



Foreign Investment and the Global Geography of Production: Why the Mexican Consumer Electronics Industry Failed

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Summary. — Explanations of industrial development in late-developing countries have become narrowly focused on the capability of governments to promote, pressure, or punish nationally-owned firms. Often overlooked is the contribution of firms, both national and multinational, in propelling, coordinating, and determining the path and location of such development. This paper examines the conditions that led to the decline of Mexico's consumer electronics industry and presents new evidence to support a more complex account of the role of both industrial and state actors within this process.

In contrast to the traditional market- or state-based theories, we argue that the decline of Mexico's consumer electronics industry largely resulted from its foreign investment regime, particularly the timing of investment and the geographical locations of local and foreign manufacturers, and the subsequent depth and quality of the relationships between these firms. The differences between Mexico's regime and that of Taiwan during the same period provide further evidence of the important role that foreign firms play in inserting local suppliers into the global production chain. We argue that Mexico's foreign investment regime and the resulting weak local-foreign ties, rather than inadequate state policy, sealed the fate of Mexico's once thriving domestic electronics industry. © 1999 Elsevier Science Ltd. All rights reserved.

1. INTRODUCTION

During the last four decades the economic performances of East Asian and Latin American countries have diverged dramatically. Most studies claimed that differences in state policy or the relationships between the state and industry could account for the divergence (see, for example, Evans, 1995). Although these studies recognized the impact that foreign direct investment can have on a country's industrial performance, they typically viewed foreign investors as homogeneous entities. While this was probably a useful first approximation, our research suggests that the nationality of the foreign investor, as well as the

competitive status of that investor's national industry, can shape the learning environment and industrial trajectory of firms in the host country.

Industrial development is often viewed as a process whereby a country's industries advance on a broad front. This is rarely the case

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however, rather, industrial development is an uneven process, whereby some industries grow rapidly, while others remain relatively stagnant or even decline (Storper and Walker, 1988; Jacobs, 1969). Moreover, certain industries inherently offer greater potential for stimulating national growth and provide more opportunities for the acquisition of new skills and technologies. Electronics has clearly established itself as a dynamic, fast-growth industry in today's global economy. In contrast to other industries, the broad spectrum of activities covered by the electronics industry has provided nascent firms and countries with multiple points of entry into the industry, ranging from routine, simple assembly to more sophisticated capital- and knowledge-intensive manufacturing (Perez, 1985).

East Asia's rapid economic expansion and entry into the international economy can be attributed to its success in developing a globally competitive electronics industry. Behind the Asian electronics miracle is a complex web of international interdependence, including many joint ventures and technology transfer agreements that have provided local firms with opportunities for borrowing and internalizing new processes (see, for example, Ernst and O'Connor, 1992). Contemporary studies of Asia tend to equate the rise of the more glamorous, high-end sectors of the industry, including computers and semiconductors, with Asia's rapid economic and industrial growth. Yet, at the heart of this success was Asia's initial entry into the more prosaic consumer electronics industry during the late 1960s. Production of computers and semiconductors came later and relied on the previously accumulated knowledge and capital base of consumer electronics firms.

In 1965, an observer of the global economy easily could have concluded that Mexico, *and not Taiwan or South Korea*, would become one of the most successful developing countries in establishing a competitive, indigenous electronics and related parts industry. In 1970, the Mexican consumer electronics industry was larger than that in either South Korea or Taiwan. At that time Mexico had 16 manufacturers of televisions, 30 manufacturers of radios and audio equipment, and 120 supplier firms, the majority of which were wholly Mexican-owned. So why did Mexico fail, with its advantages of greater wealth, a larger internal market, an established indigenous industry, and a base of skilled personnel?¹

Building on earlier conclusions about East Asian success, observers have blamed Mexico's industrial failures on inadequate state intervention (Grunwald, 1985a; Wilson, 1992) or, as an outcome of Mexico's subordinate insertion within the international division of labor (Sklair, 1993; Gereffi, 1994). In this paper, we examine the components of Mexico's geographical and foreign investment situation that account for the difficulties it experienced in developing a consumer electronics industry. In doing so, we are forced to reconsider many of the theoretical insights and policy implications drawn from earlier studies of East Asia's success. By opening the foreign investment "black box," we find significant differences between the foreign firms hosted by Asian countries and Mexico. Furthermore, we suggest that there is a strong correlation between certain characteristics of a nation's foreign investors and that country's economic and industrial opportunity.

To understand better the factors that have contributed to the growth and decline of Mexico's indigenous consumer electronics industry, we also examine the industrial trajectory of Taiwan's domestic electronics industry during 1965–85. The comparison may not seem obviously appropriate, but in fact both countries initially shared similar industrial policies and industrial characteristics. Both countries were opened to foreign investment in 1965. At the time, both countries housed an indigenous consumer electronics industry, although Mexico's was far larger and more advanced. Initially, neither country had an explicit electronics policy or sector-specific foreign investment policy. Rather, their industrial policies remained fairly general and did not target particular industries, as commonly attributed to South Korea. Finally, both countries were seen as natural sites for foreign direct investment from their larger industrialized neighbors, Taiwan for Japan and Mexico for the United States.

In the first section, we present an overview of Taiwan's experience in developing a viable, "global" electronics industry. The second and third sections introduce the reader to Mexico's interior and border consumer electronics industries. The remaining sections provide a chronological account of the investment decisions of firms seeking to utilize Mexico's low-cost labor market and describe how variations among these firms, including their location decisions, affected the development trajectory

of Mexico's domestic electronics industry. In the concluding section, we review the implications of this research for understanding the differences in industrial development in East Asia and Latin America.

2. TAIWAN REVISITED

East Asia's economic success has attracted the attention of many scholars and has provided an opportunity for political science to reassert itself within a debate traditionally dominated by standard economic analyses. Many analysts now credit an "Asian developmental state" with a singularly uncanny capacity to predict and choose industrial winners (Deyo, 1987; Wade, 1990; Wilson, 1992; Evans, 1995). This approach, though providing an alternative to standard economic theory, has difficulty capturing the true complexity behind the success of East Asia's electronics industry. Although the case of South Korea's growth may substantiate claims of state-driven development (and, more recently, perhaps of state-driven crisis), such approaches are not applicable to all developing countries, for they do not adequately account for the many other cases in which state industrial policies were either inadequate or insignificant in stimulating development, or more importantly, emerged only *after* substantial industrial development had occurred.

New evidence indicates that many Asian countries do not fit neatly within this unidirectional, top-down model in which corporations are viewed as mere pawns of omniscient central government bureaucrats (for a critique on Japan, see Callon, 1995). Recent studies of Taiwan's electronics industry point to a more negotiated process, whereby interfirm alliances fostered an environment ripe for the lobbying of state government by locally-owned manufacturers. These events, together, allowed Taiwanese firms to insert themselves within the global electronics value chain (see, for example, Lam, 1992; Kuo, 1995). These newer revisionist approaches therefore recognize the complexity and variety of paths for local industrial development and identify the roles of developmental actors often overlooked under both traditional and mainstream theories.²

Kuo (1995) and Lam (1992) depart from the state-centric model to highlight the impact of interfirm collaboration on Taiwan's industrial trajectory. Foreign investors made it possible

for local firms to gain access to global production chains and implement new technologies, thereby strategically positioning local entrepreneurs within emerging international markets (see, for example, Ernst, 1994). Taiwan's linkages with both Japanese and US multinational firms provided the initial catalyst for developing a successful indigenous industry.

Japanese electronics firms chose to invest in Taiwan for several reasons. Some sought access to Taiwan's growing consumer market; others, specifically suppliers of labor-intensive parts such as wire harnesses, were more interested in tapping into Taiwan's cheap labor markets. In the case of transistor radio production, Japanese supplier firms opted to follow the lead set by their assembler customers in relocating to lower-cost production sites in Asia. By the early 1970s, Japanese assemblers, including Sanyo, Hitachi, and Matsushita, expanded their Taiwanese operations because, in part, of rising trade friction with the United States. The physical proximity of the island to Japan, and its colonial heritage, added to its attractiveness (Simon, 1988; Wade, 1990). As a result, Taiwan received a disproportionate share of investment from newly mobile Japanese consumer electronics companies.

Often Taiwanese entrepreneurs established joint ventures with smaller Japanese components makers and assemblers that were seeking access to the highly protected Taiwanese consumer market (Gold, 1988, p. 166). In most cases, these joint ventures were the result of local content requirements and restrictions on the degree of foreign ownership. During the 1960s, it was not uncommon for national governments in developing countries to impose such restrictions: for instance, Mexico also required joint ownership and local sourcing of firms seeking access to their local consumer markets.

Through their participation in these joint ventures, local firms in Taiwan were able to observe and learn new technologies, internalize new production processes, and increasingly participate in the changing international electronics industry. Importantly, the location of Taiwan's free trade zones put these foreign firms close to local Taiwanese firms, thereby, indirectly facilitating crossfirm communication (Hobday, 1995; Zenger, 1977). Both foreign and Taiwanese firms were also members of the same trade association, fostering additional channels for information exchange and learning (Kuo, 1995).

In the mid-1960s, US consumer electronics firms established manufacturing sites in Taiwan. This investment eventually opened new markets for Taiwanese-made parts and components. The decline of the US parts industry, and the rising cost of Japanese-made components during the 1970s, added to the urgency on the part of US firms to find new sources of low-cost parts and electronic components. US firms, which initially perceived Taiwan as merely a source of cheap labor, increasingly became aware of the capabilities and competitiveness of the island's growing indigenous parts industry and eventually began procuring parts from this local supplier base.

These US customers also provided local firms with the opportunity to dissolve their Japanese joint ventures and establish wholly-owned Taiwanese facilities. Their success is demonstrated by the shift in *locally produced parts* in Taiwanese electronics exports from 10% in 1972 to over 30% by 1979 (Wilson, 1992, p. 24). US firms continued to source from Taiwanese parts makers even after the firms closed their Asian operations in the late 1970s and early 1980s. Once established in Taiwan, Japanese and US multinationals also trained Taiwanese employees and managers and initiated programs to upgrade the quality of the products they received from local parts manufacturers. Schive (1990) argues that this aspect of foreign investment created substantial backward linkages and the necessary channels for the transfer and adoption of new technologies and manufacturing processes. The literature has not examined this process in sufficient detail; however, there are suggestive anecdotes. For example, when General Instruments opened its operations in Taiwan in 1964 it initiated a rigorous training program for Taiwanese managers and worked closely with Taiwanese parts producers to assist them in upgrading the quality and standard of their products. By 1987 several senior executives in Taiwanese electronics firms were former employees and managers for General Instruments and other US electronics plants (Sease, 1987).

According to Hayashida (1994), a similar dynamic was put into play by Japanese home appliance makers. These firms implemented a series of training seminars for Taiwanese parts makers and dispatched Japanese engineers to work at these local supplier facilities. Furthermore, large numbers of Taiwanese engineers worked at Japanese plants in Taiwan prior to

opening their own domestic manufacturing facilities. In summary, the Taiwanese electronics industry greatly benefited from the heterogeneity of foreign investors. The dual regime of Japanese and US corporations provided education for Taiwanese managers and workers, helped improve the quality and efficiency of parts productions, and supplied stable markets and international business linkages for local firms. This combination of features created a solid foundation for Taiwan's indigenous electronics industry, as well as for its future globally competitive information technology and computer industry.

The role of the state in contributing to the development of Taiwan's electronics industry was not *sui generis*, but rather resulted from aggressive lobbying by local firms. The first of the local-multinational corporation alliances occurred *prior* to the implementation of proactive product- or market-specific policy targeting. It was not until the mid-1970s, after these relationships were well established, that the state became an advocate for local electronics firms and shifted legislation from its original general mandate meant to attract foreign investment to one aimed at encouraging and protecting local firms by restricting foreign participation in certain markets and technologies (see Lam, 1992; Kuo, 1995). Their ties with foreign firms provided local manufacturers with the know-how and legitimacy necessary for leveraging more customized industrial policy in the 1970s. The electronics industry was the agent Taiwan, that led the state to its policies.

3. MEXICO'S DOMESTIC CONSUMER ELECTRONICS INDUSTRY

Consumer electronics production in Mexico began as early as 1940 with the local assembly of vacuum-tube radios. In 1950, Mexican firms started manufacturing transistor radios and black-and-white (B&W) televisions. By 1968, there were a large number of Mexican and foreign-owned electronics firms (mostly consumer electronics). In the early 1970s, for color televisions 85–90% of the total value was produced in Mexico and for black-and-white televisions it was 95% (Nuñez, 1990).³ This industry was considerably larger and more advanced compared with nascent electronics industries in other developing countries. Mexico's consumer electronics firms were located

mostly near Mexico City and primarily supplied the growing domestic market.

Under the import substitution industrialization (ISI) policies of the 1950s and 1960s, Mexico attracted several foreign manufacturers seeking access to its expanding domestic market. In the 1930s, North American Philips, a subsidiary of Philips Holland, began manufacturing consumer durables, including refrigerators and lighting equipment for the domestic Mexican market. In the 1950s, Philips started manufacturing consumer electronics. During the 1960s, the Mexican domestic market attracted other foreign electronics firms including Admiral, Philco, Telefunken, Beck, Motorola, Stromberg Carlson, General Electric, and Emerson. Foreign components manufacturers, including Sylvania (picture tubes), RCA (picture tubes), Corning Glass (glass for CRTs), TRW (electronic components), Avnet (electronic components), Globe Union (electronic components), Federal Pacific (electronic components), and Sprague Electric (capacitors) also opened manufacturing operations in Mexico.

Paralleling the growth of foreign investment was the simultaneous expansion of Mexican-owned manufacturing facilities. These operations were predominately subsidiaries of family-run conglomerates (Nuñez, 1990; Fujita *et al.*, 1994). The largest Mexican manufacturer of radio and television sets was the Majestic Corporation, a multifirm conglomerate consisting of 57 Mexican firms that sold products in Mexico and other Latin American countries (Business Week, 1970, p. 49). Majestic, which started production in 1957, resembled US consumer durable manufacturers such

as General Electric, Philco, and Admiral by having a broad product line that included both white goods (fans, refrigerators, stores, etc.) and consumer electronics. Majestic focused primarily on the low-end consumer market by manufacturing inexpensive radios and B&W television sets.⁴ By the early 1960s, Majestic procured a significant share of its parts from an extensive supplier base of Mexican electronic parts and cabinetry firms (Business Week, 1970, p. 49). Other Mexican-owned consumer electronics manufacturers at the time included Zonda, Skyline, Royal, and Autec.

Due to local content rules, domestic parts sourcing remained high, averaging 85–98%. There was limited vertical integration, and most of Mexico's independent supplier firms specialized in particular segments of the production chain. For example, cabinet manufacturers made the wooden cabinets for console sets; plastics firms manufactured the casing for portable radios and smaller televisions; and electric cable and electronic componentry firms produced the necessary wiring and passive components, such as resistors, capacitors, and inductors for the video and audio equipment (*Comercio Exterior*, 1970). These firms were usually small or medium-sized and were typically family-operated. Ownership was evenly divided; approximately half of Mexico's component firms were joint ventures with European and US firms, and the remaining firms were wholly-owned Mexican operations.

During 1965–82, the industry experienced significant growth in both output and new investment (see Figure 1). Foreign firms such as

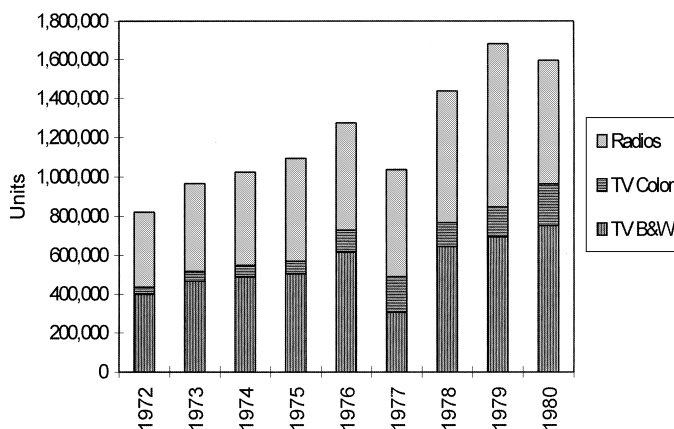


Figure 1. Television and radio manufacturing in Mexico, 1972–80. (Source: CANIECE, 1987).

Philips, General Electric, Admiral, Philco, and Magnavox expanded their Mexican operations during the early 1970s. Other foreign firms, *viz.*, Stromberg Carlson, Telefunken and RCA opened new facilities in Mexico City. A number of Mexican-owned firms also established new operations following the lead set by Majestic. For example, Packard Bell⁵ began assembling radios, phonographs, audio consoles, and B&W televisions in the mid-1960s. The entry of Grupo Industrial Alfa⁶ during the mid-1970s further demonstrated the profitability and significance of the industry. Larger regional cities, including Guadalajara, began to host medium-sized, regionally-based consumer electronics operations (e.g., Zonda). As new firms entered the industry, there was increasing pressure to diversify product lines and consumer goods. After the mid-1970s, the production of small-sized color televisions increased fivefold, replacing more outdated B&W consoles. Production of smaller, portable radios accelerated tenfold during the same period with local content averaging 95%. In summary, prior to the early 1980s, the industry expanded its production capacity and attempted to adopt to changes in consumer demand and new technologies.

By the early 1980s, however, the growth of this industry was severely constrained. By the late 1980s, only 25% of the original audio manufacturers and 47% of the video equipment makers continued to produce for the domestic market (Fujita *et al.*, 1994, p. 222). Surviving firms were forced out of manufacturing, and began to assemble and distribute imported Asian products, thus reflecting the larger reconfiguration in the international consumer electronics industry. By 1985, Asian consumer electronics firms clearly had become the global leaders in terms of cost, quality, and technology. In contrast, the ranks of the US consumer electronics industry had thinned, with only General Electric, RCA, and Zenith remaining. Rising imports from Asian component manufacturers further devastated Mexico's indigenous supplier base, and the cyclical nature of Mexican consumer demand expressed during the global recession of the early 1980s disrupted corporate planning. As a result, by 1988 local content rates in Mexico's domestic consumer electronics industry dropped to 10% (Nuñez, 1990, p. 93).

In part, the decline of this industry can be attributed to Mexico's growing domestic financial crises of the 1980s. Rising imports, both legal and contraband, also threatened the

position of domestic producers, as did the unexpected decision on the part of Mexican policy makers to lower trade barriers for components in 1982 (Zermeño, interview, 1997). But, of interest here is why, in contrast to Taiwan, Mexico's indigenous electronics industry was unable to sufficiently cushion itself against the economic crisis of the early 1980s. After all, Taiwan's insertion within the global electronics industry during the late 1970s, propelled by its interfirm relations and parts-sourcing arrangements with Japanese and US manufacturers and assemblers, had allowed it to weather the global economic crisis. The following sections provide a historical account of the foreign investment regime experienced in Mexico during 1965–85. By examining this regime, we can identify clear differences between the characteristics of the investors hosted by Mexico and Taiwan, and the channels for learning that were either opened or closed to firms in each country. It is these differences, rather than simply national industrial policy, that shaped the industrial trajectories of each country.

4. THE BORDER INDUSTRIALIZATION PROGRAM: 1965–74

The decision in the 1960s by US consumer electronics firms to move television assembly and component production offshore was driven by the increasing penetration of their domestic market by Japanese-made goods. Already by the mid-1950s, US consumer electronics assemblers began substituting low-cost imported Japanese components for US-made parts.⁷ In the late 1950s, finished products from Japan, such as transistor radios, entered the US market. Imported tape recorders and B&W television sets quickly followed. As a result of these imports, by the late 1960s US radio manufacturing had largely ceased (Curtis, 1994, p. 109; Schiffer, 1991). Contemporaneously, Japanese firms captured an ever-greater market share for B&W televisions—in response, US manufacturers increasingly switched to the production of color televisions. The ability to stave off competition in the color television market was limited, however, by the increasing popularity of small Japanese-made color sets (Itagaki, 1987; Hiramoto, 1994; MIT Commission on Industrial Productivity, 1989, p. 14). By the mid-1960s, US color television manufacturers found themselves struggling to

maintain market share against aggressive Japanese manufacturers (Porter, 1983, 1986).

In response, many US consumer electronics firms decided to transfer labor-intensive segments of the production chain to developing countries with low labor costs. Firms typically used these offshore sites to assemble low-quality and/or labor-intensive parts and components, rather than to produce complete sets. Independent parts suppliers in the United States were among the first to move their production facilities to Mexico. After all, they were the first to be affected by the increasing penetration of Japanese-made goods. US assemblers that produced components in-house also moved their parts operations overseas. Gradually, these firms would move a significant share of their total assembly and manufacturing operations overseas.

By the late 1960s, Mexico and Taiwan vied for direct US investment (Grunwald, 1985b, 1985b, p. 18). Mexico's advantage was its border infrastructure and its proximity to the United States, which allowed US manufacturers to be closer to their parent facilities and headquarters, their domestic supplier base, and their core consumer market (Fawcett, 1993, p. 5). Mexico's geographic proximity however, was not sufficiently advantageous to preclude larger US firms, including RCA, General Instruments, Zenith, Philco, and Admiral, from opening facilities in Asia, specifically in Taiwan. In the late 1960s, Taiwan had one of the lowest hourly wage rates of any developing country (see Table 1). Early investment by Japanese electronics firms also demonstrated the ability of Taiwan, including its labor market, to support a growing foreign electronics industry.

In 1965 Mexico initiated the Border Industrialization Program in an effort to attract US firms moving offshore (Baerresen, 1971). Under this program, foreign-owned plants, referred to as *maquiladoras*, were given immunity from Mexican import duties if they were located within 10 miles of the US-Mexican border and re-exported all finished products back to the United States. Under this program, cities along the US-Mexican border, and later those in Mexico's interior (1971), established free-trade zones and built industrial parks to house new foreign investors.⁸ This was encouraged by US tariff schedules 806/807, which allowed US firms to circumvent high import duties on only the value-added from Mexican labor, raw materials, or parts. The program quickly

Table 1. *Wage differences in electronics assembly by country, 1970 (average hourly earnings, including supplementary compensation in US dollars)*^a

Country	Semiconductors	Consumer electronics
Taiwan	n.a.	\$0.14
Hong Kong	\$0.28	0.27
Singapore	0.29	n.a.
Jamaica	0.30	n.a.
Korea	0.33	n.a.
Mexico	0.61	0.53
Japan	1.30	0.58
Canada	2.11	3.50
United States	2.97	2.69

^a Source: Adapted from Wilson (1992, p. 22). Wilson's original source: US Tariff Commission, Economic Factors Affecting the use of Items 807.00 and 806.30 of the Tariff Schedule of the US, Washington, DC 1970, p. A-90.

attracted a large number of US investors, and by June 1971 Mexico hosted 293 predominantly US-owned 'maquiladora' plants and in 1978 there were 540 of which 32% were in electric/electronics industries (Fernandez-Kelly, 1983, pp. 34, 39).⁹

One of the most aggressive US firms was Warwick. With its longstanding reputation as a low-quality, low-cost original equipment manufacturer (OEM), it was the first US television assembler to move to Mexico. As an OEM for Sears, Warwick was unable to hold onto its market share on the basis of brand name loyalty.¹⁰ Rather, in contrast to other US manufacturers, Warwick was forced to compete with Japanese OEMs in the late 1960s. The resulting pressure to lower its wholesale prices forced Warwick to pursue immediate cost-cutting strategies. Warwick, therefore, became a pioneer through its decision to transfer the majority of its operations to Tijuana, Mexico in 1966. In 1968 and 1974, Warwick opened two additional facilities in Mexico to assemble and produce components and parts for both its B&W and color television facilities (Skclair, 1993, p. 51). Although Warwick never captured more than 9% of the US market, it nonetheless remained the largest electronics assembler in Mexico until the mid-1970s. During 1966-74, Warwick was also responsible for the majority of the B&W television exports from Mexico to the United States. As Figure 2 indicates, when Warwick discontinued the production and export of complete television sets from Mexico in 1974,

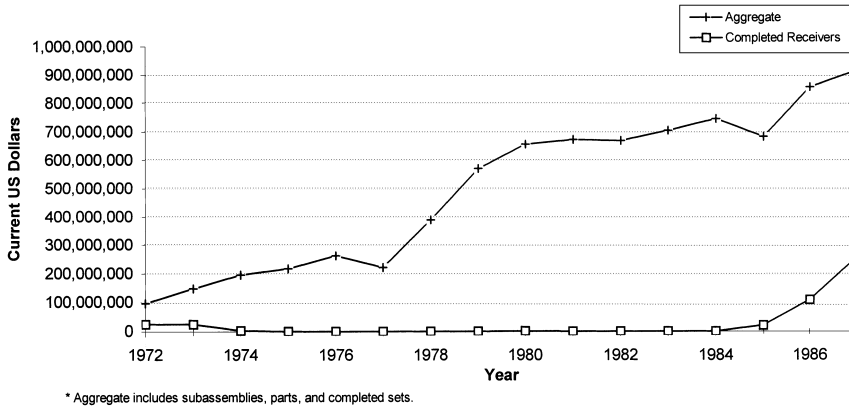


Figure 2. Mexico's TV exports to US custom value. (Source: Feenstra, 1995).

Mexican exports of complete receivers to the United States ceased altogether.

With the exception of Warwick, before 1970 the majority of US electronics plants in Mexico produced passive electronics components and parts that were shipped directly to final goods assemblers in the United States. Most of these parts suppliers initially located their facilities in Tijuana and Nogales, and they were primarily small independent firms that supplied US B&W television manufacturers with low-cost, low-quality tuners and passive componentry. These firms had no intention of using these facilities to participate in Mexico's expanding domestic market, as had been the objective of many of their Japanese counterparts in Taiwan. Rather, these companies simply took advantage of Mexico's lower labor costs. As a result, these initial investments did not provide firms in Mexico's interior with the opportunity for establishing joint ventures or purchasing arrangements.

By the early 1970s, larger US electronics manufacturers followed suit and also opened facilities along the US-Mexican border. Commercial and corporate real estate companies fueled the burgeoning competition between border cities. By the early 1970s, many of Mexico's border towns had established some form of industrial park. Typically, these parks sought investment from a large US firm in order to offer a "seal of approval" for other potential investors. In 1969, Matamoros successfully courted Telectronics (which would later go bankrupt). During the 1970s, Ciudad Juarez was able to recruit a considerable

number of Fortune 500 firms after RCA agreed to locate their core operations within the city's industrial park (Sklair, 1993, p. 102).¹¹ Prior to the early 1980s, Ciudad Juarez housed the largest number of US *maquiladoras*; however, only a handful were producers of consumer electronics products and parts.

By 1973, over 100 electronics *maquiladoras* were fully operational in the border states of Baja California and Sonora (Mexican-American Review, 1974, p. 26). Our data show that most of these plants produced or assembled parts and components.¹² Only four firms, Warwick, GTE, Magnavox, and Teledyne, used their Mexican facilities to assemble complete sets.¹³ Initially, Nogales had a clear advantage over other cities along the border as a result of its proximity to electronics parts suppliers in California and Arizona. Wage rates in Nogales were also significantly lower than those in Tijuana—\$0.34 per hour in Nogales versus \$0.46 per hour in Tijuana (Kent, 1971, p. 6). In 1969, Arthur D. Little designed and financed the construction of Parque Industrial de Nogales, S.A., as a means to attract new investors to the region (Kent, 1971, p. 6). By the early 1970s, the park housed plants owned by Magnavox, General Instruments, and General Electric. In 1973, 17 of the 37 *maquiladoras* in Nogales were manufacturers of electronics components.¹⁴ Of these, eight had parent corporations or plants in Arizona, California, or Texas (Bosse, 1973, p. 21).

As a result of these investments, northern Mexico was a key source of parts for the ailing US consumer electronics industry. Vertically

integrated firms, such as Zenith and RCA, used their facilities in Matamoros and Ciudad Juarez, respectively, to produce components for their assembly operations in the United States. During 1968–77, Mexico provided US producers with the largest foreign source of television tuners, a labor-intensive component. In both 1971 and 1972, Mexico was responsible for 43% of tuner imports to the United States. In the early 1970s, Mexico was also the largest exporter of tantalum capacitors to the United States.

These foreign investors had little interest in the growing consumer base in Mexico. Rather, they were focused on the single goal of surviving in the US market. The smaller firms hoped to use their Mexican operations to stave off the pressures that had forced many of their fellow producers out of the industry altogether (Newsweek, 1972, p. 60). Mexico offered a close, relatively safe investment environment and an opportunity to cut costs by employing Mexican workers; consequently, firms located close to the border. These firms did not seek access to the domestic market so they were not required to source parts from Mexican-owned firms. This stands in contrast to the Taiwanese investment regime over 1965–75, where Japanese producers were interested in accessing the local market. These Japanese firms were forced to seek joint ventures and establish local parts suppliers in order to meet the high local content requirements. Although US firms in Taiwan never tried to gain access to local consumer markets, the contemporaneous development of Taiwan's supplier firms, and their physical proximity to these US firms, facilitated local sourcing agreements. Both of these conditions were lacking in Mexico before the mid-1970s.

The distance between Mexico's interior and the border further restricted the level of interaction between Mexico's two distinct consumer electronics industries. As initially required under Mexican law, the first *maquiladoras* were located along the US-Mexican border. This policy was originally intended to encourage industrial development and employment in the northern border cities, while simultaneously providing continued protection for domestic firms (Skclair, 1993). This law, however, may not have been necessary, as even with the opening of the entire country during the 1970s to *maquiladora* investment, new electronics investors continued to locate plants close to the border. As with earlier investors, they enjoyed the benefits of proximity to their US suppliers,

corporate headquarters, and customer base. The primary objective for these firms was primarily to protect their position within their own domestic market. It was not to take on greater risk by attempting to penetrate new foreign markets.

5. SELLING TO THE BORDER?

Despite the continuing relocation of production facilities to Mexico, foreign investment levels fluctuated dramatically throughout the 1960s and early 1970s. This phenomenon was important, because it colored the perceptions of Mexican part suppliers (Grunwald, 1985b, p. 164; Sanchez, interview, 1997; Zermeño, interview, 1997). They saw the *maquiladoras* as unstable and very susceptible to market vicissitudes. This image was especially pronounced for the smaller US component makers that established plants in Mexico in a fruitless effort to survive. The complete televisions assembled at the US-Mexican border during the 1970s were typically low-quality, low-cost products whose domestic markets were under the greatest threat from imports (e.g., Warwick). Due to vicissitudes of the US market, the purchasing requirements were too unpredictable to warrant an aggressive marketing campaign on the part of local supplier firms in Mexico's interior (Sanchez, interview, 1997). Furthermore, prior to the mid-1970s, the larger US *maquiladoras* were producing simple, passive componentry that required only basic raw materials and had little need for Mexican-made subcomponents.

The other possibility was for Mexican suppliers to attempt to establish sourcing arrangements with the handful of US manufacturers that had established both ISI plants in Mexico's interior and *maquiladora* plants at the border. By supplying to these firms, ideally Mexican firms could open new channels for sourcing to both the US *maquiladoras* and eventually to plants in the United States. By the early 1970s, RCA, General Electric, and Magnavox were the only US firms that had established facilities at both the border and interior of Mexico. But, the ability of local firms to use these ISI plants to access the US electronics industry proved difficult. First, both the RCA and General Electric ISI plants had little demand for Mexican-made consumer electronics components. By the 1970s, General Electric, which had originally opened its

Mexico City operations to manufacture radios for the Mexican consumer market, switched to manufacturing mostly white goods such as refrigerators and stoves. RCA's Mexico City plant manufactured only picture tubes for B&W and color televisions and required few locally-made parts or electronic componentry. Magnavox, which at first appeared to offer greater potential for Mexican parts producers, closed its border operations and sold its Mexico City plant in the mid-1970s.

In addition, as noted in our interviews with veterans of Mexican parts suppliers, it was necessary for Mexican firms first to establish contact with corporate headquarters before initiating sourcing arrangements with a *maquiladora* plant (e.g., Sanchez, interview, 1997). A multi-industry study by the Colegio de la Frontera Norte and the University of Texas, El Paso in the late 1980s found that 59% of plant managers had freedom or great influence on purchasing to purchase, while 41% had little or no control over purchasing (Aron *et al.*, 1993).¹⁵ Several factors, including the poor reputation of Mexican firms and the bias of US manufacturers for Asian-made parts, made it increasingly difficult for competitive Mexican firms to insert themselves successfully within these US purchasing chains.¹⁶ The centralized nature of purchasing also limited the extent to which US *maquiladora* plants could learn about new sources of parts and components from US plants in Mexico City. In contrast to US subsidiaries in Taiwan, the Mexican *maquiladora* plants had little autonomy over and knowledge about their own purchasing. It was more efficient for US corporations to centralize their North American purchasing department than it was to decentralize responsibility for purchasing decisions to *maquiladora* managers. US subsidiaries located across the Pacific probably had greater autonomy as a result of their physical distance from their US headquarters.

In addition to the lack of linkages between the border and interior plants because of US corporate purchasing policies, another problem related to the geographical separation of Mexican parts suppliers and the *maquiladoras* restricted the creation of local-foreign relationships. From its initiation, the Border Industrialization Program offered US firms a wide selection of host cities at which to locate along the US-Mexican border. Consumer electronics activities were dispersed along the border, with five major *maquiladora* centers

along the Texas border alone, including Ciudad Juarez, Nuevo Laredo, Piedras Negras, Matamoros, and Brownsville (Newsweek, 1969). Connections between these cities were not well developed because of the relatively weak transportation infrastructure interlinking Mexican border cities. The reason is that the transportation system is organized as a hub-and-spoke system radiating out from Mexico City and connecting to US transportation arteries going North from the border.

The Mexican government intended to encourage linkages and preferred investment that provided some benefits beyond jobs and foreign exchange; however, with the exception of infrastructure and public works, at the onset there were few policies to promote local-foreign relations. Perhaps what some have characterized as the "ambiguous" pre-1974 Mexican government policy toward *maquila* investment (Sklair, 1993, p. 50; Wilson, 1992, p. 27) may be explained, in part, by the general anti-US sentiment common in Mexico. Wilson (1992) has concluded that this ambivalence and lack of state action precluded the development of local-foreign investment.

The logic internal to both the US consumer electronics industry and the promoters of industrial parks in the border cities indicate that there was little "space" for state policies directed at industrial upgrading. Most Mexicans assumed that the *maquiladoras* were temporary. As mentioned earlier, this seemed a reasonable conclusion, given the large number of small, highly vulnerable firms, many of which did close. Mexican entrepreneurs did not press for the institutionalization of local-foreign networks or increasing local participation in *maquiladora* activities. The problem was not mistaken state policy, but rather an environment in which state policy could well have been completely ineffectual because of US and Mexican firm strategy. Any decision to purchase Mexican parts would have to be made at corporate headquarters in the United States.

Although the Mexican federal government decided to open the entire country to foreign investment in 1971 (Sklair, 1993, p. 140), the response by foreign investors was disappointing. The state's decision alone could not change the difficult investment scenario. Few firms chose to locate in the interior, quite understandably, because moving to the interior would have increased the distance from the US market and infrastructure. Even when they located in the interior, however, local content

rates remained extremely low (2–3%), especially in comparison to the 30% average in Taiwan (see, for example, Wilson, 1992).

Investment before 1974 offered few opportunities for linkages to develop. Production sites were scattered, and the investors tended to be small, vulnerable firms with no interest in establishing ties to the Mexican economy. The assemblers had established suppliers in the United States, so there was no reason to solicit new suppliers. These characteristics reinforced the decision of Mexican suppliers to concentrate on supplying domestic TV assemblers, such as Majestic located in Mexico City, rather than risk investing in linkages to the highly mobile, shifting US firms. The uncertainties were too great and the distance to the northern border too far, especially given Mexico's relatively weak infrastructure, to convince the domestic firms of the advantage of foreign-local relations.

The initial investments in consumer electronics maquiladoras were exclusively by US companies. Thus the Mexican border was tied to the production decisions, strategies, and constraints motivating US producers. The US companies that opted to rely heavily on offshore production to lower production costs were already in severe difficulties and had a high probability of failure (Willard and Cooper, 1985, p. 311). Here the Mexican situation diverged from that of Taiwan, which was receiving investments from US and Japanese firms. In the case of Taiwan, all the US investors eventually closed; however, their operations imparted skills to the Taiwanese and built supplier relationships that continued even after US firms left. Put in another way, production knowledge was created in Taiwan and US managers learned about Taiwan and Taiwanese capabilities. These relationships then provided a conduit for Taiwanese firms to begin supplying US companies with parts and components. Moreover, Japanese firms continued to operate their manufacturing facilities in Taiwan. Mexico experienced none of these advantages.

6. THE MAQUILADORA RECESSION, 1974–76

The instability of the US investors was confirmed during the 1974–75 recession, validating the perception among Mexican businessmen that investing in plant and equipment

to supply the maquilas would be unwise (Sklair, 1993, p. 200). It is difficult to make generalizations, as the recession varied by city and industry, but consumer electronics was particularly hard hit. Tijuana and Nogales experienced considerable employment losses due to factory closures (Sklair, 1993). Whatever business relationships or production knowledge that had been acquired during operation of these earlier factories was dispersed when the factories closed.

The Mexican government played a role in worsening the situation. In 1974, not foreseeing the impending global recession, the Mexican government increased the minimum wage by 22%. For many firms, this was the latest in a series of wage hikes that increased labor costs more than 100% over 20 months (Mexican-American Review, 1974, p. 4). According to Sklair (1993, p. 59), minimum wages tripled in dollar terms from the late 1960s to the first peso devaluation in 1976. Added to this financial pressure were the mandated benefits that increased the total wage to 50% above the Mexican minimum wage.

For the US consumer electronics companies already experiencing lower demand due to the US recession, the rapidly increasing wages and a concomitant upsurge in labor activism prompted some firms to reevaluate their investments in Mexico. Because the electronics operations were labor-intensive, Asian firms could offer low-end televisions and television parts at a better price than US firms could make them in Mexico (Mexican-American Review, 1974, p. 5). By the end of the oil crisis of 1974–75, there had been a dramatic reorientation of the global consumer electronics supplier chain to the advantage of Asian parts and components suppliers, and Japanese firms had established assembly factories in the United States, while US firms continued to withdraw from the industry.

Although the smaller firms experienced the greatest losses during the 1974–75 recession, some larger firms were severely affected.¹⁷ In 1974, US giant Magnavox announced that it would discontinue all production in Nogales, Mexico. In 1977, after purchasing Warwick a year earlier, Sanyo closed all its Mexican factories. By the end of the recession, most of the smaller component makers in Nogales and Tijuana had disappeared.

As a consequence of this recession, the possibility that Mexican firms could become *maquiladora* suppliers vanished. The space

formerly occupied by relatively inefficient, low-quality US suppliers was now occupied by highly efficient, high-quality Japanese suppliers. In addition, aggressive low-cost Taiwanese independents had built their capabilities supplying United States and, to a lesser extent, Japanese electronics firms. The new competitive environment demanded ever-greater quality at constantly decreasing costs—a difficult objective for Mexican companies that relied on antiquated technology and a protected home market.

7. NEW BORDER DEVELOPMENTS: TARIFFS, TRADE AND MORE TROUBLE

After the 1974–75 recession, the *maquiladora* sector, specifically the consumer electronics industry, experienced several changes. In response to the previous instability, fluctuating unemployment rates, and rising wages, the Mexican government developed measures aimed at improving the investment environment. In 1976, the Mexican government lowered wages and launched promotional campaigns and seminars touting the benefits of *maquiladoras* for US firms (Television Digest, 1976). Although these efforts may have improved the environment, it is difficult to say whether such policies were the reason for the new investments in consumer electronics. A new round of investment began; however, it also was related more to the reconfigurations of international industry than to Mexican policy decisions.

The investments by Japanese firms in the United States in the mid-1970s were contemporaneous with a new wave of *maquiladora* investment by the US firms struggling to compete.¹⁸ The most significant investment was by Zenith, which moved the greater part of its assembly operations from the United States to Mexico (its television tube production remained in the United States). Prior to this, Zenith's Mexican plants assembled only components. Moreover, RCA, Sylvania, and CTS (soon to exit the business) commenced *maquiladora* production (Television Digest, 1977).

In the mid-1970s, the loci of *maquiladora* investment shifted from Tijuana and Nogales to Ciudad Juarez and Reynosa on the Texas border. Both cities experienced a considerable influx of investment from US consumer electronics firms. But, unlike the earlier investments

in Tijuana and Nogales, which were mainly by smaller independent parts suppliers it was the leading US consumer electronics firms that concentrated in Ciudad Juarez and Reynosa. This was one result of a shift within the television and consumer electronics industry to a more oligopolized structure with a few dominant firms (Dicken, 1992, pp. 327–328).¹⁹ This shift is also reflected in the dramatic increase in the average number of employees per establishment in Ciudad Juarez and Reynosa from 100 employees to an average of 400 employees. Since these assemblers required large numbers of workers, smaller cities such as Nogales and Nuevo Laredo, were no longer attractive locations because of their small labor markets. In addition, transportation costs could be minimized because the Texas border was much closer to these assembler's television tube operations in the Midwest and the large East Coast and Midwestern markets.

Maquiladora production gradually shifted from component assembly as many US parts suppliers went out of business and the number of final assembly plants increased. This trend is reflected in the export statistics. By the late 1970s, Mexico's role had shifted from being a parts supplier (the parts being increasingly imported from Asia, except for picture tubes that came from the United States and Asia) and exporter of B&W televisions to an assembler of color TV chassis and kits. The trend was also affected by US trade law, which had higher tariffs for finished televisions than for incomplete televisions. Companies such as RCA, Sylvania, Zenith, Thomas, Quasar, and Motorola shifted their Mexican plants to incomplete set assembly.

The new *maquiladoras* were more permanent than earlier operations, allowing Ciudad Juarez and Reynosa to weather the 1982 recession, even as television assembly factories in the United States closed. This time production at the Mexican factories was far more stable and provided greater potential for growth and backward linkages. Still, the possibility of Mexican firms becoming suppliers continued to dwindle, because US firms were now almost completely dependent upon Asian parts suppliers. In effect, building backward linkages to Mexican firms was no longer viable economically because of the ready availability of low-cost Asian-made parts.

Since parts could be imported into Mexico duty-free as long as they were exported later, US firms could assemble televisions in Mexico

and avoid high tariffs on parts. US tariff laws had been written to protect US corporations assembling televisions overseas. Thus, parts and components had higher tariffs than completed sets, so if the parts were shipped to Mexican plants and imported into the United States in the form of an assembled or semi-assembled television, the duty was lower. For example, the duty on a television tube was higher than on a finished television. Often US companies would purchase the tubes in the United States or Asia and assemble the entire TV set in Mexico (Ohgai, interview, 1996). The rules enacted to protect US parts firms ultimately encouraged the decay of the US parts infrastructure, while strengthening the Asian infrastructure. Assembly in Mexico also circumvented the voluntary restraints the United States negotiated in the late 1970s with Japan and in the early 1980s with Korea and Taiwan limiting the number of televisions that could be imported into the United States.

In the early 1980s, when Mexico received investment from more stable firms, it was too late for local firms to benefit because the market had changed. To remain in business, US firms competing with high-quality Japanese assemblers needed similar quality parts; they had to purchase from Asian component makers. In contrast, when the Taiwanese first entered the consumer electronics parts market, they did so on the basis of joint ventures with Japanese firms, when global quality standards were far lower, so they could evolve with the global standards. At an advantageous time Taiwanese firms were able to produce relatively low-quality and low-technology parts as a means of entering markets. Mexico never had such opportunities.

8. CONCLUSION

Consumer electronics was the industry that placed Korea and Taiwan on their economic development path. Our comparison of the Mexican and Taiwanese experience provides a deeper understanding of the complicated nature of development, and an insight into the constraints faced by the Mexican state and its industry. To explain the differences between Taiwan's and Mexico's economic development, the critical variables are not the competence of state bureaucracies or inadequate industrial policies, but rather relate to ownership and the spatial and temporal characteristics of Mexico's

US-dominated investment regime during 1965–85. It is only by relating developments in Mexico to those in Taiwan during the same period that we can understand how and why the situation in Mexico unfolded.

We identified several factors that contributed to Mexico's failure and the demise of its electronics industry. Mexico's misfortune in initially receiving investment only from the declining US parts makers and assemblers, and a lack of integration of the indigenous Mexican consumer electronics industry with foreign investors, were serious obstacles to creating the backward linkages that might have assisted in sustaining a Mexican-owned group of electronics firms. Mexico never experienced the mutually reinforcing relationships generated between foreign and national firms that developed in Taiwan. In Mexico the foreign-local exchanges were fleeting or nonexistent, thereby providing little catalyst for entrepreneurs. In contrast to Taiwan, Mexican firms were in a protected but ultimately stagnant market and did not experience first-hand the changes in the global industry.

Another significant obstacle was the long distance between the US-Mexican border and the interior industrial centers such as Mexico City and Guadalajara. In contrast, foreign investors in Taiwan were located close to indigenous entrepreneurs, thereby encouraging communication. The *maquiladoras* were widely separated from one another, thus inhibiting the creation of a "critical mass", i.e., a supporting network of suppliers. The changing centers of electronics assembly along the border meant that there was insufficient opportunity for a local infrastructure to develop. The transient nature of these foreign investors provided little incentive to Mexican firms to make large-scale or long-term investments to supply the *maquiladoras* (Grunwald, 1985a, p. 127). Because they could not generate relationships with US consumer electronics firms during the late 1960s and 1970s, Mexico's industry missed the opportunity to benefit fully from the technical expertise and production methods of foreign firms, and consequently developed few sustainable capacities.

Blaming the Mexican government for these failures is as simplistic as crediting the Taiwanese government with success. Even an autonomous state, whether embedded or not, cannot undertake political actions directed toward specific industries without recognizing the internal logic and trajectory of a particular

industry. Given its proximity to the United States, Mexico began with a problematic investment scenario. Mexico's dependence on the US consumer electronics firms provided it with few alternatives for upgrading its electronics industry. In fact, it was only in the 1980s that Mexico began to receive the Asian investment that transformed it into a leading assembler of televisions (Kenney and Florida, 1994; Choi and Kenney, 1997).

While recognizing Mexico's difficult initial conditions, however, it is also true that the Mexican government did not develop any significant sectoral policies. Perhaps an effort to convince Mexican parts suppliers to relocate to the northern border region, combined with a long-term persistent campaign to induce foreign investors to buy Mexican parts, might have set the groundwork for a more positive outcome. But, success would not have been guaranteed, as the great vicissitudes their target customers experienced would have made any effort to integrate Mexican firms with US-owned *maquiladoras* extremely difficult. Policy makers driven by various short-term political considerations (and, to an even greater degree, academicians viewing decisions retrospectively and having no deep industry knowledge) often overlook the importance of physical proximity,

industrial concentration, and industry trajectories.

In Taiwan the indigenous industry developed connections and joint ventures with Japanese firms and gradually began supplying US firms. This permitted the creation of the "bed" for Evan's "embedded autonomy". Mexico's bed of local firms had little interest in supplying the *maquiladoras*, so autonomy was far more difficult and autonomous state action would likely have ended in failure. It is difficult to support the assertion that if the state had been more active it could have fully corrected the problems of the Mexican consumer electronics industry and the instability of the early foreign investors. In the late 1980s and 1990s, Mexico developed a thriving Japanese firm-led consumer electronics industry in Baja California, even though there were no significant sector-specific policies for this industry. Our study of the Mexican consumer electronics industry provides ample evidence that the state-centric theories undervalue industrial trends, geographic factors, infrastructure and labor variables, and global economic shifts and oversimplify or fail to characterize correctly the historical and industrial complexities at play. In this sense, they may be poor guides for policy-making.

NOTES

1. Though we do not examine the development in other Latin American countries, a similar decline was experienced by firms in Argentina, Colombia and Brazil (Azpiazu, Basualdo and Nocheff, 1988).
2. Haggard (1990) begins the process by recognizing that these are different state policies, but does not explicitly acknowledge that different industrial structures condition the outcomes of industrial policies. This has become much more obvious with the recent Asian financial crisis, where the fates of Korea and Taiwan have diverged noticeably.
3. Even the most valuable component in a television, the picture tube, was produced in Mexico.
4. Majestic controlled over 16% of the B&W television market in 1970 (Saul Flaschner, interview, 1997).
5. Packard Bell SA had no affiliation to Packard Bell in the United States. The rights to the name were purchased from Teledyne during the 1970s by a Mexican firm as a means of acquiring the brand name. No production, marketing, or financing arrangements were made between the Mexican and the US companies.
6. Grupo Industrial Alfa, SA (Alfa) was created in 1974 to manufacture steel, paper products, and packaging materials. Its origins can be traced back to Mexico's Cerveceria Cuauhtemoc brewery founded in 1891 by Eugenio and Robert Garza Sada (Robinson, 1982, p. 44). Alfa entered the consumer electronics market in 1975 with the purchase from Ford Motors of its Philco operations in Mexico City. In 1978, it also purchased the Mexico City operations of Admiral and Magnavox (Flores, interview, 1997).
7. Baerresen (1971, p. 118) showed that Japanese suppliers offered various tuner components at between 30 and 60% less than did US suppliers.
8. Several terms were used to describe the foreign plants that took advantage of these free trade zones. *In-bond plants* referred to the bonded nature of these firms, specifically to their requirement to purchase a govern-

- ment bond as a means of guaranteeing the re-export of all goods produced or assembled within this border export zone. The bond was approximately 1 percent of the value of the imported materials, equipment, or components (South, 1990, pp. 551, 567).
9. It is important to note that not all of these firms were in the consumer electronics industry. Another important sector was transistor and semiconductor assembly; however, by the end of the 1970s nearly all semiconductor assembly had been relocated to South-east Asia (Scott, 1985).
10. These were sold at Sears stores under the brand name Silverstone for the US market.
11. The park's owner was Antonio Bermudez, a major Mexican proponent of the *maquiladora* program (Business Week, 1972).
12. Our database draws on several sources. The most important source is *Television Digest*, the weekly television trade journal. It primarily covers events and decisions specific to the US television industry. The other important source of information is a database on foreign investment in Mexico compiled by the North American Committee on Latin America (Herold, 1979). Our database is not a complete record of all investments in Mexico during 1965–85; however, it provides sufficient detail to examine the broad trends in investment and their impact for the border economy.
13. The share of complete sets assembled by GTE, Magnavox, and Teledyne was insignificant.
14. Not all of these were consumer electronics facilities. Some plants assembled transistors and components for other purposes.
15. It is unlikely that the US industry, which was under such severe pressure because Japanese television sets were already considered to be higher quality, could risk sourcing suspect parts. The electronics industry traditionally has operated with global purchasing offices located at headquarters, though in the early 1980s many US firms established regional components purchasing operations in Asia.
16. Brannon, Dilmus and Luckner (1994) show that this reputation persisted into the 1990s. Kenney and Florida (1994) found a similar belief among Japanese managers in the early 1990s.
17. During this period there was a global shift as US semiconductor firms, some of which had operations in Mexico, decided to relocate assembly and quality control facilities to Southeast Asia (Scott, 1985).
18. The first investments were by Sony in 1972. In 1973, Matsushita purchased the Motorola plant in central Mexico. The bulk of investment in Mexico by Japanese consumer electronics firms occurred after the late 1970s (Kenney, 1999).
19. Despite the fact that the number of competitors decreased, price competition remained ferocious, prompting all participants to adopt measures aimed at lowering costs.

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