



THE HARD DISK DRIVE INDUSTRY IN THE PHILIPPINES AND JAPANESE DIRECT INVESTMENTS

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The study explores in depth the phenomenon of the overseas spread of Japanese computer industry, by focusing on the FDI behavior of a segment of the industry, namely that of the hard disk drive (HDD) sector. It studies the various motivations for the choice of the Philippines both by Japanese HDD assemblers and by their suppliers, based on a firm-level survey conducted in 1997-98 in the Philippines and in Japan. It examines why the Japanese HDD assemblers have strategically chosen to locate mainly in the Philippines, in contrast with American HDD firms' geographic spread, which took mainly the Asian mainland route, from Singapore to China, passing through Malaysia and Thailand. The study likewise attempts to evaluate the validity of other possible motivations, namely: the imitative or 'bandwagon' behavior of Japanese investors, the dispersion motive, the deepening motive, as well as motivations based on possibilities for agglomeration among them. Finally, the study examines the strengths and weaknesses of the country's policy regime in attracting Japanese direct investments into the industry.

1. Introduction

The hard disk drive (HDD) industry in the Philippines is of recent vintage. Not considering the assembly of semiconductors that may have eventually found their way into HDDs, one can probably date the birth of the industry to March 1988, when Sunward Tech-

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nologies Phils. Inc., an ISO 9002 certified, wholly-owned subsidiary of American-owned Sunward Technologies, began assembly and test of heads.¹ At about the same time, in May 1988, Tsukiden Electronics Industries, Inc. (TEII) was established as a subsidiary of an independent Japanese firm (the Tsukiden Group) whose production activities had been closely linked since the 1970s to NEC in Japan. Its first plant was established to produce 5.25" floppy disk drives (FDDs) and 3.5" HDDs (since 1989), including printed circuit boards (PCBs) and flexible printed circuit assemblies (FPCAs), as a subcontractor to NEC Technologies Hong Kong Ltd. (NEC HK). Tsukiden sourced part of its thin film heads assembled by Filipino-owned Integrated Microelectronics, Inc. (IMI, established in August 1980) and from another Filipino-owned company, Ionics Circuits, Inc. (ICI, established in 1974) as a second priority source. Tsukiden assembled drives for NEC HK until August 1997, when a change in technology resulted in the closing of the Tsukiden factory and a shift in subcontracting to a dedicated factory of Laguna Electronics, Inc. (LEI), also a subsidiary of the Tsukiden Group.

These early investments were not immediately followed by others, however. The momentum was brusquely interrupted by the political instability into which the Philippines was plunged by the attempted *coup d'etat* of December 1989, a well-publicized kidnapping of a Japanese executive, and a recession that was to last until 1993. The current wave of HDD investments was ushered in by the entry, in close succession, of all of the Japanese majors, beginning with Hitachi Computer Products (Asia) Corp. in 1994, producing 2.5" HDDs. Hitachi was followed a year later in 1995 with the almost simultaneous establishment of Fujitsu Computer Products Corporation and Toshiba Information Equipment Inc. for the production of 3.5" and 2.5" HDDs, respectively. Under a year later, NEC Components Philippines was set up to produce printed wiring boards

¹ Sunward, and its Philippine subsidiary, was eventually acquired by Read Rite Corporation in 1994.

(PWBs) mainly for the automotive industry but also partly for HDDs. As mentioned earlier, NEC HK had already been operating in the Philippines as a 'factory-less firm,' through Tsukiden as subcontractor. However, it also decided to start its own HDD assembly in the country and started constructing in early 1999 a new factory for the assembly of 3.5" HDDs, with a production capacity double that of its present subcontractor LEI. It was expected to start commercial operations in May 1999. As will be discussed below in greater detail, except probably for Hitachi, Japanese assemblers followed the subcontracting route before finally deciding to set up their own HDD assembly plants in the country.

The entry of the four Japanese HDD majors was accompanied by the relocation of a number of Japanese supplier firms between 1994 and 1996: Nidec Philippines Corporation (entered in 1995, although HDD-related spindle motors started production only in 1997); Luzon Electronics Technology, Inc. (a 100%-owned subsidiary of Hitachi Metals, Inc. engaged in slider assembly and HGA); Tsukuba Philippine Die-casting Corporation (aluminum base plates for 2.5" HDDs); San Technology (voice-coil motor, HGA, and HSA); Mette (base plates and covers); Sunpino (FPCs); and Precision Technology or Pretech (spacer rings). Singaporean-owned CAM Mechatronics also began producing HDD components in 1995. Laguna Electronics Incorporated, a company belonging to the Tsukiden Group and established in 1993, set up a second plant dedicated to assembly of IBM-licensed high-capacity HDDs for NEC HK, with commercial operation starting late 1998. Other investments by Japanese majors are expected, including an investment by TDK in MR heads scheduled for 1998, although there has as yet been no entry by either American or Japanese media manufacturers. According to a respondent, however, a number of media producers expressed interest, before the onset of the Asian financial crisis, to establish production facilities in the country.

As can be seen, the HDD industry in the Philippines is dominated by Japanese-owned major assemblers and suppliers which either belong to the majors' *keiretsu* or are their independent con-

tractors or suppliers in Japan. Sunward's early investment was not followed by other American HDD companies. American-owned Read-Rite Inc. did take over the HGA operations of Sunward Technologies Phils. in 1994, and decided to retain them. Conspicuously absent in the mid-1990s wave of investment were the American majors that established themselves a decade earlier in Singapore and later moved into Malaysia and Thailand, and more recently, China. American-owned Seagate earlier decided to put up shop to produce MR heads² in Cebu, but this was far from the clustering of Japanese majors in Luzon.³

Thus, it is clear that the development path of the HDD industry in the Philippines shows certain characteristics different from those of the industry as it evolved in other parts of the Asian region. In particular, there appears to be a stronger Japanese presence in the industry than elsewhere in the region, while US HDD firms—with the exception of Read-Rite and probably Seagate—that have already created network linkages in the region are conspicuously absent. In the following section, we inquire into the motivations that drove Japanese HDD investments to locate in the Philippines rather than in other Southeast Asian sites earlier chosen by US HDD. The first part of the section discusses the distinction in motivational factors between supplier and assembly firms, as well as the factors that appear to give the Philippines, at least to Japanese assemblers, a clear edge over possible alternative sites. The second part explores the significance to the Japanese of motivational factors that are found to have influenced US HDD firms' decision to invest in the region, namely, (1) the imitative behavior of firms or bandwagon effects, (2) the dispersion motive, (3) the deepening motive, and (4) the possibilities for agglomeration economies. In addition to the micro-level factors that attract the HDD industry to locate in the country, we

² The current financial crisis, however, has forced Seagate to temporarily suspend operations in the Philippines in favor of China.

³ Recently, however, there is talk of Seagate's most recent decision to locate a plant in the freeport of Subic.

Inquire into whether the macroeconomic environment matters at all. In the third section, we argue that public policies and institutions in the country, particularly those that have liberalized trade and investments, have played a role in creating and sustaining a business environment conducive to foreign investments inflows into the industry. In the fourth and final sections, we summarize the main findings of the study.

To assemble a database that would allow evaluation of our various hypotheses, we interviewed sometime in 1997-1998 key respondents of five (5) HDD assembly and nine (9) supplier firms, or a total of 14 HDD firms. The respondents were presidents of Philippine subsidiaries of the US firm, Sunward/Read-Rite, and of the four Japanese HDD assembly firms, as well as officers in charge of Asian or Philippine operations in company headquarters in Tokyo. Likewise, the interviews involved mainly presidents (or their delegates) of seven (7) Japanese supplier firms—Nidec, Tsukiden/Laguna Electronics, Luzon Electronics Technology, NEC Components, Tsukuba Die-casting, San Technology, and Haneda Corporation,⁴ and of two (2) Filipino-owned subcontracting firms, IMI and ICI.⁵ The interviews yielded first-hand information on the history, motivations, linkages, and the nature of interaction between assemblers and suppliers in the HDD industry.

2. Motivations for Locating in the Philippines

From a macro perspective, the most recent wave of Japanese investment in the mid-90s appears to have been triggered by a new round of yen appreciation. The *endaka* started in 1985 with the Plaza

⁴ Haneda Corporation, which was established in 1991 and went into manufacturing for HDD in 1994, used to supply aluminum base plates and cover to NEC HK through Tsukiden. However, with the shift of NEC HK to IBM-licensed HDDs, Haneda lost out to IBM's preferred suppliers.

⁵ Other firms that were contacted but where interviews did not materialize were Sunpino, CAM Mechatronics, and Seagate.

Agreement, but at that juncture the domestic political and economic situation in the Philippines was inauspicious. The country was in the midst of a major debt crisis, which contributed to the gradual disintegration of the Marcos regime and the Aquino "revolution" of early 1987. As a result, the Philippines was bypassed in the first wave of *endaka*-driven Japanese investment, which went elsewhere in ASEAN, particularly Thailand and Malaysia, until the end of the 1980s. However, by the time the yen appreciated sharply in 1994 and reached historic levels in the second half of 1995, the Philippine economy, the political situation, and the investment climate had all substantially improved as a result of the Aquino and, particularly, Ramos presidencies.

Yet a closer examination of the data from the investment histories of the other ASEAN countries indicates that this *endaka* explanation is not complete. In contrast to other electronics segments, the Japanese did not generally relocate assembly or component production in the HDD industry offshore in the 1980s. In Singapore, not a single Japanese firm invested in the HDD sector in the 1980s, in contrast to the stream of investments by American HDD companies over the decade. In Malaysia, only Hitachi Metals established itself in 1989 to produce magnetic heads. In Thailand, the only HDD major to invest was Fujitsu in 1988 to produce heads, although there were some minor investments during the year by fully Japanese-owned Habiro Co. Ltd. (motor hubs for HDDs). It appears therefore that in spite of the *endaka* triggered by the Plaza Agreement, the Japanese HDD firms were not yet ready to move out assembly facilities from Japan. For instance, Hitachi, according to a respondent at the Tokyo headquarters, saw the Americans moving into Asia in the early 1980s and began to ponder the need to do likewise. However, it decided against it at the time and instead set up a factory north of Tokyo which was eventually closed down five years later. Only then did Hitachi seriously consider relocating to Asia.

The picture therefore changed somewhat in the 1990s. The intensifying competition in the worldwide HDD market, the desire of

Japanese majors to carve larger shares of that market, coupled with the steep *endaka* of 1994, gave the final push to Japanese assemblers to move their facilities out of Japan. Thus, although American HDD makers continued to invest in the HDD industry in Southeast Asia, especially in Singapore and Malaysia, the Japanese majors started to move in, too. In Malaysia, Hitachi Metals expanded in 1995; Hitachi Electric entered in 1996 with HDD manufacturing and semi-test equipment; and Fuji Electric came in 1997 with drive manufacturing. In Thailand, Fujitsu was the main player with a succession of investments: in 1990, head production; in 1991, 2.5" and 3.5" drive production; and in 1994 and 1995 expansion of its 2.5" drive facility. These took place with other important investments by major HDD suppliers: Nidec (having bought Seagate's Thai spindle motor facility) in 1991; Hoya Opto Ltd. (glass disk polishing for HDDs) in 1992; and Minibea Thai Co. Ltd. (spindle motors) in 1996. The latter investments were certainly attracted by the desire to supply the concentration of US and Japanese HDD assemblers. HDD components started to be manufactured from 1991 onwards by a joint-venture between Japanese and Singaporeans, Tool Products Ltd., in addition to investments by 100 percent Japanese-owned suppliers, including Eiwa Co. Ltd. (covers), JVC Components Co. Ltd. (motors), and Asahi Komag Ltd. (polished substrate for memory disk).

In sum, Japanese investment in the Philippines after 1994 has to be viewed in the context of a more general expansion of the Japanese presence in the HDD industry in the Southeast Asian region during the 1990s. The location to the Philippines was thus not an isolated case. On the other hand, there are two striking features of Japanese HDD investments in the Philippines which are not similarly observed in the other ASEAN countries. The first is the entry and concentration in the country of the four major HDD assemblers from Japan and their growing local supply network. The second feature is the almost exclusive choice of the Philippines as an overseas assembly site. For three of the four Japanese assemblers in the country, the exception being Fujitsu, the Philippines is currently their only Asian assembly facility outside Japan. Why then was the Philippines so chosen?

*Location decision: the Philippine advantage**HDD component manufacturers*

Interviews of Japanese HDD assemblers and components manufacturers conducted in the Philippines from June to October 1997 showed a basic difference between the motivations of the major HDD assemblers and the components manufacturers. For the latter, the main factor that attracted them to the Philippines was the potential volume of business created as a result of the decision of the four HDD assemblers, and possibly other American HDD assemblers in the future, to locate in the country. Almost invariably, their answer to the question of why they chose the Philippines was "to be close to the HDD majors." As one respondent noted, the 'majors' included Seagate, which, at the time of interview, had decided to locate itself in Cebu. This motivation undoubtedly holds for TDK with its recent investment in MR heads, as well as other component suppliers (e.g., media), that are in the pipeline. According to the Tokyo-based respondent of Hitachi, many of the available vendors now operating in the Philippines came after the announcement of the relocation decisions of Fujitsu and Toshiba which materialized in 1995, a year after Hitachi established itself in the country. Two of its own suppliers with whom the firm had close relationships in Japan—Pretech (precision machining and turned parts) and Sunpino Technology (PCBA and FPCA)—arrived at a decision to start operations in the Philippines while Hitachi was still doing its feasibility studies on its relocation.

The question of how close to assemblers components manufacturers need to be remains unresolved for the industry as a whole; supply chains in Southeast Asia are increasingly dispersed. However, for Japanese assemblers operating in the Philippines, there appears to be a trend towards a growing concentration of supply sourcing from two locations: Japan for major components (e.g., wafer, media) produced by parent companies; and the Philippines for components and sub-assemblies that are locally available. This

can be verified from Table 1 which shows the sources of major components and sub-assemblies of three Japanese assemblers. The entry of component manufacturers (e.g., Nidec for spindle motors and eventually TDK for MR heads) into the country has led to shifts of sourcing away from other ASEAN countries. As revealed by the interviews, assemblers used to import components such as spindle motors from Thailand or certain PCBs from Singapore, but have increasingly turned to local sources once these have come on stream and have been found to be competitive. Even component manufacturers, such as Nidec, have started to shift to Philippine-based parts suppliers (e.g., machined or die-cast parts, bearings) as these became available from supplier firms that have relocated from Japan or from other Southeast Asian sites. Respondents have also expressed their anticipation of the components that will become available locally when TDK becomes operational.

According to the responses from the interviews, Japanese suppliers and assemblers believe that it is important to be geographically as near each other as possible to facilitate communication, particularly because of the short technological cycles of the HDD industry. Especially at the early stages of production, there is need for an intensive interaction between engineers of the components manufacturers and assemblers to ensure that the product specifications are exactly met and that technical problems that crop up are addressed quickly. Indeed, close supervision starts even before the production stage: the CEO of NEC HK would regularly visit the construction site of the new factory being set up by its sub-contractor LEI. During the production period, engineers of assemblers frequently inspect the component manufacturers' shop floor. The Nidec president admitted that he is used to receiving frequent, even weekly, visits from engineers of its assembler-customers. This is because Nidec's spindle motors are fully customized for the assembler, making close communication between them a top priority. Similarly, Tsukuba Die-casting reported frequent interaction with its customers, sometimes on a daily basis. HDD assemblers, on their end, expressed satisfaction in having such major components manufacturers as Nidec, Rohm Philippines (a semiconductor manufacturer), and TDK nearby.

Table 1 - Sourcing of Japanese HDD Assemblers
in the Philippines, 1997

Component/ Sub-assembly	Assembler 1	Assembler 2	Assembler 3
Wafer	Parent firm, Japan	Parent firm, Japan	Parent firm, Japan Intel, TI, other wafer producers, Japan
Media	Parent firm, Japan	Nihon Fuji Denki, Japan; Komag, Malaysia; in-house, Philippines	Hoya, Singapore and Japan
MR heads	Parent firm, Japan	Partly parent firm, Japan; partly in- house, Philippines	Yamaha, Japan; TDK, Philippines (once operational)
Spindle motors	Nidec, Philippines	Nidec, Thailand and Philippines; Minibea, Thailand	Nidec, Philippines; Minibea, Thailand

Table 1 (continued)

Component/ Sub-assembly	Assembler 1	Assembler 2	Assembler 3
Printed circuit board (PCB)	Parent firm, Japan and 2 local firms, Singapore;* will start sourcing from a local (Filipino) firm, Philippines	Parent firm, Japan; Subsidiary, Vietnam	Board from CMK Thailand, Malaysia, Taiwan; In-house assembly, Philippines
Base and cover	Nidec, Philippines	Mette, Philippines	Tsukuba Die-cast, Philippines; two other Japanese firms, Philippines
Voice coil motor	San Tech, Philippines; Shingetsu **	Shingetsu, Malaysia; TDK, Philippines (once operational)	N.A.

* Tri-M, a Singaporean PCB maker, which has a history of subcontracting with a Filipino-owned firm, is said to be preparing to move to the Philippines.

** Subcontracting with IMI, a Filipino-owned firm.

Source: Interviews, 1997, 1998.

Tsukuba Die-casting, a supplier of aluminum base for HDDs, has a unique position of having two other small Japanese firms located with it in the same compound: KapCo, engaged in coating of the aluminum die-cast; and P-Ton, engaged in plastic injection. This, according to the president of Tsukuba Die-casting, has the advantage of reducing production time, providing close communication and interaction among the three firms, and reducing cost for the customer who has to deal with only one firm with regard to product specifications.

HDD assemblers

The interviews of key personnel at the assembly firms' headquarters in Japan (conducted in October-November 1998), a number of whom had directly participated in the decision-making process on location, generally confirmed the responses of the presidents of Philippine subsidiaries regarding the reasons for their choice of the Philippines. Though expressed differently, their responses converged on three basic reasons for locating in the Philippines. It will be noted that the four HDD assemblers are among Japan's largest multinationals, so that information on a country is easily gathered by one or more of their affiliate companies or subsidiaries and easily communicated throughout the system when location decisions have to be made. Moreover, all the respondents claimed having made intensive studies on several alternative sites in Asia before making the final decision on the Philippines.

Strategic location. The Philippines is considered by assemblers as being located strategically, with relatively easy access to the different countries of East and Southeast Asia which serve both as sources of parts and components and as markets for HDDs. An important consideration is the country's proximity to Japan where, at present, all R&D and ramp-up take place, where benchmarking of productivity levels is undertaken, where engineers and trained technicians mainly originate, and where Filipino engineers, technicians and even operators are sent for training. Asked why China, which is geographically more proximate to Japan than the Philippines, was

not chosen, a respondent remarked that this was due to the logistical and fiscal difficulties they have encountered in bringing goods in and out of China. Because of the short technological life-cycles of the industry's products, it is important that technology be transferred fast, from ramp-up to mass production. Hence, the need for a constant movement not only of parts/components but also of personnel between Japan, the Philippines, and third countries. Moreover, the short life-cycle of the product implies that it has to reach the market "fresh" (the Japanese word *seisen shokuryohin* or literally 'fresh food product' was more than once used) otherwise it loses much of its value. In this regard, a respondent contrasted the proximity of its plant's present location in the industrial zones in Laguna to the international airport of Manila with those of Zones II and III of Thailand to Bangkok airport. Also, HDD makers have to react fast to market changes because of the stiff competition among multinational assemblers. Speed in delivery of components and shortened lead times were mentioned as additional reasons for the strategic advantage of the Philippines as an assembly point.

The fact, however, that Fujitsu chose Thailand before the Philippines as its HDD assembly site implies that differences in geographical proximity to Japan among countries in the region may be a necessary but not a sufficient condition for the choice of a location site for Japanese assemblers. Other factors had to be considered, among the more important of which seem to be the overall business environment and the relative tightness of labor markets. Having thus recovered to a large extent its political and economic stability in the mid-90s, the Philippines, with its geographic proximity to Japan relative to Singapore, Malaysia, and Thailand, coupled with its relative abundance of workers, appeared on the scene as a strong contender for Japanese HDD investments.

Relatively abundant supply of workers, engineers, and technical graduates. It was noted by the respondents that although direct labor makes up only 2-3 percent of unit cost, labor cost still mattered in absolute terms due to the large volume of production. As Table 2 indicates, monthly wages of factory workers and junior high school

graduates in the country were lower in 1995 than in Malaysia, Thailand, and Singapore, though higher than in Indonesia. The percentage of age group enrolled in tertiary education is likewise higher in the country than in other ASEAN countries⁶ (World Bank, 1997), so that the majority of electronics firms (both HDD and semiconductor firms) in the Philippines employ mainly female laborers who have finished at least two years of college. Moreover, the relatively abundant supply of operators in the Philippines, given high unemployment and underemployment rates in contrast to the full-employment status of Singapore, Malaysia, and Thailand before the 1997 financial crisis implies a lower labor turnover rate. When asked why expansion of existing facilities in Thailand did not preclude the setting up of new plants in the Philippines, the response from the Fujitsu respondent was that it needed more elbowroom because of the prevailing labor shortage in Thailand.

Table 2 – Relative Wage Levels in ASEAN

Country	Factory Workers	Junior	Technical	Managers	
		H.S. Graduates	College Graduates	Division	Dept.
Philippines	1.0	1.0	1.0	1.0*	1.0*
Indonesia	0.63	0.54	1.36	1.0*	1.0*
Thailand	1.23	1.29	2.46	1.83*	1.63 - 1.7**
Malaysia	1.28	1.36	3.12	1.83*	1.63 - 1.7**
Singapore	4.10	4.70	6.91	4.83	3.0 - 3.33

* Data are lumped for Philippines and Indonesia;

** Likewise for Thailand and Malaysia.

Source of Basic Data: *The Current State of Japanese Affiliated Manufacturers in ASEAN, 1995*. JETRO Overseas Research Department, August, 1996.

⁶ For the latest available year, the World Bank (1997) reported tertiary ratios to be 27 percent for the Philippines, 10 percent in Malaysia, 21 percent in Thailand, 9 percent in Indonesia, and 19 percent in Singapore (excluding for the last, polytechnics. If these are included among tertiary institutions, the ratio for Singapore rises to a high 46 percent).

But even more important than the supply and wage cost of operators seems to be the relatively more abundant supply of engineers and technical graduates in the country. The Philippines turns out about 30,000 engineering graduates yearly.⁷ In terms of enrollment in technical subjects that are directly relevant to industrial competitiveness (such as science, mathematics, and engineering), the Philippines has 0.33 percent of its population enrolled in the so-called 'core technologies,' or more than double the rates in Malaysia, Indonesia,⁸ and Thailand, although only a fifth and a third of those in Korea and Taiwan, respectively.

In relative terms, Table 2 shows that the monthly wage of technical college graduates is the lowest in the region,⁹ even lower than that in Indonesia. Though quality clearly differs so that these numbers must be taken as indicative, technical graduates in Singapore have to be paid seven times the Philippine wage, three times in Malaysia, 2.5 times in Thailand, and 1.4 times in Indonesia. It is also reported (World Bank, 1997) that aside from shop floor wages and salaries of engineers, production managers and supervisors being lower in the Philippines than in Malaysia, the quality of

⁷ During the interview of an HDD assembler president, we asked why China was not preferred to the Philippines as the firm's investment site for HDD when the former turns out a bigger number of engineers. The answer given was that engineers are in short supply everywhere else in China except in Beijing. However, to attract them to the South, where most of the foreign investment flows are going, engineers from Beijing have to be paid a costly sum and given perks to agree to work outside the capital.

⁸ In terms of absolute numbers, however, Indonesia has a slightly bigger number of enrollment (240,597) than the Philippines (224,754) in 1996.

⁹ Data compiled by the Services Group of the World Bank (1997) from various publications and firm-level interviews, however, present a somewhat different picture from that in Table 2 whose information is based on a 1995 JETRO survey of Japanese manufacturers operating in ASEAN. According to the WB table, although Philippine wage levels in 1996 were way above those in Vietnam and, to a certain extent, in Indonesia for all labor categories (unskilled and skilled labor, technicians, engineers, and middle management), they were generally comparable to those in Thailand, although lower than in Malaysia. Singapore was not included in the WB list.

engineers in the Philippines is said to far exceed that in Malaysia, where companies have to rely increasingly on the services of expensive expatriate technical staff.

In addition, respondents of the four HDD assemblers said that there is a rather low turnover rate of engineers and technical graduates in the Philippines (although recently, there had been some experience of 'raids' and 'pirating' of engineers by newly established HDD firms). A low turnover rate of engineers is highly desirable in short technological life-cycle products like HDDs because a considerable amount of funds is invested in training both at home and abroad. From a long-run viewpoint, one respondent (president of a major who had experience of running a subsidiary in Thailand) said that because of the large number of engineering and technical graduates in the Philippines, it had better chances than Thailand of advancing into technology-intensive industries.

The above discussion provides a clue as to why Fujitsu's earlier decision to locate in Thailand did not attract other Japanese assemblers, unlike Seagate whose assembly activity in Singapore was followed by other American firms. The location decisions of the Japanese assemblers were made at a time of tight labor markets in the other Southeast Asian countries so that the Philippines, with its large supply of operators and technicians, became a logical choice. Even Fujitsu, while maintaining and expanding its Thai operations, found it strategically sound to establish an HDD assembly plant in the Philippines.

Labor trainability due to facility with the English language. The widespread use of the English language in the Philippines was cited as its third advantage over other possible production sites in Asia. This advantage might seem astonishing at first, especially since American HDD firms do not seem to have put a premium on the language factor in their location choices. The fact, however, that the Japanese respondents, *without exception*, both in the Philippine subsidiaries and at their Japanese headquarters, cited English profi-

ciency as a Philippine advantage over other possible location points makes this factor significant enough to warrant attention. Thus, we tried to probe the underlying reason for the importance of 'language' to the Japanese assemblers and received the following explanations:

- (1) The ability of workers and technicians to understand instructions in English facilitates skills training and transfer of technology from Japanese engineers and supervisors;
- (2) This facility, in turn, is considered an advantage because speed of skills development is required by the shortness of technological cycles and the time during which products have to reach the market;
- (3) Japanese management style is such that expatriate managers (including presidents) routinely visit the shop floor to communicate directly with line workers; and
- (4) Japanese managers and trainers do not need to learn another language aside from English.

The country's perceived edge in terms of relative abundance of workers is thus enhanced by their trainability due to their relative ease in the use of the English language. Some respondents even affirmed that everything else being equal, a Filipino worker who can communicate in English will be preferred by a Japanese mentor to, say, a Thai or a Chinese worker who can communicate only in his/her native language. And in the case of Singapore and Malaysia, where English is currently used as a second language, respondents said that, tighter labor markets (resulting to higher wages and labor turnover rates) worked against their being selected for HDD assembly. Given the importance to Japanese firms of workers' being able to communicate in English, language proficiency is one of the tests to which prospective applicants are subjected, along with mathematical skills.

In addition to the Filipino workers' proficiency in English enhancing their trainability, it also contributes to cost reduction on the part of the firm. A Japanese firm with a Thai facility confirmed that it has to provide at least 90 hours of training

on the Thai language to its Japanese engineers and managers assigned to that country in order to give them a minimum of communication ability.

Other explanatory factors in the location decision

Given the three factors that were explicitly cited by the Japanese assemblers as giving the Philippines a clear advantage over other Southeast Asian locations, we examine other factors that can be hypothesized as influencing Japanese HDD firms' choice of the country. Such motivational factors that appear to explain US HDD location decision in the Asian mainland (Brimble and Doner, 1998; Haggard, Li, and Ong, 1999) are: (a) imitative behavior of firms, (b) dispersion motive, (c) deepening motive, and (d) possibilities for agglomeration economies. In the case of the imitation motive or bandwagon mentality, firms are hypothesized to choose a location after a demonstrated success of operations in a given site by one or other firm. The dispersion motive, on the other hand, drives firms to chase after lower production costs, either in the form of cheaper material or labor costs, or of investment incentives made available by host governments. This motive explains the initial motivation of US HDD firms to locate production out of the United States and into Singapore, and subsequently to lower-labor cost areas, such as Thailand and Malaysia, and eventually the Philippines and China. Closely related though distinct is the deepening motive which makes firms invest (or re-invest) in areas where a "localized technical knowledge" has developed over time. This distinction from the dispersion motive explains to a certain extent why US HDD firms continue to invest in Singapore long after the city-state had lost its initial labor cost advantage. Firms are also attracted to locate in sites where possibilities for agglomeration economies exist. These are attained through the spatial clustering of assembly and supplier firms resulting to information exchange, resource pooling, etc. Although most of these motives were not specifically mentioned by most Japanese respondents, inference that they are at work may be derived from observation of Japanese HDD firms' behavior in the market, making them worthwhile to consider. In the discussion that

follows, we attempt to evaluate the importance of each of these motivational factors in explaining the location of the HDD industry in the Philippines by the Japanese.

Imitative behavior of firms

The herd instinct, bandwagon, or simply learning story is often invoked to explain the behavior of Japanese and other investors, including in the HDD industry. On the one hand, the timing of the establishment of the four HDD assemblers seems to be too close to affirm such a hypothesis. Hitachi was first established in April 1994 while Fujitsu was set up a year after, that is, in April 1995, followed a few months later by Toshiba in July, and by NEC Components less than a year after, in March 1996. Only the decision by NEC-Computer Storage Products, set to operate only in 1999, could be considered as 'delayed,' although NEC HK was already subcontracting HDD assembly with Tsukiden as early as 1989. The fact that decisions seemed to have been taken by the assemblers at roughly the same time appears to weaken the credibility of the bandwagon explanation.

On the other hand, the timing of actual location need not mean that there were no previous consultations made between them. To probe the importance of this factor, we explicitly raised it in our interviews, both at the Philippine subsidiaries and their Tokyo headquarters. First, we asked the president of NEC Components, which set up a Philippine plant after the entry of Hitachi, Fujitsu, and Toshiba, whether his firm consulted the other assemblers before making a decision on location. The NEC Components president answered in the negative, adding that these were his firm's competitors (who could not be trusted to give unbiased answers?) and that therefore he had to rely on his own feasibility studies and judgment to arrive at a final decision. However, he admitted that he did receive favorable information on the Philippine operations of Pretech, a component supplier, from its president to whom he happened to talk at the time he was making a decision on an Asian location.

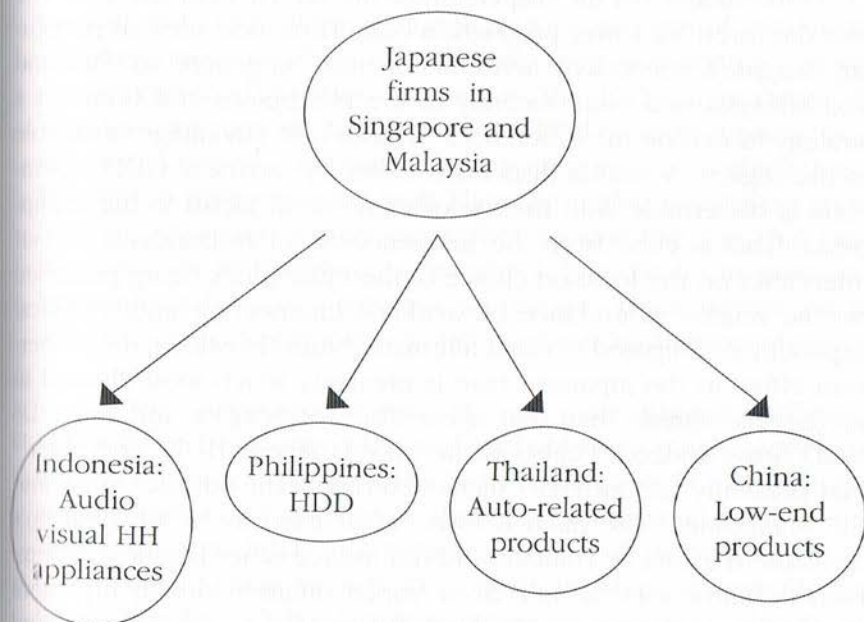
Second, in a tightly knit society like Japan, even if no overt discussions are undertaken, it is not unthinkable that competitors get to know about one another's major decisions long in advance of actual investments being made. Moreover, with at least a one-year gap between assemblers' actual investments, the latecomers must have certainly received confirmation of the 'correctness' of their own location decisions from the fact that other majors preceded them. Queried on this possibility, the respondent from Hitachi, the first among the four assemblers to build its own HDD factory in the Philippines, tended to think that his firm's decision to locate in the Philippines must have assured the other assemblers who were already contemplating to set up shop in the country. He noted that Hitachi's decision was made in spite of the country's bad investment publicity at the time, especially after the Wakaoji kidnap case.

However, when asked on the impact of Hitachi's locating in the Philippines on their subsequent location decision, respondents from the other HDD assembly firms, with the possible exception of Toshiba, claimed that they did not consciously take Hitachi's decision into consideration, since they themselves have had previous successful experiences of subcontracting with Philippine-based firms. It was rather this latter 'demonstration effect' which served as an important basis for their own decisions. To support their claim, the respondents noted that although they had not set up their own HDD assembly plants before Hitachi did, they had, in fact, come earlier than Hitachi in the business of HDD in the Philippines, that is, NEC-HK through Tsukiden, Toshiba through IMI and ICI, and Fujitsu through FujitsuTen. Although the Tokyo-based respondent of Toshiba did admit that the previous location decision of Hitachi was considered in its feasibility study, he was quick to insist that it was not a major consideration in Toshiba's final decision to locate in the Philippines.

Probably a more explicit case of imitative behavior can be found among component suppliers. By their own admission, some major and minor supplier firms located in the Philippines in order to be close to the HDD majors. Moreover, as mentioned earlier, many of

the present suppliers decided to relocate after the coming of three Japanese assemblers. The location decision of the four Japanese HDD assemblers and the potential spread of US firms already in the Asian mainland served as signaling device on the long-run possibilities of the country as a base for HDD production in South East Asia. Thus, what might appear superficially as purely imitative behavior or herd mentality in such location decisions might in fact be rooted in a strategic decision to ensure presence in a potentially important source of demand. Indeed, the 1996 report of the Japan Electronics Machinery Industry Association on the "Direction of the Southeast Asian Electronics Industry" provides a Japanese perspective of the relocation movements of Japanese firms in Asia (see Figure 1).

Figure 1.



The Philippines seems to be viewed as a relocation site for Japanese HDD component manufacturers presently based in Singapore and Malaysia, in the same way that Thailand had been chosen for automotive parts production, and Indonesia for audiovisual and household appliances. China's much lower wage costs are, on the other hand, a magnet for Japanese investments in low-end, highly labor-intensive production. Because of the growing concentration of the Japanese HDD assembly and components manufacturing in the Philippines, a respondent from a Tokyo headquarter noted that the country has started to be referred to as the 'second disk island' after Singapore.

Dispersion motive

One motive for the dispersion of the US' HDD industry in Asia was the quest for lower production cost. Thus, one sees, in particular, Seagate's successive investments from Singapore to Thailand and Malaysia and more recently to the Philippines and China as a strategy to exploit the differences in labor cost advantages available in the region. A similar dispersion effect by Japanese HDD assemblers is discernible with their relocation out of Japan to the Philippines. This is clear from the insistence of all respondents in our interviews on the location choice of the Philippines being premised on the relative abundance of workers, engineering and technical capabilities compared to other alternative sites. However, the dispersion effect in the Japanese case is presently much more limited in geographic spread than that observable for Seagate and other US HDD firms. Indeed, Fujitsu is the only Japanese HDD assembler¹⁰ that presently has an HDD manufacturing plant outside Japan and the Philippines. The main reason earlier cited as to why Fujitsu's decision to locate in Thailand did not induce other Japanese assemblers to follow was the tight labor market situation already prevalent at the time not only in Thailand but mainly so in Malaysia and

¹⁰ IBM-Japan, which has an HDD assembly plant in Thailand, does not have one in the Philippines, although it still subcontracts IBM-licensed HDDs with LFI through NEC HK.

Singapore. And interviews of Tokyo-based respondents have shown that there are as yet no current plans by any of the four majors to relocate to another site.

Another discernible difference in the management of Japanese subsidiaries is that there seems to be no tendency, even in the case of Fujitsu, to use its Thailand-trained engineers and managers to oversee the Philippine facility, unlike the Singaporean subsidiary of Seagate that has been managing other transplants in Thailand or China. Although some technical information exchange takes place between the Thai and the Philippine facilities of Fujitsu, no Japanese expatriate who has served at the Thai facility has been sent to manage the Philippine plant. All training still takes place in Japan and managers are sent directly from headquarters to the Philippines. According to the Fujitsu respondent, these two plants are kept parallel and are made to compete instead in terms of productivity. He cited one case where a technically more demanding and engineer-intensive HDD was assigned to the Philippines rather than Thailand because of the greater availability of engineers in the country. Moreover, he said that it was presently unthinkable for Filipinos to accept training from Thais but prefer to receive it directly from the Japanese. Explaining further, he said that the Thai facility has been in operation only for about four years, in contrast to Seagate's facilities in Singapore, so that the Thais are not yet perceived to be in a position to 'teach' workers in other countries.

In the case of component suppliers, some dispersion effects are also seen to be taking place, and probably to a much wider extent than in the case of assemblers. Nidec Philippines is now supplying spindle motors to assemblers after having exported them from its Thai subsidiary. It has also recently announced its plan to join with the Toshiba group to set up a plant in China for small motor production for HDDs. Japanese media manufacturers already relocated from Japan in the Asian mainland have expressed interest in putting up their production facilities in the country; and Singaporean components suppliers, such as CAM Mechatronics, have set up parallel plants and/or have completely relocated in the Philippines.

In general, therefore, one can say that the history of the Japanese HDD assembly industry outside Japan has been too short to observe the extent of the dispersion or spread effects discernible in the US HDD industry in Asia. On the other hand, given the tendency of Japanese assemblers to keep their value chain as short and as geographically concentrated as possible, it does not seem likely that they will develop a regional and global network of the nature and extent developed by US HDD firms. Japanese component manufacturers, on the other hand, appear to be more footloose, following US and Japanese assemblers to their relocation sites and thus in the process becoming more dispersed.

Industry-specific supply infrastructure

Deepening motive. A respondent at the Tokyo headquarters of Toshiba indicated that one of the main considerations that attracted the firm to the Philippines was the historical background of reliable production of HDD components and sub-assembly in the country. Further probing into this statement indicated that a major reason for the firm's decision to set up an assembly factory in the country was its previous experience of successful subcontracting (HSA) with domestic firms, especially IMI and ICI. This indicates a deepening motive whereby Japanese investors were attracted by the possibility of exploiting technical knowledge and capability already existing in the country (Brimble and Doner, 1998). The importance of this factor, though not underlined by the other major assemblers, is nevertheless implied by the fact that two other HDD assemblers mentioned that their decision to locate HDD assembly in the country had been preceded by similar HDD manufacturing in the country through OEM firms (NEC-HK subcontracting own-designed and IBM-licensed HDDs with Tsukiden, and, more recently, with Laguna Electronics, and Hitachi with Filipino-owned ICI and IMI). In particular, the Toshiba respondent noted that one of its component suppliers had successful sub-assembly work done for it by IMI. In addition, some Japanese or Singaporean component manufacturers, such as of PCBs, which have not yet established a manufacturing base in the Philippines are said to be subcontracting sub-assembly

work with IMI and ICI to supply Japanese assemblers in the country. Once production proves to be competitive and the volume of business warrants it, investment may follow in manufacturing plants. As earlier noted, in some cases, component manufacturers preceded HDD assemblers who relayed relevant information to the latter (e.g., Toshiba Semicon before Toshiba Information Equipment; Pretech before Hitachi; NEC Components before NEC Computer Storage Products).

This point seems to reveal an important feature of Japanese management strategy in the HDD industry, namely the 'testing of the waters' phase that often precedes long-term investments. It also seems to underline a more risk-averse attitude of Japanese multinational management than that of the American HDD firms which appear to be more nimble and risk-taking, as typified by Seagate's relatively rapid decisions to move assembly in and out of locations (such as in Thailand or Cebu, Philippines). On the other hand, this management style may be a function of size, since Japanese HDD assemblers generally belong to large conglomerates or very large multinationals whose HDD assembly is often only one division of its computer-related products department. Being such, the implied 'deeper pockets' of the Japanese HDD assemblers may explain to a large extent their longer "staying power" in a given location.

Further deepening has also taken place in terms of supply industry development in the form of local investments in facilities by Japanese manufacturers, which are either subsidiaries of the Japanese multinationals (e.g., Hitachi Components Philippines), members of the assemblers' *keiretsu* or independents (e.g., Nidec; Tsukuba Diecasting). Some respondents at Headquarters admitted that most Japanese assemblers buy components and sub-assemblies from other Japanese firms, but insisted that this was not a specific strategy, but is merely based on practicality, given the easier access to Japanese headquarters, where sourcing decisions are centralized, by Japanese component manufacturers in terms of geographic, linguistic, and cultural proximity. They stressed that if domestic (i.e., Filipino or other nationality-owned) component firms prove to be

more competitive, they can supplant Japanese component manufacturers, in view of the highly competitive nature of the industry. While sourcing decisions are still mainly centralized in Japanese headquarters, Philippine subsidiaries are given the right to suggest alternative sources which are then evaluated and compared with existing and other potential suppliers. Japanese respondents have also insisted that they do not usually ask or request their Japanese component suppliers to relocate with them to the country.¹¹ The reason is that they do not—better still, cannot—guarantee exclusive purchase of their suppliers' products, given the rather limited scope of their assembly production. Some of their own component suppliers have nevertheless followed them to the Philippines and have found business with them and other assemblers.

Admittedly, however, due mainly to the short history of the HDD industry in the country, industry-specific supply infrastructure can still be said to be shallow. Even among Japanese-owned component manufacturers operating in the country, there exist gaps, such as in the production of the more basic silicon wafer for recording heads,¹² media, MR heads, and even PCBs which have to be sourced either from Japanese parent firms or other suppliers based in East or Southeast Asia. As has been noted, however, some major and minor component suppliers both from Japan and Singapore have started to set up shop in the Philippines, leading possibly to what one of the Tokyo respondents foresees—the development of a concentrated base of suppliers in the Philippines in the long run.

¹¹ The extent to which Japanese assemblers actually influenced the relocation decisions of their suppliers remains an open question that merits further inquiry. None of the interviews of majors conducted thus far has elicited any admission of a direct influence exerted on suppliers' decision. On the other hand, there are indications that majors in Thailand, Singapore, and Malaysia actually orchestrated the entry of many of their suppliers and that the latter's decisions were not purely arms-length assessments of business prospects (Brimble and Doner, 1998; Haggard, Li, Ong, 1999).

¹² One must note, however, that even with the longer history of US HDD firms in Southeast Asia, wafer fabrication for heads has not been undertaken in the region.

Compared to the localization of Japanese-owned component firms, however, there has been little perceptible development of domestic, Filipino-owned and -managed supplier firms. Indeed, with the possible exception of consumer appliances, the entire electronics industry in the Philippines is characterized by a conspicuously low degree of backward linkage development. Although the electronics industry generates the highest proportion of the country's total exports and has been the fastest growing group of exports in the 1990s, exports are concentrated in semiconductors (about 75 percent of total electronics exports) and have local value added of less than 30 percent. After almost a quarter of a century when the first semiconductor firms invested in the Philippines (e.g., Intel), local supply has been limited mainly to indirect materials such as chemicals, packaging, plastic covers, etc.

There are only a few Filipino-owned firms that are capable of original equipment manufacturing (OEM), such as Integrated Microelectronics, Inc. and Ionics Circuits, Inc., which have the experience of subcontracting with both American and Japanese MNEs in the HDD industry. However, they are subject to fluctuating demand, because rapid technological change can easily displace them in favor of foreign-owned subsidiaries that have followed the HDD assemblers to the country. A concrete case is that of ICI that had to give up its subcontracted assembly work of head stacks for Japanese HDD makers, IBM-Japan and NEC HK, leading to a shutdown in its newly built plant,¹³ in favor of Laguna Electronics, a Japanese subsidiary.

¹³ This is an interesting case of how technological change can affect assembler-supplier firm relationships. Ionics Circuits, Inc. had to give up assembly work to Laguna Electronics. But such displacements are not limited to Filipino-owned firms. Tsukiden had to abandon assembly work for NEC HK in favor of LEI, although the latter is also a member of the Tsukiden Group. Haneda Corporation, a base and cover die caster, had to give up subcontracting for NEC HK to Tsukuba Diecasting and Mette, because the Haneda's base/cover was based on old HDD technology. But even Tsukuba Diecasting is aware of the possibility of being displaced by other suppliers once new technology is developed that will change the materials now being used for the base/cover it produces.

This constitutes an example of a possible displacement of a local by a Japanese firm. Although the goal of Filipino-owned OEM firms is to attain a stage of original brand manufacture (OBM), wherein it can design its own products and sell them in the world markets, there is little to suggest that this goal can be attained in the near future. Filipino-owned engineering firms have yet to acquire the technology and the expertise to provide specialized services, such as clean room provision and maintenance or the production of less sophisticated components, such as base plates and cover.

On the other hand, there are at present some Filipino-owned firms with some expertise that could be harnessed by the HDD industry, such as those engaged in PCB assembly, die and mold-making and metal casting. Japanese majors have expressed a desire to see such a local supply base develop in the country. This may be related to a deliberate effort of the Japanese government (see discussion below of JETRO-supported BOI project on backward linkage development) to encourage supplier-industry development in the Philippines.

Although the country does not yet possess a pool of engineering skills specific to the industry (such as precision engineering), there exists a vast pool of engineering and technical people that can be easily trained—and who are in fact rated as 'very trainable' by the majors themselves—for production and eventual transmission of skills to an even greater pool of operators. The NEC president stressed that while Singapore already has the necessary skills because of its relatively long history of continuous industrialization, engineers in the Philippines can be trained in a rather short time to reach comparable levels. One of the reasons why all HDD assembly and component producers are now clustered in the economic zones south of Metro Manila is proximity to the capital city where the more important public and private universities and technical colleges are found. These institutions are their main sources of fresh recruits for technical, managerial, and administrative positions.

Possibilities for agglomeration economies

The clear clustering of Japanese majors and components manufacturers in the export processing zones (EPZs) of Laguna and Cavite (see map) might suggest possibilities for agglomeration economies. Although there are EPZs other than those located in the Laguna-Cavite areas, the American (Read-Rite) and four Japanese assemblers have chosen to locate in Laguna: Toshiba, Hitachi and NEC Computer Storage in the Laguna Technopark (Biñan, Laguna), and Fujitsu and Read-Rite in Carmelray Industrial Park (Canlubang, Laguna). Of the 11 major and minor suppliers in our sample, seven (7) have also chosen to locate in Laguna: NEC Components in the Light Industry Science Park in Calamba, while six (6) are at the Laguna Technopark, close to Toshiba, Hitachi, and NEC. These are Nidec, TDK, Laguna Electronics, Filipino OEM manufacturers ICI and IMI, while Mette is near Fujitsu and Read-Rite in Carmelray Industrial Park. The other four are in Cavite, more or less an hour's drive by automotive transport from Laguna: Sunpino and San Technology in the Cavite EPZ (General Trias, Cavite), Haneda Corporation in People's Technology Complex (Carmona, Cavite), and Luzon Electronics in the Gateway Business Park, which is also where semiconductor firms have opted to locate, such as Intel and Angkor-Anam. Early-comers such as the American semiconductor firms that have invested in the country during the 1970s, can be found in older export zones, such as Texas Instruments in the Baguio Export Processing Zone (1979) and National Semiconductors in the Mactan Export Processing Zone in Cebu (1979). Most old semiconductor firms (including Intel, Philippines, 1974) and HDD firms (e.g., Sunward Technologies, now Read-Rite, Tsukiden), as well as new ones (Shindengen, Phil., 1995), started out in Metro Manila but have all expanded or built new plants in either Laguna or Cavite EPZs. On the other hand, American HDD major Seagate opted to locate in the New Cebu Township far from the cluster of HDD firms in Laguna and Cavite. Being more vertically integrated than Japanese assembly firms, Seagate is less reliant on Philippine-

based suppliers than on its existing regional and global network.¹⁴ That Seagate's location decision is motivated by a logic different from that of Japanese assemblers can be inferred from its recent consideration of moving into the Subic Freeport, home to FedEx's Asian hub, which will ensure efficient linkages with this network while allowing it to take advantage of the country's relative abundance of technical and semi-skilled labor.

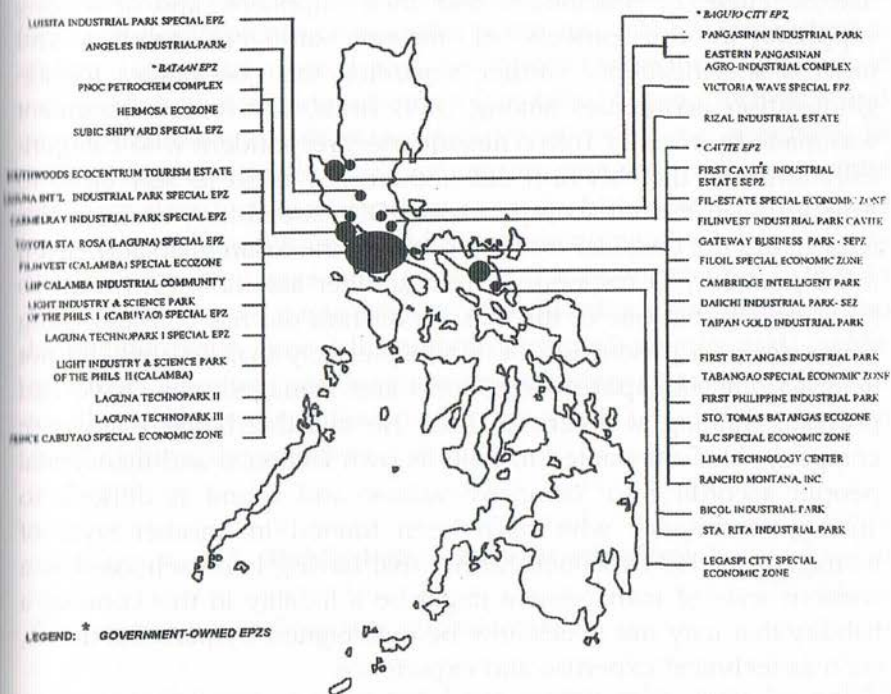
The observed tendency for Japanese components manufacturers to locate close to the assemblers concretizes the need for close interaction between them, especially at the beginning stages of production, a need that has been underlined by both assemblers and components manufacturers during the interviews. However, true agglomeration economies of the nature and scale at work in the developed countries, and to a certain extent in Singapore, are probably still non-existent. There is little, if any, interaction at the level of product or technology development between suppliers and assemblers because such activity takes place mainly among parent companies in Japan. The close interaction between assemblers and suppliers/subcontractors occurs at the level of the former ensuring that specifications are rigorously met by the latter. Hence, discussions take place mainly at the level of process modifications and adaptations whenever deemed necessary. This interaction can also be observed to be taking place among suppliers belonging to different segments of the value chain. First tier-suppliers like Nidec find it necessary to work closely with Tsukuba Die-casting on whose base it mounts the spindle motor. On the other hand, Tsukuba Die-casting, while having to receive instructions for specifications directly from Toshiba for the base and cover it supplies, must closely interact with Kapco for surface treatment and with P-Ton for plastic injection parts. Such agglomeration economies originating from collocation of suppliers is exemplified by the fact that lower-tier suppliers Kapco and P-Ton are located in the same compound as higher-tier supplier Tsukuba Die-casting.

¹⁴ The author is grateful to D. McKendrick for this plausible explanation of Seagate's decision to locate far from the Japanese HDD firm cluster.

THE PEZA ECONOMIC ZONES

(as of 30 April 1997)

LUZON



But while assemblers have similarly opted to locate close to one another in the zones, offering possibilities for agglomeration economies among them, there is little to suggest that this in fact is taking place. A respondent at Tokyo headquarters noted that Japanese society is a much less open one than that of the US, so that there is not much interaction among 'competitors.' The close interaction is limited, as discussed above, to the very narrow circle of assemblers and their suppliers, and/or among suppliers in the process of meeting stringent product and process specifications. Further, regarding the possibilities for agglomeration economies among HDD firms, a revealing statement was made by another Tokyo headquarters respondent who categorically affirmed that his firm did not see any need to stay close to American—nor even to Japanese—HDD assemblers, and for this reason, did not consider creating a base in the Asian mainland. Even more pointedly, a respondent from another assembly firm went so far as saying that one of the reasons his firm did not consider using Singapore as a production base was precisely that his firm did not want to hire Singaporean engineers and managers who have had previous training at American firms. He said that being a Japanese company, his firm wanted to train its own technical and managerial people according to 'company values' and found it difficult to 'manage managers' who have been trained in another style of management. He explained further that having been schooled in a western style of management might be a liability in this context, a liability that may not necessarily be outweighed by personal assets, such as technical expertise and experience.

On the other hand, this same respondent who was knowledgeable about the industry both in Japan and the US, having worked at the firm's US-based subsidiary for more than a decade, expressed doubts as to the degree of technical information-sharing presumed to take place among HDD firms even in the US. He was of the opinion that even there, the discussions generally do not go beyond HRD or labor-management relations, but that the agglomeration economies are realized mainly through the mobility of technical people, as when former IBM-trained personnel moved out to set up Seagate or

join other HDD firms. He noted, however, that such mobility is very low in the Japanese case, thus providing little possibility for agglomeration economies occurring through this route. Similarly, one cannot yet expect resource pooling among firms in a nascent industry that is yet to find its own dynamism. However, through informal gatherings, Japanese managers in the ecozones are said to discuss common problems, such as human resource development or industrial waste disposal. A respondent at Tokyo Headquarters said that he thinks externalities take place mainly due to a certain amount of mobility among technical and managerial people within the industry, allowing the possibility of information exchanges among them. In particular, Filipinos at the managerial or technical level are more mobile than their Japanese counterparts,¹⁵ and it is a well-known phenomenon in the industry that Filipino managers tend to move from one electronic firm to another. Moreover, some amount of technical exchange might also be taking place especially among technical people and middle managers who take part in committee meetings of the Semiconductor Electronics Industry Foundation, Inc. (SEIFI), of which a number of HDD firms are members.

3. Public Policies and Institutions

Non-industry specific supply infrastructure

The Philippines does not have a clear edge over its ASEAN neighbors in terms of availability and cost of non-specific infrastructure, such as industrial land and other utilities. The Services Group of the World Bank (World Bank, 1997) found that serviced industrial land (including utility connections) in major urban locations is priced higher in the Philippines than that in Vietnam, Malaysia, Thailand,

¹⁵ In contrast, China is perceived to be a potentially attractive investment destination. As the interviews revealed, this is a fact that has often frustrated Japanese HDD firms that have invested in the training of local personnel, in the hope that they will eventually replace Japanese managers.

and Indonesia, though lower than that in Taiwan. Similarly, construction prices for standard factory buildings also tend to be at the high end of the pricing range for the region. In the case of power supply, while the problem of shortage is no longer considered a major economic problem since the early 1990s when the government encouraged private sector generation of electricity, peak rates for electricity remain among the highest in the region—50 percent higher than in Thailand or Vietnam and about double those in major industrial countries except Japan. Moreover, peak water charges are higher than those prevailing in Vietnam and Thailand, although lower than those in Malaysia and Indonesia. Nevertheless, the Philippines seems to be generally at par with those in other neighboring countries, in so far as international telephone charges, sea freight rates, and air freight rates are concerned; indeed, they are found to be at the low end of the price range for the region. However, the Manila port facilities are congested, leading to higher cost of distribution due to longer waiting time (World Bank, 1997). This is an area critical to outward-oriented foreign direct investment that has to be addressed adequately and immediately.

To a large extent, the entry of private capital—especially in conjunction with Japanese capital, such as that of large trading companies—into the construction of economic zones, where the majority of HDD assemblers and components manufacturers have chosen to locate (see below), has provided better and more efficient infrastructure and facilities, including an international airport and port facilities in the former American base-turned ecozones, such as Clark and Subic. The interviews revealed a prevalent perception among Japanese respondents that the business environment in general has vastly improved in the country, particularly with respect to political stability and the peace and order situation,¹⁶ and even with respect to basic infrastructure.

¹⁶ In contrast, China is perceived to be a potentially attractive investment site by a number of survey respondents, although the drift of economic and political development is said not to be clear enough to warrant additional investments. At best, a wait-and-see attitude seems to prevail among respondents with regard to China.

Unlike Singapore, however, there are no policies or institutions that are specifically targeted to develop or attract the HDD industry, not even in terms of developing drive-related expertise. In general, except for some macroeconomic policies impacting on industrial sector development (such as import protection policy) or a few cases of industry-specific development programs, the Philippine government has at present no systematic 'industrial policy' to speak of, as in the tradition of some East Asian economies. While it is true that the Board of Investments annually issues a list of "preferred activities" under its Investment Priority Program, the list is so long and so diffuse as to allow distillation of any coherent objective of industrial policy that BOI might be pursuing. Possibly the closest one can get to an industry-specific policy are the Progressive Car Manufacturing Program and the Electronics Local Content Program of the 1980s. The latter was scrapped in 1986 and the former is in the process of being dismantled. There are, nevertheless, some macroeconomic and non-specific industry-relevant policies and institutions that have an indirect influence—whether positively or negatively—on the growth of the HDD industry.

Investment promotion policy

In an attempt to attract foreign capital and technology into the country, the Investment Incentives Act and subsequently the Export Incentives Act were passed into law in 1967 and 1970, respectively. The former created the Board of Investments whose main activity eventually became that of granting incentives under the two laws. In order to consolidate the different and overlapping incentives under these Acts, as well as to correct a number of biases inadvertently written into these two pieces of legislation, the Omnibus Investments Code (OIC) was passed in 1987. The major change in the incentives under the OIC was the granting of an income tax holiday (to replace tax credits on net value added in a previous legislation) to both exporters and non-exporters. The income tax holiday consisted of exemption from income taxes for six years for pioneer firms and four years for non-pioneer firms. The holiday could be extended to a maximum of eight years for pioneer and for six years for non-pioneer

firms, so long as certain conditions are met relating to capital intensity, the use of local materials and foreign exchange earnings. In addition, a 3-year income tax holiday was made available to expanding firms, proportionate to their expansion. This is the incentive most frequently mentioned by HDD firms interviewed, most of which were granted pioneer status: a 3-year income tax holiday for firms that are export-oriented. A strong boost to foreign investments, especially those that were export-oriented, came with the passage of the Foreign Investments Act (FIA) in 1991. This Act liberalized existing regulations by allowing foreign equity participation up to 100 percent in all investment areas not included in the Foreign Investment Negative List (FINL), so long as the enterprise was exporting at least 60 percent (instead of 70 percent under the OIC) of their output. The FINL was originally made up of three lists: List A (for areas designated under the Constitution or specific legislation as exclusive of foreign participation); List B (for areas where foreign investment is limited due to reasons of defense, risks to health and morals, and protection of SMEs), and List C (certain areas of investment in which already exists an adequate number of enterprises to serve the needs of the economy and where further foreign investment was not necessary). List C, however, had been empty for quite some time after the passage of the OIC and was subsequently scrapped in an amending legislation. Thus, the OIC of 1987 and the FIA of 1991 are important landmarks in the country's attempt to create an environment more conducive to exports, as well as to foreign direct investments. According to the World Bank (1993), the FIA of 1991 made the Philippine foreign investment regime resemble those of its Asian neighbors in structure and compares favorably in terms of equity allowances (except for Hong Kong). See Table 3 for a comparative picture of incentive systems in ASEAN. These two pieces of legislation, together with the more basic political and economic stability of the country, certainly set the stage for the entry, among others, of Japanese HDD major and minor firms during the mid-90s. The holiday for non-pioneer firms could be extended to a maximum of eight years for non-pioneer and for six years for non-pioneer

Table 3 - Comparison of Investment Incentive Policies in ASEAN

Incentives	Indonesia	Malaysia	Philippines	Singapore	Thailand
General Rules					
Maximum foreign equity for non-preferred firms (%)	80	50	Only specific industries restricted	Only specific industries restricted	50
Land Ownership by Foreigners	Only building	Generally unlimited	Lease only	Non-residential land only	Industrial land only 3-8
Regular Taxes					
Maximum corporate Income tax rate (%)	35	35 (plus dev't. tax)	35	31	30-35
Loss Carry forward (years)	5	Unlimited	None	Unlimited	5
R&D allowance	No	Yes	No	Yes	No
Accelerated Depreciation	Yes	No	No	Plant and machinery	Plant and machinery

Table 3 (continued)

Incentives	Indonesia	Malaysia	Philippines	Singapore	Thailand
Concessions to Promoted Firms					
Duty exemption on capital equipment	Yes	Yes	Yes	Yes	Yes
Exemption/credit for export duties on RMs	Yes	Yes	Yes	Yes	Yes
Income tax holiday (years)	No	5	Up to 8	5 - 10	3 - 8
Accelerated depreciation	All firms	Yes	No	All firms	All firms
Investment allowance	No	Up to 100% of income	100% of infrastructure expense	Up to 50% of investment	Partial exemption of export income
Additional export incentives	No	Double deduction on export promotion expenses	No	Partial exemption of export income	Partial exemption of export income

The interviews revealed that during the decision-making process on investment location, the package of financial/fiscal incentives offered by the Philippine government to foreign investors was evaluated and compared with those being provided by other ASEAN countries. However, none of the HDD majors volunteered this incentive policy as giving the Philippines a clear edge over competitive sites in other Asian countries. Generally, they considered the available incentives as being at par with those available in the rest of ASEAN, although a number expressed appreciation for the pioneer status they received entitling them to two more years of tax holidays in addition to the usual four years. This corroborates the finding by Manasan (1988) from about a decade ago that incentives in ASEAN are very similar to one another and merely cancel each other out in the investors' evaluation of potential host countries. It also bolsters the belief that the rest of ASEAN might have mimicked the Singaporean incentive package.¹⁷ On the other hand, the president of the Read-Rite subsidiary was the only respondent who mentioned financial incentives as one of the reasons why they stay in the Philippines. However, he noted that the Philippine government lags behind other ASEAN countries like Singapore and Malaysia in terms of incentives given for skills training.

Export processing zones had traditionally been out of the purview of the Board of Investments since their creation in the 1980s. They were directly supervised and managed by the Export Processing Zone Authority (EPZA). Since the passage of Republic Act 7916, or the Special Economic Zone Act of 1995, the Philippine Economic Zone Authority (PEZA) has taken full responsibility for the development and management of four government-owned EPZs, as well as for the nurturing of the privately developed and managed ones. As of April 15, 1997, as many as 56 such economic zones (ecozones) have been identified. All the HDD majors and minor supplier firms, without exception, are presently located in the ecozones. Being

¹⁷ There are, however, incentives that are not yet available in the Philippines but are provided in other ASEAN countries, such as land ownership (only lease holding is allowed in the country) and the Net Loss Carry Over (NOLCO).

export and free trade enterprises, they enjoy the incentives provided by the PEZA (Box 1). A number of these newer ecozones are partly leased and developed by Japanese trading firms which have facilitated the entry of Japanese electronic firms into the country through their marketing efforts in Japan. The cash-strapped Philippine government allowed private firms, including foreign ones, to lease and develop zones, thereby opening up more space and facilities for investors while encouraging both export growth and the advantages of efficient industry-related infrastructure. The emergence of such privately developed ecozones, that appear to be more dynamic and cost-effective than older, government-owned and developed export zones, has enhanced the overall climate of liberalization for foreign investments in the country.

Incentives for Export and Free Trade Enterprises

1. Corporate income tax exemption for 4 years to a maximum of 8 years
2. Exemption from duties and taxes on imported capital equipment, spare parts, materials, and supplies.
3. After the lapse of the income tax holiday (ITH), exemption from national and local taxes, in lieu thereof, special 5 percent tax rate
4. Tax credit for import substitution
5. Exemption from wharfage dues, export tax impost, fees
6. Tax credit on domestic capital equipment
7. Tax and duty-free importation of breeding stocks and genetic materials
8. Tax credit on domestic breeding stocks and genetic materials
9. Additional deduction for training expenses (labor and management)
10. Permanent resident status for foreign investors and immediate members of the family
11. Employment of foreign nationals

12. Additional deduction for labor expense (50 percent of wages corresponding to the increment in number of direct labor subject to certain conditions)
13. Exemption from SGS inspection
14. Simplified import-export procedures

In terms of incentives offered, although the incentives available at BOI and PEZA are generally similar,¹⁸ firms operating in the zones receive all the benefits available from BOI but are free from the restrictiveness of the Investment Priority Program (IPP)¹⁹ and from other BOI regulations²⁰ (World Bank, 1997). Moreover, unlike BOI, eligibility to incentives is automatically granted to firms located in the ecozones. It is therefore not surprising that in 1995, some 85 percent of approved investments in the highly export-oriented electronics industry was recorded by PEZA while only 15 percent registered under the BOI.

A recent World Bank comparison of government incentives provided by other EPZs in the region suggests that the country's package of benefits and other incentives is not only competitive²¹

¹⁸ However, PEZA-registered firms will have an edge over BOI-registered ones when an important incentive in the form of tax and duty exemption on imported capital equipment and its accompanying parts will have ceased to become available to BOI-registered firms (registered on or before 31 December 1994) by 31 December 1997 for firms located inside the National Capital Region (NCR) and by 31 December 1999 for those located outside NCR.

¹⁹ The IPP is a list of activities being promoted by the BOI and are eligible for incentives. Activities not included in the list are, therefore, unable to avail of the incentives.

²⁰ This includes prohibition to locate a factory in the national capital region, duty-drawback schemes for imported materials rather than duty-free importation, possibly higher effective tax rates.

²¹ This does not, however, preclude the fact that in some areas, the country's ecozone regime is less competitive than those in, say, Thailand or Malaysia. Such areas include: the lack of clarity of the ecozone concept, especially as it applies to non manufacturing activities; the uncompetitive impact of the gross income taxation approach; unclear policies governing sales to the local market; and excessively generous package of fiscal incentives in certain instances (World Bank, 1997, p. 79).

but can be easily considered "the most generous and flexible set of incentives available anywhere." Duty-free import privileges are said to be without parallel in its provision of full exceptions in perpetuity for export and free trade enterprises for almost all project-related inputs, whereas other countries either restrict such privilege to production-related items or those not available locally, or is made available only once. Moreover, the range of promoted activities in the country's ecozones is very broad, allowing services, utilities, infrastructure development, and tourism accommodations in addition to manufacturing. The country's ecozone is also said to be unique among East Asian programs in that incentives are provided to ecozone developers and other infrastructure providers (World Bank, 1997, p. 79). Being under the purview of the Philippine Economic Zone Authority (PEZA), ecozones enjoy the benefits of a more efficient bureaucracy that simplifies procedures, coordinates the activities of national and local public agencies affecting investors (such as payment of national and local taxes) and, in general, reduces the costs of importation. One will note among the incentives listed in Box 1 are the exemption from SGS inspection and simplified import-export procedures. Problems associated with government bureaucratic procedures, especially Customs, tend to present problems for firms located outside the zones. Respondents located in the zones, however, said that they had little problems associated with the government bureaucracy, and not even with the Customs Office. On the other hand, both public and private ecozones in the country have been found to be least competitive in ASEAN, except possibly for those of Indonesia. This is because the purchase price of serviced industrial land, construction costs, and factory shell rental rates are at the high end of the range, worsened by more expensive power and less efficient transport infrastructure (World Bank, 1997).

Trade policy

The problems spawned by the protracted import-substituting protection policy in the Philippines have been well documented (see Bautista, Power, and Associates, 1979; Medalla, Tecson and Associates, 1995, 1996). The government thus embarked on a Trade Policy

Reform program starting 1981 and will culminate in the adoption of a uniform 5 percent tariff policy in 2004. The program is two-pronged: a tariff policy reform designed to gradually lower tariff levels and differentials across commodities and industries, and a trade liberalization program that would dismantle quantitative restrictions on imports, tariffify them, and include them under the overall tariff reduction program. So far, the results have been generally in the direction anticipated by policymakers: much lower and less dispersed effective rates of protection, signs of improved allocative efficiency in the manufacturing sector, reduction in industrial concentration, and a more vigorous small and medium enterprise sector.

Strictly speaking, the HDD industry is not affected directly by the above policy since being wholly export-oriented, HDD firms can import their raw materials and components duty free. However, the fact that import barriers have remained relatively high means that to facilitate importation, they would do well to locate in export-processing zones. Otherwise, they will have to incur the additional costs associated with the duty-drawback system or the use of bonded manufacturing warehouses,²² the means typically used by export-oriented firms located outside the zones and registered under the BOI. These zones therefore derive their basic rationale from the need to isolate export-oriented industries and firms from those that sell to domestic markets. Indeed, the moment firms in such zones sell to domestic rather than a foreign clientele, they lose their duty-free importation privilege, at least on that portion sold domestically. Thus, a regime of very low import barriers (such as in Singapore) towards which the Philippines is moving can be expected to reduce the need for export processing zones. It will not, however, remove the need for them altogether. This is

²² The transaction costs typically involves the foregone interest (or interest payments made, if borrowed) on duties paid for imported parts/components or machinery while the evaluation procedure on the duty drawback is ongoing. In the case of bonded manufacturing warehouses, actual payments are involved to maintain one, not counting the 'informal' payments made to facilitate movement of goods in and out of the bonded warehouse.

because apart from duty-free importation, distinct advantages exist to locating in such zones. These have something to do with the reduction in the cost of doing business, improved infrastructure, and possible agglomeration effects.

Local content policy: the Electronics

Local Content Program

The Electronics Local Content Program (ELCP) was adopted by the BOI in 1975 under pressure from electronic parts and component manufacturers and was applied to audio-visual appliances. It required assemblers to source from local suppliers parts and components included in a list drawn up by the government. The program was eventually scrapped in 1986 and has been generally judged as having failed to promote the development of the supplier industry. Although the HDD industry could not have directly benefited from it (since it was scrapped before the industry was born in the Philippines and since being export-oriented, it would not have fallen under the scope of the program), there might be an indirect benefit to the extent that the program had somewhat helped to induce the creation of some expertise in metal and plastic injection. Although no local supplier has yet emerged in die-casting (e.g., of base and cover for HDDs), this is a potential area for development relevant to the HDD industry.

It might be useful at this point to mention the weaknesses of the ELCP and its failure to develop a viable support industry to electronics. The major difficulty cited is that it was more regulatory than promotional. It forced assemblers to source locally, on the questionable assumption that this would automatically induce the emergence of a network of parts and components manufacturers. There were no measures or incentives to upgrade the quality and cost-competitiveness of the supplier firms, who could not cope with the cost-quality-delivery requirements of assemblers. The latter were thus forced to settle for high-priced, low-quality parts and components, which in turn discouraged all possibilities for export-orientation. This, in turn, limited the growth of assemblers' demand and output, and hence

their demand for parts and components. On the other hand, knowing fully well the difficulties faced by assemblers as a result of the local content policy, the government was forced to make eligible in-house production of parts and components as satisfying the local content regulation. Assemblers who were price and quality conscious were thus driven to rely more on in-house production (which constituted in the end about 50 percent of the value of local content induced by the program) thus reducing the possibility of greater inter-firm linkages and specialization, and eventually undermining the development of the local supporting industry.

The experience of ELCP underlines the importance of directly addressing the problem of backward linkage development in the country. While Singapore addressed it through its industry-upgrading programs and the provision of skills training and assistance on the technology side, the Philippines has not been active in the provision of collective goods. Recently, however, in place of the local content policy, a more positive approach is being undertaken by the BOI under its Backward Linkage Program. Launched in 1995, it seeks to encourage assembler-manufacturers to subcontract their component requirements and to transfer technology to local suppliers. It has, to date, three sub-projects: the Assembler-Supplier Matching Program, the Center-Satellite Pilot Project, and the BOI-JETRO Support Industry Promotion Project. Of the three, the second and the third involve the extension of technical assistance to supplier firms. In particular, the third is more focused on upgrading the capabilities of local suppliers in the metal press and plastic injection sectors to meet the standards of Japanese assemblers in the country and abroad. It can thus have potential benefits to the HDD industry in terms of development of local suppliers of die-cast base and cover. It should be noted that the project is funded by the Japan External Trade Organization (JETRO) and involves Japanese consultants, a possible indication that the Japanese are interested in actually developing the local supplier industry, starting from metal and plastic injection, where studies have shown local firms to have some expertise that could be further developed. The Japanese government is also actively supporting a project in the Metals Research

Industry Development Council (MIRDC), specifically in the area of tools and dies.

Technical education and skills training

Most of the good engineering colleges and universities are located in Metro Manila, so that locating in the zones which lie south of the National Capital Region somewhat eases the problem of recruitment of technical people. However, since Laguna and Cavite are still in the countryside vis-à-vis Metro Manila, it still takes some strong motivation and possibly added incentives on the part of the firm to coax them to either relocate to these places or bear the burden of commuting. On the other hand, even this might become less of a problem in the future since the current movement of land development for residential use is definitely in the direction of these adjoining provinces.

The more serious problem lies in the weaknesses of the technical training being given in all but the top universities and state colleges that offer engineering and technical courses. And even the best engineering schools are plagued by lack of finance, leading to a serious lack of equipment and more seriously, a technically relevant and strong engineering faculty. Possibly the foremost engineering department in the country, that is, in the University of the Philippines, is continually facing the problem of losing its faculty members in the electronics and communications engineering department to the private sector, particularly to foreign electronics firms. The country's technical training system under the responsibility of TESDA (Technical Education and Skills Development Authority) has been found to be both ill-managed and under-financed, having the lowest per capita expenditure in the region, with the exception of Bangladesh (WB, 1997). The curricula of engineering and technical schools typically do not address the technological needs of industry and hardly receive inputs from the industrial sector. Some state and technical colleges have tried to address this problem by requiring their students to undergo hands-on training or apprenticeship in electrical and electronics firms to become eligible for graduation.

However, the poor quality of engineering and technical education cannot be adequately compensated for by OJT. On the other hand, the implication is that the private manufacturing sector will have to and does invest quite substantially in worker training. Yet, unlike in other countries such as Singapore and even Malaysia, the Philippines does not make available any meaningful incentives to encourage more of it to be undertaken.

That little effort at the technological front is being expended is readily obvious from the low levels of R&D²³ in the country. And while R&D is said to be predominantly undertaken by the public sector, the government agency responsible for it—that is, the Department of Science and Technology (DOST)—spent no more than 0.02 percent of GDP in such related activities in 1995. Given such low levels of technological effort, it is not surprising that an indigenous supplier base is only very slowly emerging, if at all, in response to the more than two decades of existence of the electronics sector in the country. And unless something is done to create a more proactive and relevant technological environment in the country, it is not evident that the development of the HDD industry will make any significant difference in terms of deepening the country's indigenous industrial base.

4. Summary and Concluding Remarks

Possibly in much the same way that US HDD firms, led by Seagate, had chosen to locate in Singapore in the 1980s, the major Japanese multinationals have opted to make the Philippines their assembly point in Asia in the 90s. Such investments have to be seen in the context of a more general relocation of the Japanese HDD industry overseas occurring during this decade. Although Japanese

²³ As in most activities for which little attention of government is accorded, there are no recent hard data on R&D activity in the country, the 'latest' R&D-GDP ratio being available for 1984, i.e., at 0.1 percent. There is little to suggest that this ratio has changed much since.

direct investments in Asia were driven in the 1980s by the *endaka* following the Plaza Accord, the HDD industry did not seem to be in a position to relocate outside Japan at the time. On the other hand, the investment climate in the Philippines was inauspicious during the 1980s, so that the country missed out on the rather large wave of Japanese investments that flowed naturally to other Asian countries. However, by the time the Japanese HDD firms were ready to move overseas, the Philippines had recovered its political and economic stability. The steep *endaka* that occurred in 1994 was thus followed by the successive entry into the country of the four Japanese HDD assembly firms, as well as their suppliers. The choice of the Philippines as a location for Japanese HDD investments has two distinguishing features not similarly observed in other ASEAN countries. These are: (1) the concentration in the country of the four major Japanese HDD assemblers and their growing supply network; and (2) the choice of the country as the sole location of HDD assembly outside Japan for three out of the four Japanese assembly firms. Conspicuous is the near absence of US HDD firms' investments in the country.

The motivations for such a choice are different between assembly and supplier firms. The former have cited three factors, namely, the strategic location of the country, the relative abundance of workers, particularly of engineers and technicians, and worker trainability especially in terms of their English language proficiency. On the other hand, the supplier firms chose the Philippines "to be near the majors," that is, in view of the actual and potential business generated by the assembly firms.

Other possible motivations were explored during the interviews. First, the 'imitative behavior' or 'bandwagon effect' could not be strongly asserted for assembly firms. Only one major—Toshiba—admitted to having considered the decision of other assembly firms in their choice of locating in the country.²⁴ Although Hitachi, the

²⁴ And even in this one exception, the Tokyo-based respondent was quick to insist that it was not a major consideration in its location decision.

first Japanese HDD assembler to open a plant in the country, tends to think that its decision might have influenced that of the later-comers, the latter have asserted that their decisions have been made entirely on the basis of their own investigations and, more importantly, of their earlier experience of successful subcontracting with Philippine firms. Even Hitachi admitted having been strongly influenced by the experience of production in the country by one of its component suppliers. The 'imitative behavior' explanation for assembly firms, thus, appears relevant, but only if recast in terms of the 'demonstrated success' of the Philippines as a production location. On the other hand, the 'imitative behavior' seems more *a propos* to component suppliers' decisions, but again, only when seen as a strategic positioning in a growing market resulting from the presence of the assemblers.

Second, the dispersion motive observed in the spread of US HDD firms in mainland Asia is observable in the Japanese assembly firms' decision to relocate in the Philippines in search of plentiful and cheap labor. A similar, though more extensive, dispersion effect is seen for Japanese supplier firms which decided earlier than the majority of the assemblers to relocate in the Asian mainland in order to stay close to mainly American assemblers already in operation there. And when the rest of the Japanese assemblers decided to move to the Philippines after 1994, the Japanese suppliers again followed them to the country.

Third, the presence of some amount of industry-specific supply infrastructure seems to have been a positive element in the decision taken by both assembly and supplier firms to locate in the Philippines. Due to a history dating back to the late 1980s of HDD assembly subcontracting by Japanese assembler NEC HK with Tsukiden, of sub-assembly subcontracting with two Filipino-owned firms IMI and ICI, as well as the presence of an American sub-assembly firm, Sunward (eventually Read-Rite), a handful of supplier firms mainly Japanese, had earlier moved to the country. Thus, one can observe a deepening motive wherein an existing, though limited, local supply base attracted more investments into the industry.

And as the industry develops, reinvestments are being undertaken to exploit the growing knowledge and skill-intensive capabilities of the managerial and technical workforce. One cannot help noting, however, that the development of an indigenous supplier base has been slow and may in a sense even be hampered by the growing concentration of Japanese supplier firms in the country. Thus, although there is an emerging trend towards sourcing concentration by assembly firms from two locations, namely Japan and the Philippines, the latter refers mainly to Japanese-owned supply sources.

Finally, the possibilities for agglomeration economies appear very limited at present, although the clustering of both assemblers and supplier firms in the Laguna-Cavite ecozones offers opportunities for such economies in the future. Currently, however, interaction takes place mainly between assemblers and supplier firms, as well as among supplier firms, and is limited to ensuring that product specifications are met. Exchanges among assemblers are believed to take place mainly to find solutions to common problems, such as human resource development or waste disposal. Some cultural reasons might also explain the weaker tendency of Japanese assembly firms to engage in cooperative activities with competitors, reasons however that might eventually be eroded by the demands of fierce competition within the global HDD industry.

With regard to the role of public policy, there are no specific policies that target the attraction and development of FDI in the industry. Although electronics is among the so-called export winners being encouraged by the government (though without any additional incentives in the formal sense), the HDD industry has not been singled out for development. There had been an Electronics Local Content Program in the 1980s, but this had been phased out years before the entry of the industry in the late 1980s. Moreover, being export-oriented, it would not have been covered by the Program anyway. From hindsight, however, the industry might be indirectly deriving some benefit from the Program, to the extent that the Program encouraged the growth of the tool and die-cast or the metal and plastic injection industries.

A number of macroeconomic policy reforms in the late 1980s and the 90s may have favored the entry of FDI in the industry. These are the on-going trade policy reform which reduced systematically the bias against exports, the Foreign Investments Act that greatly liberalized foreign equity ownership, the successive amendments of the Investment Incentives law in the attempt to align the country's investment incentives with those of other ASEAN countries, and the creation of privately owned ecozones which, though still uncompetitive in certain cost aspects relative to other ecozones in the region, nevertheless eased infrastructure and bureaucratic bottlenecks for investors.

Possibly the greatest obstacle to the long-run development of the industry in the country lies, however, in the serious weaknesses in terms of the quality and extent of technical training as well as of the extent of technological effort available in the country today. Such weaknesses certainly compromise the development of an indigenous supplier base and the overall long-run attractiveness of the country as a location site for the industry.

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