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FDI and Export-Performance Requirements

In light of past Asian successes with export-led growth and the reorientation of countries in Latin America and elsewhere toward the penetration of external markets, one might suppose that the imposition of export-performance requirements on foreign investors would fit well with the development objectives of host countries.

Further, once foreign investors are launched on an export trajectory, perhaps the key ingredient that was so frequently absent in the domestic-content-requirement-in-a-small-protected-market setting—full economies of scale—provides auspicious starting conditions for ongoing success.

But using export requirements to launch that export trajectory imposes a burden on other sectors of society that have to supply the resources and/or pay for the subsidy. And special treatment for foreign-owned exporters, like special treatment for domestic-owned exporters, opens the door to interest-group politics and rent seeking by those who want to get or keep privileges.

Why must host countries provide scarce resources and run the political-economic risks of rent seeking by special interest groups to force or entice international investors to engage in such export operations? Shouldn't the profit motive and self-interest of the foreign investor be sufficient, without the expenditure of public resources?

To begin to provide answers, this section looks in some detail at the three largest industrial sectors in which FDI has come to provide a channel for host countries in the developing countries and economies in transition to penetrate international markets—the automotive, petrochemical, and electronics/computer sectors.

Drawing out policy conclusions from the examination of these industries is a challenge: the evidence in these sectoral cases is dense, confidential, episodic, incomplete, and not structured with sufficient controls and precise comparisons to isolate the impact of export incentives/requirements from other influences on firm decision making. The individual industries differ among themselves in many ways, as do the processes by which they have spread, and are spreading, into the developing countries and economies in transition.

But despite these drawbacks, the examination of the globalization of these three sectors (automotive, petrochemical, and electronics/computers) provides important insights for less-developed countries and economies in transition about the difficulties of using FDI in manufacturing to penetrate international markets.

These investigations are the longest and most complicated in this book. The results are also the most surprising. The evidence presented here shows export-performance requirements playing a crucial role in pushing global corporations (against considerable resistance) to incorporate developing- and transition-economy sites into their international sourcing strategies. It shows forceful interventions on the part of host authorities leading to bursts of investment by major companies in each industry that generate exports sustained in the billions of dollars per year. It shows cumbersome combinations of carrots and sticks used to force exports helping (and often appearing necessary) to create new patterns of international production that enhance not only the welfare of the hosts that deployed them and the firms that obeyed them but global welfare as well.

Does this mean that export-performance requirements of the kind deployed in the automotive, petrochemical, and electronics/computer industries should now occupy a legitimate place in the policy toolbox of contemporary less-developed countries and economies in transition? Should their use of export-performance requirements be enlarged and rationalized, or should they offer to cut back and control the use of export-performance requirements as part of some larger package of policies to govern international investment?

To assess these policy choices requires moving beyond the examination of export-performance requirements per se, to ask three broader questions: First, how well do international markets work in apportioning FDI in line with comparative advantage? Second, what obstacles inhibit international markets from functioning more effectively? And third, what investment-diverting actions are other countries taking to shift the location of international manufacturing production in their own direction? These larger questions are the subject of the next chapter. Only after addressing them will it be possible to assess under what conditions host authorities in the developing countries and economies in transition might reasonably abandon the use of export-performance requirements altogether.

This chapter, on export-performance requirements, lays the groundwork, therefore, for the broader analytical investigations of market failure, investment-distorting interventions of other kinds, and, ultimately, the global strategic-trade struggle to attract international investment, which is the subject of chapter 6.

Before embarking on these great analytical investigations and trying to draw the implications for home, host, and collective public policy, it is necessary, first, to examine the interaction between export requirements and foreign-investor behavior in each of these three sectors in some detail—perhaps too much detail for some, doubtless not enough for others.

FDI and Exports in the Automotive Sector: Mexico, Brazil, and Thailand

Despite contemporary preoccupations with a "great sucking sound," "runaway plants," and a possible "hollowing out" of the industrial base—in which home-based firms presumably rush to set up production in lower-cost sites abroad—the task of enticing or pressuring the major automotive firms to establish export-oriented production facilities in Latin America and Southeast Asia turns out to have been, in retrospect, remarkably difficult.

The would-be hosts faced dedicated opposition from home-country labor, home-country governments (national and subnational), and, perhaps most surprisingly, from the parent corporations themselves. The economic and political-economic dimensions of this struggle continue today.

Automotive Investments in Mexico and Brazil

US and European automobile firms initially considered the idea of creating a competitive automotive industry in Mexico and Brazil completely far-fetched. They cited a long list of impediments to ever having successful operations, led by derogatory references to the culture and work ethic of the indigenous labor force ("siesta culture" in Mexico and "tropical influences" in Brazil) (Shapiro 1993).

Such characterizations persisted as long as subscale plants with high domestic-content requirements were the predominant form of production.[1] Mexico, with a smaller internal market, set the domestic-content

1. There is an interesting parallel evolution in the foreign firms' evaluation of obstacles to investing in Eastern Europe and the former communist states, whose populations are sometimes alleged to have lost their "work ethic" under socialism. For subscale protected

requirement in the 1960s and early 1970s at 60 percent, which allowed body stampings to be imported but required the power train (engines and transmission) to be manufactured locally. Brazil, with a larger internal market, set the domestic-content requirement at 90 to 95 percent, which meant that all the major components had to be produced internally.

In each country, however, as the size of the domestic market began to be large enough to support plants with full economies of scale, the costs and quality in manufacturing principal components at a number of individual sites began to rival or surpass home-country alternatives. Small levels of exports of automotive parts appeared in the mid-1970s, and within the corporate hierarchies of General Motors, Ford, Volkswagen, and Fiat, at least, there were advocates for export expansion from Latin America (Samuels 1990; Shapiro 1993, 1994; Bennett and Sharpe 1985). Engine plants in both countries showed cost advantages over production in Michigan, Ohio, and upstate New York.

The idea of expanding sourcing patterns to include lower-cost offshore production sites became more urgent in the United States as Japanese imports put increasing competitive pressure on parent operations in the home country. Imports from Canada, Germany, and Japan had been growing steadily for more than a decade, but Japanese import growth started a double-digit climb after 1974 that did not flatten out until the mid-1980s (Nelson 1996, figures 3.12 and 3.15).

Rather than a smooth spread of international investment along lines of international comparative advantage, however, the notable feature of this period was in fact the stout resistance that the parent companies, in conjunction with home-country political authorities, mounted against the host-country desires for exports.

Some of the opposition was quite straightforward: organized labor in the United States, Germany, and Italy, for example, pressured the parent companies, local governments, and national governments to keep jobs in place. In this process, they used sticks as well as carrots. Sticks included German laws that forbade firms to relocate production if it resulted in layoffs, Italian government threats to withhold subsidized credit if Fiat moved production abroad rather than building new plants in the Mezzogiorno, and electoral and campaign finance penalties from the United Auto Workers in the United States for officials who failed to protect jobs. Carrots included what became a sharp escalation of investment subsidies in the United States, Canada, and Europe to maintain existing production sites or attract new investment.

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plants, the workers appear substandard; but once workers from the same identical cultural background find themselves in full-scale export-oriented plants, they suddenly begin to win international intrafirm prizes for performance. See box 6.1 on General Motors' 1992 investment in Szentgotthard, Hungary.

Other aspects of the opposition are more opaque, in particular the motivation of the parent companies themselves. To be sure, within the firms there was bureaucratic opposition to global/regional sourcing strategies on the part of managers for whom such strategies posed a threat (e.g., from plants in Lima, Ohio, against imports of four-cylinder engines in the case of Ford and from plants in upstate New York, against imports of two-cylinder engines in the case of General Motors/Pontiac). But one strategic task of headquarters is to ensure that myopic managers do not jeopardize the long-term competitive position and profitability of the firm, a task all the more important as Japanese imports surged and "big three" market share dropped after 1974. There remain, therefore, important questions about the behavior of international investors, about possible market failures and appropriability problems, and about the welfare effects of delay in making what will be characterized as "irreversible investments under uncertainty" (which will have to be addressed later).

Foreign Investors and Global/Regional Sourcing from Mexico

Concerned about a growing trade deficit in the automotive sector, the Mexican government passed a resolution in 1969 and a decree in 1972 explicitly requiring that foreign auto firms increase exports. Exports grew from $26 million in 1970 to $122 million in 1975, but the auto trade deficit surged toward $1 billion.

Frustrated by the reluctance of the automobile investors to source more vigorously for the US market from across the border, Mexican authorities decided in 1977 to make access to the protected Mexican market contingent upon export expansion: they adopted a trade-balancing Trade-Related Investment Measure (TRIM) that established a foreign-exchange budget for each producer of finished vehicles, requiring that imports be matched with exports. Although the trade-balancing TRIM was much more cumbersome than what was becoming the norm for the industry in the developed countries—namely, multimillion dollar investment-subsidy packages, largely in the form of up-front grants, for plants whose scale was frequently larger than the market in which they were located (after 1977, the so-called "Irish model")—it generated a similar impact on the corporate bottom line, as the next chapter will show (Bond and Guisinger 1985).

In response, the US companies mounted a campaign within both Mexico and the United States, with a puzzling goal. Puzzling, because the campaign's objective was not to reshape the Mexican proposal to increase the credit toward the Mexican government's foreign-exchange requirement that they received from complying in those subsectors where production in Mexico already offered cost advantages nor to accede to Mexican

export demands in return for augmented import liberalization in the automotive sector.[2] Instead, the US companies sought to pressure the Mexican government into abandoning the push for exports altogether.

Ironically, for students of comparative advantage, it was Ford—which had the longest and clearest record demonstrating the lower costs of producing engines in Mexico and which had a market share that was beginning to drop more precipitously than that of General Motors and Chrysler in the face of Japanese imports (Nelson 1996, figure 3.12)—that led the effort against the export requirements. Henry Ford II took his opposition to the Mexican program up personally with then-Secretary of State Cyrus Vance, then-US Ambassador to Mexico Patrick Lucy, and then-Mexican President Lopez Portillo. Ford prided himself on enjoying particularly smooth relations with the United Auto Workers (UAW) Union and bore the brunt of the UAW pressure not to invest further in Mexico.

Undeterred, Mexico persisted in using what carrots and sticks it possessed to prod the international automotive companies to expand exports.[3] The turning point in the parent companies' strategy came only in 1979, led by General Motors, not Ford. Weighing the appeals of senior managers who advocated "extreme" cost-cutting efforts so as to remain competitive with the Japanese in the US market against the opposition of entrenched parts producers to displacing established production sites (General Motors had the largest degree of vertical ownership of parts suppliers among the big three), General Motor's chairman finally sided with the former. The company announced its hitherto largest-ever one-time investment, the simultaneous construction of four new engine plants in Mexico, designed to expand exports from that country by a factor of 20.

With this break in the ranks of foreign-investor opposition to the Mexican export program, Ford, Chrysler, and Volkswagen followed suit within months, establishing export-oriented expansion plans of similar dimensions. Nissan joined them in less than a year.[4] The result was not

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2. The US companies enjoyed the rents generated in the protected market; indeed, Chrysler's Mexican affiliate was then its only profitable subsidiary and, as a senior financial executive explained, the parent needed to protect this "cash cow" (Samuels 1990, 148).

3. It is not clear from the case studies of investment decision making in the auto companies to what extent the managers in the Mexican subsidiaries who knew the comparative cost structures in the two countries and who were lobbying the parent for expansion of the Mexican operations might have shared some of their knowledge with senior Mexican officials.

4. Mexico, like Brazil, consistently left the choice of exactly how to meet a subsidiary's export requirements up to the parent firms themselves, rather than insisting that fully assembled cars be sold abroad. This allowed the international companies to make their own calculations of comparative advantage, rather than having the specifics imposed

at all like the case of a small country using a few trade rents from import restrictions to subsidize the creation of inefficient export-oriented jobs within its borders. Instead, like the globalization of the petrochemical and electronics/computer sectors analyzed next, this change in Mexico (and a nearly simultaneous shift in Brazil) represented the beginnings of a vast restructuring in the international industry.

In engines alone, the new capacity in Mexico from this single burst of investment grew in less than three years (by end-1981) to more than one million units per year, with 80 to 90 percent destined for foreign markets. Overall, automotive export levels passed $1.5 billion per year in the first five years after the reorientation of foreign investor strategy, with direct employment of some 121,000 workers concentrated in three geographic areas (in the north, center-north, and center of the country). Wages and benefits in the collective labor contracts were among the highest in the country, second only to those of the large state-owned enterprises (Peres Nuñez 1990).[5] Outsourcing, as confirmed in subsequent studies by Feenstra and Hanson (1995a, 1995b), employs (comparatively) high-skilled workers in (comparatively) high-skilled jobs in the host country.[6]

The presence of the large auto investors stimulated complementary investments by foreign parts firms, of which Clark, Dana, and Eaton were the largest (Booz, Allen & Hamilton reported that Mexico's joint-venture requirement inhibited an even greater number of foreign component producers from setting up plants in Mexico).[7] The creation of backward linkages within Mexico was extensive: within five years, there

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upon them by host authorities. This strategy helped make the Latin American experience more successful than similar efforts in Southeast Asia (especially Malaysia). See the case study of the difficulties of Malaysia's effort to launch a "national champion" car firm with exports of a national car in chapter 6.

5. More broadly, Aitken, Harrison, and Lipsey (1996) find that—after controlling for size, geographic location, skill mix, and capital intensity—foreign-owned firms pay higher wages than do domestic firms in Mexico (as well as in Venezuela and the United States). They argue that these wage differentials, together with productivity differentials, are consistent with greater human capital formation in foreign firms and with lower worker turnover. They highlight the importance of this evidence in the context of Lucas's argument (1993) that on-the-job training is by far the most important avenue for human capital formation and Grossman and Helpman's description (1991a, 1991b) of the linkage between on-the-job training and higher rates of growth.

6. Outsourcing is defined by Feenstra and Hanson as the share of imported intermediate inputs within industries. For criticism of this expansive definition, which mixes home-country firms that are merely shoppers abroad with home-country firms that operate factories as direct investors, see the discussion of the globalization of the computer/electronics industry later in this chapter.

7. In addition to citing the Booz, Allen & Hamilton study, Peres Nuñez (1990) reports interviews with companies making the same assertion.

were 310 domestic producers of parts and accessories, of which 110 had annual sales of more than $1 million.

The foreigners introduced industry best practices, such as zero-defects procedures and production audits, in weekly meetings with Mexican suppliers. Such behavior was clearly self-interested: one GM plant that featured coaching assistance for its suppliers achieved the lowest number of quality-related rejects in all GM operations worldwide, 1.7 percent, due in large part, in the judgment of one of the participating Mexican firms, to the technical assistance and team spirit that the subsidiary imparted during these sessions (Peres Nuñez 1990, 129-30). Such behavior also benefited domestic suppliers. The spillovers of export-related marketing expertise to domestic producers, for example, were impressive: an analysis of the 10 largest auto parts exporters in 1987 (excluding engines), which accounted for $461 million in sales and 59 percent of total auto-parts exports, found foreign ownership in only four of the firms (Booz, Allen & Hamilton in Peres Nuñez 1990).[8]

The evidence of externalities for the local economy from FDI in the automotive sector fits with the discovery by Aitken, Hanson, and Harrison (1997) that foreign manufacturing investors in Mexico, in general, act as export catalysts for domestic firms. They found that the probability of a Mexican-owned plant engaging in exports is positively correlated with its proximity to multinational investors but uncorrelated with the concentration of overall exporters. The externality between the presence of foreign plants and exports on the part of domestic plants is independent of proximity to international borders or to the capital city. They conclude that the export spillovers they observe must spring, directly or indirectly, from ways in which the foreign investors act as a conduit for technology, management, distribution services, and information about foreign markets (Aitken, Hanson, and Harrison 1997).

The combination of export-oriented foreign investors and export-oriented domestic suppliers gave rise to what might be considered a political externality as well: both groups exercised their political voice on the side of greater openness and less protection in the subsequent policy debates, which ultimately led to the revolution in liberalization after 1985.

With the automotive export base firmly established after 1979, Mexico has grown to become the largest developing-country exporter in this sector in the world, with exports of $14 billion and employment of 364,000 by the mid-1990s.

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8. There is evidence that foreign investors helped local suppliers to become more productive and more sophisticated and helped them to penetrate external markets (Peres Nuñez 1990). The growth in exports from Mexican firms over time suggests a valuable feed-back loop in which contact with foreign buyers challenges the indigenous firms to enhance the competitiveness (price and quality) of their products. For a skeptical view of the learning-by-exporting hypothesis, however, see Roberts and Tybout (1997).

Foreign Investors and Global/Regional Sourcing from Brazil

In the Brazilian case, the shift of parent-company investment strategy toward incorporating host production sites that had originally been oriented toward domestic production into a global sourcing network was slightly less abrupt than in Mexico. Nonetheless, it illustrates many of the same dynamics of struggle between old and new, and developed- and developing-country production locations.

With a larger domestic market in Brazil, the attempt by the international auto companies to comply with early domestic-content requirements led to a larger number and greater array of full-scale-sized operations there than in Mexico. By the mid-1970s, there were plants turning out machined castings, forgings, transmissions, and engines more cheaply than could US and European sites. The result was a gradual buildup of exports, passing $200 million by the middle of the decade.

To try to stimulate exports further, Brazil launched the Special Fiscal Benefits for Exports (BIFIEX) Program. Under the program, foreign firms committed to specific dollar values for total exports and net foreign-exchange earnings. In return, they received one dollar of duty-free imports for every three dollars in exports. Federal and state value-added and sales taxes were waived on exports and turned into a credit that could be used toward tax obligations on production for the domestic market. (The BIFIEX Program was not unique to the automotive sector.) As in the Mexican case, the parent companies in the United States and Europe had to weigh the advantages of expanding exports from Brazil against pressures from labor and local political constituencies in the home countries to maintain production there. The tensions were particularly acute for Fiat.

For more than a decade, Fiat had been maneuvering between enjoying state support at home and asserting its independence abroad, a balance made particularly difficult in light of the demands of the Italian state to support regional development in the Mezzogiorno.[9] In 1976, lured by extensive infrastructure support from the state government of Minas Gerais (which wanted to develop its own industrial base as a counterpoise to Sao Paulo), as well as the BIFIEX incentives from the federal government, Fiat created its first wholly owned foreign subsidiary and its most extensive automotive investment outside Italy. Within five years, it exported 40 to 50 percent of production and became Brazil's largest private exporter.

This posed a threat to the domestic market shares of the other major auto investors, because BIFIEX allowances for duty-free imports might have enhanced Fiat's internal competitive position. To forestall

9. For background, see Prodi (1974) and Wells (1974). See also Bergsten, Horst, and Moran (1978, chapter 11) and Rogers (1979).

this eventuality, Volkswagen, Ford, and General Motors, within a 12-month period, each signed commitments to try to export $1 billion each over a 10-year period.

But once again, it was General Motors' decision to move toward global/regional sourcing in 1979 that triggered the actual "burst" of export-oriented investment that extended to all of the rest of the firms besides Fiat.

The cost advantages of producing engines in Brazil had become increasingly clear during the mid-1970s, and executives from General Motors do Brasil had been pressing headquarters for a more central role for their operations in the face of declining market share in the US market. But, as Shapiro (1994, 230) observed, "although internationally competitive production costs might be a necessary condition for a firm to begin exporting from a country, it is not a sufficient one."

As pressure to cut costs to try to compete with the Japanese in the US market intensified after 1974, supporters of export expansion in the General Motors do Brasil offices grew more vocal. They offered a double justification: the expansion of engine capacity in Brazil could be used both for export and for the introduction of the new J car series in the Brazilian domestic market (Chevrolet Cavalier, Opel, and Monza). They lobbied the Detroit headquarters without success, however, until 1979. Then, following closely upon the parent company's shift toward an international sourcing strategy in Mexico, the company decided to produce engines for its US Pontiac division in Brazil.

The other producers expanded export-oriented operations in step. Ford, like General Motors, concentrated on producing engines and other components in Brazil.[10] Fiat and Volkswagen, in contrast, began to use Brazil as a site for sourcing finished vehicles, with the former exporting back to the home market in Italy and the latter exporting the Beetle and other models to developing-country markets. Over the next three years alone, the value of automotive exports jumped by a factor of three, to $1.5 billion.

The inclusion of Brazil in the global sourcing strategies of the parent firms had a favorable impact on unit costs and on quality control, similar to the Mexican experience. Within four years of the inception of the new export-oriented investment programs, the World Bank found that the prices of Brazilian auto parts and vehicles were on balance competitive with or below those of comparable products elsewhere. At the same time, with fewer restrictions on foreign ownership than Mexico, Brazil gradually built up a larger and more sophisticated supplier network of both foreign and domestic participants. By 1988, automotive exports approached $3 billion.

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10. Ford faced protests about its expansion of production in Brazil not only from the UAW union in the United States, but from European unions as well (Shapiro 1993, 220).

General Motors began to rank several of its Brazilian plants as having the highest productivity in the company's entire portfolio of operations. Helped, not hurt, by import liberalization in the automotive sector after 1990, Brazil climbed to 10th in the world in vehicle production by the middle of the decade and stood poised to move higher with $12 billion in new investment.

Foreign Investors and Global/Regional Sourcing from Thailand

In Southeast Asia, the obstacles to using foreign firms to penetrate international markets in the automotive sector were even more formidable than in Latin America and contained some novel elements.

Japanese automobile firms insisted that their investment agreements throughout Southeast Asia contain explicit export restrictions, a phenomenon Borrus, Ernst, and Linden also record for Japanese firms in the electronics/computer sector and Frank (1980) has found for Japanese and European firms in other industries as well.[11]

In the hierarchical and centralized Japanese decision-making structure, moreover, there is no documented analogue to the bureaucratic aggressiveness of regional managers eager to expand exports even if it meant displacing established production at home, as discovered by Samuels (1990) and Shapiro (1993, 1994) within the US and European auto companies in Latin America.

Finally, there were numerous alliances and joint ventures among the principal Japanese auto investors in Southeast Asia, reinforcing the solidarity among them. This type of arrangement was largely (not totally) absent among the big three and their European and Japanese rivals in Latin America.

At the same time, however, Southeast Asian markets gave smaller Japanese companies (Isuzu, Mazda, and Daihatsu) a chance to steal a march on the larger firms (Toyota, Nissan, and Mitsubishi), and host efforts to stimulate rivalry among them, when successful, have proved as potent in stimulating matching moves as were similar efforts in Mexico and Brazil. Thailand provides the clearest example of a host using such rivalry to break out into international markets (for contrasting evidence on Malaysia, which was not as successful in breaking into international markets, see box 8.1 on that country's attempt to create a "national champion" car company as an exclusive joint venture with Mitsubishi).

As in other countries, Thailand's development strategy for the automotive sector focused first on generating employment via domestic-content requirements in the late 1970s and early 1980s, ranging from 45

11. For an analysis of Japanese investment in the electronics/computer sector, see Borrus (1994), Ernst (1994), and Linden (1996).

percent to 62 percent for passenger cars and light/heavy trucks. Even as operations grew large enough to begin to capture economies of scale in production, however, exports by Japanese firms remained practically nil (less than $10 million per year in the same period that Mexican and Brazilian exports of auto parts were surpassing the multibillion dollar mark), partly because of Japanese claims of inferior quality on the part of Thai producers (Doner 1991).

The miniboom of exports in the automotive sector in the early 1980s began, in fact, with indigenous firms (not Japanese investors) penetrating international markets, first with simple products such as oil tanks and radiators, then more complex items, such as wiring harnesses, brake drums, stamping dies, jigs, and molds. These exports, and achievement of OEM status by some Thai firms that became suppliers to external buyers, undermined the Japanese assertions that Thailand was incapable of generating products of sufficient quality and reliability for international use.

The resolution of the battle between the Thai government and Japanese manufacturers over the construction of diesel-engine plants for one-ton pickup trucks launched Thailand as a major export platform in the automotive sector. Manufacture of the engines for these small trucks required plants with economies of scale too large for domestic consumption alone. Output, consequently, had to be incorporated into the regional/global supply network of the builder. In 1985, as in the earlier Mexican case, Thai authorities used a combination of carrots and sticks to prod the Japanese parent companies. Lacking funding for grants of the kind that were becoming increasingly prevalent in the investment promotion packages of the developed countries, the carrots included tax breaks plus reduction in domestic-content requirements for the firms that built diesel engine plants. The sticks included limiting approval to three projects in a market dominated by four principal foreign investor groups (three Japanese and one European).

The result was unprecedented rivalry among the four (even "home-based" Toyota, the firm most opposed to global sourcing) (Doner 1991, 216).[12] All four submitted bids that included large new export commitments, and, ultimately, Thai authorities allowed all four to build plants. From the resulting inflow of investment came a rush of externally directed production: automotive-sector exports from this first round of outward-oriented projects rose by a factor of eight over the next five years, approaching $2.5 billion annually.

As in the cases of Mexico and Brazil, the backward linkages from the major auto investors have been large and the spillovers in performance

12. As Doner points out, this competition among the four investor groups, and the consequent commitment of each to export expansion, took place *prior* to the Plaza Accord of 1985 with its subsequent exchange-rate incentive for Japanese producers to move production to lower-cost sites offshore (see also Lim and Fong 1991).

and quality to domestic Thai firms extensive. Seventy-nine Japanese investors in auto components and parts followed the principal firms into the market (more than twice as many as in Indonesia, Malaysia, Singapore, or the Philippines) (Doner 1995a). As in Mexico, were it not for a requirement that foreign firms find a local partner rather than set up wholly owned subsidiaries, the numbers might well be higher (for more details, see chapter 7). The pace at which the foreign parents introduced new technology into products and processes oriented toward external markets turned out to be faster than that for purely domestically oriented operations.

The Japanese parent companies were particularly active in organizing "cooperation clubs" of the kind that are widespread in Japan to enhance quality control, product improvement, cost reduction, scheduling and delivery, and technical performance among suppliers (Institute of Developing Economies 1995). Within 10 years, 150 local firms qualified as OEM components producers; fewer than half of these firms (67) included any Japanese FDI in the plants. Forty-two of the wholly owned Thai firms received technical assistance from Japanese buyers. The remaining 41 wholly owned Thai companies acquired OEM certification on their own (Institute of Developing Economies 1995, 19-20, table 4). An additional 200 to 250 Thai firms qualified for REM status.

With the decision by the Japanese parent firms to make a dedicated shift toward a regional sourcing strategy came a political-economic "externality" as well: it altered the way in which the Japanese firms wielded their political clout in the host-country and international arenas. Once launched beyond the borders of protected individual markets, the Japanese auto firms became a force for an Association of Southeast Asian Nations (ASEAN) complementation scheme, which was initiated in 1988.

Export-Performance Requirements for Foreign Investors and Global Sourcing in the Automotive Sector: A Preliminary Assessment

The behavior of the auto firms examined here introduces some puzzles about the role of price signals in the FDI decision-making process. Why were the companies so sluggish in responding to cheaper cost-production opportunities, especially for engines, even as evidence that it was in their interest to do so became clearer and clearer and even as the need to cut costs in the home market grew after 1974?

Part of the explanation must come from the political pressures applied by labor leaders and elected officials in the home country. These political pressures were reinforced by economic inducements as well, in particular the sizable buildup in developed-country locational incentives over this

period. As documented in the next chapter, from the late 1970s into the mid-1980s, 9 of the European Community (EC) members, Canada, and 37 US states began to offer significant assistance to attract new investment or retain existing facilities, with grants in the EC case reaching up to 60 percent of the cost of the project. The automotive sector has been the leading recipient of such locational incentives in the developed countries.

Even independent of such incentives, some hesitation about reorienting corporate strategy and changing production patterns is quite rational: firms want to minimize lump-sum start-up expenditures and exit costs and they may value delay as they gain more information (as Dixit-Pindyck models of "irreversible decisions under uncertainty" predict—see chapter 6).

But it is hard to conclude that the firms would have been better off, or that global welfare would have been improved, if the Mexican, Brazilian, and Thai authorities had not intervened with their export-performance requirements—cumbersome though they were—to jump-start the outward-oriented investment process. The extent to which firm calculations of firm welfare and objective calculations of global welfare diverge will receive further scrutiny after data from the petrochemical and electronics/computer industries are added to the debate.

Moreover, the pattern of great hesitation about making new investments, followed by rapid follow-the-leader behavior in all three countries (Mexico, Brazil, and Thailand), demands careful examination for signs of market failure, in particular, signaling difficulties (asymmetric information) and appropriability problems.

As for the stakes in attracting world-scale-sized plants, the globalization of the automotive sector provides a first look at three kinds of benefits to hosts such as Mexico, Brazil, and Thailand that are successful in triggering a burst of export-focused investment—the provision of rents and externalities, the generation of agglomeration effects, and the creation of political-economic interest groups favoring further liberalization.

As evidence of the rents and externalities found in imperfectly competitive industries, the international companies paid relatively high wages, offered relatively high benefits, and provided training to highly mobile managers and workers. They formed strong backward linkages to domestic suppliers and generated spillovers in the form of coaching to domestic firms about management practices, quality control, and export marketing. They brought with them second tiers of foreign investors who did the same. Their contribution was dynamic: the hard-won strategic decision of the international automobile companies to integrate a given set of Mexican, Brazilian, and Thai production sites into their global/regional network carried with it a dynamic commitment to keep technology, management, and quality at the cutting edge needed for the parents to compete in international markets. The age of the technology employed was on the

order of one-third more recent than any other method of acquiring such technology (Doner 1991, 1995b; Mansfield and Romero 1980; Blomstrom and Kokko 1997; Blomstrom, Kokko, and Zejan 1992).[13] The value of this "parental supervision"—of this "integration effect"—will become even more evident in the petrochemical and electronics/computer studies that follow.

The evidence on agglomeration effects is not sufficiently detailed to judge for sure whether scope, scale, and specialization are extensive enough to qualify as Helpman-Krugman "industrial complexes" and "economic poles," although the aggregate size of the automotive sector in Brazil (10th largest in the world), in Mexico (largest auto exporter among the developing countries), and perhaps in Thailand ($6 billion output) suggests so. There are overlapping economies of scale in assembly, in components (engines, chassis, drive trains, brakes, and ignitions), and in related supplier industries (steel, glass, tires, and electronics). The subsequent economic geography of Monterrey, Matamoros, Sao Paulo, Minais Gerais, and Bangkok can hardly be separated from the hosts' breakthroughs in provoking General Motors, Ford, Chrysler, Nissan, Fiat, Volkswagen, Toyota, Mitsubishi, Isuzu, Mazda, and Peugeot to make the decision to set up export facilities.

Finally, there was the political-economic "externality" of putting into place powerful actors with a major interest in further liberalization of trade and investment and with the political clout to help bring it about.

But the battle to secure the spread of export-oriented facilities along the lines of international comparative advantage was not "won" in the course of the cases examined here. The developed countries have launched a counterattack against the globalization of the automotive sector with the increasingly vigorous use of locational subsidies, whose value per job created (as documented in chapter 6) has climbed more than 10-fold over the past decade and a half. In addition, the effort to influence the placement of automotive facilities has been reinforced by manipulation of rules of origin and antidumping actions, which will feature prominently in the next studies of the petrochemical and electronics/computer industries.

FDI and Exports in the Petrochemical Sector

Despite the ostensible differences between the automotive and the petrochemical industries, the globalization of these two sectors demonstrates similar challenges to would-be host countries that wish to insert themselves into the global sourcing arrangements of the international companies that dominate each sector.

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13. See the detailed discussion in chapter 7.

The analysis of FDI patterns in petrochemicals also introduces one prominent new tool in the struggle to maintain old or capture new productive capacity around the world, namely, the use of antidumping regulations as a protectionist and investment-shifting mechanism. These regulations are deployed more frequently in petrochemicals than in any other industry, and their impact will reappear in the examination of the electronics/computer sector that follows.

The petrochemical industry emerged between World War I and World War II as oil and natural gas began to supplement coal tar as a raw material for organic chemicals. The industry consists of three stages: primary building-block petrochemicals such as methanol, ethylene, propylene, butadiene, and benzene; intermediate petrochemicals, comprising more than 100 more complicated organic derivatives; and petrochemical products, such as synthetic fibers, fertilizers and pesticides, paints, pigments, plastics, and synthetic rubber.

During World War II, the demand for synthetics that could substitute for natural materials, especially rubber, led all the major industrial states to take an active role in financing the buildup of a domestic petrochemical industry. After the war, the United States government sold its facilities, already embedded in infrastructure, to private companies. European and Japanese authorities assisted in rebuilding the petrochemical industries in their countries. Along with aerospace and steel, public-sector actions have made the location of the petrochemical industry among the most "path driven" of all sectors.

The petrochemical industry is one of the most capital- and energy-intensive industries in the world, with economies of scale larger than in the automotive sector: gross capital stock per employee is more than three times that of the manufacturing average and typical capacity in a contemporary ethylene plant is 300,000 to 400,000 tons of output per year (Chapman 1991; Chemical Manufacturers Association, *U.S. Chemical Industry Statistical Handbook,* 1996). Historically, there has been a comparative advantage for locations where availability of capital, infrastructure, and natural gas converged, including the United States, Canada, the United Kingdom, Holland, and parts of the former Soviet Union. Natural gas provides methane, ethane, and propane, which must be shipped under pressure and/or at low temperatures if the petrochemical facilities are not contiguous. Absent natural gas, the colocation of petrochemicals and oil refineries—in which naphtha that is generated as a byproduct of producing gasoline can substitute as a feedstock—has provided alternative production sites in Europe and in Japan.[14]

14. While both naphtha and natural gas/ethane prices vary as a function of crude-oil prices, Chapman (1991, 174-75) shows that ethane prices have tended to be lower, giving petrochemical producers relying on natural gas an advantage.

Until the oil crisis of 1973-74, national-security concerns about denial of supplies in time of war tended to predominate over the search for scale efficiencies and the minimization of transportation costs in the location of production. Twelve of the fourteen European nations provided support for private or state-owned operations after the end of World War II. In many cases, they supported small-scale plants that proved particularly vulnerable to international competition in subsequent years (Bower 1986). Prior to 1974, the distribution of production reflected a desire to maintain petrochemical operations close to final markets: a survey of 537 plants producing the 9 most widely used petrochemical products in 1974 showed that 536 of them were placed to supply nearby industrial consumers, with subsidies and tariffs used to compensate for size and transportation penalties. Only one plant, in Trinidad, was built outside of the industrial world to optimize on scale and transportation savings, utilizing indigenous crude oil as an input and exporting to the United States (Stobaugh 1988).

FDI in Export Facilities in the Hydrocarbon-Rich Countries

The internationalization of the petrochemical industry came in two waves, the first after the oil crisis of 1973, the second after the oil-price surge in 1981. Hydrocarbon-rich host governments, led by Saudi Arabia, Iran, Indonesia, Venezuela, Mexico, Algeria, and Canada, insisted that more value added be created near the source of supply, via new petrochemical investments on the part of oil and chemical firms. Their carrots included cheap natural gas, public expenditure on surrounding infrastructure, and (occasionally) preferential access to petroleum output. Their sticks included reduced access to petroleum and the threat of bestowing what favors they had on rival firms. Their strategy relied on savings in feedstock and transportation costs, with a sudden availability of capital from the oil boom, to make up for weakness in the third variable (infrastructure)—taking full advantage of economies of scale in the process.

This assertiveness on the part of the new petrochemical hosts (old hosts to oil/gas companies) generated the beginnings of a massive redeployment of investment in the industry. In 1978, the Fluor Corporation calculated that new petrochemical plants worth a total of some $14 billion were concurrently under construction in developing countries (*The Wall Street Journal*, 19 September 1978). Chapman (1991, chapter 9) identifies Shell, Exxon (oil companies with large positions in the petrochemical industry), Dow, ICI, and BASF as leaders in the internationalization of the industry, but the participation in new ventures near the sources of supply was so broad as to make identification of first movers and followers difficult. Stobaugh (1988, chapter 9) reports that 18 new plants to produce 9 basic petrochemicals were launched between 1974 and 1985

in locales where they could optimize savings in feedstock and transportation costs, in marked contrast to the single such plant in existence prior to 1974.[15] Of these, 14 were plants for converting hard-to-transport methane to methanol, accounting for approximately half of the 27 methanol plants built in the noncommunist world during this period.

As a result, the share of noncommunist world methanol capacity built to serve export markets grew from negligible amounts to 45 percent. Looking at both ethylene and methanol production complexes, the largest gainers were Canada, the Persian Gulf (in particular Saudi Arabia), Indonesia, Mexico, and Singapore, where ethylene prices were roughly half those in the United States and one-third those in Europe and Japan and where methanol prices were roughly one-third those in the United States and close to one-fourth those in Europe and Japan (US International Trade Commission 1983).[16] In a detailed study of the economics of plants in two of these areas (Saudi Arabia and Mexico), Gray and Walter (1984) calculate that world welfare as well as host welfare was improved by the new investments because the natural gas inputs (which otherwise would have been flared or reinjected in the fields) were provided at a cost of collection that included an appropriate return on the capital employed. The findings of Gray and Walter are supported by Chapman (1991).

Once the fundamental building blocks of primary petrochemicals began to be set in place, engineering synergies and interlocking economies of scope/scale followed. The economics of cracking operations are much more favorable if a full range of coproducts can be fully produced for subsequent commercial sale. Once the parent firm makes a strategic decision to commit to the initial investment, argues Chapman (1991, 134), there follows "a momentum of development which tends to promote further agglomeration in massive industrial complexes." Stobaugh (1988, 138-43, table 9.1) identifies two chains of interlocking products, in particular, that have come out of the installation of new capacity near the sources of supply. From methane—the most expensive feedstock to transport—comes methanol, ammonia, urea, and finally fertilizers, which have higher levels of value added and larger transportation savings at each stage. More than a dozen such methanol-ammonia-urea-fertilizer complexes were constructed in the hydrocarbon-rich countries during this initial period of globalization. From ethylene—the next-most expensive feed-

15. Even for more advanced products made from these ingredients, transportation costs may be a large fraction of a product's value; they are 40 percent of the final price of vinyl chloride, for example, based on a trip across the Pacific.

16. Chapman (1991, chapter 8) presents a survey of relative feedstock cost estimates that suggests even larger advantages for hydrocarbon-rich developing countries. This advantage continued after the fall in oil prices in the mid-1980s. In all cases, the United States falls in the mid-range of input costs, with Europe and Japan at the high end.

stock to transport—a complicated array of organic derivatives follow logically, including polyethylene, ethylene glycol, ethanol, styrene monomer, ethylene dichloride, vinyl chloride, and polyvinyl chloride. Saudi Arabia has launched the largest integrated production facilities for of these products (Stobaugh 1988, 138-43, table 9.1).

This redeployment of global investment led to large-scale shifts in the distribution of production capacity in the industrial states. Surveying the US market in 1978, Salomon Brothers reported that "for the first time in the history of the industry" there was "not a single new announcement of a large US chemical plant costing $25 million or more" (*The Wall Street Journal*, 19 September 1978). US capacity for methanol declined by almost one-quarter, and Japanese capacity by as much as one-half. Overcapacity in ethylene production in Europe ranged between one-quarter and one-half. Public authorities in Europe and Japan encouraged large-scale consolidations in the industry. In the United States, the number of US producers of the 8 petrochemicals in the Stobaugh survey declined by 44 percent (the plants that were shut down had, on average, one-half the capacity of those that continued to operate).

Recalling the reaction of home countries and parent corporations to the pressures for global sourcing in the automotive sector, one might ask why there was less evidence of pressure to keep existing production in place during this period, at least initially?

Five factors help to explain the smoother shift of productive capacity along lines of international comparative advantage in the petrochemical sector. First, the petrochemical industry is much less labor intensive than is the automotive industry (less than one-third as labor intensive), and the unions representing petrochemical workers were less potent politically. Second, as noted above, the hosts that insisted on establishing new facilities in their hydrocarbon-rich states were ready to bear much of the cost and risk of infrastructure-related expenditure in the rationalization of production.

Third, the new petrochemical hosts (old petroleum hosts) proved particularly adept at playing the US, European, and Japanese parent firms against each other in arranging for the awarding of investment contracts. Stobaugh (1988) reports that the Saudis, for example, managed to select partners and award contracts to firms that agreed to close some of their own home-country capacity to make way for the petrochemical exports from Saudi Arabia. Fourth, the home governments in the developed world were anxious to please and fearful of antagonizing the energy-rich states during this period.

Finally, the petrochemical industry was split, with price controls on natural gas in the United States providing US producers with a competitive advantage over rivals in Europe and Asia, allowing the former to watch with equanimity as a disproportionate share of the restructuring fell on the latter.

The ultimate distribution of international comparative advantage has remained an open question, however. Input costs and transportation savings alone have not dominated the equation, especially as energy prices have declined since the mid-1980s. Construction costs in some of the new areas have run 1.3 to 1.5 times higher per unit of installed capacity than those of the US Gulf coast, and managerial weaknesses have added further penalties (Sonatrach's state-owned petrochemical facilities in Algeria, for example, have consistently failed to achieve design performance, according to Papageorgiou, due to limitations in management and labor) (Fayad and Motamen 1986; Papageorgiou cited in Chapman 1991, 182).

With the dissipation of concern about access to oil, therefore, the established sites began to wage a battle to prevent further decay in their position, via trade restraints on petrochemical imports. Contrary to initial expectations that Saudi petrochemical products would enter Europe duty free, the European Community restored tariffs on petrochemical imports, as did Japan, as part of government-led efforts to manage an orderly downsizing of the industry. For US producers, the calculus toward trade barriers has been more complex. Of the nine principal petrochemical products, the United States maintained a positive net trade balance in all except methanol, even after the end of the artificial advantage generated by price controls on natural gas. This export posture of the US producers has led them to be cautious about trade restraints at home.

The split in the interests of firms from the United States, Europe, and Japan (matched by splits between the more efficient producers and the less-efficient producers in the developing world) made lowering trade barriers in the chemical/petrochemical sector one of the more problematic tasks when the Uruguay Round trade negotiations began in 1986. The chemical/petrochemical industry became one of the holdouts in the drive for zero-for-zero tariff negotiations that was accomplished in nine other manufacturing sectors.

Instead, basic tariff levels that ranged from 10 to 25 percent, with tariff escalation and higher effective rates of protection on many particular products, were "harmonized" when the round ended in 1994. The stated goal was to reach a level of 6 to 7 percent within 5 to 15 years. Important less-developed countries—including Argentina, Brazil, India, Indonesia, Thailand, and Venezuela—refused to participate in the resulting outcome, provoking the major petrochemical firms to urge at the Singapore WTO Ministerial in 1996 that no further tariff reductions be considered in the chemical sector until the holdouts sign on (International Council of Chemical Associations 1996). As a result, protectionism in developing countries and economies in transition has provided developed-country producers with a rationale (and an excuse) not to further liberalize themselves.

Perhaps more important than tariffs in determining the course of glo-

balization of the industry, the petrochemical sector has become a particularly easy target for a newer form of investment-diverting trade protection: antidumping regulations.

As chapter 6 demonstrates, antidumping procedures have veered sharply away from legitimate concerns about preventing international price discrimination and predatory behavior. As currently construed and now incorporated into the WTO, antidumping regulations are inherently protectionist and discriminatory. Antidumping actions are particularly easy to launch and win against industries with high fixed costs, such as petrochemicals.

The struggling petrochemical industry in Europe, led by two of its less-efficient companies (Montedison and ENI of Italy), became a particularly heavy user of antidumping actions over the course of the 1980s.[17] From 1980 to 1990, the European Community initiated 904 antidumping investigations. According to Messerlin (1990a, 1990b), 40 percent of the cases targeted petrochemical imports. Of these, two-thirds were brought against producers in the developing countries and economies in transition, with between 65 and 90 percent won by the plaintiffs, resulting in either antidumping duties or "price undertakings" (voluntary export restrictions) (Eymann and Schuknecht 1993; Olechowski 1993).[18] While the United States has been a vigorous initiator of antidumping actions in various sectors (documented in chapter 6), petrochemical imports have not been as frequent a target for US producers as they have been for European producers.

Simultaneous with antidumping protectionism and investment diversion, the attraction of new chemical plants has become, with autos, one of the highest-stake games in the investment-incentive contest. In their examination of 15 investment decisions in the petrochemical industry, Gray and Walter (1984) found that location of a facility in Germany and Belgium) was highly sensitive to the provision of cash grants and other direct subsidies. "On purely commercial grounds," they concluded (307), the latter "would be marginal without the backward-area incentive package that was granted." The largest subsidy packages ever approved by the European Commission have been in the petrochemical sector, to Elf Aquitaine and to Dow, to renovate an eastern German petrochemical complex. In the latter case, the European Commission reduced the German government's offer of $7.8 billion by $1.0 billion, but the final $6.8 billion/$800,000 per job outcome still dwarfed other investment packages.

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17. Montedison was party to 37 percent of all EC chemical cases initiated between 1980 and 1985, ENI to 32 percent. Next came Hoechst with 24 percent and Alusuisse with 22 percent (Messerlin 1990a, 1990b).

18. Messerlin's analysis of the relationship between antidumping and antitrust cases in the European Community shows that the petrochemical producers used antidumping procedures to keep out suppliers that threatened their market-sharing and price-setting practices (Messerlin 1990a).

While investment incentives for failing industries are not directly comparable to greenfield investment—because the former may involve extra costs for cleanup and downsizing—the package was estimated to give Dow new capacity for more than half a billion dollars ($550 million) below the cost of building additional capacity from scratch, adding 11 percent to the parent's annual profits (Dow Chemical Gets Go-Ahead in East Germany, *New York Times*, 9 November 1995).

Meanwhile, in the overall competition for chemical and petrochemical operations, the less-developed countries have become not insignificant participants, with one East Asian nation spending about $100 million in subsidies to attract a new chemical plant to its territory (Graham 1996a).

FDI and Exports in Petrochemicals: A Preliminary Assessment

In comparing the globalization of the petrochemical industry with the automotive industry, one might first be inclined to dwell on the differences between the two industries: the greater weight of home-state public-sector investment in the post-World War II period to build up the local petrochemical industry; the unique force of the oil crisis in providing new hosts with an opportunity to upset the equilibrium in the petrochemical industry; and the greater role of input costs and transportation savings in establishing the new pattern of comparative advantage in the petrochemical industry. More than in the automotive sector, the evolution of the petrochemical industry highlights the somewhat arbitrary placement of production for highly capital intensive industries with large economies of scale.

But there are important similarities as well. For both industries, there has been a need for would-be hosts to intervene to generate exports on the part of international investors and global welfare, as well as individual host welfare, has benefited as a result. Specifically, in both industries there has been

- a proclivity toward stasis and stickiness in international investment behavior;
- a major role played by home-country authorities in reinforcing this stasis and stickiness (in the petrochemical case, a role inspired by national-security planning on the part of central governments rather than by lobbying on the part of subnational political authorities and labor groups, as in the automotive case);
- a need for shock treatment to propel international companies in a new direction that ultimately matched their own self-interest;
- a subsequent burst of moves and matching moves by the major firms in establishing a new pattern of international investment once the

departure from the old distribution of production got underway; and

- an enhancement of efficiency in the industry and, in the principal cases, of global welfare from the new pattern of production.

And, as in the automotive industry, the payoff to would-be hosts from success in triggering new investment, and the opportunity cost of waiting for such investment to occur on its own, are substantial. The payoff extends beyond the obvious benefits of establishing this or that plant. In addition, the provision of common infrastructure introduces economies of scope and scale, and there are technical synergies among complementary products in both the ethylene and methanol chemical chains that enhance the scale effects and transportation savings from the construction of large integrated petrochemical complexes.

As for obstacles to the ability of host countries with comparative advantage on their side to use FDI in petrochemicals to penetrate international markets, there is the by now familiar battle of locational subsidies, plus an additional distortionary vehicle to attract/preserve internal capacity—an intense deployment of antidumping actions to keep out exports and induce investment in the domestic industry.

Consideration of how easy such antidumping cases are to initiate, how effortless they are to win, and how substantial they can be in inhibiting export-oriented investment in developing countries and economies in transition will follow the analysis of globalization in the electronics/computer industry (where antidumping actions also figure prominently). But a further worrisome trend has already emerged; in both the battle of locational subsidies and the imposition of antidumping duties, any given host now has to be wary not just of actions by developed-country authorities but increasingly of those by fellow members of the developing countries and economies in transition.

FDI and Exports in the Electronics/Computer Sector

The electronics/computer sector is so different from the automotive and petrochemical industries—much less capital intensive (in most stages), highly sensitive to assembly costs, driven by rapid changes in technology—that it might seem at first glance to have little complementary contribution to make in addressing questions of market function and the possible justification for host intervention.

But, like the other two sectors, the electronics/computer sector has proved to be a particularly rich target for host countries eager to obtain "rents" from investors, eager to obtain backward linkages, spillovers, and externalities for supplier industries, and eager to obtain the "integration"

effect that comes when parent firms align domestic operations with the pace of change that they face competing in international markets.

And despite the ostensible ease of new hosts in attracting export-oriented investors (a process more fraught with difficulty than is commonly appreciated), there has been a vigorous counter effort on the part of developed countries to rearrange international production patterns at variance with comparative advantage. In addition to locational subsidies and antidumping actions, this counter effort features a further tool of investment-diversion—manipulation of "rules of origin"—that is more prominent in this sector than in the others (although present to a certain degree in all three).

In comparing the globalization of the electronics/computer sector with the globalization of the automotive sector, the roles of Southeast Asia and Latin America are reversed, with the former being the pioneer in harnessing FDI to penetrate international markets and the latter only recently trying to play catch-up.

Since the late 1960s, the sharp upward trajectory of FDI in electronics/computer production in East and Southeast Asia (first South Korea, Taiwan, Singapore, and Hong Kong, then Malaysia, Thailand, Indonesia, the Philippines, and China) has been concentrated in two broad product categories: consumer electronics (televisions, radios, electronic watches, video cassette recorders, and radio cassette recorders, including major components such as picture tubes); and office automation equipment and industrial electronics (computers and peripherals, communications equipment, telephone sets, mobile phones, answering machines, and semiconductors, including major components such as disk drives, printers, switching equipment, and printed circuit boards).[19]

Here, at last, one might expect to witness the smooth workings of comparative advantage in international markets. But the story turns out to be much more complex.

Foreign Investors and Global/Regional Sourcing from East/Southeast Asia

Beginning in the late 1960s, Japanese imports put US electronics/computer firms under the same kinds of competitive pressures in the US home market as they put US automobile firms under almost a decade later. From this very early period, therefore, US electronics/computer firms' FDI strategies for East Asian production (like the FDI strategies of some European firms, most notably Philips) anticipated the US automakers' strategy after 1979: abandoning initial resistance to moving abroad, they

19. Dividing the electronics/computer industry into these two subgroupings is the convention for studies of this sector (see Ernst and O'Connor 1992).

began to devote their creative energies to figuring out how to integrate offshore sites into an international sourcing system that strengthened their competitive position at home.

Demonstrating follow-the-leader investment dynamics similar to those of the auto companies, the major US firms in the electronics/computer industry set up Asian operations in close succession—first in Singapore and then in Malaysia (Encarnation 1992; Ernst 1983). General Electric opened its first foreign television-parts plant in Asia in 1968. RCA and Zenith followed with offshore assembly operations the next year. Semiconductor producers exhibited the same behavior: Fairchild set up operations in Asia in 1968, Texas Instruments in 1969, National Semiconductor in 1970, and Motorola in 1973. The export-performance requirements of the host countries showed a lighter touch for the electronics/computer sector than for the automotive sector—similar to what chapter 6 will call the Irish model—combining locational subsidies and grants, preferential ownership and labor regulations, training assistance, and tax rebates in return for export operations, often with low-cost or public-supplied land in special free-trade zones. Despite rising labor costs and an appreciating yen, the burst phenomenon for Japanese investors (commonly referred to as "fish" behavior, as when a school of fish changes direction) came later, after the Plaza Accord of 1985. Over the next four years, Urata (1995, table 5) shows, the number of offshore units of Japanese parents in East and Southeast Asia doubled, with the number of subsidiaries in Malaysia and Thailand approximately tripling.

But there has been a clear divergence in strategy between US and Japanese parent firms. Whereas US investors incorporated East Asian output into an effort to maintain their competitive position at home, Japanese investors used East Asian production sites largely to supply local markets while apparently being careful to protect established facilities at home. Shipments back to the United States home market have accounted for more than 60 percent of the total sales of US electronics/computer subsidiaries in East Asia. For Japanese investors, the comparable figure for shipments back to the Japanese home market was no more than 25 percent (Encarnation 1992).[20] East Asian subsidiaries of Japanese firms concentrated on assembling knockdown kits produced in Japan for sale in protected local markets. In contrast to their US counterparts, Japanese affiliates were not a powerful vehicle for penetrating the Japanese market in the electronics/computer industries.

One might suppose that this divergence merely represents the Japanese economy's own comparative advantage in electronics/computer production.

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20. Moreover, in each segment of the electronics/computer market, Japanese firms have maintained bilateral trade surpluses with the East Asian countries where their subsidiaries are located, while US firms have consistently maintained bilateral trade deficits (Borrus, Ernst, and Haggard forthcoming 1998).

But the fact that this pattern is not at all unique to the electronics/computer industry, but is mirrored in the behavior of Japanese manufacturing investors in general, casts doubt on this explanation.

From 1977 through 1985, US manufacturing investors in East and Southeast Asia sold, on average, approximately 40 percent of their output in local markets and exported 60 percent, with 35 to 40 percent coming back to the US home market. For Japanese manufacturing investors, the figures were reversed: 55 to 68 percent was destined for the local economy, with 30 to 40 percent exported and 10 to 16 percent of that coming back to the Japanese home market (Encarnation 1994, tables 3 and 5).[21] Along the same lines, Campa and Goldberg (1997) have found that "outsourcing" (the share of imported intermediate inputs within industries) increased over the course of the 1980s in the United States, Canada, and the United Kingdom but not in Japan, where the share of imported intermediate inputs was smaller at the beginning and declined during the 1980s. The behavior of Japanese subsidiaries in East and Southeast Asia mirrors Japan's more general outlier status as an importer of manufactured products (Bergsten and Noland 1993).

What is striking, as Encarnation (1994) points out, is that the Japanese firms' practice of keeping their home-country market as a kind of preserve for home-country production did not change noticeably after the Plaza Accord in 1985 drove up the value of the yen nor after the burst of outward investment that Urata (1995) subsequently recorded.

In 1977, prior to the Plaza Accord, US manufacturing investors brought 34 percent of their East Asian production back to the United States home market; the Japanese brought 10 percent back to the Japanese home market. By 1988, the comparable figures were 40 percent and 14 percent, respectively, and by 1991 they were 36 percent and 16 percent (Encarnation 1994).

Besides alerting would-be hosts to the costs of intra-*keiretsu* protectionism,[22] this contrast between Japanese firms more focused on production for local Southeast Asian markets and US/European firms more focused on production for international markets (especially the home market) provides a useful test of the "integration effect" hypothesis: did this

21. This difference in orientation helps to explain the greater tolerance of Japanese investors and the lesser tolerance of US investors for joint-venture arrangements. As analyzed in chapter 7, joint-venture partners can assist with domestic-market penetration, but they frequently constitute a hindrance to export operations because the latter require higher standards of quality control and more rapid introduction of (valuable and sensitive) technology that might be misappropriated.

22. As part of Japan's protective trade strategy, argues Encarnation (1994), the obstacles to FDI in Japan faced by US and European firms have also served, indirectly, to hinder Southeast Asian access to the Japanese market; a greater corporate presence on the part of Americans and Europeans in Japan would provide multiple channels for goods and services brought in from Southeast Asian affiliates.

difference in strategic orientation have a significant impact on how the parents treated their affiliates and on the kind of supplier relationships they developed in the indigenous economy?

The evidence shows the impact of the "integration effect" quite clearly. As in the case of US automotive investors, once the US electronics/computer firms instituted global sourcing, they began a process of systematically upgrading the technology, enhancing the quality control mechanisms, and expanding the managerial responsibilities of their subsidiaries—a notable difference from the Japanese investors.

Borrus (1994), Ernst (1994), and Linden (1996) document a progression in which US parents moved their affiliates from simple hand assembly of items such as printed circuit boards, to hand-and-automated assembly of more complex subsystems, and to responsibility for process and even product design (see also Lim and Fong 1991). Motorola's Southeast Asian subsidiaries evolved from rudimentary printed circuit-board assembly for pagers and private radio systems to worldwide responsibility for design, development, and automated manufacture of double-sided six-layer printed circuit boards and for design and development of integrated circuits for disk drives and other peripherals. Hewlett Packard's plants in Southeast Asia progressed from the assembly of calculators to manufacture, tooling development, process design, and even chip design for portable printers, desktop personal computers, and servers. Compaq upgraded its regional operations from printed circuit board assembly to overall corporate responsibility for design and manufacture of notebook and portable personal computers.

Japanese firms, in contrast, maintained higher-value-added operations at home while transferring only lower-end processes to their East and Southeast Asian subsidiaries. They did move large segments of labor-intensive assembly offshore (including cassette recorders, headphones, low-end tuners, cameras, calculators, some VCR models, under-20-inch televisions, and microwave ovens), reaching local-content levels near 60 percent. But the local content contained few sophisticated components. For personal computers, Borrus (1994) finds that (in contrast to US producers) Japanese subsidiaries sourced memory, drives, power and mechanical components, plastics, and printed circuit boards from Japan. In audio equipment, core components such as magnetrons, chips, and recording heads originated exclusively in Japan. Unlike US firms, global responsibilities were not given to the managers of Japanese subsidiaries for production of advanced products, let alone for their design. The Japanese parents maintained control over high-value-added system integration and design functions in Japan.

"Because their Asian affiliates were integrated into production operations serving advanced country markets," Borrus (1994, 134-35) concludes, "US firms upgraded their Asian investments in line with the pace of development of the lead market being served, the US market. In essence,

they upgraded in line with United States rather than local product cycles. By contrast, Japanese firms were led to upgrade the technological capabilities of their Asian investments only at the slower pace necessary to serve lagging local markets."[23]

Moreover, as in the automotive sector, not only did the US subsidiaries that were tightly integrated into the parents' global/regional sourcing networks receive higher-grade operations and higher-grade responsibilities, but there is evidence that the US subsidiaries have been transferring more advanced technological and managerial responsibilities to local suppliers.

Rasiah (1993, 1995) examined the evolving relationship between nine local machine tool firms and seven foreign electronics firms (five American, one Canadian, one Japanese) in Malaysian free-trade zones over more than two decades. The early links between the foreign investors and their local suppliers consisted of the latter carrying out simple machining and stamping. From this elemental base, the Malaysian suppliers moved up to contracts for precision tooling and parts fabrication. At the beginning of the relationship, the foreign subsidiaries developed machinery prototypes before subcontracting the work to the indigenous firms, often with the engineers of the former supervising and monitoring the work of the latter. Later, engineers on both sides drafted plans for the machinery together (Rasiah uses the example of an auto-wafer mounter), which the local suppliers then produced on their own.

Over the course of time, all nine of the local machine-tool firms began to export, via channels provided by the foreign firms, to Thailand, the Philippines, Singapore, South Korea, Indonesia, and the United States. Seven of the nine limited their exports, at the time of the study, to sister plants of the foreign investors outside of Malaysia; two had also built up subcontracting orders from independent purchasers abroad. Eng Technology, for example, founded in 1974 as a family business to repair and maintain the machinery of foreign integrated circuit companies, began to export on its own in 1984 and ultimately came to send more than half of its output of precision parts to disk drive buyers outside of the country (Linden 1996).

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23. To integrate host subsidiaries into the global competitive strategy of the parent, US and European investors have strongly preferred to operate with wholly owned or majority owned affiliates, giving an advantage to countries such as Hong Kong and Singapore that did not insist upon joint ventures. In this context, it is instructive to contrast Malaysia's extraordinarily successful experience in the electronics/computer sector with its weak performance in the automotive sector. In the former, Malaysia allowed foreign investors to operate in free-trade zones such as Penang with wholly owned subsidiaries; in the latter, Malaysia insisted upon creating a "national champion" automotive company as a joint venture with Mitsubishi. Box 8.1 provides a case study of this "national champion" joint venture, where there have been repeated lags in the introduction of new technology and difficulties in penetrating external markets.

In short, Rasiah traces a pattern in which, as part of their relationship with the foreign companies, the indigenous machine-tool suppliers moved from "backyard workshops," to stamping and machining parts, to manufacture of precision computer-numeric machine tools and factory-automation equipment for the international and domestic marketplace. The owners of seven of the nine local machinery manufacturers had had prior work experience at one of the foreign firms before starting their own operations; 10 percent of the employees of the local machinery manufacturers had had prior work experience with one of the foreign firms as well.[24]

By 1990, this first generation of indigenous suppliers had delegated many tasks to a second level of local firms; this second level often took on orders beyond its capacity, forcing it to subcontract the excess to a third tier of local firms.

Many local companies became high-volume exporters, in some cases sending more than half of their production abroad. The export composition of all local firms in the machine-tool industry in Malaysia rose from 0.4 percent of output in 1984 to 31.6 percent of output in 1990. Their major competitors in the markets they served were from Germany, Japan, and Taiwan. Using growth rates for the number of manufacturing machines and machinery structure as proxies for capital widening and capital deepening, Rasiah (1995) concludes that the local firms underwent considerable capital widening and deepening during this process.[25]

Focusing in more detail on the spillovers to domestic suppliers from a single outward-oriented foreign investor, Linden (1996) highlights two cases involving Motorola. In the first, Motorola transferred surface-mount technology for printed circuit boards to a Malaysian firm, Bakti Comintel,

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24. This finding is similar to Katz's observation (1987) that managers of indigenous firms in Latin America often began their careers after being trained by the affiliates of foreign investors. Isolating pure externalities (benefits generated by foreign firms that do not accrue to owners or workers in the form of higher profits or wages or to users of the firms' output) from other beneficial spillovers is an arduous task. For a discussion of the concept and measurement of externalities, see Graham (1996a).

25. The evidence from Rasiah (1995) and Linden (1996) indicates that foreign firms help local suppliers to become more sophisticated and more productive, and help them to learn how to export. Does the process of exporting, and the contact with external buyers, stimulate or teach the local firms how to remain at the cutting edge of product development, quality, and price? The detailed case studies here suggest that the answer is affirmative. So do other studies: Blomstrom and Persson (1983) find that foreign firms help developing-country firms to enter world markets by providing links to final buyers in the developed economies. Keesing and Lall (1992) argue that foreign investors provide knowledge about design, packaging, and product quality that is used in local companies' operations beyond their role as suppliers to those investors. Kokko, Tansini, and Lejan (1996) find a significant relationship between the presence of foreign investors and the likelihood that local firms in Uruguay export to world markets. These findings run counter to the more doubtful perspective of Roberts and Tybout (1997).

which developed the capacity over time to supply not only Motorola-Malaysia but to ship finished products to 11 Motorola sites worldwide. In the second, Motorola farmed out "flex circuits" to a local Malaysian company, QDOS Microcircuits, which used the contract to grow beyond an exclusive-supplier relationship with Motorola to become a contractor to Siemens and Hewlett-Packard in Penang and to 10 international corporations outside of Malaysia.

For Japanese investors that did develop regional and international ties (albeit seldom with the home market), rather than concentrating exclusively on production for the local market, there appears to be similar potential for spillovers. Linden (1996) follows a Malaysian metal stamping firm, Atlan Industries, which started as a supplier to Sharp, added other customers, including Sony, NEC, Toshiba, and Casio, and grew to be a regional and international exporter. Sony helped one Atlan subsidiary, Cirrus, to learn how to use automated transfer-press technology supplied by other Japanese firms, and then invited Cirrus to build a plant in Jakarta to supply Sony's Indonesian operations.

In the aggregate, by the early 1990s the electronics/computer sector grew from virtual insignificance in 1968 to become the leading generator of employment, fixed assets, output, and exports in the Malaysian manufacturing industry. The phrase "outsourcing" hardly captures the dynamism of the interaction between parent and subsidiary or the magnitude of direct and indirect benefits for the host economy.[26]

But producers in the United States and Europe, as well as Japan, have not been content simply to let the globalization of the electronics/computer industry proceed along lines of international comparative advantage. Whereas Japanese firms have used intra-*kereitsu* ties to maintain production sites in the home market, US and European firms, workers, and public authorities began a battle of their own in the mid-1980s to divert investment and maintain or expand production at home. This battle employed two familiar weapons, locational subsidies and antidumping cases. It also featured a new kind of investment-diverting trade restriction that has proved to be particularly effective, the distortionary use of rules of origin.

Turning first to locational subsidies, the electronics/computer sector has been the focus of intensive activity within the OECD. Recent packages of grants and subsidies in the developed countries have included a $320 million investment-incentive package for a semiconductor plant in the United Kingdom and a $289 million investment-incentive package for a microprocessor plant in the United States (see figure 6.1).

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26. Following Feenstra and Hanson (1995a, 1995b), "outsourcing" has come to be defined as the share of imported intermediate inputs within an industry. This characterization does not distinguish between home-country firms that are simply shopping abroad for components and home-country firms that are setting up overseas production facilities explicitly to produce them.

Looking next at antidumping restrictions, of the 1,558 antidumping cases initiated between 1980 and 1989, those involving electronic products were the fourth most likely to result in restrictive arrangements. For the European Union alone, consumer electronics and office/computing machinery were the second-largest target, behind only chemicals/petrochemicals, with more than a third of the cases brought against exports from the developing countries (Eymann and Schuknecht 1993; Finger 1997).

Rules of origin constitute the novel element that this examination of FDI in the electronics/computer sector introduces into the depiction of the battle for the location of production (however, rules of origin have also figured prominently from time to time in the struggle for automotive production). As chapter 6 will point out, rules of origin can be manipulated, like antidumping regulations, to force investment and thwart the more general liberalization of trade and investment. Rules of origin determine how much domestic content a product must have to qualify as an internal product in a preferential trade agreement. In semiconductors, for example, in 1989, the European Community unilaterally declared that the process of diffusion, or wafer fabrication, had to be performed in the European Community for integrated circuits to be considered of local origin. Otherwise, the integrated circuits would be subject to the European Community's 14 percent semiconductor tariff. Even though wafer fabrication was not cost-competitive in Europe, compared to Asia or the United States, Dataquest recorded the construction of 22 new fabrication facilities within two years of the change in the rule of origin. The largest directly attributable to the change was a plant expansion by Intel in Ireland.

The European Union also established product-specific rules that require printed circuit board assembly within Europe and set high value-added requirements for photocopiers. It has negotiated association agreements in Central and Eastern Europe that require 60 percent domestic content for products to qualify for entry into the European Union.

As chapter 6 spells out in some detail, the European Community's aggressiveness on rules of origin in the late 1980s spurred various industry groups in the United States, in particular some segments of the electronics/computer sector, to follow the same path in the North American Free Trade Agreement. There, the United States used rules of origin to extend an umbrella of trade-protection-cum-investment-diversion to telecommunications, computers, color televisions, fax machines, and photocopiers (Jensen-Moran 1996a, 1996b).

With regard to telecommunications, the NAFTA rule requires that 9 of every 10 printed circuit board assemblies, the essential component of office switching equipment, be packaged within the NAFTA countries. In response, ATT shifted some production from Asia to Mexico, and Fujitsu and Ericsson brought new investments to Mexico as well. As for

color televisions, NAFTA required that television tubes be produced within the region to qualify for preferential status. Prior to NAFTA, there was no North American manufacturer of television tubes; in the first two years after NAFTA's passage, five factories took shape within the NAFTA region, with investments from Hitachi, Mitsubishi, Sony, and Samsung.

In the case of computers, the US negotiators proposed a rule that would have required two of the three key components (the motherboard, flat panel display, and hard disc drive) to be North American in origin. With forceful opposition from IBM and other companies that wanted to maintain their more flexible international sourcing patterns, the negotiators settled on a final rule requiring "only" the motherboard to be North American.

NAFTA also tightened origin rules for printers, photocopiers, and fax machines, requiring more components to be manufactured locally. For printers and photocopiers, all major subassemblies have to be produced in North America (equivalent to an 80-percent domestic-content requirement). According to Xerox, this rule was instrumental in motivating its competitor, Canon, to construct a plant costing more than $100 million in Virginia, rather than in Malaysia or in China, where the production costs would be lower (Jensen-Moran 1996b, 985).

Exports, Global Sourcing, and FDI in the Electronics/Computer Sector: A Preliminary Assessment

The globalization of the electronics/computer industry, like the automotive industry, highlights the role of competitive pressures in the home markets in pushing international firms to invest along lines of comparative advantage. For US firms, under heavy competitive pressures at home, the export-performance requirements of host countries in Southeast Asia merely seemed to speed them in the direction they were headed anyway. For Japanese firms, with a home market more protected from electronics products produced offshore, the export-performance requirements of host countries in Southeast Asia only achieved results after the Plaza Accord revaluation of the yen. Even then, exports were still largely oriented toward third markets. The host authorities devoted considerable public resources to the creation of free trade zones—following the Irish model of grants and subsidies—and enjoyed enormous economic returns from the subsequent investment activities. They probably played a less decisive role in altering parent corporate sourcing strategies in the electronics/computer sector than in the automotive and petrochemical sectors.

The initial payoff from attracting export-oriented facilities was substantial. Moreover, once international investors incorporated new production sites abroad into their global/regional sourcing strategies, the electronics/computer firms, like their automotive counterparts, generated

the dynamic integration effect of keeping their subsidiaries close to the cutting edge of technology and best-management practices.

The benefits that host countries received from FDI in the electronics/computer sector again included valuable spillovers to indigenous suppliers and associated industries. The technological and managerial coaching described by Borrus (1994), Ernst, Linden (1996), and Rasiah in helping to generate robust, internationally competitive indigenous firms is reminiscent of similar evidence of external stimulus for the supplier base found by Peres Nuñez (1990) and Doner in the automotive industry. The desire to use offshore sites to enhance their own competitive position worldwide led the electronics/computer companies to engulf the suppliers, as well as their own plants, in a continuous flow of technical and management improvements, which was notably absent from indigenous and foreign-owned plants that were focused exclusively on selling in the domestic market.

Once again, there is evidence of agglomeration properties of scope and scale among external investors and indigenous suppliers in the clusters or poles where the foreign firms settled. There is also the political "externality" of pressure for further liberalization from the outward-oriented foreigners and the local firms that followed them into international markets.

Despite the sensitivity of the electronics/computer sector to competitive pressures, however, there is extensive evidence here, as in the automotive and petrochemical sectors, of intrusive efforts by firms, workers, and public authorities in the developed countries to capture and/or preserve such valuable conglomerations of economic activity, particularly thick in technological spillovers, at home.

Locational incentives and antidumping regulations again played a role; so did the intra-*keiretsu* protectionism of Japanese parent firms. But the study of globalization in the electronics/computer sector highlights an additional policy tool deployed in the struggle to divert investment in one direction or another—the manipulation of rules of origin.

This completes the list of ingredients, or at least provides a reasonably logical cutoff point, necessary to begin assessing what might be the most appropriate and most effective way for hosts and would-be hosts in the developing countries and economies in transition to construct their own policies toward export-oriented FDI.

Export-Performance Requirements and the Globalization of the Automotive, Petrochemical, and Electronics/Computer Sectors

The examination of the globalization of these three sectors (automotive, petrochemical, and electronics/computers) provides interesting and useful but also perplexing results for less-developed countries and economies in

transition that want to use foreign manufacturing investment to penetrate international markets.

Perhaps the first and most important discovery is that the benefits for those countries that have managed to attract such investment, and the costs (or opportunity costs) for those countries that have failed to secure such investment are much more significant than conventional calculations suggest.

Not only do the export-oriented facilities in these three sectors bring the usual list of capital, technology, and management skills to an operation enjoying full economies of scale, they also provide an incentive structure between parent and subsidiary that ensures rapid technological upgrading, managerial upgrading, continuous pressure for quality control, and timely and cost-efficient production. Indeed, the decision to incorporate a plant into the global sourcing strategy of a multinational firm appears to have a dynamic "integration effect," whereby the parent seeks to maintain peak standards in the subsidiary.

At the same time, all three industries (especially the automotive and electronics/computer industries) show much greater likelihood of providing spillovers and externalities for local suppliers if plants are thoroughly incorporated into the global/regional sourcing network of the parent instead of oriented primarily toward the domestic market.. These spillovers would come in the form of management training, technical coaching, technology transfer, and export assistance.

Further, there is often a political-economic "externality" as well, because foreign investors stop using what clout they have in the political arena to preserve their own protected status and shift their attention to leading the fight on behalf of greater liberalization against protectionist opponents in the polities where they operate.

The second discovery is more surprising, namely, that the efforts of host authorities to entice foreign investors to develop export-oriented facilities have not proceeded easily or smoothly, even (oddly enough) when there were increasingly clear indications that the establishment of such facilities coincided with the long-term self-interest of the parent corporations. Instead—despite mounting competitive pressures to cut costs in the home market—there is considerable evidence of reluctance, hesitation, and "stickiness" associated with the decision to invest in new export-oriented operations.

Then, however, in multiple cases in each of these sectors, once a leading company was pushed or enticed to establish an export base, the action of the "first mover" provoked rapid matching moves on the part of other investors (and component supplier firms) in the industry. To cope with this stickiness, host authorities had to intervene (forcefully in the case of the automotive and petrochemical sectors, more lighthandedly in the case of the electronics/computer sector) to trigger a response on the part of major investors in the industry to begin a process of regional

or global sourcing from their country. Success from such intervention, in the cases examined here, paid huge benefits and set in motion a "burst effect" among other members of the industry that launched the country on a new trajectory of industrial development. The result in each case was a far cry from the usual depiction of export-performance requirements as using public monies or trade rents to generate a weak, uncompetitive, and heavily subsidized stream of exports.

The stakes in attracting foreign investors to move to new locales, on the one hand, and in keeping them in place where they already operate, on the other, are high. In response to globalization in these three industries, developed-country authorities have themselves been intervening in important ways both to prevent exit and to capture new investment. Their principal tools have been locational incentives, grants, subsidies, and investment-diverting protectionist measures such as rules of origin and antidumping actions.

Success or failure in this pulling and tugging over the location of world-scale production facilities involves not just the individual decisions of individual companies with regard to individual plants. In the major automotive, petrochemical, and electronics/computer cases examined here, it also determines what is sometimes grandly called the "configuration of economic geography," with features such as agglomeration of specialized suppliers (many of whom also enjoy economies of scale), labor pooling, and a high potential for technological and human resource externalities (Marshall 1920; David and Rosenblum 1990; Krugman 1991; Helpman and Krugman 1985).

The role of international comparative advantage in determining the ultimate pattern of production is not unimportant, but neither is it decisive. Instead, the grappling over the locational decisions of international companies does resemble a strategic-trade struggle over the distribution of highly valuable economic activity (inframarginal activity). It is a contest that is much more complicated but not less serious than the stylized strategic-trade battles pitting the respective home countries of Boeing and Airbus against each other in a fight to capture aerospace and related "rents."

What are the implications for the design of public policy toward FDI in the developing countries and economies in transition? One cannot conclude from the success stories in these three industries—however broad a portion of international industrial investment they cover, across quite diverse industries and countries—that the use of export-performance requirements will always produce as favorable or as powerful an outcome as witnessed here. But few hosts or would-be hosts would conclude, after studying these industries, that their wisest course is to rest passively and wait for world-scale manufacturing investments to arrive on their own. The rewards for action are too great, and the costs or opportunity costs of inaction may be too severe.

Is the appropriate conclusion, therefore, that export-performance requirements should be considered a legitimate tool of public policy for developing countries and economies in transition? Should their use be rationalized and expanded—enlarging the subsidy component and making any foreign investor eligible, for example, as a transitory way to lock into the parent's externality-filled sourcing network (differentiating this approach, therefore, from simply subsidizing all exporters)? Or should developing countries and economies in transition be willing to control and limit the use of export-performance requirements as part of some larger policy bargain among nations?

To begin to answer these questions requires a more in-depth look at possible indications of market failure in the investment process in manufacturing industries such as these and at the investment-diverting and investment-distorting activities of the countries struggling to capture or retain these externality-rich segments of economic activity. These are the tasks of chapter 6.