8

FDI and Technology-Licensing Requirements

Much of the literature on mandatory technology licensing as a substitute for FDI reaches well beyond the acquisition of technology per se and toward a broader goal of nurturing an indigenous business class, with a political as well as an economic rationale: to enhance national autonomy, national power, and national security.

In the analysis of whether technology-licensing requirements are the best method to meet these objectives, political and economic considerations need not necessarily be in conflict, because the (political) ability to influence events, resist external pressures, and, in the extreme, conduct military operations is a function of the (economic) resources a given country can devote to collective or individual efforts to affect outcomes upon the world stage. Thus, what enhances a country's economic prospects may also enhance its national power and autonomy.

But they are not always congruent, and sometimes require complicated trade-offs between how much independence and autonomy a country hopes to acquire in return for foregoing the creation of a certain amount of wealth.

The literature on replacing FDI with mandatory technology licensing draws inspiration from what has customarily been referred to as the "Korea model" (or the "Japan-Korea model") of development.

Despite the differences and idiosyncrasies in the historical evolution of Japan and South Korea, the key ingredients of this model are:

- import restraints combined with vigorous export promotion;
- fiscal subsidies and other preferences to create national-champion firms in particular sectors; and

Institute for International Economics | http://www.iie.com

- severe restrictions on FDI, combined with aggressive insistence upon licensing and other technology-sharing arrangements that leave control of firms in national hands (Westphal 1979; Amsden 1989; Haggard 1990; Wade 1990; Schive 1990).

In the aftermath of the Asian financial crisis of 1997-98, there is reason to ask whether a system of import restraint and export promotion that focuses on chosen sectors and preferred national firms can ever escape the political-economic corruption and crony capitalism that have figured so prominently in the history of many Asian economies. But to give as fair a hearing as possible to those who favor technology-licensing requirements, it might be appropriate to focus first on what has been the core appeal of the Korea model, namely, the alleged superiority of such requirements to a more liberal orientation toward FDI in four areas (two economic, two political):

- enhanced technological deepening, achieved by creating broader and more independent indigenous research and development capabilities;
- enhanced industrial deepening, achieved by transporting the country beyond mere screwdriver assembly;
- enhanced political autonomy, based on a greater ability to control the actions of national champion firms; and
- enhanced national security, based on greater self-reliance and less dependence upon outsiders.

How well do mandatory technology-licensing requirements accomplish these objectives in comparison to a more liberal approach to trade and FDI?

Mandatory Technology Licensing and Technological Deepening

Perhaps the strongest argument on behalf of the model comes from comparing the levels of indigenous research and development in South Korea and elsewhere. Evans (1995), for example, highlights the different levels of internal research and development in South Korea and Mexico: the two countries have roughly equal amounts of local manufacturing value added, but South Korea has indigenous research and development expenditures of approximately 2 percent of GDP whereas Mexico has indigenous expenditures of only about 0.02 percent of GDP.

This is an impressive contrast. It is important, however, to look more closely at how the superior South Korean performance came about. A large part of this vigorous internal effort is accounted for by a relatively small number of firms in a single industry. The electronics industry, led

Institute for International Economics | http://www.iie.com

by three firms—Samsung, Lucky Goldstar, and Hyundai—accounted for more than 40 percent of all research and development personnel in South Korean industry in 1992 (Ernst 1994).

And this intensity in research and development is a recent phenomenon. It did not emerge during the heyday of the Japan-Korea model (from the promulgation of the law for electronics industry promotion in November 1969 until the basic guidelines of policy for liberalization of technology imports of February 1978), when a combination of import protection, FDI restriction, and mandatory technology licensing helped to found the *chaebols* (South Korean industrial conglomerates).

As Westphal (1979, 252) has noted, even the electronics industry had a thin layer of research and development activity as late as 1979. "Electronics production," he observed, "is largely an assembly operation, and little infusion of the basic technological know-how has taken place."

Instead, the drive to deepen the technological capabilities of the *chaebols* grew out of exposure to competitive pressures as labor costs rose in South Korea, and the South Korean firms had to match the prices and quality of their rivals when those rivals spread their operations through Southeast Asia in the 1980s.

Between 1980 and 1984 the number of industry-managed research and development institutes grew four-fold, from 8 to 32. Between 1985 and 1991, the number of research and development personnel in the electronics industry grew from roughly 5,000 (32 percent of all researchers in South Korean industry) to about 16,000 (41 percent of all researchers in South Korean industry). Research and development spending climbed to 4 percent of turnover (Ernst 1994).

Throughout this period, the *chaebols* benefited from a highly favorable business environment. Sound macroeconomic policies and a high savings rate not only provided fiscal incentives for research and development but also funded a strong educational infrastructure to back it up (World Bank 1993; Fishlow et al. 1994).

To be sure, South Korean authorities targeted specific levels of research and development expenditures (six key technologies in the Sixth Five-Year Economic and Social Development Plan). But the public-sector share of research and development expenditure fell steadily, from 68 percent in 1978 to 16 percent in 1990. And, while the centrally directed public intervention did mobilize resources within highly concentrated industries to help them to master reverse engineering and efficient mass-production techniques, the targeting effort, in the view of a close observer, has had a seriously detrimental by-product, namely, a dearth of independent and innovative small and medium-sized supplier firms that has "substantially constrained" the prospects for on-going technological expansion (Ernst 1994, 56).

In the aftermath of the financial upheavals in Asia, what must South Korea do now to ensure that the country once again becomes a model

Institute for International Economics | http://www.iie.com

of economic growth and development? Ironically, according to Ernst and others, the best approach to ensure that South Korea regains its position as a developmental model for other countries is to abandon the Japan-Korean model of development. These observers recommend turning the public and private sectors away from industrial targeting and toward policies that focus more on diffusing technology, in particular, on expanding "the future role of inward FDI as a vehicle for technology diffusion" (Ernst 1994, 118).[1]

The evidence introduced in chapters 5 and 7 by Mansfield and Romero (1980), Vernon and Davidson (1979), Blomstrom, Kokko, and Zejan (1992), Haddad and Harrison (1993), and others—showing that wholly owned subsidiaries within highly competitive industries provide the most rapid vehicle for the transfer of technology into a given economy, with potentially significant spillovers to indigenous firms—supports this recommendation. Products and processes that are less than three years old are more likely to be introduced for local production via the subsidiaries of foreign investors than via licensing, by a ratio of 4 to 1. Products and processes that are 10 years old are still more likely to be introduced for local production via the subsidiaries of foreign investors than via licensing, by a ratio of 3 to 1.

Why should this recommendation for contemporary South Korea not be the preferred strategy for other hosts from the beginning, if the policy is supported by fiscal, educational, and competition policies of a kind that will reward research and development activity in general?

The answer, according to Evans (1995), for example, is that a particular historical sequence is required: (1) the erection of a "greenhouse" of tariffs to protect infant sectors from external competition and (2) "midwifery" of fiscal support and preferred procurement. Only after this preparation can indigenous firms be ready to participate successfully in international markets (see also Evans and Tigre 1989).

It is difficult to judge such a contention because there is no calculation of the opportunity cost to the economy of following the steps recommended by Evans (1995) compared with a sequence featuring greater openness to trade and investment. Furthermore, the subsequent developmental contribution of national firms generated via such midwifery has not been compared to that of the national firms Peres Nuñez (1990) found growing to international status in the midst of the Mexican automotive industry or that of the national firms Borrus (1994), Ernst (1994), Rasiah, and Linden (1996) found growing to international status in the midst of the Malaysian electronics/computer industry. And there is no calibration

1. Ernst argues that the challenge for South Korea now lies in trying to use inward FDI and alliance relationships with foreign companies to acquire "best practice" management, production, and marketing techniques, as well as product and process technology. In both areas, "outdated policy instruments that focus on excessive restrictions continue to be an important constraint" (1994, 119).

Institute for International Economics | http://www.iie.com

of how difficult and costly it is to ensure that there are institutional prerequisites for successful midwifery, including relentless exposure of greenhouse-grown national firms to international competition at the right moment, ruthless cutoff of greenhouse life support to apparent losers, and independent and noncorruptible public authorities who can navigate such a rent-seeking-filled environment with minimal blemish.

Until such calculations, comparisons, and calibrations can be investigated more thoroughly—however optimistic the investigators are willing to be that political-economic payoffs and other manifestations of crony capitalism can be kept under control—it would seem that the burden of proof that this constitutes a superior path for development should fall on those who might still advocate pursuit of the Korea model.

Technology-Licensing Requirements and Industrial Deepening

From the outset, any assessment of the Korea model of industrial self-sufficiency has to be modified to note that, in the South Korean case, US companies actually played a central role in the creation and subsequent development of the electronics industry.

As Ernst (1994) points out, four American firms—Motorola, Signetics, Fairchild Semiconductor, and a joint venture called Komy Semiconductor—dominated the creation of South Korea's chip assembly industry from its inception in the late 1960s through the end of the 1970s. These foreign investors opened up export channels for chips and for consumer electronics assembled in South Korea: their share of exports did not drop below 40 percent until 1980. They also, in Ernst's estimation (1994), exposed South Korean workers and managers to organizational techniques that helped to curb the rigidities and inefficiencies of the highly authoritarian South Korean business practices.

Then, even after the South Korean *chaebols* began to dominate in the industry, these *chaebols* relied on OEM relations with major US firms to penetrate external markets: Samsung selling videocassette recorders and microwave ovens via General Electric; Daewoo selling televisions for Zenith and Emerson; and Goldstar selling videocassette recorders via Zenith and Philips and microwave ovens via Whirlpool. In 1986, OEM contracts accounted for 33 to 81 percent of all consumer electronics exports from South Korea, depending upon the product; by 1992, the overall OEM share of South Korean consumer electronics exports was 69 percent.

Thus, the stylized view of the emergence of South Korean firms as self-sufficient except for licensed technology has to be modified to take into account a rather large direct and indirect contribution from FDI and foreign corporate alliances.

Institute for International Economics | http://www.iie.com

While the appeal of the Japan-Korea model comes from the dynamic growth that has taken place in leading sectors, such as electronics and automobiles, the appeal dims in examining the situation in lagging sectors. Here, the relatively weak performance of South Korea in some industries, such as chemicals/petrochemicals, can be traced in large part to the regulations and controls (joint-venture requirements, technology-transfer requirements, etc.) that host authorities placed upon foreign investors such as Dow Chemical (Schwendiman 1984).

The Korea model thus contains notable cases of unsuccessful deepening and poor industrial performance. Proponents of the Korea model have not systematically compared the list of successes in building national champions with counter examples plagued by large expenditure of resources and far less successful results.

Moving beyond South Korea, there is impressive evidence of a growing number of national champions and Third World multinational corporations emerging from among the ranks of local firms in the developing countries and the economies in transition (Evans 1993; Evans and Tigre 1989; Encarnation 1989; Lall et al. 1983; Wells 1983). And, once such national champions achieve a certain level of size, experience, and self-confidence, they hold their own in negotiating technology transfer, product development, and marketing arrangements with foreign firms. They use international business ties, including the acquisition of foreign companies, to enhance their competitive position in international markets.

But the studies of the automotive, petrochemical, and electronics/computer industries in chapter 5 showed multiple examples of such firms growing up in industries filled with foreign investors, often beginning as suppliers to foreigners.

In light of this, the contention that countries that adopt a more liberal approach to FDI will be caught in the trap of mere final assembly is not supported by the data. The automotive industry in South Korea should be compared with the automotive industry in Brazil and Mexico, and the electronics/computer industry in South Korea should be compared with the electronics/computer industry in Malaysia and Thailand.

Such comparisons would have to consider the nontrivial issue of diversification. In the automotive industry, for example, the prospects for the countries examined earlier—Mexico, Brazil, and Thailand—are linked to the performance of almost all the major international companies from the United States, Japan, and Europe, whereas the prospects for South Korea are much more directly dependent upon the fate of a single national champion, Hyundai, backed at some distance by Daewoo. As for electronics/computers, the dependence is less stark for South Korea, with three principal national champions, Samsung, Lucky Goldstar, and Hyundai. However, there is still nowhere near the robust diversification that Malaysia or Thailand enjoy in this sector.

Institute for International Economics | http://www.iie.com

Technology-Licensing Requirements and Enhanced Control over National Champions

Placed in comparative historical perspective, the ability to control national champions in ways that meet internal developmental needs better than FDI turns out to be a somewhat elusive undertaking.

The sectoral studies in chapter 5 showed evidence of some of the European frustrations with their own national-champion strategies. The Italian government provided subsidies and preferences to Fiat in the hope that the Italian national champion would then serve as an agent of regional development. Fiat did become such an agent of regional development, but in Minas Gerais, not the Mezzogiorno. Volkswagen faced similar conflicting loyalties, between the demands of the government that had helped launch it and the demands of an increasingly independent senior management that saw the future of the company as requiring a thoroughly global strategy. Even France, the strongest proponent of national-champion industrial targeting, had to watch as Michelin built plants abroad at a rate twice that of the rate at home (Vernon 1974).

Overall, the idea that national champions would better serve domestic developmental goals than would other firms soon ran into the dilemma that to remain competitive such champions preferred to, and had to, match the behavior of their rivals elsewhere. If they did not, they increasingly became wards of the state and a burden on indigenous development.[2]

The "Who-Is-Us?" debate—questioning whether firms of own-country nationality can be counted on to behave systematically differently from firms of other-country nationality—is likely to grow more intense, not less, for national planners in the developing world and economies in transition. To maintain their competitive position in international markets, South Korean firms have positioned their research and development and higher-value-added activities in developed-country markets, not at home. And developed-country hosts are not making this choice any less agonizing: as recorded previously, the United Kingdom set a new record for attracting investment in the electronics/computer sector with its $320 million, $48,000 per job bid for Lucky Goldstar.

The case study in box 8.1 records the costly and comparatively ineffective effort of Malaysia to establish Proton, a national-champion automobile company. Now, after great domestic sacrifice for Malaysia in launching the national champion, Proton is repaying the favors bestowed upon it by moving production offshore to Vietnam and the Philippines (Institute of Developing Economies 1995).

Finally, wherever national-champion companies ultimately decide to

2. Well before the "Who-Is-Us?" debate became popular, this dilemma was explored in Bergsten, Horst, and Moran (1978, chapter 11).

Institute for International Economics | http://www.iie.com

Box 8.1 The problematic experience of creating a national-champion car company in Malaysia

Malaysia's decision to develop a national-champion automotive company, Proton, via technology licensing from a minority Japanese partner, provides a marked contrast to its more successful strategy with multiple foreign investors and multiple ownership patterns in the electronics sector. Like other countries in Southeast Asia, Malaysia's early approach to auto-sector development centered on local-content requirements. Like them, it struggled to break into export markets in the face of export prohibitions on the part of Japanese investors.

Instead of offering trade liberalization on imports in exchange for higher export performance, however, as Thailand, Mexico, and Brazil did, Malaysia demanded increasingly higher levels of domestic content, from 42 percent to 80 percent, supplied by firms that had to meet "bumiputera"—quotas of Malay ownership. Instead of letting foreign investors choose where comparative advantage might dictate an opening for international market penetration (e.g., engines or wiring harnesses), Malaysia insisted upon production and export of a particular product, a national car, built by Proton. Instead of playing rival investors off against one another, Malaysia relied on a single joint venture between Mitsubishi and the Heavy Industry Corporation of Malaysia (HICOM), the government's principal development agency from 1983 to 1993.

In an effort to achieve economies of scale, Malaysian authorities gave Proton's passenger car substantial preferences and advantages in the Malaysian market. Reductions in or exemptions from tariffs on imported components were made only to Proton. Exemptions of sales tax were made only to Proton. Civil servants were able to receive special low-interest loans only when they purchased automobiles from Proton.

"Consumer choice has been restricted by (Malaysian) policy, as buyers have little option but to purchase relatively expensive Proton products," concluded a study by the Institute of Developing Economies in Tokyo. "It cannot be denied that one critical key to the success of the Proton lies in the transfer of economic rents from other sectors."

With this help, Proton's market share in Malaysia grew to almost 50 percent in the mid-1980s. But output remained around 80,000 units per year. It became evident that the key to achieving full economies of scale lay in penetrating international markets.

(*continued on next page*)

position their highest-value-added and most rapidly growing divisions, the adoption of a national-champion development strategy opens the door, inevitably, to pleading for special preferences on the part of powerful rent-seeking constituencies that may well not be able to distinguish their own self-interest from their interpretation of the national interest.

Technology-Licensing Requirements and National Security

In much of the literature about the Korea model, national security appears to be in the eye of the beholder; that is, the phrase "national

Institute for International Economics | http://www.iie.com

Box 8.1 (*continued*)

Its joint venture partner, Mitsubishi, however, did not want to introduce competition among the products the parent sold in the English market and continued to use its Australian facility for exports to Great Britain rather than expanding production in Malaysia.

Searching for ways to break out into international markets, Malaysian authorities decided to sidestep Mitsubishi's established sales channels. In 1984, Proton contracted with an independent British importer, Mainland Investment, which had franchise rights for eleven automobile models in Great Britain, to serve as an outlet for Proton cars. It simultaneously arranged with a second independent agent, Bricklin, which marketed Yugos in the United States, to act as distributor in the Western Hemisphere. This strategy, of exporting Mitsubishi-produced cars via non-Mitsubishi distribution networks, did not prove viable.

Malaysia was left in 1988 with having to reverse direction, turning greater control over the direction of its national champion to the joint-venture partner, Mitsubishi, in return for an expansion of capacity and a promise of exports. Despite ongoing complaints about the slow pace of incorporating the newest product and process technology, Proton attained a domestic market share of 81 percent by 1993 and boasted of exports approaching 20,000 vehicles. Considered a success by Malaysian authorities in comparison to previous low export levels, this accomplishment still amounted to less than one-fifth the value of Thai automotive exports or one-thirtieth the value of Mexican automotive exports in the same period.

Proton automobiles cost approximately 15 to 20 percent more in Malaysia than in Europe. "Why are the cars so expensive?" asked the Economist Intelligence Unit. "The labour costs are low, demand is high and the tax rates for locally made cars are not outrageous. The answer, it seems, is that local buyers are having to pay high prices to subsidise the growth in exports."

The Proton-Mitsubishi alliance announced plans in 1995 to internationalize its own operations, producing small buses in Vietnam and manufacturing automotive components in the Philippines, eventually leading to the production of passenger cars there.

Sources: Doner (1991, 1995b); Lim and Fong (1991); Institute of Developing Economies (1995); Economist Intelligence Unit, 1996.

security" can be evoked to justify practically any set of policy interventions without measurement of cost, effectiveness, or alternatives.

In the debate about national security and industrial policy (or strategic-trade policy) in the developed countries, in contrast, the national-security rationale for public-sector intervention has come to assume a much more rigorous and even measurable form. The threat that requires genuine national-security attention is the possibility of denial, delay, manipulation, or the placing of conditions upon the provision of some good or service to domestic users for whom the cost of moving to the next best available alternative is quite high (Moran 1990, 1993; Graham and Ebert 1991; Graham and Krugman 1995).

The necessary condition for such a genuine national-security threat to

Institute for International Economics | http://www.iie.com

exist is a high degree of concentration among external suppliers. While there is learned debate about exactly how to measure the necessary degree of concentration, one rule of thumb suggests that if more than four suppliers from four countries control more than 50 percent of the market, translated into an appropriate Hirschman-Herfindahl index, there is little likelihood of effective collusion to enable suppliers to engage in denial, delay, manipulation, or the placing of conditions upon the provision of the good or service.

Absent such concentration, there is no genuine national-security threat. Absent such concentration, there is no well-justified reason to protect nationally owned suppliers, or to prevent FDI from competing with nationally owned suppliers, or to block foreign acquisition of nationally owned suppliers.[3]

This attempt to define with rigor a legitimate national-security rationale for public intervention substantially narrows the sphere where this justification applies. It helps to separate out instances in which there may be a real threat to national security from the variety of other rent-seeking behaviors parading under the national-security label.

The number of industries, or subindustries, with such a high degree of concentration is quite small, even in the sphere of military and dual-use technologies and equipment High performance jet engines, space launch vehicles, satellite equipment, advanced materials, avionics, displays, and associated high-speed computer processing are some goods for which there is tight supplier concentration, and even here the availability of slightly second-best suppliers of these goods is growing.

Countries with a robust indigenous business sector have more options to maintain such crucial products or technologies in national hands on national soil or to diversify suppliers. But, for better or for worse, the realm in which host countries in the developing world and the economies in transition can claim a genuine national-security justification for creating and supporting exclusive national suppliers is becoming quite narrow, and the cost and performance penalties for choosing to rely on exclusive national suppliers is rising steeply (Moran 1990).

At the same time, the possibility of establishing commonly defined, commonly measured national-security exceptions to predominantly liberal treatment of trade and investment appears more likely than it has in the past, at least in theory. This approach should be acceptable to developed and developing countries alike, without any need to appeal for broader restrictions of FDI as contained in the Japan-Korea model.

3. For the subtle (but not analytically distinct) case of foreign acquisition of nationally owned military suppliers, see Moran (1993).

Institute for International Economics | http://www.iie.com