI, slightly more than 9

cents (0.093) was in the maquiladora industry. U.S. firms, by contrast, invested 29 cents out of every FDI dollar in maquilas. The intensity index is the ratio of these numbers. Its interpretation is that for every dollar invested, U.S. firms put more than three times as much into the maquiladora industry.

3. U.S. investment in the maquiladora industry: The business view

The relatively higher concentration of U.S. investment in the maquiladora industry may simply reflect a greater U.S. awareness of the program, but this seems unlikely for a variety of reasons, not the least of which is that global firms spend large sums of money trying to understand their opportunities in foreign markets. Rather, it is more likely that the pattern reflects U.S. locational advantages together with the economic interests of U.S. firms in using Mexico as an export platform. There are several advantages for U.S. firms from their location next door to a developing country. Potentially, these advantages allow U.S. firms to penetrate foreign, third country, markets, and to shore up their competitiveness against imports into their domestic U.S. markets.

Explanations offered by the United States International Trade Commission (USITC) for the engagement of U.S. firms engage in production sharing arrangements are essentially a business-view (U.S. International Trade Commission, 1999). Each firm investing in maquila operations is understood to be taking a strategic decision that will raise its profits. Decisions include (1) formation of strategic alliances, (2) product specialization, (3) vertical integration, (4) contracting out, (5) regional manufacturing centers, and (6) closer coordination between producers and suppliers. Strategic alliances refer to the combination of technologies and expertise that are possible through joint ventures or similar cooperative arrangements. For example, the U.S. firm Whirlpool and the Mexican firm Vitro formed a joint venture in 1989 which sought to combine the expertise

of both in order to produce and distribute market small sized refrigerators in North and Central America, and Asia (U.S. International Trade Commission, 1999.) Similarly, the U.S. firm Johnson Controls formed a partnership with Varta AG and Grupo Isma SA to supply car parts throughout North America (U.S. International Trade Administration, 1999).

Product specialization refers to the strategic concentration on a particular line of products. For example, since the signing of NAFTA, there has been a significant reduction in the number of vehicle models produced in Mexico (U.S. International Trade Administration, 1999). This allows firms to capture greater economies of scale and to rationalize production across North America.²

Vertical integration refers to the reduction of firm reliance on outside contractors. If labor intensive processes can be performed in Mexico, then for some firms it will be more cost effective to integrate those production stages into the firm rather than relying on arm's length relations. An example of this process is the movement of several U.S.-based textile firms into apparel production in Mexico (Bair, 2001). The idea of contracting out is precisely the opposite process—the shedding of certain production steps that had been inside the firm—and is also happening in the apparel industry where there is a rise in the number of “complete package” manufacturers.³ This type of maquila receives a set of specifications for a particular garment and returns the final product to the U.S. company—often a large retail chain such as J.C. Penny, or a brand such as Liz Claiborne. The maquila does everything but design the product, from purchase of the textiles, to cutting, sewing, laundering, and finishing.

Another reason given for the use of the maquila-production sharing arrangement is to take advantage of regional manufacturing centers and the scale economies they offer. Examples can be found in the most advanced

² Note that the same process occurred in Canada when it signed the Auto Pact (1964) with the United States, creating free trade in the automotive industry. Krugman and Obstfeld (2000) argue that the focus on fewer vehicle models created substantial scale economies in Canada and led to almost a 50 percent increase in Canadian productivity in the car industry.

³ Vertical integration and its opposite—contracting out—are choices facing every firm. The optimal strategy depends on a wide variety of factors, including technology, property rights,

cases of production sharing, including motor vehicles, apparel, color TVs and parts, computer hardware, and measuring and control devices. Regional clusters, or regional manufacturing centers offer a number of advantages to the firms in the region and the industry, including the opportunity for closer coordination between producers and suppliers.

All of these reasons are germane to an understanding of the individual motives behind the use of the maquila form by U.S. firms. Analytically, however, they are *ad hoc*, "after the fact" explanations in which the only possible generalization is the weak observation that motives vary across firms and industries. That is, analysis at the firm level provides little information about the reasons for the overall pattern of U.S. investments in the maquiladora industry.

4. U.S. investment in the maquiladora industry: The economic view

Economic theory, specifically, international trade theory, offers a more systematic approach to understanding the industrial composition of U.S.-origin maquila. Until fairly recently, maquila firms were unable to sell output into the Mexican market. In effect, they were created to export, hence the theory of international trade is a useful place to look for an explanation of the growth and development of the industry.

Trade theory uses the insights of the business strategy approach utilized by the USITC, but it organizes those insights differently to describe the vast majority of the reasons behind the use of the maquiladora industry by U.S.-origin firms. In addition, it goes beyond pure description to an explanation of the reasons why some industries almost never engage in maquila investments, while other industries make relatively intensive use of the maquila format.

While there are a large number of special cases, most international trade

textbooks organize the explanations for trade under three broad principles: comparative advantage, economies of scale, and purely strategic behavior.⁴ Comparative advantage based investments refers to the fact that the U.S. and Mexican economies have very different factor endowments and, as a consequence, different opportunity costs in the production of goods and services. In particular, Mexico's abundant supply of low skilled and semiskilled labor, and the U.S.' abundance of physical capital and skilled labor are complementary in some production processes. Garment manufacture, for example, if it includes the production of textiles and apparel design, requires a variety of skilled labor, and capital, as well as less skilled cutters and sewers.

The comparative advantage approach is a useful starting point, but its primary conclusion that low wages are the main determinant of U.S. investment immediately runs into three limiting problems. First, it cannot explain the location decisions of firms given the regional structure of wages inside Mexico (Hanson, 1997). That is, if low wages are the goal, then all the maquila should be in Chiapas—or better yet, Guatemala. Hanson shows that the main maquila locations also are the regions of highest wages. Second, and related to the first point, the comparative advantage model is unable to explain the geographical concentration of several key sectors, including electronics, and cars and car parts. That is, as more firms agglomerate in a particular locale, wages are driven up and infrastructure is stressed, yet firms continue to crowd into a handful of existing locations. And third, firms that base their production decisions on the availability of low wage labor are very sensitive to changes in their overall cost structure, not just labor costs, and yet strong growth has continued over the last few years in spite of the industry's increasing uncertainty about its tax liabilities. While this issue is far from resolved, it is highly likely that taxes will take a larger share of future maquila revenues (Gerber, 1999; 2001).

During the last 15-20 years, trade economists have developed a number of alternative models of trade and growth. These models do not rule out a

⁴ See, for example, Krugman and Obstfeld (2000), the market-leading text in the United States.

role for comparative advantage, but certain types of trade are clearly not well explained by traditional models of the Heckscher-Ohlin, factor proportions, variety. One of the more prominent models of the last decade and a half is the idea of economies of scale (EOS) based trade. EOS is the simple idea that the average cost of production declines as a firm increases its size, at least up to a point. EOS limits the number of plants a firm can build, since each one must be of a minimum size. In addition, transportation costs play an important role, since they provide strong incentives to locate production as close to the market as possible.

The industrial development of northern Mexico is a clear illustration of the effects of EOS based trade. Prior to 1986 or 1987, when Mexican economic policy favored the production of import substitutes rather than exports, there were strong incentives for firms to locate in or near Mexico City. Since production incentives were oriented towards the domestic market, high transportation costs and the need to produce in only a few locations dictated that Mexico City was the logical location. With the opening of Mexico's economy, however, the implicit incentives of the new economic policy favor production for external markets. In Mexico's case, the largest external market is the United States, and the northern border states are as close as possible to that market. Therefore, in order to reduce transportation costs, and given that production of a particular type must be confined to a few plants, the optimal location strategy is to place the plants in as few locations as possible, each of which should be physically close to the U.S. market (Krugman and Livas Elizondo, 1995).

This type of scale economy is called internal economies of scale, since the scale effects are generated inside the firm. A second form of scale economies occurs when there is no incentive for individual firms to get larger, but each firm becomes more productive as the industry grows. In this case, the scale economies are external to the firm, but internal to the industry. External economies stem from the ability of firms to share a common labor pool, a common supplier base including nontraded inputs (legal, accounting, marketing, etc.), and information about markets and trends (Marshall, 1920).

Figure 3 illustrates the key ideas of these two types of scale economies. Note that there is an undefined amount of overlap between the two, and that some firms may have both types. Note also that while it is relatively easy to identify the factors that determine internal economies of scale (high fixed costs plus significant transportation costs) it is much harder to identify those that lead to external economies and regional agglomerations. Historical accident may play an important role (e.g., the role of World War II in the development of Monterrey) and give the regional concentration of firms an unexplainable, accidental, component. Once established, however, external economies generate significant self-reinforcing factors that lead to more and more growth. Eventually the centripetal forces of growth inducement are offset by the centrifugal forces of congestion, including wage increases, infrastructure inadequacy, and other costs.

5. The sectoral composition of U.S. origin maquila

Before applying the concepts of comparative advantage, economies of scale, and strategic behavior, an overview of the sectoral composition of U.S. origin maquilas is necessary. Table 2 shows the number of firms and workers, by two-digit sector.⁵ Several features stand out. First, two sectors (SIC 23, Apparel and other textile products, and SIC 36, Electrical and electronic equipment) account for more than 58 percent of all workers (Table 2). More specifically, more than 43 percent of all workers can be found in the six largest four digit level industries (Table 3). In other words, U.S. investment is highly concentrated.

A second feature of Table 2 is the near complete absence of investment in a number of sectors. That is, apparel and electrical and electronic products

⁵ U.S. origin maquila are from SOLUNET, provider of a commercial database called *The Complete Twin Plant Guide*. SOLUNET phones each firm (U.S. and non-U.S.) at least once per year. If contact cannot be established, the firm is dropped from the database. Another difference between their method and SECOFI's is that they do not try to measure the share of fixed capital that is Mexican, U.S., or some other nationality. Instead, they simply inquire about the origins of the firm. Any technique for measuring firm nationality introduces bias, but this is perhaps the simplest and most direct method.

(SIC 23 and 36) receive the bulk of investment, a few other sectors receive modest amounts, and a few receive nearly no investment whatsoever. For example, SIC 30, Chemicals and allied products, has less than one-tenth of one percent of the total number of workers in U.S. origin firms. Other manufacturing industries with less than one percent of the total number of workers are Food and kindred products (SIC 20), Tobacco products (SIC 21), Textile mill products (SIC 22), Lumber and wood products (SIC 24), Paper and allied products (SIC 26) Printing and publishing (SIC 27), Petroleum and coal products (SIC 29), and Primary metal industries (SIC 33).

And third, about ten percent of employment in U.S. origin maquilas is outside of the manufacturing sector. Wholesale trade and services account for 9 out of 10 of these nonmanufacturing workers.

In addition to the pattern of sectoral concentration, two other pieces of information are relevant to the economic logic of U.S. investment in the maquiladora industry. First, U.S. investment is highly concentrated geographically, and second, the pattern of U.S. investment is very different from the existing structure of U.S. manufacturing. Geographically, U.S. investment is concentrated in five cities, each of which is directly on the border. In order of importance based on the number of firms, Tijuana (276), Ciudad Juarez (254), Mexicali (98), Reynosa (86), and Matamoros (80) contain 50.4 percent of U.S. origin firms (794/1576) and 51.4 percent of the workers (444,816/865,182).

In addition, the sectoral concentration is wildly different from the pattern of U.S. manufacturing. Table 3 explores this relationship with location quotients comparing the top five cities and the rest of Mexico to U.S. based manufacturing. The indexes in Table 3 are conceptually the same as those in Table 1, and are constructed as follows:

$$\text{Index}_i = (W_{i,\text{maq}}/W_{\text{maq}})/(W_{i,\text{us}}/W_{\text{us}}),$$

where W is the number of workers, "i" is the industry, "maq" is the maquiladora sector, and "us" is the United States. In other words, Index_i is the percent of maquila workers (in U.S. origin maquilas) in industry i divided by the percent of U.S. manufacturing workers in the same industry

in the United States. A number equal to one means that the share of maquila employment is identical to the share of U.S. manufacturing employment. A number greater than one implies relatively more employment in that sector in the maquiladora industry, and less than one implies relatively less. For example, in proportion to its absolute size, Electrical and electronic equipment, SIC 36, in the top five cities has 5.45 times as many workers in U.S. origin maquila as there are in U.S. manufacturing. And Textile mill products, SIC 22, has one third as many.

Table 3 highlights the fact that U.S. maquila operations are concentrated in four industries when judged by the overall pattern of U.S. manufacturing. The four are Electronic and electrical products (SIC 36), Leather and leather products (SIC 31), Apparel and other textile products (SIC 23), and Instruments and related products (SIC 38). Electronics and Apparel both reflect the high numbers of workers shown in Table 2, but Leather and Instruments (SIC 31 and 38) are only moderately large employers.

In addition to industrial concentration, there is an interesting set of differences between the border cities and the rest of Mexico. In particular, the traditional labor intensive industries such as Apparel (SIC 23) and Leather (SIC 31) are more intensely concentrated in the interior, while the newer Electrical (SIC 36) and Instruments (SIC 38) are more concentrated in the five border cities.

6. Comparative advantage, economies of scale, and strategic behavior

The hypothesis of the economic view of U.S. (or any other country) investment in the maquiladora sector is that comparative advantage and economies of scale explain most of the observed pattern of location and concentration. Consider the two traditional, labor intensive, industries with high levels of concentration, Apparel (SIC 23) and Leather (SIC 31). Both sectors are relatively more concentrated in the U.S. origin maquiladora industry than in U.S. manufacturing (Table 3). In addition, both sectors are

relatively more important outside the main border cities. Furthermore, both sectors make standardized goods, where technological change is slow, and capital requirements are low. Hence, they play directly into Mexico's comparative advantage in the production of standardized, labor intensive, goods. Production sharing by U.S. firms enables them to take advantage of Mexico's factor endowments and increase their own competitiveness which is lagging in the United States.⁶

Similar reasoning leads to an explanation of a number of cases where there is relatively little U.S. activity, for example Chemicals (SIC 28). Many of these industries are capital intensive, or require natural resources that are in relatively short supply (Paper and allied products, SIC 26), and are outside the domain of Mexico's comparative advantage. Consequently, those industries receive much less U.S. investment, since there are no economic gains from investment by U.S. firms.

Consider another case, that of Furniture and fixtures (SIC 25). In spite of the relocation of a number of firms from the U.S. to Mexico, it remains relatively less important to the maquiladora than it is in U.S. manufacturing. This sector produces relatively low valued, bulky items, however, and transportation figures importantly in its overall cost structure. This is what differentiates it from the Apparel and Leather sectors, and also what explains its relatively greater concentration near the U.S.-Mexico border where transport costs are less.

Transportation costs are important in a number of other sectors, as well. For example, Mexico may have a potential comparative advantage in auto production, but the lack of a well developed parts supplier base, coupled with the high transportation costs of bringing all the parts for a car into one assembly location, and then moving the cars to market, have constrained the development of the auto industry.⁷ This is not to say it is an unimportant industry, but rather to point out that its relative size is about one-half as

⁶ U.S. commercial policy offers apparel and footwear manufacturing the highest levels of protection of any domestic sector.

⁷ The Office of Technology Assessment (1992) estimated that Mexican transportation costs in the auto assembly industry more than offset labor cost savings when compared to U.S. industry. This is likely to change over time, however, as more parts suppliers locate in Mexico

important to the U.S. origin maquiladora industry as it is to U.S. manufacturing.

The case of the Transportation equipment (SIC 37) industry is interesting in part because it has been argued that Mexico has developed regional manufacturing clusters in this sector (Carillo, 2000). To some extent, the aggregated, 2-digit level data in Tables 2 and 3 are inadequate for measuring this, since it is subcategories of the sector that are important, and because an important part of Mexico's automobile and truck parts specialization is located in the Electrical and electronic equipment (SIC 36) sector. In particular, Electrical equipment for internal combustion engines (SIC 3694) is the third largest 4-digit industry, and within the Transportation equipment sector, Motor vehicle parts and accessories (SIC 3714) is the sixth largest (Table 3).

Electrical and electronic equipment (SIC 36) is another sector that is argued to have developed regional manufacturing clusters. Proving or disproving the existence of clusters is beyond the scope of this paper, but a couple of observations are warranted. First, the idea of a regional cluster is at bottom an argument that external economies of scale must be at play. That is, the centripetal forces of industry agglomeration must offer advantages to the firms located in the regional cluster. At the macro-aggregate level, there is statistical support for this idea. Specifically, the fact that it is much more concentrated in the five major border cities than in the rest of Mexico (Table 4) supports but does not prove the hypothesis of regional manufacturing clusters.

The nature of the regional advantages that firms find in the five border cities is uncertain, but there are several candidates. First, there are large labor markets which are well known throughout Mexico. This means that the border continues to draw the labor it needs as it expands its production, and that there has developed a large pool of workers with experience working in maquilas. Second, there are the demonstration effects of firm success and size of the industry. This signals to other firms that the infrastructure of industrial parks, government regulations, and utilities are present, and that local institutions are familiar with industry needs. And

third, there is a pool of supporting input suppliers, including important service providers such as lawyers, accountant, equipment repair and maintenance personnel, and so forth.

In most models of external economies, specialized input suppliers play an important role, but the Mexican case is somewhat different given that less than 3 percent of intermediate inputs are national origin. Nevertheless, average value added in the maquiladora industry is about 25 percent of the output value, and about one-half of that is direct labor costs while the other half is diverse expenditures (*gastos diversos*) on rental of machinery, equipment, buildings, and land, along with electricity, telecommunications, customs services, shipping and handling, maintenance, and other (INEGI, 2000). In sum, for the average maquila, the labor skills of the workers in the supporting economy are relatively more important than intermediate input suppliers.

A final point on strategic behavior is worth mentioning. In the cases of at least two industries, movement into Mexico is partly motivated by strategic decisions involving the direction of the industry's evolution under conditions of a changing global economic environment. The incorporation of the Multi-Fiber Agreement (MFA) into the WTO, and the pending conversion of textile and apparel quotas into tariffs (and their eventual reduction), will reduce the protection given by U.S. commercial policies to its relatively uncompetitive apparel industry. This has prompted the movement of apparel producers, but appears to have also begun a movement of U.S. textile manufacturers into the Mexican apparel industry as a defensive strategy to guarantee a market for their textile production (US International Trade Commission, 1999). In addition, Mexico's changing commercial policy environment, and its signing of numerous free trade agreements around the world, has created an incentive for appliance manufacturers and automakers to locate production there. Whether these are temporary phenomenon, or long term trends, is too early to tell.

Conclusion

Perhaps the most outstanding feature of U.S.-origin maquilas is the extent to which they differ from the structure of manufacturing in the United States. The incentive for U.S. industries to use the maquila form varies widely and U.S. investment has not duplicated the domestic U.S. pattern. In particular, usage of the maquila form of production by U.S.-origin firms is not at all consistent with the idea of export platforms. That is, American firms do not appear to use the maquila to lower the costs of production for goods that are substitutes for those produced in the U.S. Rather, they appear to use the maquila form to extend the U.S. comparative advantage into new areas of production. Industries that are able to make use of Mexico's comparative advantage, or that have been able to establish regional production centers, have been able to increase their competitiveness. For most of the rest, the maquiladora form of FDI offers no particular advantage.

Indeed, the tax advantages of the maquiladora form of production may be declining for all U.S. industries. While overall U.S. foreign direct investment in Mexico is not affected, free trade under the NAFTA is making the maquiladora form less useful for U.S. firms. For example, the most recent U.S. International Trade Commission annual report on production sharing noted that many U.S. firms no longer bother to use the maquiladora designation since the NAFTA eliminated many of the barriers in several industries (U.S. International Trade Commission, 1999). Furthermore, in several cases, Mexico's commercial policy has extended maquila-style rules to the rest of its economy. The best example of this is the Programa Sectoral (PROSEC) which has reduced import tariffs to between 0 and 5 percent in most cases.

PROSEC is Mexico's response to the scheduled elimination of the tariff waiver granted to maquiladora imports. The waiver was required to expire in January, 2001, but the Mexican government has struggled to put an alternative set of rules in place, and there has been widespread confusion over the extent of the new PROSEC rules, and how companies take advantage of them. In addition, firms have expressed concerns over the

new Permanent Establishment asset taxes, and the alternative Safe Harbor provisions (CIEMEX-WEFA, 2000, and Gerber, 2001). Further, with the signing of NAFTA, Mexico originally announced that the maquiladora sector would cease to exist as a separate sphere of Mexican manufacturing.

Given the disappearing advantages to the maquiladora designation (at least for U.S. firms), the uncertainty over tax rules, and, in at least a few instances, concerns over energy and water supplies, it is conceivable that the relative importance of the maquiladora industry may have reached its zenith. While it seems certain that U.S. economic ties to Mexico will continue to deepen, it is much less certain that the maquiladora industry will capture the same share of U.S. FDI as it has in the past.

Table 2
U.S. Origin Maquiladora Firms

<i>SIC Code</i>	<i>Description</i>	<i>Firms</i>	<i>Workers</i>	<i>Workers-- Share of total</i>
07	Agricultural services	2	176	0.0002
17	Special trade contractors	3	50	0.0001
20	Food and kindred products	21	6,831	0.0079
22	Textile mill products	12	4,129	0.0048
23	Apparel and other textile products	290	146,576	0.1694
24	Lumber and wood products	26	7,578	0.0088
25	Furniture and fixtures	48	11,137	0.0129
26	Paper and allied products	19	3,578	0.0043
27	Printing and publishing	13	5,012	0.0058
28	Chemicals and allied products	10	1,269	0.0015
30	Rubber and miscellaneous plastic products	93	28,641	0.0331
31	Leather and leather products	27	16,017	0.0185
32	Stone, clay, glass, and concrete products	30	11,052	0.0128
33	Primary metal industries	16	3,252	0.0038
34	Fabricated metal products	90	30,359	0.0353
35	Industrial machinery and equipment	80	43,396	0.0502
36	Electrical and electronic equipment	436	359,941	0.4160
37	Transportation equipment	60	43,329	0.0501
38	Instruments and related products	73	36,315	0.0420
39	Miscellaneous manufacturing industries	50	16,070	0.0186
42-49	Transportation and utilities	12	4,421	0.0051
50, 51	Wholesale trade	87	42,066	0.0486
52-59	Retail trade	15	6,397	0.0074
72-95	Services	65	37,130	0.0429
20-39	Manufacturing industries	1,394	774,842	0.8956
01-19, 40-99	Nonmanufacturing sectors	184	90,340	0.1044

Source: SOLUNET, 2001.

Table 3
U.S. origin maquila: The largest sectors

<i>SIC Code</i>	<i>Description</i>	<i>Firms</i>	<i>Workers</i>
23	<i>Apparel and other textile products</i>	290	146,576
2339	Women's, misses' and juniors' outerwear, nec Scarves, contractors, athletic uniforms, all other	222	91,276
2399	Fabricated textile products Seat belts and seat and tire covers, apparel and apparel accessories, other fabricated textile products	26	41,771
35	<i>Industrial machinery and equipment</i>	80	43,396
3577	Computer peripheral equipment	14	13,030
3585	Air-conditioning and warm air heating equipment and commercial and industrial refrigeration equipment Automobile air-conditioning and other air-conditioning	12	7,525
36	<i>Electrical and electronic equipment</i>	436	359,941
3613	Switchgear and switchboard apparatus	12	9,854
3621	Motors and generators	19	15,544
3643	Current-carrying wiring devices	19	11,558
3645	Residential electric lighting fixtures	19	7,694
3651	Household audio and video equipment	18	32,399
3677	Electronic coils, transformers, and other	47	14,855
3679	Electronic components, nec: Antennas, radio headphones, printed circuit/electronics assembly, other electronic components	158	119,098
3694	Electrical equipment for internal combustion engines	62	64,884
37	<i>Transportation equipment</i>	60	43,329
3714	Motor vehicle parts and accessories Engines, transmissions, wiring harnesses, brakes, suspensions, other	44	33,255
38	<i>Instruments and related products</i>	73	36,315
3822	Automatic controls for regulating residential and commercial environments and appliances	9	6,607
3841	Surgical and medical instruments and apparatus	20	8,988
3842	Orthopedic, prosthetic, and surgical appliances and supplies	18	9,482

Source: SOLUNET, 2001; U.S. Census Bureau.

Table 4
The structure of U.S. origin maquila in comparison to U.S. manufacturing

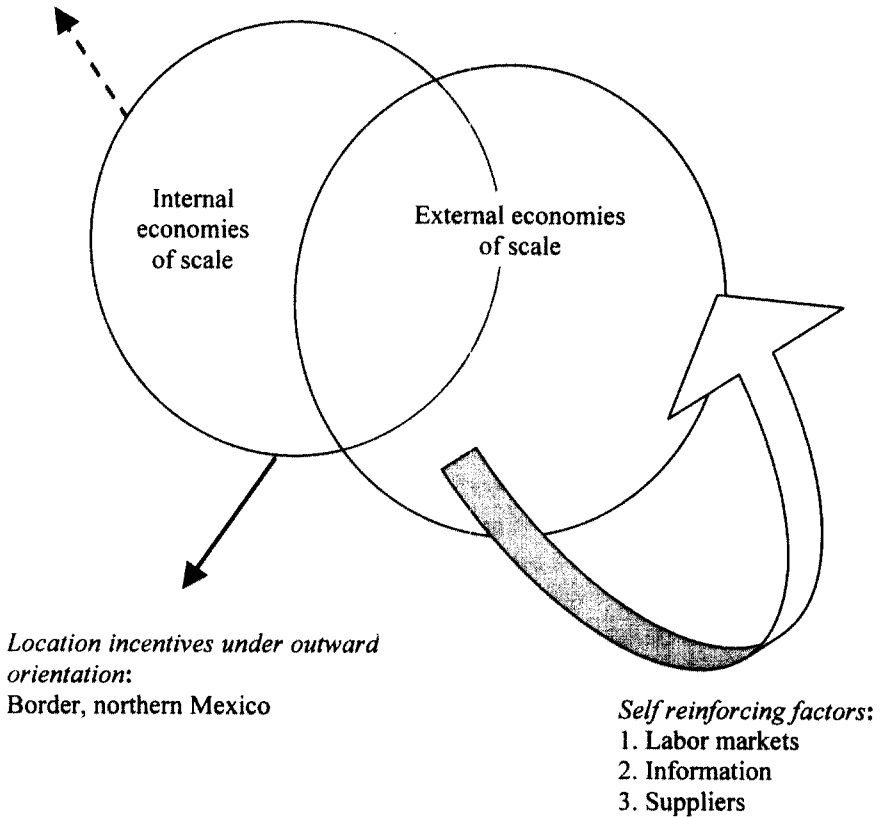
<i>SIC Code</i>	<i>Description</i>	<i>Location Quotients:</i>	
		<i>Top 5 cities</i>	<i>Rest of Mexico</i>
20	Food and kindred products	0.06	0.14
22	Textile mill products	0.32	0.04
23	Apparel and other textile products	3.36	7.86
24	Lumber and wood products	0.21	0.22
25	Furniture and fixtures	0.54	0.36
26	Paper and allied products	0.15	0.12
27	Printing and publishing	0.10	0.05
28	Chemicals and allied products	0.03	0.03
30	Rubber and miscellaneous plastic products	0.80	0.40
31	Leather and leather products	4.74	6.07
32	Stone, clay, glass, and concrete products	0.30	0.63
33	Primary metal industries	0.10	0.12
34	Fabricated metal products	0.63	0.31
35	Industrial machinery and equipment	0.46	0.52
36	Electrical and electronic equipment	5.45	4.38
37	Transportation equipment	0.49	0.65
38	Instruments and related products	1.30	0.72
39	Miscellaneous manufacturing industries	1.067464	0.880284

Source: Author's calculations based on data from SOLUNET, 2001 and U.S. Bureau of Labor Statistics.

Figure 3

Internal and external economies of scale

Location incentives under import substitution industrialization: D.F., Estado de Mexico



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Abstract

The Structure of U.S. Outward Foreign Direct Investment in Mexico's Export Processing Industry

James Gerber

The industrial pattern of U.S. outward foreign direct investment in Mexico's maquiladora industry is analyzed within the economic framework of comparative advantage and economies of scale. Descriptive statistics and location quotient indexes are used to show that U.S. firms are far more likely than firms from other countries to use the maquiladora form when they commit foreign direct investments to Mexico. In addition, U.S. investments tend to be highly concentrated, both in terms of industrial sectors and geographically. Another feature of the industrial concentration of U.S. investments is that it is fundamentally different from the industrial composition of U.S. manufacturing at home. In a causal sense, U.S. FDI in Mexico's maquiladora sector appears to stem from the characteristics of Mexico's comparative advantage and economies of scale, both internal and external.

Key word : foreign direct investment, comparative advantage, export processing zone, maquiladora, location quotients, economies of scale